

Improving Dissolved Oxygen in the Delaware River Estuary: **Moving from a Pathway to Implementation**

Thomas Amidon, BCES
Namsoo Suk, Ph.D.



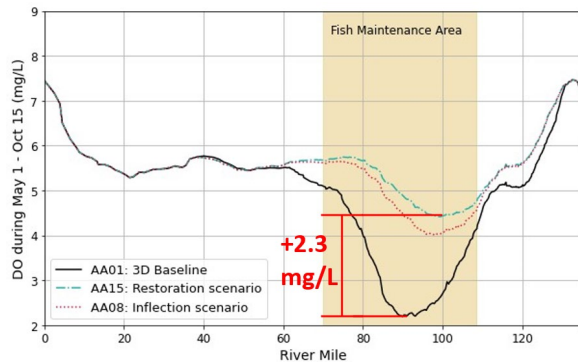
February 11, 2025

2025 Delaware Estuary Science & Environmental Summit

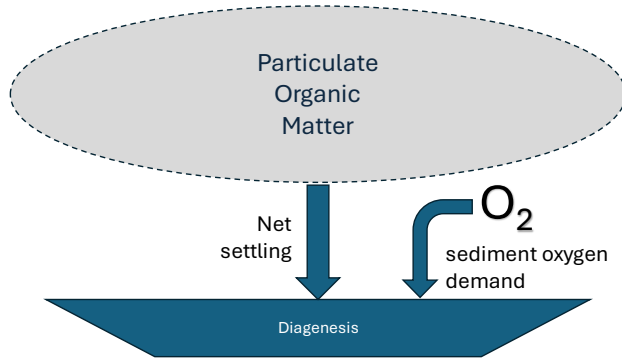
The following slides describe ongoing staff research as of February 10, 2025, and do not necessarily reflect policies or proposals of the Delaware River Basin Commission.

This presentation is provided as a contribution to an ongoing dialogue in the spirit of advancing collective understanding of environmental processes.





A Pathway for Continued Restoration of Dissolved Oxygen in the Estuary



What improvements is DRBC making to its model and why?



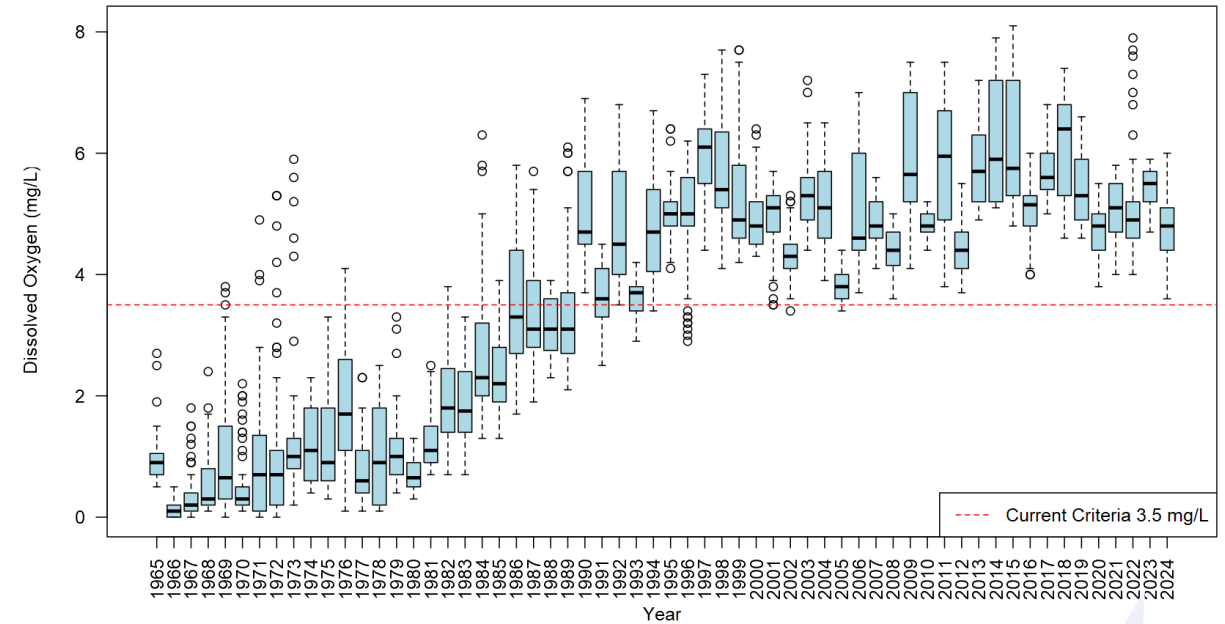
Why is a wasteload allocation study both necessary and beneficial?

