



FISH PASSAGE CENTER

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MEMORANDUM

TO: Charles Morrill, WDFW

Michele DeHart

FROM: Michele DeHart

DATE: April 13, 2015

SUBJECT: Opportunities to use increased spill to reduce impact of anticipated low flows in 2015.

In response to your request, the Fish Passage Center (FPC) staff has discussed whether increased spill at the Snake River FCRPS projects would be used as a tool to reduce the impact of the anticipated low flows in 2015. In response to a request from the Nez Perce Tribe in 2011, the FPC provided an extensive review of analyses that documented the benefits of increased spill proportions on juvenile survivals and fish travel times (July 14, 2011). Below is a brief synopsis of the findings from these analyses. We have attached a copy of this July 14, 2011, memorandum for your reference.

- Increasing the proportion of spill provided for fish passage at hydroelectric projects has resulted in higher juvenile spring/summer Chinook, fall Chinook, sockeye and steelhead survival and faster juvenile fish travel time through the FCRPS.
- Increasing spill proportion provides mitigation for low flows through the hydrosystem. In observations of years with similar flow and water travel time, juvenile fish survival and fish travel time are improved in years with higher average spill.
- Spill proportion and water travel time (i.e., flow) are correlated with smolt-to-adult return rate. Increasing spill proportion and faster water travel time (i.e., higher flow) result in higher smolt-to-adult return rate.
- Fresh water passage conditions affect early ocean survival. Spill proportion and water travel time affect ocean survival of Chinook and steelhead.
- Increasing spill proportion allows a higher proportion of downstream migrants to avoid power house passage. Powerhouse passage through juvenile bypass systems decreases smolt-to-adult return rates. Direct estimates of project survival do not capture the delayed mortality effect of project passage and therefore underestimate project impact on juvenile survival and adult return.

- Model simulations indicate that juvenile survival could be significantly increased and juvenile fish travel time could be decreased by increasing spill proportion in low flow periods.

Opportunities in 2015

According to the April 6, 2015, STP Forecast, flows at Lower Granite Dam (LGR) are expected to average approximately 65.1 Kcfs for the period of April 6 to June 20, 2015. This average flow level is well below the Biological Opinion flow objective of 85 Kcfs for the spring period. Also according to the STP, daily flows are expected to peak at LGR at 86.5 Kcfs in late May (May 26th). Based on these forecasted flows and the 2015 Fish Operations Plan (2015 FOP), below is a list of where and how spill can be increased at the Snake River FCRPS projects in order to reduce the impact of these predicted low flows. For illustrative purposes, we modeled these spill levels at each of the Snake River projects, in comparison with the 2015 FOP spill levels. The modeled spill relied on the predicted daily average flows for LGR from the April 6, 2015, STP. We assumed these same daily flow at all four Snake River projects. Both the FOP and the modeled spill levels assumed the same power house minimums of approximately 12 Kcfs at LGR and LMN, 11.5 Kcfs at LGS, and 10.5 Kcfs at IHR.

Lower Granite Dam

According to the 2015 FOP, spring spill at LGR is 20 Kcfs (24 hours) from April 3rd to June 20th. To reduce the impacts of the anticipated low flow conditions, spill at LGR could be increased up to the 115%/120% gas cap, which is estimated to be approximately 40 Kcfs. Based on the daily flows from the April 6, 2015, STP for the April 6–June 20 period, gas cap spill at LGR could result in an average spill proportion of approximately 0.63, with daily spill proportions ranging from 0.46 to 0.77 (Figure 1). The 2015 FOP spill level of 20 Kcfs resulted in an average spill proportion of approximately 0.32, with daily spill proportions in the 0.23 to 0.46 range (Figure 1).

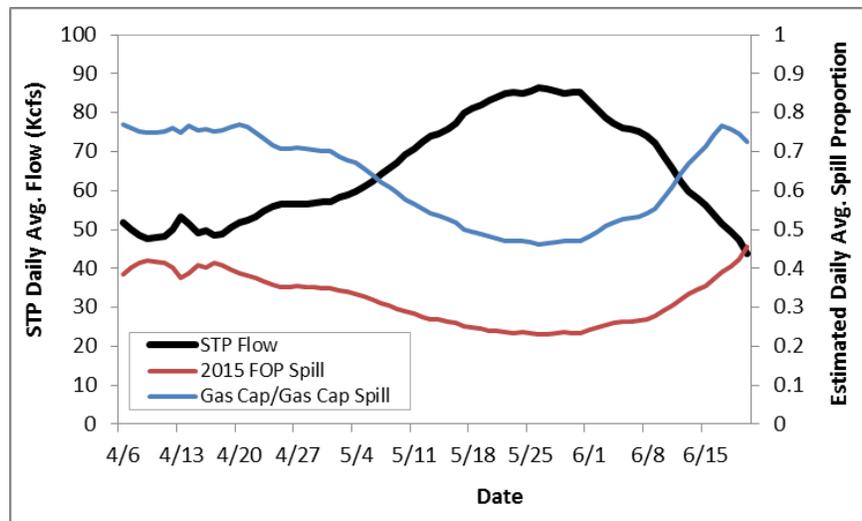


Figure 1. Predicted daily average flow (April 6, 2015, STP) and estimated daily average spill proportion at LGR under the 2015 FOP (20 Kcfs/20 Kcfs) versus Gas Cap/Gas Cap (~40 Kcfs).

