Appendix H

2012

Dworshak Operations

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1. Introduction

The 2010 BiOp calls for specific actions at Dworshak Dam during the salmon migration to meet temperature objectives for the lower Snake River. This Appendix describes the 2012 Dworshak Dam summer operations and its affect on the lower Snake River water temperatures.

2. Dworshak Operations

The 2010 BiOp, RPA Actions 4 and 15 call for the following Dworshak Dam specific actions. Each action is listed below in *italics* followed by the Corps' response to the actions in 2012:

<u>RPA Action 4:</u>

1. *Refill the (Dworshak) reservoir by about June 30 to 1600 feet.*

Dworshak reservoir was refilled to elevation 1600 feet on July 1, 2012. Daily inflow into Dworshak reservoir averaged about 17 kcfs during the April through June time period.

2. *Draft the reservoir to elevation 1535 feet by the end of August and elevation 1520 feet (80 feet from full) by the end of September unless modified per the Agreement between the U.S. and the Nez Perce Tribe for water use in the Dworshak Dam.*

Dworshak reservoir was drafted to elevation 1535 feet on August 31, 2012, and drafted to elevation 1520 feet on September 19, 2012 consistent with the agreement with the Nez Perce Tribe.

3. *Regulate outflow temperatures to attempt to maintain water temperatures at Lower Granite Dam tailwater at or below the water quality standard of 68° F.*

Dworshak reservoir outflows were managed to maintain water temperatures at Lower Granite Dam tailwater below 68°F as shown on Figure H-1. The average daily tailwater temperature at Lower Granite Dam did not exceeded 68°F during 2012. Between July 9 and September 19, Dworshak Dam released the maximum volume of water (13.1 kcfs) without exceeding the 110 percent TDG standard. Released water temperatures averaged 46.7º F, with a range between 44.5º F to 49.9º F. Dworshak seasonal average release temperatures during the flow augmentation season from 1999-2012 are shown on Figure H-2. Dworshak operations were coordinated at TMT meetings eight times during June through September 2012, as shown on Table H-1.

Figure H-1
Lower Granite and Dworshak Tailwater Temperatures
July 1- September 22, 2012

