Protecting Human Health & Aquatic Life from Toxic PAH Pollution in Stormwater

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Your environmental voice since 1970

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Introduction to PAHs

- PAHs are a class of persistent organic pollutants
- Many PAHs are toxic, carcinogenic, or mutagenic to aquatic life and humans.
  - Exposure related to birth defects and developmental problems.
- 16 PAHs are on USEPA's priority pollutant list
- PAH contamination has been increasing
- Contamination is costly to remediate

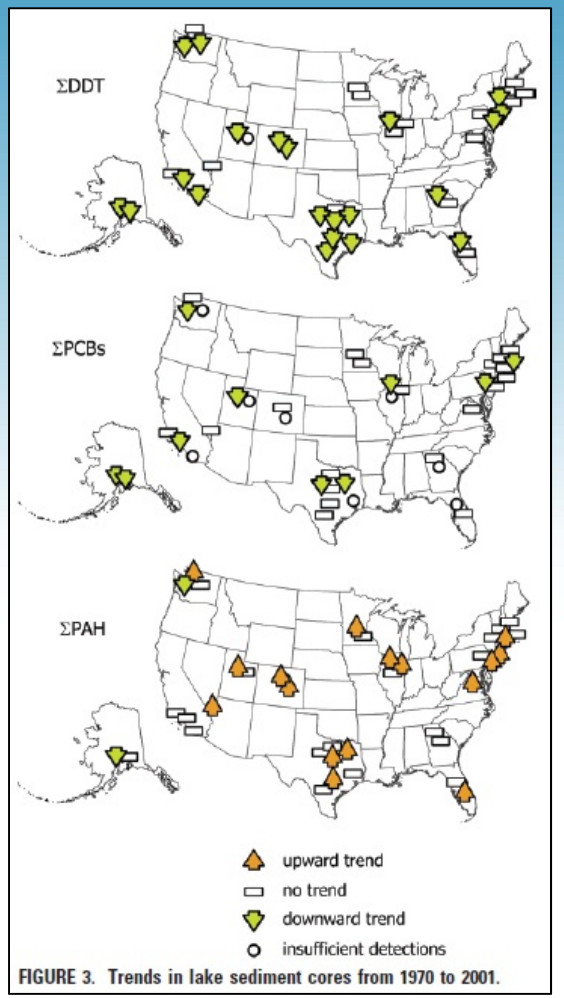

FIGURE 3. Trends in lake sediment cores from 1970 to 2001.

Van Metre & Mahler 2005

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PAH Sources

PAH Concentrations (mg/kg) in Urban Sources

Fresh asphalt: 1.5
Weathered asphalt: 3
Fresh motor oil: 7
Brake particles: 16
Road dust: 24
Tire particles: 86
Diesel emissions: 102
Gasoline emissions: 370
Used motor oil: 440

Pavement Sealants

Asphalt based: 50

Coal-tar based: **70,000**

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Types of Sealants

- Coal-tar based: 50,000-100,000 mg/kg PAHs
- Asphalt-emulsion: 50 mg/kg PAHs
- Acrylic/Latex: PAH-free

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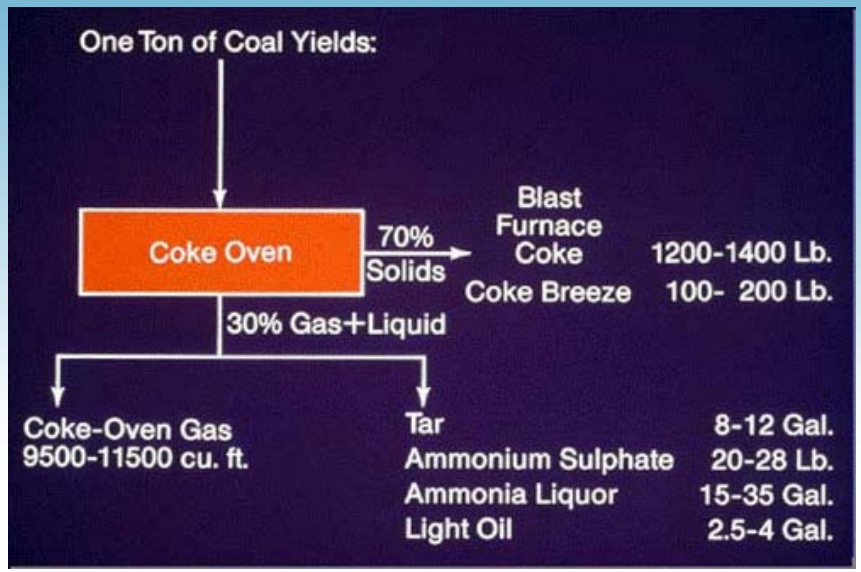
PAH Source: Coal Tar Sealant

What is coal tar?

- By-product of coking coal
- 50% PAHs by weight
- Carcinogenic
- Exempt from RCRA requirements to encourage its "beneficial" use.
  - Including use in pavement sealants



