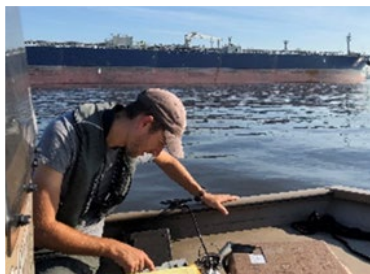


Presented to an advisory committee of the DRBC on April 23, 2026. Contents should not be published or re-posted in whole or in part without the permission of DRBC.

# Results of estuary dissolved oxygen model enhancements

## Water Quality Advisory Committee



**Matthew Amato, PhD**  
Joseph Fogarty, PhD  
Li Zheng, PhD  
Thomas Amidon, BCES  
Namsoo Suk, PhD

**April 23, 2026**  
*Zoom*

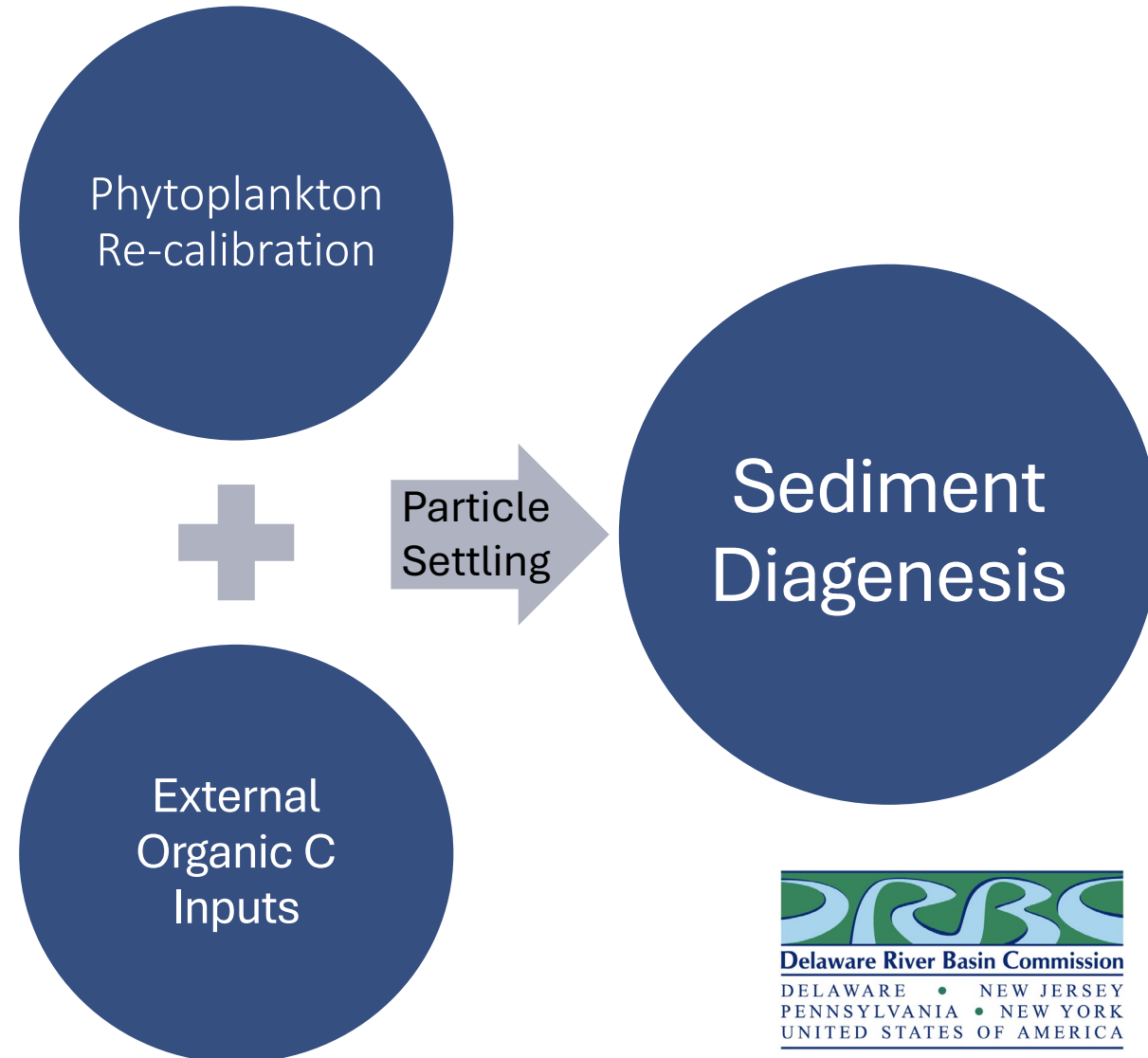


# Recall last WQAC Dec 2025 we reviewed model enhancements...

## Major Enhancements:

- Re-calibrated phytoplankton dynamics (internal organic C production)
- Characterized external organic C loads from tributaries, marshes, atm. deposition
- Applied spatially varying net settling scheme
- Coupled WQ model with sediment diagenesis

