



FISH PASSAGE CENTER

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MEMORANDUM

TO: Paula Calvert, Oregon-DEQ
Eugene Foster, Oregon-DEQ

FROM: Margaret Filardo

DATE: November 17, 2015

SUBJECT: Sampling for GBT in 2015

In response to your request we are providing a summary of conditions encountered in 2015 and the conduct of gas bubble trauma (GBT) monitoring that took place this year. In a normal year, sampling for GBT begins with the implementation of the voluntary spill program and continues to the end of the spill program (August 31st), or until fish numbers decrease to a level such that sampling quotas cannot be met. GBT sampling requires the handling of a minimum number of fish to assure that the sample observations are representative of the population. In most years if the decrease in fish numbers occurs, it normally occurs toward the end of August when TDG levels are well below the waiver criteria.

Characterization of flow, spill and temperature in 2015

Flow

In 2015 the runoff volume at The Dalles (January–July) was 83% of average (1981–2010). If we consider a longer time period, 1929 to 2014, the runoff volume at The Dalles Dam ranked 68 out of the 87 year record. The low runoff volumes resulted in flows that were considerably less than observed in 2014, or an average of the past ten years (Figure 1).

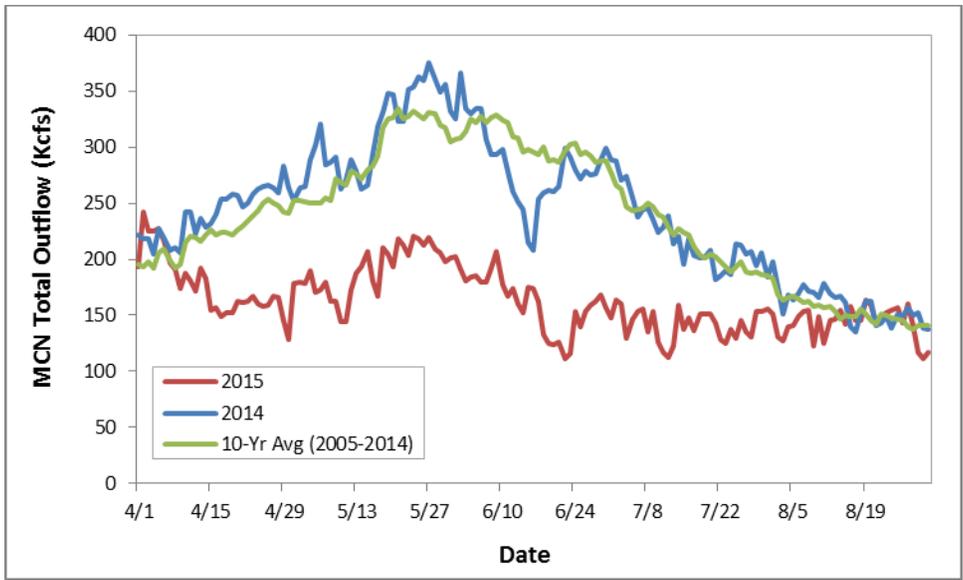


Figure 1. Average daily flows at McNary Dam during 2015 and 2014 as well as the past 10-year average.

Spill

Due to the low flow levels the volume of water spilled at the Middle Columbia projects was also low, since three of the four projects call for spill as a percentage of total flow. Flows in the Snake and Middle Columbia rivers were sufficiently low throughout the entire spring and summer seasons such that uncontrolled spill did not occur. Because of the extremely low flows in 2015, TDG levels were less than the Oregon waiver limit of 120% tailrace TDG throughout the spring and summer spill period, and considerably less during June and July when sampling was interrupted (Figure 2).

