

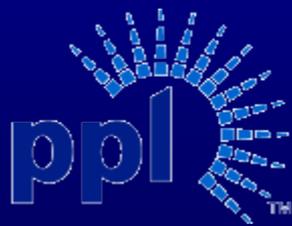
# Water-Quality Monitoring in Response to Young-of-Year Smallmouth Bass Mortality 2008 - 2010



Pennsylvania Fish and Boat Commission



Pennsylvania Department of Environmental Protection



Pennsylvania Power and Light



Pennsylvania Bass Federation

December 11, 2012

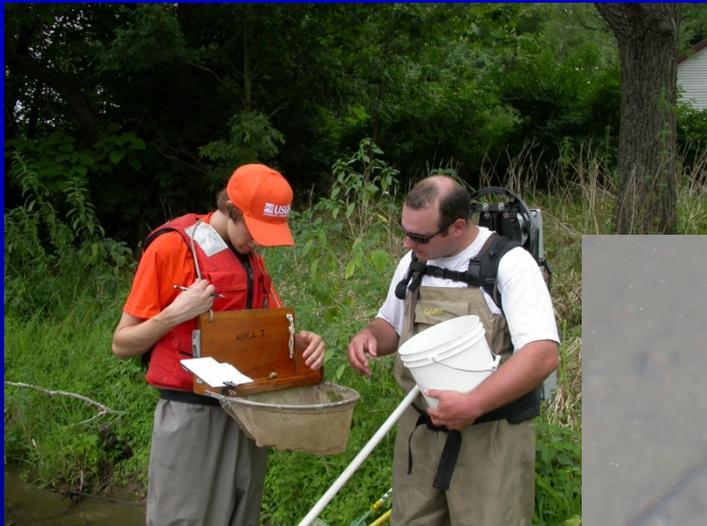
# Problem

- Large-scale smallmouth bass mortality
- Primarily Young-of-year (YOY) fish
- Primarily Susquehanna River Basin
- Late June/July



Photo by PFBC, 2008

# Annual YOY Smallmouth Bass Surveys



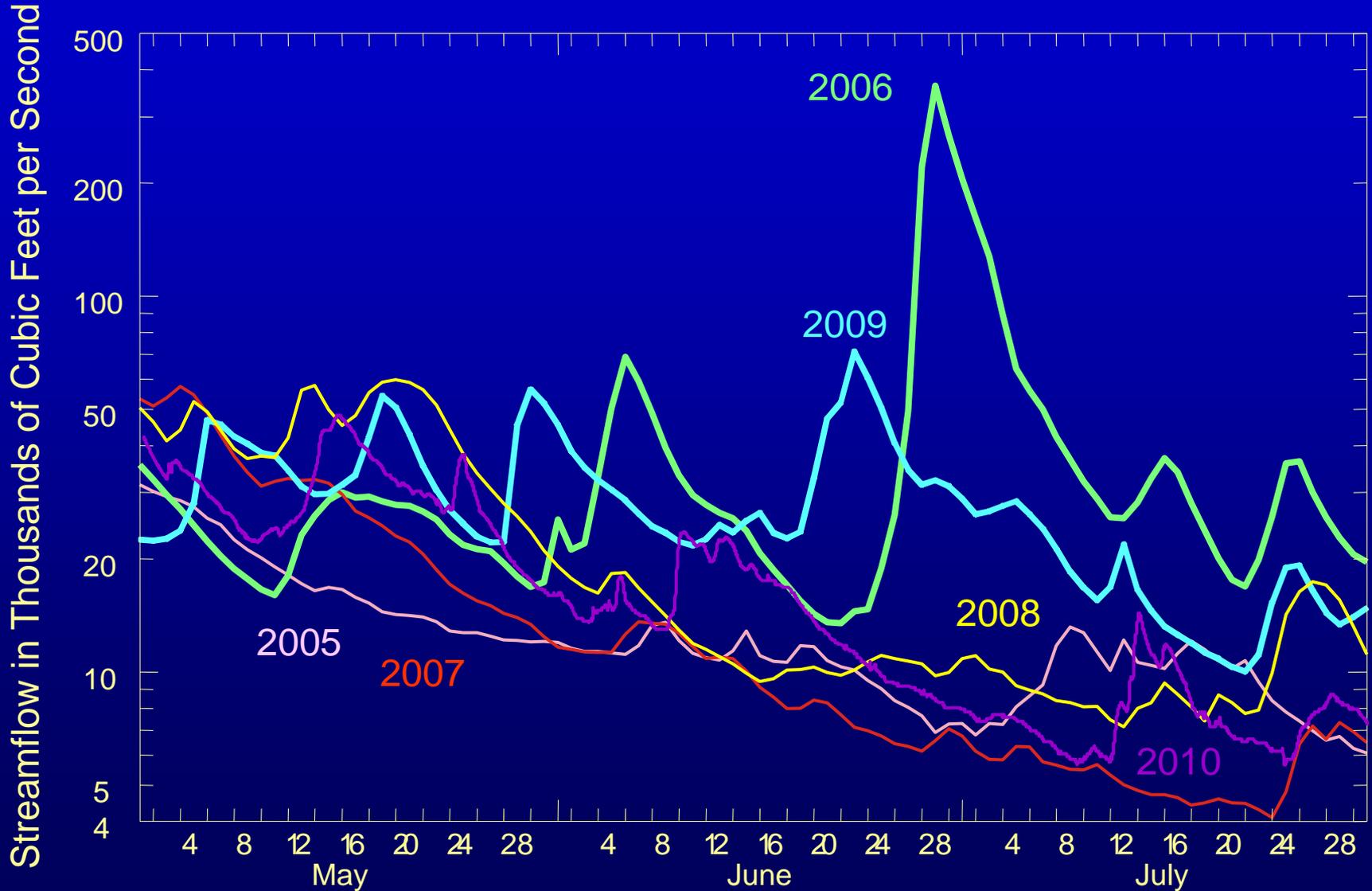
## Pathogens Include:

- bacteria species
  - trematode parasites in epidermis and skeletal muscle
- (Vicki Blazer, written commun. 2009).



# Streamflow

Susquehanna River at Harrisburg



# Working Hypothesis - 2008

- Dissolved-oxygen concentrations and water temperatures of Susquehanna River are at times stressful to YOY smallmouth bass.
  - Stress may predispose YOY to infection by bacteria and parasites (Durborow and others, 1998; Ripley and others, 2008)
  - Stressful DO defined as  $<5.0$  mg/L

# Monitoring Objectives

- Characterize summertime dissolved-oxygen and temp.
  - YOY SMB microhabitat
  - Main-channel locations
- Compare Susquehanna River with reference streams

