



pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION



BUREAU OF CLEAN WATER

2016 Draft Integrated Water Quality Report

August 1, 2016

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Tom Wolf, Governor

Patrick McDonnell, Acting Secretary

Agenda

- Introductions: Neil Shader, DEP Press Secretary
- Remarks from DEP Acting Secretary Patrick McDonnell
- Overview of 2016 Draft Integrated Water Quality Report and current research on Susquehanna River – Josh Lookenbill, DEP
- Questions

Integrated Water Report

- DEP published the 2016 Integrated Water Quality Monitoring and Assessment Report
- Report required by EPA every 2 years
- Examines more than 86,000 miles of streams and rivers and 160,000 acres of lakes and ponds

Integrated Water Report

- Examines 4 main uses of waterways:
 - Water Supply
 - Aquatic Life
 - Recreation
 - Fish Consumption
- Sources of contamination
 - Acid Mine Drainage
 - Agriculture
 - Urban stormwater runoff
 - Unknown

Process

- Monitor surface waters for biology, chemistry and physical habitat using methods outlined in the approved 2015 Assessment Methodology
- Waters not meeting standards as outlined in the Methodology are considered impaired and added to the impaired list of waters in the Integrated Report (Category 5)

Consequences

- Impaired waters on Category 5 require a TMDL or TMDL alternative
- All point and non-point sources of the impairment cause are identified and assigned an allowable pollutant load
- Point source discharge permits issued to implement TMDL
- Non-point source implementation through voluntary compliance to construct best management practices (BMPs)
- EPA guidance states TMDL developed within 13 years of first listing

2016 Integrated Report (IR) Summary

	Aquatic Life Use	Fish Consumption Use	Recreational Use	Potable Water Supply Use
Streams (miles)				
Assessed*	83,222	8,177	18,356	3,446
Supporting	66,565	5,830	10,791	3,390
Impaired	9,821	2,052	7,398	50
Approved TMDL**	7,283	676	155	12
Compliance	46	---	---	---
Pollution***	3,229	---	---	---
Restored****	167	84	47	21

* Database management to remove assessments from stream lines in lakes and impoundments reduced total miles assessed.

** TMDL miles reported here are only those overlapping impaired segments. A TMDL allocation may include an entire watershed, including streams listed as attained.

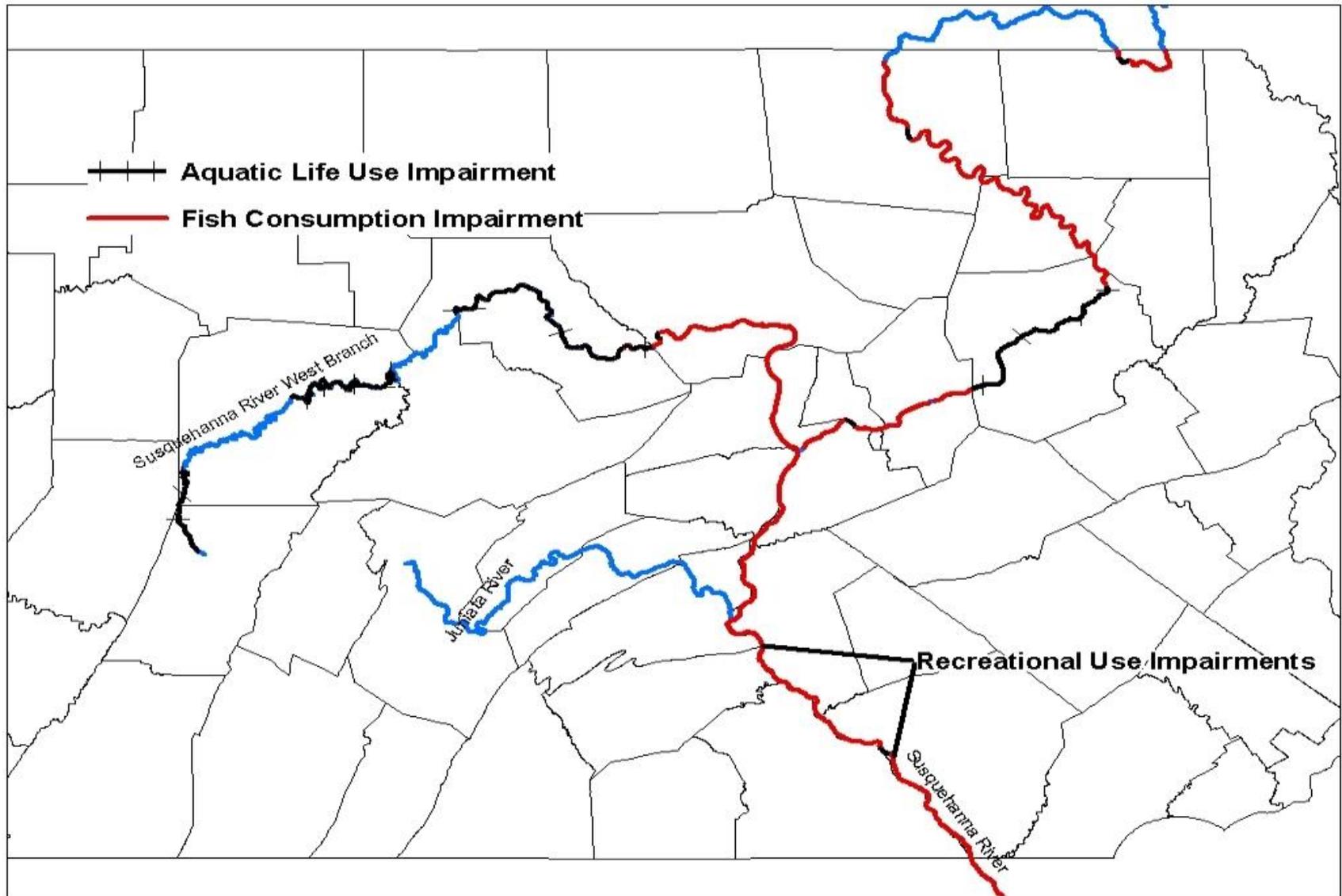
*** 2,489 miles have both pollution and pollutant problems.

**** Stream miles now attaining and removed from Category 5 and placed in Category 1 or 2. The sum of miles exceeds total miles restored due to overlap between assessed uses.

➤ Susquehanna River - Eleven Year Study

- Began in 2005 with the discovery of diseased young of year smallmouth bass
- Intensive studies began in 2012 and since that time 32,000 man hours by DEP staff alone have been dedicated to studying the river
- When an impairment was found it was added to the list of impaired waters
- Data collected since 2012 indicate the river is in reasonably good condition and capable of supporting fish and macroinvertebrates