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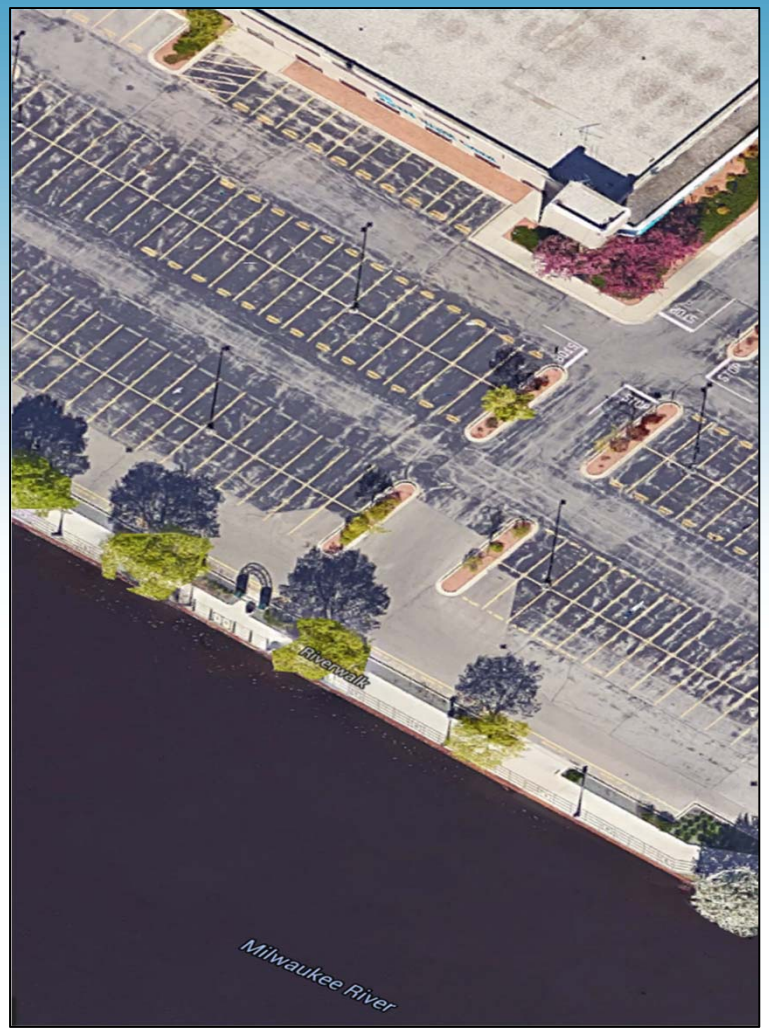
How do sealants pollute?

- Worn off by tires, snow plows, and general weathering.
- Particles wash into storm drains and waterways or tracked or blown into buildings
- Reapplication every few years ensures constant source of PAHs



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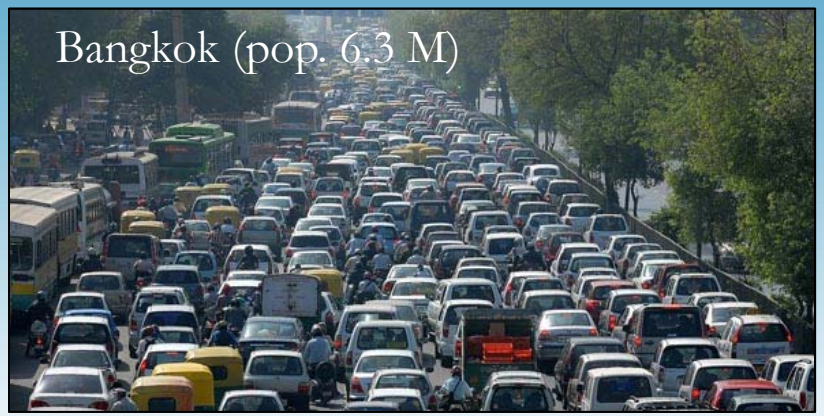
PAH concentrations in urban river sediments around the world
(in mg/kg, sums of 16 PAHs)



median: **1.6**
max: **8.4**
(n=8; Boonyatumanond et al 2006)

median: **2.2**
max: **8.7**
(n=20; Shen et al 2009)

median: **36**
max: **208**
(n=40; Baldwin et al, 2017)

Slide credit: Austin Baldwin, USGS

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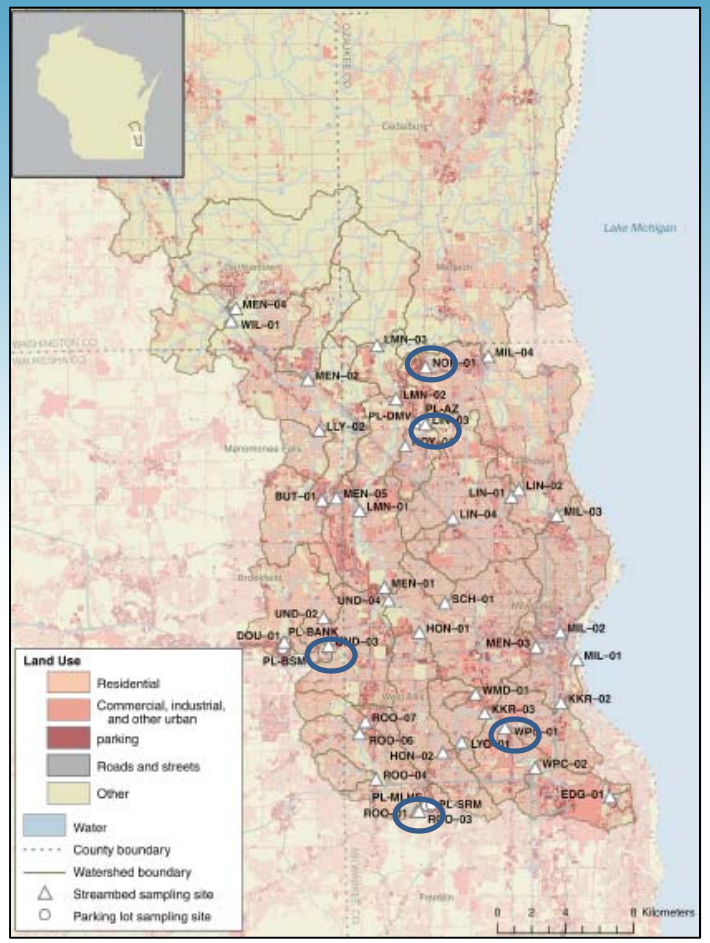
Wisconsin Information

Milwaukee area:

- 78% of samples exceeded probable effects threshold
- 77% of PAHs come from coal-tar-based pavement sealants

Smaller Cities:

- PAH concentrations exceeded threshold effects concentration in 2 of 3 cities
- Coal-tar-based sealants identified as major source in all three cities.



