

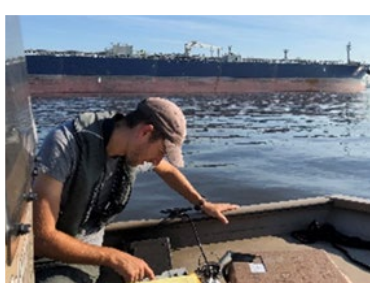
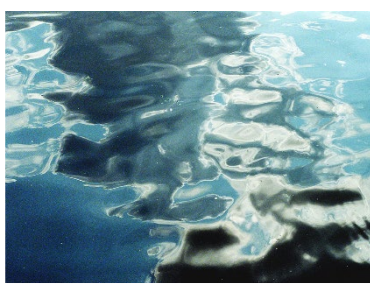
Presented to an advisory committee of the DRBC on April 23, 2026. Contents should not be published or re-posted in whole or in part without the permission of DRBC.

Model Suitability Evaluation

Water Quality Advisory Committee

Victor J. Bierman, Jr., PhD, BCEEM
Senior Scientist Emeritus,
LimnoTech (ret.)
Liaison to Model Expert Panel

April 23, 2026
Zoom



Who is the Model Expert Panel?



Eutrophication Model Expert Panel

Name	Affiliation	Role
Carl Cerco	U.S. Army Corps of Engineers (Ret.)	Panel Members
Bob Chant	Rutgers University	
Steve Chapra	Tufts University (Emeritus)	
Tim Wool	U.S. EPA Region 4 (Ret.)	
Vic Bierman	LimnoTech (Ret.) Liaison to Model Expert Panel	Technical Consultants
Scott Hinz	LimnoTech	

What was the Expert Panel Review?



- Ongoing process, not a single event
 - Panel meetings every 2-3 months
 - Frequent email exchanges
- Intensive data and model evaluation
 - Exchanges of data sets, model parameters and model results
 - Reviews of relevant scientific literature and technical reports
- Iterative process
 - Repeated cycle of review, feedback and revision
 - Collaborative improvement

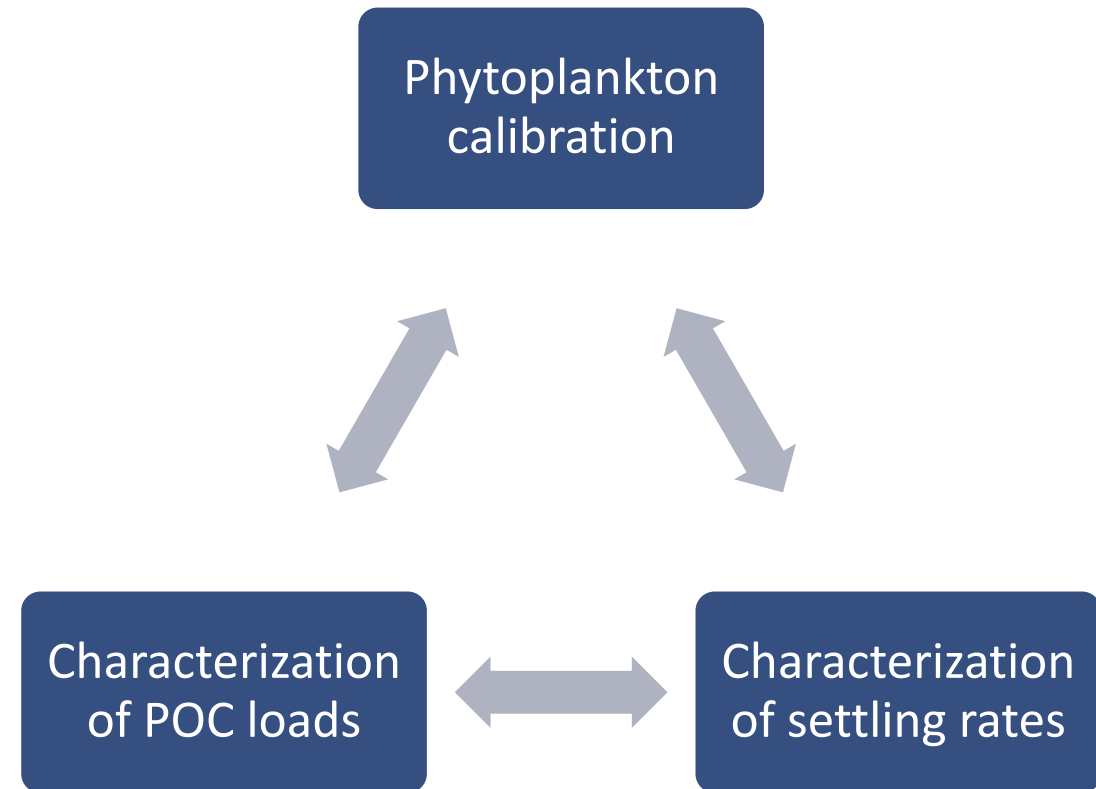
Why was the model developed and how is it expected to be used?



