

# *Low Oxygen Environments in Chesapeake Bay*

Why we care about low oxygen?

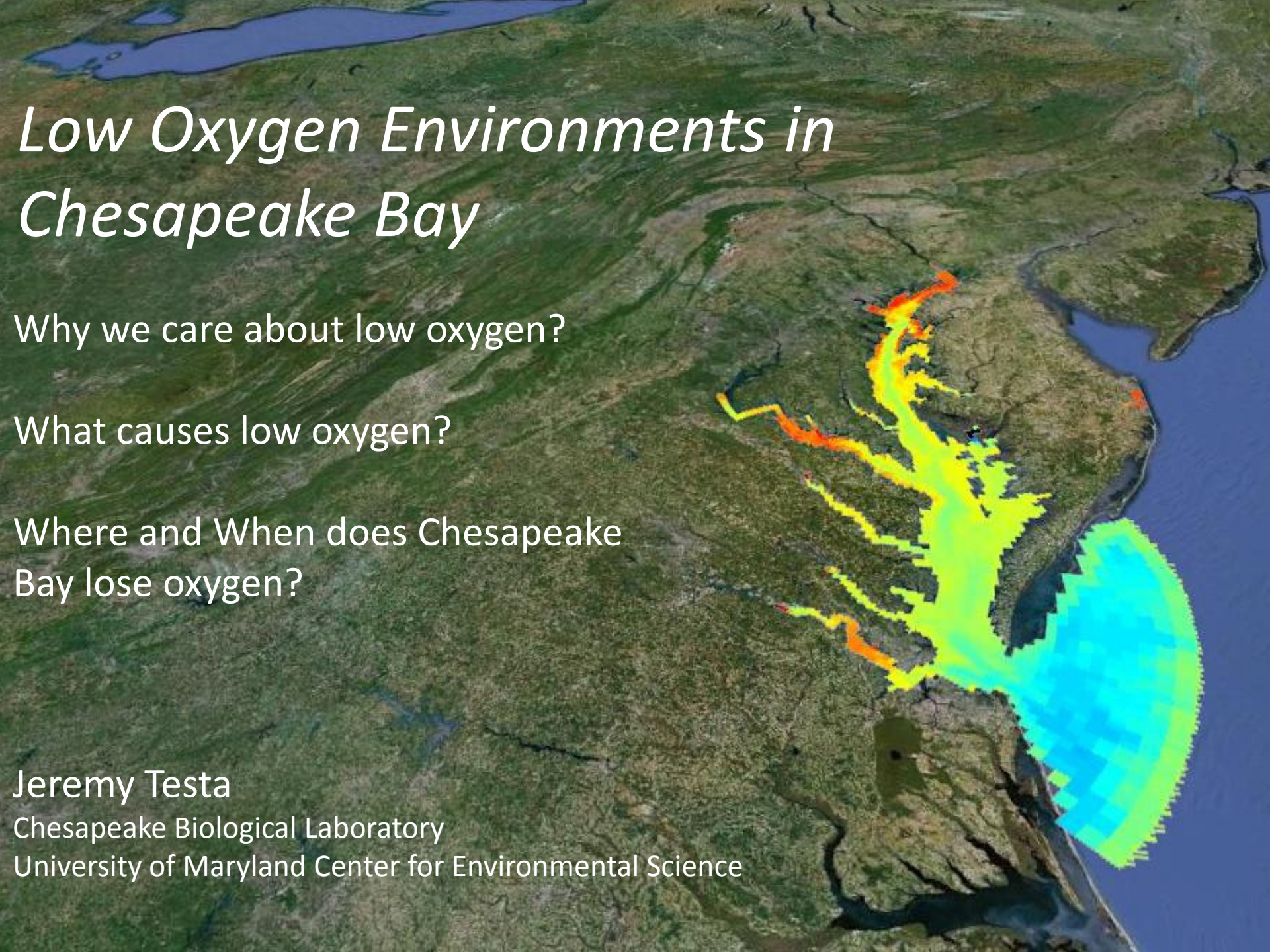
What causes low oxygen?

Where and When does Chesapeake Bay lose oxygen?

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Chesapeake Biological Laboratory