Baldwin et al. 2017

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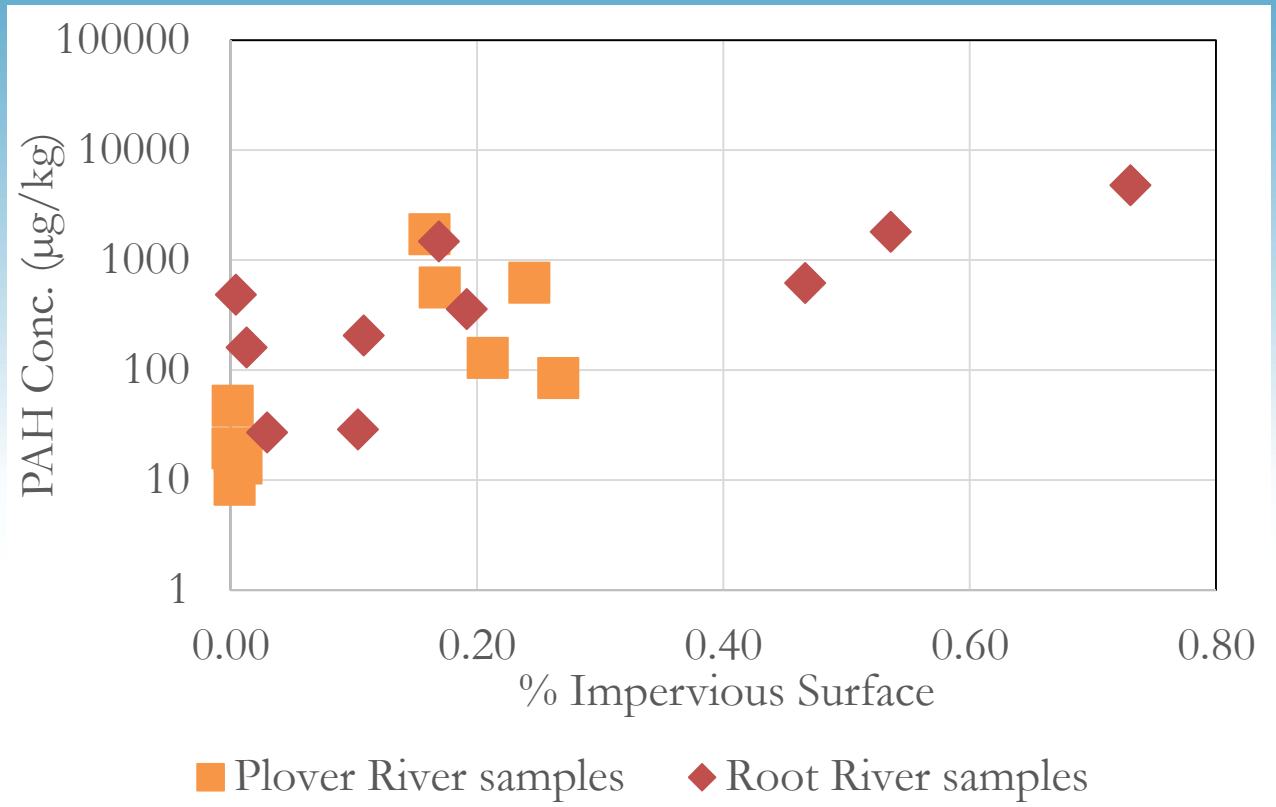
Wisconsin Information



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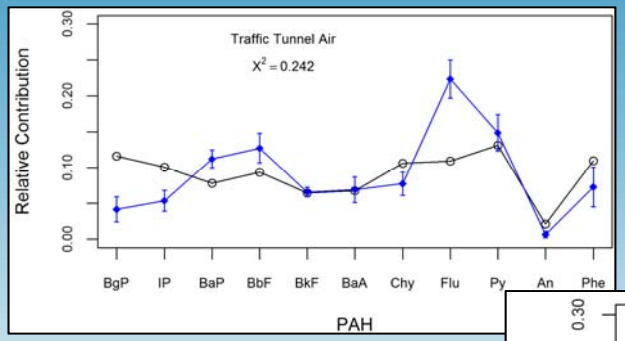
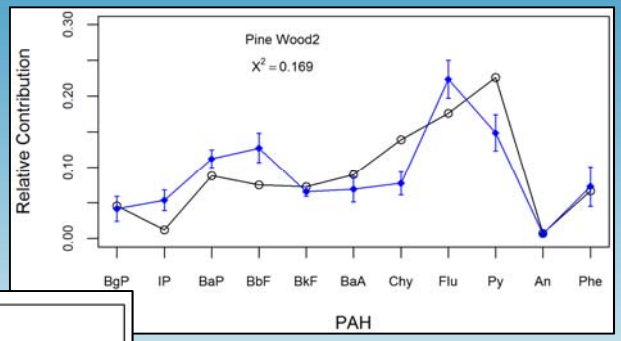
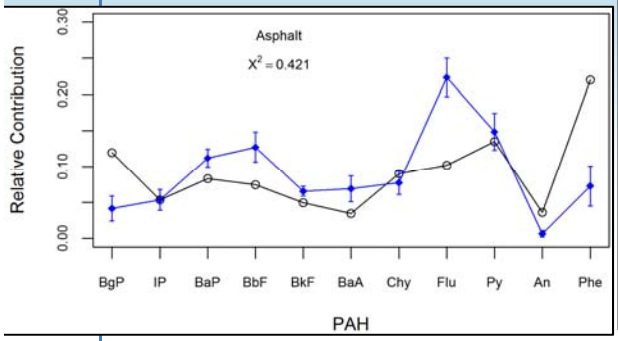
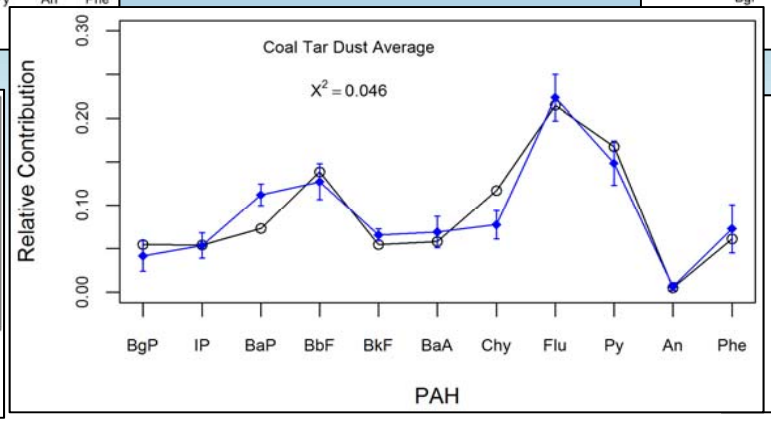
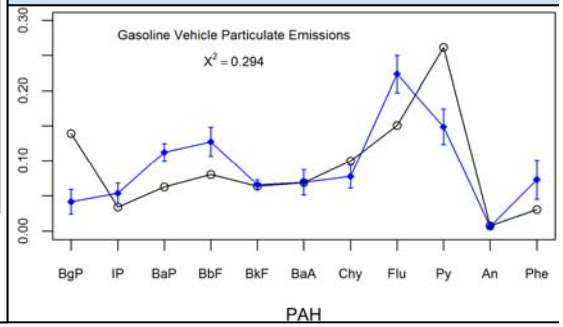
Wisconsin Information