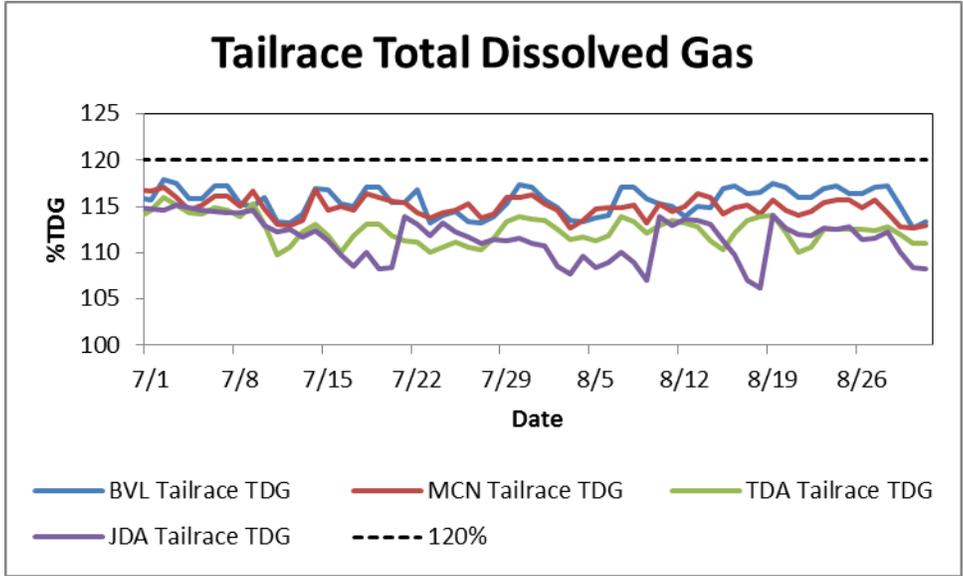


Figure 2. Total dissolved gas (TDG) levels at the tailrace monitors for the Middle Columbia River monitoring sites during July and August of 2015 compared to the 120% Oregon DEQ TDG waiver.

Temperature

The temperature data presented here are from the water quality monitors that are located both in the forebay and tailrace at each project for the passage period of April 1st through August 31st. In 2015, temperatures at Middle Columbia projects were higher earlier in the season than the previous ten years. This pattern is presented here for Bonneville Dam (Figure 3). Water temperatures began to exceed the 68°F water temperature standard during the second half of June and continued above 68°F past the end of the TDG waiver period on August 31st.

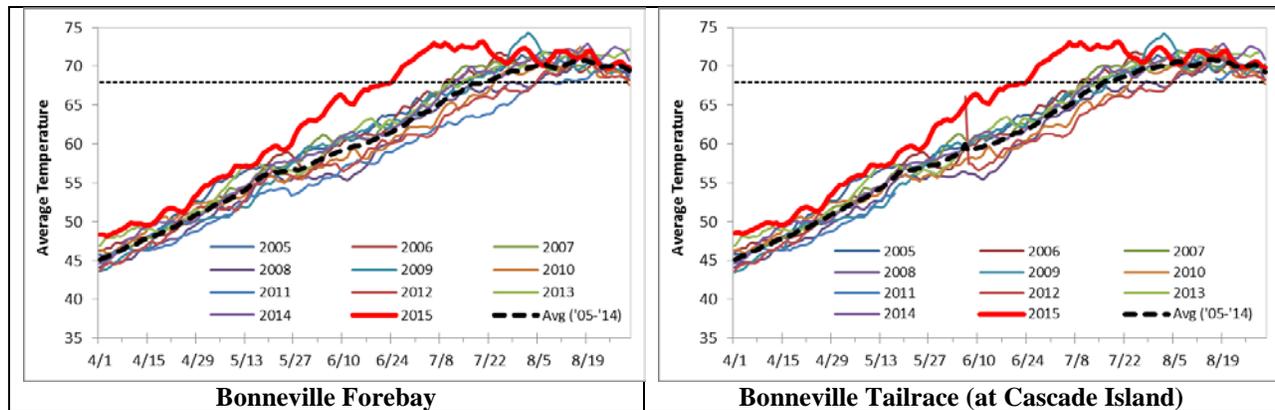


Figure 3. Daily average temperature (°F) at the Bonneville Dam water quality monitors in the forebay and tailrace (at Cascade Island), April 1-August 31, 2005-2015. Dashed line represents the 10-year average (2005-2014). Horizontal dashed line is provided at 68°F for perspective relative to the water quality standard.

Gas Bubble Trauma Monitoring

As part of the Oregon DEQ waiver requirements for the TDG waiver, monitoring for GBT is conducted twice a week at McNary and Bonneville dams' smolt monitoring facilities.

McNary Dam

In 2015 GBT sampling at McNary Dam occurred from April 15th to July 16th. On June 18th, the U.S. Army Corps of Engineers (COE) Biologist at McNary Dam requested a reduction in GBT sampling from twice-per-week to once-per-week due to an increase in the number of mortalities of recovering GBT examined fish. At the time higher than normal temperatures were observed in the river and were close to exceeding 68°F. This request was consistent with the COE's protocols to provide precautionary measures to avoid or minimize any direct or delayed mortality resulting from additional thermal stress when handling juvenile salmonid fishes at water temperatures above 68°F (20°C). The FPC advised Oregon DEQ on this matter and, given that forebay TDG levels were below the EPA 110% standard and GBT levels were minimal to-date, they agreed that once-per-week sampling was warranted. McNary Dam continued once-per-week sampling until July 16th when sampling for GBT was terminated for 2015 due to continued excessive temperatures and high mortalities in the recovery raceways. As with the reduction in sampling, FPC advised Oregon DEQ on the matter. Given that forebay TDG levels were below the EPA 110% and mortalities for recovering fish were elevated, FPC and Oregon DEQ staff agreed that GBT sampling should be terminated.

