Annual communication cycle – Dissolved oxygen methods

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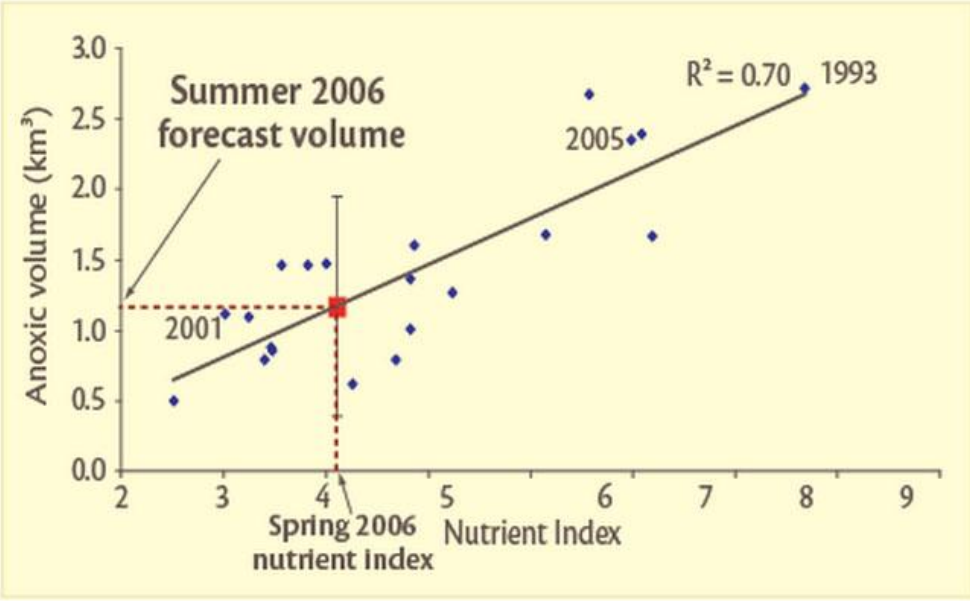
A partnership between
UMCES
NOAA

2005-2008 Anoxia forecast method

- Dave Jasinski, Chesapeake Bay Program
- Anoxia defined as DO ≤0.2 mg/l
- Summer defined as average June-September conditions
- TN and TP cumulative loads from the Susquehanna (Jan-April, then updated once May loads came in) and northern point sources
- Algal Index = (TN1 + TN2) + ((TP1 + TP2)$^{x\ 10}$), where

TN1 = Susquehanna Spring TN Load
TN2 = Below Fall Line Point Source Spring TN Load
TP1 = Susquehanna Spring TP Load
TP2 = Below Fall Line Point Source Spring TP Load

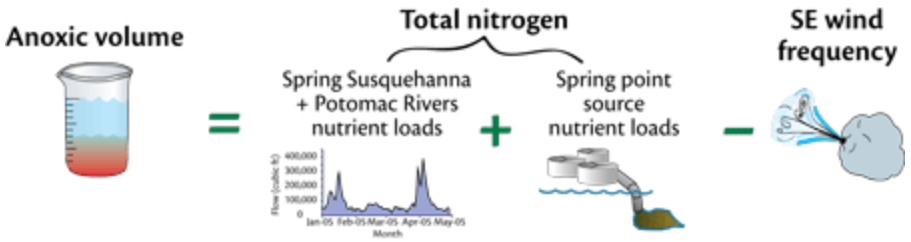


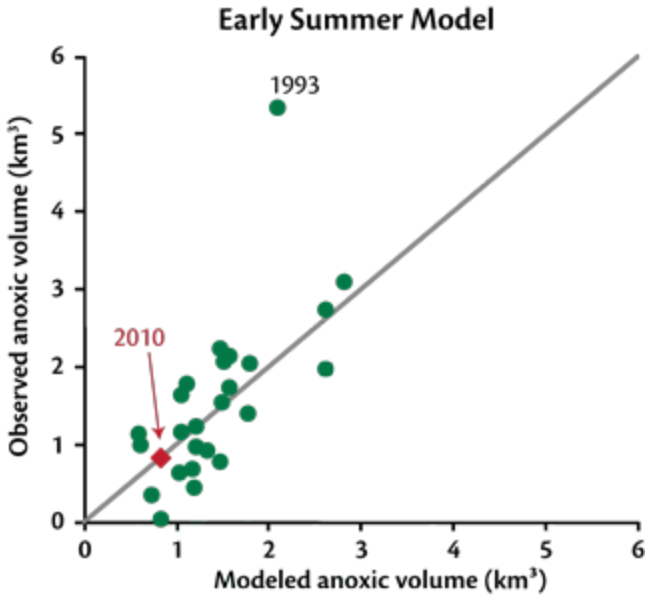
2009 Anoxia forecast method

- Jeni Keisman recreated Dave Jasinski's method
- Anoxia defined as DO ≤0.2 mg/l
- Summer defined as average June-September conditions
- TN and TP cumulative loads from the Susquehanna (Jan-April only, not updated) and northern point sources