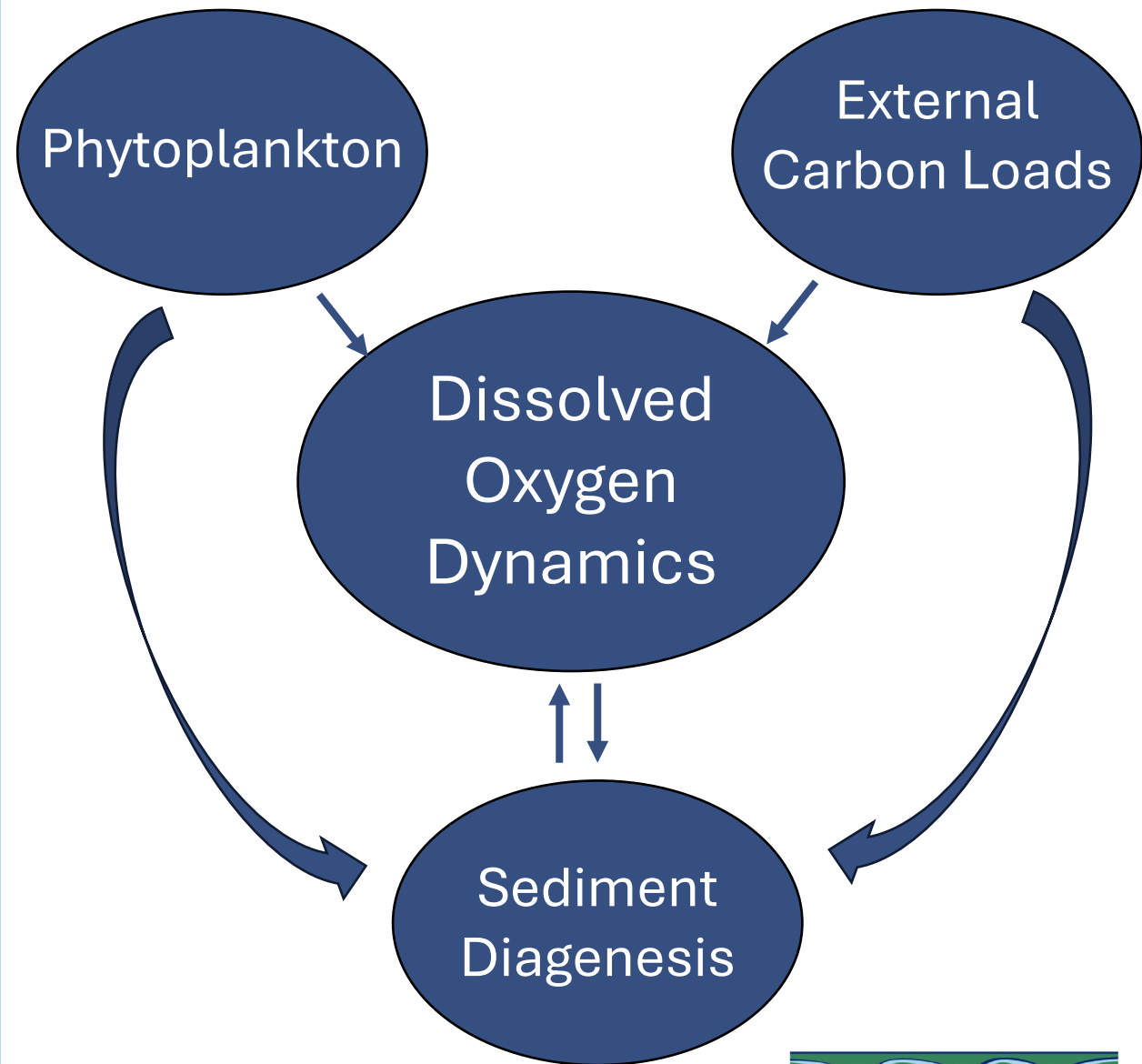
**Goal: Improve sediment impacts on dissolved oxygen**



# Today will showcase the results of the model enhancements...

## Model-Data Comparisons for:

- Total Chlorophyll-a
- Water Column Particulate C
- Sediment Oxygen and Nutrient Fluxes
- Dissolved Oxygen



# Total Chlorophyll-a

## Enhancement:

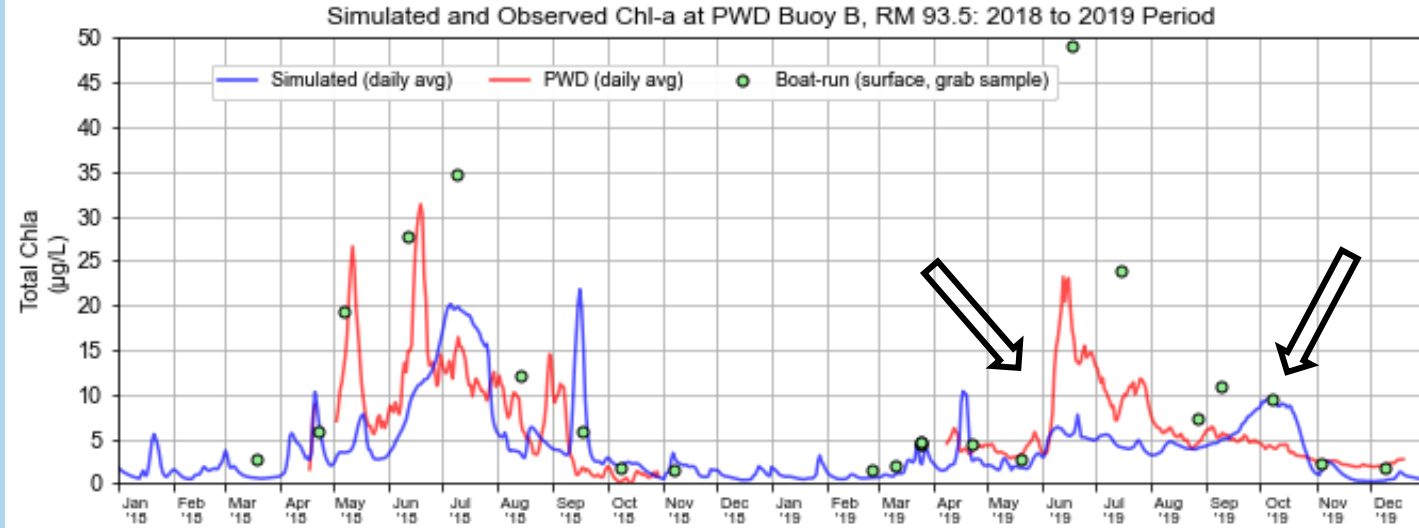
- Re-calibrated phytoplankton growth response to light and nutrient availability

