



FISH PASSAGE CENTER

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MEMORANDUM

TO: Todd True, Earth Justice

FROM: Michele DeHart, FPC

DATE: May 8, 2018

RE: Smolt Monitoring Gas Bubble Trauma and River Conditions

In response to your data request dated May 7, 2018 the Fish Passage Center staff has summarized the current Smolt Monitoring Program, fish gas bubble trauma monitoring, dissolved gas monitoring and river flow and spill conditions occurring over the past weeks. All of these Smolt Monitoring Program fish data and river flow, spill and dissolved gas data is updated daily and is available to the public at www.fpc.org. Our conclusions are listed below followed by detailed discussion of each point.

- We have reviewed the recent article attached to your email. We have concluded that this article is misleading and contains significant technical inaccuracies.
- Decades of data analyses has shown that spill is the best route of passage for juvenile salmon and steelhead. Juvenile fish that pass over spillways have a higher smolt to adult return rates.
- In 2018 spill for fish passage is being managed to the State of Washington 115% forebay/120% tailrace dissolved gas level limits which have been set conservatively to guard against dissolved gas trauma in juvenile salmon and steelhead.
- Decades of dissolved gas bubble trauma monitoring and analyses has shown that spill for fish passage can be safely implemented at the 125% tailrace gas cap.
- Consistent with past years data, current dissolved gas trauma monitoring in 2018 indicates that gas bubble trauma incidence is not reaching the conservative action criteria established by NOAA Fisheries and the regions fishery managers.
- Monitoring in 2018 has at times indicated that some forebay dissolved gas levels are higher than the tailrace dissolved gas levels of the adjacent upstream project. This is an unusual occurrence, and as such, there is still uncertainty as to what is driving this phenomenon.

The Comparative Survival Study (CSS) has been collecting and analyzing data on juvenile fish survival through the Columbia River Hydrosystem for over 20 years. In addition to providing a time series of smolt-to-adult return (SAR) data, the CSS provides data on smolt out-migration timing, juvenile migration rates and travel times, juvenile reach survivals, and evaluates these parameters for the purpose of informing management and recovery decisions related to those stocks. The CSS uses a wide range of metrics to explain both in-river survival of juvenile salmonids, as well as subsequent SARs. Overwhelmingly, the results of this data show that decreased in-river travel times and dam power house passage rates are related to increased survivorship, both in-river and SARs (CSS; McCann et al., 2017). As both of these metrics are tied directly to spill levels, passage by way of spill appears to be the most effective way currently available to increase survival through the hydrosystem for outmigrating juvenile salmonids.

Similarly, the Smolt Monitoring Program has been collecting data on juvenile fish condition and dissolved gas trauma (GBT) in the Columbia River Basin every year since 1995. All data associated with these efforts are available to the public via the FPC website, including data describing the current year's conditions, which are updated daily. While in 2018, spill levels are being maintained at the 115% forebay/120% tailrace total dissolved gas (TDG) limits defined by the State of Washington's waiver, as a result of involuntary spill events, data for GBT are available over a wide range of TDG concentrations. This is true over the last twenty years as well, where observations have occurred at tailrace TDG levels as high as nearly 140%. This wide range of TDG observations allows for a robust assessment of the impacts of TDG on the salmonid population as they move through the hydrosystem.

Since the enactment of the GBT monitoring program in 1995, the action criteria for reduction of spill was defined as greater than 15% of fish showing any signs of GBT, or greater than 5% of fish sampled showing severe signs of GBT (NOAA Biological Opinion 2000). This action level incorporates a margin of safety based on studies finding significant mortality does not occur in test fish until approximately 60% of a population is showing signs of GBT (Maule et al. 1997a, 1997b). A recent FPC review found that over the past ten years (2008-2017), a total of 1,004 GBT samples have been conducted at five FCRPS projects (LGR, LGS, LMN, MCN, and BON), with a total of 99,560 fish examined. Over these 1,004 GBT samples, there have only been three instances where the 15% GBT incidence rate has been met or exceeded (Figure 1). All three of these instances where the 15% fin GBT action criterion was met occurred when tailrace TDG levels were in excess of 125% (FPC Memo 58-17). Tailrace TDG levels of 125% or above have only materialized when excess spill occurs due to flows in excess of hydraulic capacity and/or lack of market. And while all three incidences where 15% GBT criterion was met occurred at TDG levels of 125% or more, there were 41 samples in the past ten years with TDG levels at or above 125% that had GBT incidence rates well below the 15% criterion.