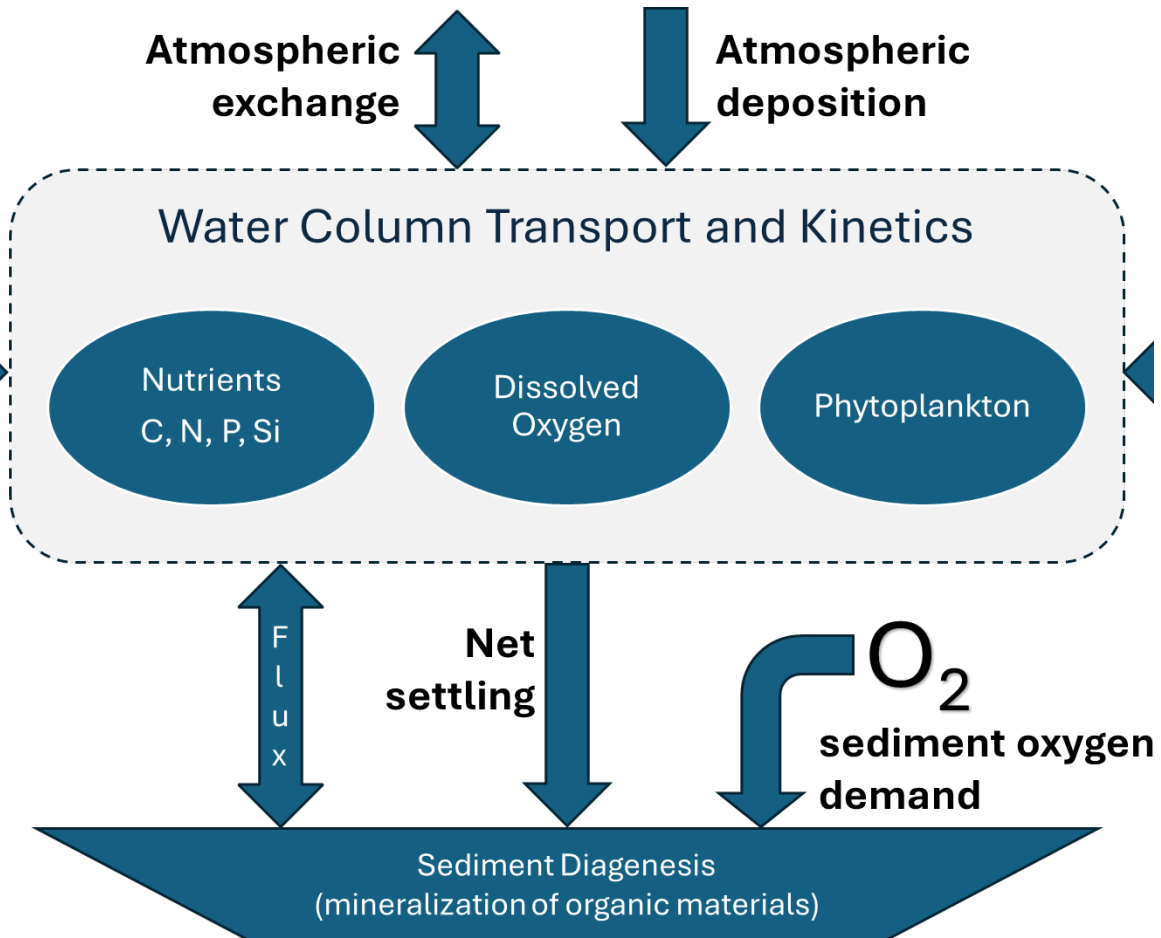
- Goal
 - To develop a technically sound model for the Delaware River Estuary that accounts for all significant dissolved oxygen processes
- Purpose:
 - To determine ambient dissolved oxygen levels that would result from various pollutant reduction scenarios
- Expected Use
 - Determine loading conditions needed to achieve dissolved oxygen criteria
 - Requires daily scale prediction of change in dissolved oxygen

How was the model improved?

- Better science
 - Mechanistic sediment diagenesis model
- More data
 - More complete characterization of external POC sources: tributaries, marshes, atmosphere
- Refinements to model processes
 - Phytoplankton
 - Settling
 - CBOD



Model was good before - why is this upgrade significant?



- Sediment diagenesis model directly links organic carbon and DO between water column and sediments
- Result is a more constrained model with less uncertainty

How “good” is the model?



EPA/100/K-09/003 | March 2009
www.epa.gov/crem

Guidance on the Development, Evaluation, and Application of Environmental Models



Office of the Science Advisor
Council for Regulatory Environmental Modeling

- Corroboration: Quantitative and qualitative methods for evaluating the degree to which a model corresponds to reality.
 - In some disciplines, this process has been referred to as validation.
 - In general, the term “corroboration” is preferred because it implies a claim of usefulness and not truth.



Model is Corroborated for its Intended Use



- Model calibrated to intensive dataset from 2018-2019
- Model successfully hindcasted historical conditions in 2012
- Model is consistent with observed data across a range of flow and temperature conditions
- **Model upgrade allows for a more defensible evaluation of future load reduction scenarios**
 - **Future scenarios incorporate changes to sediment dynamics that impact dissolved oxygen**

Conclusions

Model is defensible and useful

1. Model is scientifically defensible over a wide range of environmental conditions in the Delaware River Estuary
2. Model upgrade represents a significant advance in the state of the science
3. Model is suitable for its intended use
 - Determine loading conditions needed to achieve dissolved oxygen criteria