Historical dissolved oxygen recovery driven by carbon reductions

- DRBC wastewater CBOD allocations in 1968
- Federal Clean Water Act grants for improved wastewater treatment



July & August Dissolved Oxygen by Year
USGS Monitor 01467200, Delaware River at Penns Landing (formerly Ben Franklin Bridge)

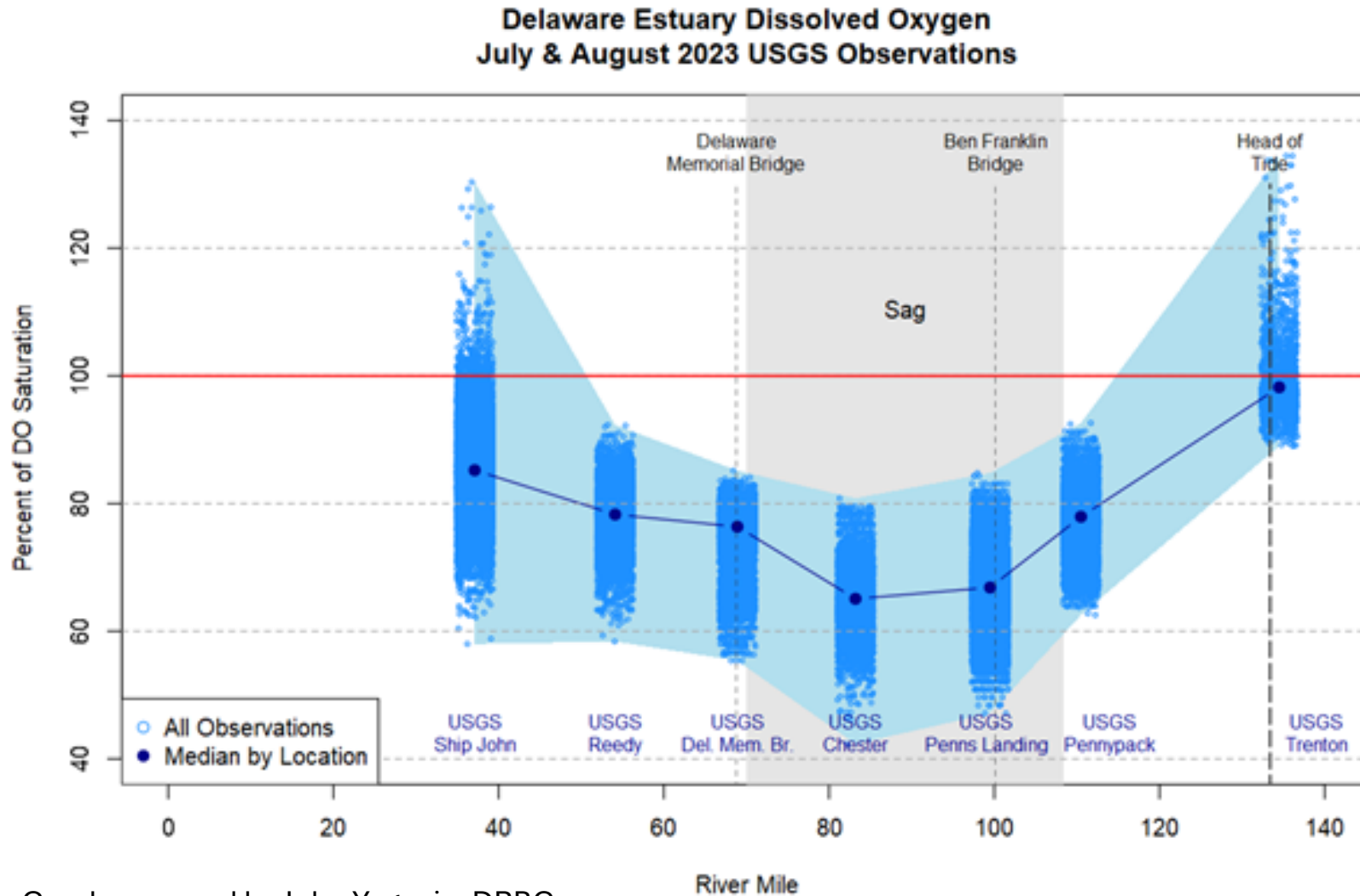


Graphs prepared by John Yagecic, DRBC

Historical
Dissolved
Oxygen
Recovery

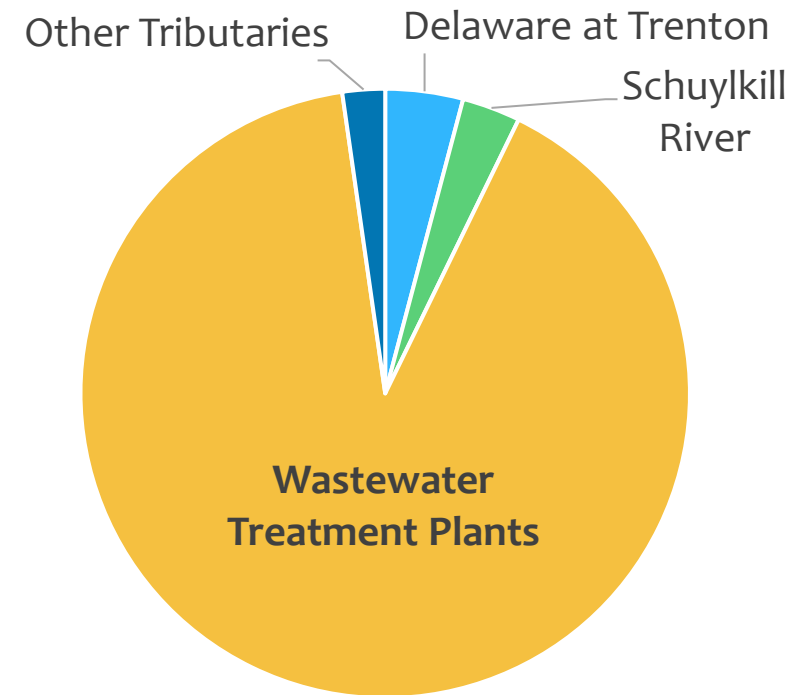


