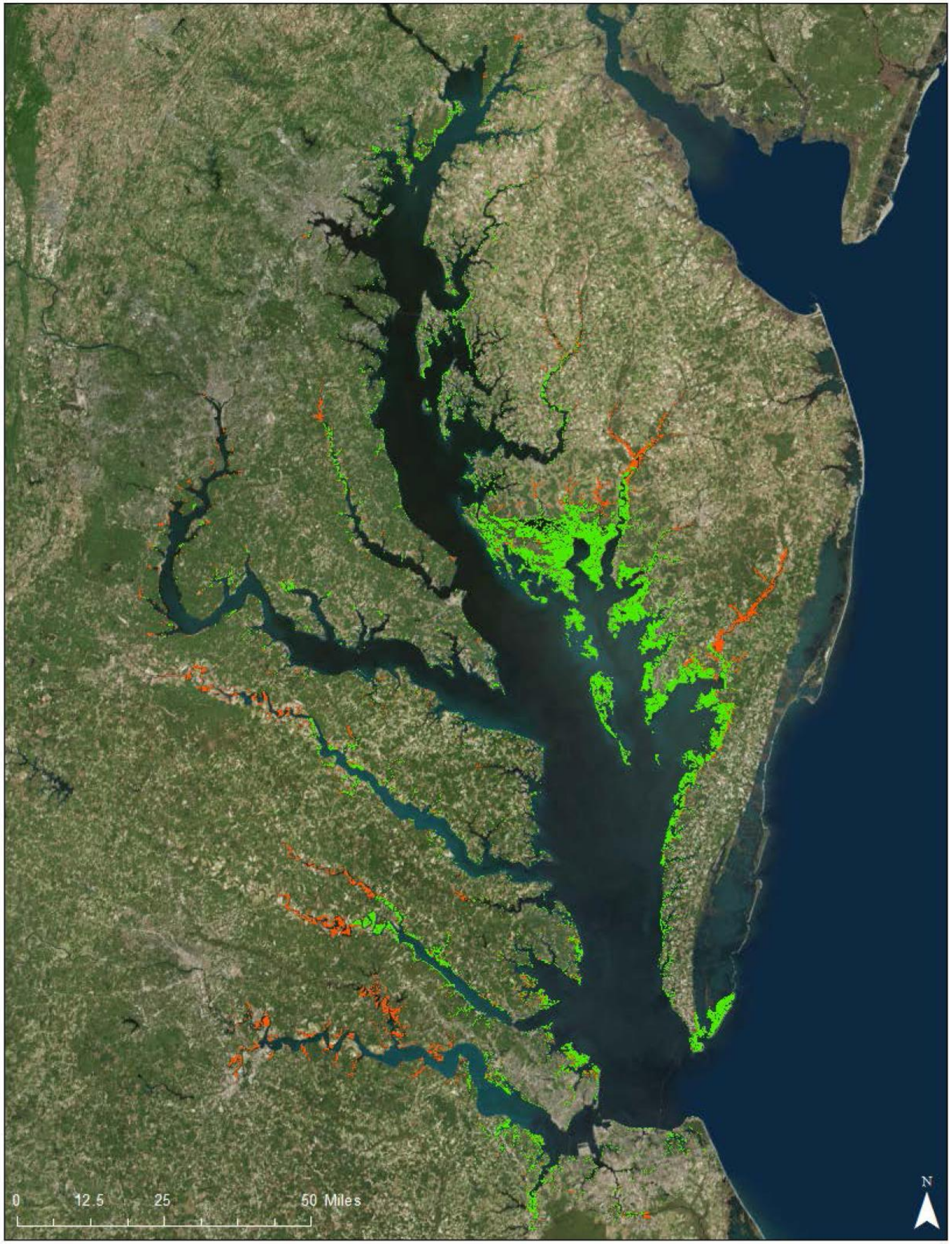
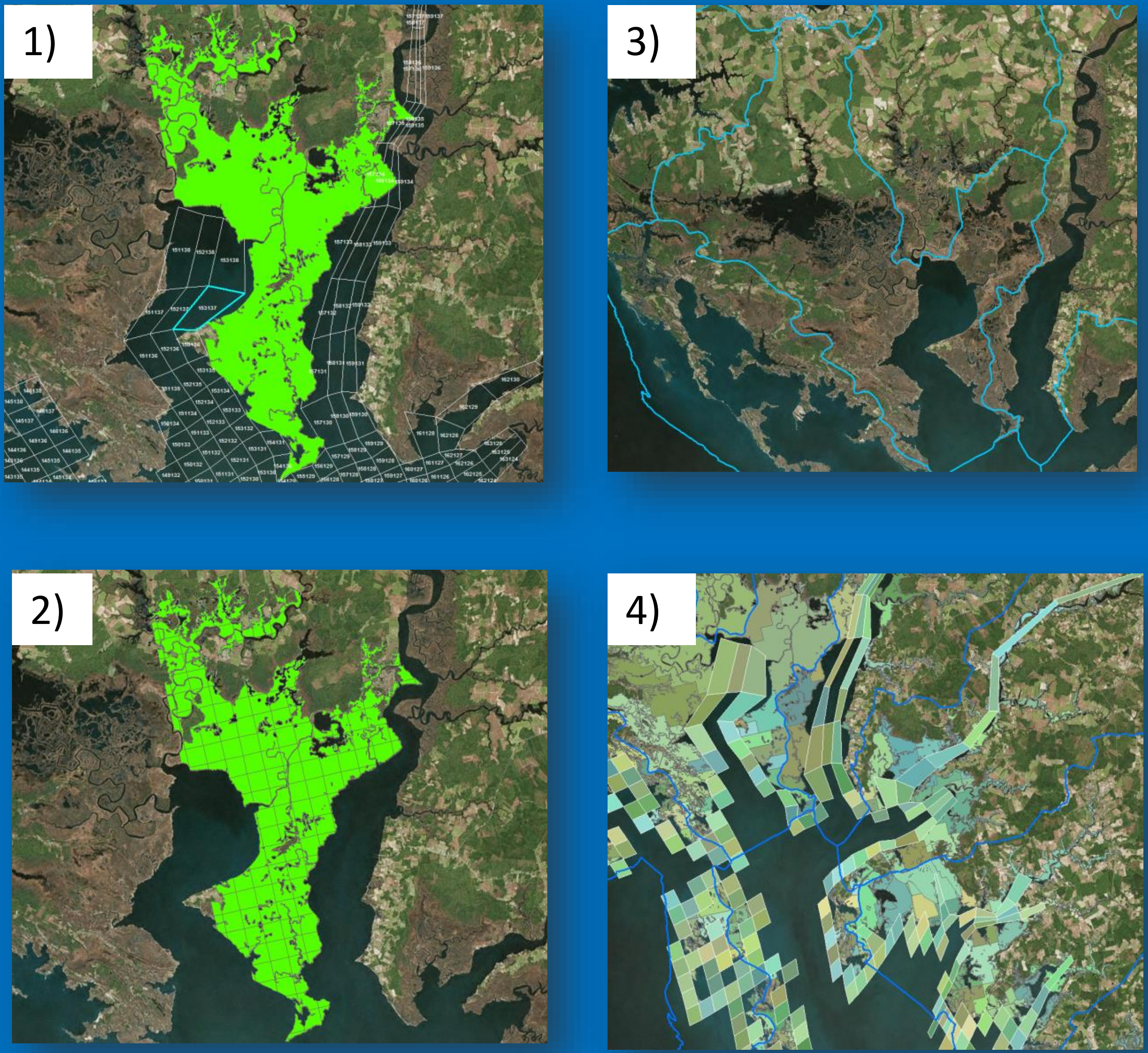
# Wetland Nutrient Attenuation and Wetland Loss