University of Maryland Center for Environmental Science





# Hypoxia and Chesapeake Animals

Low dissolved oxygen levels that are detrimental to aquatic organisms

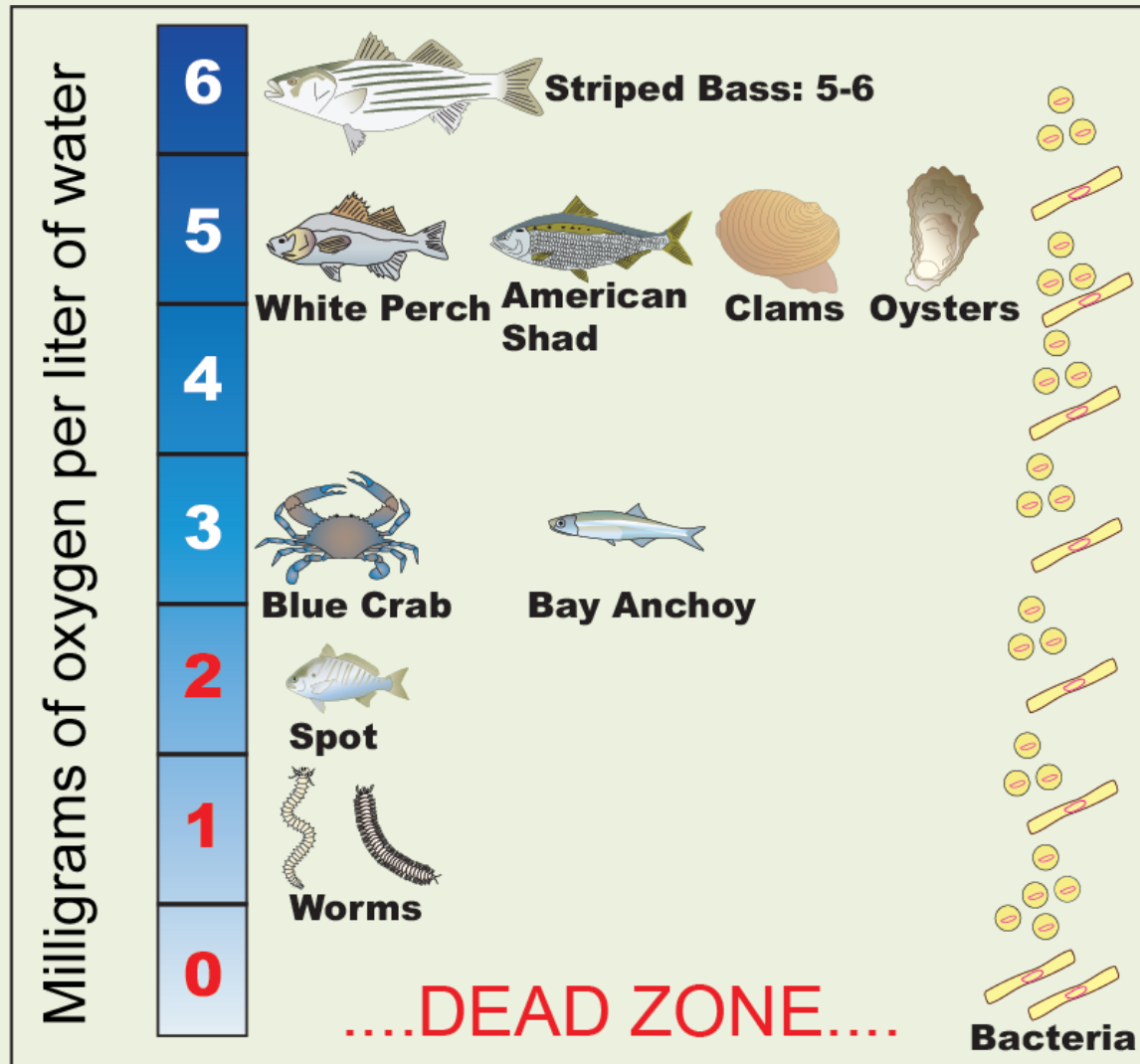


Image courtesy of [www.teachococeanscience.net](http://www.teachococeanscience.net)

of [http://www.teachococeanscience.net/teaching\\_resources/education\\_modules/dead\\_zones/get\\_started/](http://www.teachococeanscience.net/teaching_resources/education_modules/dead_zones/get_started/)



<http://www.youtube.com/watch?v=7r6jXjAOEHQ>

Image From Weeks Bay NERRS site:

[http://oceanservice.noaa.gov/education/kits/estuaries/media/supp\\_estuar10d\\_disolvedox.html](http://oceanservice.noaa.gov/education/kits/estuaries/media/supp_estuar10d_disolvedox.html)

# Visualize Hypoxic Effects

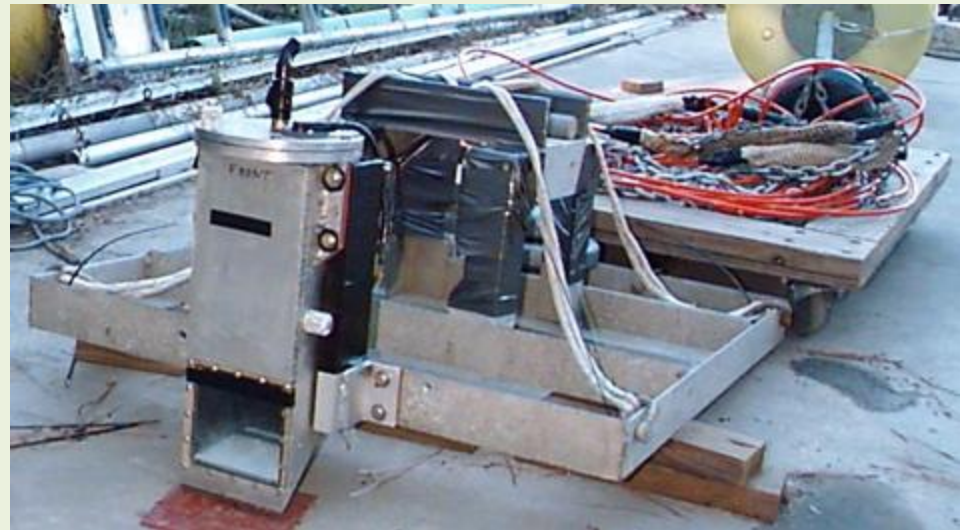
Benthic Hypoxia in the Adriatic Sea

<http://www.marine-hypoxia.com/joomla/content/view/33/41/>



Worm Cam

[http://www.vims.edu/webcam/wormcam/public/Time\\_Lapse/Wormcam\\_Apr10-May06.mov](http://www.vims.edu/webcam/wormcam/public/Time_Lapse/Wormcam_Apr10-May06.mov)