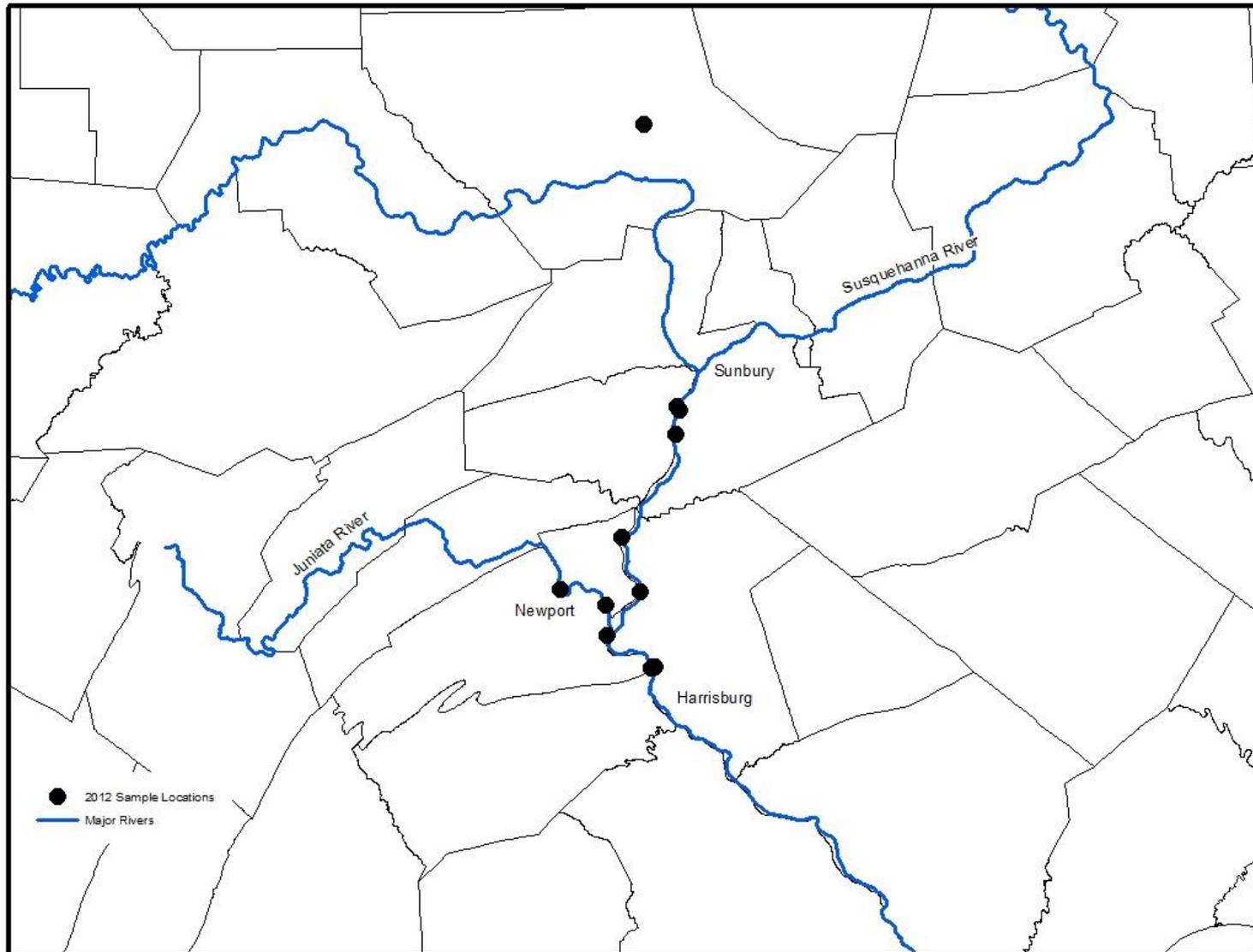
Current Major River Impairments



The Complex Susquehanna River



Susquehanna River Sites 2012

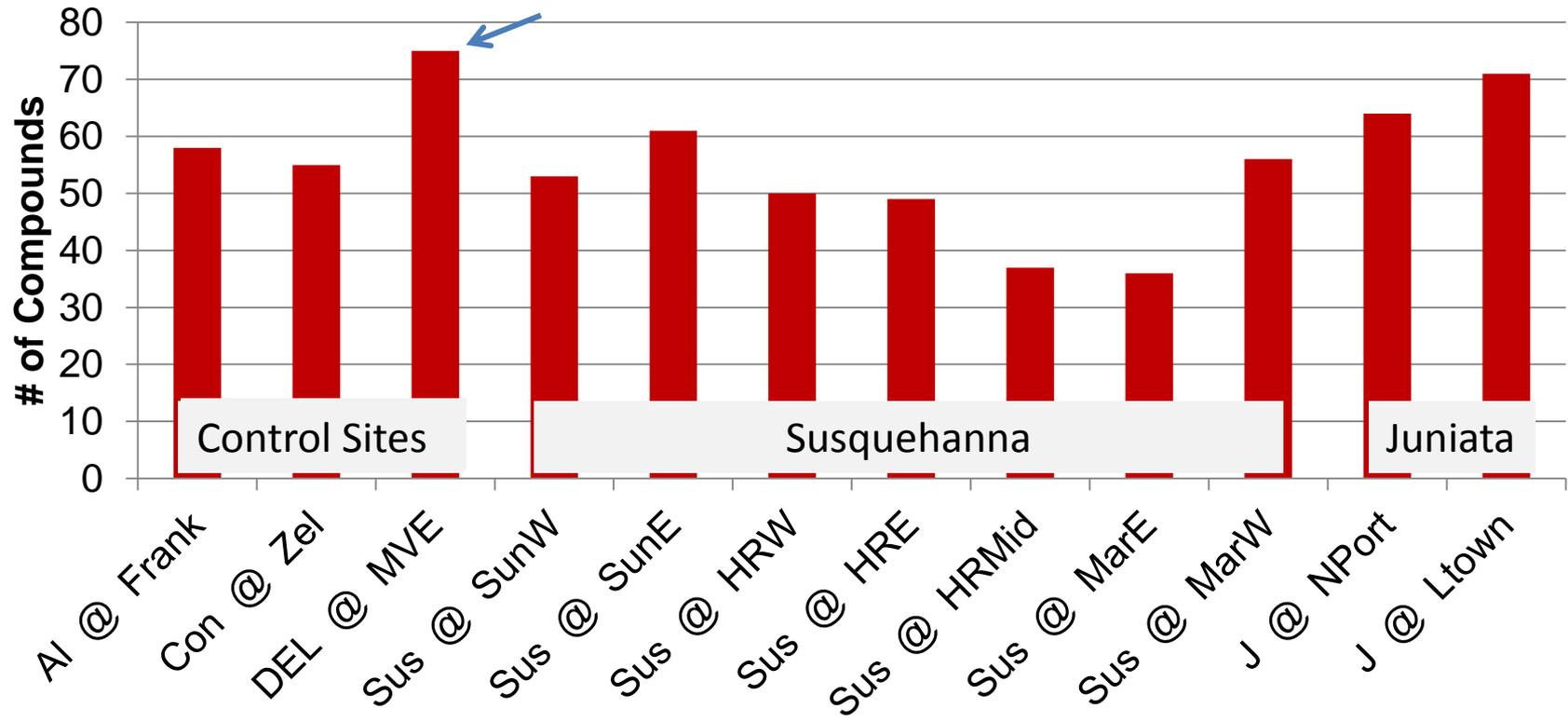


2012 Passive Samplers (Total Estrogenicity)

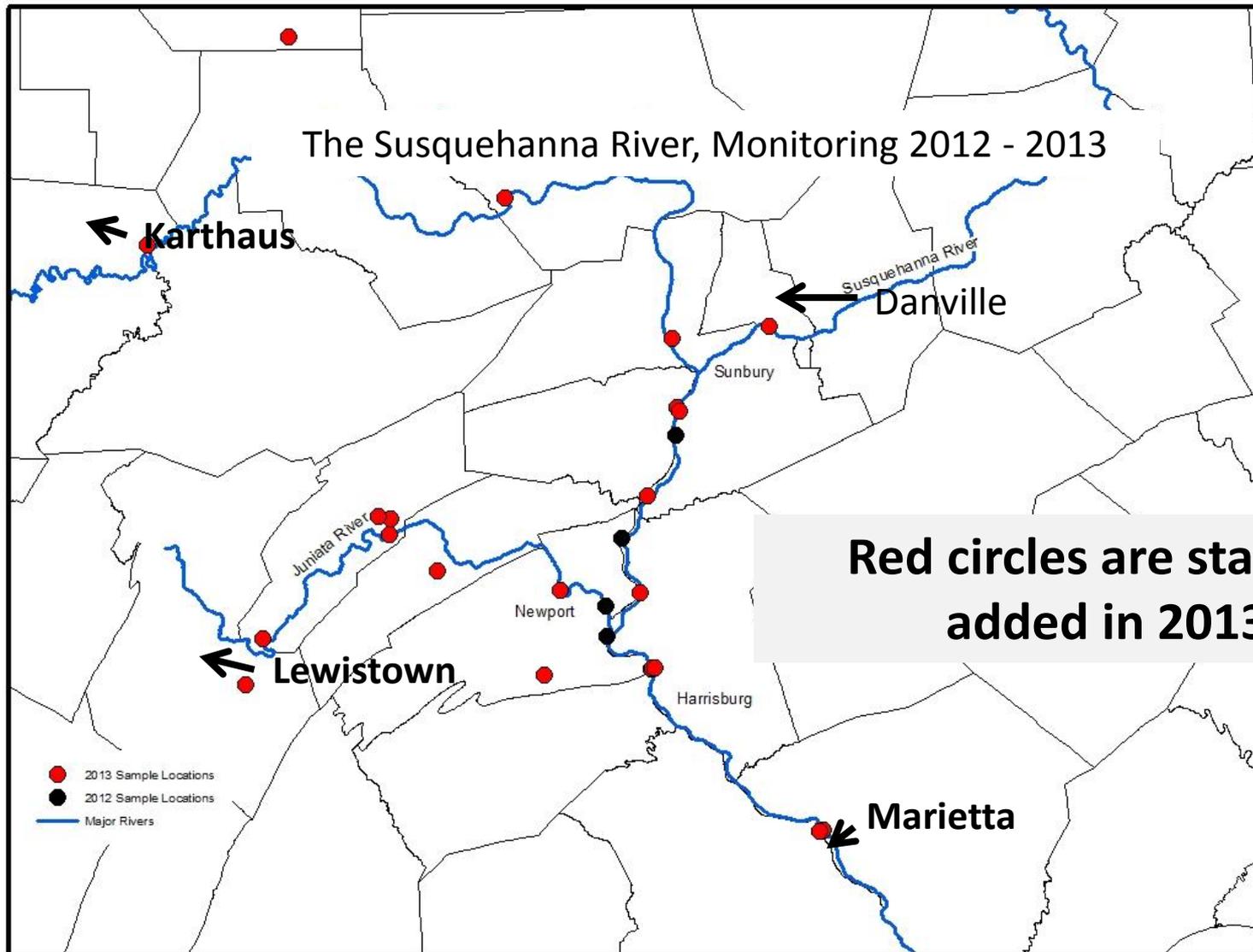
Location	Site	Grab Water Sample @ Deployment EEQ* (ng/L)	Grab Water Sample @ Retrieval EEQ (ng/L)	ng/POCIS
Susquehanna River @ Harrisburg	Harrisburg East	BD**	BD	0.879
Susquehanna River @ Harrisburg	Harrisburg Middle	BD	BD	0.617
Susquehanna River @ Harrisburg	Harrisburg West	0.174	BD	2.948
Delaware River @ Trenton, NJ	Trenton	BD	BD	1.222
Fabrication Blank	N/A	--	--	BD
Field Blank	All	--	--	BD
*EEQ = estrogen equivalents				
**BD = below detection; detection limit = 0.35 ng/L				