## Result:

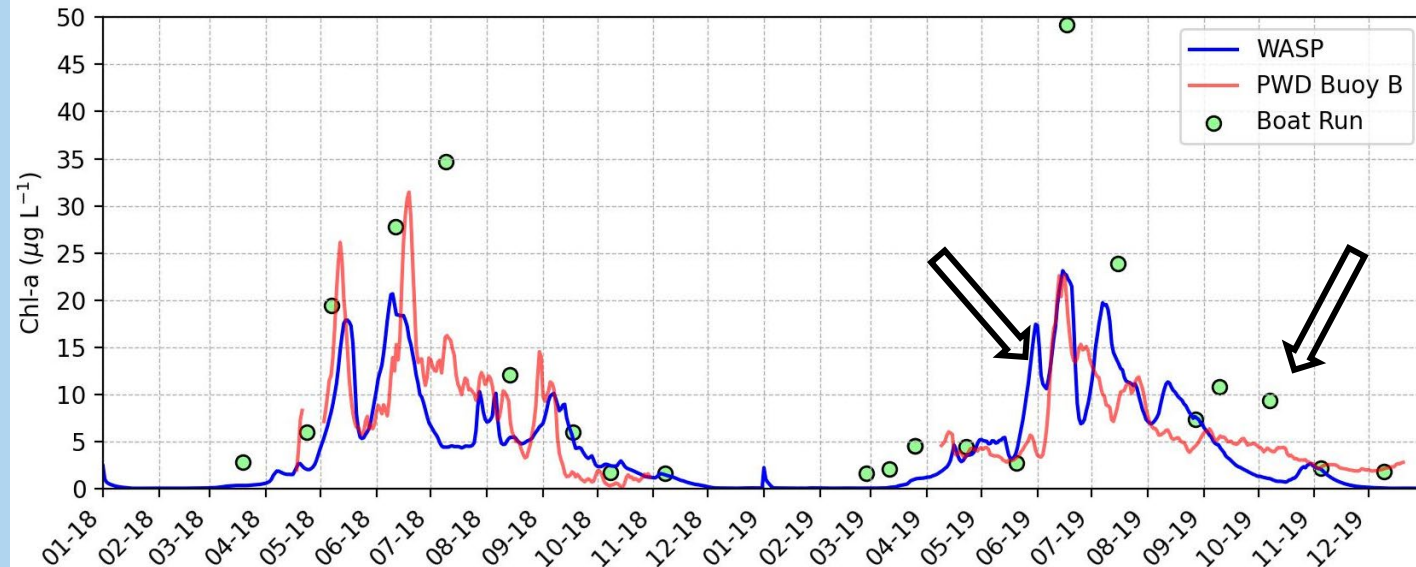
- Superior capture of phytoplankton dynamics and their impact on DO/C production



## 2024 Calibration Report



## Updated 2026 Model



# Particulate Organic C

## Enhancement:

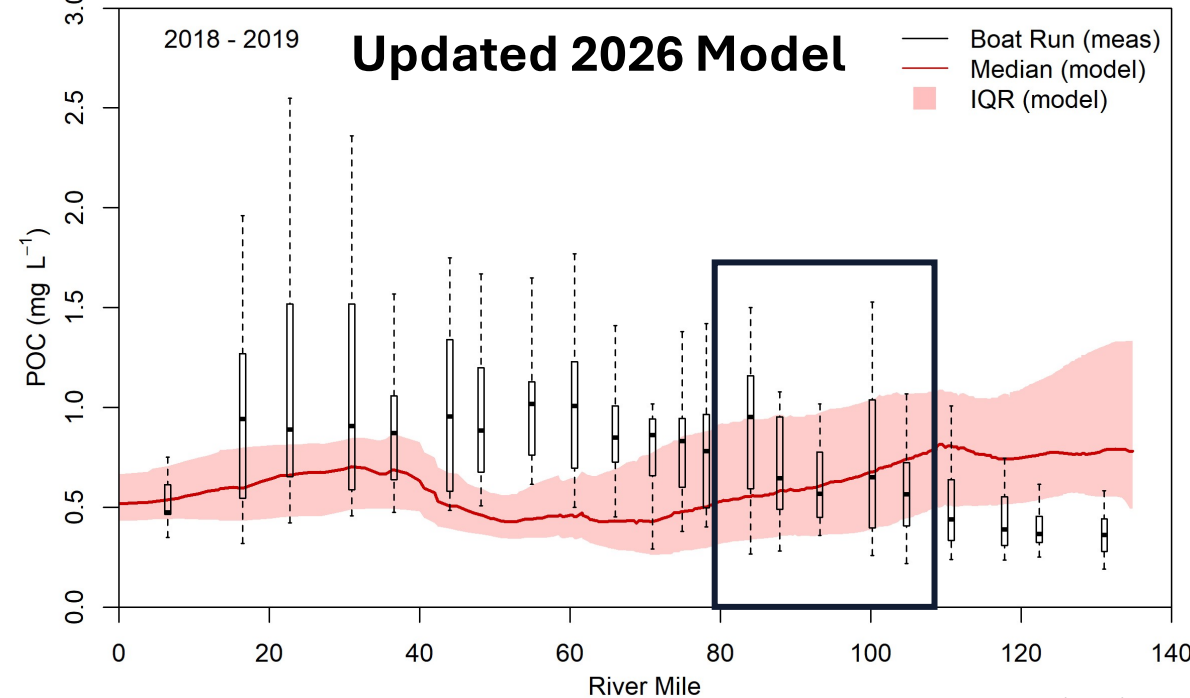
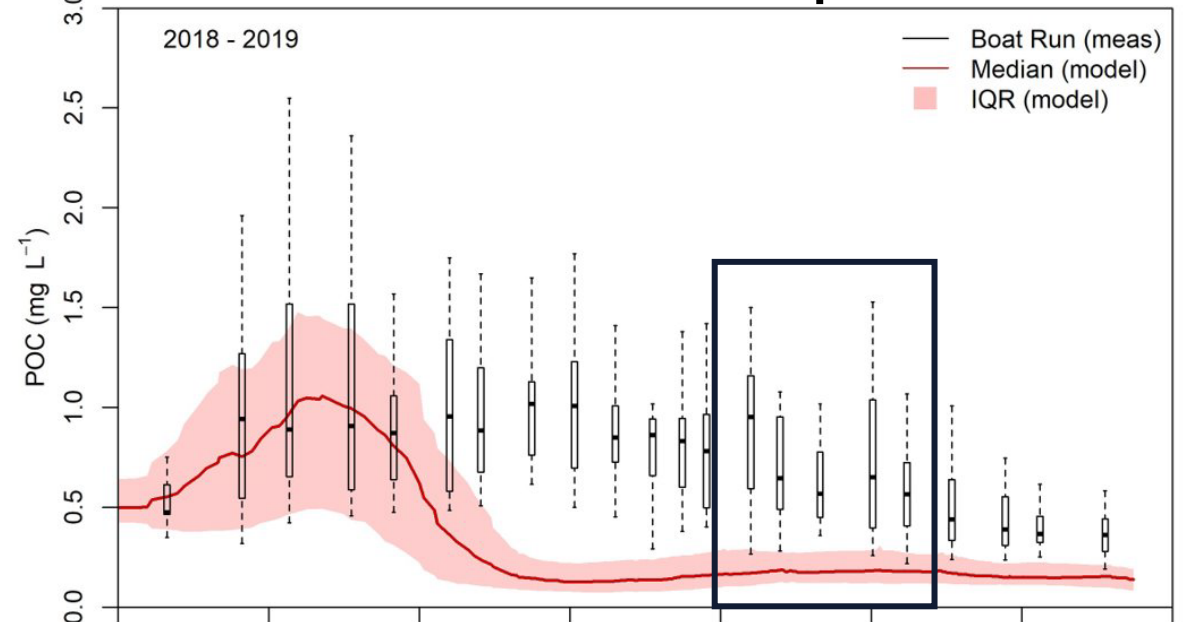
- Re-specification of particulate organic C loads from tributaries using USGS continuous sensors and depth-averaged measurements
- Added particulate organic loads from tidal marshes and atmospheric deposition

