Capitol Lake and Puget Sound.

An Analysis of the Use and Misuse of the Budd Inlet Model.

David H. Milne PhD
February, 2016.

Executive Summary.

The Washington Department of Ecology's Report, "Supplementary Modeling Scenarios" purports to demonstrate that Capitol Lake's effect on Puget Sound lowers the dissolved oxygen content of Sound waters and is responsible for violations of water quality standards there. The Report presents outputs of a complex computer simulation, the "Budd Inlet Model," that are said to support the authors' claims. That is not the case. In fact, errors and shortcomings aside, data in the Report, not recognized even by its authors, support the view that *Capitol Lake's effects on Puget Sound are actually beneficial.*

The following problems with the Report are noted. (There are others, too many for a single page summary.)

1) Water Quality standards violations in Capitol Lake itself were vastly overestimated;

2) The calculations of Total Organic Carbon (from plant growth) entering the Sound from the Lake or Estuary scenarios overstate the amount of TOC in the Lake case and understate it in the Estuary case;

3) An inappropriate technique was used to calculate East Bay water residence times;

4) The authors mistakenly assume that Capitol Lake's ecology is phosphorus limited and base several pages of irrelevant discussion and calculation on that assumption;

5) The Budd Inlet model produces many demonstrably wrong answers where compared with observed data; yet the authors consider every dissolved oxygen calculation accurate to within 0.2 mg/L;

6) Answers derived from the authors' method of finding water quality standards "violations" (based on calculated unknown/unknowable conditions in hypothesized pre-modern waters) are not subject to independent confirmation or refutation (not testable) by scientists elsewhere;

7) The authors' hypothesis of how organic carbon created by plants in the Lake enter and affect Budd Inlet is not ecologically realistic and, contrary to their claim, is not testable by the Budd Inlet model;

8) A Figure showing water quality violations in the hypothesized pre-modern (pre-dam) estuary is formatted in a way that makes it impossible to judge the extent of the violations; proper formatting shows that violations are as widespread in that "natural" water (and comparable in size) as they are today with Capitol Lake present;

9) There is no Figure showing violations in the modern water if the dam were not present – a critical omission making it impossible to see whether that "estuary scenario" would be better or worse than the "lake scenario;"

10) The authors avoided simulating the effect on the Lake/Inlet interaction that would result from a program of harvesting Lake plants, an option that might improve Inlet water quality;

11) The authors avoided simulating the Lake's effect on the Inlet if nutrient nitrogen levels in the Deschutes River were reduced, an option that might improve Inlet water quality;

12) Figures included from other sources, said to bolster the authors' claim, actually show the opposite; beneficial removal by Capitol Lake of nutrient nitrogen from Deschutes River water.

No public policy decisions should be based on the contents of the Supplemental Modeling Report.