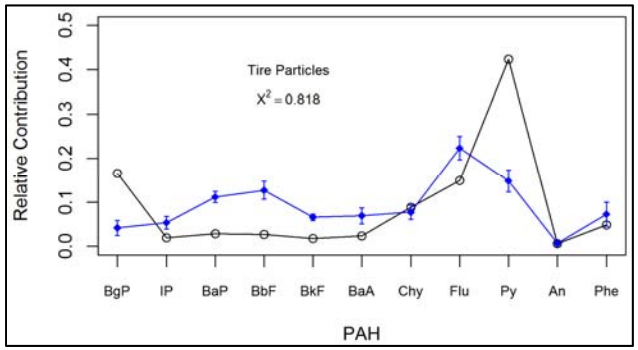


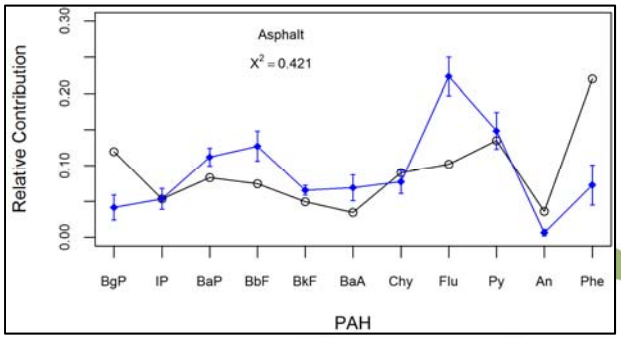












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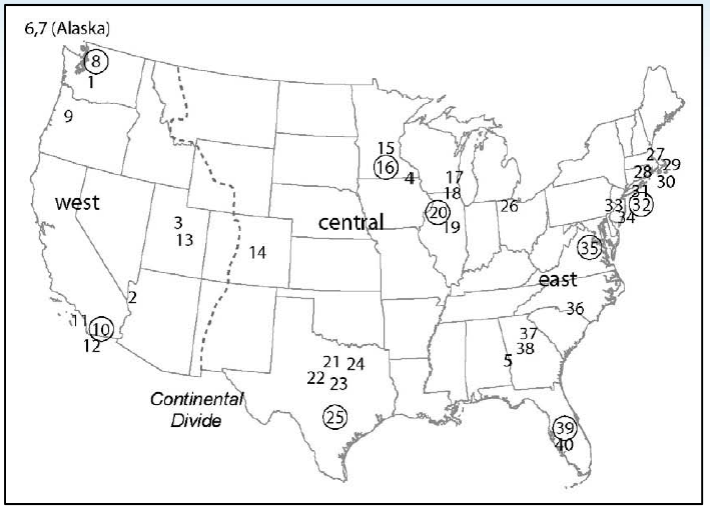
Other Studies

Location	Contribution
40 US Lakes	~50%
Lake Como, TX Watershed	>70%
Minneapolis/St. Paul, MN	67%
Springfield, MO	>80%

Also:

- South-central PA
- Austin, TX
- Toronto, Ontario, Canada



Van Metre et al. 2010

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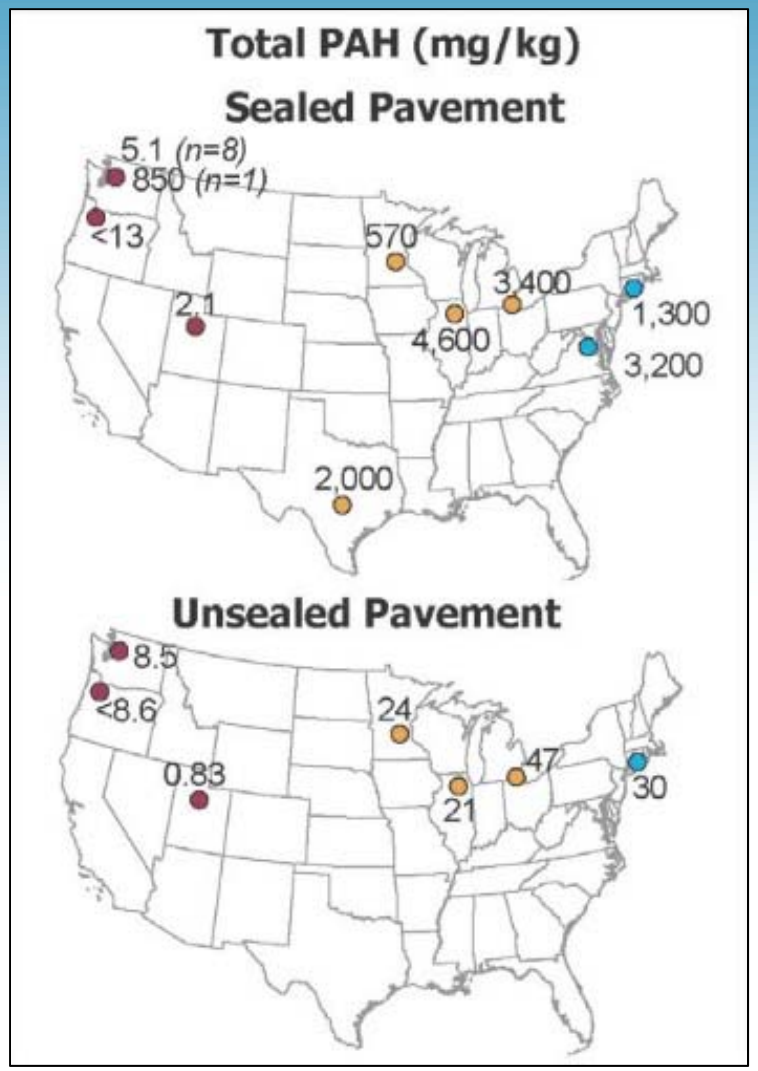
Other Studies



Van Metre et al. 2009

- Unsealed parking lots subject to same "urban background" PAH sources.