2013 Passive Samplers

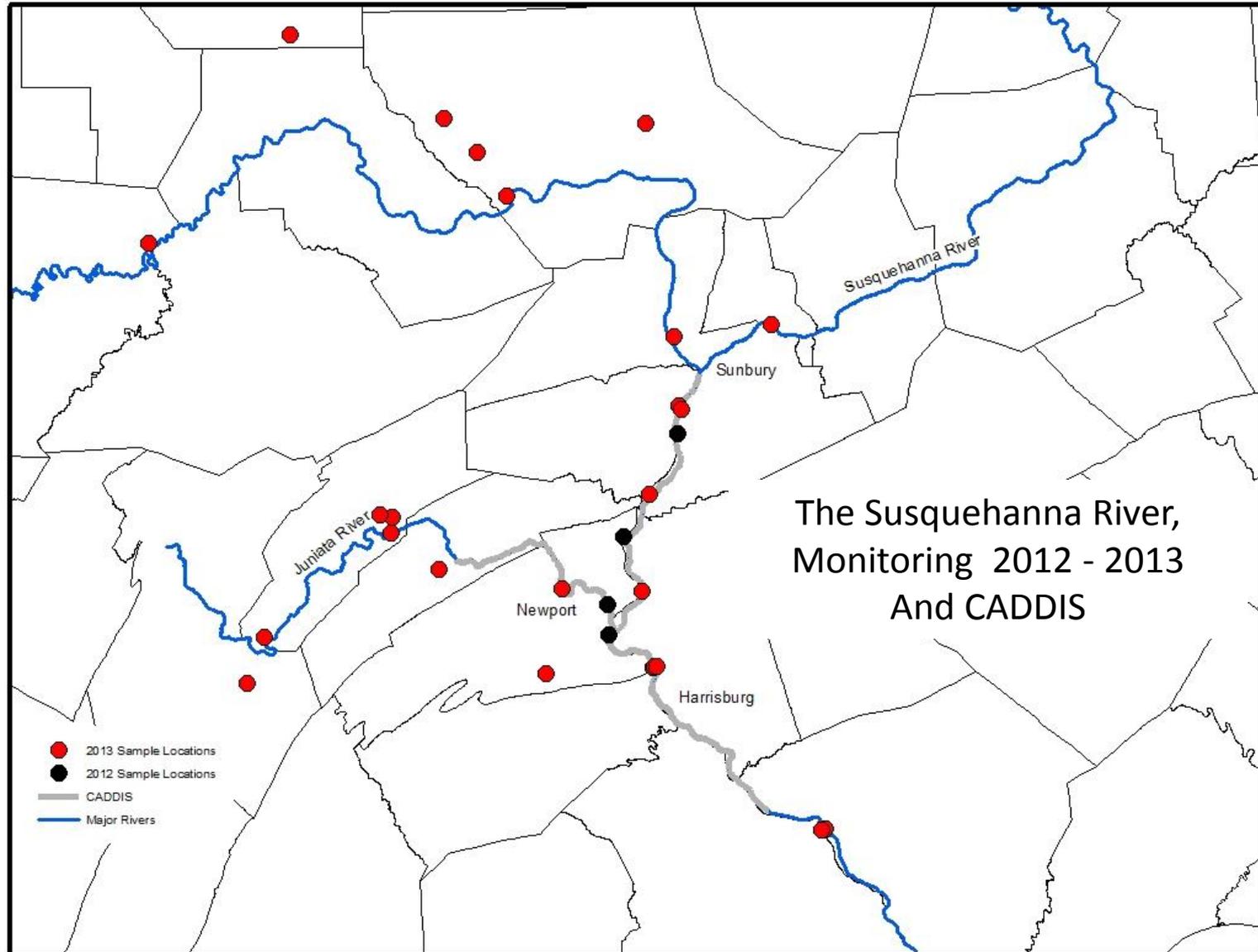
2013 Passive Samplers - Total # of Compounds per Site
(not including pharmaceuticals)