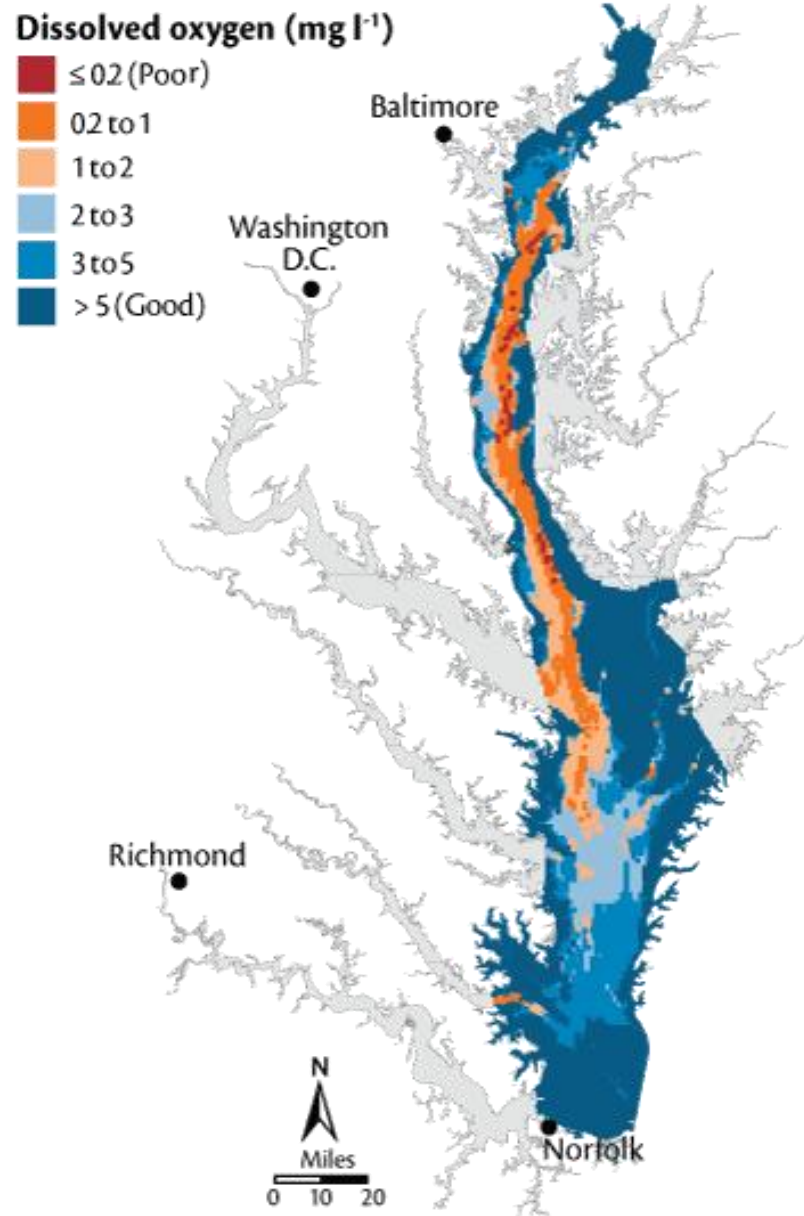
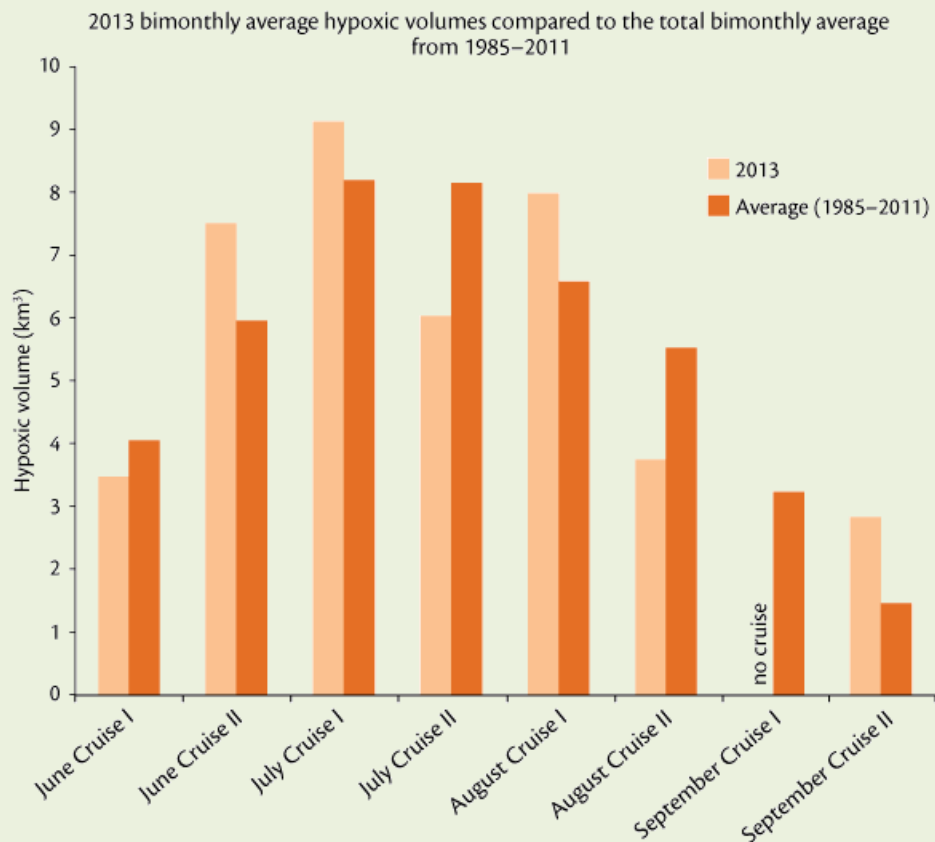
# Hypoxia in the Chesapeake? Causes and Location

# *How Do We Measure It?*



MD DNR

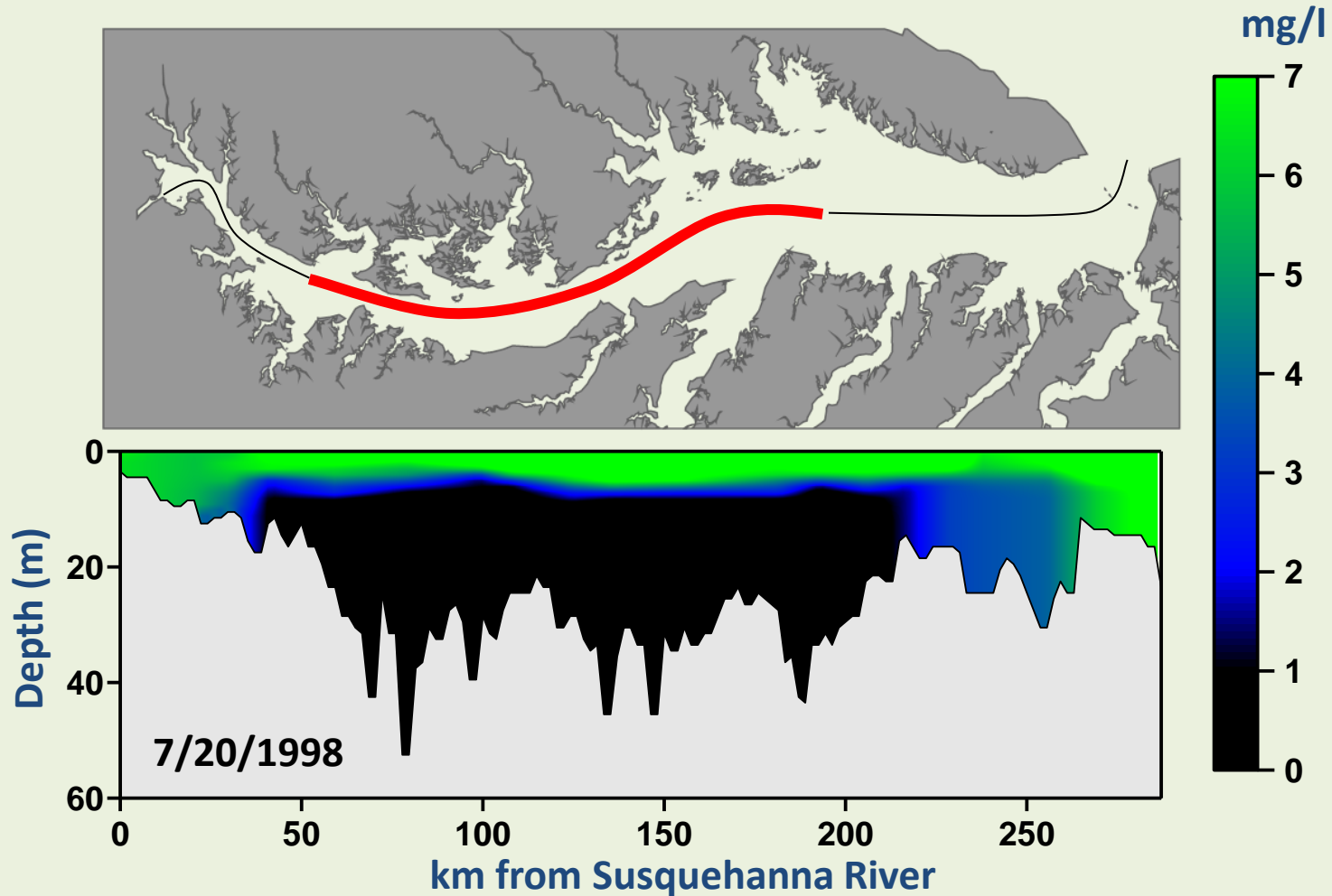
# Chesapeake Bay Hypoxia Distribution



Images courtesy IAN EcoCheck:  
<http://ian.umces.edu/ecocheck/forecast/chesapeake-bay/2013/>