# Chesapeake Bay Tidal Wetlands

- Extent from National Wetlands Inventory.
- Determined largely from vegetation perceived via aerial photography.
- 190,000 hectares of estuarine (green) and tidal fresh (red) wetlands.
- Shape files provided by Quentin Stubbs and Peter Claggett, EPA Chesapeake Bay Program.

# Assign Wetlands Areas to Model Cells




1. Wetlands polygon.
2. Divide polygon into “fishnet.”
3. Overlay 10-digit HUC boundaries.
4. Assign wetlands areas to model cells based on proximity and local watershed boundaries.
5. Thank you, Scott Bourne, ERDC.

# Wetlands Module

- We don’t want to develop a complete wetlands biogeochemical model.
- We do want to develop a simplified module that includes:
  - Particle burial (organic and inorganic)
  - Respiration
  - Denitrification
  - Primary production?
  - Others?

# Particle Settling

$$V \cdot \frac{dC}{dt} = Transport\ + Kinetics\ - WSw \cdot C \cdot Aw$$

V = volume of WQM cell adjacent to wetlands
C = concentration
WSw = wetland settling velocity
Aw = area of wetland adjacent to WQM cell

This applies to all particles, organic and inorganic. Present settling rates 0.05 m/d for most particles, 0.005 m/d for phytoplankton.

# Respiration

$$V \cdot \frac{dC}{dt} = Transport\ + Kinetics\ - f(DO) \cdot f(T) \cdot WOC \cdot Aw$$

V = volume of WQM cell adjacent to wetlands
C = concentration
f(DO) = limiting factor = DO/(Kh+DO)
f(T) = temperature effect
WOC = wetland oxygen consumption
Aw = area of wetland adjacent to WQM cell

At present, WOC = 0.5 g DO/sq m/d at 20C. WOC doubles for a 10C temperature increase. Kh = 1.0 g DO/m3.

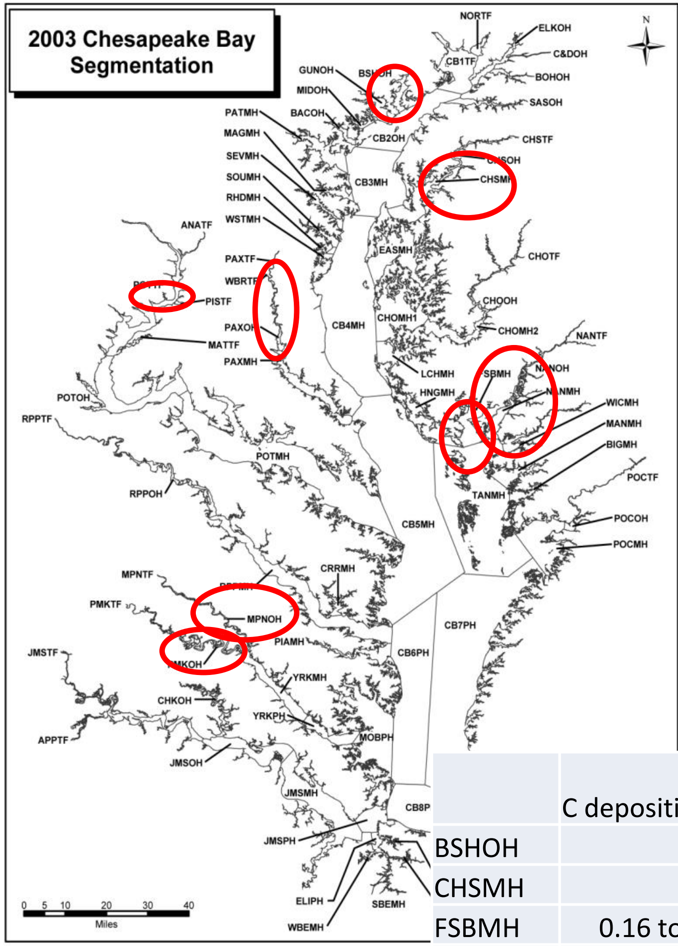
Previous calibration had WOC = 1 g DO/sq m/d and no limiting factor. Wetland areas from TMDL model.

# Denitrification

$$V \cdot \frac{dC}{dt} = Transport + Kinetics - MTC \cdot f(T) \cdot C \cdot Aw$$

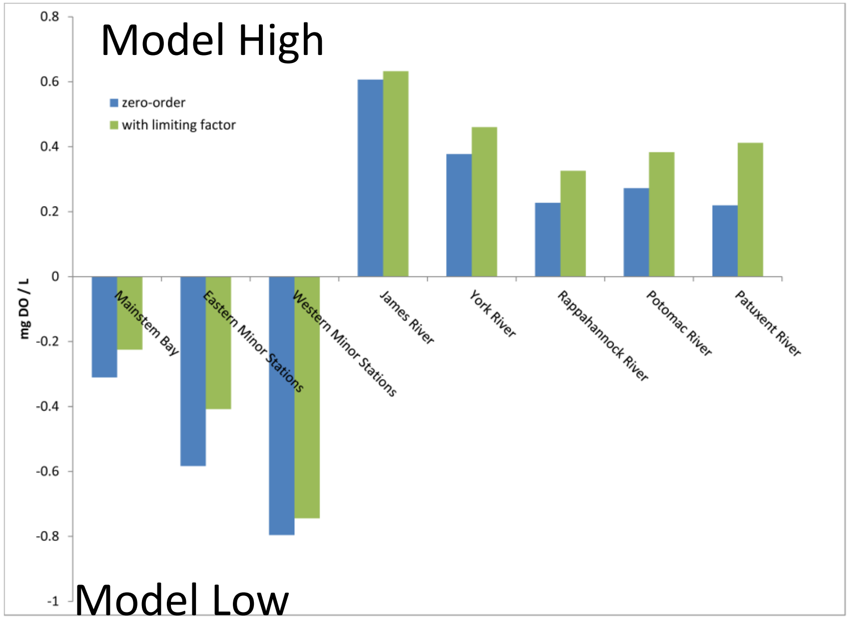
V = volume of WQM cell adjacent to wetlands
C = nitrate concentration
MTC = mass-transfer coefficient
f(T) = temperature effect
Aw = area of wetland adjacent to WQM cell