## Result:

- The mass balance of particulate organic C in the model is much more robust



## 2024 Calibration Report



# Sediment Oxygen Demand

## Enhancement:

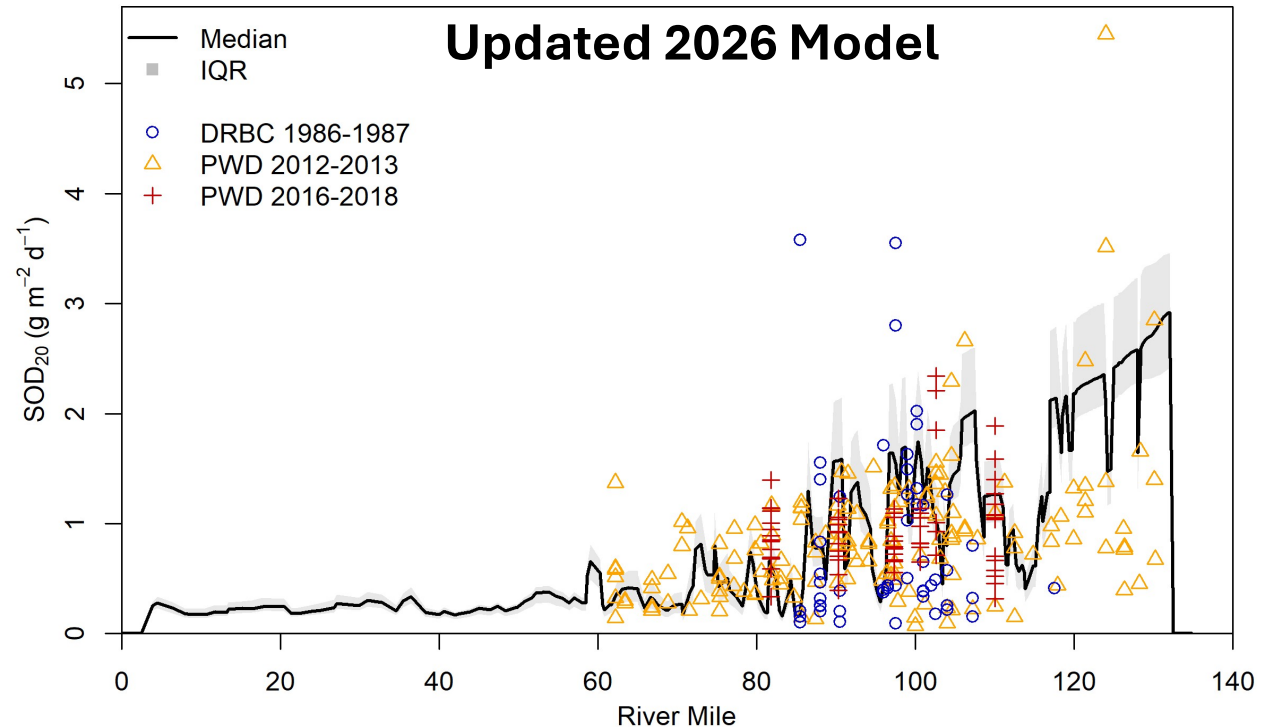
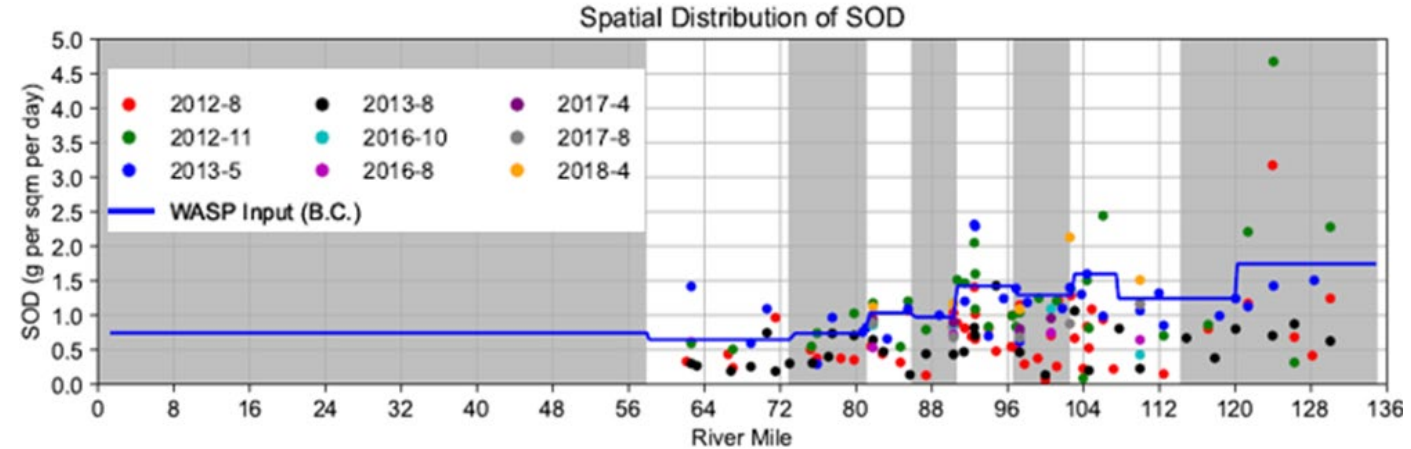
- Refined estuary C budget and particle settling rates
- Coupled WQ model to sediment diagenesis model

