

# PAHS are Rarely Causes of Impairment in U.S. Clean Water Act Section 303(D) Reports

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## Abstract

- The US Clean Water Act (CWA) became law in 1972. Every two years, states and territories must submit information on the attainment of water quality standards in their surface waters (rivers, streams, lakes, bays and other marine, etc.) and a list of impaired waters that may require development of enforceable controls to address each cause of impairment — the goal being increasing attainment of water quality goals. Many of the 56 reporting entities evaluate PAHs as a potential cause of impairment on the basis of analysis of water and sediment samples.
- Impaired water reports are used to identify point sources of pollution that require specific action. The reports also provide a nationwide picture of non-point source (NPS) pollution. These reports are revisited every two years and provide a basis for evaluating the effectiveness of NPS control measures.
- Data mined from recent CWA attainment (305(b)) and impairment (303(d)) reports from the 50 states demonstrate that PAHs are infrequently identified as either point or non-point sources of impairment. In several of the rare cases in which PAHs is identified as a cause of impairment, the source appears to be either atmospheric deposition or decaying organic matter in anoxic wetlands environments.

## QUESTION: PAHs are ubiquitous, but are elevated concentrations also ubiquitous?

- PAHs are naturally ubiquitous
  - Astronomers estimate ~20% of carbon in the universe is in the form of PAHs
- In the terrestrial environment:
  - Biogenic & Petrogenic
    - Decaying organic matter and its fossil end products – oil & gas & coal
  - Pyrogenic – incomplete combustion of organic matter
    - Forest fires, fireplaces & wood stoves, compost heaps (biogenic/thermal), cooked food, roasted coffee beans, roasted chocolate beans....
    - Internal combustion engines, carbonization or gasification of coal, frictional heating of lubricants
- Environmental science focus on PAHs because of legacy issues
  - MGPs, Emissions from pre-controlled power plants, fuel spills & leaks
  - Vehicle exhaust, wood fires, association of PAHs with airborne particles

## Clean Water Act 305(b) & 303(d) Reports

- Every state is required every two years to report to EPA on the conditions of state waters
- EPA summarizes results in a Water Quality Assessment & TMDL data base (<http://www.epa.gov/waters/ir/index.html>)
  - Information presented in this poster was updated using the most recent data summarized on EPA's web site during week of October 20–27, 2014
- EPA: *Because of differences in state assessment methods, the information in this site should not be used to compare water quality conditions between states or to determine water quality trends*
- BUT...the data can be used to answer a “yes/no” question:
  - Have PAHs been identified as a “Cause of Impairment” of US water bodies?
  - If yes, how often?



## Rivers & Streams

Number of States Included in EPA Online WQA & TMDL Site = 50

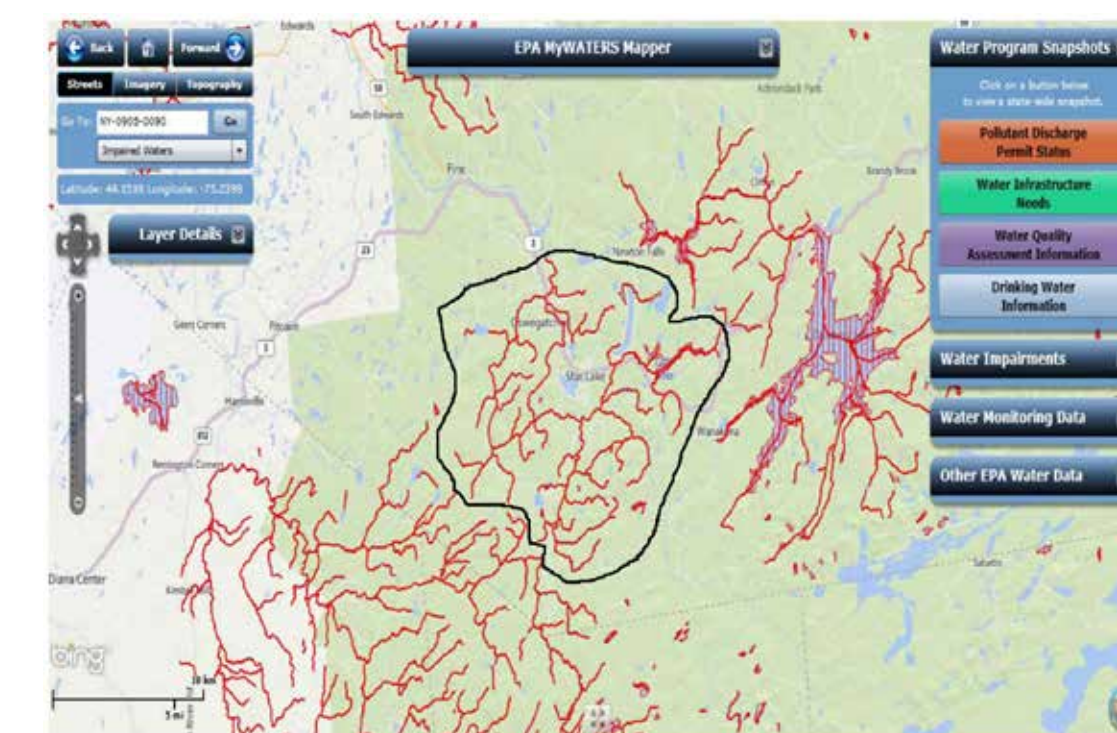
Number of States Reporting PAHs as a Cause of Impairment (CoI) = 14