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US EPA

- Found coal-tar-sealed surfaces released 100-1,000 times more PAHs than asphalt-sealed or unsealed surfaces.
- "Due to the expense of retrofitting control measures into existing stormwater sewage and discharge systems, many municipalities may opt for banning coal tar-based sealants due to PAH content and related chronic toxicity effects on the environment."
- Starting in 2020, industrial facilities using coal-tar sealants will no longer be eligible for coverage under multi-sector general permits for stormwater discharges.

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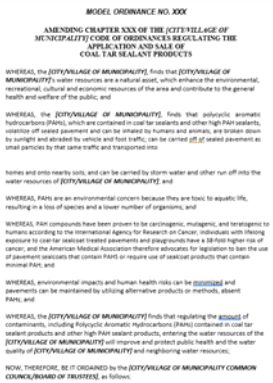
Calls to Action

<u>Great Lakes and St. Lawrence River Cities Initiative</u>: " BE IT FURTHER RESOLVED, that the Cities Initiative encourages its member municipalities…consider implementing a local ordinance or ban on the use of coal tar sealants"



MODEL ORDINANCE NO. XXX

AMENDING CHAPTER XXX OF THE *[CITY/VILLAGE OF MUNICIPALITY]* CODE OF ORDINANCES REGULATING THE APPLICATION AND SALE OF COAL TAR SEALANT PRODUCTS

WHEREAS, the *[CITY/VILLAGE OF MUNICIPALITY]*, finds that *[CITY/VILLAGE OF MUNICIPALITY]*'s water resources are a natural asset, which enhance the environmental, recreational, cultural and economic resources of the area and contribute to the general health and welfare of the public; and

WHEREAS, the *[CITY/VILLAGE OF MUNICIPALITY]*, finds that polycyclic aromatic hydrocarbons (PAHs), which are contained in coal tar sealants and other high PAH sealants, volatilize off sealed pavement and can be inhaled by humans and animals, are broken down by sunlight and abraded by vehicle and foot traffic, can be carried off of sealed pavement as small particles by that same traffic and transported into

homes and onto nearby soils, and can be carried by storm water and other run off into the water resources of *[CITY/VILLAGE OF MUNICIPALITY]*; and

WHEREAS, PAHs are an environmental concern because they are toxic to aquatic life, resulting in a loss of species and a lower number of organisms; and

WHEREAS, PAH compounds have been proven to be carcinogenic, mutagenic, and teratogenic to humans according to the International Agency for Research on Cancer, individuals with lifelong exposure to coal-tar sealcoat treated pavements and playgrounds have a 38-fold higher risk of cancer; and the American Medical Association therefore advocates for legislation to ban the use of pavement sealcoats that contain PAHS or require use of sealcoat products that contain minimal PAH; and

WHEREAS, environmental impacts and human health risks can be minimized and pavements can be maintained by utilizing alternative products or methods, absent PAHs; and

WHEREAS, the *[CITY/VILLAGE OF MUNICIPALITY]* finds that regulating the amount of contaminants, including Polycyclic Aromatic Hydrocarbons (PAHs) contained in coal tar sealant products and other high PAH sealant products, entering the water resources of the *[CITY/VILLAGE OF MUNICIPALITY]* will improve and protect public health and the water quality of *[CITY/VILLAGE OF MUNICIPALITY]* and neighboring water resources;

NOW, THEREFORE, BE IT ORDAINED by the *[CITY/VILLAGE OF MUNICIPALITY COMMON COUNCIL/BOARD OF TRUSTEES]*, as follows:

March 2017 Milwaukee County ICC unanimously approves model ordinance banning sale and use of high-PAH pavement sealants in order to:

- protect local environment
- protect human health

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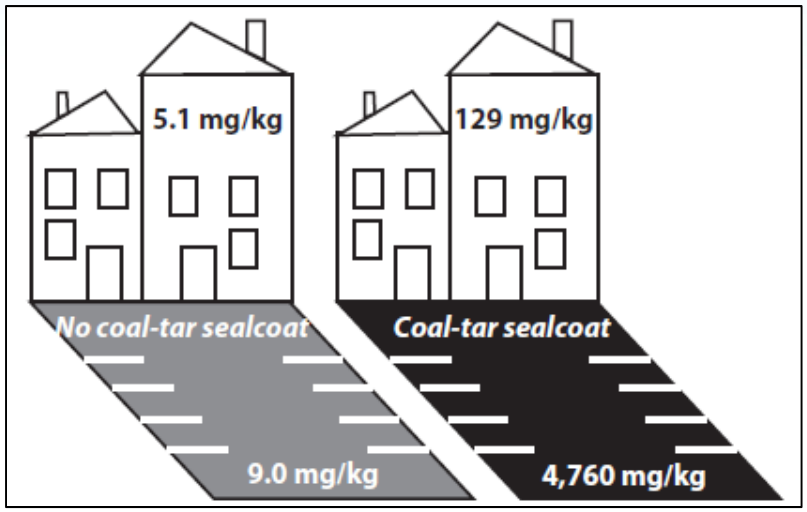
Public Health

American Medical Association: " RESOLVED, That our American Medical Association advocate for legislation to ban the use of pavement sealcoats that contain polycyclic aromatic hydrocarbons"

Children's Hospital: "PAHs create a significant concern for children's health and well-being. We believe the ordinance that was recommended by the unanimous vote of the Milwaukee County Intergovernmental Cooperation Council is an effective way to control PAH contamination."



