pH and the Lower Deschutes

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The operation of the Selective Water Withdrawal (SWW) facility (aka, "the fish tower") in Lake Billy Chinook (LBC) is currently a point of controversy in parts of the angling community. Claims have been made that the operation of the SWW has degraded the trout population in the Deschutes below LBC. These claims have largely been scientifically disproven, but concerns about elevated levels of pH are worthy of review.

Portland General Electric and the Confederated Tribes of Warm Springs (PGE/CTWS), the joint owners of the Pelton Round Butte hydroelectric facility (PRB) that creates LBC as well as Lake Simtustus, have commissioned a comprehensive study of river conditions that will include detailed measurements of pH levels, and factors affecting pH, above and below PRB. This study has been underway for over a year and final results are due in 2018. This brief essay is an attempt to provide some background and context in the meantime.

Along with fish passage, the operation of the SWW is intended to meet three main state standards: dissolved oxygen (DO), temperature, and pH. Simultaneous compliance has proven difficult. For some time, targets for DO and temperature largely have been met while pH has periodically been high.

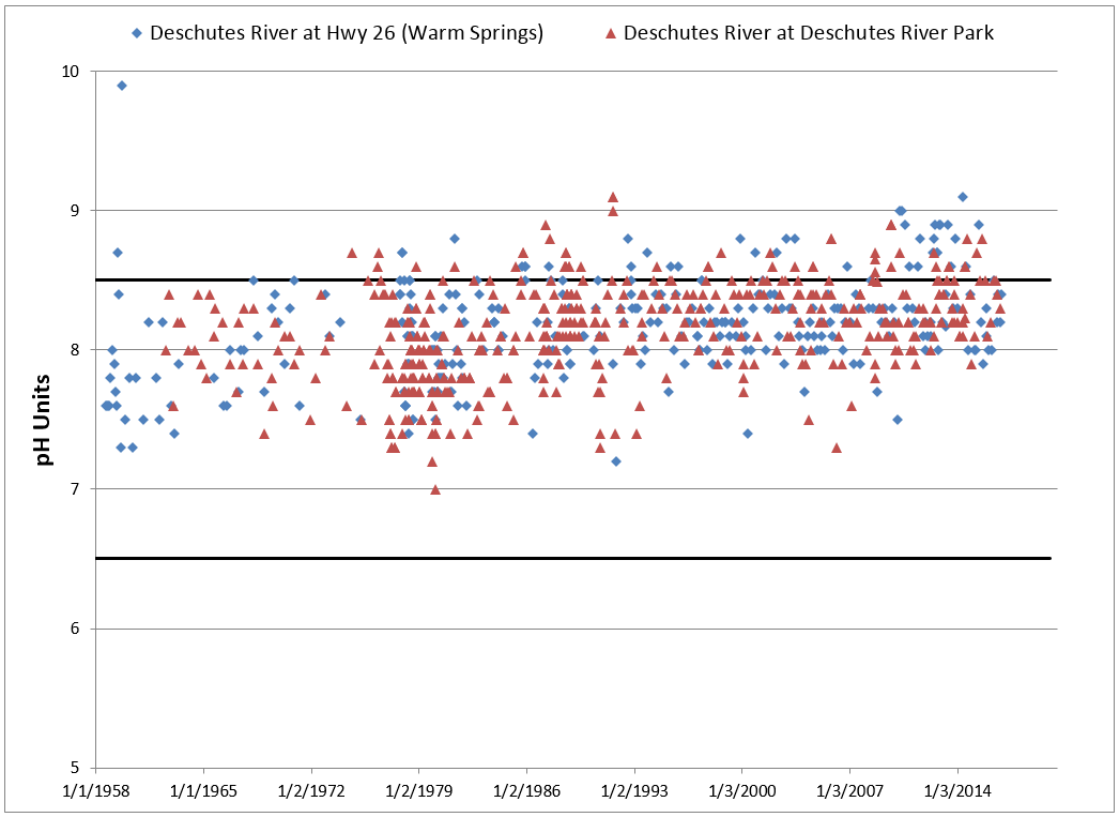
Desired DO levels immediately below PRB are achieved by spilling water from the Reregulating Dam, the lowest of the dams, creating turbulence, and oxygenating the water. This mimics the natural turbulence that would occur in the narrow canyon environment if PRB were not in place. Temperature goals are met by withdrawing warmer surface water to blend with colder water from the bottom of LBC. Top and bottom water are combined to match a temperature profile that would naturally result from the confluence of the Deschutes, Metolius, and Crooked Rivers if PRB was not in place. Prior to SWW operation, the lower Deschutes had an artificially cold profile from bottom water withdrawal only.

Achieving temperature targets does entail drawing surface water from LBC which at times can have higher pH levels than current Oregon Department of Environmental Quality (ODEQ) standards. It is unclear, however, if this is detrimental to downstream fish or macroinvertebrates.

The ODEQ pH standard for the Deschutes River is a range of 6.5 to 8.5. As illustrated below, this standard has been consistently violated since the 1970s (the dark lines indicate the 6.5 and 8.5 boundaries). There does seem to be a recent increase in the frequency of pH levels over 8.5, but violations have consistently occurred for decades. It is important to note that the limited data in the graph could lead to inaccurate conclusions. The study currently underway will correct this with continuous data over a two year period. In the meantime, however, the graph below reflects the best available science.

In 1995 ODEQ wrote an extensive report on pH levels across Oregon. It stated that rivers "generally fall within the range of 6.0 to 9.0 pH units, and the biota are likewise usually adapted within this range". In fact, the Environmental Protection Agency recommends pH ranges of 6.5-9.0 units for freshwater

aquatic life. While the pH levels in the Deschutes River have been measured above the 8.5 ODEQ target, they have almost always been at or below 9.0. In fact, there have only been two measurements above 9.0, on 8/20/1991 and 5/12/2014. (There was a 9.9 reading on 9/1/1959 but this measurement is suspect.)



Source: Oregon Department of Environmental Quality

The 1995 ODEQ report states that salmonids are "sensitive to pH in the range of 9.2 to 9.7", levels not observed by ODEQ in the lower Deschutes. In fact, repeated studies by the Oregon Department of Fish & Wildlife has shown that since the operation of the SWW resident trout continue to have growth rates and condition factors similar to pre-SWW operation and the angling catch rate continues to compare favorably to blue ribbon trout streams across the western US. The speculation is that the new temperature profile allows both fish and their food sources to experience a more natural lifecycle in a pH range that remains beneficial, even if elevated when compared to ODEQ targets.

pH levels in the Deschutes clearly require continued monitoring and further investigation. It is not clear what natural pH levels are for the Deschutes or what might be causing pH to approach and exceed 9.0, if only rarely. The SWW is certainly part of the equation as are polluted urban and agricultural runoff above and below PRB along with the recent drought and record high air temperatures. It seems evident to me, however, that the SWW is not a "smoking gun" pointed at the lower Deschutes.