# Water-Quality Sonde



# Sonde Servicing



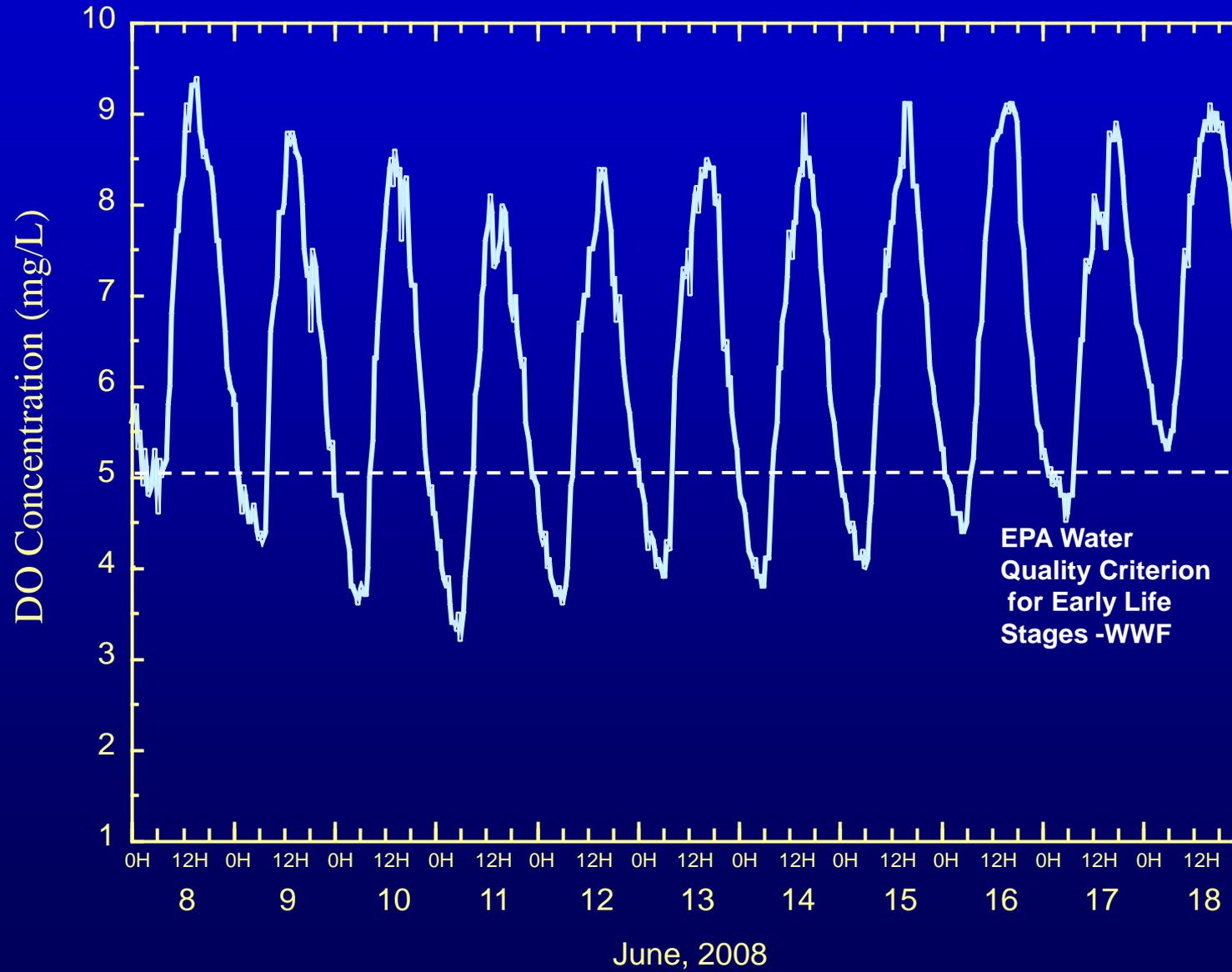
Cleaning



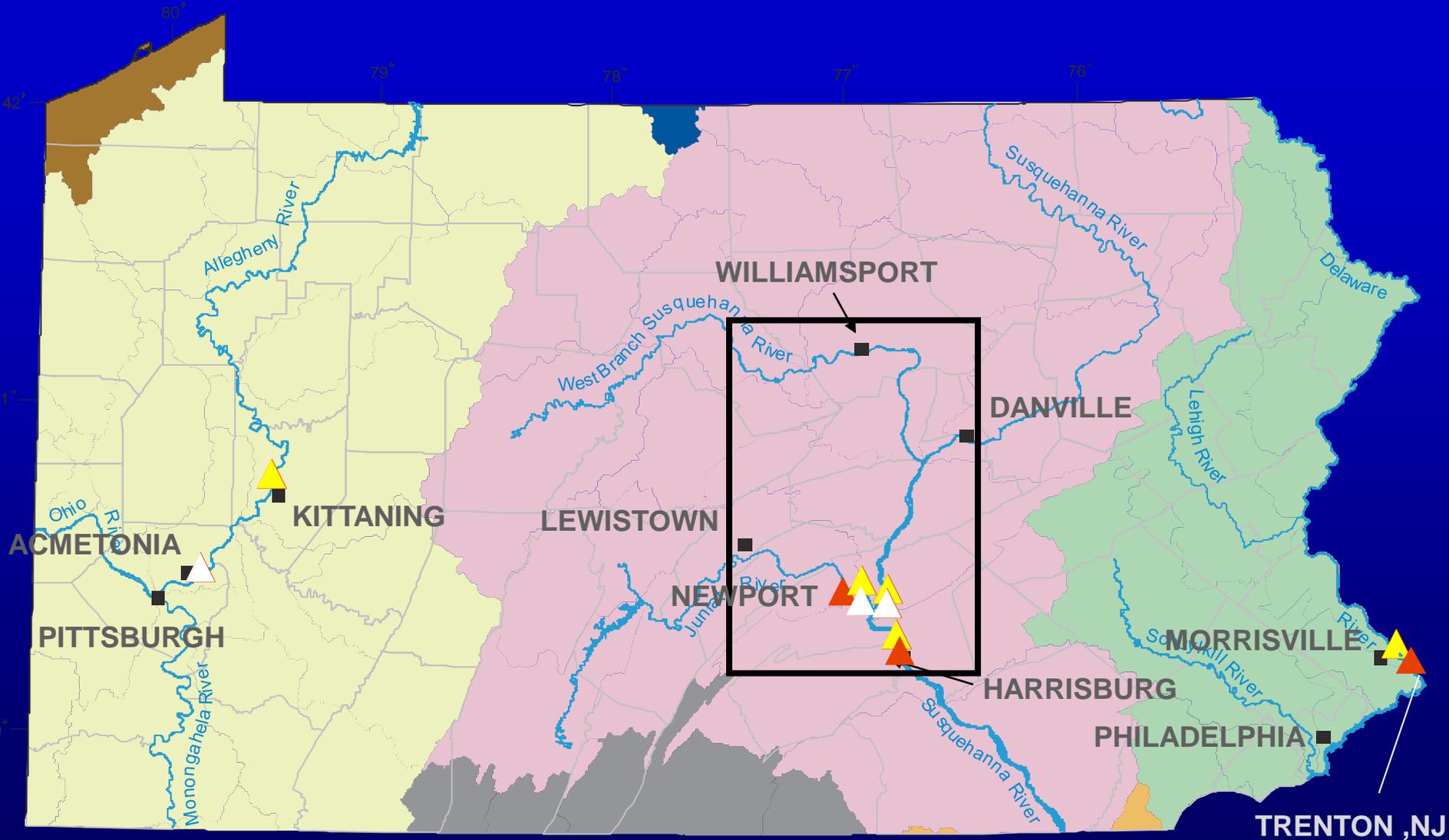
Calibration



# Daily Dissolved Oxygen Fluctuations



# Continuous Monitoring Stations



- ▲ YOY MICROHABITAT STATION
- ▲ MAIN CHANNEL STATION
- ▲ MAIN CHANNEL STATION WITH GAGE



# Microhabitat/Main Channel Comparison

Susq. River  
Clemson Island

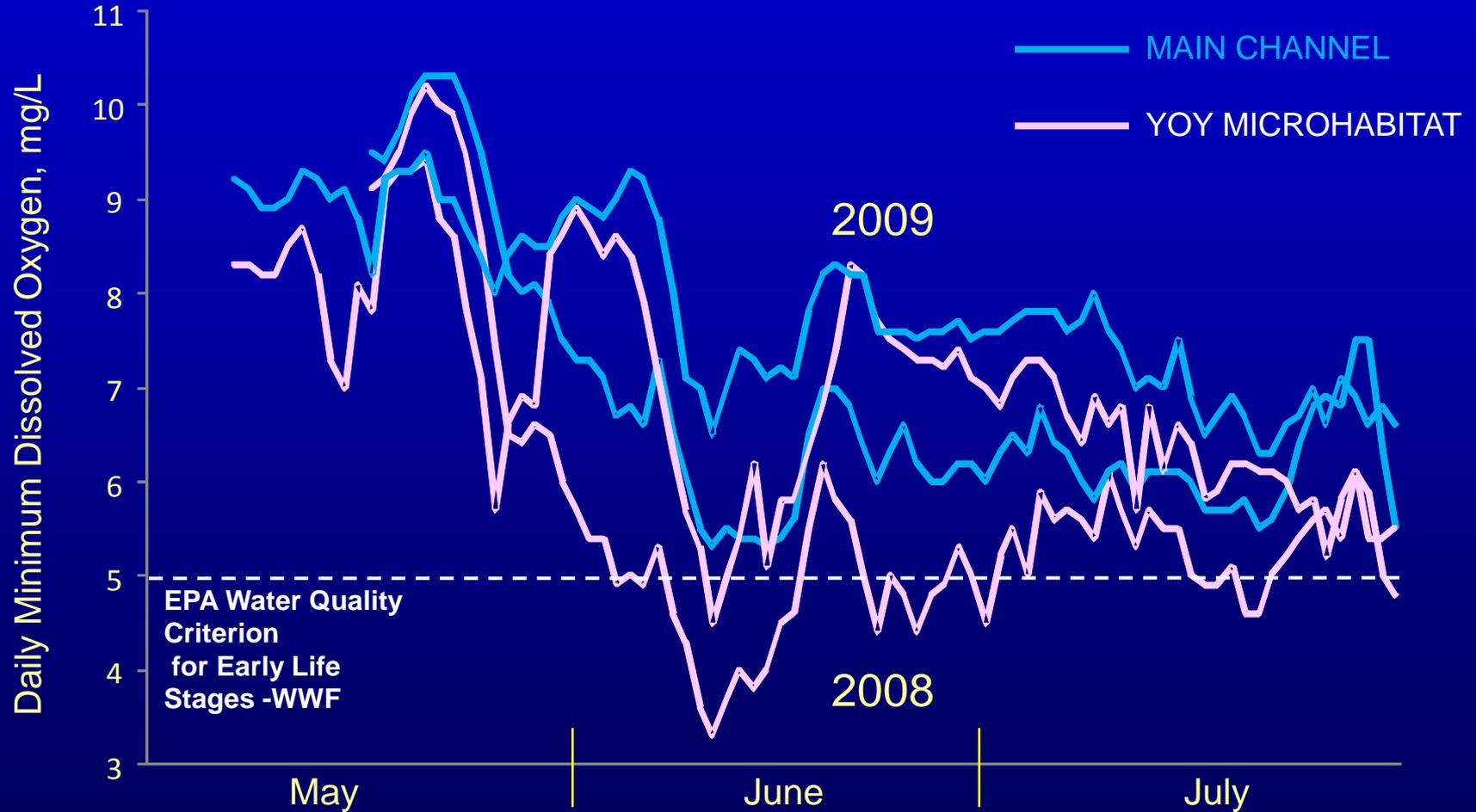


▲ Sampling Site without Streamflow gage

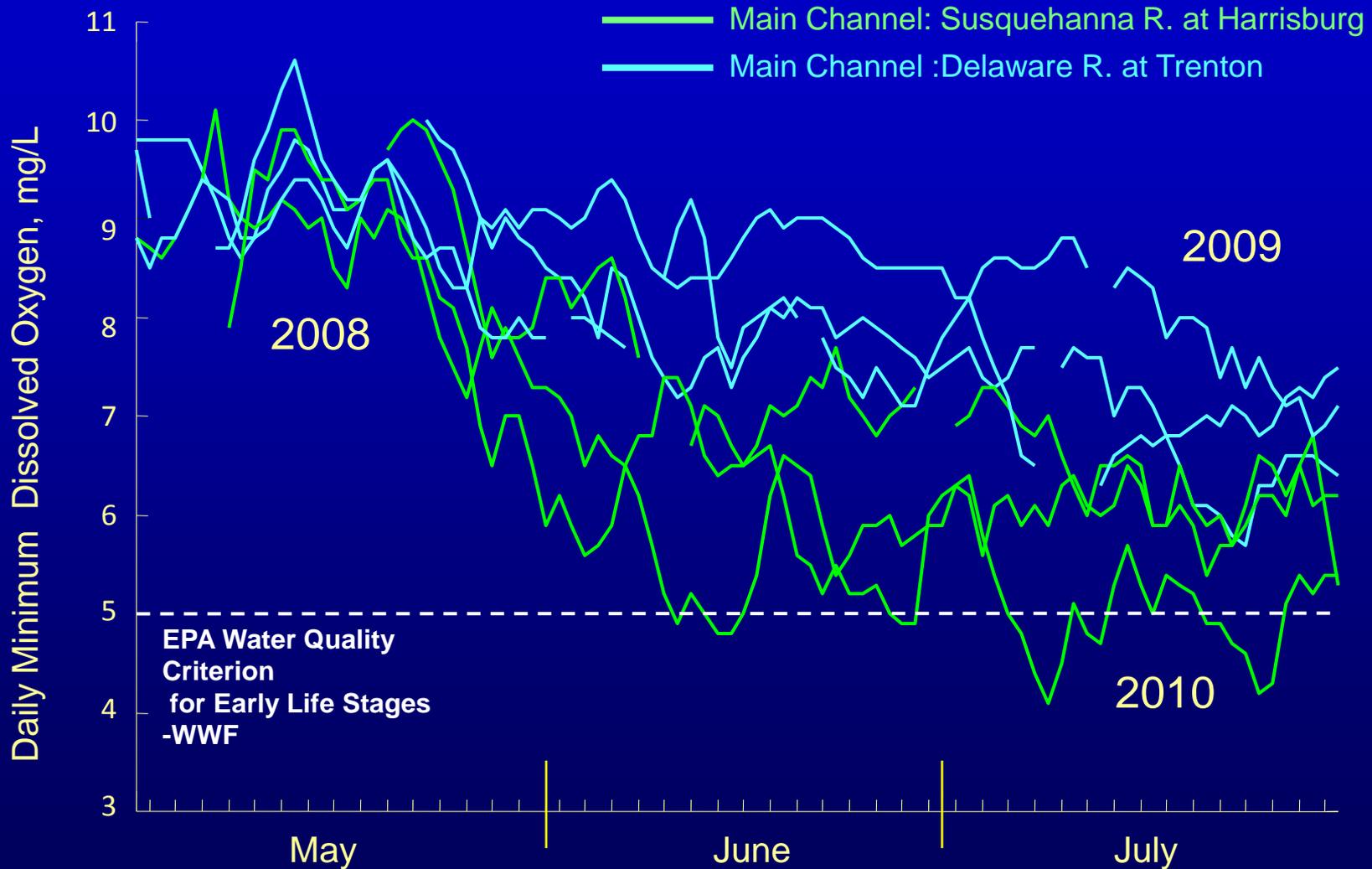
