

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



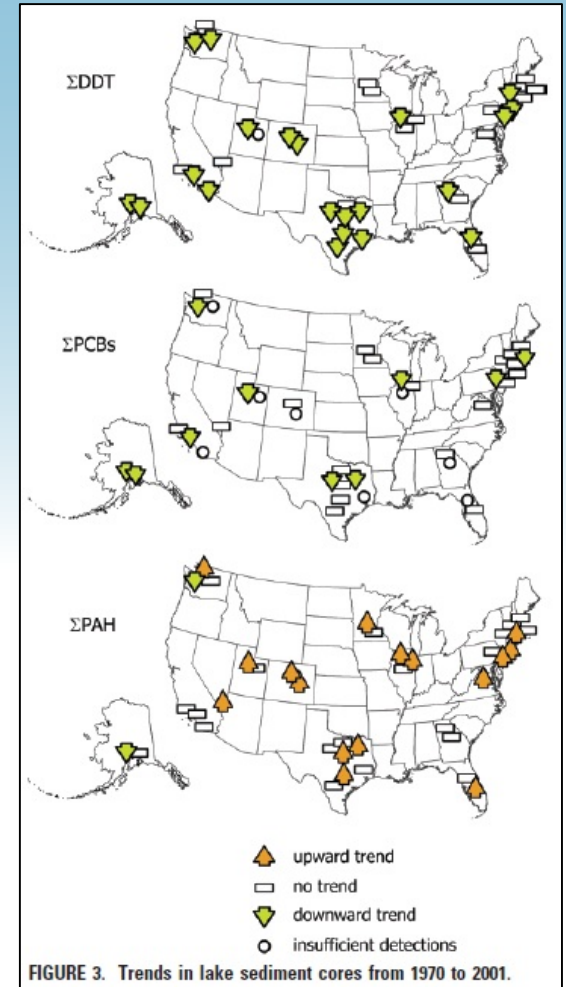
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Introduction to PAHs

- 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



Van Metre & Mahler 2005

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**



Types of Sealants

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

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)



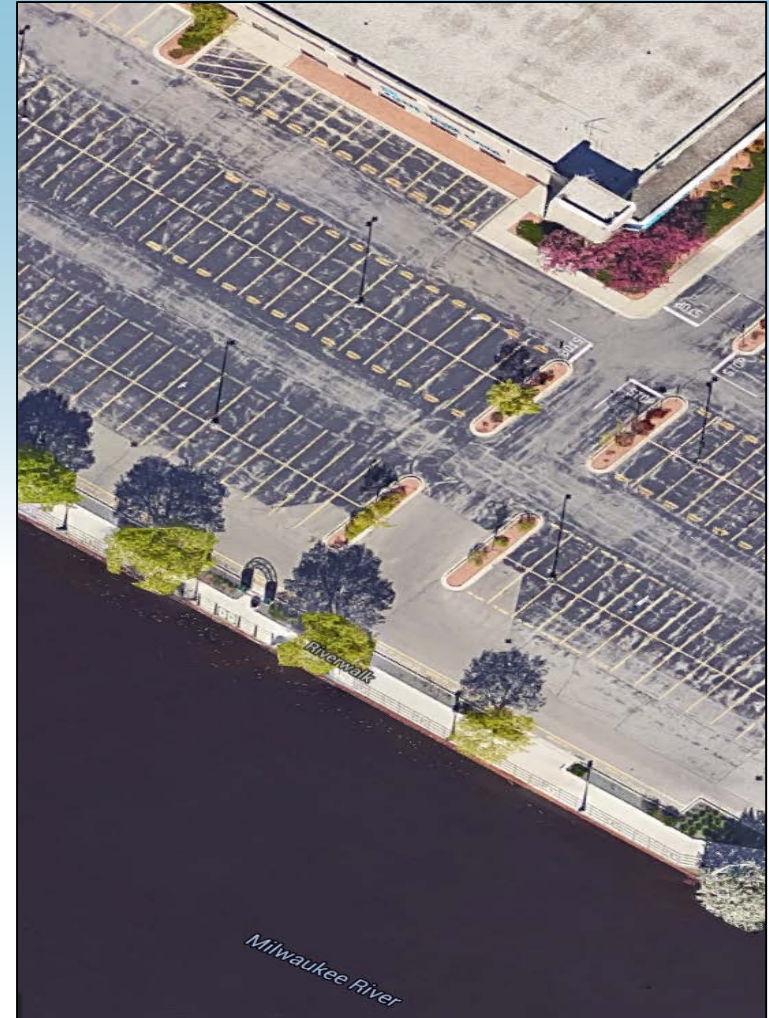
median: **36**

max: **208**

(n=40; Baldwin et al, 2017)

How do sealants pollute?