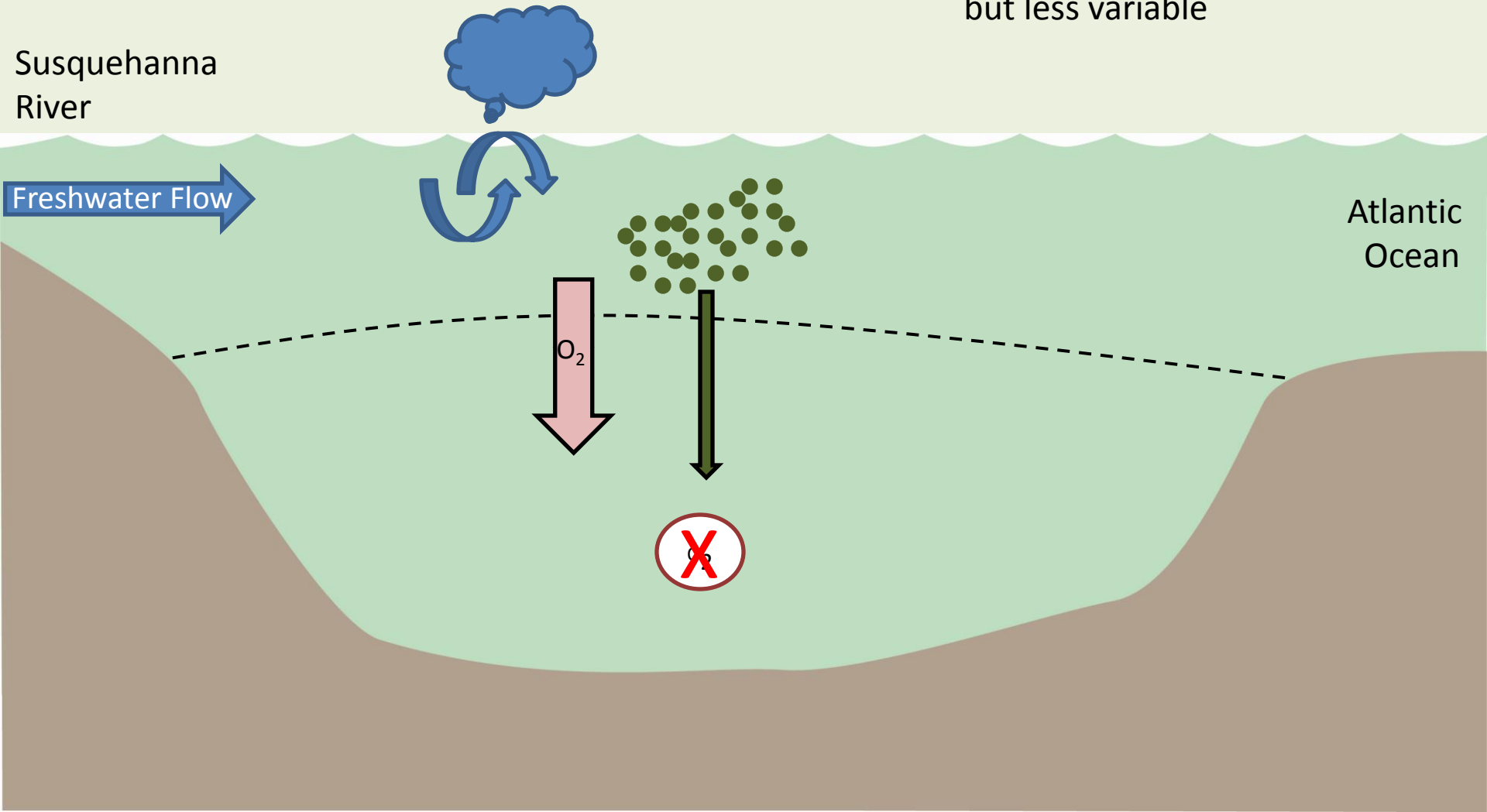
# Chesapeake Bay Hypoxia Distribution



(Jim Hagy 2002)