▲ Sampling Site with Streamflow gage

# Dissolved Oxygen

Susquehanna River at Clemson Island



# Dissolved Oxygen



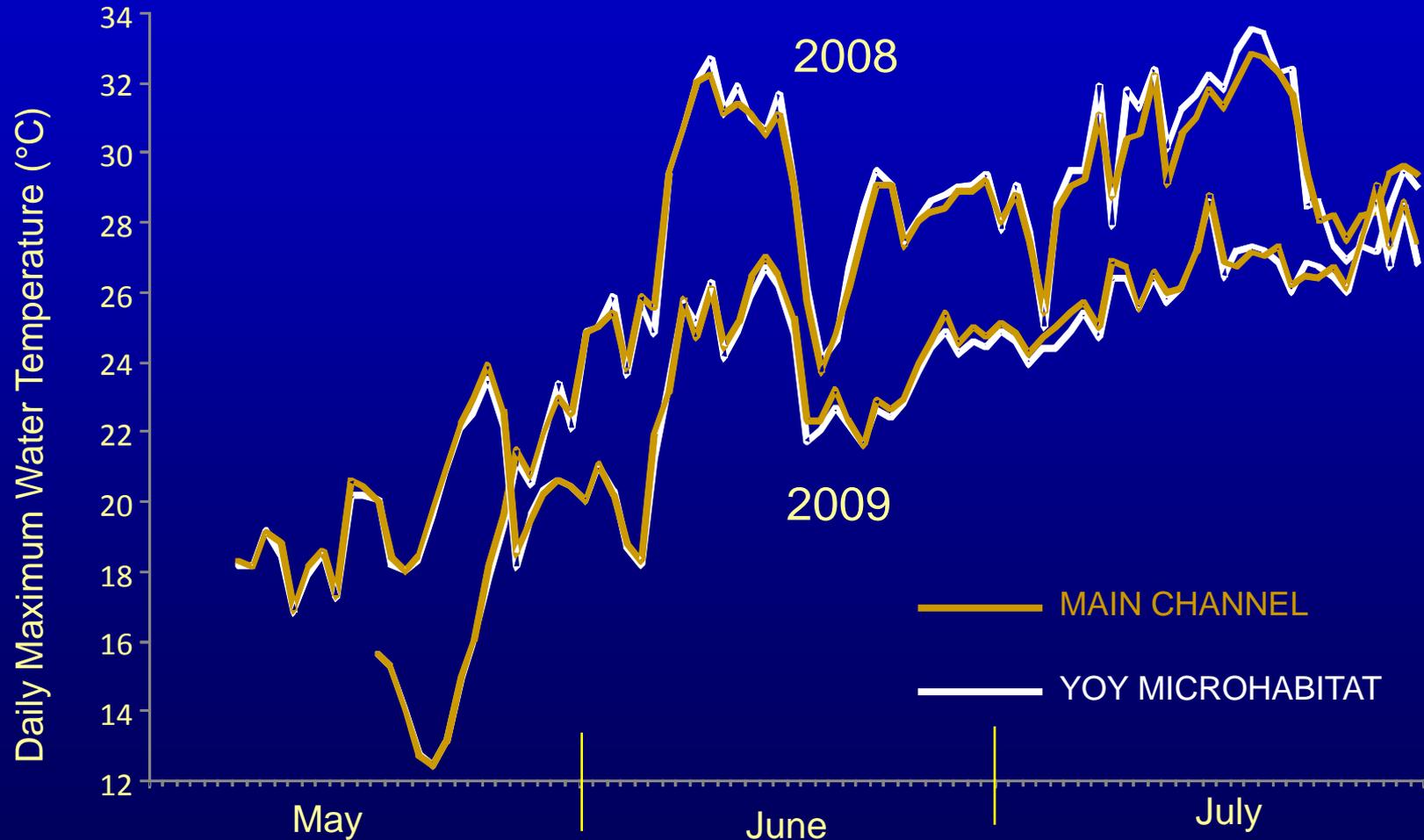


# Summary of Dissolved Oxygen Findings

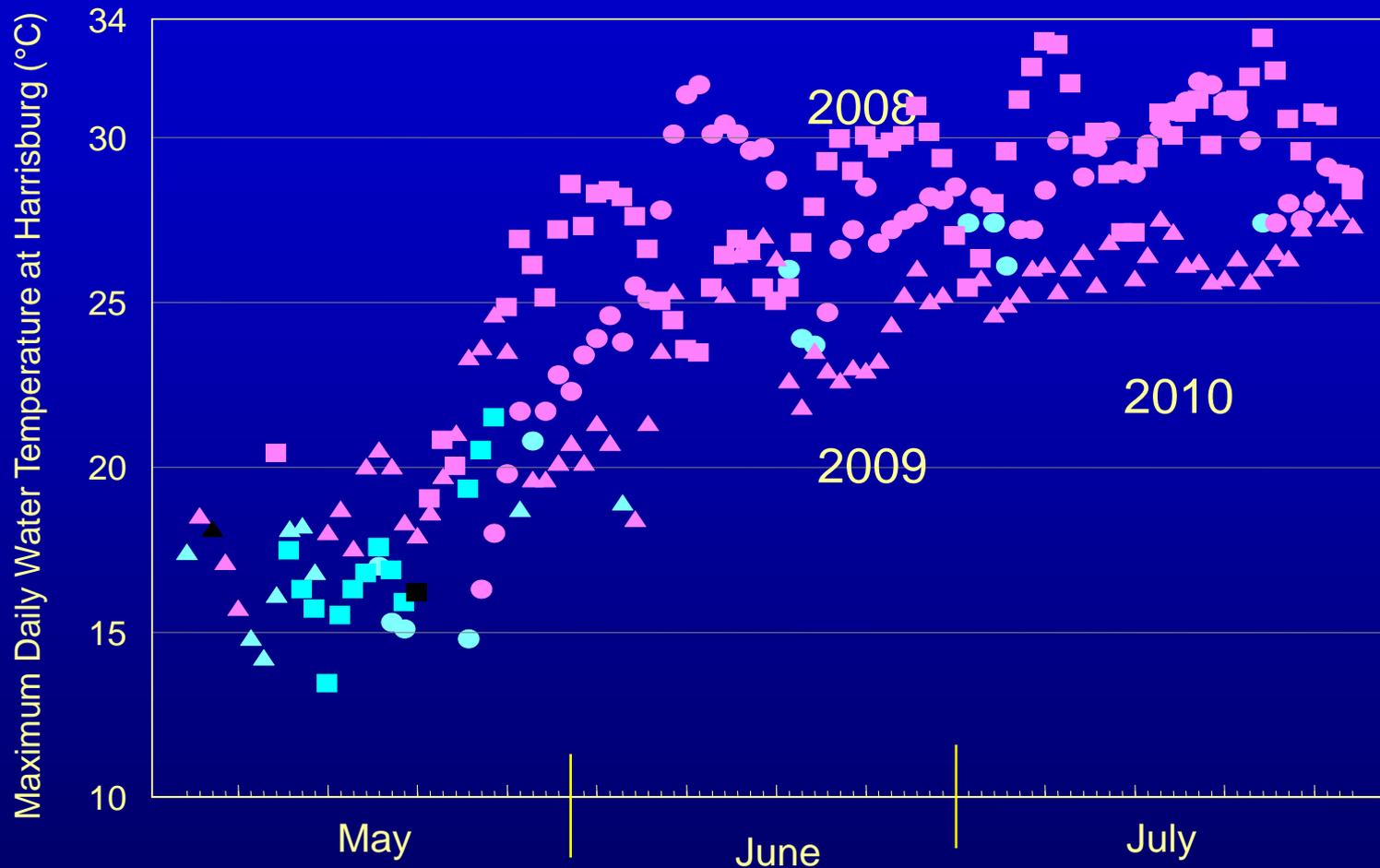
- Dissolved oxygen in microhabitat:
  - Lower than in the main channel
  - Daily minima below 5.0 mg/L at times
- Daily min. dissolved oxygen In Susquehanna River at Harrisburg:
  - 1.1 to 2.2 mg/L lower than the Delaware River at Trenton
  - 0.4 to 1.1 mg/L lower than in the Allegheny River nr. Pittsburgh

# Water Temperature

Susquehanna River at Clemson Island



# Water Temperature



Susquehanna River at Harrisburg **Warmer** than Delaware R. at Trenton

Susquehanna River at Harrisburg **Cooler** than Delaware R. at Trenton

Susquehanna River at Harrisburg **Equivalent** to Delaware R. at Trenton



# Summary of Water Temperature Findings

- Max Daily Water Temperature at Harrisburg averaged:

1.6 to 2.2 °C warmer than the Delaware River at Trenton

1.5 to 3.4 °C to warmer than the Allegheny River near Pittsburgh.