“DO sag” still persists



Graph prepared by John Yagecic, DRBC

Ammonia Loads by Source

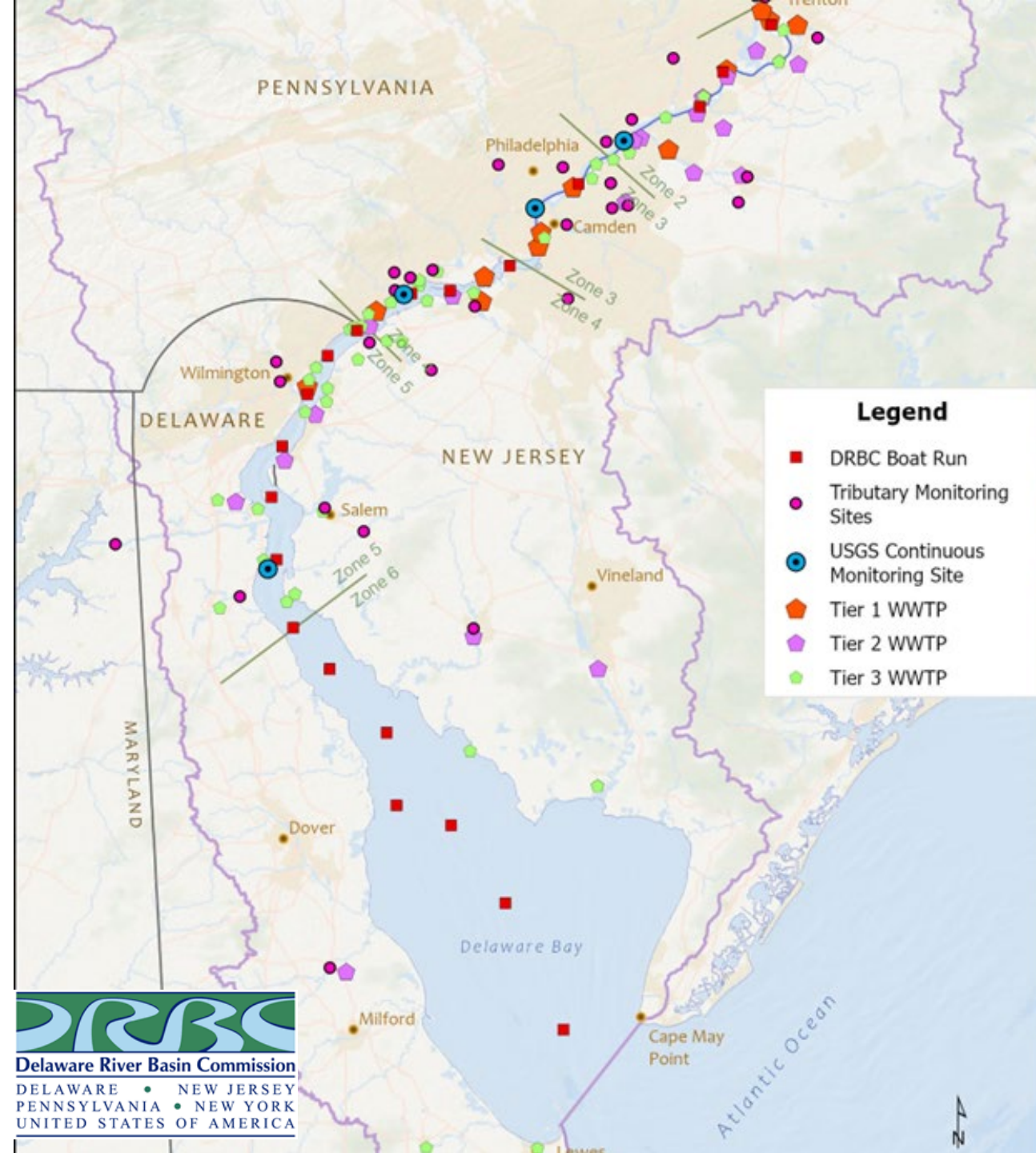


DRBC performed detailed technical studies

- Extensive monitoring 2018-19
- Hydrodynamic modeling
- Water quality modeling
- Final reports published 2024
 - Incorporated WQAC comments from 2022 draft reports

Purpose:

To determine dissolved oxygen levels that would result from various pollutant reduction scenarios.