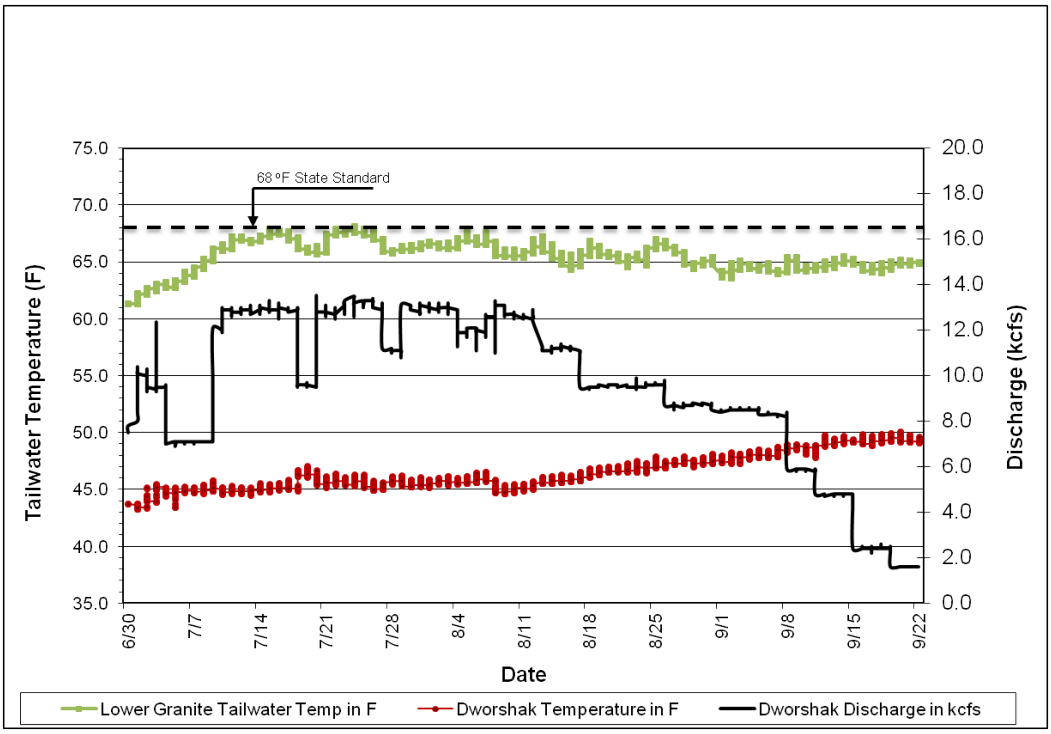


Figure H-2
Dworshak Dam Seasonal Average Release Temperature
1999-2012

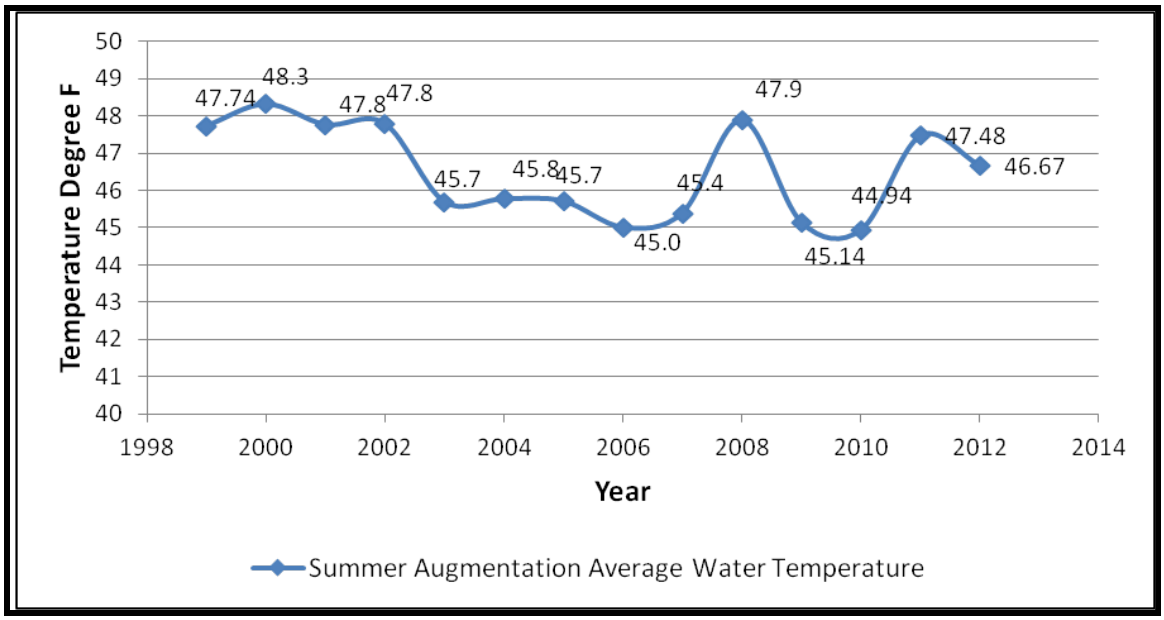


Table H-1
Dworshak Summer Operation Coordination with TMT
July 1 - September 22, 2012

TMT Meeting Date	Presented CE-QUAL-W2 Results at TMT	TMT Coordinated DWR Discharges in kcfs	TMT Coordinated DWR Discharges Temperature
6/20/2012	Yes	7.5	45°F
7/11/2012	Yes	12.5	Continue45°F
7/18/2012	Yes	9.5	Continue 45°F
7/25/2012	Yes	13.3 + 3.6 spill	Continue 45°F
8/8/2012	Yes	12.5	44°F
8/15/2012	Yes	11.0	Continue 44°F
8/22/2012	Yes	8.5	Continue 44°F
9/12/2012	No	5.8	Continue 44°F

RPA Action 15:

1. *Continued development of the CE-QUAL-W2 model for estimating river temperatures from Dworshak Dam on the Clearwater and Upper Snake River near the confluence with the Grand Ronde River (Anatone gauge) through the four lower Snake River dams to assist in real-time decision making for Dworshak Dam operations.*

The CE-QUAL-W2 model was used from June 12, 2012 to August 24, 2012 to support decisions regarding operation of Dworshak Dam for flow augmentation and temperature management on the lower Snake River. The results were presented and discussed routinely with TMT members and FCRPS Action Agencies to develop best management strategies (Table H-1). By September 2012, the ambient temperatures and daily solar radiation cumulative totals were low enough that further model computations did not forecast a likelihood of exceeding 68.0°F below Lower Granite Dam for the remainder for the water year.

3. Dworshak Dam Storage Project Operations Summary

In 2012, water from Dworshak reservoir was drafted to meet BiOp reservoir pool elevations and/or for temperature moderation in the lower Snake River. These operations began on July 9 and ended on September 19, when the Dworshak reservoir elevation reached 1520 ft. TMT made specific requests for temperature moderation on August 8, 15 and 22 (see Table H-1). For a significant portion of the summer period Dworshak releases were driven by the 110 percent TDG Idaho water quality standard. These operations resulted in a peak release rate of 13.5 kcfs and an average rate of 10 kcfs between July 9 and September 19.