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



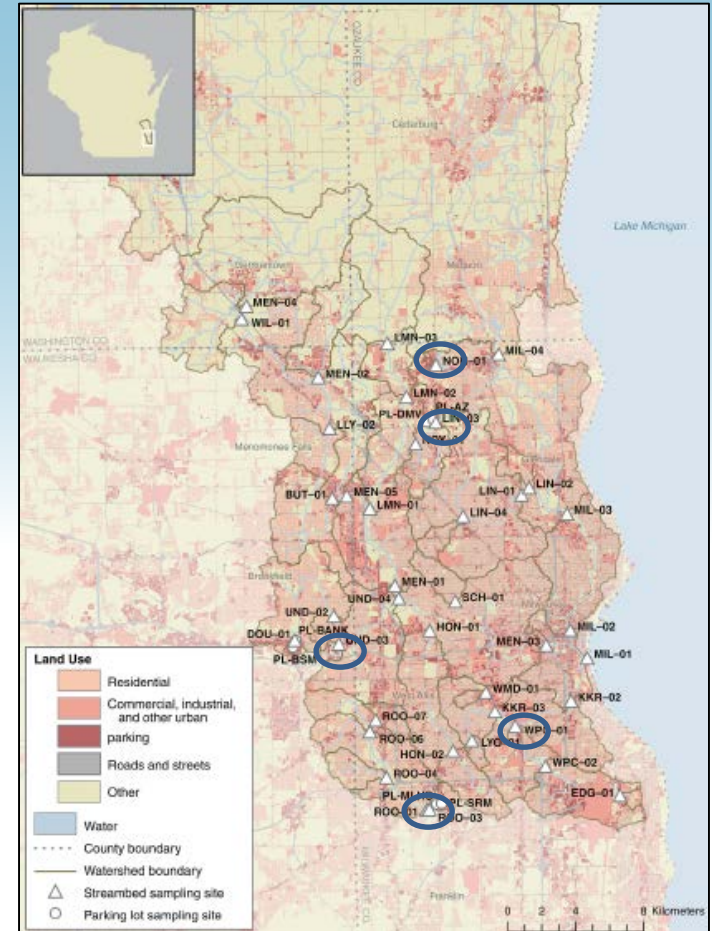
Wisconsin Information

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

Other Studies

Location

Contribution

40 US Lakes

~50%

Lake Como, TX Watershed

>70%

Minneapolis/St. Paul, MN

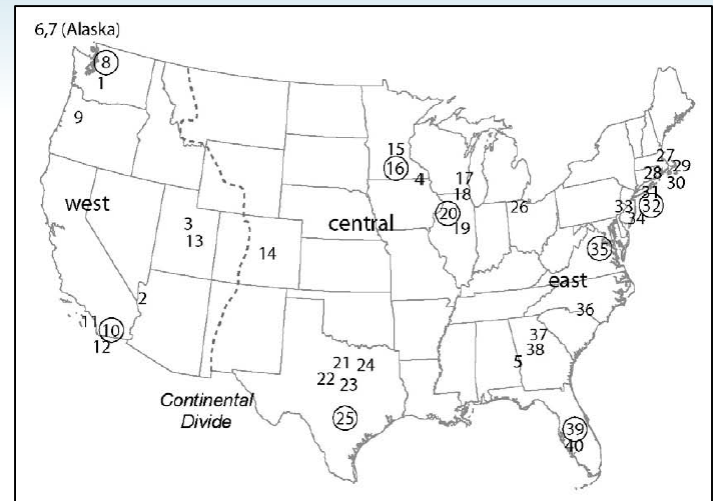
67%

Springfield, MO

>80%

Also:

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



Van Metre et al. 2010

US EPA

- Found coal-tar-sealed surfaces released 100-1000 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.