2010-2011 Anoxia forecast

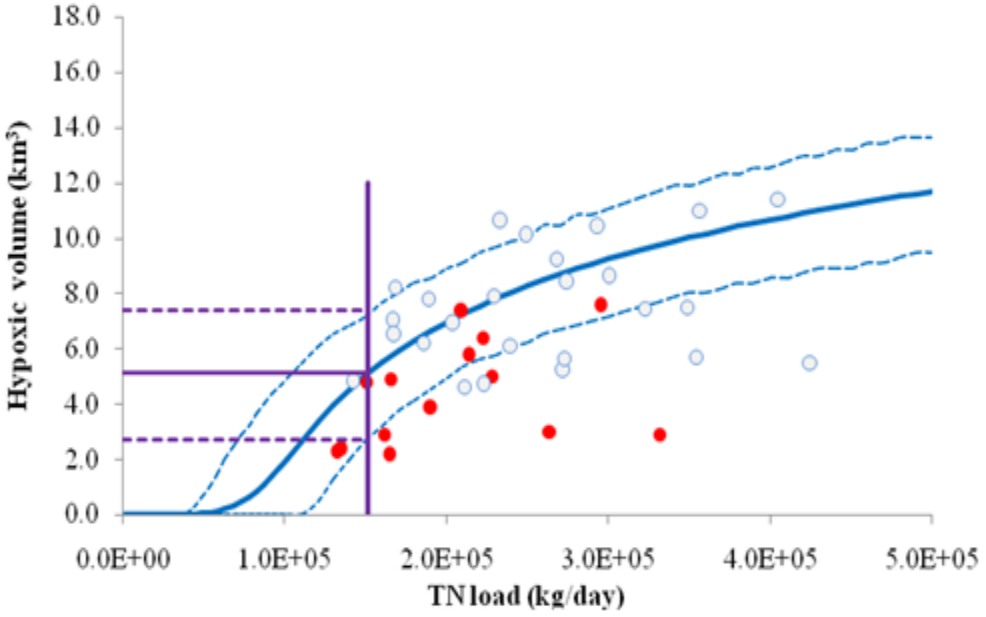
- Rebecca Murphy, Johns Hopkins University
- Anoxia defined as DO ≤0.2 mg/l
- Early summer (June – mid-July) and late summer (mid-July – Sept)
- Total nitrogen loads from the Susquehanna River
  - January – April for early summer
  - January – May for late summer forecast
- Prevailing wind direction and speed





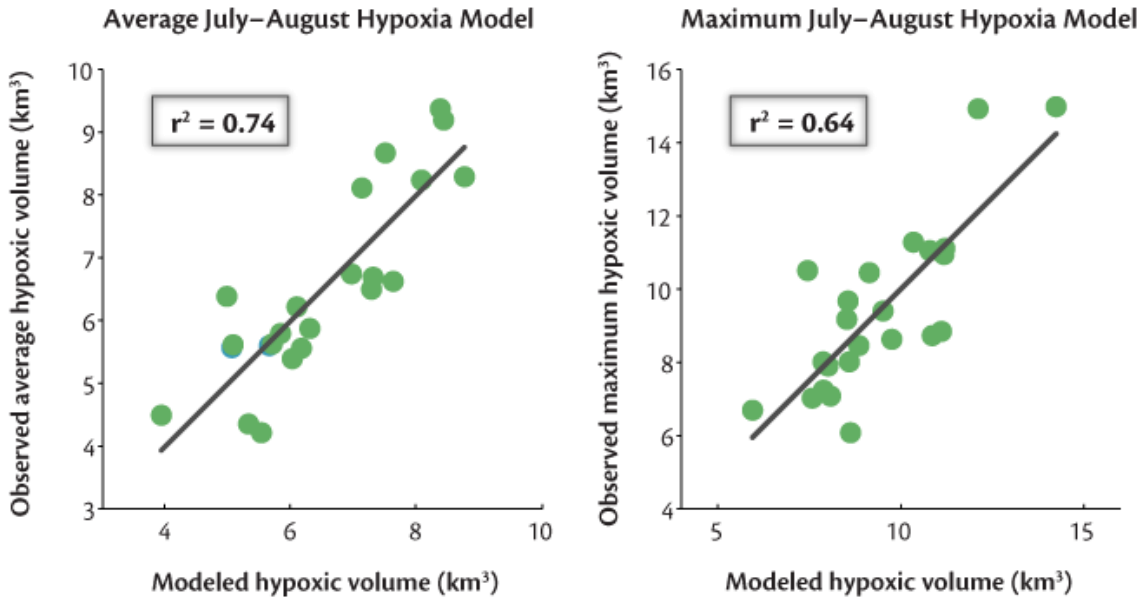
2006-2011 July hypoxia forecast

- Don Scavia, University of Michigan
- Hypoxia defined as DO ≤ 2.0 mg/l
- Total nitrogen loads from the Susquehanna River from January to May



