

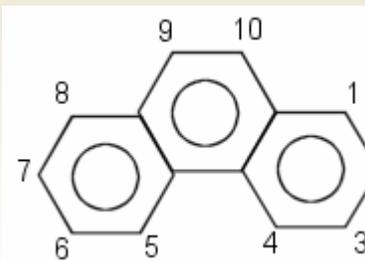


You're standing on it!

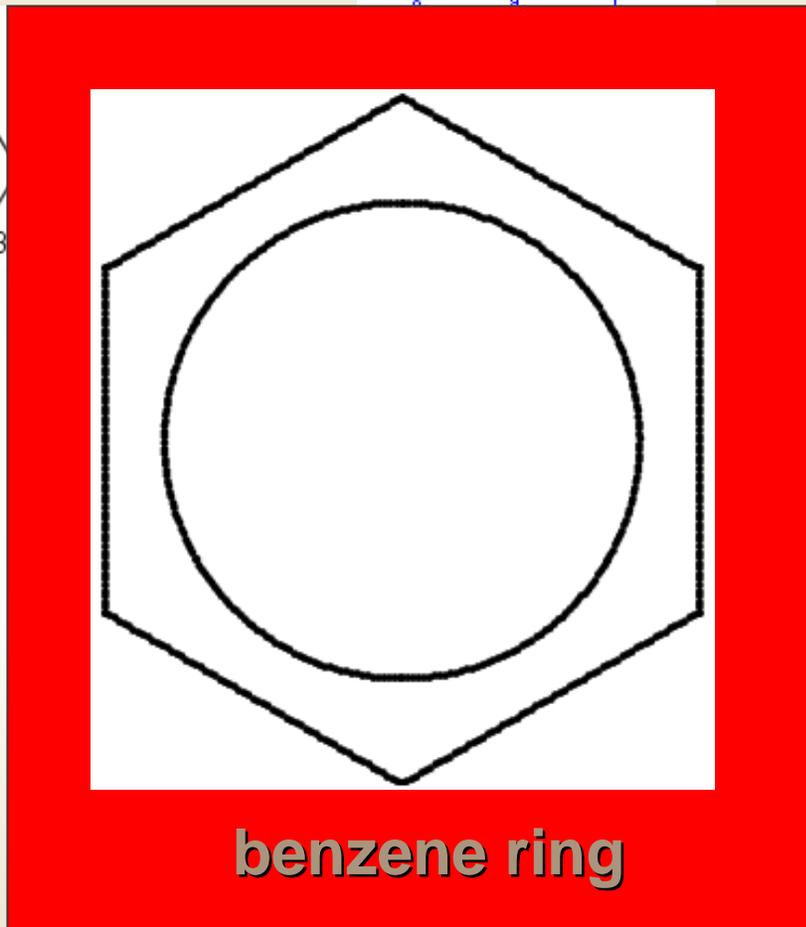
Parking Lot Sealcoat as a Major Source of PAHs in Urban and Suburban Environments

**Barbara Mahler and Peter Van Metre
U.S. Geological Survey**

What are PAHs? polycyclic aromatic hydrocarbons)