	Report Year	% Assessed Miles w/ PAH as Col
Alabama	2012	0.4
California	2010	0.007
Indiana	2010	0.1
Louisiana	2012	0.4
Massachusetts	2012	0.007
Montana	2014	0.1
New Hampshire	2010	0.001
New Jersey	2010	2.2
New York	2012	0.4
Ohio	2010	0.3
Oregon	2006	0.2
Pennsylvania	2006	0.07
Tennessee	2012	0.06
Virginia	2010	0.04

## Two PAH Impaired Rivers/Streams from NY State

Left: Little River & Tributaries, Adirondack State Park (2010 Report)

Right: Popolopen Creek & Tributaries, Harriman State Park & Long Mountain area (2012 Report)



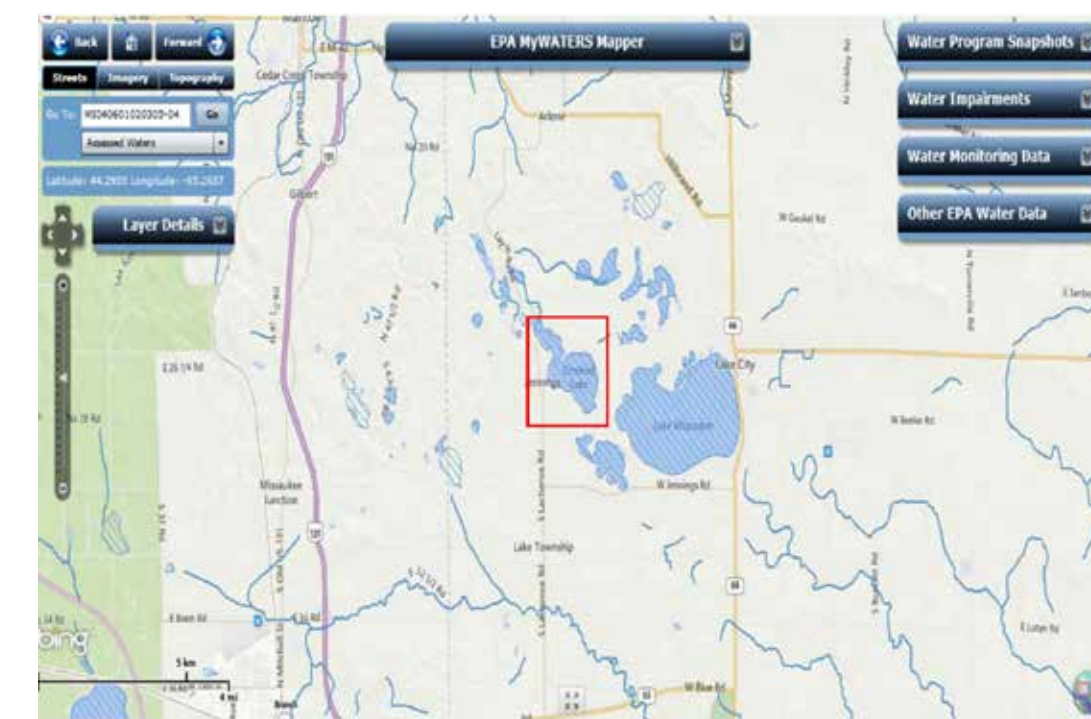
## Lakes, Reservoirs & Ponds

No. States Included in EPA Online WQA & TMDL Site = 49

No. States Reporting PAHs as a Cause of Impairment = 5

	Report Year	% Assessed Acres w/ PAH as Col
Massachusetts	2012	0.1
Michigan	2010	0.06
New Hampshire	2010	0.03
New Jersey	2010	0.8
Virginia	2010	0.07