## Result:

- Precise spatiotemporal prediction of sediment oxygen and nutrient fluxes
- Enables the model to respond to shifting water column conditions



## 2024 Calibration Report



# Sediment Ammonia Flux

## Enhancement:

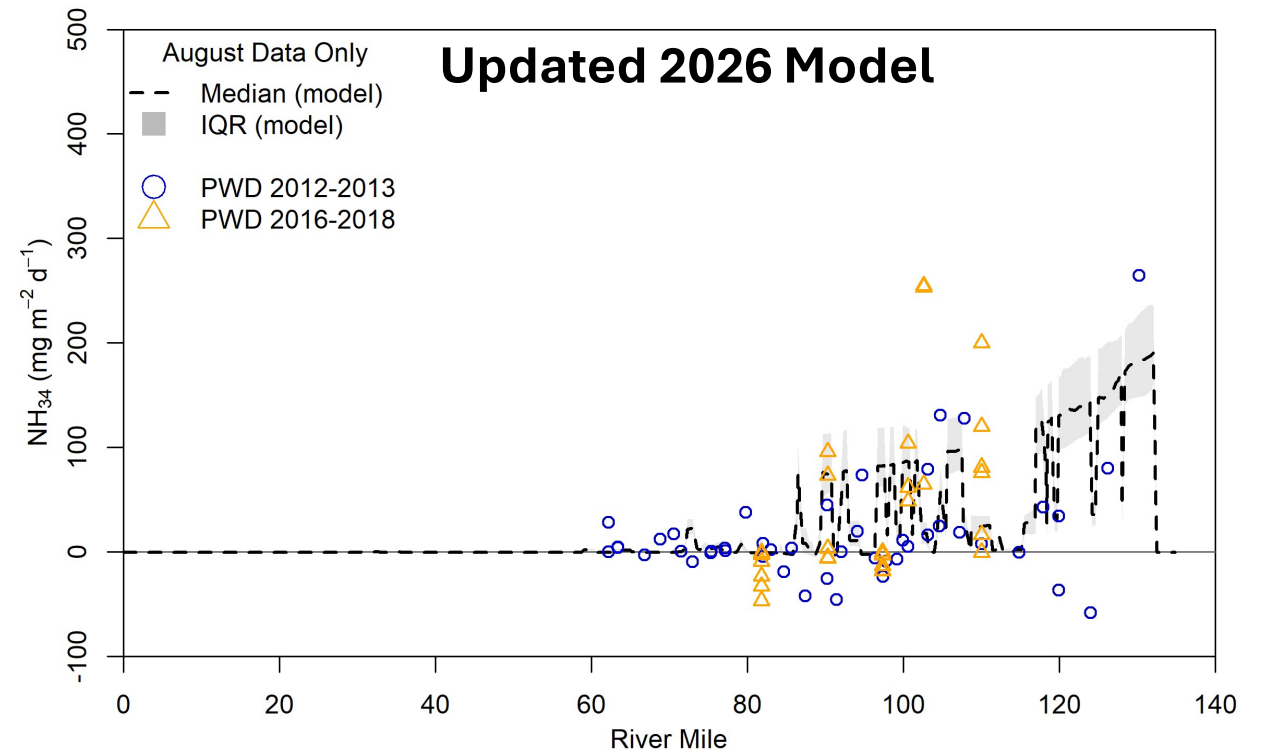
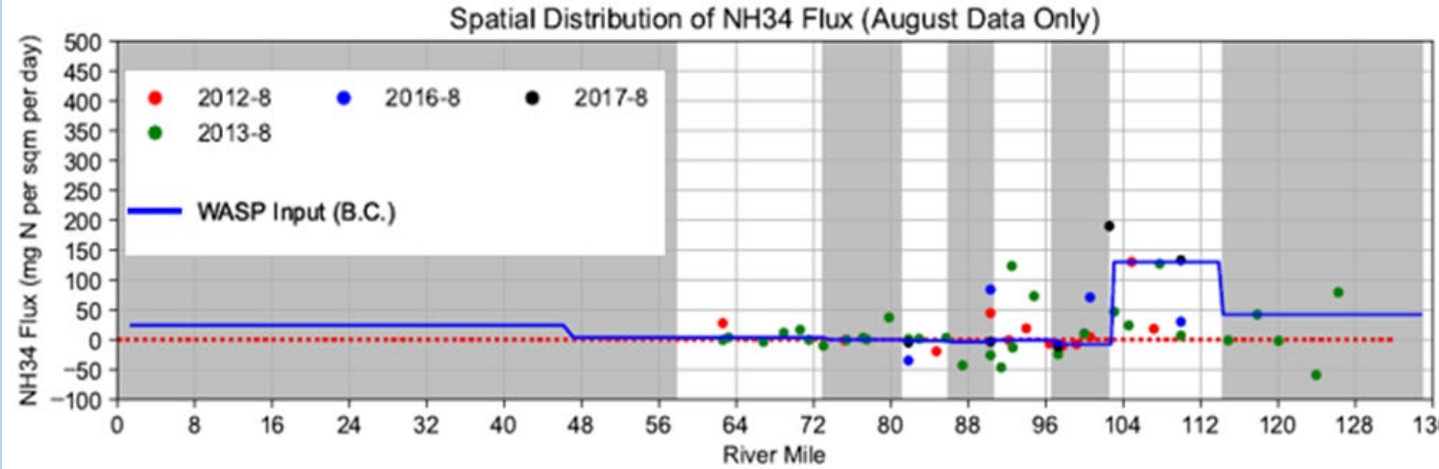
- Refined estuary C budget and particle settling rates
- Coupled WQ model to sediment diagenesis model