Source: Mahler et al. 2010

Living next to a coal-tar-sealed parking lot as a child increases excess cancer risk by **14-fold**

- Williams et al. (2013) Cancer risk from incidental ingestion exposures to PAHs associated with coal-tar-sealed pavement. Env. Sci. Tech. 47: 1101-1109.

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Public Health

- Health Canada
- Physicians for Social Responsibility
- Chicago Department of Public Health
- Connecticut Department of Public Health
- Illinois State Medical Society
- Respiratory Health Association
- Illinois chapter of the American Academy of Pediatrics

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PAHs and the Environment

PAHs accumulate in soils and waterbody sediment

- Degrades benthic invertebrate communities
- Acute toxicity in fish and amphibians
- Developmental and reproductive effects in fish and amphibians
- Causes cancer, tumors and lesions in fish

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Stormwater Maintenance Costs

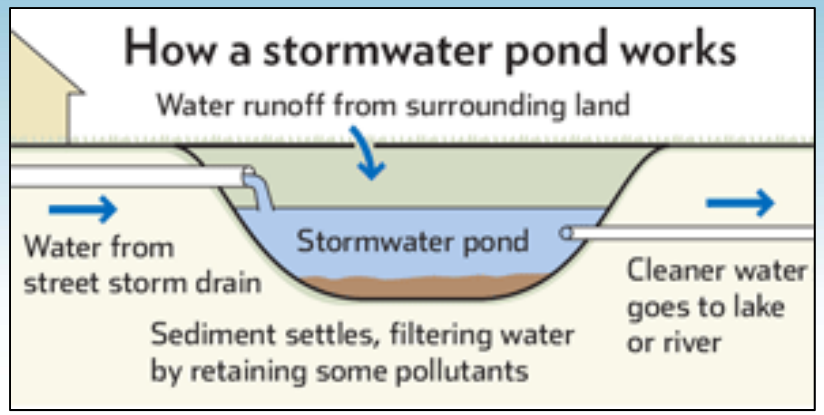

Image Source: Pioneer Press Graphics

- To remain functional, built-up sediment must be removed periodically.
- Sediment disposal can be expensive if it needs to be landfilled due to high PAH concentration
- Inver Grove Heights, MN, (pop. 34,000) estimates removal cost of $1.4 to 4 million.
- Minneapolis-St. Paul metropolitan area estimates cost of >$1 billion if just 10% of ponds require landfilling.

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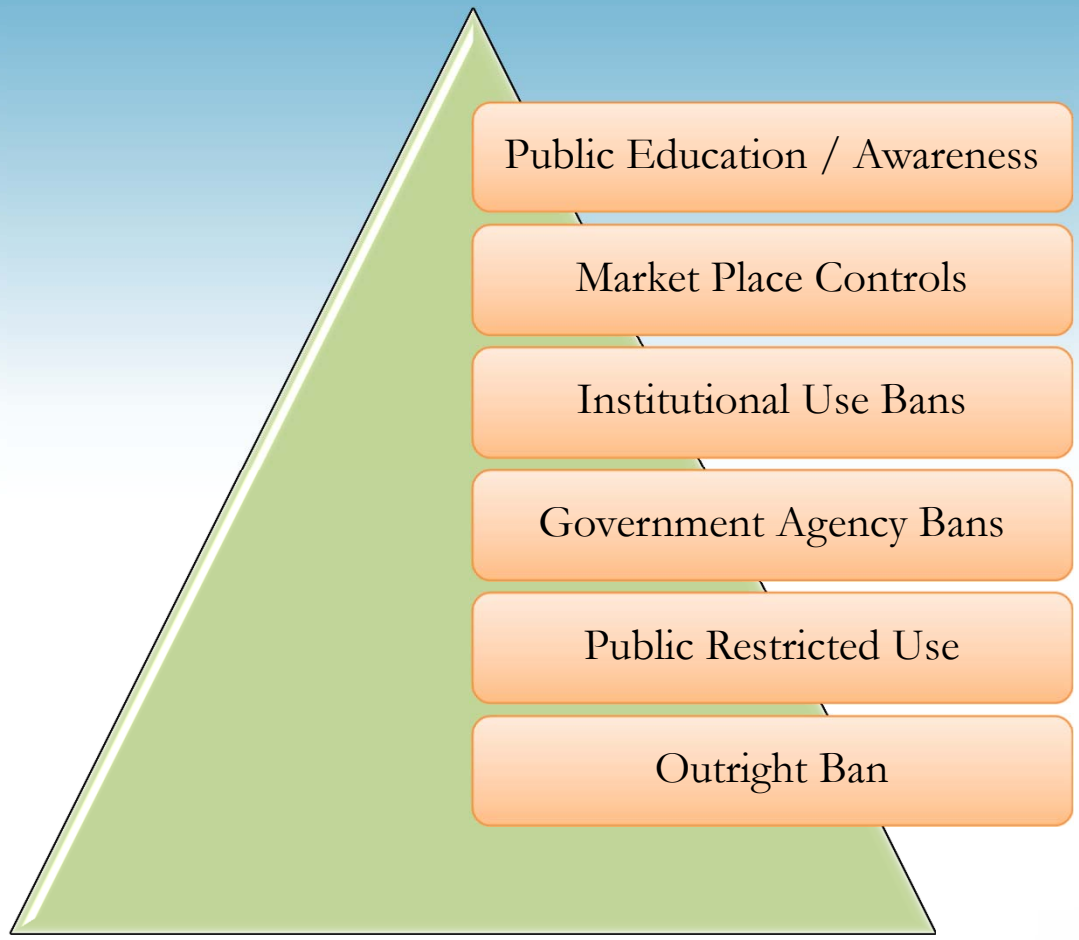
Action Options