The TDG levels in the tailwater at Priest Rapids (PRD) and Ice Harbor dams (the upstream projects) never exceeded the 120% waiver level in 2015 (Figure 4). Total dissolved gas at the MCN forebay never exceeded the 115% waiver level in 2015. There were four instances when GBT was detected in a sample at McNary Dam in 2015 (Figure 4). All four of these incidents had a prevalence of 1.0% and all of the fish that showed signs of fin GBT at MCN in 2015 had Rank 1 signs (1%–5% of fin area occluded with bubbles).

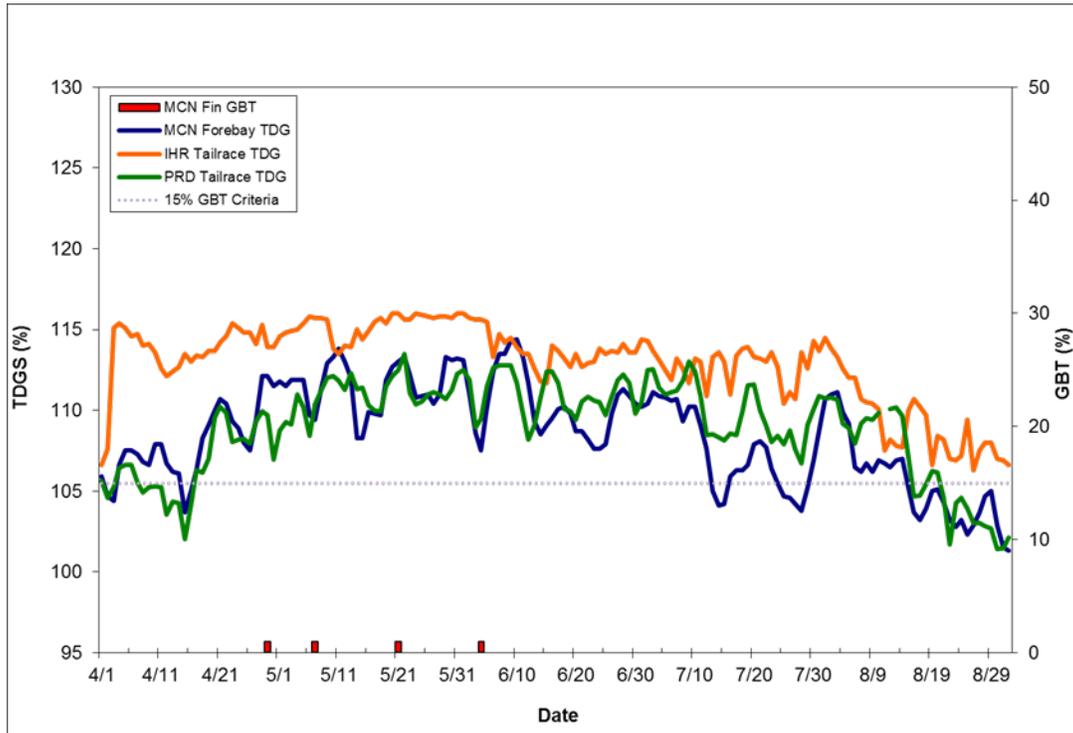


Figure 4. Percent GBT observed in the sample of fish at McNary Dam over the 2015 sampling period.

Bonneville Dam

GBT sampling at BON occurred from April 22nd to July 20th. After the July 20th GBT sample the Fish Passage Center, after advising Oregon DEQ staff, reduced sampling at BON from twice-per-week to once-per-week. Similar to MCN, the decision to reduce the sampling frequency was due to the combination of increased mortalities of recovering GBT examined fish, elevated temperatures at the facility, and TDG levels in the forebay that were generally below the EPA 110% standard. At the same time, collection of the 100 fish target was becoming difficult. On July 20th, FPC staff informed personnel at BON to proceed with GBT sampling once-per-week but only to examine fish for GBT if the target of 100 fish was obtainable. Due to continued low passage numbers, this target sample size was never obtainable, and thus, the July 20th GBT sample was the last for the 2015 season. At Bonneville Dam, there were two occasions in 2015 when signs of fin GBT in fish were recorded (May 6th and May 27th) (Figure 5). On both of these occasions the GBT prevalence was 1.0%. Both of the fish that exhibited signs of GBT at BON in 2015 had signs that were Rank 1 (1%–5% of fin area occluded with bubbles).

The Dalles Dam

Total dissolved gas in The Dalles Dam tailwater was managed under both the Oregon and Washington methodologies of estimating a 12-hour average TDG. Under the Oregon methodology, the 12-hour average is based on the 12 highest hourly TDG measurements in a single calendar day, regardless of whether they are consecutive or not. Under the Washington methodology, the 12-hour average is based on rolling 12-hour averages with the highest of the rolling averages reported as the 12-hour average for a given day. The COE managed to the gas level based on the higher of the two methodologies. The 12-hour averages under both of these methodologies are provided in Figure 5 below. Total dissolved gas in The Dalles tailwater never exceeded the 120% waiver level in 2015. Total dissolved gas in the BON forebay exceeded the Washington DOE 115% waiver level for a total of seven days in 2015. The longest continuous period where the BON forebay exceeded 115% was only three days, from May 9th to May 11th.