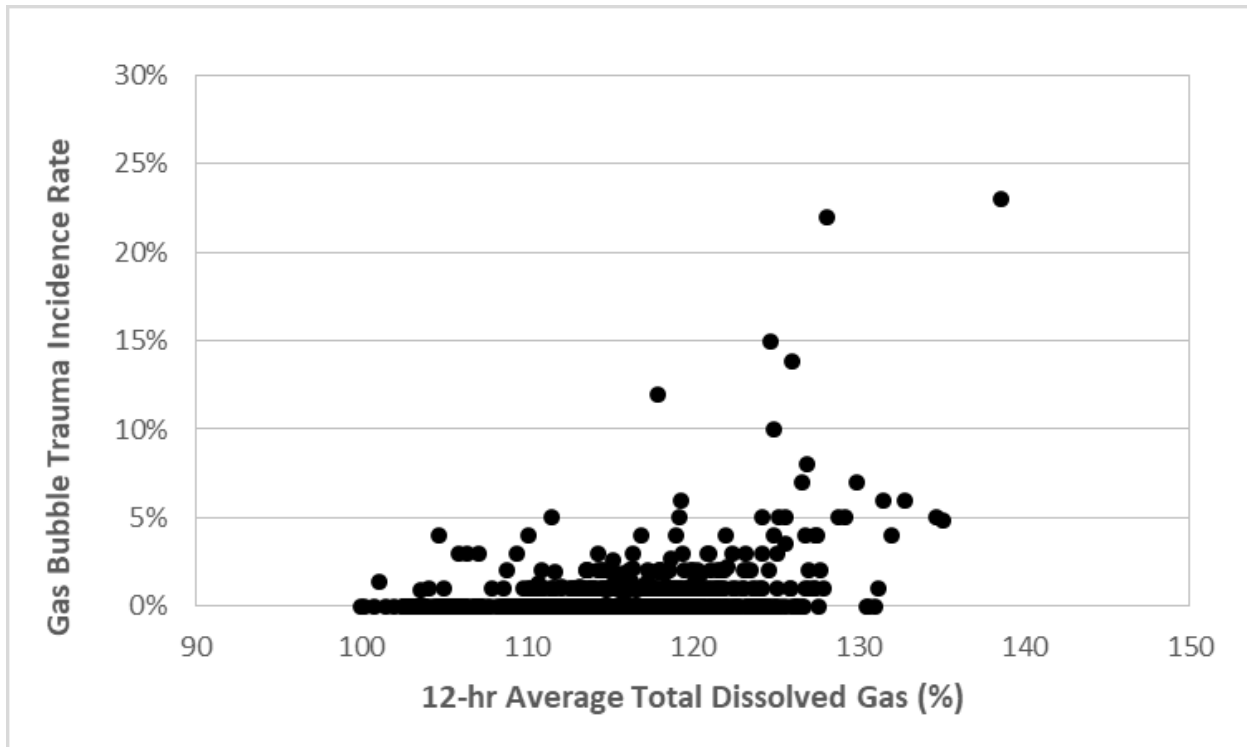


Figure 1: Fin GBT incidence rate (%) as a function of tailrace TDG observed

Preliminary data for migration year 2018 shows some instances of the 115%120% TDG limits being exceeded due to flows in excess of hydraulic capacity, however, GBT incidence rates are well within the action criteria at all FCRPS projects. Out of the 30 GBT sampling occasions on the Snake and Lower Columbia Rivers to date in 2018 (5/9/2018), a 4% incidence rate of mild symptoms of GBT was the highest observed (Little Goose Dam 4/22/18), with a majority of samples seeing no signs of GBT (Figure 2). At Lower Granite Dam specifically, the location Lt. Col. Damon Delarosa described observing signs of GBT in the Tri-City Herald article, there have been 10 sampling occasions observing a total of 507 Chinook and steelhead juveniles thus far in 2018. As of May 9th 2018, there have been no reported signs of GBT in any of the fish observed at this project.