## Result:

- Precise spatiotemporal prediction of sediment oxygen and nutrient fluxes
- Enables the model to respond to shifting water column conditions



## 2024 Calibration Report



# Dissolved Oxygen

(expressed as concentration)

## Enhancement:

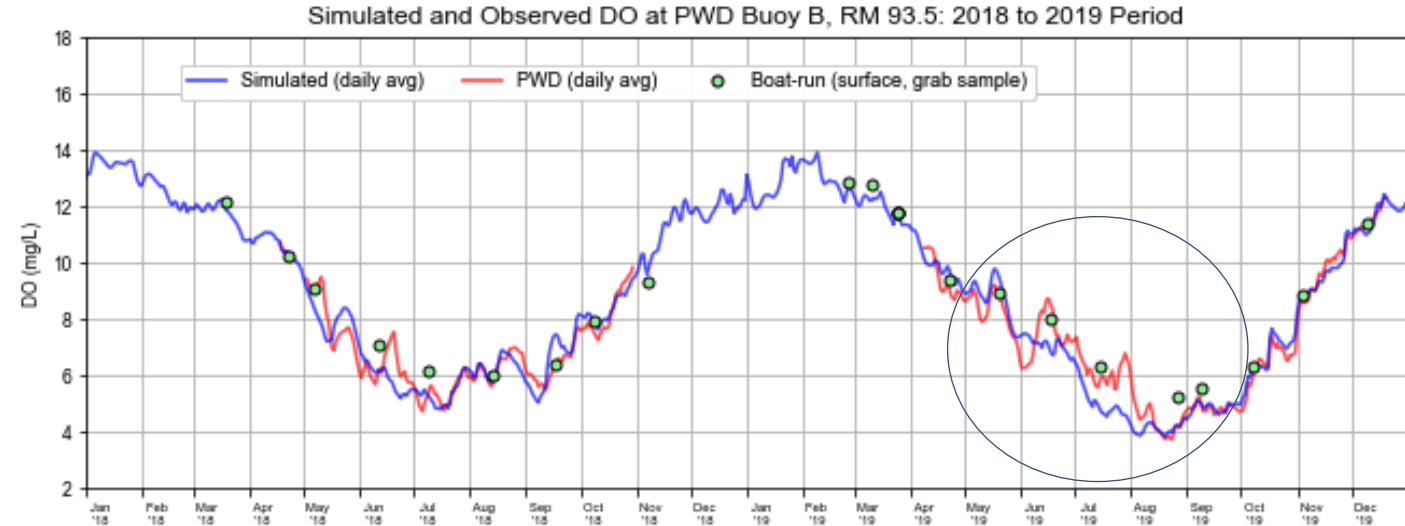
- Improved representation of algal growth kinetics and DO production
- Improved sediment oxygen demand model, now driven by interactions with the water column

## Result:

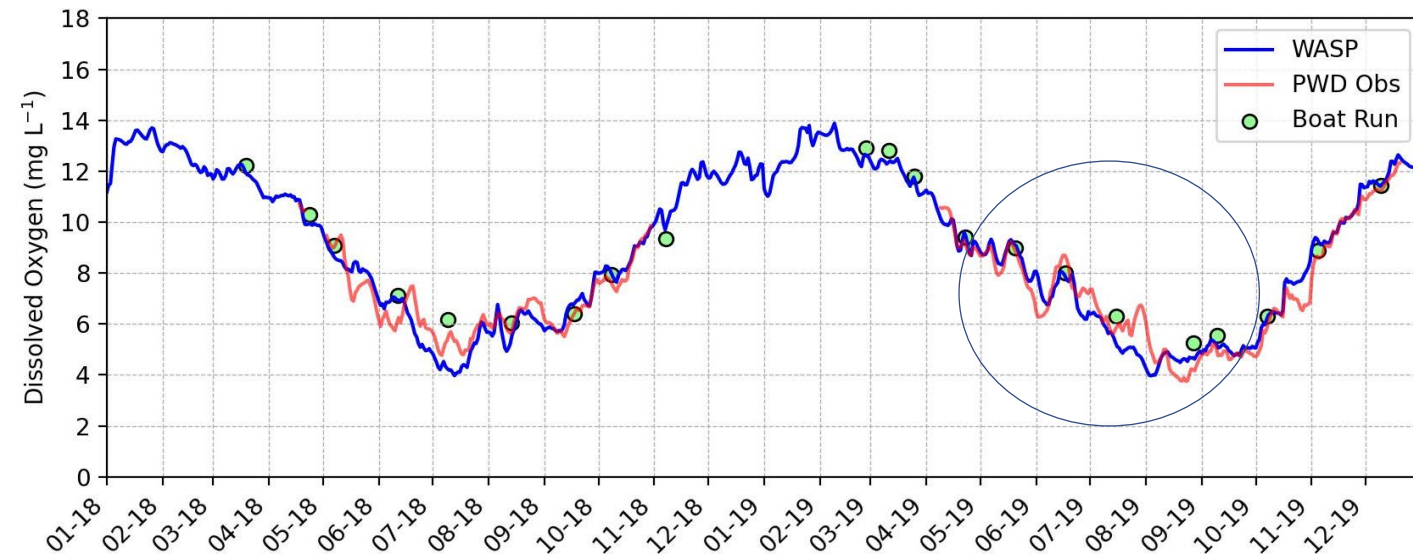
- A more scientifically defensible framework for evaluating DO dynamics
- Enhanced capacity to predict DO responses to future changes in water quality