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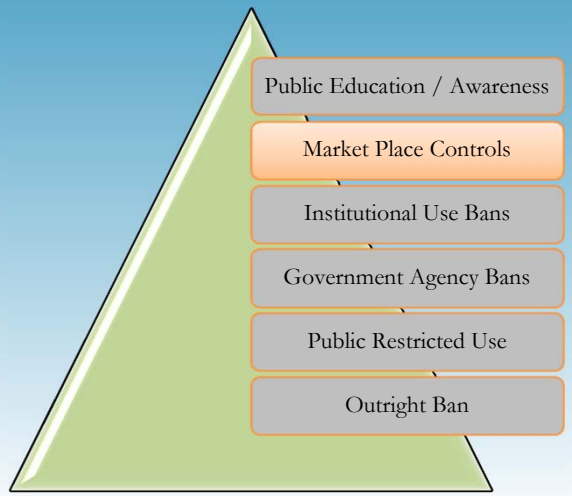
Action Options



Many retailers have stopped carrying coal-tar sealants

- **However, most sealing done by commercial contractors**

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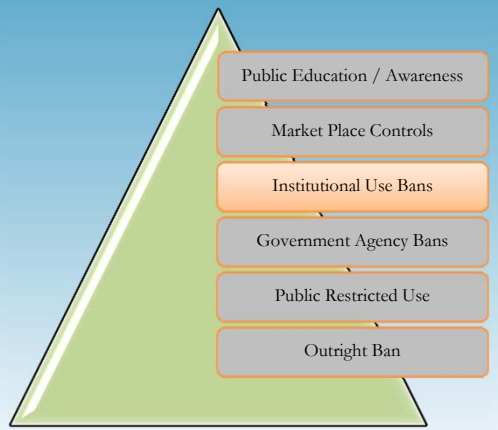
Action Options



Targets: institutions with large amounts of parking areas

- Schools
- Hospitals
- Commercial malls

MICHIGAN

MPS MILWAUKEE PUBLIC SCHOOLS

KALAMAZOO COLLEGE

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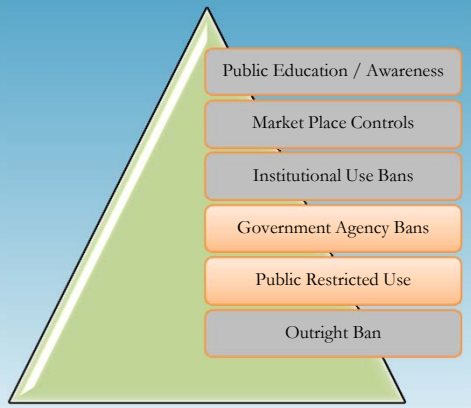
Action Options



- **No use on public or municipal properties**
- **Restrict how/where high-PAH sealants can be used**

- At least 16 communities specify low-PAH sealants on any municipal property
- Most DOTs (including Wisconsin) have stopped using
- No use on development affecting wetlands (Massachusetts)
- No use on surfaces draining to municipal storm sewer systems (Westwood, MA)
- More stringent precautions for coal-tar sealants (Boone, NC)

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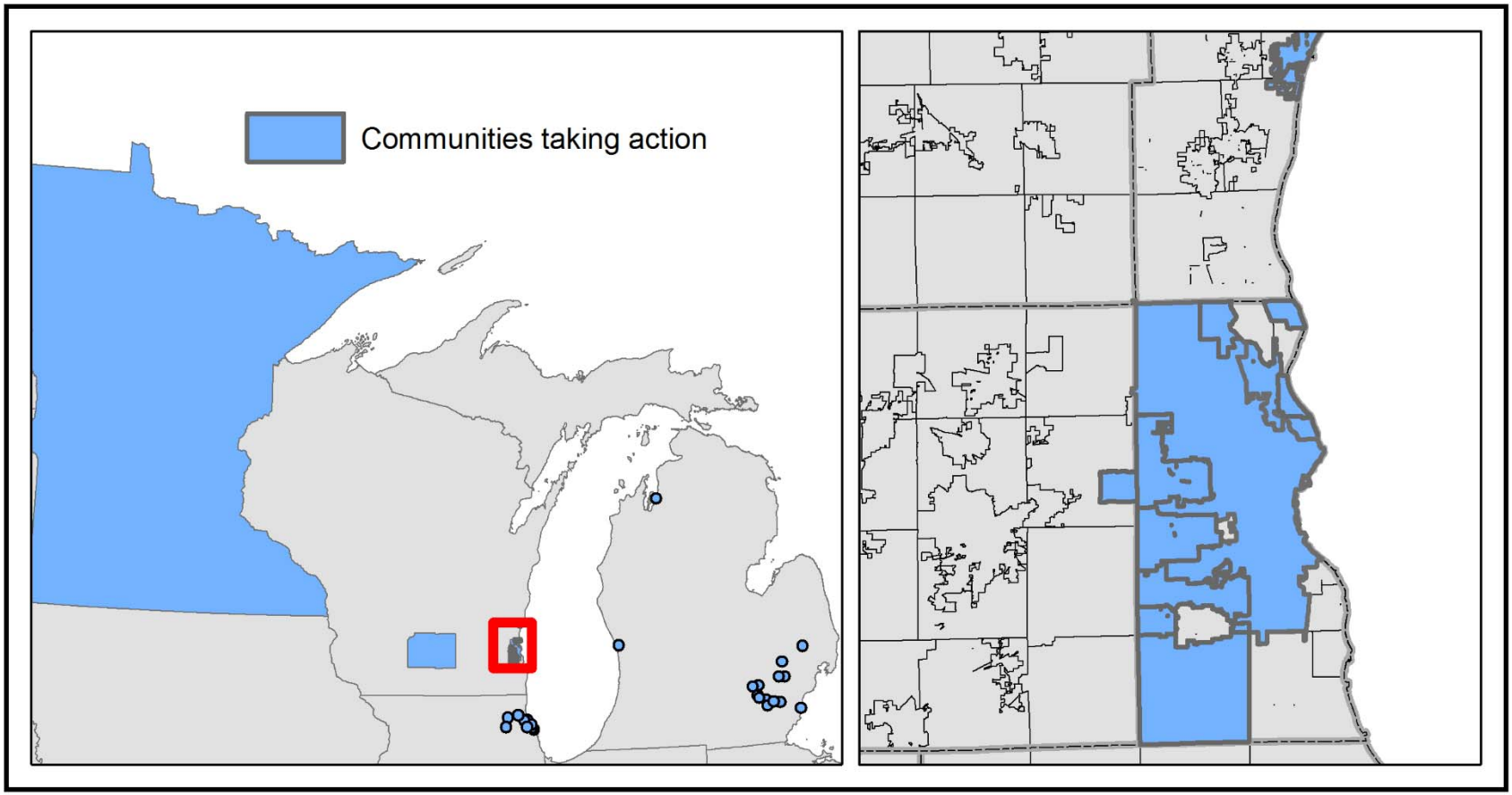
Who has enacted a ban?