4. Effects of Cold Water Releases on Lower Granite Dam Tailwater Temperatures

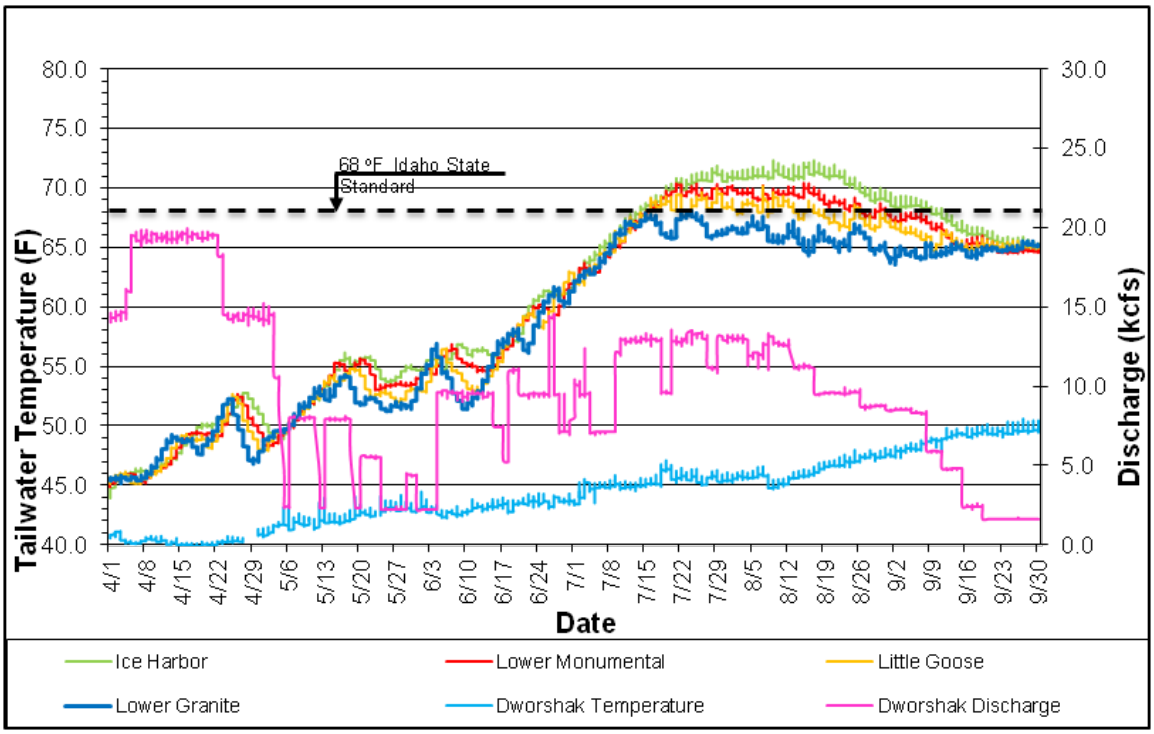
The daily average tailwater temperatures at Lower Granite Dam did not exceed 68°F from July 1, 2012 to September 30, 2012 primarily because of these factors:

1) Adequate snow pack and inflows.
2) Dworshak cool water releases throughout the summer.
3) Cooler average ambient temperatures and lower cumulative solar heating later in the summer.

Water year 2012 resulted in above average inflows to Dworshak Reservoir, similar to many other tributary basins in the Snake River watershed. An average snowpack (ranging from 88 percent to 140 percent of normal in June, depending on the station) and gradual thawing provided adequate and reliable inflows. The cooler ambient air temperatures during mid- August through September decreased the risk of exceeding the 68°F temperature standard.

As Figure H-3 shows, the Dworshak Dam cool water releases also reduced water temperatures in the lower Snake River reservoirs downstream from Lower Granite Dam. Although the lower Snake River water temperatures exceeded 68°F at Ice Harbor, it was still lower than it would have been without the Dworshak cool water releases.

Figure H-3
Lower Snake River Temperatures
July 1- September 22, 2012



5. Water Temperature Modeling

a. CE-QUAL-W2 Model Summary.

The CE-QUAL-W2 model was used from late June through early-September 2012 to support decisions regarding operation of Dworshak Dam for temperature management on the lower Snake River. The results were presented and discussed routinely with TMT members and FCRPS Action Agencies to develop best management strategies.

b. Water Quality Model Improvements.

For monitoring season 2012, Walla Walla District staff continued to use the AgriMet spreadsheet from the SYSTDG model to compile AgriMet files. The spreadsheet was enhanced with automated data update scripts written in Python. The spreadsheet is now automatically updated by pulling data from the new Water Management database, which is another significant time savings improvement. Similar scripts were written to reduce the time necessary for updating the Nash-Sutcliffe analysis tool and the Lower Granite operations file pre-processor. The end result of these modifications reduced the time necessary by over 50 percent to prepare the initial model runs. A total of 133 individual CE-QUAL-W2 simulations were run in 2012. This is a threefold improvement over the 2011 model run production. The increased volume of model runs gave managers the ability to test more potential operational variations prior to TMT meetings. Although, simulations can run in either CE-QUAL-W2 version 3.2 or 3.6, all model runs in 2012 were completed using version 3.6.

6. Conclusion

Overall, the 2012 Dworshak summer operation to cool the lower Snake River was successful. Dworshak cool water releases played an instrumental role in preventing water temperatures greater than 68ºF at Lower Granite Dam tailwater.