

Recommendations for changing methods of determining water quality (DO) standards.
by
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1 & 2) Stop using computer calculations of “natural” (pre-modern) water quality as a basis for assigning modern water quality standards violations. (Use observed data where possible.)

Figure 1 shows an example of the errors and prolonged subsequent misunderstandings created by comparing computer calculations with calculated “natural” DO concentrations.

The Figure shows a simulation by WDOE’s “Budd Inlet Model” of Capitol Lake, an impoundment of the Deschutes River in Olympia. The colors show alleged “Dissolved Oxygen Standards Violations” virtually everywhere, with a scale at the right whose minimum value is 0.2 mg/L. This Figure first appeared in the agency’s “TMDL Report” in 2012 and was subsequently repeated in WDOE’s “Supplemental Modeling Scenarios” Report of 2015.

The impoundment is defined as a “lake” by virtue of its 15.2 day water residence time. Since lakes apparently have no universal numerical WQ standards, resort to its “natural” condition, estimable only by computer simulation, is the only way presently available for identifying violations. These are “found” by comparing the modern lake water with its (calculated, presumed) oxygen contents of pre-modern times.

Capitol Lake is in fact the best-oxygenated lake in Thurston County. If the residence time had been 14.99 days, the standard for the Deschutes River (8 mg/L) would have been used. In that case, there would have been no “violations” whatsoever, anywhere at any time

in the Lake, whose bottom waters almost always have more DO than 8 mg/L.

Because the entire Lake was compared with its estimated “pre-modern” water, there would ordinarily be no way for an impartial observer to know what the calculated pre-modern dissolved oxygen levels were at any time or location for independent verification of these findings. However a unique circumstance in this instance provides a way of “knowing” what some of the pre-modern DO levels must have been. That is, the water entering the lake at the south (lower) end must have been 100% saturated with oxygen, having just flowed over a waterfall at the end of the southernmost (“red”) channel in the Figure. Comparing “known” pre-modern DO’s with the values calculated by the model, I have found that the “violations” shown in Figure 1 are in error by outlandishly large margins. Figure 2 shows my corrected version of Figure 1.

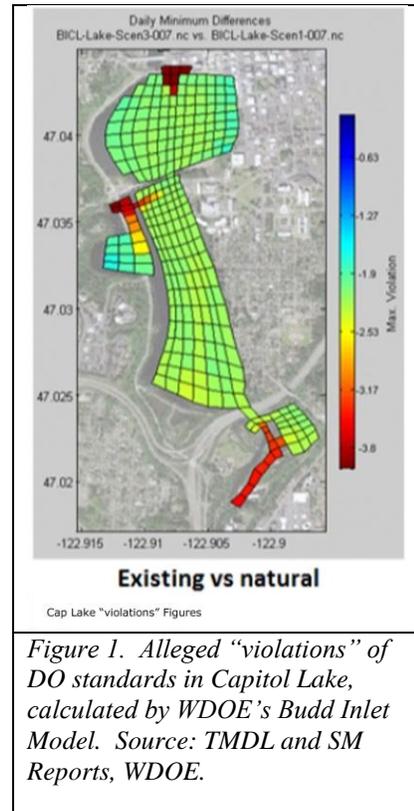
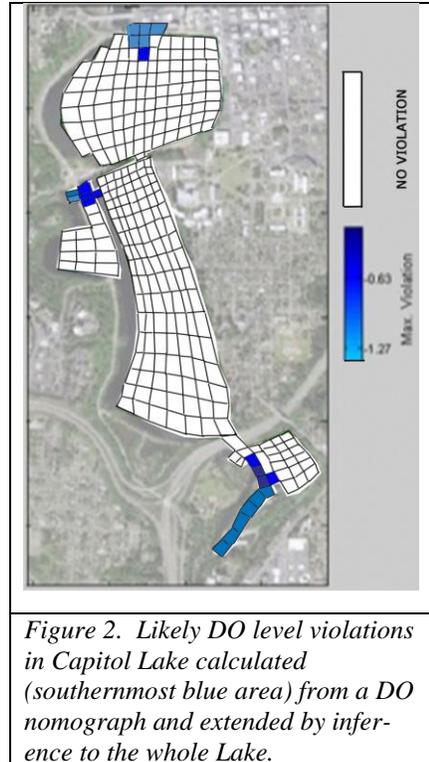


Figure 1. Alleged “violations” of DO standards in Capitol Lake, calculated by WDOE’s Budd Inlet Model. Source: TMDL and SM Reports, WDOE.

Figure 1 has been represented for the last four years as showing that Capitol Lake has “depleted oxygen levels” and “water quality standards violations.” This now-ingrained negative view of the Lake stems directly from 1) using calculated “natural” DO conditions as a baseline for evaluating modern waters; 2) ignoring abundant field data that show “extraordinary” levels of DO in the Lake at almost all times, and 3) taking computer calculations as equivalent to real-world field data in determining occurrences of standards violations. This exemplifies my reasons for requesting that these practices be changed.

This example (and others like it) is from my 2015 Report, “Capitol Lake and Puget Sound. An Analysis of the Use and Misuse of the Budd Inlet Model.” The calculations that produced Figure 2 are presented there in detail, enough so that readers are able to critique the procedure. This Report will soon be posted on the website of the Capitol Lake Improvement and Protection Association, for whom it was written. That organization’s website is;

< www.savecapitollake.org/contact/clipa.html >.



References for the TMDL and SM Reports cited here are as follows:

Roberts, Mindy, Greg Pelletier and Anise Ahmed. 2015. Deschutes River, Capitol Lake, and Budd Inlet. Total Maximum Daily Load Study. Supplemental Modeling Scenarios. WDOE Publication No. 15-03-002. (The “SM Report”.)

Roberts, Mindy, Anise Ahmed, Greg Pelletier, and David Osterberg. 2012. Deschutes River, Capitol Lake, and Budd Inlet Temperature, Fecal Coliform Bacteria, Dissolved Oxygen, pH, and Fine Sediment Total Maximum Daily Load Technical Report. Water Quality Study Findings. Publication No. 12-03-008. Wa. Dept. Ecology (DOE), Olympia WA. Available on line at <www.ecy.wa.gov/biblio/1203008.html>.