September 2024

A PATHWAY FOR CONTINUED RESTORATION: IMPROVING DISSOLVED OXYGEN IN THE DELAWARE RIVER ESTUARY

Technical Report No. 2024-6

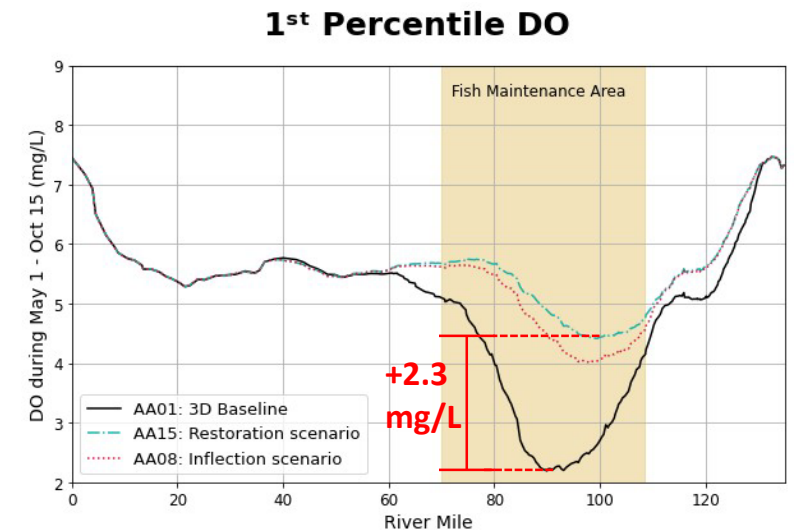
FINAL REPORT

Managing, Protecting and Improving
the Water Resources of the
Delaware River Basin since 1961



The “Pathway for Continued Restoration” shows that:

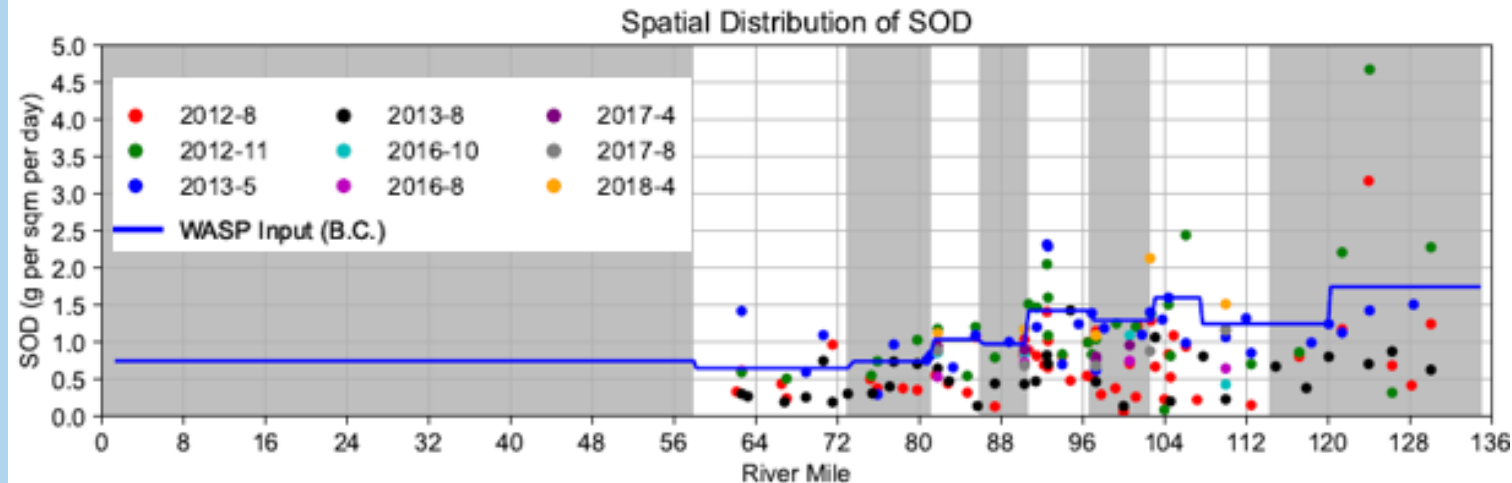
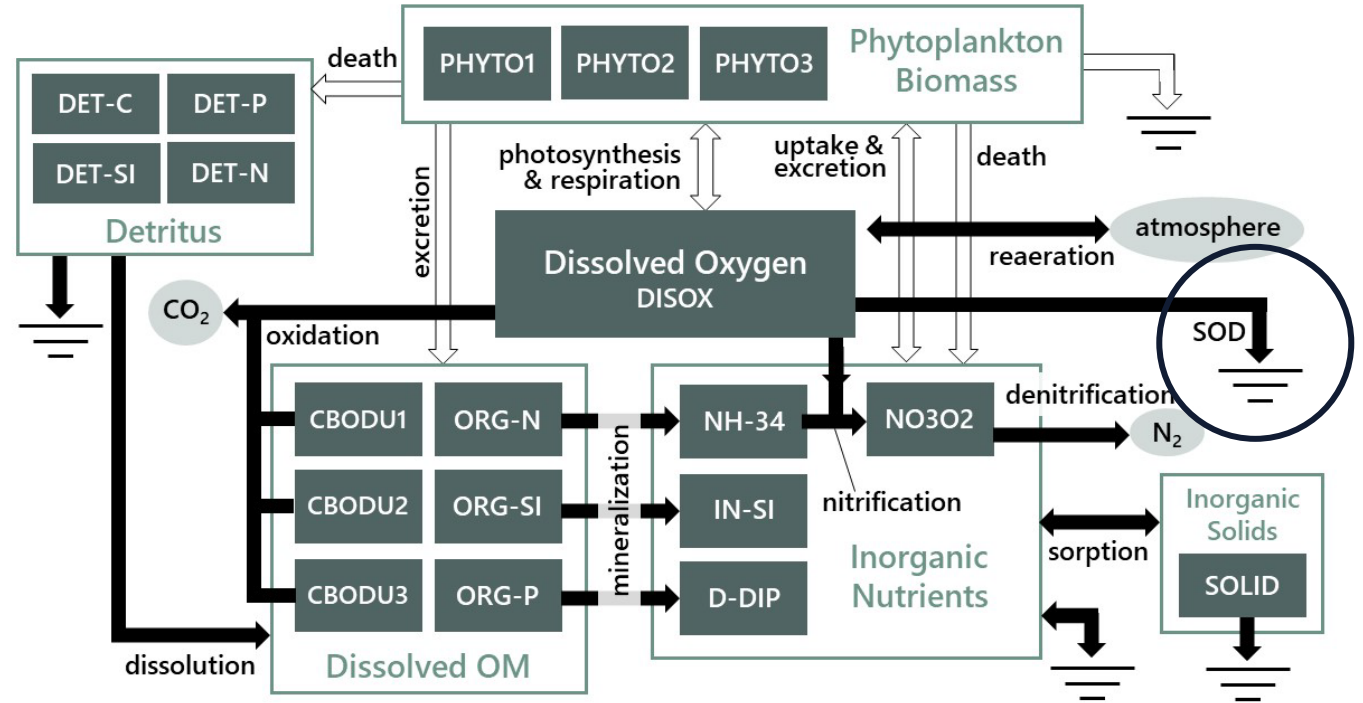
- The “DO sag” is driven by summer ammonia loads from a small number of WWTPs
- The addition of feasible treatment would significantly improve DO in the urban estuary.



Why is DRBC making improvements to its estuary DO model?