Calls to Action

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

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;

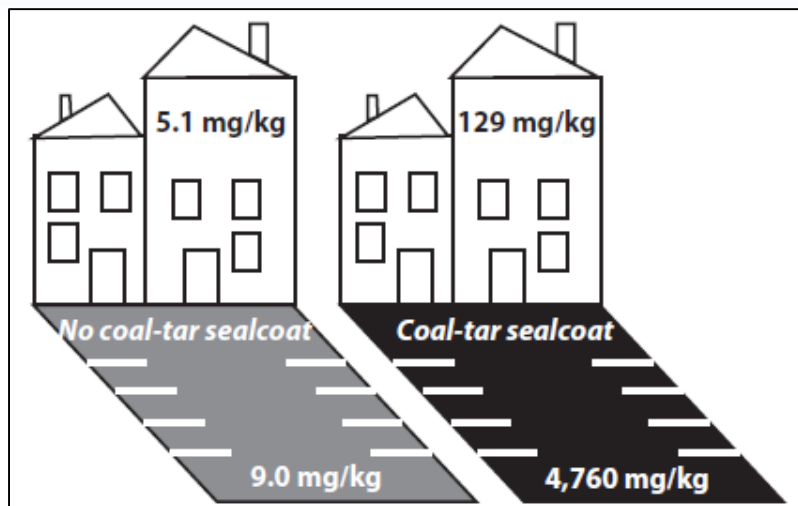
NOW, THEREFORE, BE IT ORDAINED by the [CITY/VILLAGE OF MUNICIPALITY COMMON COUNCIL/BOARD OF TRUSTEES], as follows:

Great Lakes and St. Lawrence River Cities Initiative: “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”

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 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.

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



Economic Motivation

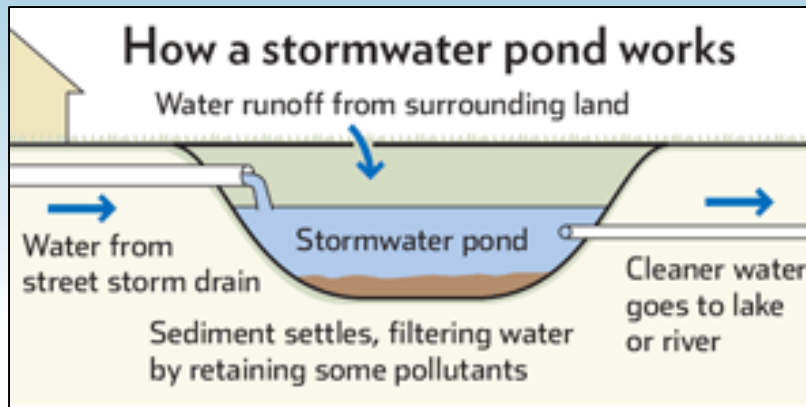
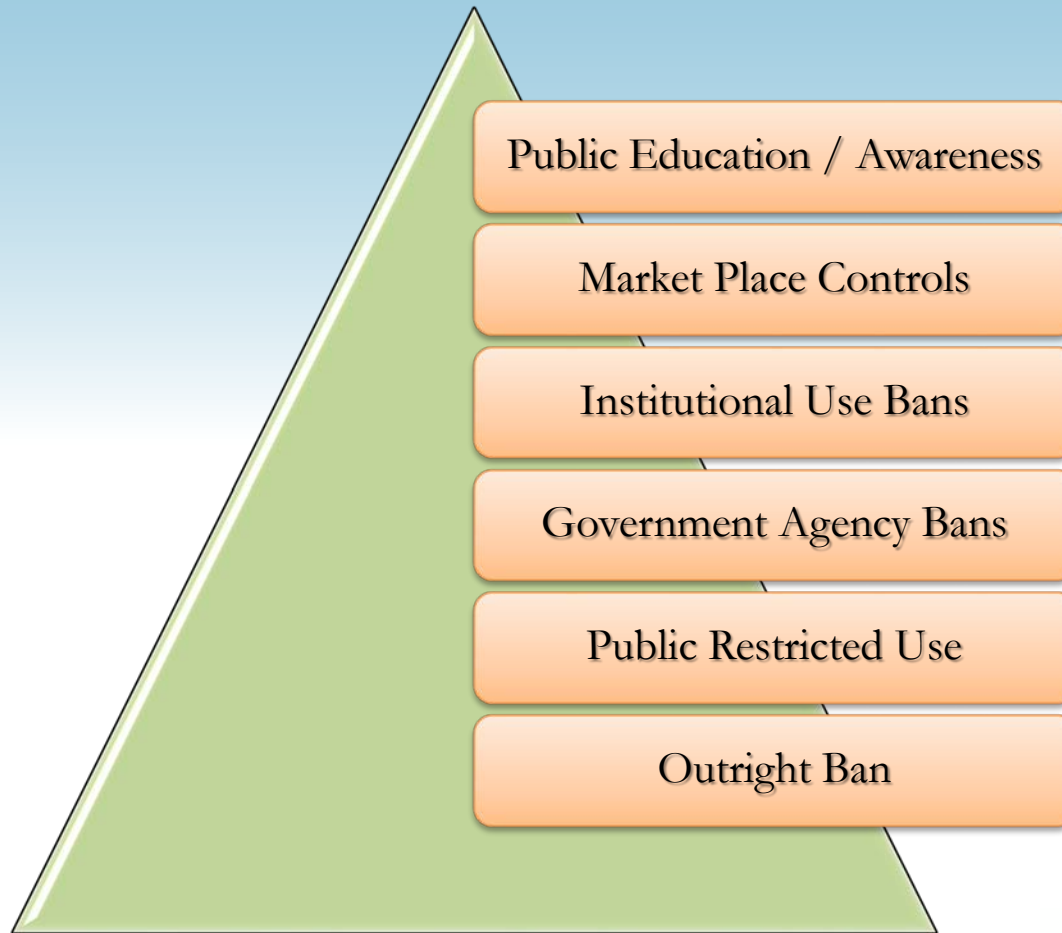