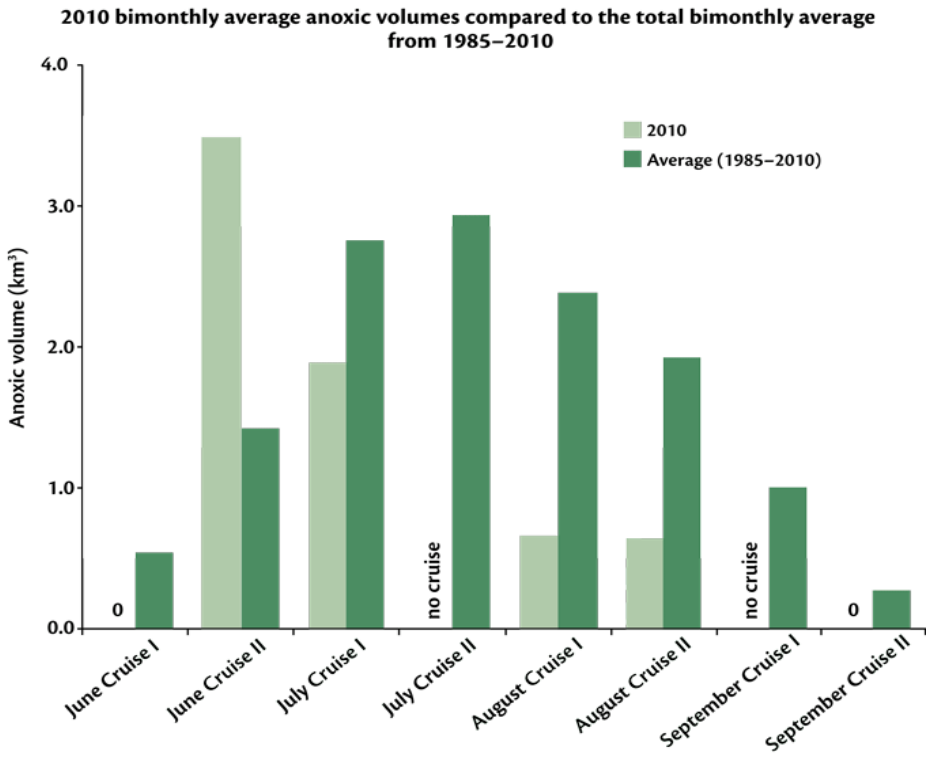
2010 July + August hypoxia forecast

- Younjoo Lee, Chesapeake Biological Lab
- Hypoxia defined as DO ≤0.2 mg/l
- Total nitrogen loads, Chlorophyll a, wind
- $[HYPOXIA] = a + b_1 \cdot [RIVER] + b_2 \cdot [CHLA] + b_3 \cdot [XWIND]$



2006-2010 Summer Review

- Jeni Keisman and Aaron Gorka, CBP
  - Calculated cruise volumes
  - Calculated summer averages (issue: average each month, then average or average across cruises)
  - Provided .d3d files for interpolation
  - Provided interpolated maps (for first few years)



2011 Summer Review

- Mike Mallonee and Liza Hernandez, CBP
  - Calculated cruise volumes in a variety of ways to try to match Jeni's methods
  - What happens if a cruise is skipped? Did not have answer for previous years, so used partial data and noted it
  - Forecasters provided advice about what they do/would do

2006-2010 report card

- Jeni Keisman, Chesapeake Bay Program
- Run Fortran code, provide scores for all stations, segments, and reporting regions
  - EcoCheck QAQC the data
- Used Bluefish to calculate pycnocline
- Provides .d3d files for interpolation software to visualize DO