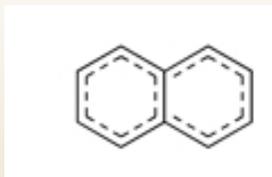
phenanthrene



benzene ring

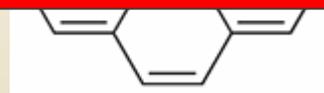


coronene

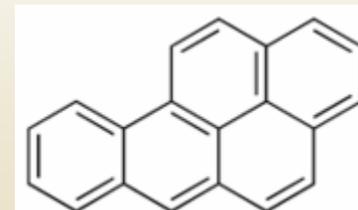


naphthalene

benzene



pyrene



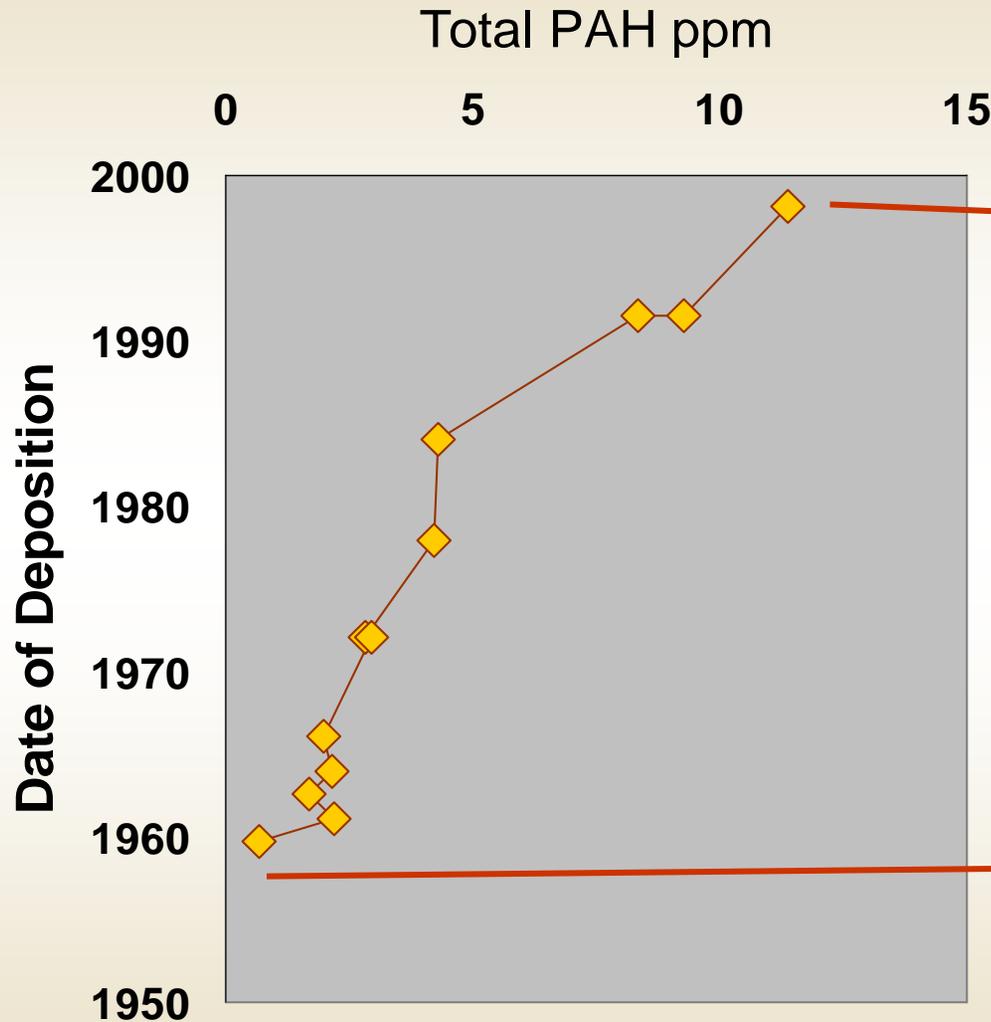
benzo[a]pyrene

Where do PAHs come from?

- Many are carcinogenic, toxic, and mutagenic
- Urban sources:
 - Used motor oil
 - Exhaust
 - Industrial emissions
 - Asphalt
 - Coal tar
 - Tires
- Mainly produced by combustion of fossil fuels