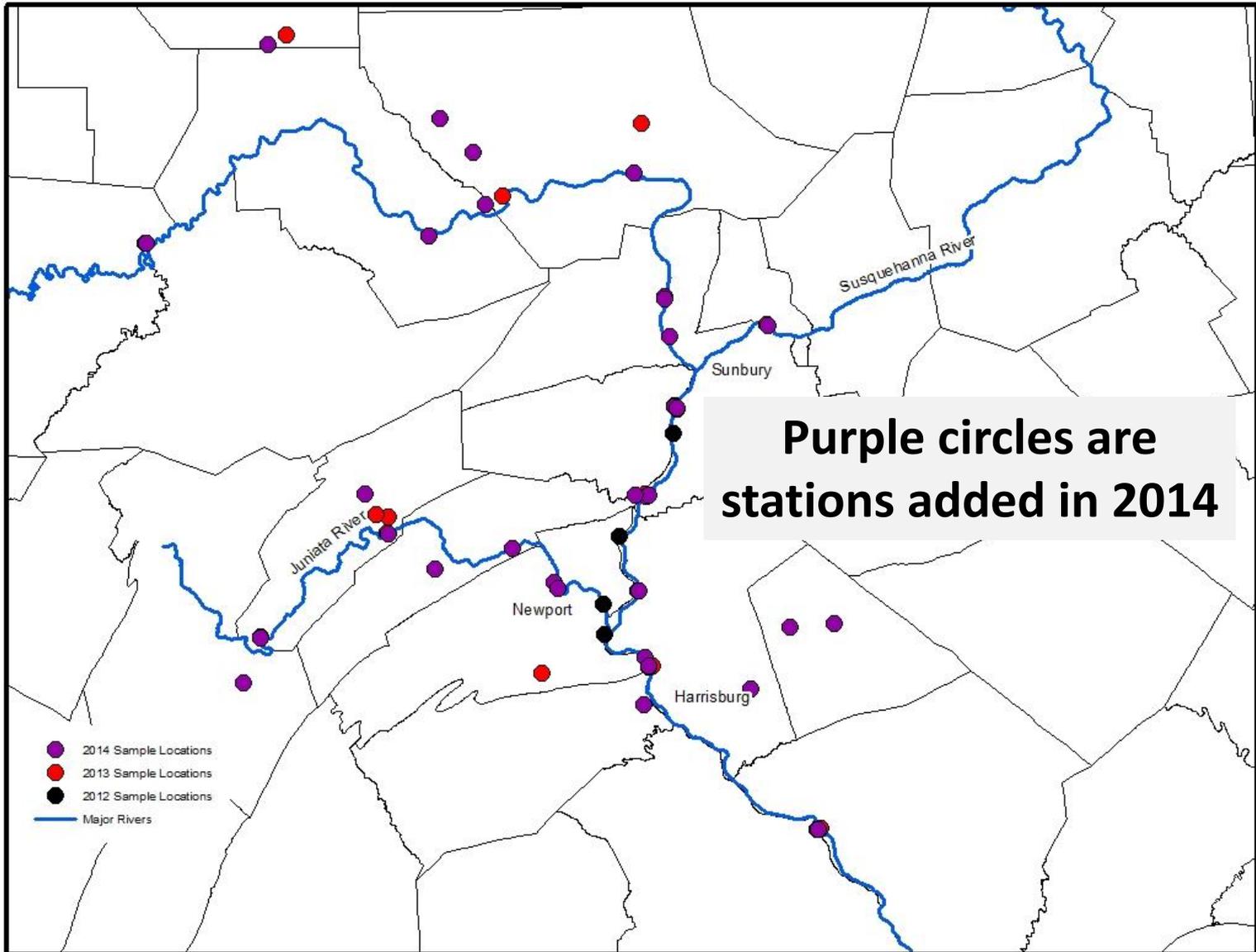
Susquehanna River Sites 2012-2013



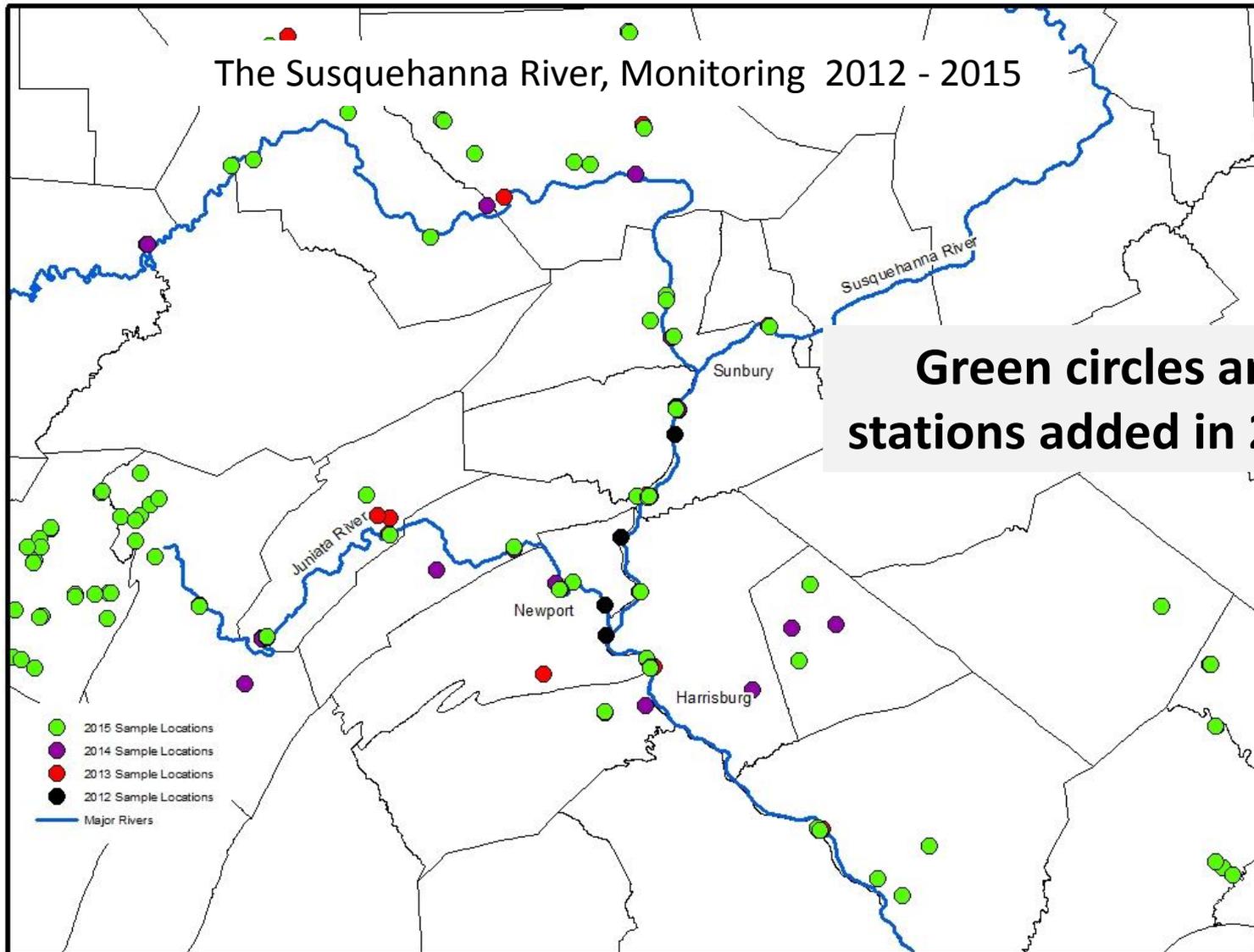
Susquehanna River Sites 2012-2013



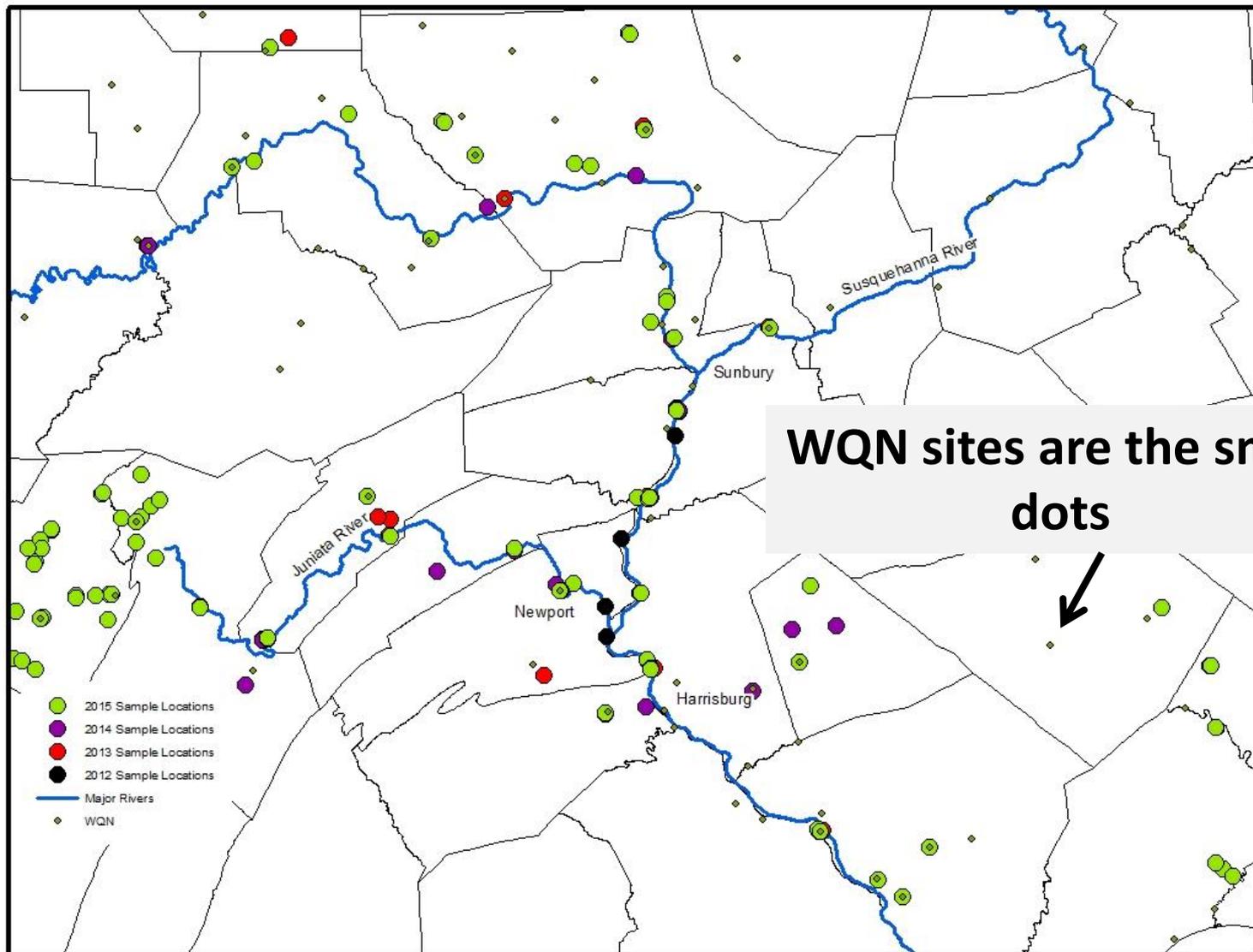
Susquehanna River Sites 2012-2014



▶ Susquehanna River Sites 2012-2015



Susquehanna River Sites 2012-2015 & WQN



CADDIS Workshop 2014

- A systematic scientific method used to analyze data in an unbiased manner
- 50 participants from several agencies including PFBC
- The case was defined as a decrease in abundance of Smallmouth bass (SMB) as a result of poor recruitment into the adult SMB population
- 14 potential causes were investigated
- The most likely causes decided on were
 1. Endocrine disrupting compounds and herbicides
 2. Pathogens and parasites