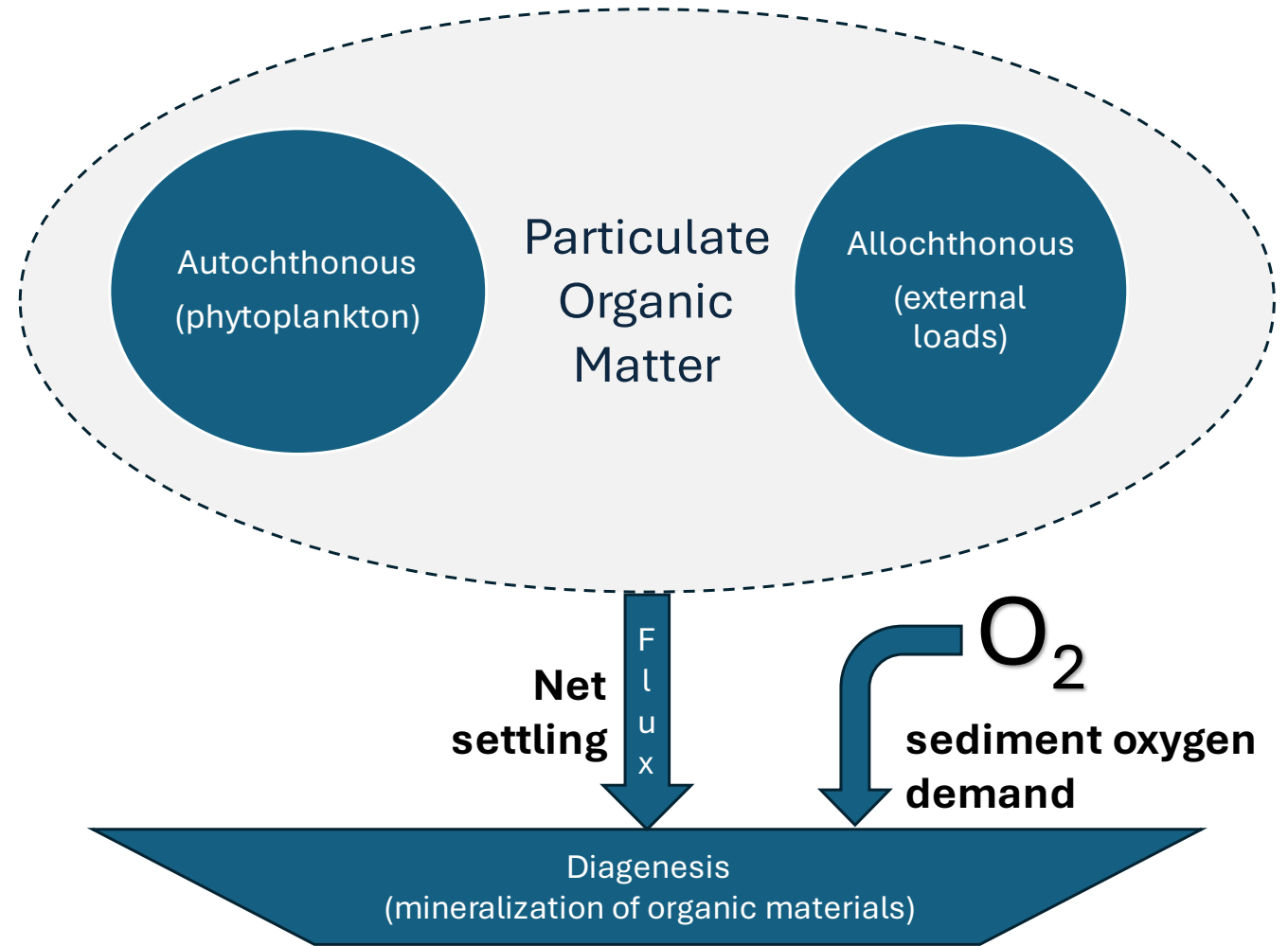
- Sediments impact DO in water column.
- Prescribed SOD rates do not account for future changes.

Dissolved Oxygen Model Kinetics (WASP)



Ongoing DRBC Model Improvements

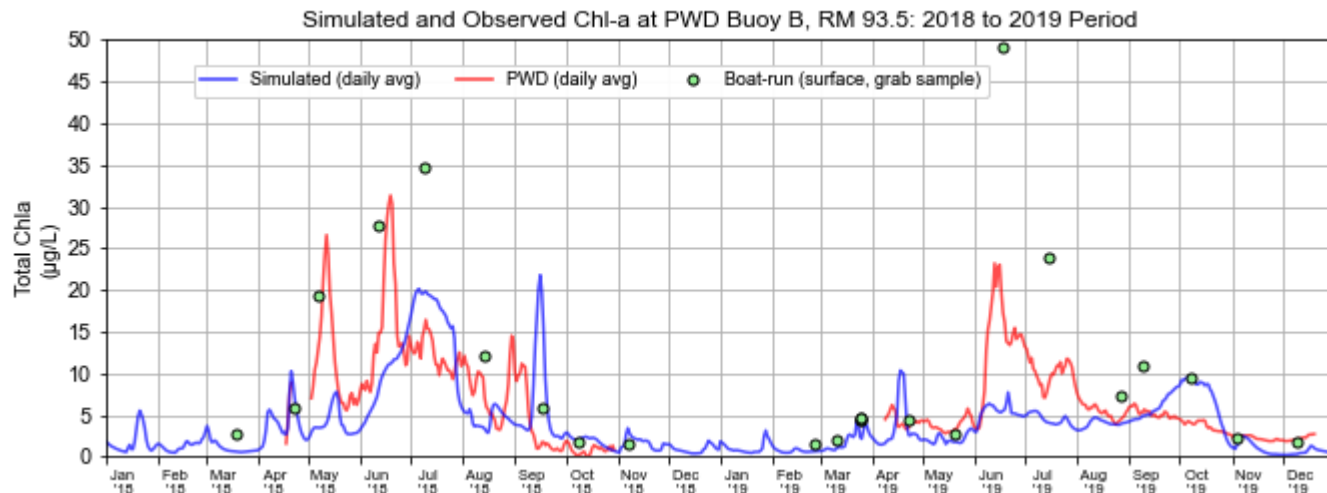
- External POM - specification of POM at major tributaries
- Internal POM – prediction of phytoplankton
- More important for coupling WQ with sediment diagenesis