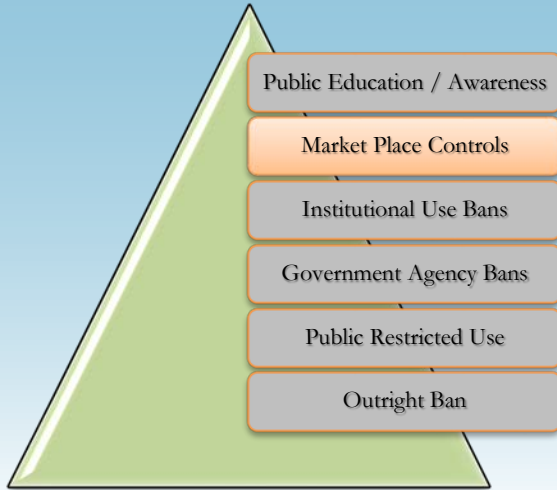
Image Source: Pioneer Press Graphics

- 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.

Action Options



Action Options

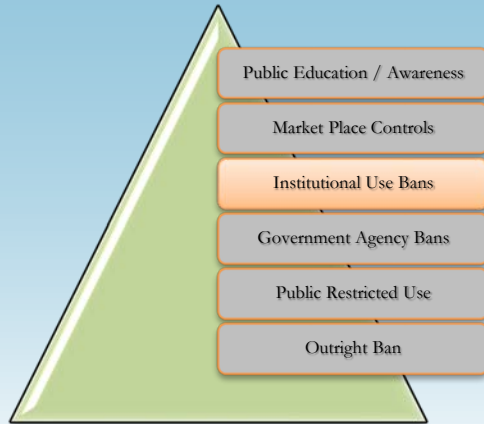


Many retailers have stopped carrying coal-tar sealants

- However, most sealing done by commercial contractors



Action Options



Targets: institutions with large amounts of parking areas

- Schools
- Hospitals
- Commercial malls

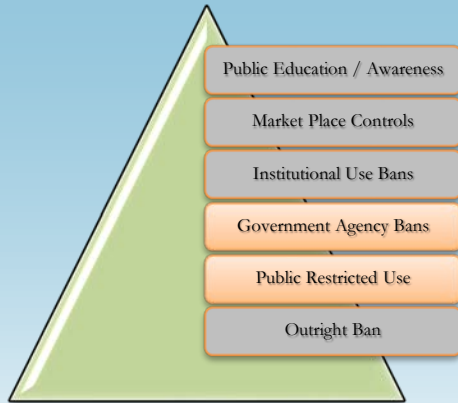


**MILWAUKEE
PUBLIC SCHOOLS**



**KALAMAZOO
COLLEGE**

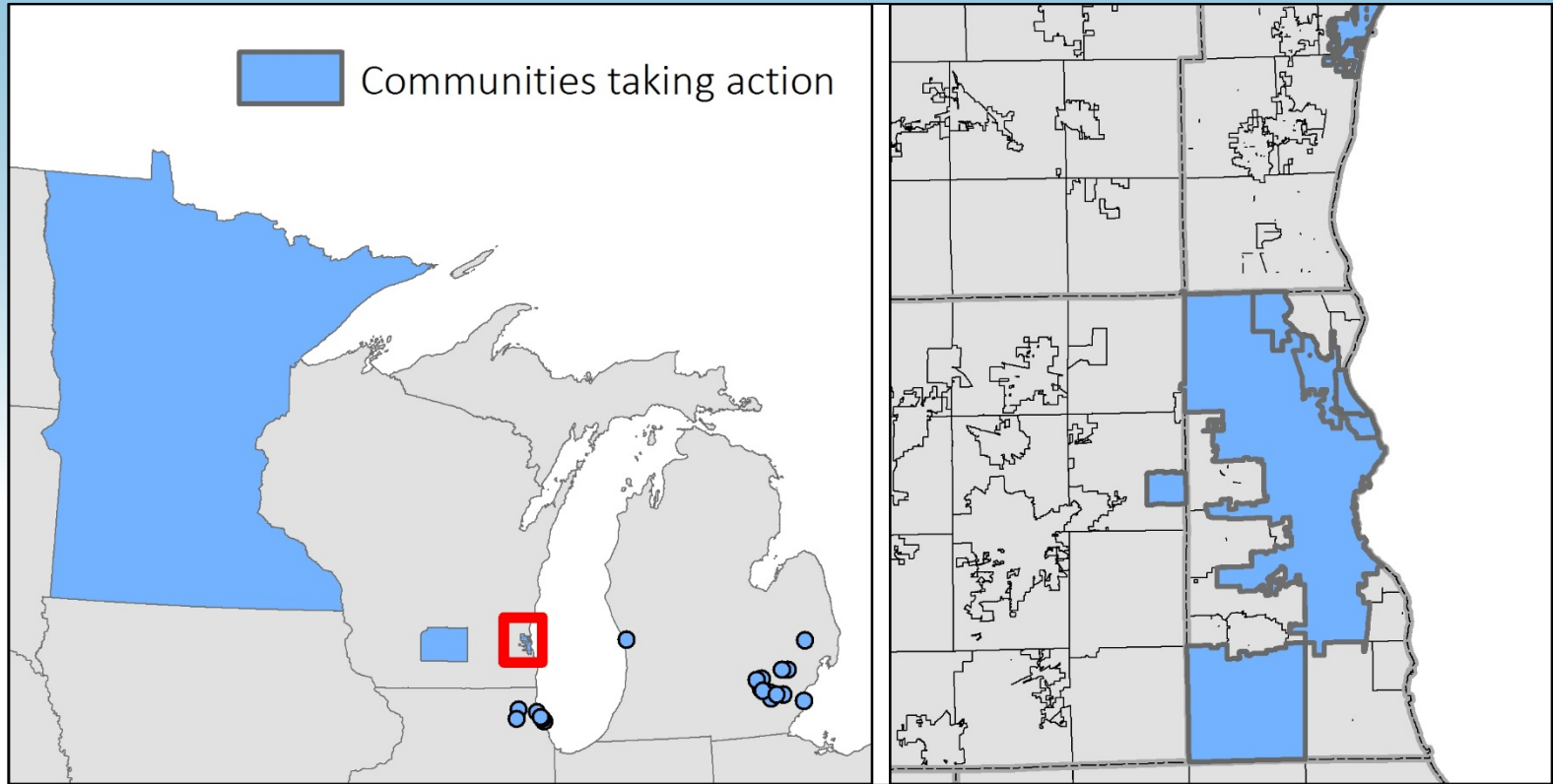