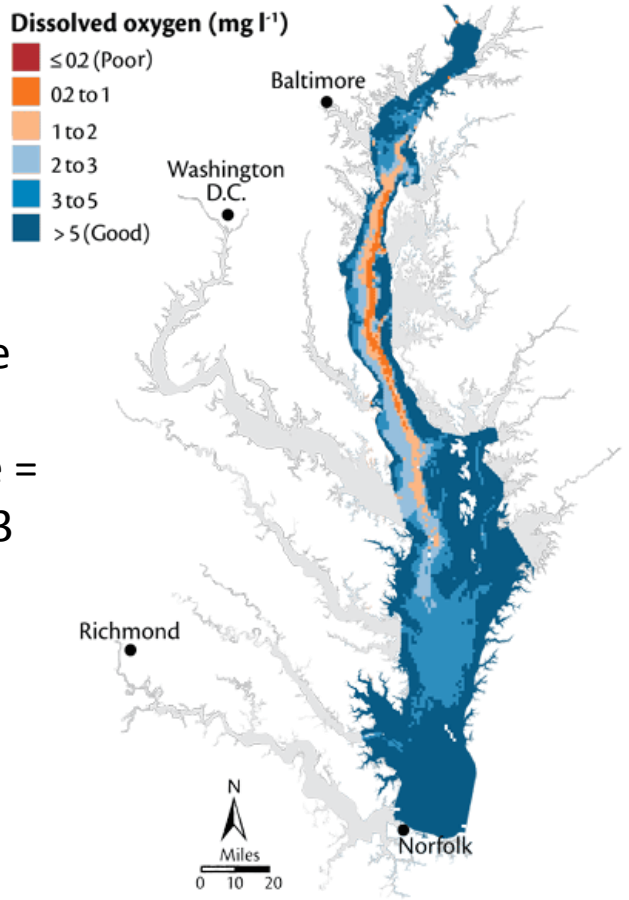
Issues to be addressed

- Boundaries
  - Mainstem vs. tributaries
  - Incorporating tribs into interpolation changes
- Pycnocline calculations
  - Bluefish
  - By hand
- Cruises
  - Total numbers change each year
  - If missing data?
- Analysis processes different
  - (criteria assessment vs. report card analysis – see handout)
- Definitions
  - Anoxia
  - Hypoxia
  - Summer
- Visualization (see next slide)

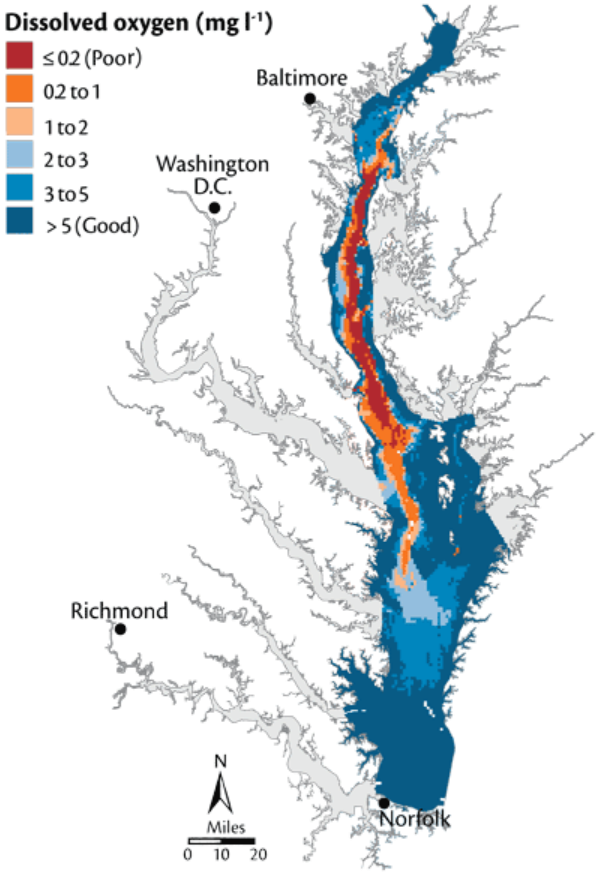
Problems with visualizing DO

- Interpolating an average minimum DO for the entire summer smooths out extremes

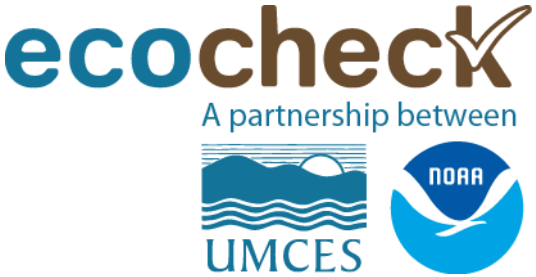
2009 average anoxic volume = 1.2 km3



2009 summer dissolved oxygen levels for the mainstem of Chesapeake Bay. Map shows minimum values of the summer average.



The highest measured amount of anoxia in Chesapeake Bay was in late August for 2009. Map shows minimum values of the late August cruise.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