At present, the mass-transfer coefficient is 0.05 m/d.
Denitrification doubles for a 10C temperature increase.



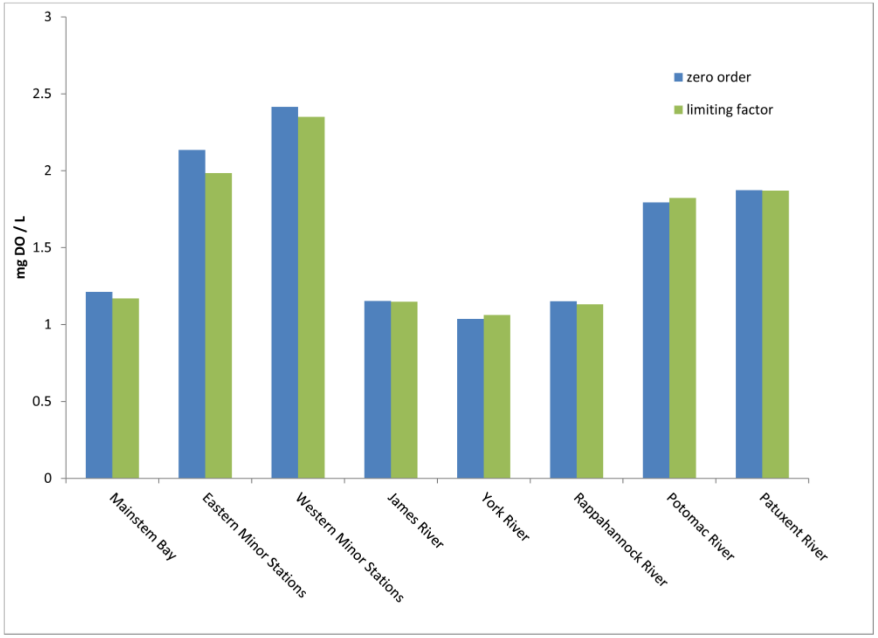

# Hot Spots for Calibration

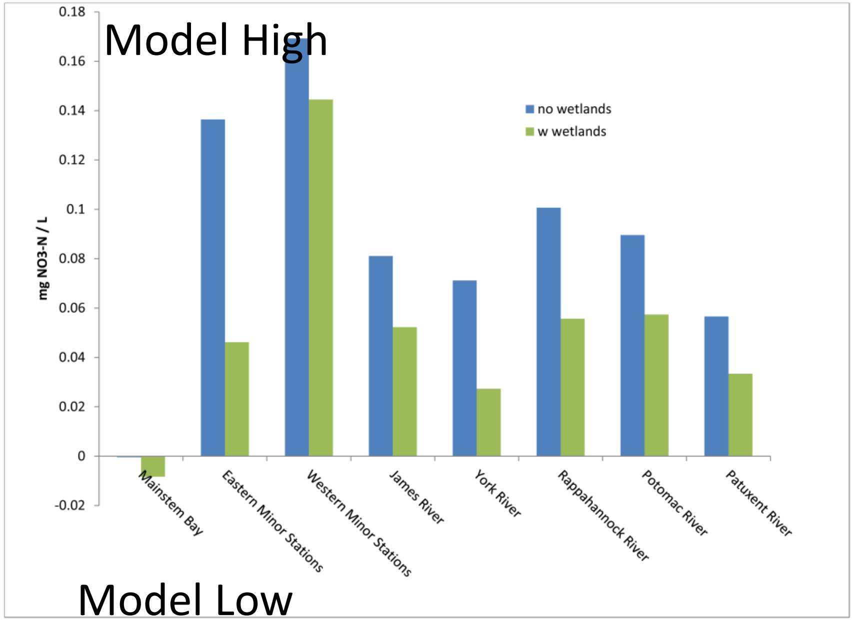
| | C deposition | N deposition | P deposition | denitrification | solids deposition | respiration |
|---|---|---|---|---|---|---|
| BSHOH | | 0.008 to 0.032 | 0.001 to 0.006 | | | |
| CHSMH | | 0.02 to 0.064 | 0.01 to 0.019 | | 3.6 | |
| FSBMH | 0.16 to 0.33 | | | | 0.3 | |
| MPNOH | 0.24 to 2.77 | 0.019 to 0.238 | 0.004 to 0.085 | | 1.43 to 42.0 | |
| MPNTF | | | | | | |
| NANMH | 0.033 to 0.126 | | | | 1.61 to 8.12 | |
| NANOH | 0.033 to 0.126 | | | | 1.61 to 8.12 | |
| PAXOH | | 0.008 | 0.002 | | 5.75 | |
| PAXTF | | 0.033 to 0.064 | 0.01 | 0.108 to 0.197 | 5.75 | |
| PMKOH | 0.61 | 0.05 | | 0.04 | | 1.12 to 2.77 |
| POTTF | 1.44 | | | 0.043 to 0.06 | 5.88 | |
| WICMH | 0.033 to 0.126 | 0.037 | 2.74x10^-5 to 0.004 | | 1.61 to 8.12 | |
| CHOMH | | 0.053 to 0.074 | 4.9x10^-4 to 0.005 | | | |
| WQGIT | | | 0.0016 | 0.026 | | |
| | | | | | | |