Action Options



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

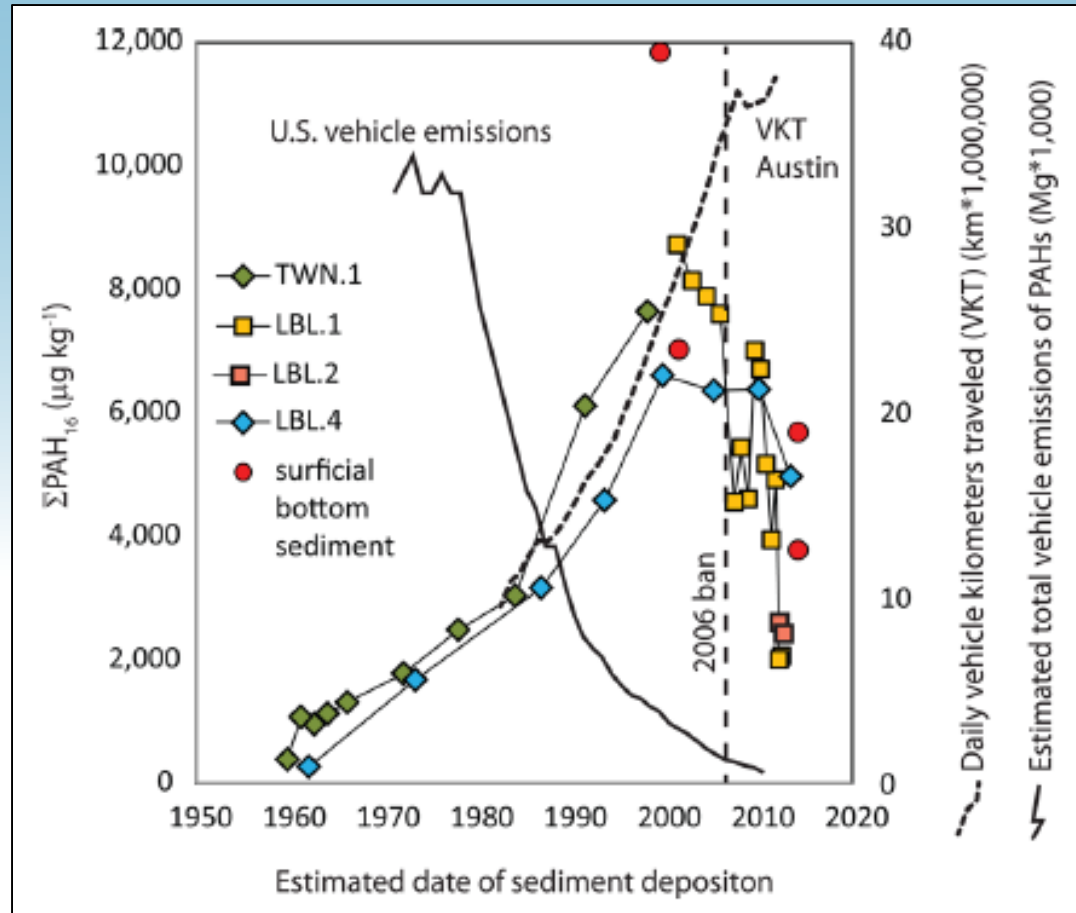
- At least 16 communities specify low-PAH sealants on any municipal property
- Most DOTs (including Wisconsin) have stopped using
- No use on development affecting wetlands (Massachusetts)
- No use on surfaces draining to municipal storm sewer systems (Westwood, MA)
- More stringent precautions for coal-tar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

Who has enacted a ban?



+ dozens of others around the county