# Chesapeake Bay Oxygen Dynamics

\*Temperature is also important,  
but less variable



Susquehanna  
River

Freshwater Flow

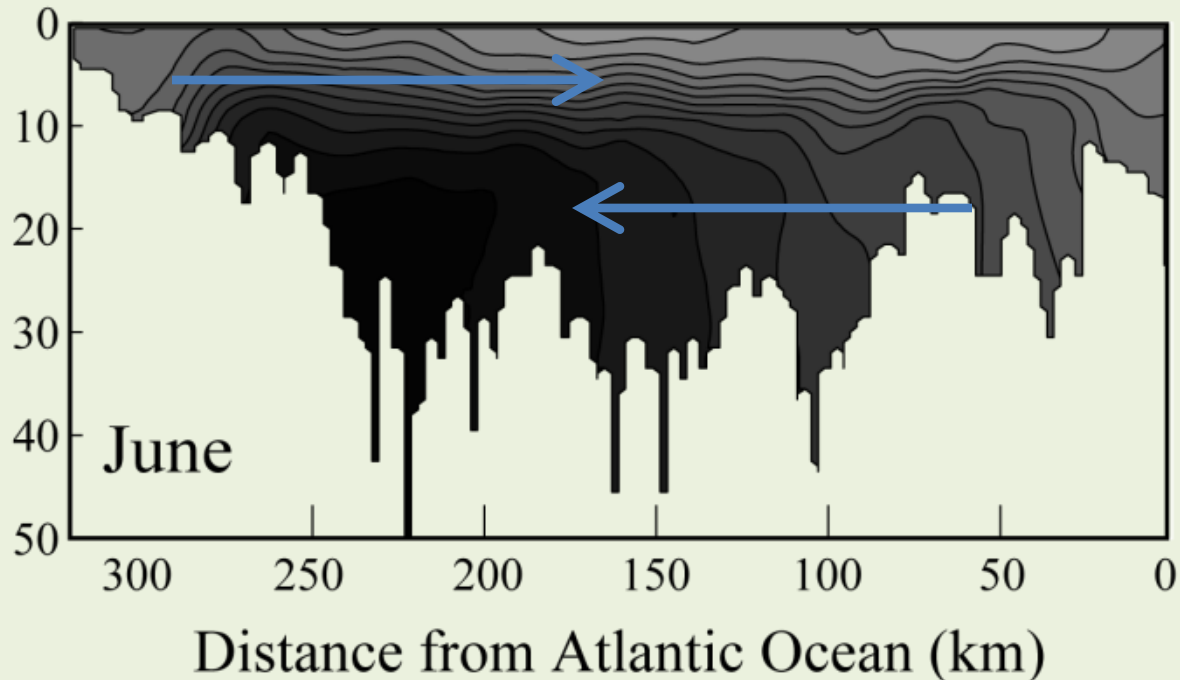
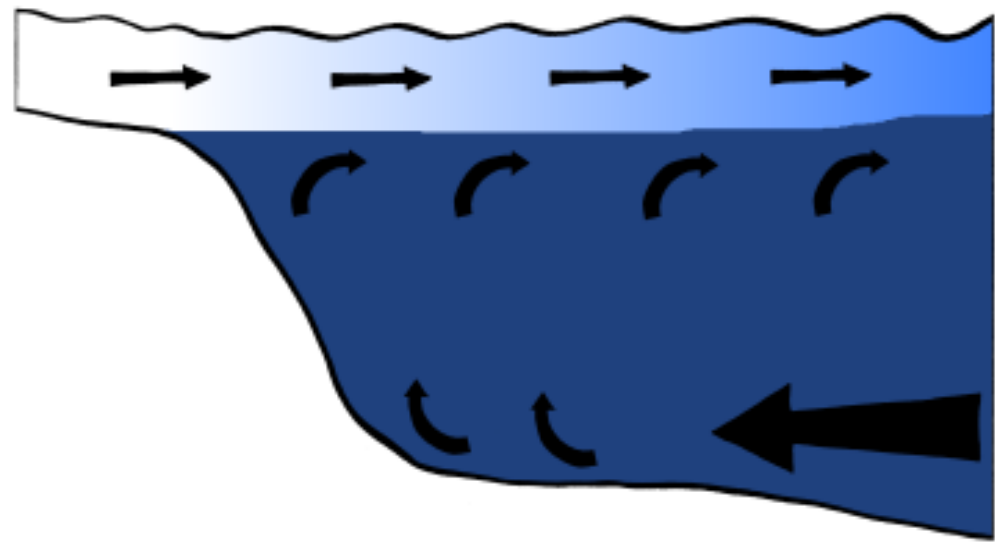
Atlantic  
Ocean

O<sub>2</sub>

X  
O<sub>2</sub>

# Is Hypoxia Natural, or Do We Contribute to It?

Susquehanna  
River



# Initial Report of Chesapeake Hypoxia: 1937

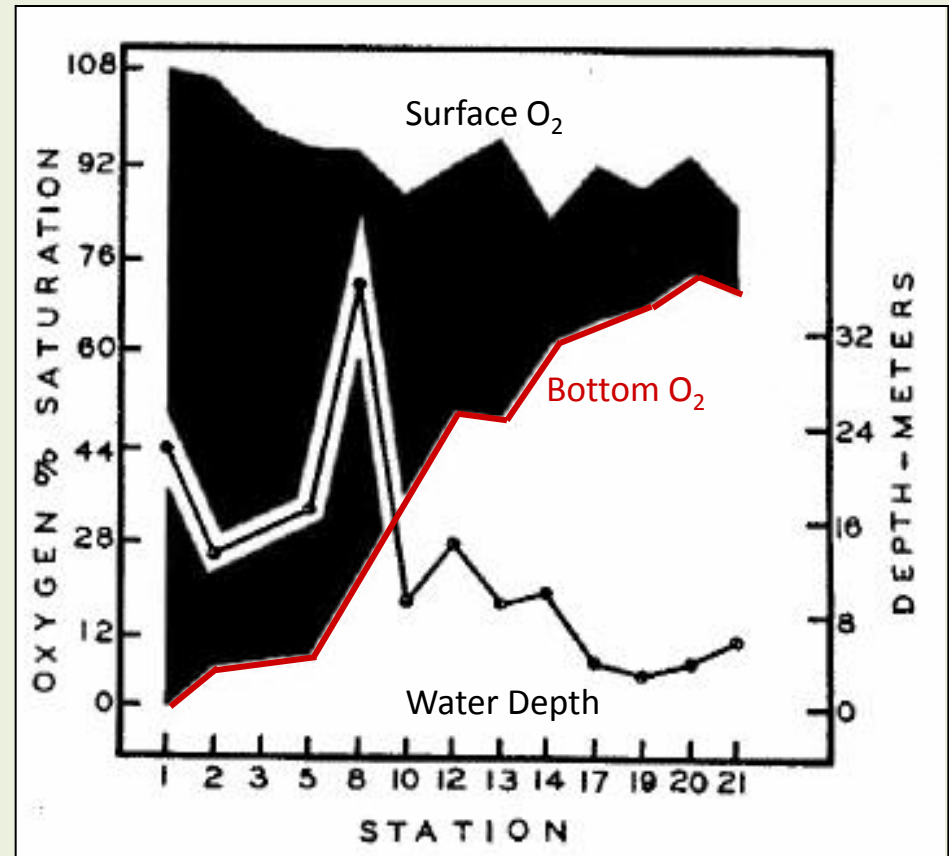
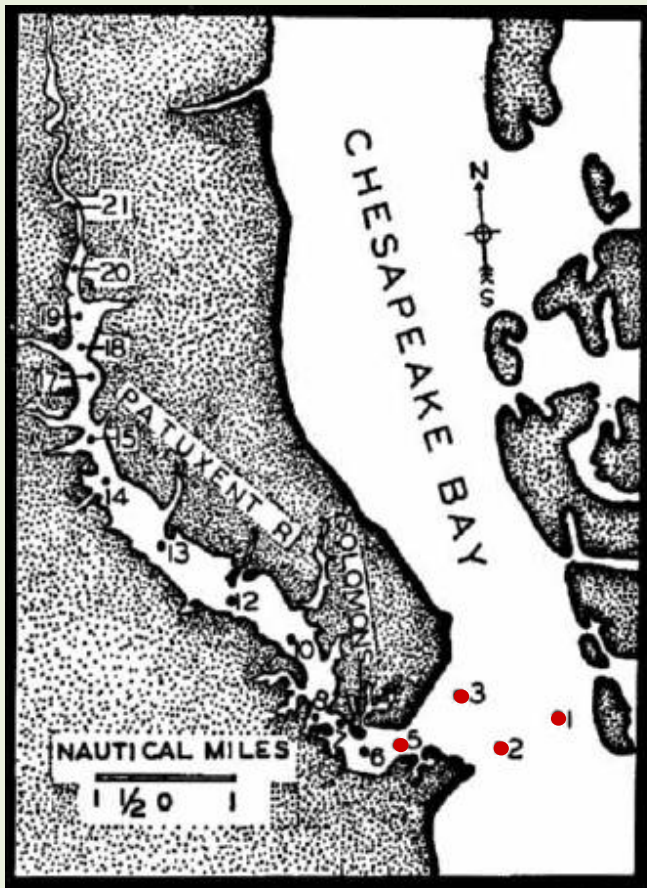
## OXYGEN-POOR WATERS OF THE CHESAPEAKE BAY