Little Goose Dam

The 2015 FOP calls for 30% spill (24 hours) at Little Goose Dam (LGS) for the entire period of April 3rd to August 31st. To reduce the impacts of the anticipated low flow conditions, spill at LGS could be increased up to the 115%/120% gas cap, which is estimated to be approximately 40 Kcfs. Based on the April 6, 2015, STP for the April 6 to June 20 period, increasing spill at LGS to the gas cap could result in an average spill proportion of approximately 0.63, with daily spill proportions ranging from 0.46 to 0.77 (Figure 2). According to the April 6, 2015, STP, flows in the Snake River are never expected to exceed powerhouse capacity. Therefore, the 2015 FOP spill level of 30%/30% resulted in a daily spill proportion of 0.30 for the entire April 6 to June 20 period (Figure 2).

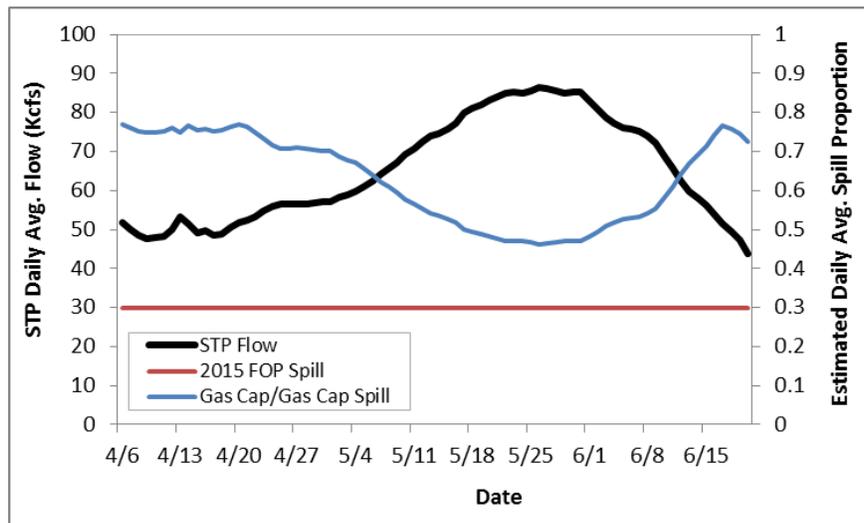


Figure 2. Predicted daily average flow (April 6, 2015, STP) and estimated daily average spill proportion at LGS under the 2015 FOP (30%/30%) versus Gas Cap/Gas Cap (~40 Kcfs).

Lower Monumental Dam

The 2015 FOP calls for gas cap spill at Lower Monumental Dam (LMN) in the spring (April 3 to June 20). While the 2015 FOP already calls for gas cap spill in the spring, there is still an opportunity for increasing spill at this project. The 2015 FOP calls for the bulk spill pattern up to flows of about 140 Kcfs. According to the April 6, 2015, STP, flows of 140 Kcfs are not expected to occur in 2015. Therefore, under the 2015 FOP, spill during spring is expected to occur under the bulk pattern for the entire time. Under the bulk spill pattern, spill is generally capped at or below 28 Kcfs. If the uniform pattern were to be used instead, the spill cap at LMN could be increased to approximately 37 Kcfs. Based on the daily flows from the April 6, 2015, STP for the April 6–June 20 period, gas cap spill under the uniform pattern at LMN could result in an average spill proportion of approximately 0.59, with daily spill proportions ranging from 0.43 to 0.76 (Figure 3). The bulk spill pattern that is prescribed in the 2015 FOP resulted in an average spill proportion of approximately 0.45, with daily spill proportions in the 0.32 to 0.64 range (Figure 3).