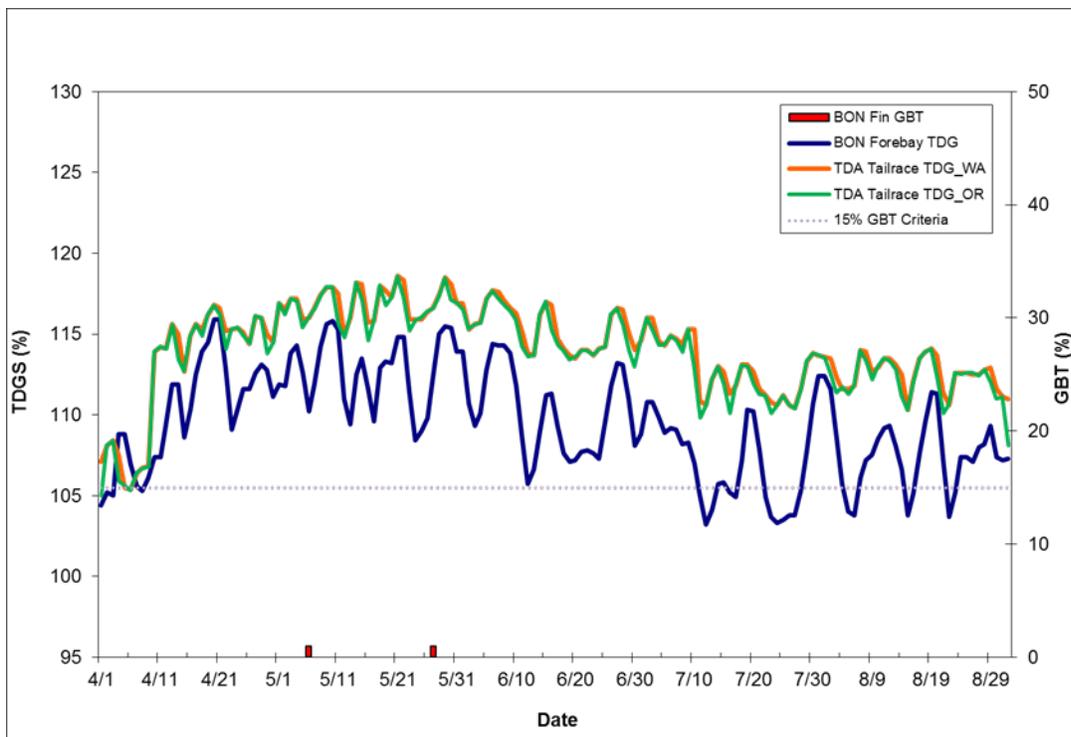


Figure 5. Percent GBT observed in the sample of fish at Bonneville Dam over the 2015 sampling season.

Condition Monitoring

Under Reasonable and Prudent Alternative 53 in the 2008 Biological Opinion the COE is directed to “Monitor and document the condition (e.g., descaling and injury) of smolts at all dams with Juvenile Bypass Systems (JBS), identify potential problems, and evaluate implemented solutions.” Consequently, condition monitoring is conducted at McNary, John Day and Bonneville dams in the Middle Columbia River. The primary role of the condition monitoring is to identify the proportion of each species of migrant juvenile salmonid and larval and juvenile lamprey (where applicable) that are descaled (salmonids only) or have significant

injuries indicative of problems in fish passage at dams, such as debris in fish bypass apparatus. Secondly, the data collected on disease, predation, and other injuries will provide a relative indication of the health of fish passing at the dams.

The dams in the Middle Columbia River equipped with JBS (McNary, John Day and Bonneville) all have high temperature sampling protocols designed to minimize stress and mortality associated with handling under these circumstances. At John Day, routine sampling under the Smolt Monitoring Program ceases and “condition only” sampling occurs twice per week. At MCN, sampling remains every other day, but target sample sizes are reduced. At BON, sampling frequency is reduced from every day to every other day. While GBT monitoring is not conducted as part of the condition sampling because the sampling protocol is different (fish are not sampled immediately as they enter the project for condition monitoring), the personnel conducting condition monitoring have also been trained to conduct GBT monitoring. SMP personnel are encouraged to report any pertinent information or observations made during the fish condition procedure. Consequently, the staff would notify the FPC Smolt Monitoring Program Coordinator of this occurrence.

Please feel free to contact me if you need any additional information.