CURTIS L. NEWCOMBE

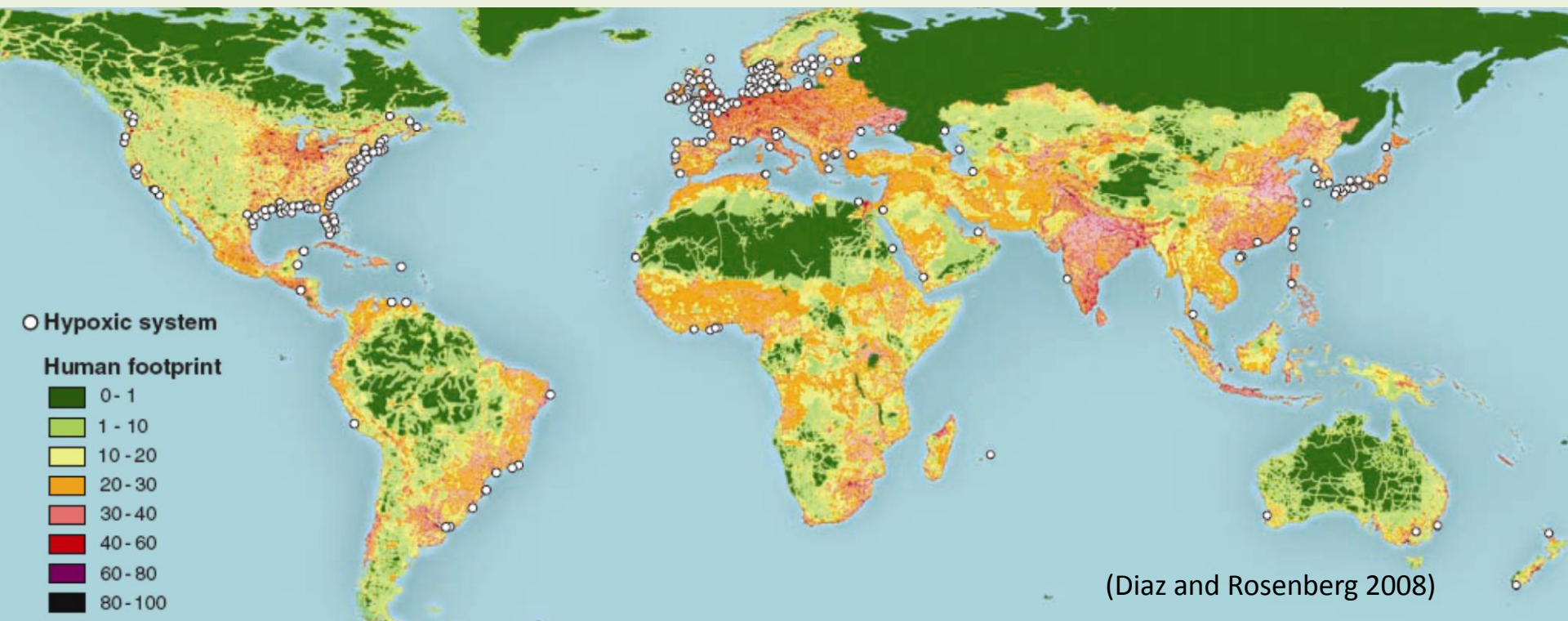
WILLIAM A. HORNE

VOL. 88, No. 2273

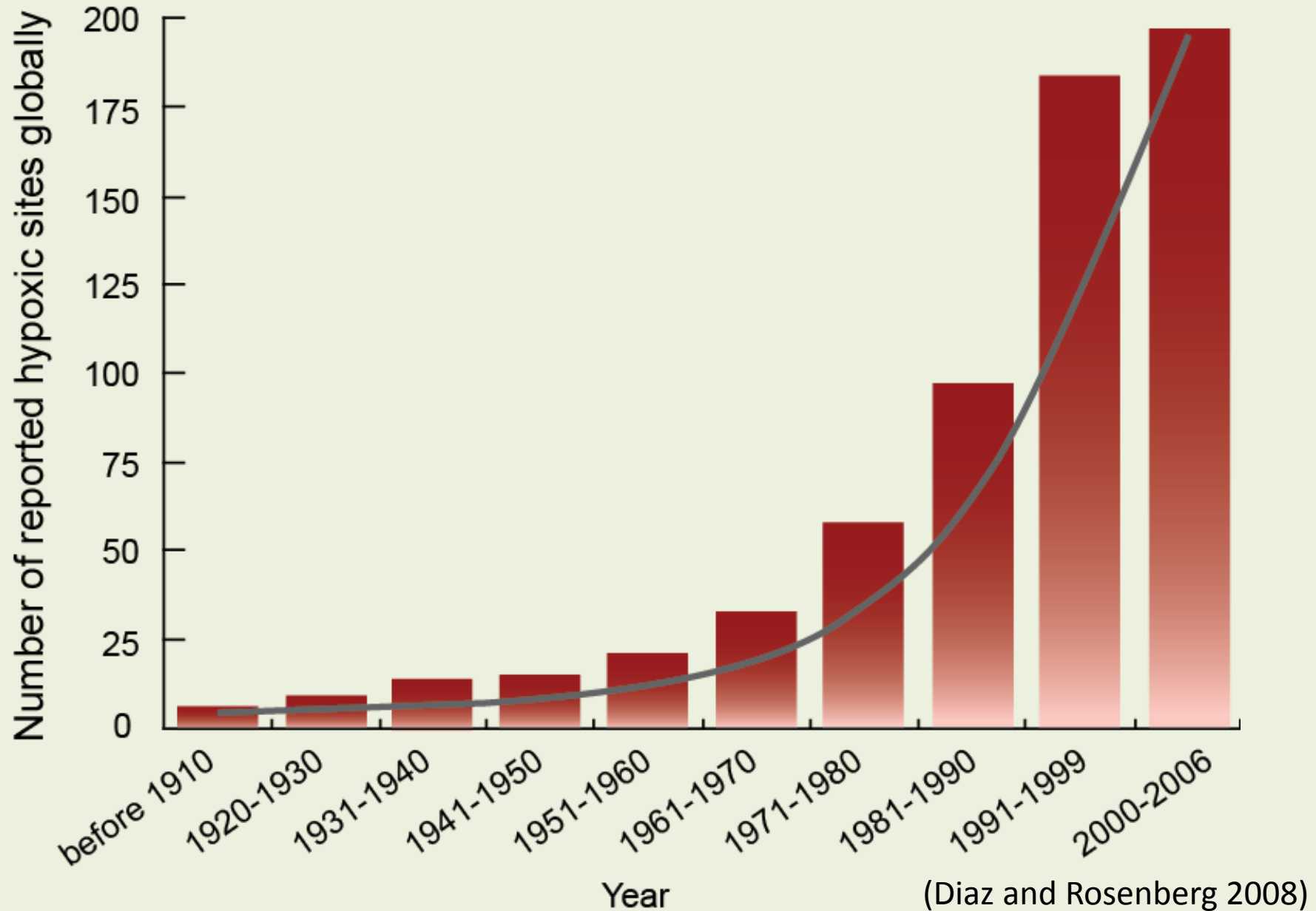