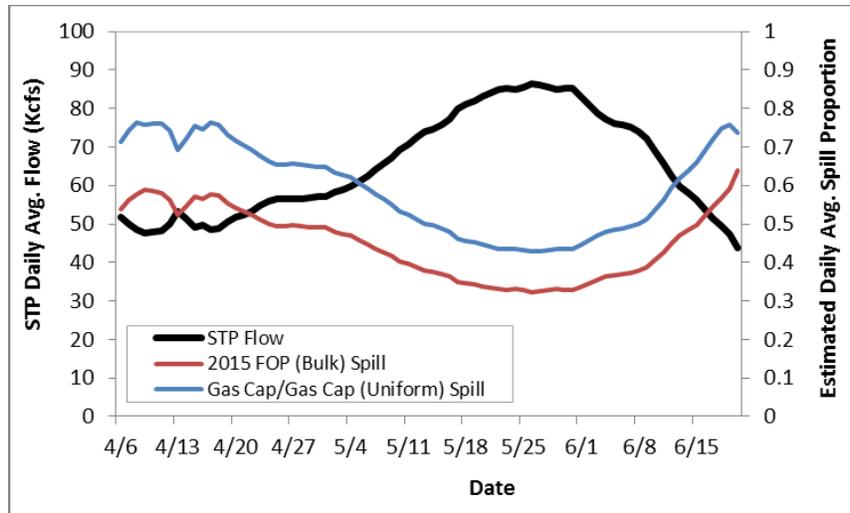


Figure 3. Predicted daily average flow (April 6, 2015, STP) and estimated daily average spill proportion at LMN under the 2015 FOP (Gas Cap/Gas Cap bulk pattern) versus Gas Cap/Gas Cap uniform pattern. Gas caps were assumed to be 28 Kcfs under “Bulk” pattern and 37 Kcfs under “Uniform” pattern for the entire period.

Ice Harbor Dam

The 2015 FOP calls for alternating spill levels at Ice Harbor Dam (IHR). From April 3rd to about April 28th, spill at IHR will be 45 Kcfs during the daytime hours (0500–1800) and Gas Cap at night (1800–0500). Beginning on April 28th, spill will alternate between 45 Kcfs/Gas Cap and 30%/30%, approximately every two days. This alternating schedule will run through July 13th, when spill will resume at the 45 Kcfs/Gas Cap level through August 31st. At the April 9, 2015, Fish Passage Operations and Maintenance meeting, the spill schedule was modified to include 30% spill from April 10th to April 14th for a test of the RSW. Spill levels on May 4th to May 6th and May 8th to May 10th were changed from 30%/30% to the 45 Kcfs/Gas Cap in order to make up for the reduced spill in the April test period.

Under the 45 Kcfs/Gas Cap treatment, the only opportunity for increasing spill would be to provide gas cap spill during the daytime hours. However, this would likely result in only a small amount of increased spill under the low flow levels that are currently being predicted for the Snake River. The larger opportunity for increased spill at IHR would be on the 30%/30% spill treatment days when spill could be increased to Gas Cap, which is generally about 92 Kcfs. Based on the daily flows from the April 6, 2015, STP for the April 6–June 20 period, 24-hour gas cap spill at IHR could result in an average spill proportion of approximately 0.83, with daily spill proportions ranging from 0.76 to 0.88 (Figure 4). The 2015 FOP spill levels (45 Kcfs/Gas Cap and 30%/30%) resulted in an average spill proportion of approximately 0.60, with daily spill proportions in the 0.30 to 0.81 range (Figure 4).

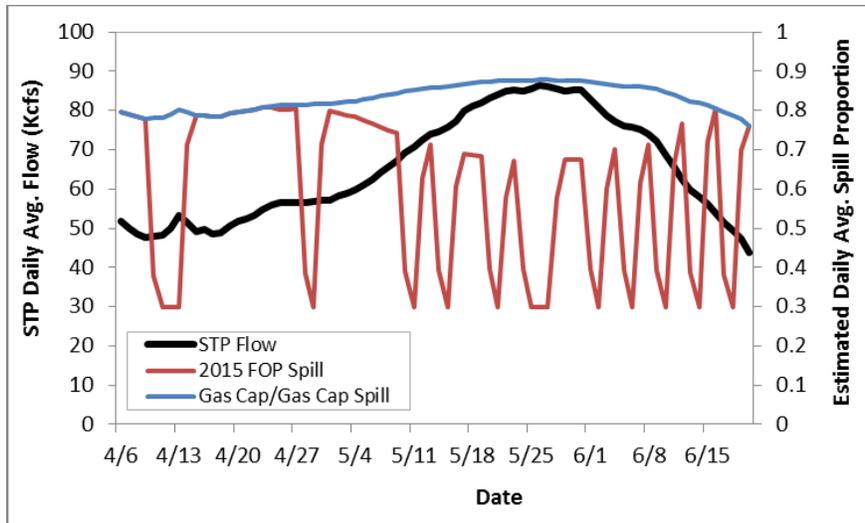


Figure 4. Predicted daily average flow (April 6, 2015, STP) and estimated daily average spill proportion at IHR under the 2015 FOP (45 Kcfs/Gas Cap and 30%/30%) versus Gas Cap/Gas Cap.