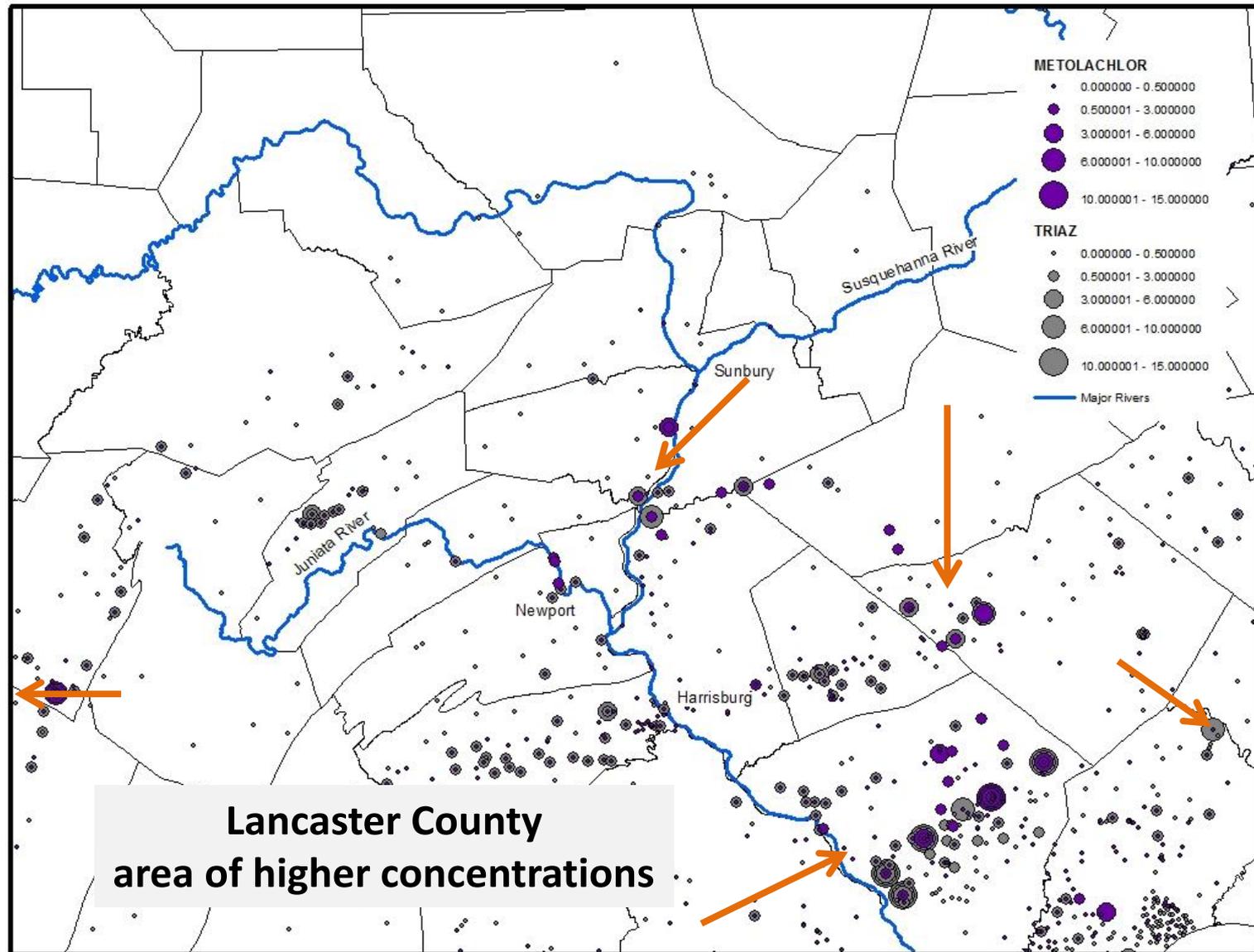
CADDIS Findings (cont'd)

It needs to be stressed that the CADDIS workgroup identified these as the most likely cause. The workgroup concluded there was not enough data to indicate these were the actual causes.

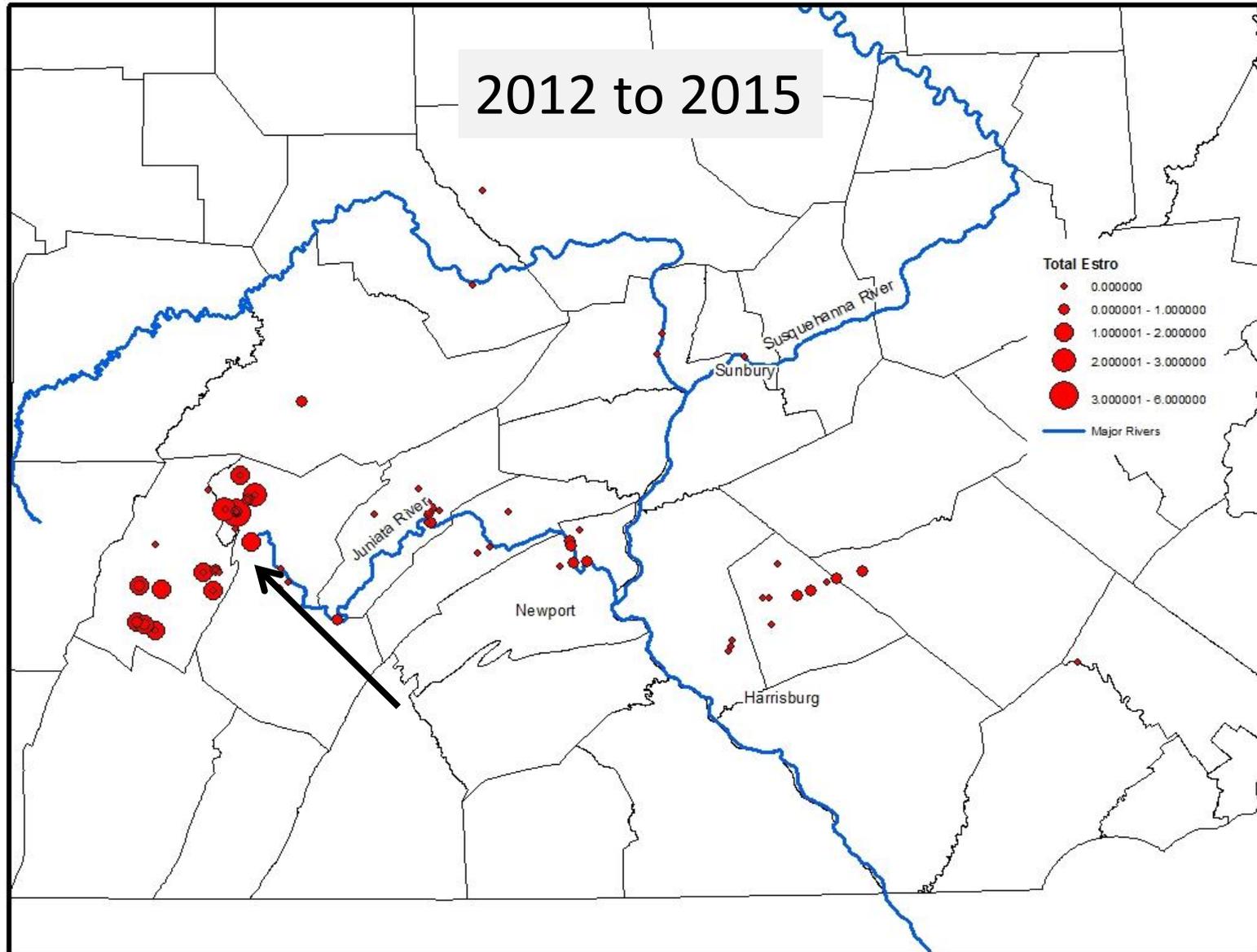
Response to CADDIS Findings

- DEP has collected emerging contaminants from over 150 sites, largely in the Susquehanna River basin
- More than 700 samples have been collected thus far
- Continue to sample more in 2016
- Compounds sampled have included legacy and current pesticides, hormones, pharmaceuticals, PAHs, PBDEs, and wastewater compounds
- Continue to fund studies of pathogens and parasites
- Funding study to determine if young of year bass are immunologically suppressed

