HOW SHOULD JUVENILE SALMONID MORTALITY RATE RESPONSES TO TAILRACE TOTAL DISSOLVED GAS (TDG) BE ASSESSED IN EVALUATION OF DAM PASSAGE OPTIONS?

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Total dissolved gas (TDG) regularly exceeds regulatory standards in the tailwaters of Upper Willamette Dams (UWD) and when it does can cause mortality in salmonids. The process of TDG generation has been quantified and large differences in intensity and duration are expected among the recently formulated Environmental Impact Study Alternatives. In a quantitative decision analysis, TDG exceedances should be converted into mortality rates for each salmonid life history stage and then integrated into a population model to quantify the demographic consequences of TDG and other mortality stresses. Gas bubble trauma and mortality have been observed in trapped fish below UWDs during high TDG events but the mortality rate experienced by tailwater fish populations is difficult to quantify because of several mitigating factors.

TDG mortality is a time-duration process that has been systematically quantified in lab studies (reviewed by Pleizier et al. 2020 DOI: 10.1111/faf.12496). Field studies suggest that lab-derived estimates of TDG mortality need to consider additional factors such as depth refugia and downstream dissipation as processes that affect mortality of fish in their native environment. (e.g. Kovac et al. 2022 dx.doi.org/10.1139/cjfas-2020-0448) The purpose of this talk is to:

- For TDG Dissipation: Illustrate the effect of bubble-mediated versus diffusive gas transfer using a diffusive transfer model from the literature and then comparing this to TDG data from the North and South Santiam rivers.
- For Depth Refugia: Illustrate the effects of alternative behavioural models (depth choice, response to sharp increases in discharge) on mortality of spring run Chinook salmon juveniles during two high TDG events in the Detroit Dam tailwater.