JULY 22, 1938



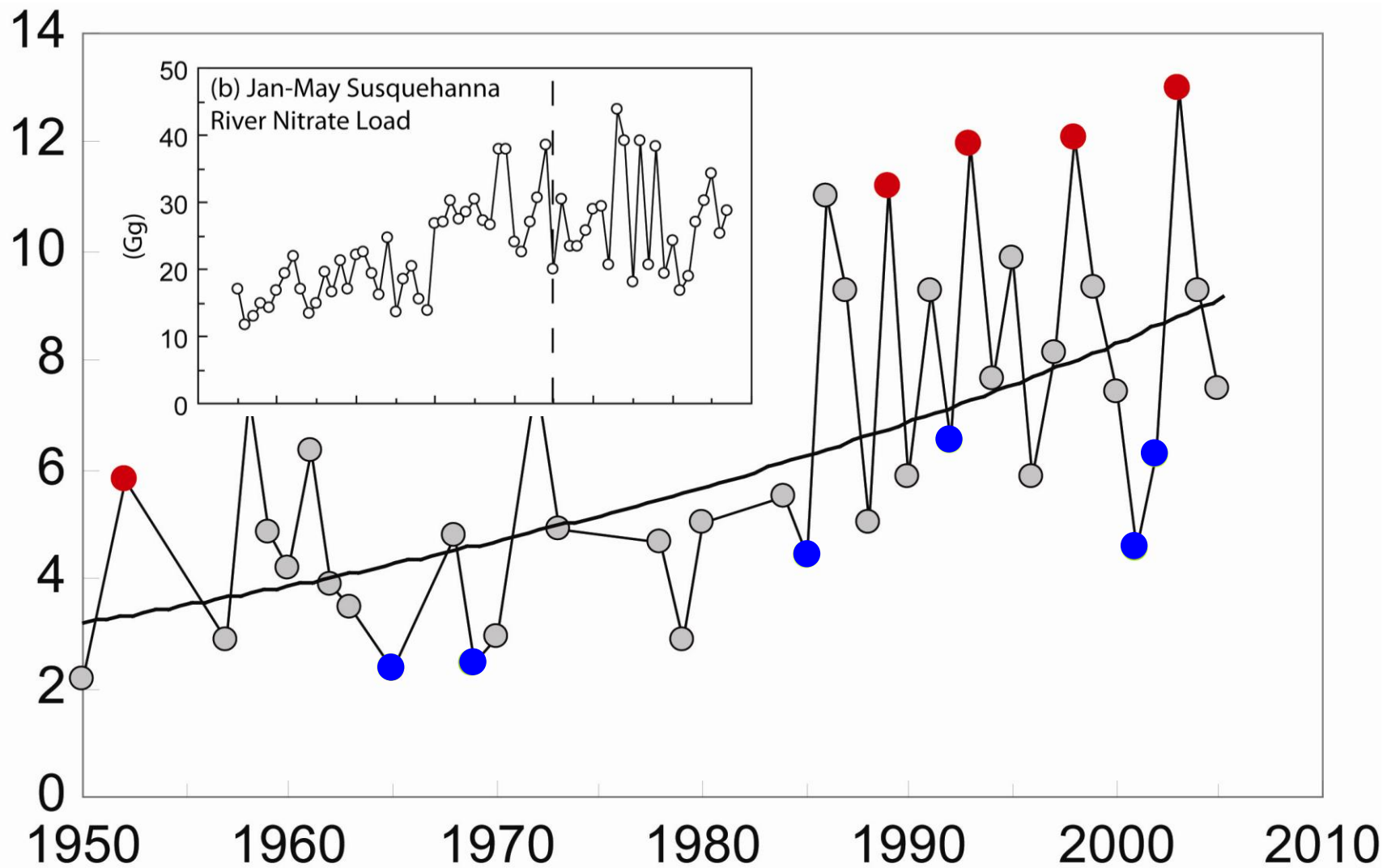
# Hypoxia is a Key Issue in Coastal Ecology and is a Growing Problem