DO Mean Difference

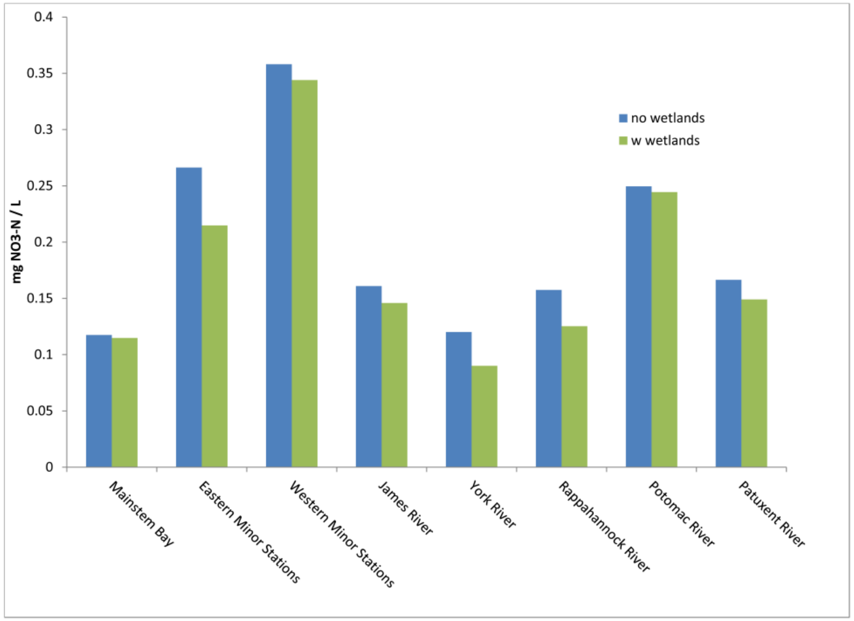
Absolute Mean Difference

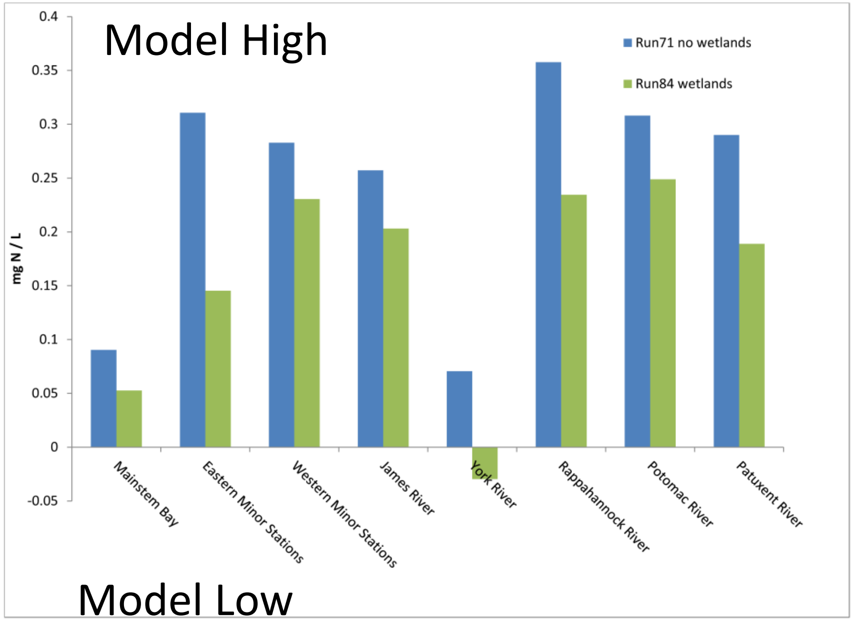





NO3 Mean Difference

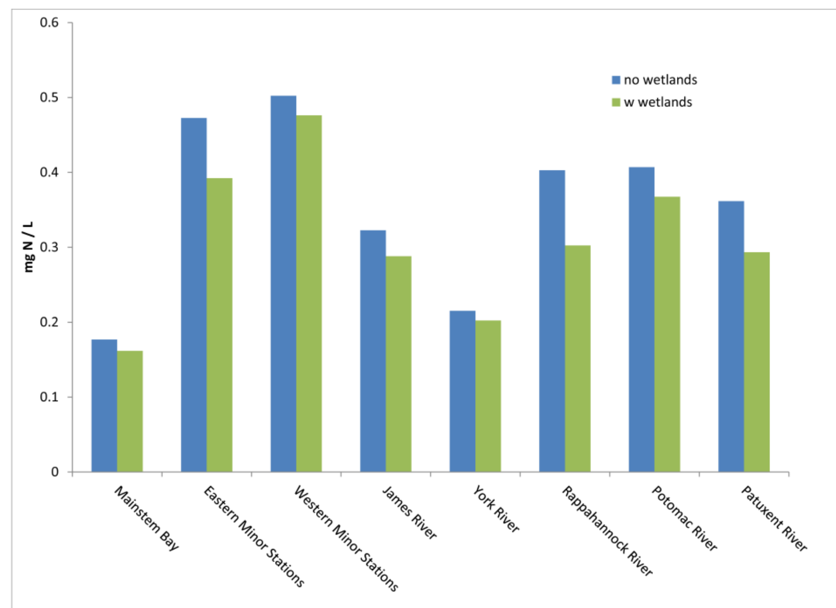
