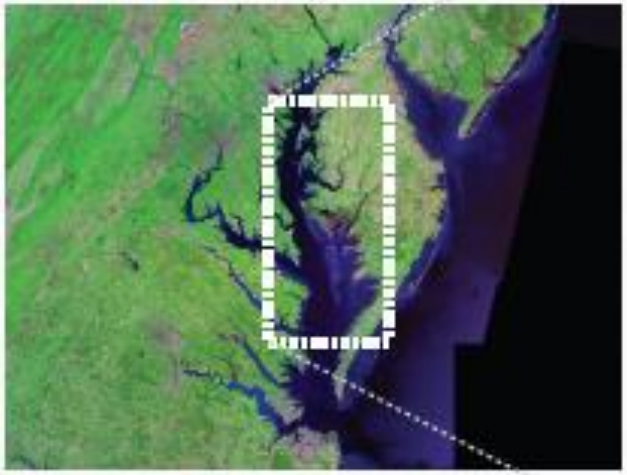
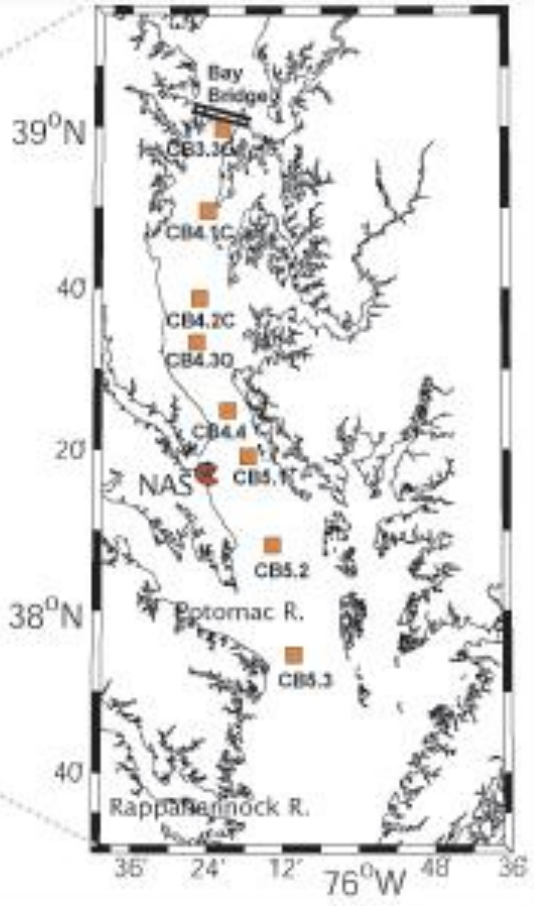
Hypoxic volume and its calculation boundaries across methods: Opening up the discussion.