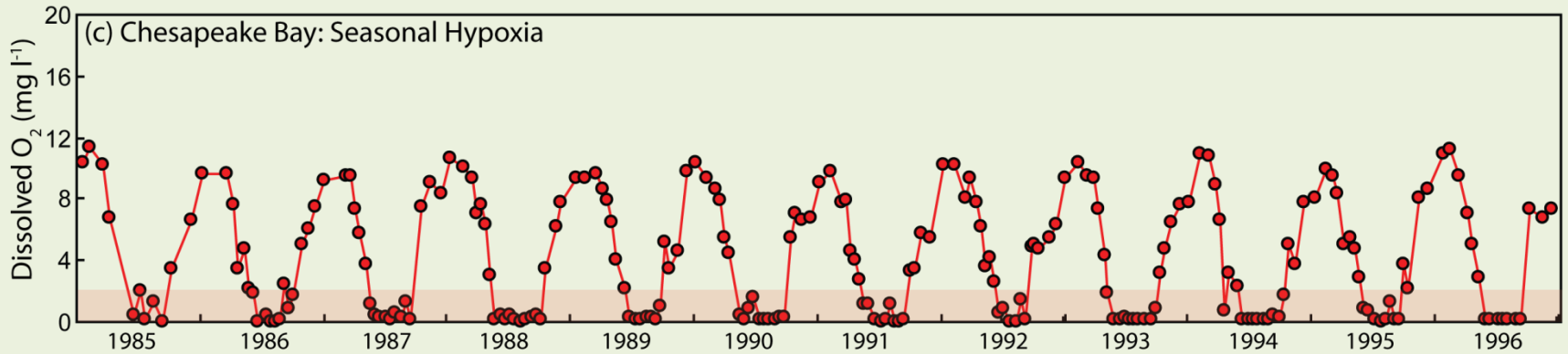
# Reported Hypoxia Around the World



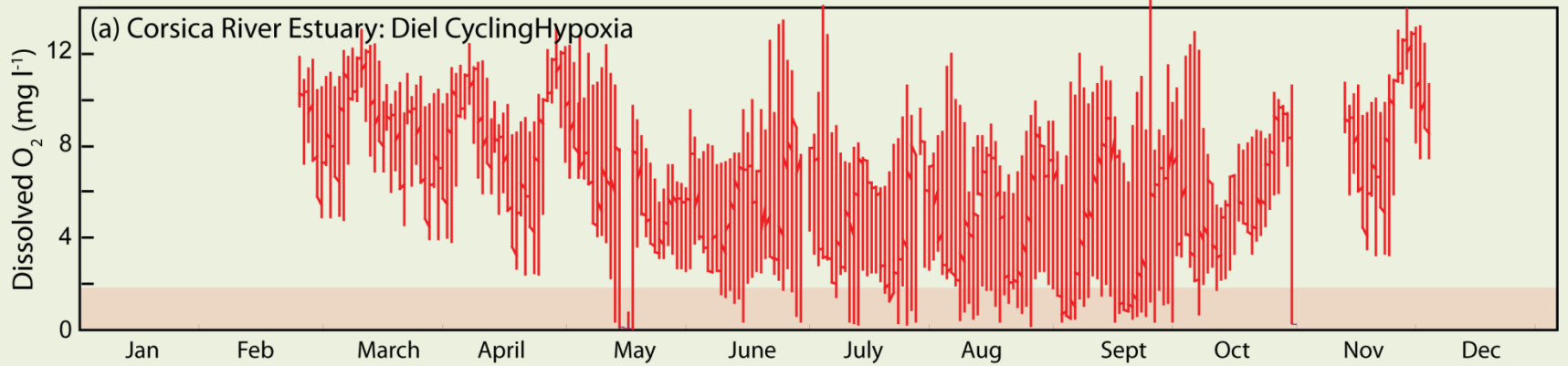
July Hypoxic Volume  
( $<2$  mg/l,  $10^9$  m<sup>3</sup>)



# Deep Water, High Algae, Persistent Low DO

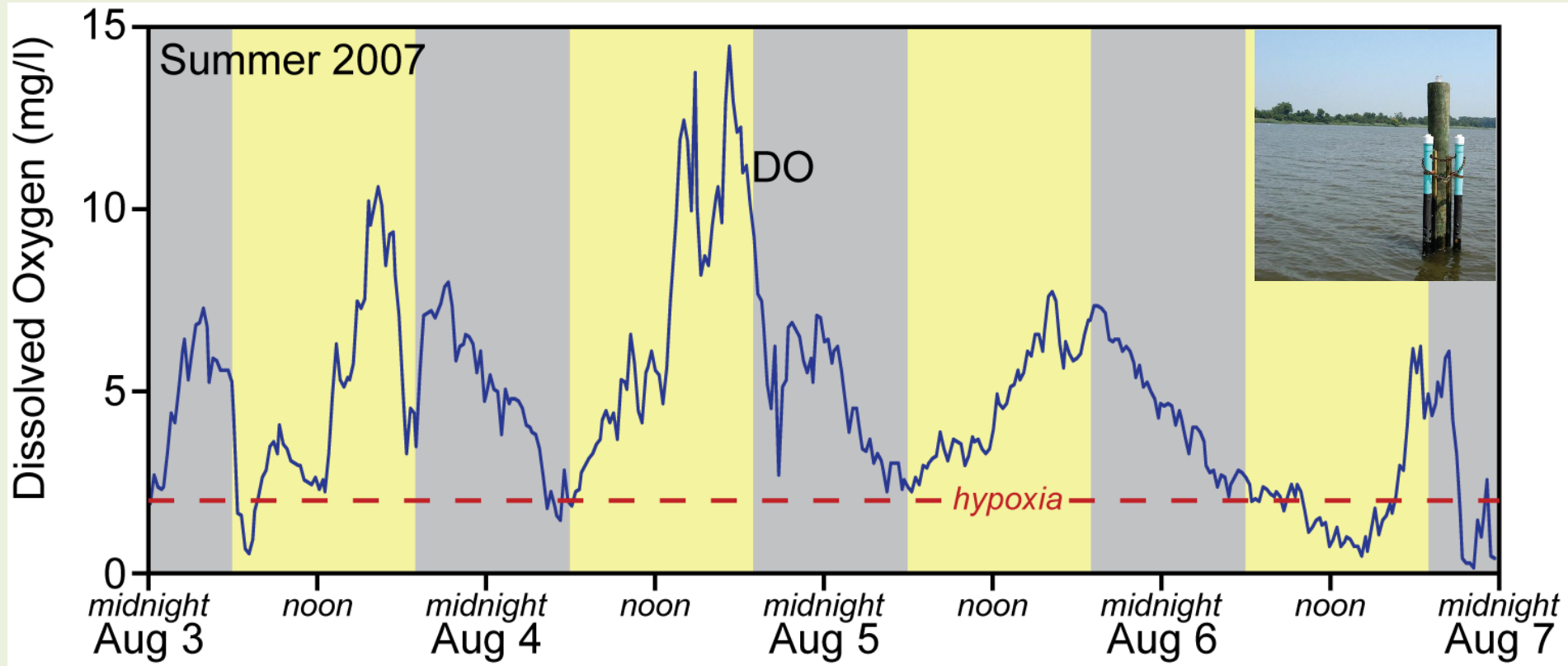


# Shallow Water, High Algae, Large Swings in DO





# Oxygen and Sunlight



# Why we care about low oxygen?

- Reduces growth and habitat for many marine organisms

# What causes low oxygen?

- The accumulation of algae and other organic matter, which can be elevated by nutrient loads from land
- Isolation of deep water from oxygen-rich water (circulation, wind)

# Where and When does Chesapeake Bay lose oxygen?

- Every year in the deep, central basin of the Bay and periodically in polluted shallow-water