Absolute Mean Difference

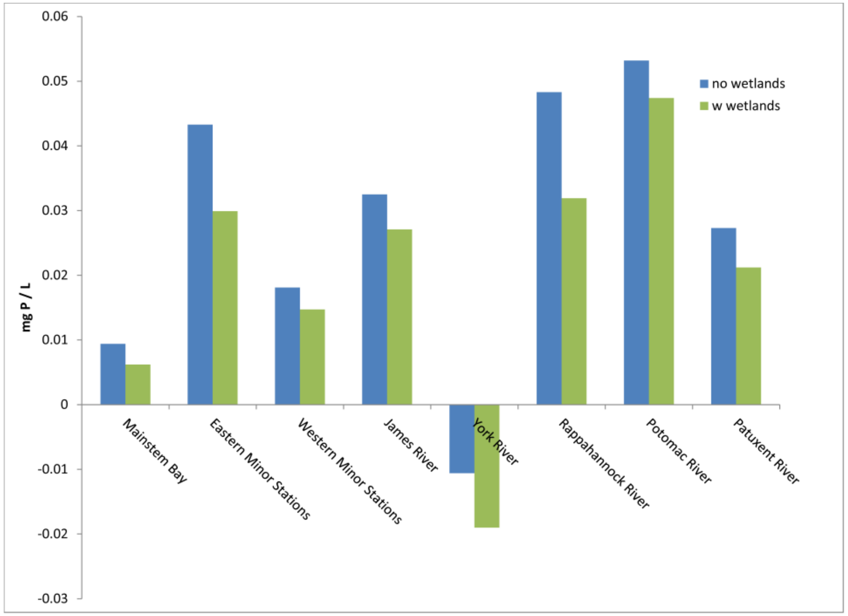





## Total N Mean Difference

## Absolute Mean Difference






Total P Mean Difference

Absolute Mean Difference