Mystery #1: PAH trends are up

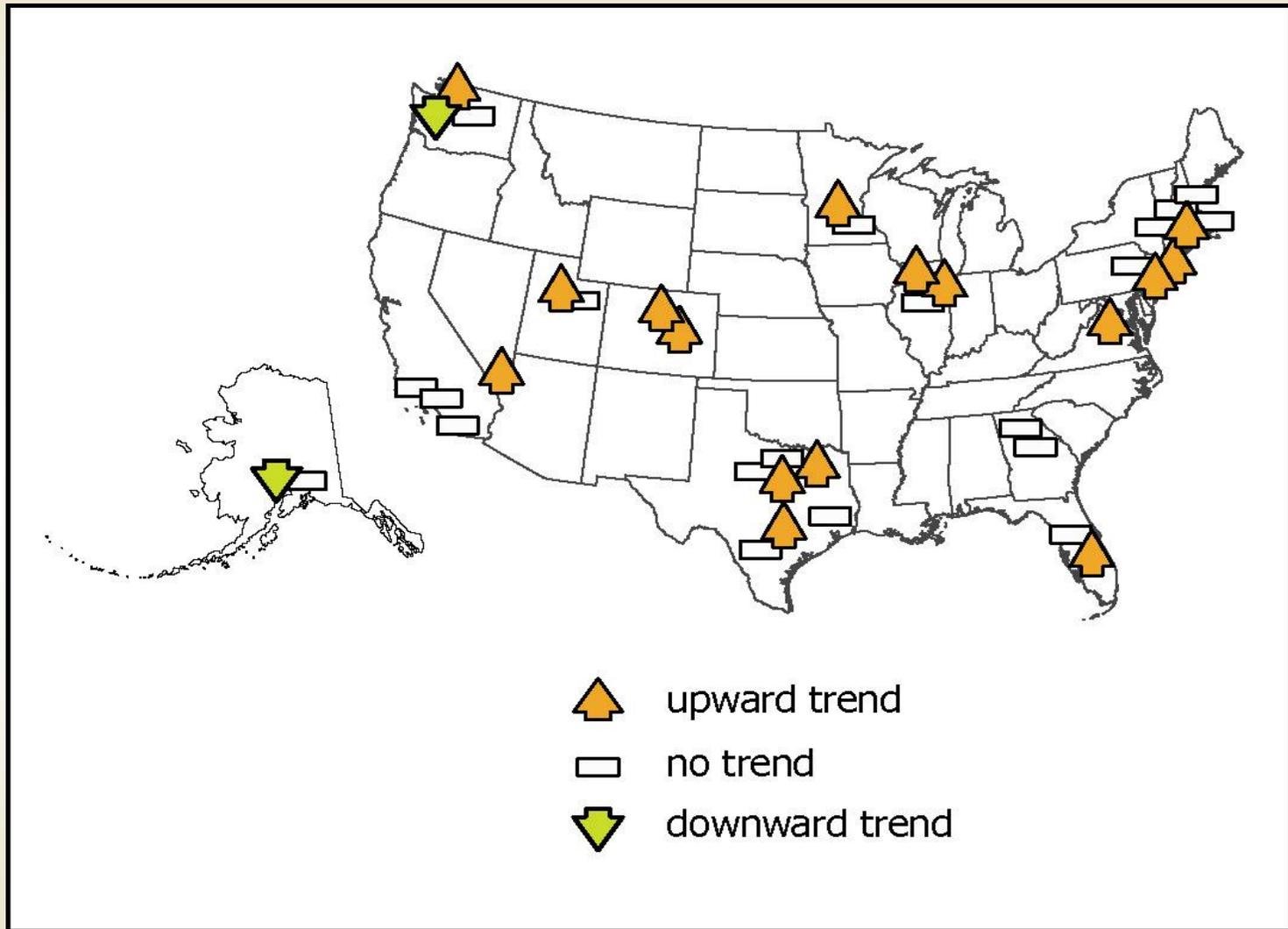


Town Lake, Austin, Texas

Van Metre et al., ES&T, 2000, 34:4064-4070



PAH trends in lake sediment: 1970 to present



Mystery #2: Why are PAH concentrations so high in City of Austin bed sediments?



- ❑ Extremely high (1,500 ppm) PAHs in some small drainages
- ❑ Probable effect concentration (PEC) is 23 ppm
- ❑ Highest are below parking lots...

... and the parking lots are sealed

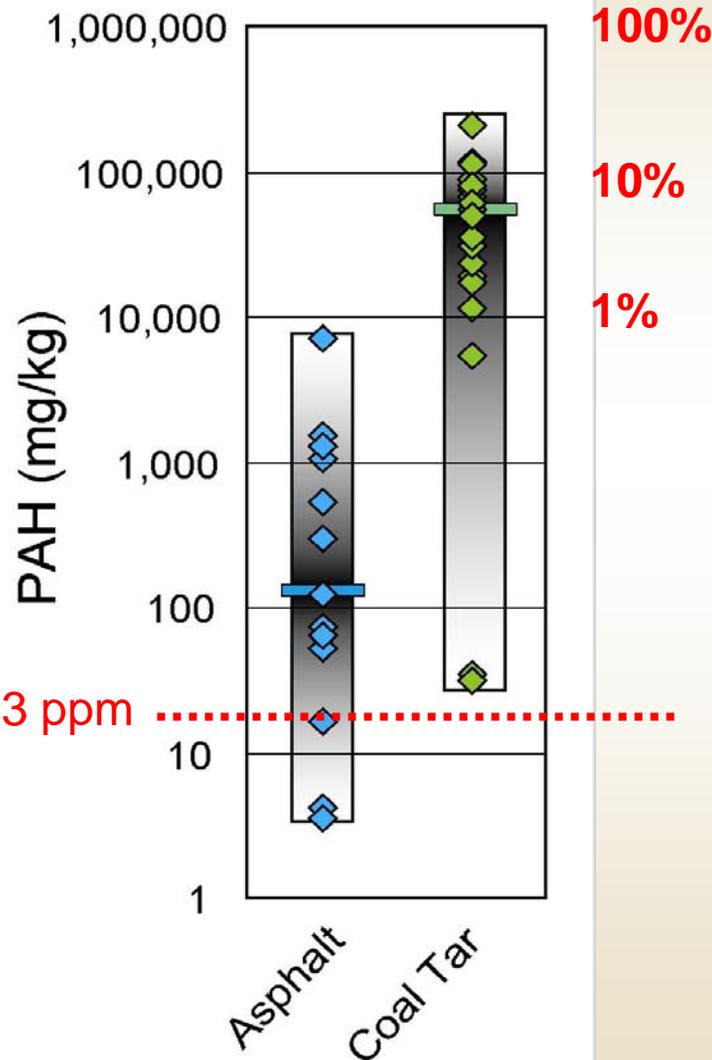




PAHs in sealcoat products

Asphalt

- Oil based
- Lower in PAH
- Used mainly in western U.S.



