



# Fact Sheet

U.S. Army Corps of Engineers  
U.S. Army Engineer Research and Development Center

July 2008

Environmental Laboratory □ 3909 Halls Ferry Road □ Vicksburg, MS 39180-6199 □ (601) 634-2504 □ <http://www.erdc.usace.army.mil>

## **Project Title: BATHTUB - Simplified Modeling of Reservoir Eutrophication**

**SPONSOR: Environmental Laboratory, ERDC**

**PI: David M. Soballe or William A. Boyd, EL**  
**601-634-4631; 601-634-3705, email: [David.M.Soballe@usace.army.mil](mailto:David.M.Soballe@usace.army.mil) or [William.A.Boyd@usace.army.mil](mailto:William.A.Boyd@usace.army.mil)**

**Description:** Bathtub software facilitates the use of empirical eutrophication models to predict water quality in reservoirs with complex morphometry. The program performs water and nutrient balance calculations in a steady-state, spatially segmented hydraulic network that accounts for advective transport, diffusive transport, and nutrient sedimentation. Eutrophication-related water quality responses (expressed in terms of total phosphorus, total nitrogen, chlorophyll a, transparency, organic nitrogen, nonortho-phosphorus, and hypolimnetic oxygen depletion rate) are predicted using empirical relationships previously developed and tested for reservoirs (Walker 1985). To provide regional perspectives on reservoir water quality, controlling factors, and model performance, Bathtub can also be configured for simultaneous application to collections or networks of reservoirs.

Bathtub can function in diagnostic or predictive modes. Typical applications are:

a. Diagnostic Mode.

- (1) Formulation of water and nutrient balances, including identification and ranking of error sources.
- (2) Ranking of trophic state indicators in relation to user-defined reservoir groups and/or the USACE reservoir database.
- (3) Identification of factors controlling algal production.

b. Predictive.

- (1) Assessing impacts of changes in water and/or nutrient loadings.
- (2) Assessing impacts of changes in mean pool level.
- (3) Estimating nutrient loadings consistent with given water quality management objectives.

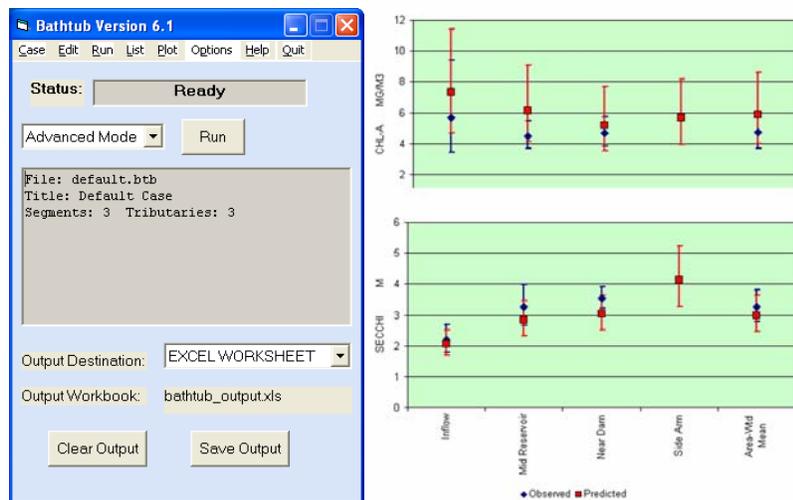
Bathtub version 6.x is an executable, Visual Basic program that runs on most computers with a Windows-based operating system (Win95 and above). It requires Microsoft® Excel and an

ActiveX control (ComDlg32.ocx ) on the host computer. The ActiveX control is distributed with Bathtub, but users must have their own licensed copy of Excel.

**Documentation:** Documentation for Bathtub appears in the US Army Engineer Waterways Experiment Station Instruction Report IR-W-96-2 entitled *Simplified Procedures for Eutrophication Assessment and Prediction: User Manual*. Revisions to this document were published in July 1998, and a copy of this manual is distributed with the program (IR-W-96\_2.pdf). Although the manual was written for the DOS version of Bathtub, it is generally applicable to the Windows version as well. Bathtub includes an extensive, on-line help system (HTML based) that is linked to the program and distributed with the software (bathtub.chm).

**Data Requirements:** Bathtub assumes steady state conditions and requires average or "representative" values for seasonal or annual inputs and outputs of water and material from the reservoir. Basic morphometric information on each reservoir (or segment) must be provided (i.e., surface area, mean depth, max depth, and length). For each tributary included in the model, Bathtub requires average flow volume, watershed area (optional) and flow-weighted concentration of any water quality constituents that are to be modeled (e.g. phosphorus). Users are strongly urged to read the manual before attempting to use this program.

**Point of Contact:** David M. Soballe, Environmental Laboratory, U.S. Army Engineer Research and Development Center, CEERD-EP-P, 3909 Halls Ferry Road, Vicksburg, MS 39180-6199, (601) 634-4631, David.M.Soballe@usace.army.mil.



### References:

[Walker, W. W. \(1985\). "Empirical methods for predicting eutrophication in impoundments: Report 3, Phase III: Model refinements," Technical Report E-81-9, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.](#)

**Download:** [BATHTUB](#)