# Reports Available



In cooperation with the Pennsylvania Fish and Boat Commission,  
Pennsylvania Department of Environmental Protection, and PPL Corporation

Water-Quality Monitoring in Response to Young-of-the-Year Smallmouth Bass (*Micropterus dolomieu*) Mortality in the Susquehanna River and Major Tributaries, Pennsylvania: 2008



Open-File Report 2009-1216

U.S. Department of the Interior  
U.S. Geological Survey

<http://pubs.usgs.gov/of/2009/1216/>



Prepared in cooperation with the Pennsylvania Fish and Boat Commission and  
the Pennsylvania Department of Environmental Protection

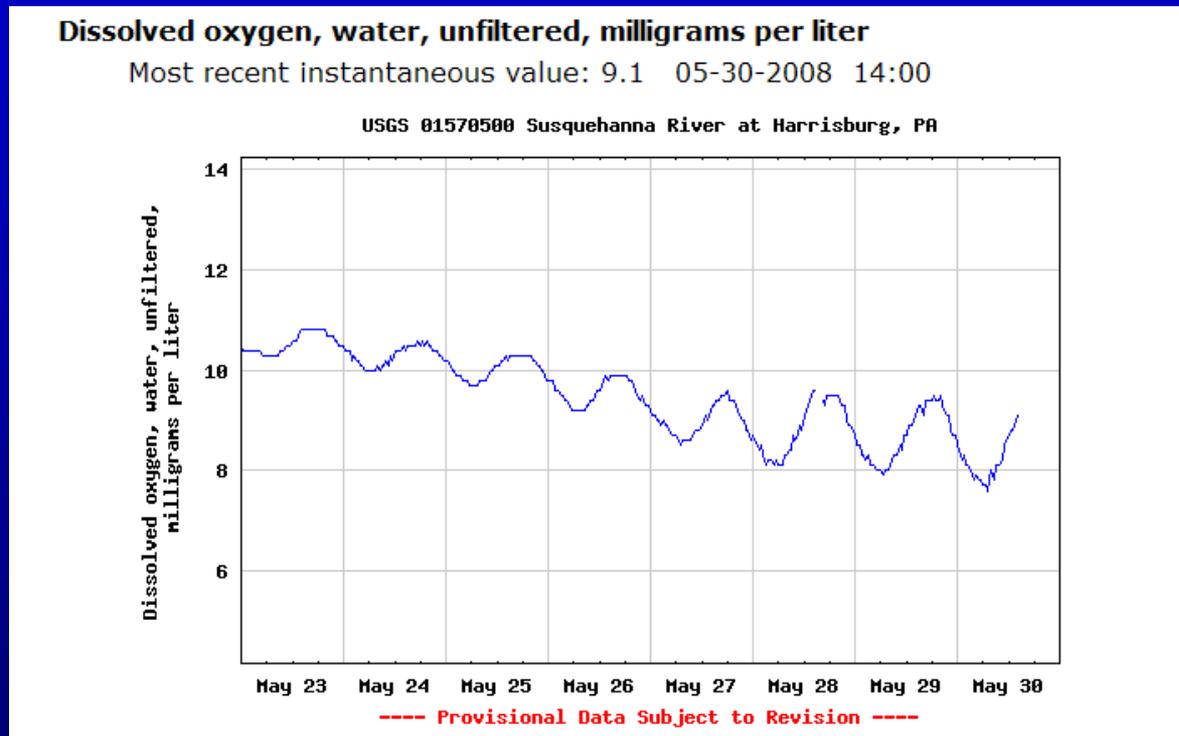
**Streamflow and Water-Quality Monitoring in Response to Young-of-Year Smallmouth Bass (*Micropterus dolomieu*) Mortality in the Susquehanna River and Major Tributaries, with Comparisons to the Delaware and Allegheny Rivers, Pennsylvania, 2008–10**

Open-File Report 2012–1019

U.S. Department of the Interior  
U.S. Geological Survey

<http://pubs.er.usgs.gov/publication/ofr20121019>

# Continuous Water-Quality Data on the Internet



- Susquehanna River at Harrisburg  
<http://waterdata.usgs.gov/nwis/uv?01570500>
- Juniata River at Newport  
<http://waterdata.usgs.gov/nwis/uv?01567000>



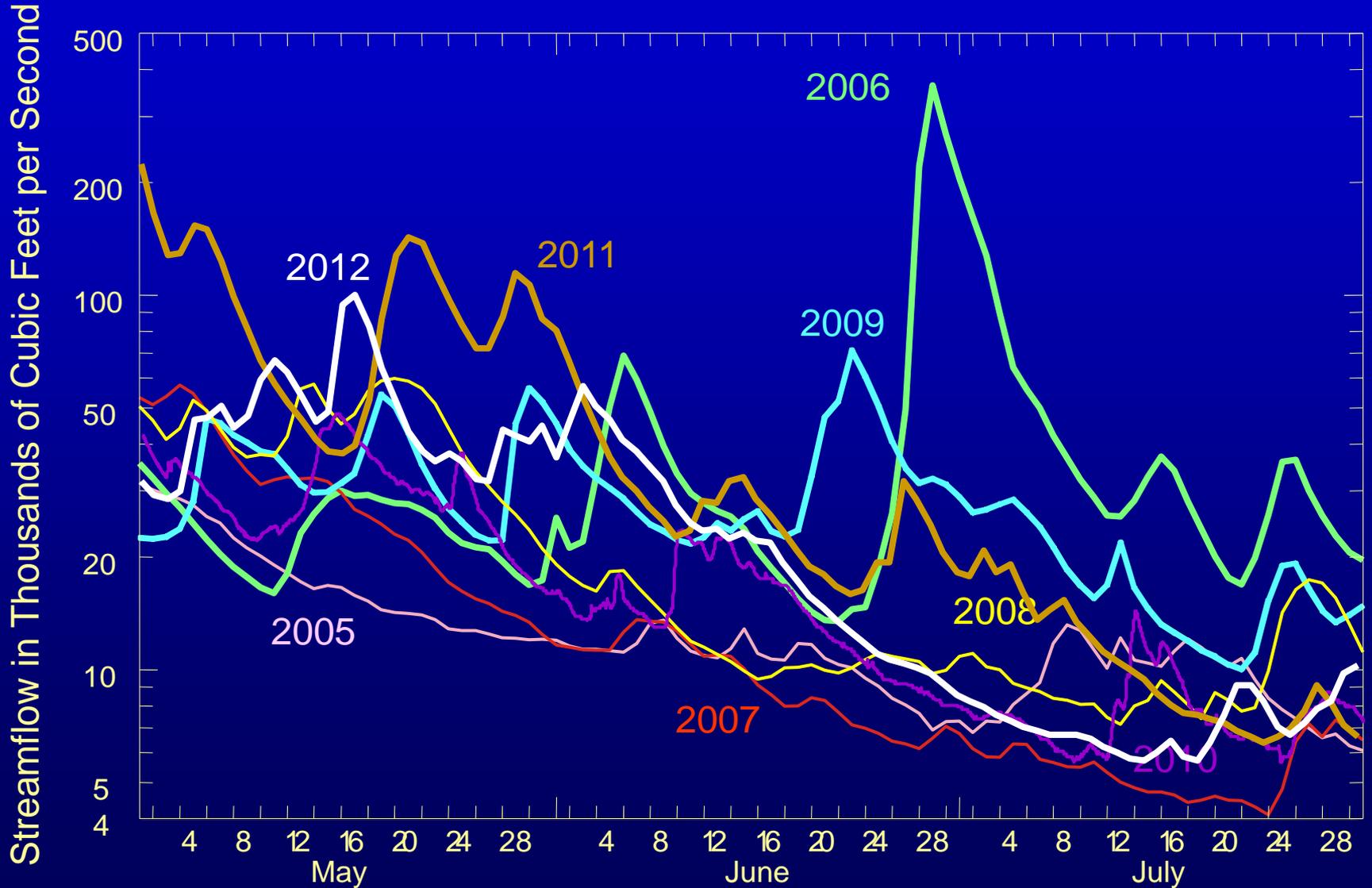
Jeff Chaplin  
U.S. Geological Survey  
215 Limekiln Road  
New Cumberland, PA 17070-2424  
Phone: (717) 730-6957  
E-mail: [jchaplin@usgs.gov](mailto:jchaplin@usgs.gov)