+ dozens of others around the county

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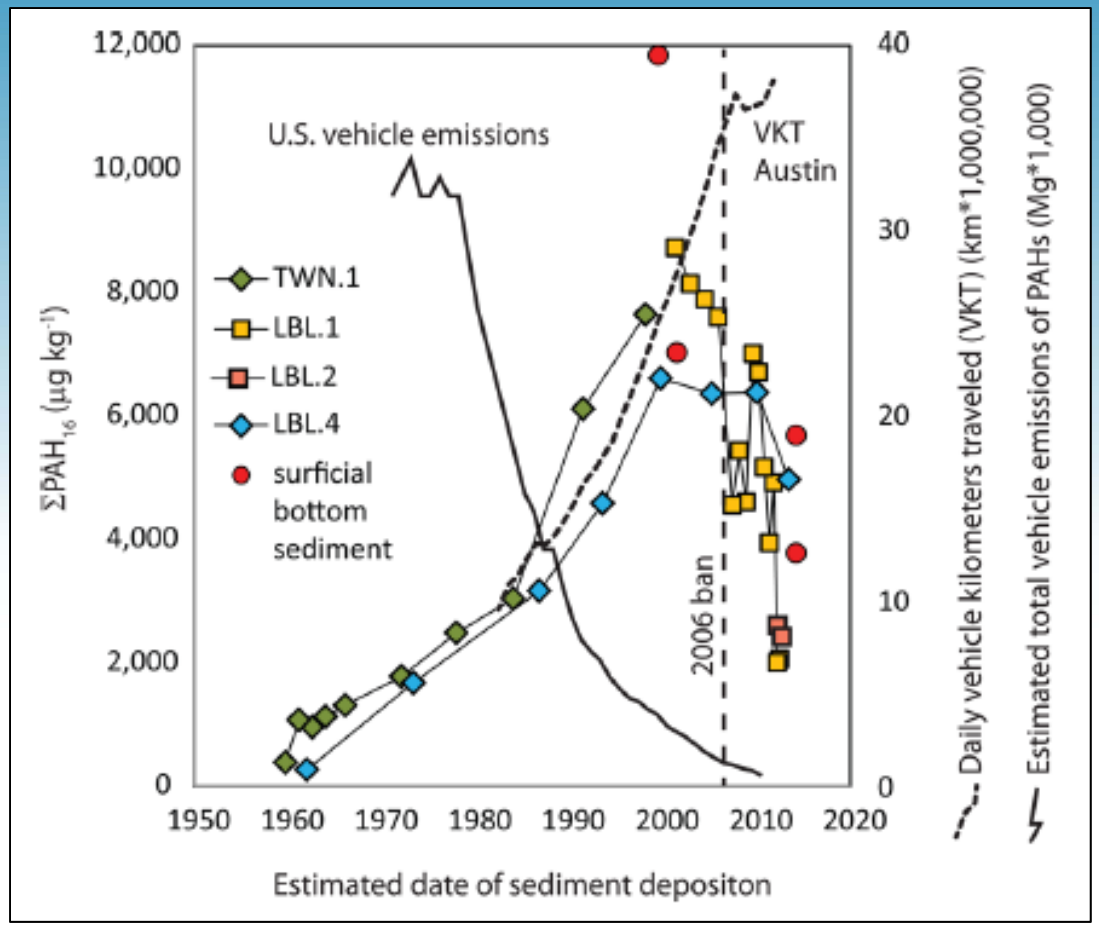
Bans are Effective



Source: Van Metre and Mahler (2014) PAH Concentrations in Lake Sediment Decline Following Ban on Coal-Tar-Based Pavement Sealants in Austin, TX. Env. Sci. Tech. 48: 7222-7228

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Enforcement Strategies

- Municipal staff check out project sites when out and about on normal business (most common)
- Annual registration systems for applicators (MI, IL communities)
- Annual testing quota (Washington, DC)

<u>Outreach and education are the critical elements--and Clean Wisconsin can help.</u>

Field Screen Test

Photo credit: Tom Ennis

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Summary

- Excessive PAHs in coal-tar sealants are known to be detrimental to the environment and human health.
- Studies find coal-tar sealants are a primary source of PAHs in areas where they are used.
- Arguments for policy action can be made on multiple grounds:
  - Human health
  - Environmental health
  - Economics
- Coal-tar sealants are a ***CONTROLLABLE*** source with ***REASONABLE*** alternatives available.

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We want to help!

- Our work directly with communities has been focused in the Milwaukee area / SE-WI.
- Have started expanding work up the Lake Michigan coast to cover the Lakeshore and the NE starting this summer.

We all love clean water. *Credit: Riveredge Nature Center*

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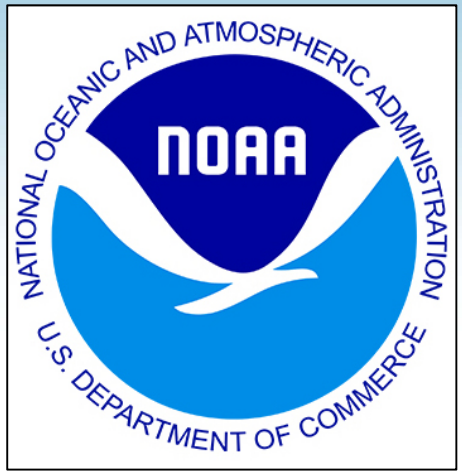
Acknowledgements

sweet water

WISCONSIN COASTAL MANAGEMENT PROGRAM



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