Workshop: Water Quality Modeling with CE-QUAL-W2

**Dates:** September 17-18, 2025

**Course Coordinator:** Dr. Todd Steissberg, ERDC-EL. Email: Todd.E.Steissberg@usace.army.mil

**Instructors:** Dr. Todd Steissberg (ERDC-EL) and Dr. Hailie Suk (ERDC-CRREL)

# Overview

Engineers, scientists, researchers, and planners are invited to participate in the CE-QUAL-W2 Water Quality Modeling Workshop, a comprehensive training program designed to enhance understanding and proficiency in reservoir and river water quality modeling. Hosted by the Environmental Laboratory (EL) of the Engineer Research and Development Center (ERDC), U.S. Army Corps of Engineers (USACE), this two-day workshop will take place September 17-18, 2024.

Through a combination of lectures, demonstrations, and practical exercises, participants will gain a solid foundation in water quality modeling and acquire the necessary skills to set up, calibrate, and simulate CE-QUAL-W2 models for various water bodies.

CE-QUAL-W2 is a state-of-the-art, two-dimensional (2D), longitudinal/vertical hydrodynamic and water quality model specifically designed to capture dynamic changes within reservoirs. With over 300 applications worldwide, this widely used model has contributed invaluable insights into the flow dynamics and water quality conditions of reservoirs, lakes, rivers, and estuaries. By facilitating environmental impact assessments, informing reservoir operations decision-making, and supporting the planning, design, and evaluation of water resources systems and infrastructure, CE-QUAL-W2 has become an essential tool in addressing both national and global environmental challenges.

Furthermore, recent enhancements to the model have expanded its capabilities, enabling more detailed modeling of phenomena such as Total Dissolved Gas (TDG), sediment diagenesis, and the buoyancy, rise, and fall of algae. Notably, the prediction of variable velocity of cyanobacteria has advanced the simulation of Harmful Algal Bloom (HAB) conditions, proving particularly useful. These enhancements make CE-QUAL-W2 an even more powerful resource for tackling complex water quality issues.

This workshop is made possible through the support of the USACE Scientific and Engineering Technology (SET) numerical model maintenance program, managed under the Hydrology, Hydraulics, and Coastal Community of Practice (HH&C CoP). This program recognizes the significance of CE-QUAL-W2 in improving the management and protection of water resources worldwide, supporting maintenance and ongoing development to improve and extend the capabilities of CE-QUAL-W2. The course instructors are Dr. Todd Steissberg (ERDC-EL, Lead Developer of CE-QUAL-W2), and Dr. Hailie Suk (ERDC-CRREL)

# Agenda

Day 1: September 17, 2025

* Lecture: Introduction and Overview
* Lecture: Introduction to Numerical Modeling
* Lecture: Hydrodynamics Modeling
* Lecture: Water Temperature Modeling
* Lecture: Water Quality Modeling
* Lecture: Model Setup I
* Workshop: Model Setup I
* Lecture: Model Grid
* Workshop: Model Grid
* Lecture: Model Output

Day 2: September 18, 2025

* 2.01 Lecture: Model Setup II
* 2.02 Workshop: Model Setup II
* 2.03 Lecture: Water Temperature
* 2.04 Workshop: Water Temperature
* 2.05 Lecture: Dissolved Oxygen
* 2.06 Workshop: Dissolved Oxygen
* 2.07 Lecture: Total Dissolved Gas
* 2.08 Workshop: Total Dissolved Gas
* 2.09 Lecture: Model Utilities
* 2.10 Lecture: Calibration and Validation
* 2.11 Workshop: Calibration and Validation