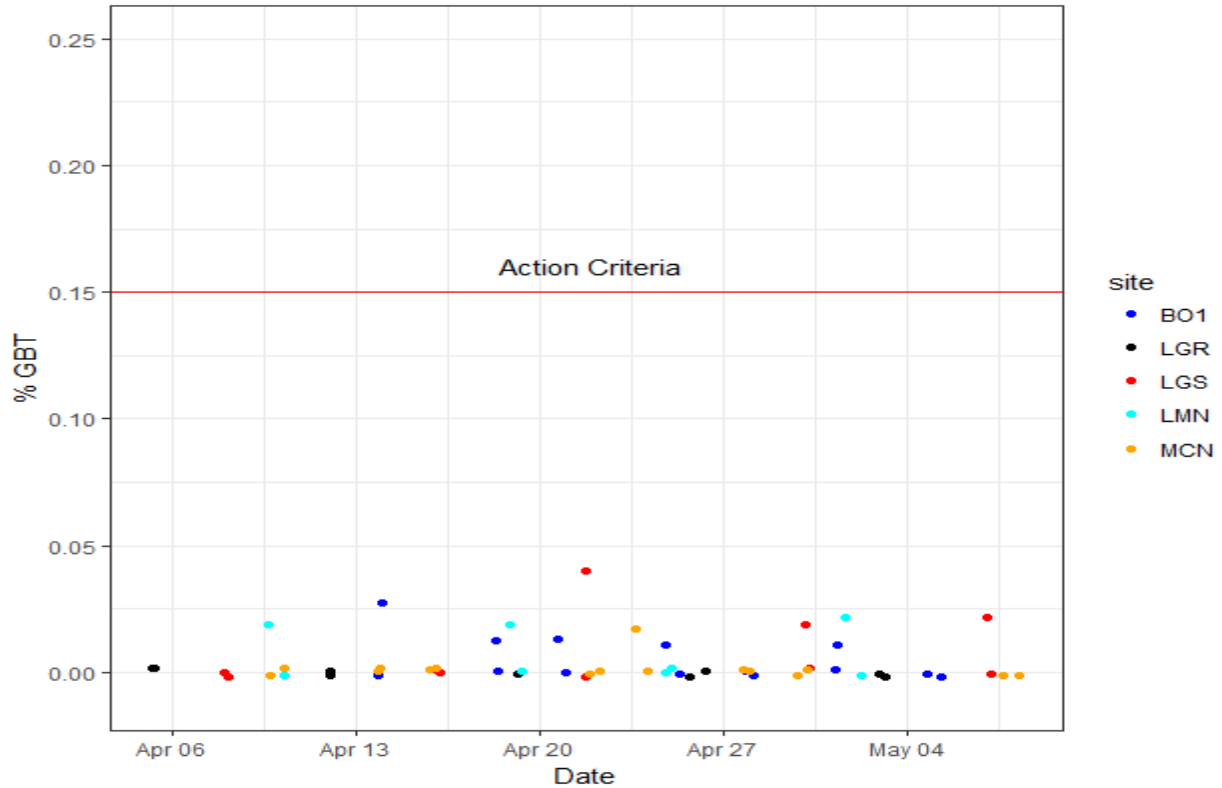


Figure 2: Fin GBT incidence rate (%) for spring 2018 spill season.

Finally, there have been some anomalous TDG readings at a few projects this year in which TDG monitors are indicating higher forebay gas levels than the adjacent upstream tailrace dissolved gas levels. This runs counter to what would be expected, as degassing typically occurs between dams. While this is unusual, there are a few theories pertaining to what may be happening, including: Malfunctioning TDG monitors, TDG monitor placements that are not optimal for calculating average TDG loads, and atmospheric changes during the time it takes for water to travel from the tailrace of a project to the downstream forebay.

Literature Cited:

- Fish Passage Center. 2017. Ten year review of spill operations, total dissolved gas, and gas bubble trauma monitoring at FCRPS projects (2008-2017). <http://www.fpc.org/documents/memos/58-17.pdf>
- Maule, A. G., J. Beeman, K. M. Hans, M. G. Mesa, P. Haner, and J. J. Warren. 1997. Gas bubble disease monitoring and research of juvenile salmonids. U.S. Department of Energy, Bonneville Power Administration, Annual Report 1996 (Project 96-021), Portland, Oregon.
- Maule, A. G., M. G. Mesa, K. M. Hans, J. J. Warren, and M. P. Swihart. 1997. Gas bubble trauma monitoring and research of juvenile salmonids. U.S. Department of Energy, Bonneville Power Administration, Environment, Fish and Wildlife, Annual Report 1995 (Project 87-401), Portland, Oregon
- McCann J.M., B. Chockley, E. Cooper, B. Hsu, H. Schaller, S. Haeseker, R. Lessard, C. Petrosky, T. Copeland, E. Tinus, E. Van Dyke, A. Storch, and D. Rawding. 2017. Comparative Survival Study of PIT-tagged Spring/Summer/Fall Chinook, Summer Steelhead, and Sockeye, 2017 Annual Report. BPA Project #19960200.
- NOAA 2000. Reinitiation of Operation of the Federal Columbia River Power System (FCRPS), Including the Juvenile Fish Transportation System, and 19 Bureau of Reclamation Projects in the Columbia Basin (COE). Appendix E