Susquehanna River Herbicides – 2012 to 2015

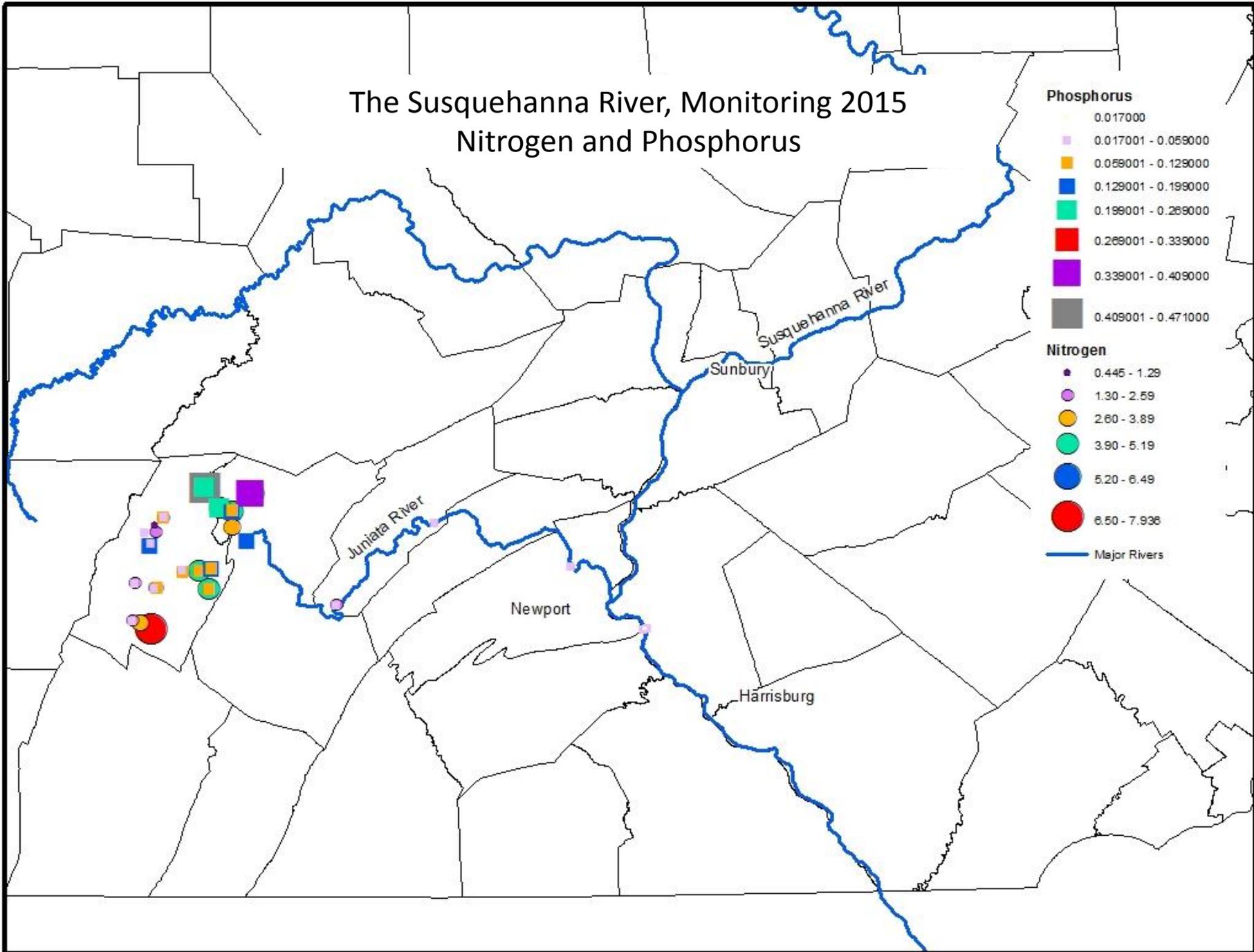


Susquehanna River Gross Estrogenicity

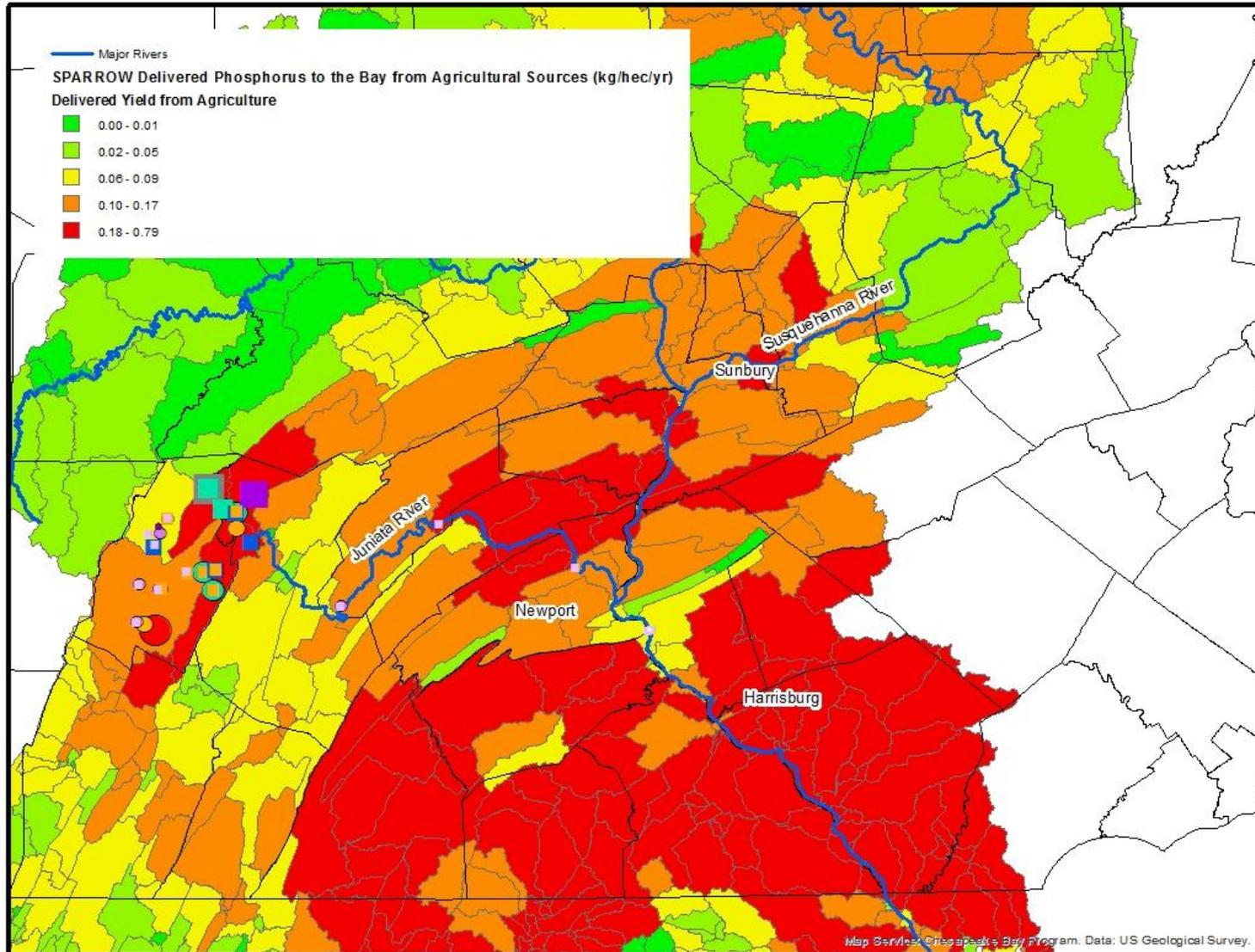


The Susquehanna River, Monitoring 2015

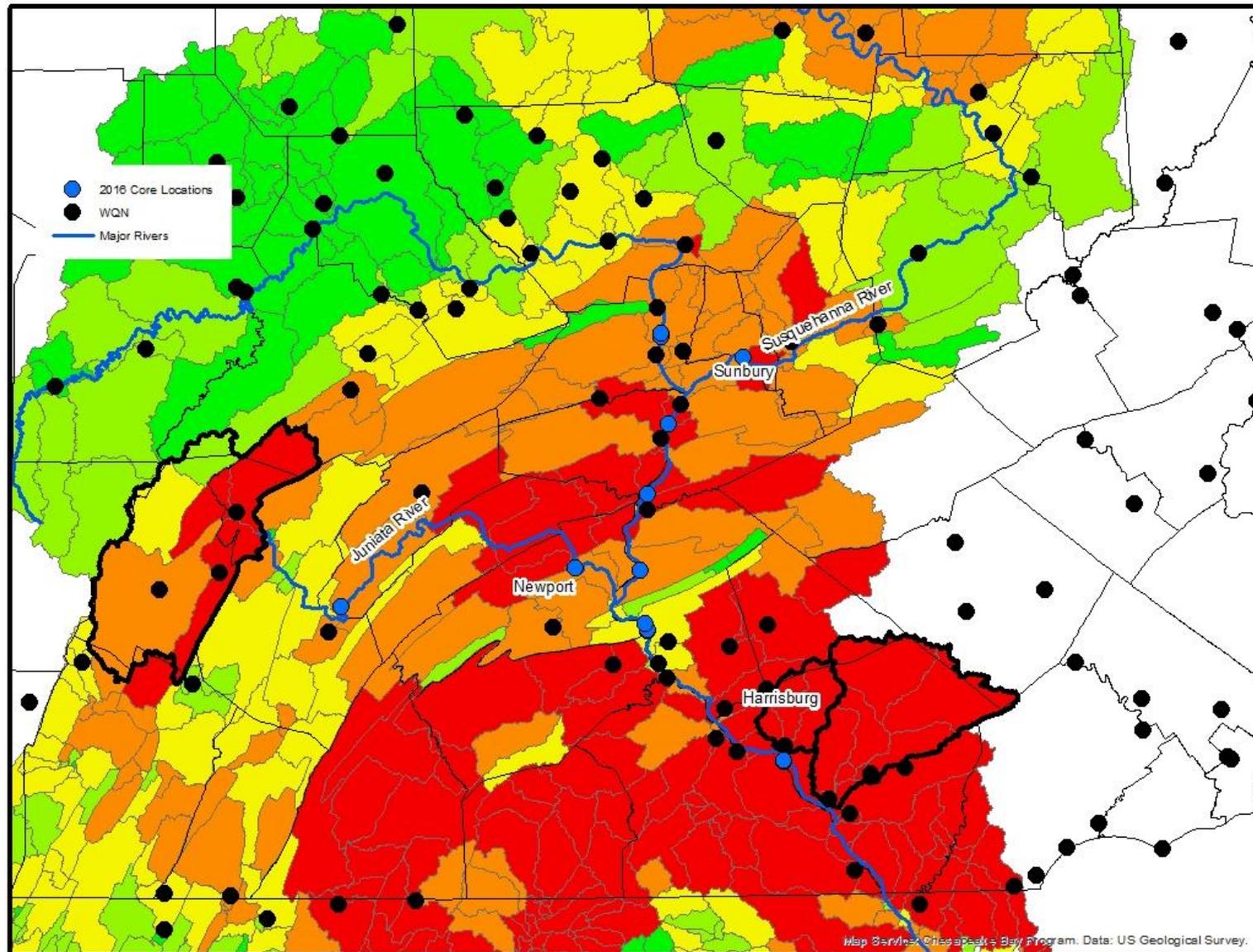
Nitrogen and Phosphorus



Sparrow Nutrient Model – Susquehanna



Sparrow Nutrient Model – Susquehanna



Data Comparison Out-of-Basin Overview

	Allegheny River		Sus. River Upriver Harrisburg		Sus. River Downriver Harrisburg		Delaware River	
pH	Good	<1%	Good	< 1%	Good	< 1%	Poor	1.78%
DO	Good	<1%	Good	<1%	Good	<1%	Good	<1%
Nitrogen	Good	<1.0	Good	<1.0	Fair	> 1.0	Fair	> 1.0
Phosphorus	Good	<0.1	Good	<0.1	Good	<0.1	Good	<0.1
Macros.	Good		Good		Good		Fair	
Fish - Ecology	Good (Intact Community)		Fair (Increasing invasive sp.)		Poor (Elevated invasive sp.)		Good (Intact Community)	
Fish – Recreation	Good (Elevated sport fish pop.)		Good (Elevated sport fish pop.)		Good (Elevated sport fish pop.)		Poor (Low sport fish pop.)	
Fish – Water Qual	Good		Good		Good		Poor	

See next slide

Effects of Invasive Species on Fish Ecology

- Compete with natives for food