December 11, 2012



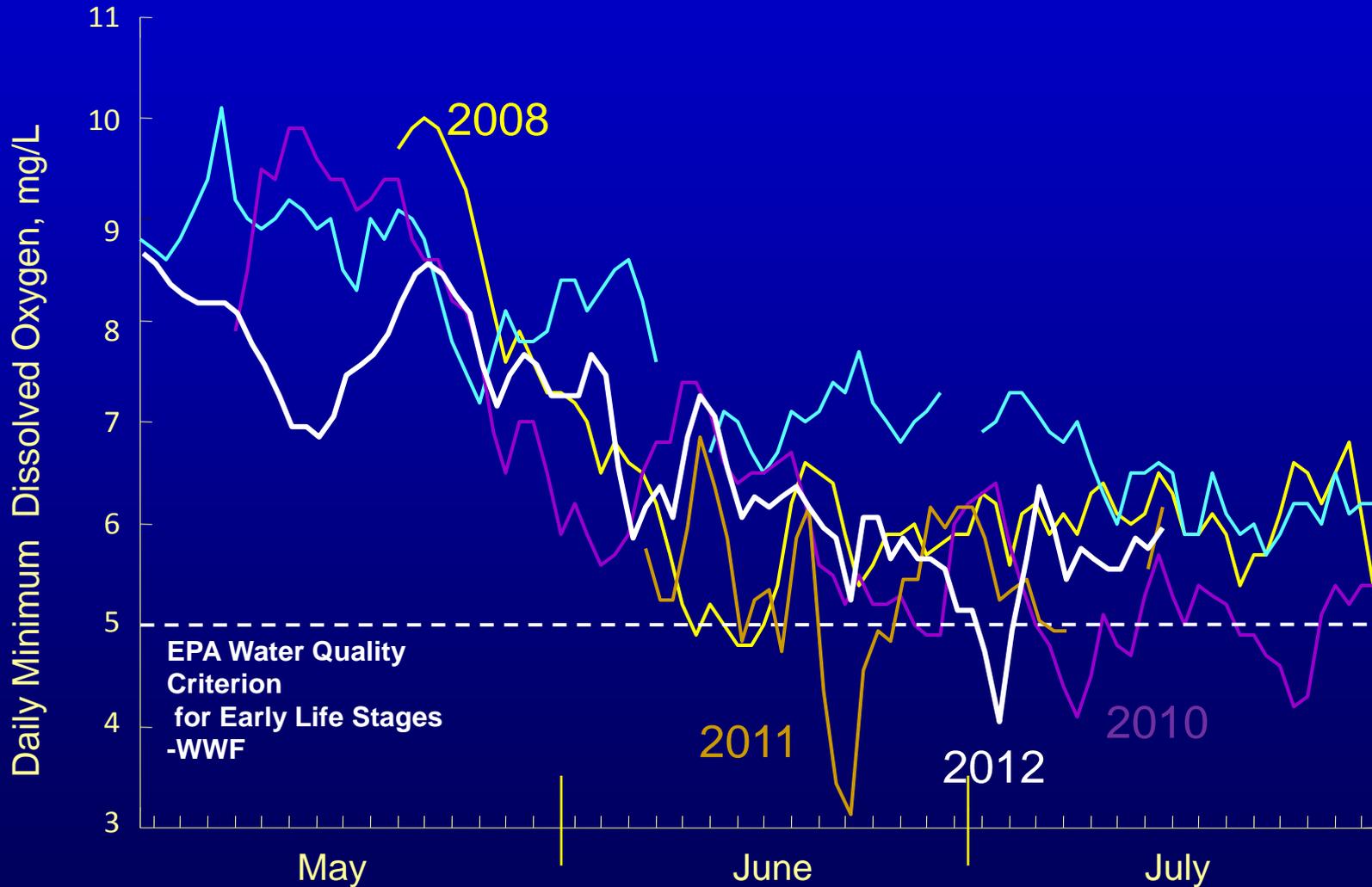
# Streamflow

Susquehanna River at Harrisburg



# Daily Minimum Dissolved Oxygen

Susquehanna River at Harrisburg



# Findings - Nutrients

Nutrient samples collected at 50 locations between Williamsport and York Haven

Analyzed water and sediment samples for Nitrogen and Phosphorus

Data indicate nutrient levels may contribute to nuisance algal growth at some locations

Long term repeat sampling needed to determine trends.