Peter Tango
Liza Hernandez
April 5, 2012
TMAW

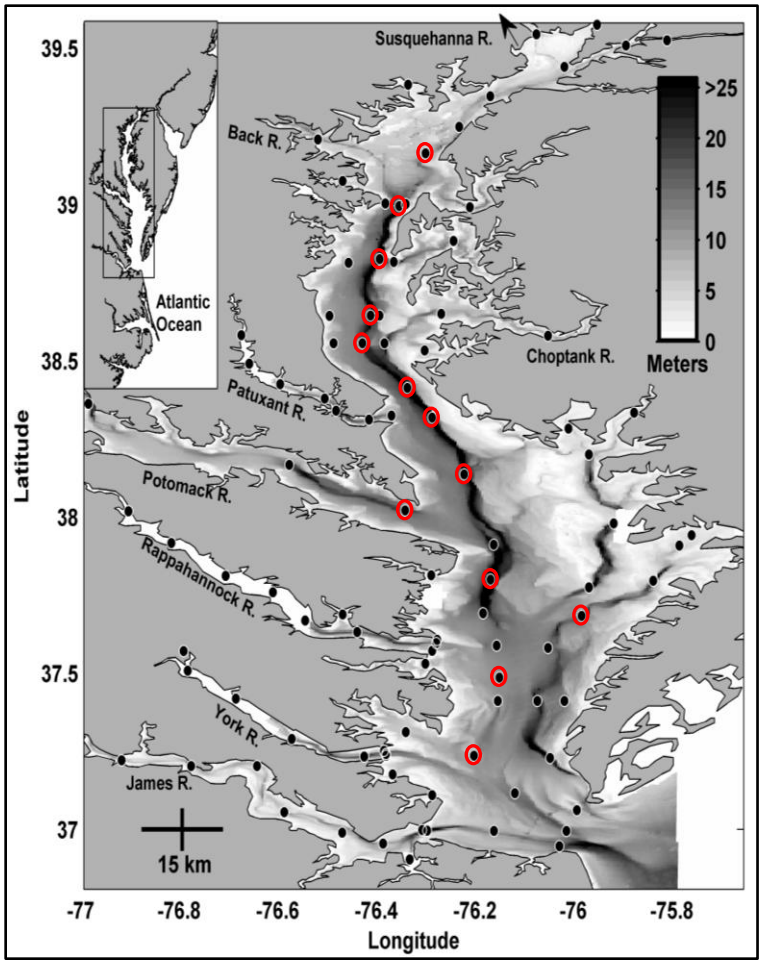
Lee and Boynton

Chesapeake Bay



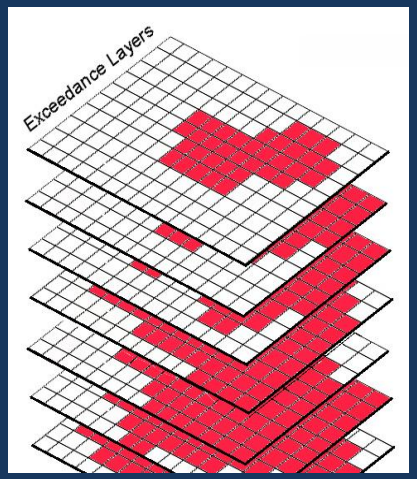


Bever and Friedrichs (CERF poster)

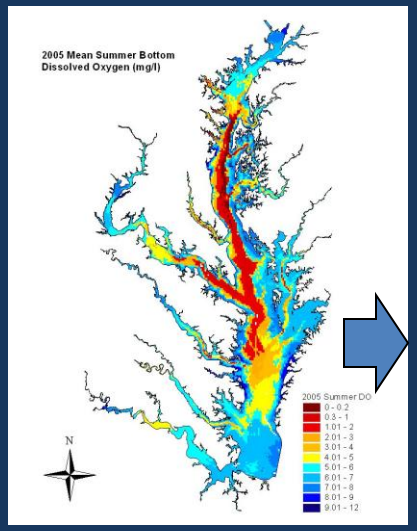


Different methods of calculating hypoxic volume from model DO simulations were used. 1) The total hypoxic volume from the 3D DO fields was calculated. 2) The CBP interpolator was used to calculate HV from discrete station location sets.