- Can prey on native species
- Compete for space and reproductive sites
- May act as intermediate hosts for pathogens and parasites
- If eaten by natives, may not have the same nutritional quality as their normal prey
- Can upset the entire food chain if become too abundant



The invasive Mimic Shiner has overrun the Susquehanna River in places

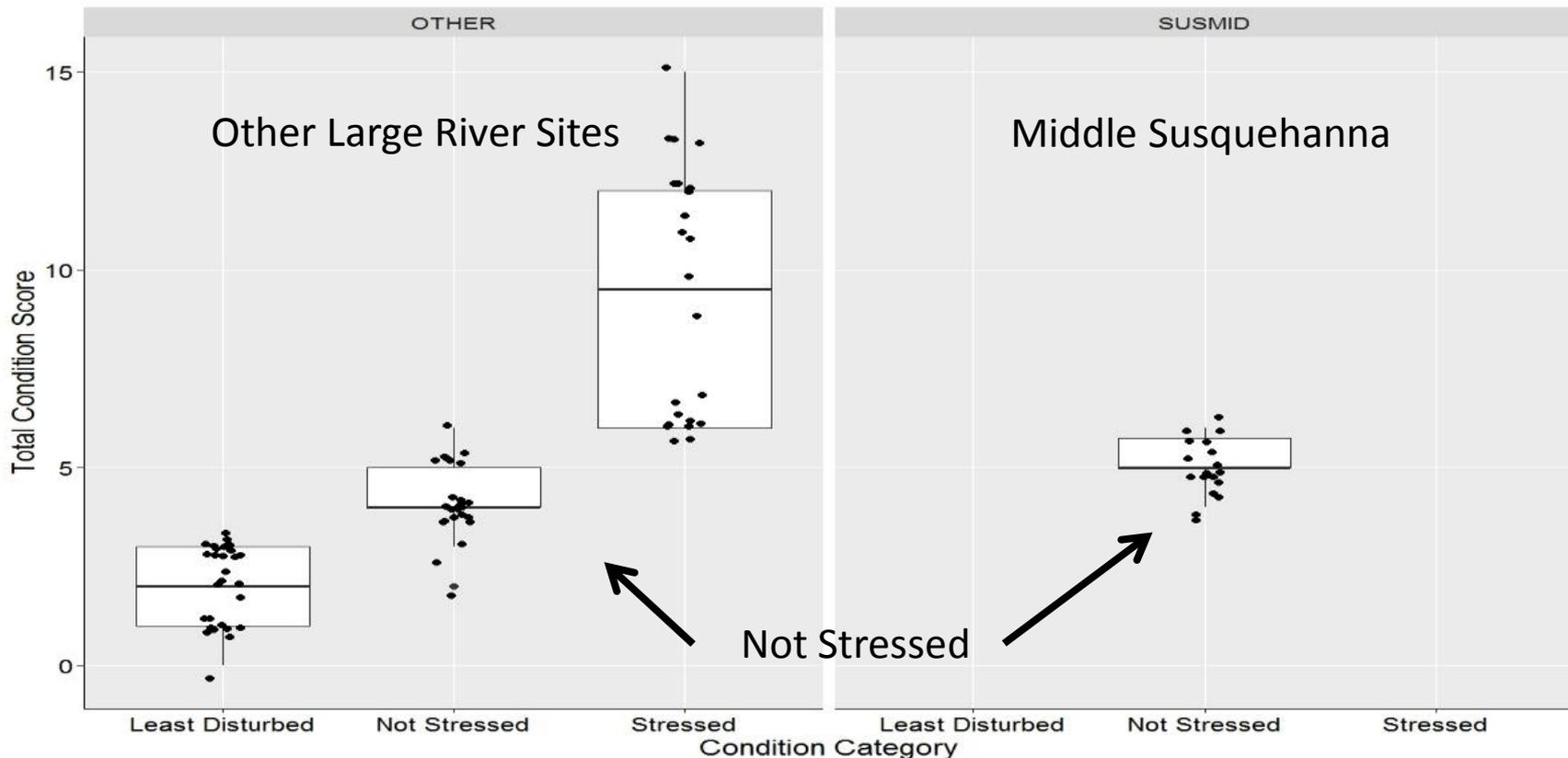
Large River Biological Assessment Protocol

Macroinvertebrates

- DEP has completed its draft of the sampling methods
- Will complete draft of the assessment method in the first half of 2017
- The new assessment method will be made available for public comment in advance of the 2018 Integrated Report
- The new methods should be completed in time to make accurate aquatic life use assessments in the Susquehanna River as part of the next Integrated Report

Large River Biological Assessment Protocol

- Part of the process is using chemistry and instream habitat to categorize sites as least disturbed, not stressed, and stressed.
- Based on these abiotic factors the Middle Susquehanna falls mainly in the not stressed category.