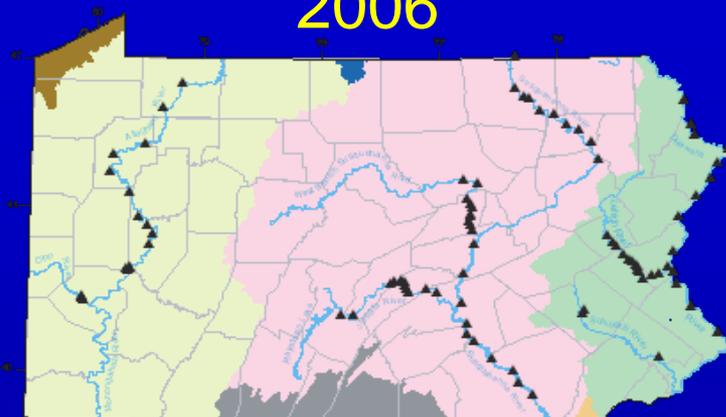


# Spatial Distribution of Disease

2005



2006



2007



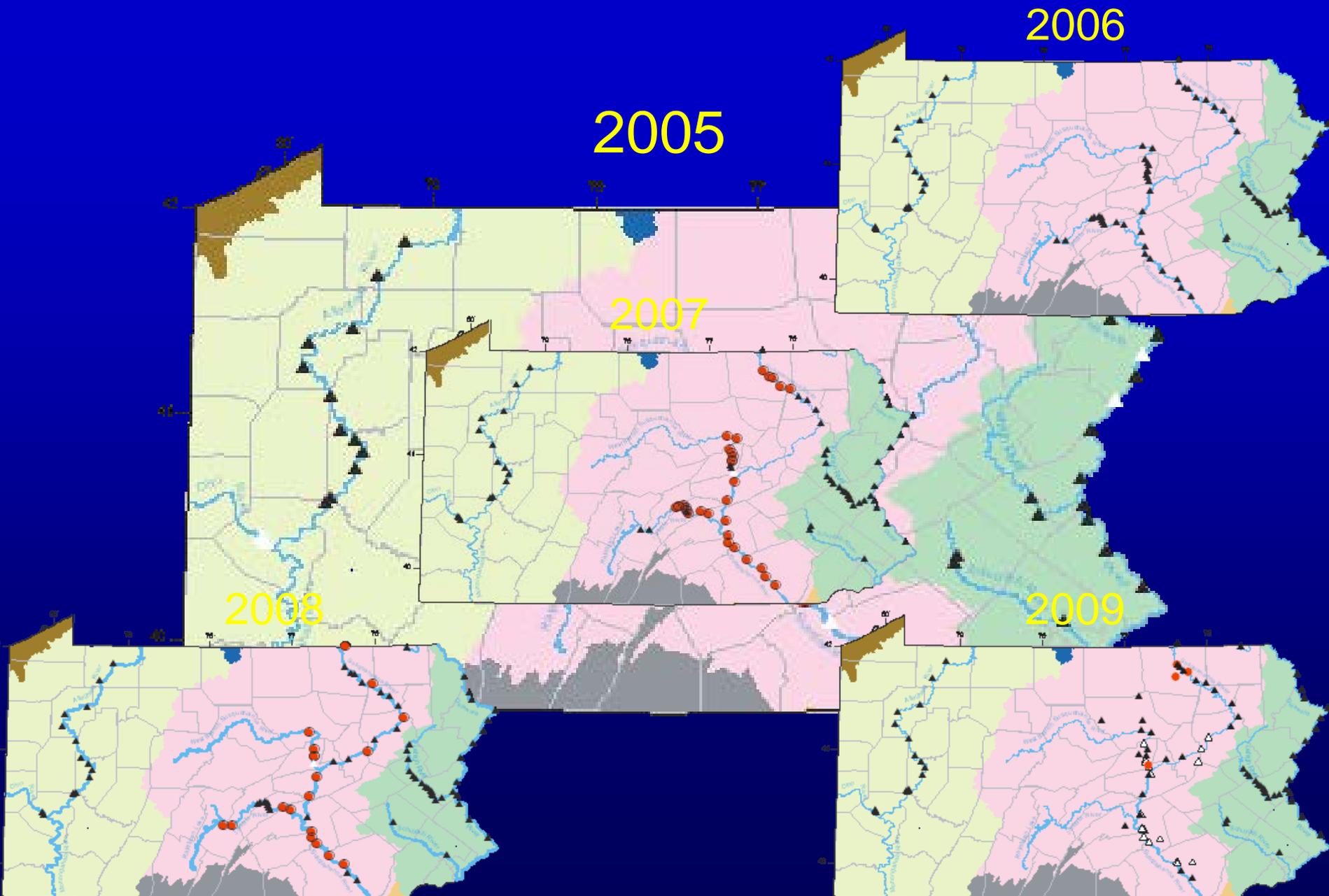
2008



2009



# Spatial Distribution of Disease



# Nutrient Synoptic Sampling

## June 11-12, 2008

- 6 teams
- USGS, PFBC, and DEP Personnel
- Water and bed sediment samples
- 25 sites (left and right banks)
- W.B. Susq. (Williamsport area) to Susq. near Harrisburg.

# Smallmouth YOY Surveys



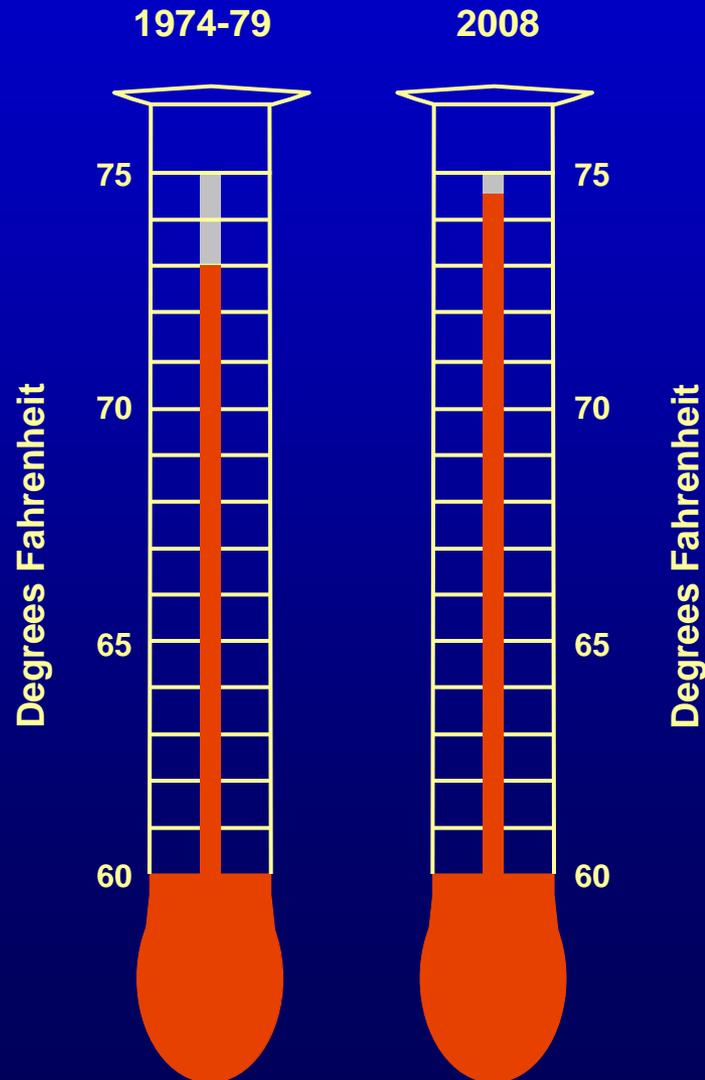
“Columnaris bacteria (*Flavobacterium columnare*) appears to be the primary pathogen” (Ken Stark PFBC, 2008)

# Installation at Ungaged Locations (May – June, 2008)

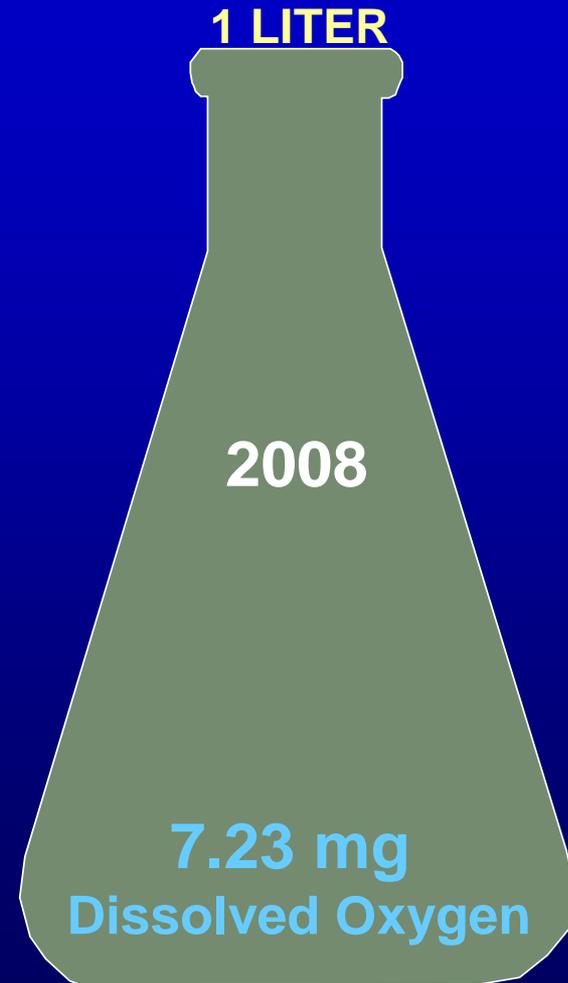
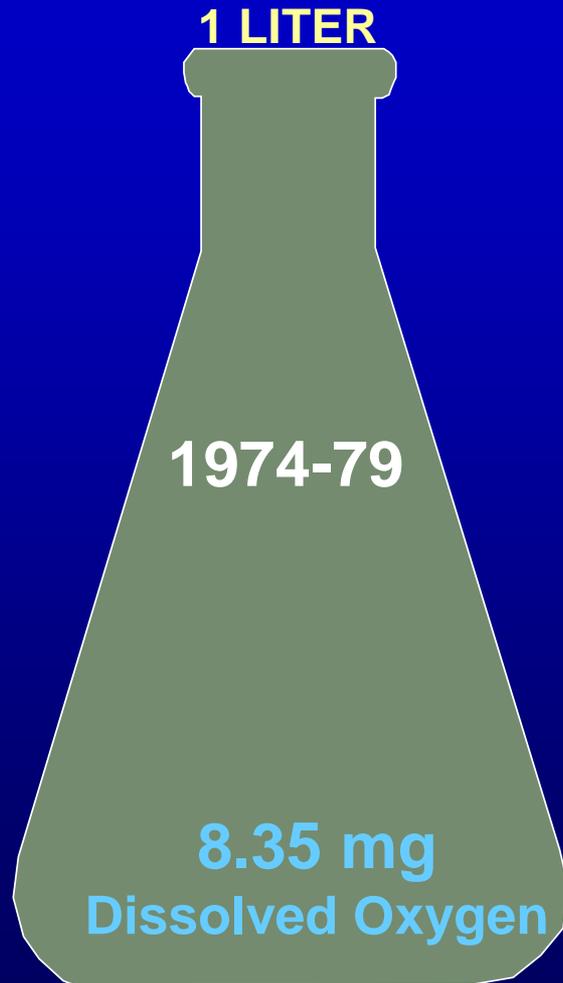