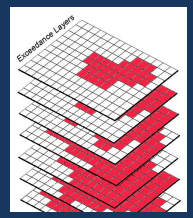
Water Quality Criteria Assessment

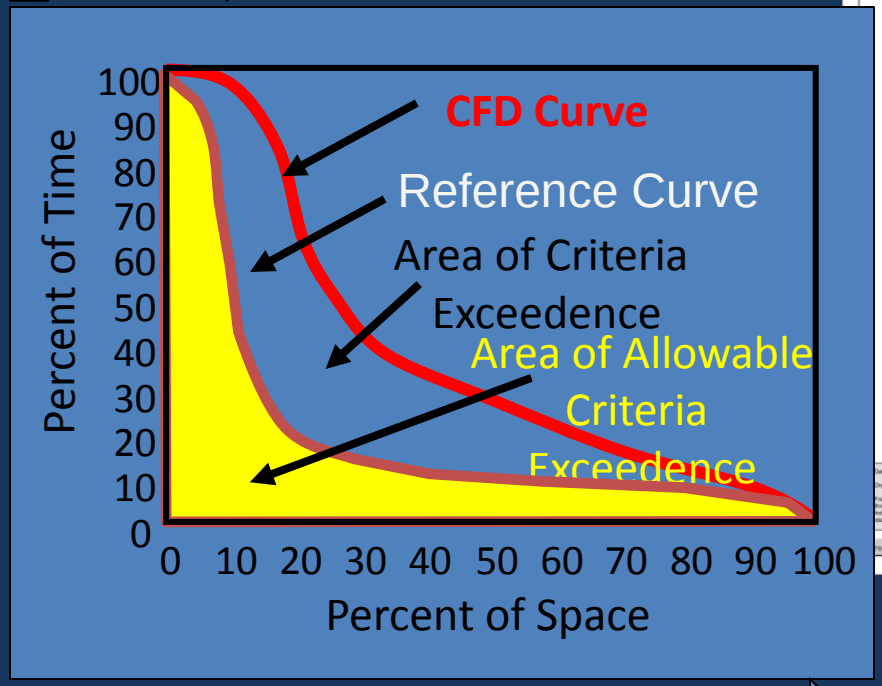


Monitoring Data



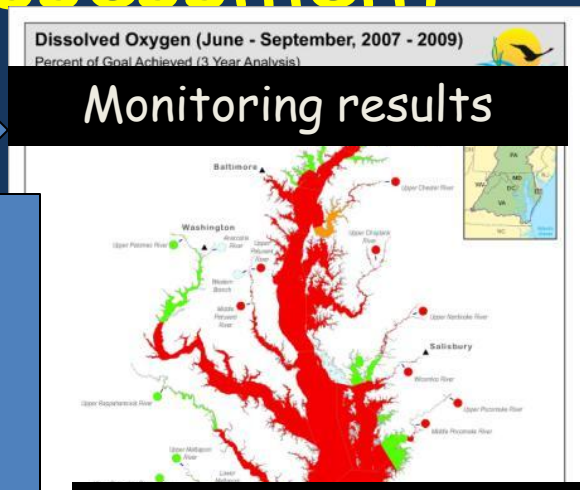
Modeling Output



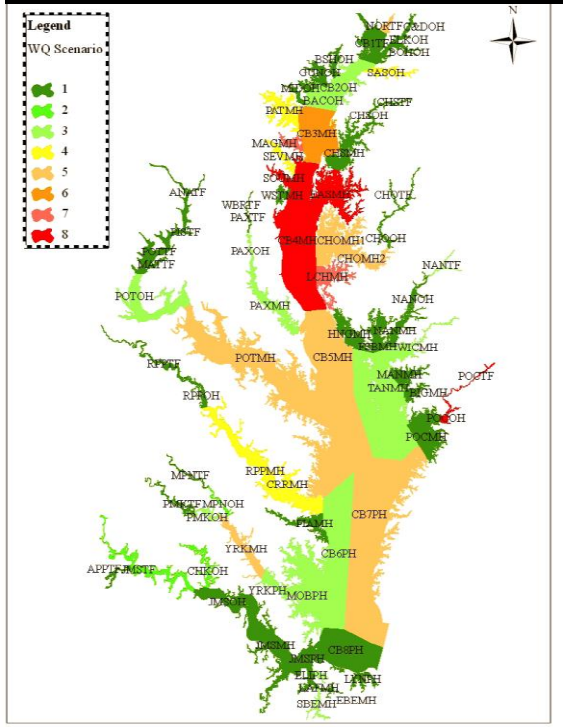


"Pollution Diet" Assessments

Monitoring results



Model scenario results



The Importance of Climate Variability to Wind-Driven Modulation of Hypoxia in Chesapeake Bay (Malcolm Scully, 2010)

- Time series used in study initially presented by Hagy et al. (2004)
  - Estimates of hypoxic volume based on surveys conducted each summer (early July) and data were spatially interpolated based on <2, <1, <0.2mg/L
- Estimates compares with wind data from Naval Air Station (NAS)
- Hypoxic volumes compared with mean summer wind speed, Susquehanna River discharge and estimated N loading

Scully

- Long-term variability of both N loading and wind direction play an important role in modulating hypoxia in the Bay (must consider for temporal trends)

Long-Term Trends in Chesapeake Bay Seasonal Hypoxia, Stratification, and Nutrient Loading (Rebecca Murphy et al., 2011)

- Hypothesis: long-term trends of increasing Bay stratification are a driving force behind the observed increased in hypoxic volume per N loading
- Re-evaluation of data on long-term hypoxic volume with more temporal resolution and calculating Bay stratification strength with similar temporal resolution

Murphy et al.

- Hypoxic volumes were calculated by summing volume of water with DO <0.2, <1, <2mg/L
- Kriging used to spatially interpolate the main channel DO observations to a 2D depth-length grid along the main channel of the Bay
- Analyses demonstrate that hypoxia duration throughout the summer and in mid-to-late summer are largely controlled by spring nutrient loads