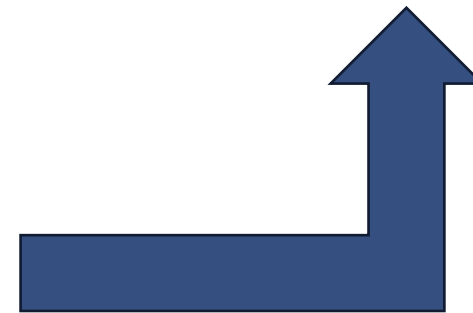
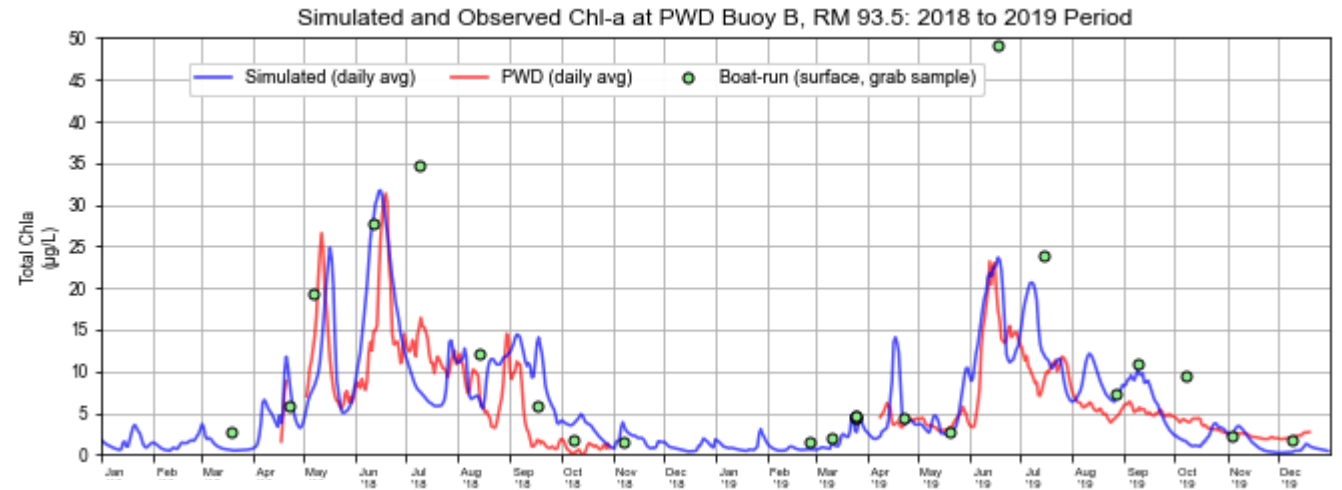
Ongoing work is yielding significant improvements!