# Findings – Historical Water Temperature

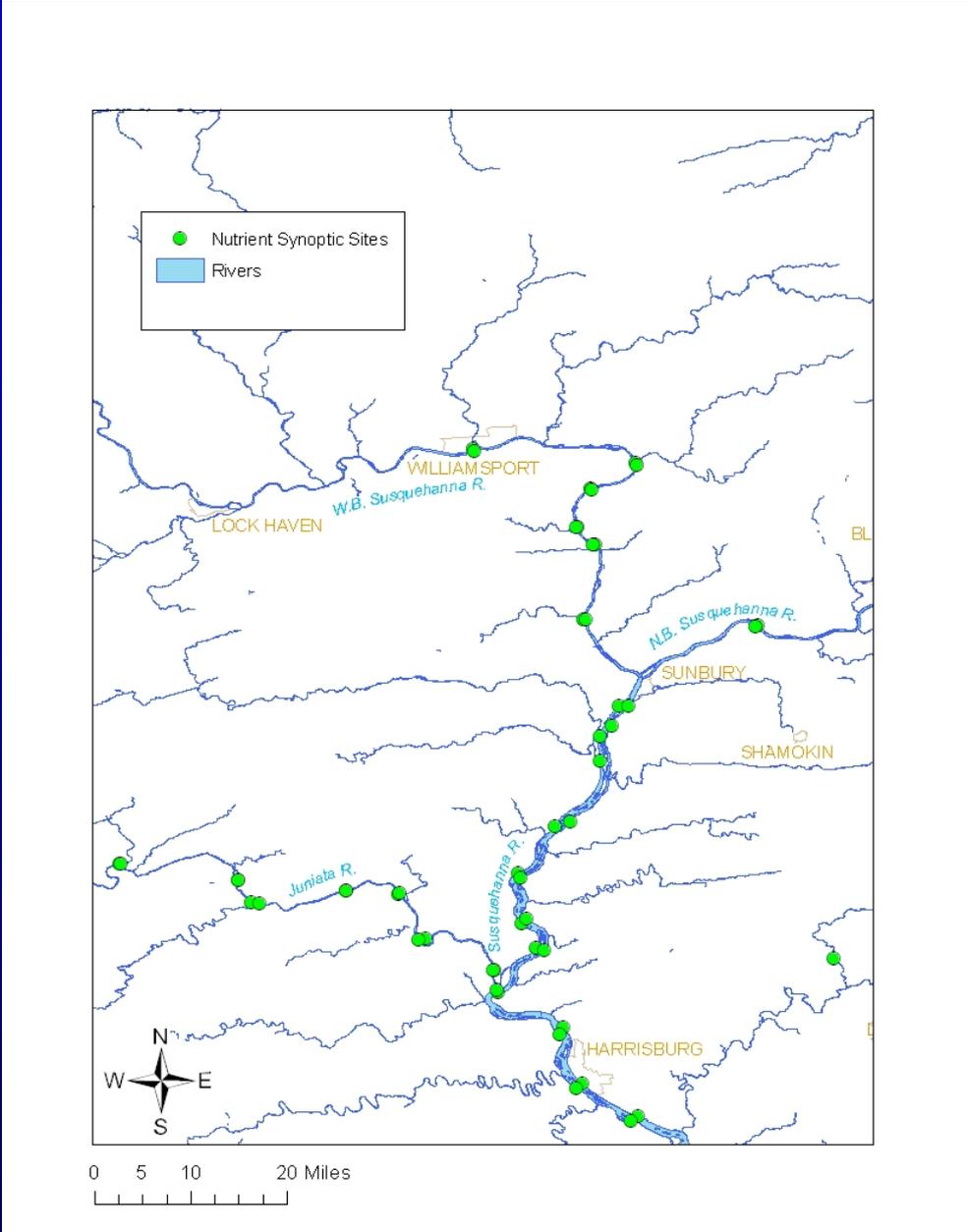
Susquehanna River at Harrisburg: 1.4 °F warmer in 2008



# Findings – Historical Dissolved Oxygen

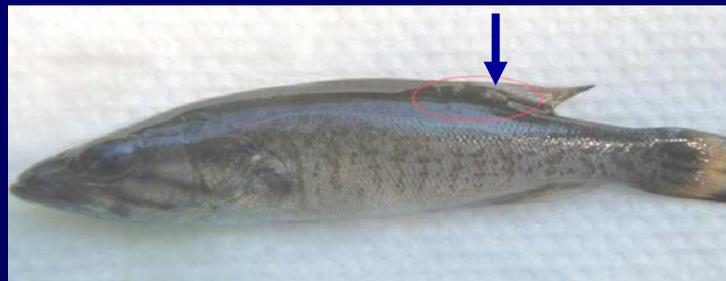
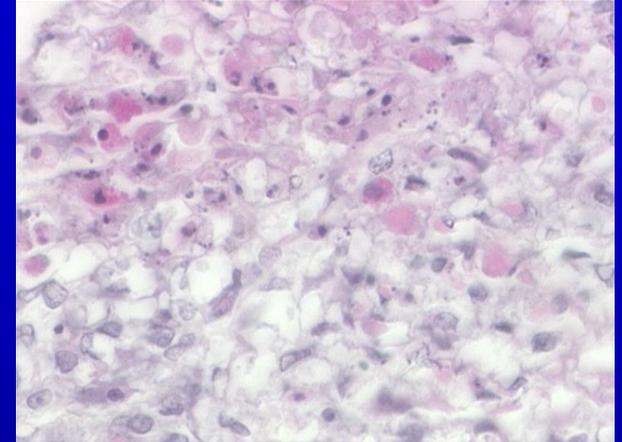


# Site Selection – Nutrient Synoptic



# Fish Pathology

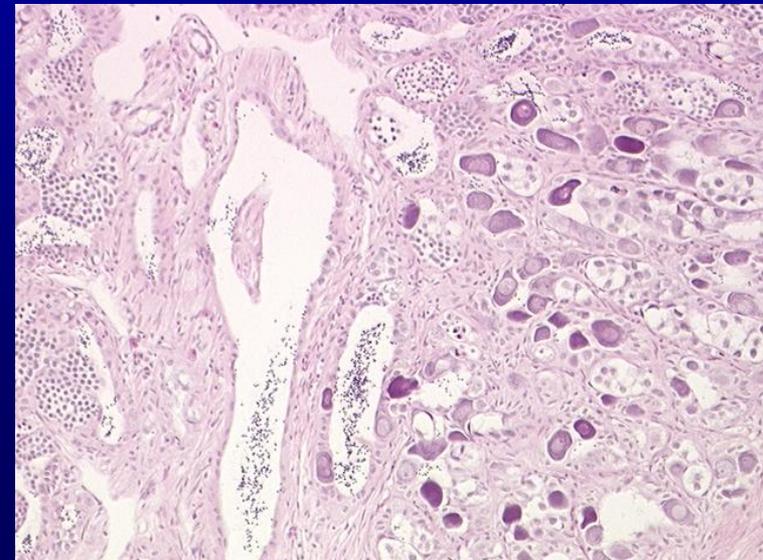
- Other bacteria present
  - motile Aeromonads (4 spp.)
- Parasites
  - Trematode and myxozoan parasites
- LMBv
  - Present in many of the fish
  - Potential stressor



Photos: V. Blazer, USGS Leetown Sci Center

# Fish Pathology

- Adult, pre-spawn work in 2009-2010
- Intersex (89 – 100%)
- Contaminants
  - 15 PCB congeners
  - 14 flame retardents
  - Personal care products, pesticides



# Fish Pathology

- Tributaries
  - No reports in tribs
  - Museum records (2008)



Photo: T. Wertz, PFBC



Photo: J. Hepp, PADEP SCRO

Found in 8 of 16 tribs  
surveyed in 2010!



# Streamflow

Susquehanna River at Harrisburg

Median Streamflow During the Critical Period (May-July)  
(In Thousands of Cubic Feet per Second)