## 2024 Calibration Report



## Updated 2026 Model



# Dissolved Oxygen

(expressed as % saturation)

## Enhancement:

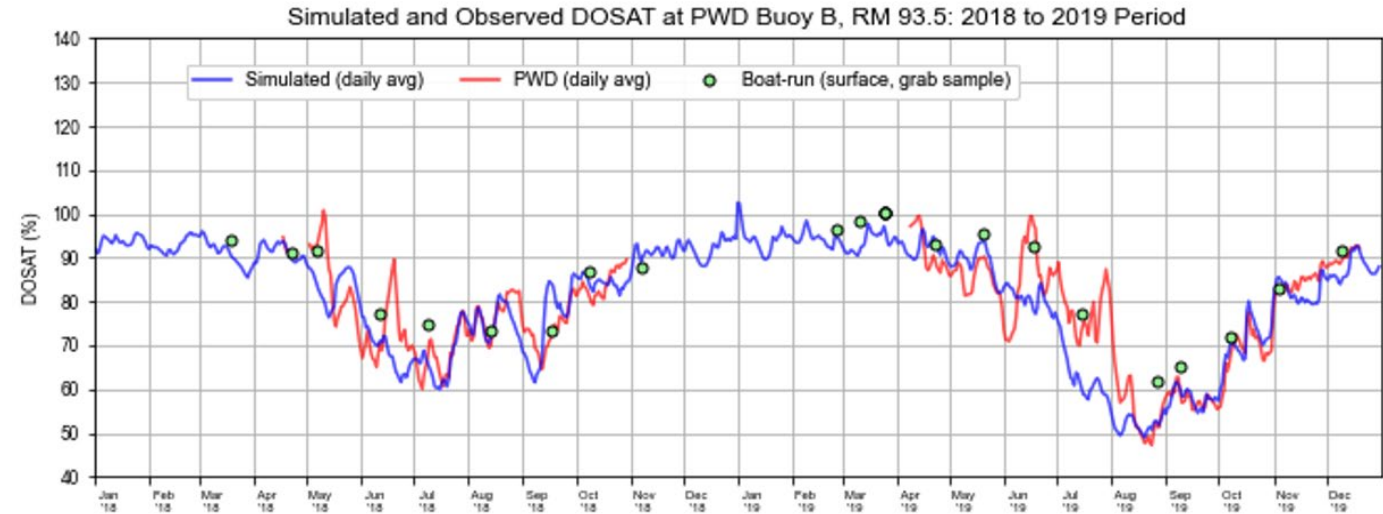
- Improved representation of algal growth kinetics and DO production
- Improved sediment oxygen demand model, now driven by interactions with the water column

## Result:

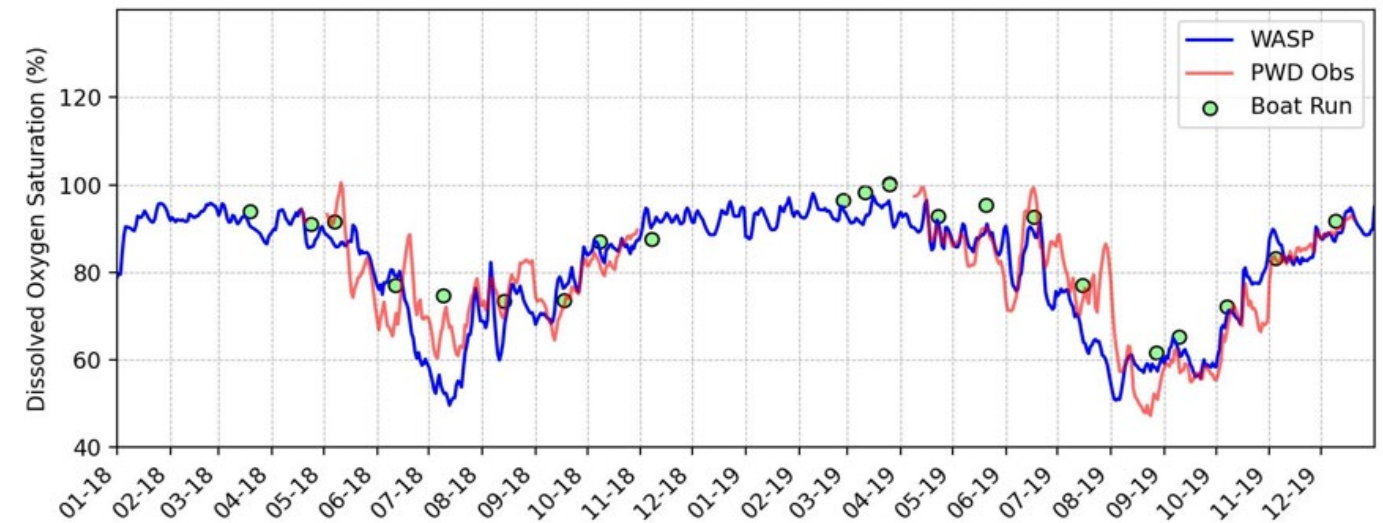
- A more scientifically defensible framework for evaluating DO dynamics
- Enhanced capacity to predict DO responses to future changes in water quality