Susquehanna River Core Stations

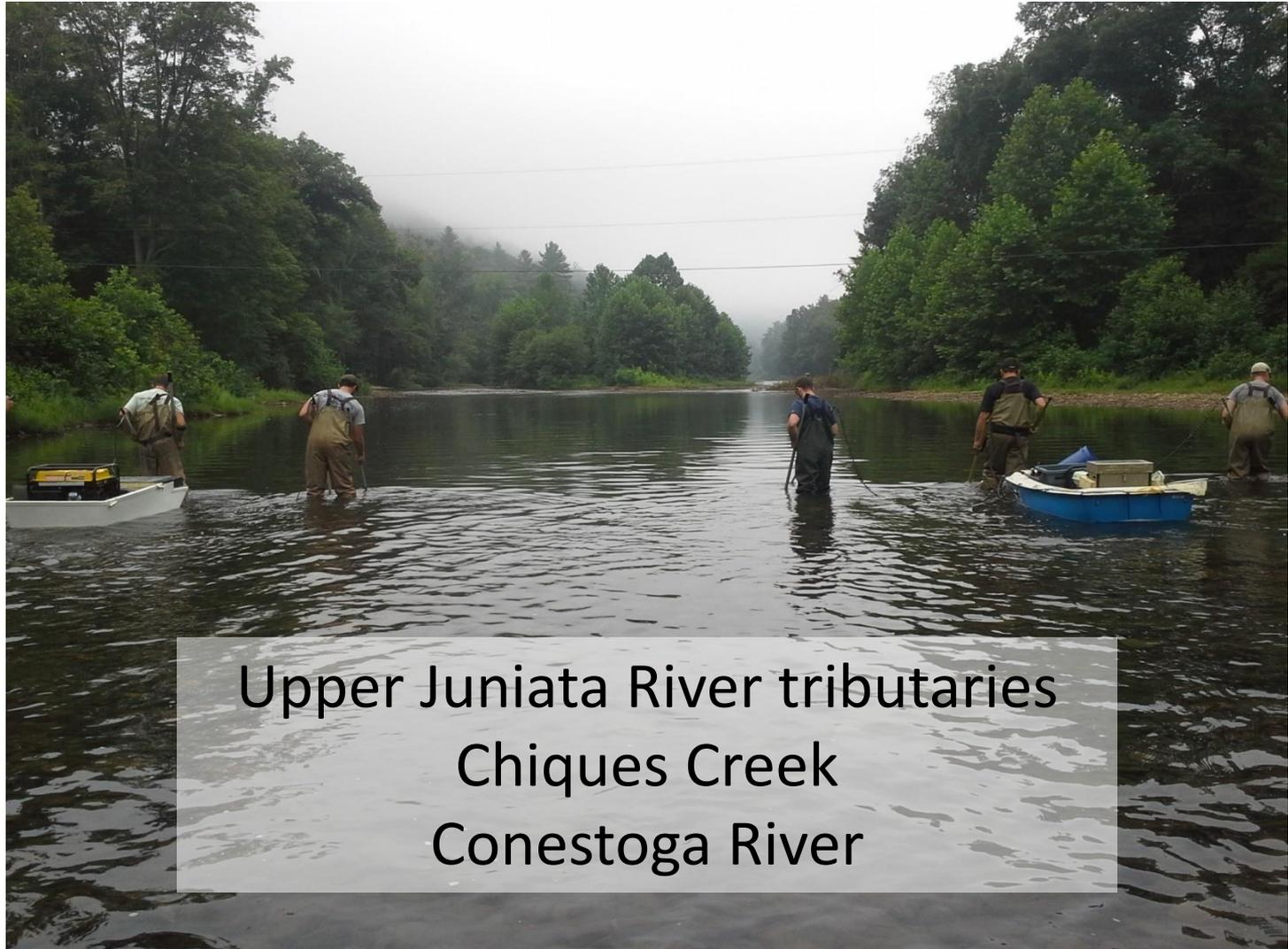
In 2016, DEP is continuing to maintain core main stem river monitoring locations:

- I. Susquehanna River @ Marietta
- II. Susquehanna River @ Rockville/Harrisburg
- III. Susquehanna River @ Danville
- IV. West Branch Susquehanna River at Milton/Lewisburg
- V. Juniata River @ Newport
- VI. Juniata River @ Newton-Hamilton

Along with other “reduced effort” main stem river monitoring locations:

- I. Susquehanna River @ Browns Island
- II. Susquehanna River @ Clemson Island
- III. Susquehanna River @ Sunbury
- IV. Juniata River @ Lewistown

Tributary Subbasin Targets



Upper Juniata River tributaries
Chiques Creek
Conestoga River

Throughout 2016:

Maintain:

- Continuous instream monitoring (CIM) effort at core main stem and tributary targets.
- Passive samplers targeting EDCs and herbicides in the spring and fall.
- Current pesticide/herbicide stormwater sampling effort with additional samples at select sites to characterize temporal variability.



Throughout 2016:

- Fund the processing of a subset of fish contaminant and fish health samples collected from 2013 & 2014 that would provide beneficial data for an EDC cause assessment.
- Continue to support pathogen, parasite and fish immunology work.
- Focus additional effort on development of a fish community assessment method for both wadeable and nonwadeable surface waters.



Throughout 2016:

- Maintain the benthic macroinvertebrate effort as part of routine sampling and assessment activities and focus assessment development effort for semi-wadeable surface waters.
- Focus additional effort on development of periphyton / algal community assessment development effort.



Throughout 2016:

- Sediment sampling in the spring and fall targeting EDCs and Herbicides.
- Continue to collect and preserve samples for potential future thiamine or thiaminase analyses as part of routine surveys.



Conclusions

- Evaluation of the conventional water quality data available demonstrates attainment of numeric water quality criteria in the River study areas.
- Emerging contaminants are at higher concentrations in tributaries than in the Susquehanna River mainstem where the highest levels of diseased YOY bass are observed.

Conclusions

- While emerging contaminants have been found, it is unknown if and at what concentrations these contaminants might result in disease due to immunosuppression.
- Preliminary qualitative and semi-quantitative analysis of macroinvertebrate and fish community data do not suggest there are major issues occurring to aquatic life. However, more rigorous analyses are needed to correctly assess the aquatic life and they are currently under development.

Final Points

- DEP has dedicated an unprecedented amount of time and staff into studying the river.
- DEP scientists continuously analyze the data as it becomes available and adjust the focus of current and future surveys and develop new testing methodologies as needed.
- New technology puts DEP at forefront of scientific research

Final Points

- DEP continues to identify problem areas in the Susquehanna River
- DEP still working to determine cause of smallmouth bass mortality
- DEP focus now shifts to pollution from Susquehanna tributaries
- Since the studies began in 2012 assessments were completed on 21 tributaries to the River and 11 have at least a portion of the basin listed as impaired.

Final Points

- Water quality in the Susquehanna has improved, thanks to efforts upstream
- While Smallmouth bass mortality still being researched, population is improving
- Susquehanna capable of supporting healthy populations of fish and insects
- Also capable of supporting populations of invasive species
- Need to determine the cause of Smallmouth bass mortality before a restoration plan can be put into effect

▶ Healthy Young of Year Smallmouth Bass

Major goal of the Susquehanna River studies is to find the reasons behind the smallmouth bass decline



DEP Mission

“To protect Pennsylvania’s air, land and water from pollution and to provide for the health and safety of its citizens through a cleaner environment. We will work as partners with individuals, organizations, governments, and businesses to prevent pollution and restore our natural resources.”



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Questions?

(For credentialed media only)

Please type your question into the chat window and include your name and affiliation.