### Crooked Lake Michigan



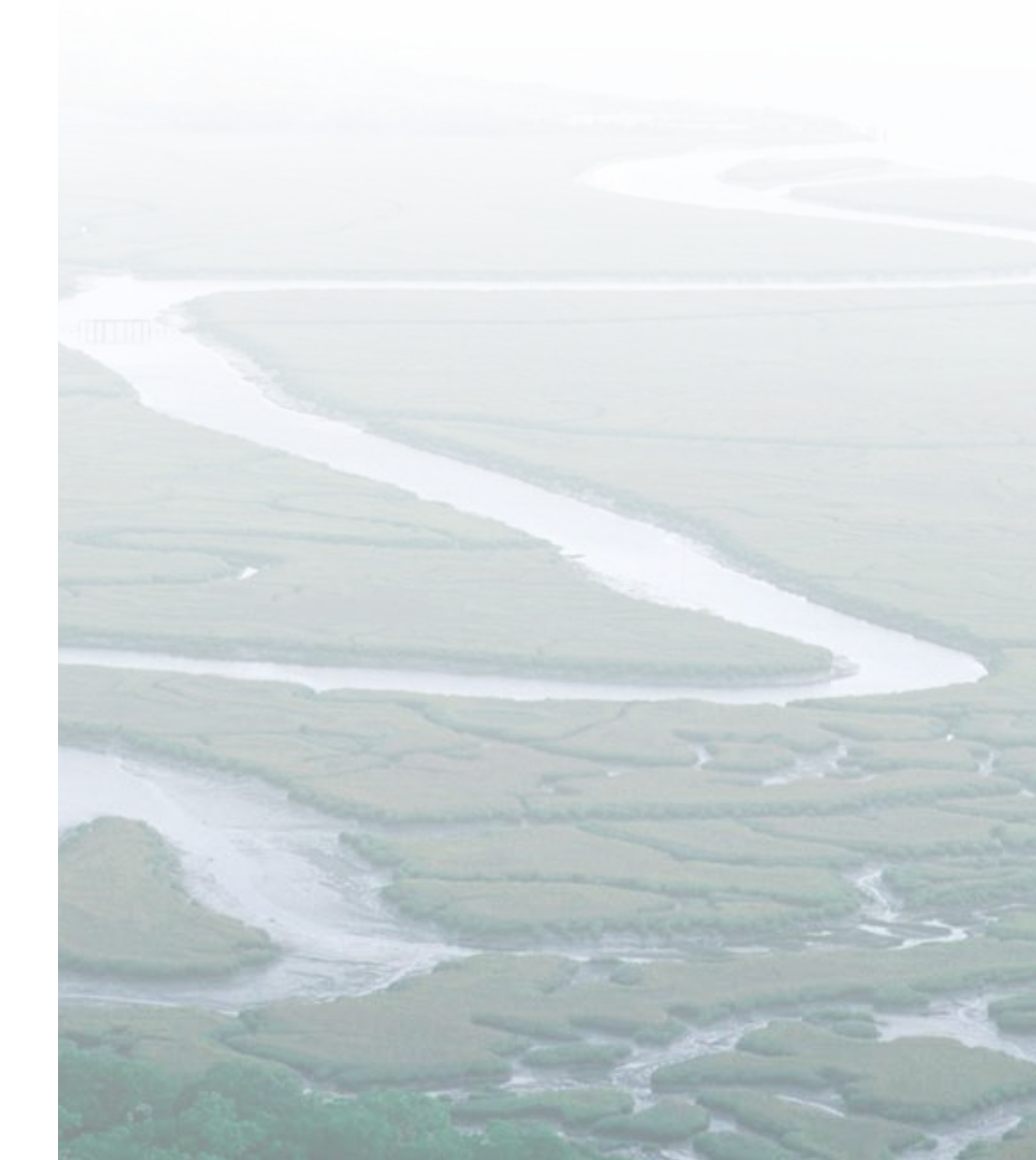
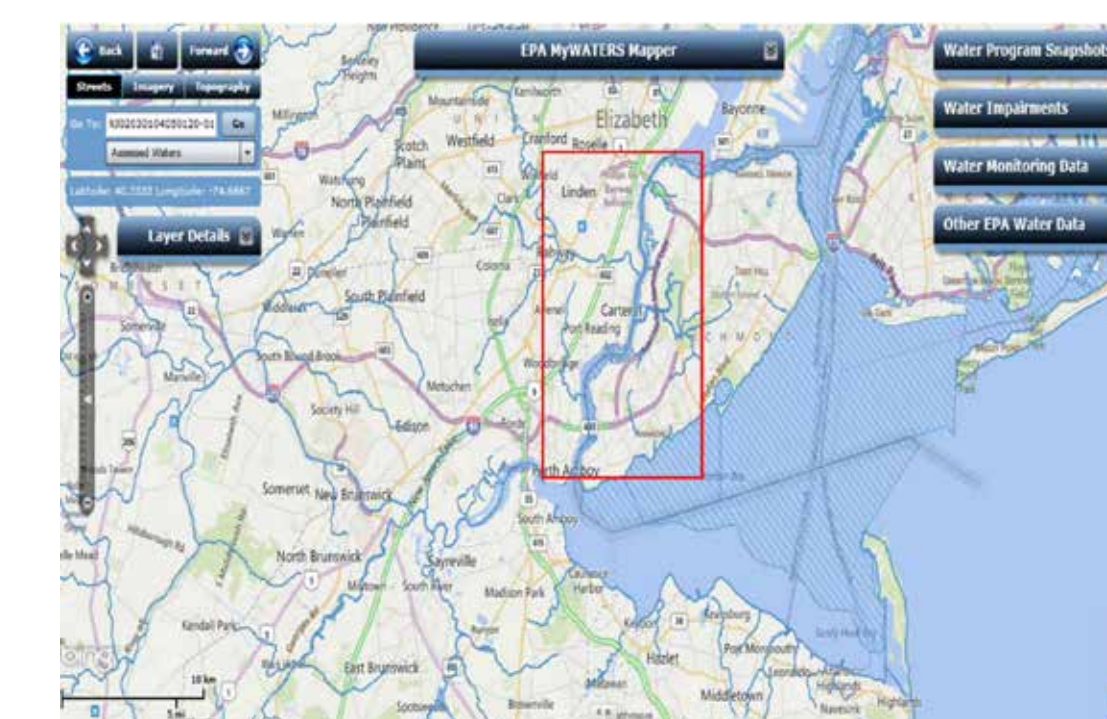
## Bays & Estuaries