## 2024 Calibration Report



## Updated 2026 Model

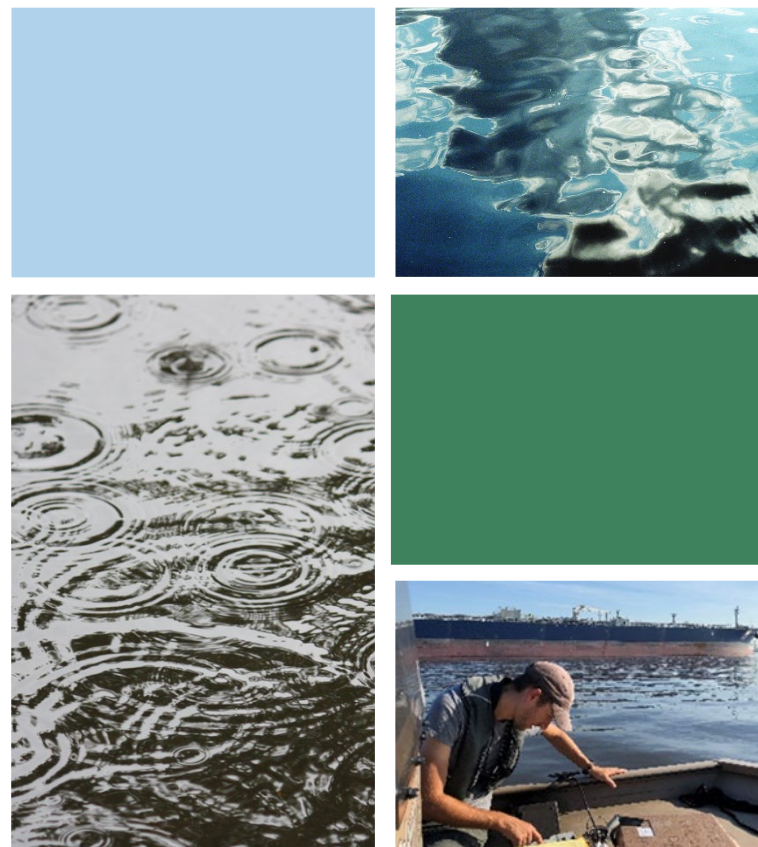




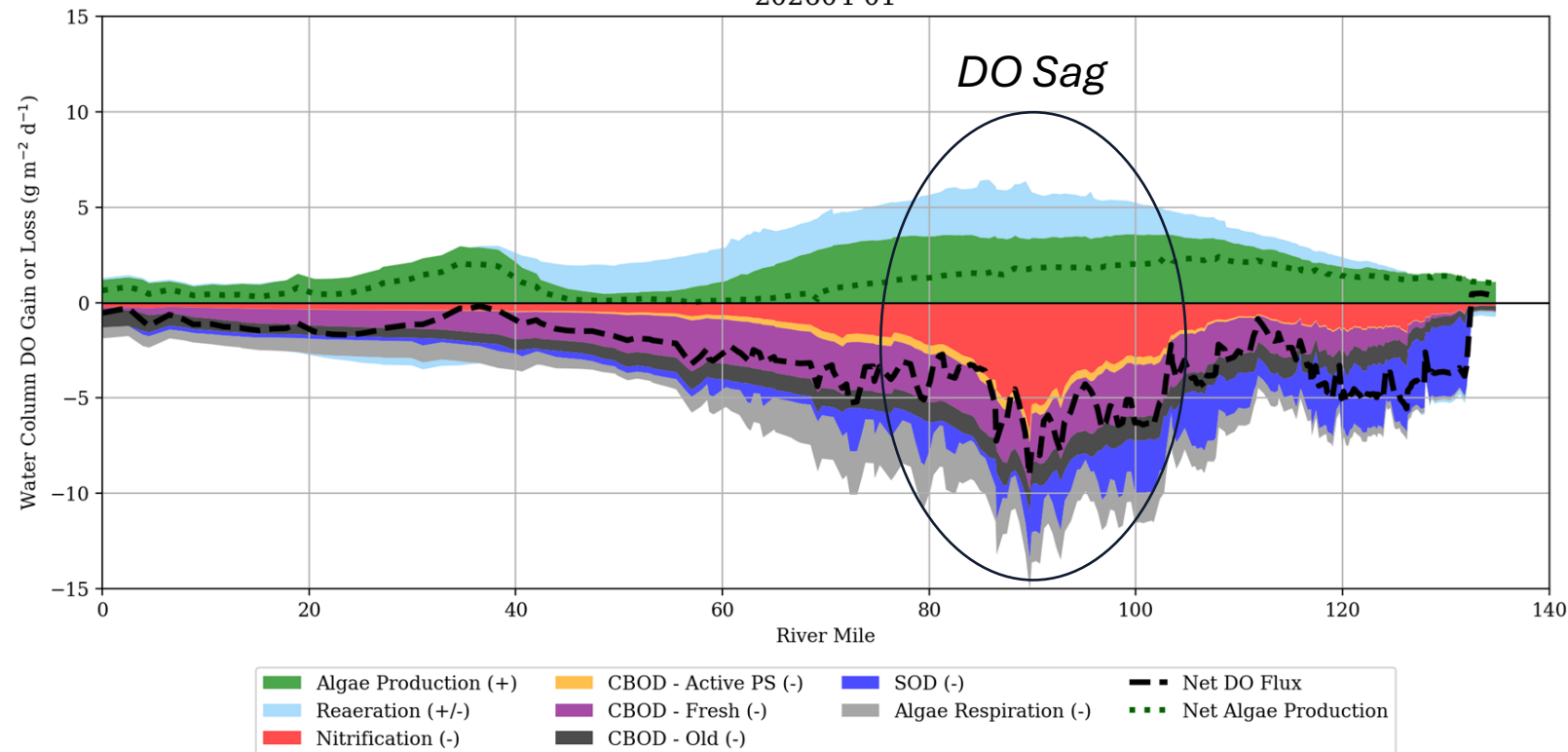
# Re-Calibration Goal:



- ✓ Improve mechanistic representation of the different processes influencing DO dynamics throughout the estuary



Simulated DO Gain (+) and Loss (-) from Different Processes, June 2019  
202604-01

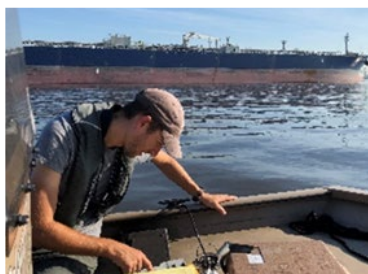




# Discussion

## Next Step:

- Supplemental Model Calibration Report on track to be published Q3 2026



**Delaware River Basin Commission**

DELAWARE • NEW JERSEY  
PENNSYLVANIA • NEW YORK  
UNITED STATES OF AMERICA