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

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)

Outreach and education are the critical elements--and Clean Wisconsin can help.

Field Screen Test

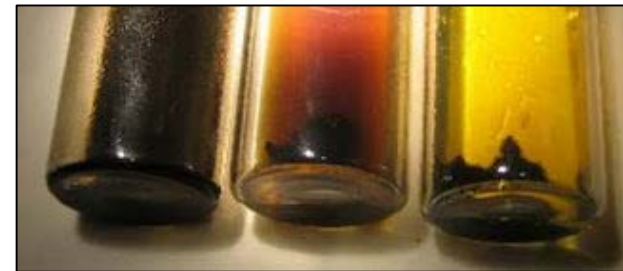


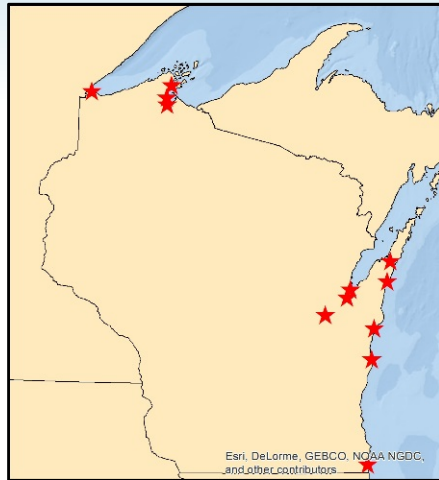
Photo credit: Tom Ennis

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.

Coming Your Way This Summer

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



Our 12 target Coastal communities
for project expansion



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

Acknowledgements