No. States Included in EPA Online WQA & TMDL Site = 22

No. States Reporting PAHs as a Cause of Impairment = 5

	Report Year	% Assessed Sq Miles w/ PAH as Col
California	2010	0.8
Connecticut	2012	0.3
New Hampshire	2010	1.1
New Jersey	2010	8.7
Virginia	2010	0.03

### Arthur Kill



## Other Reporting Categories

**Wetlands**  
No. States Included in EPA Online WQA & TMDL Site = 9  
No. States Reporting PAHs as a Cause of Impairment = 1\*  
\* 0.02% of 219 acres assessed in California's 2010 report

**Coastal Shoreline**  
No. States Included in EPA Online WQA & TMDL Site = 12  
No. States Reporting PAHs as a Cause of Impairment = 0

**Ocean & Near Coastal Water**  
No. States Included in EPA Online WQA & TMDL Site = 5  
No. States Reporting PAHs as a Cause of Impairment = 1\*  
\* 2.6% of 376 square miles assessed in Washington's 2008 report

**Great Lakes Shoreline**  
No. States Included in EPA Online WQA & TMDL Site = 6  
No. States Reporting PAHs as a Cause of Impairment = 0

**Great Lakes Connecting Channel**  
No. States Included in EPA Online WQA & TMDL Site = 1  
No. States Reporting PAHs as a Cause of Impairment = 0

**Great Lakes Open Water**  
No. States Included in EPA Online WQA & TMDL Site = 3  
No. States Reporting PAHs as a Cause of Impairment = 0

**Inland Lakes Shoreline**  
No. States Included in EPA Online WQA & TMDL Site = 1  
No. States Reporting PAHs as a Cause of Impairment = 0

## What does this tell us about the distribution of PAHs?

- Outside of legacy or spill/leak locations, PAHs rarely present at concentrations sufficient to be a “cause of impairment.”
- Some “impaired” locations are not near any geologic, hydrologic (i.e., sediment transport) or anthropogenic source of PAHs
  - Atmospheric deposition
  - Biogenic processes
- Screen for PAHs used by most states is PEC
  - EPA has long recognized that PAH concentration does not usually correlate with toxicity. PECs usually overestimate PAH sediment toxicity
  - EPA 2003 guidance on developing Equilibrium Partitioning Sediment Benchmarks (ESBs) & subsequent work by many address methods for estimating PAH concentrations that could be associated with impairment
  - A few states incorporate PAH aquatic toxicity testing into 303(d) reports