phytoplankton
corresponds to
internal POM

Published calibration



Ongoing revised calibration

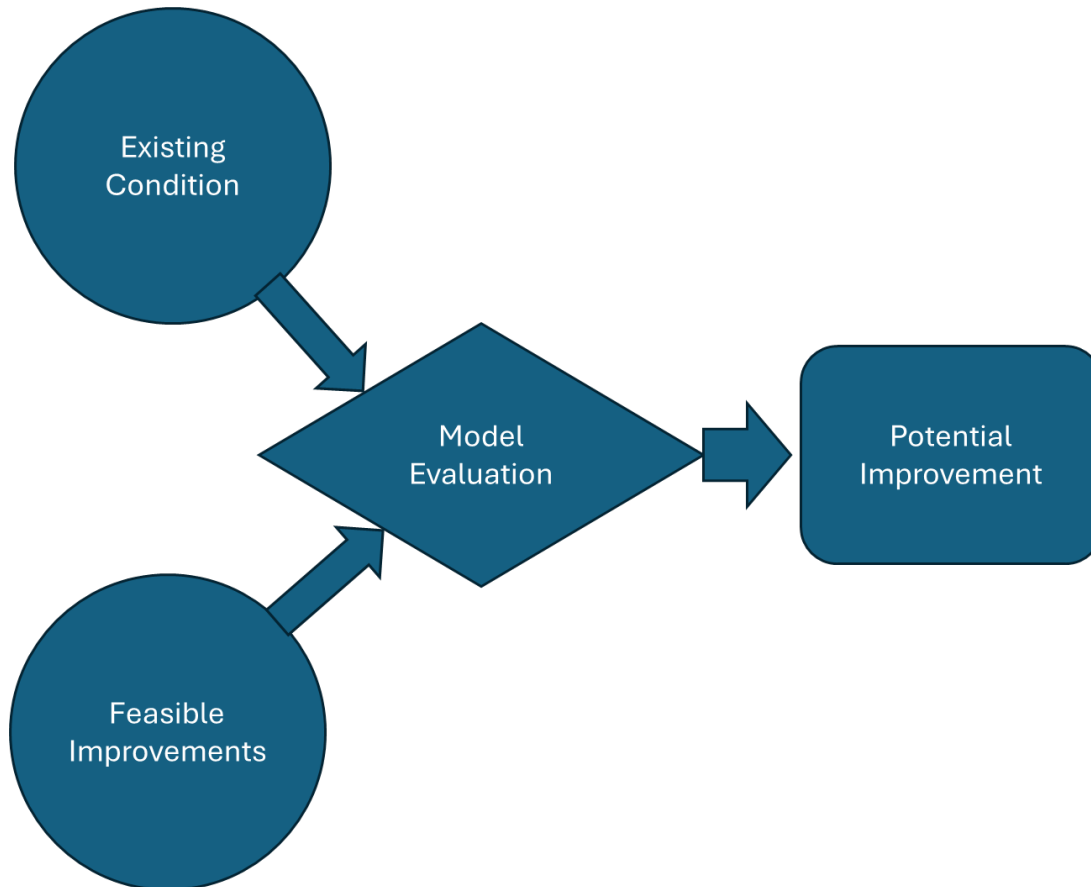


Wasteload Allocation Study

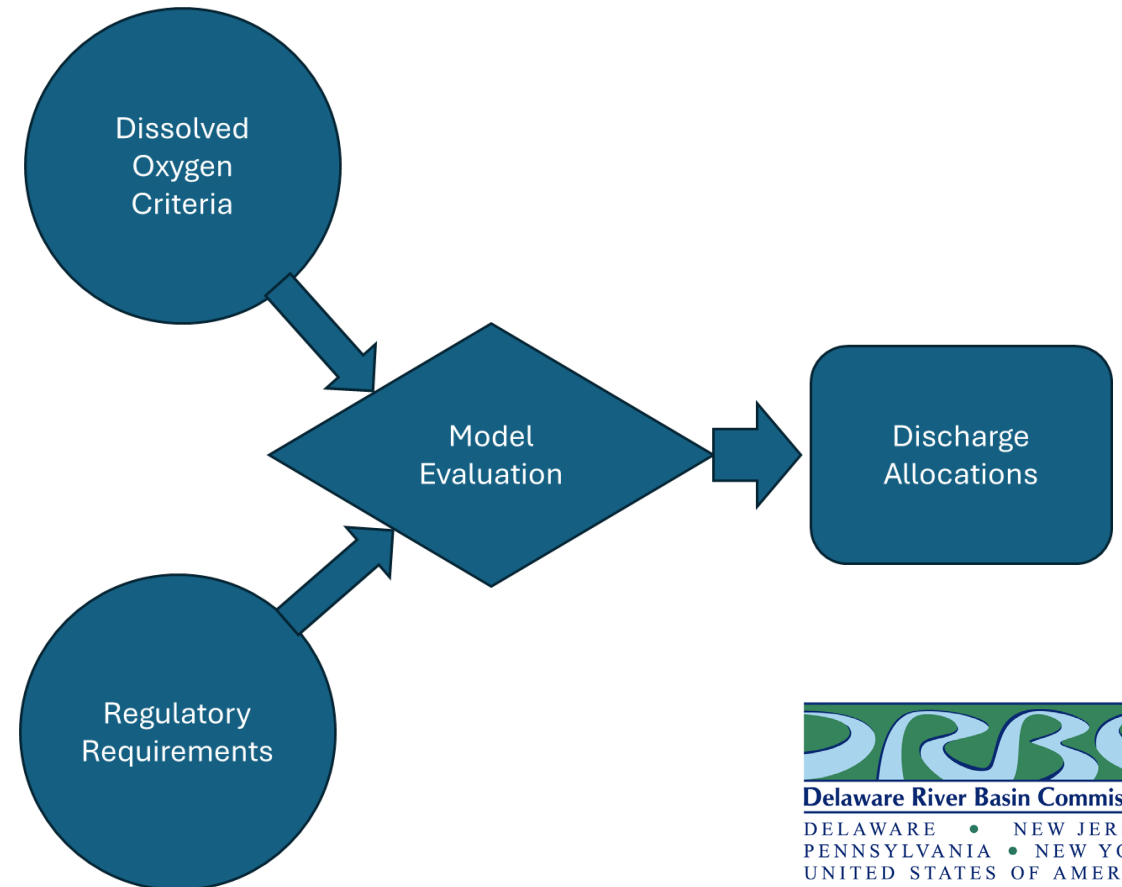
- Multiple discharges in a complex tidal environment must be evaluated together
- Translates DO criteria into specific allocations
 - Ammonia, CBOD, etc
- Components include:
 - Design condition, nonpoint source quantification, reserve capacity
- DRBC to conduct with estuary States and USEPA

Why is a WLA study necessary and beneficial?

“Pathway” Analysis



WLA Study



Recap

- **Big Picture:** the addition of feasible treatment to remove ammonia from a relatively small number of WWTPs would improve the level of DO in the urban estuary, resulting in a significant ecological uplift.
- **Model Improvements:** DRBC is finalizing model improvements that will allow us to dynamically simulate sediment interactions and changes, thereby allowing us to better understand future sediment impacts.
- **Model Application:** DRBC will work directly with the estuary States and USEPA to calculate individual wasteload allocations required to implement DO criteria in the estuary.



Questions?
For more information, contact:



Thomas.Amidon@drbc.gov
Namsoo.Suk@drbc.gov