PEC of 23 ppm

Coal tar

- From coking of coal
- 50% or more PAH by weight
- Known carcinogen*

StreetPro
PAVEMENT TEXTURE

STRIPE-A-LOT

New
England
Sealcoating



Advanced Asphalt

QUALITY
ASPHALT
COATINGS, INC.



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PAVING AND SEALCOATING

Licensed & Insured Engineering Contractor
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EN'S
ALT, INC.

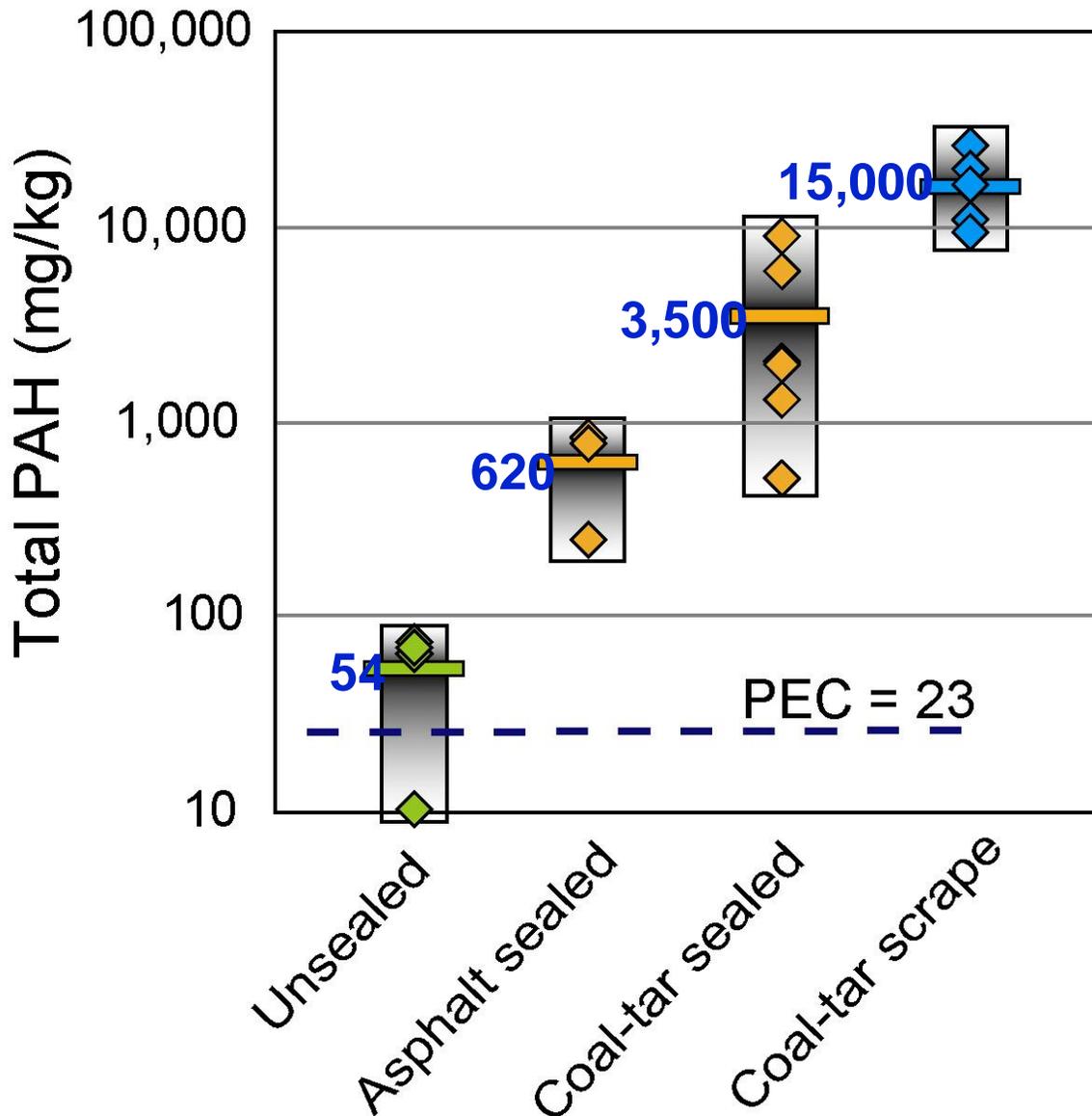
Care, Inc.

The Study

- ❑ Sampled artificial runoff from 13 parking lots
- ❑ Analyzed particles and water for PAHs



PAHs in Parking Lot Sediments



← **Black R. Ohio**
1,100 mg/kg

← **Charles R. MA**
66 mg/kg

← **Urban Lakes**
12 mg/kg

*Just how much
PAHs are in coal
tar sealcoat?*



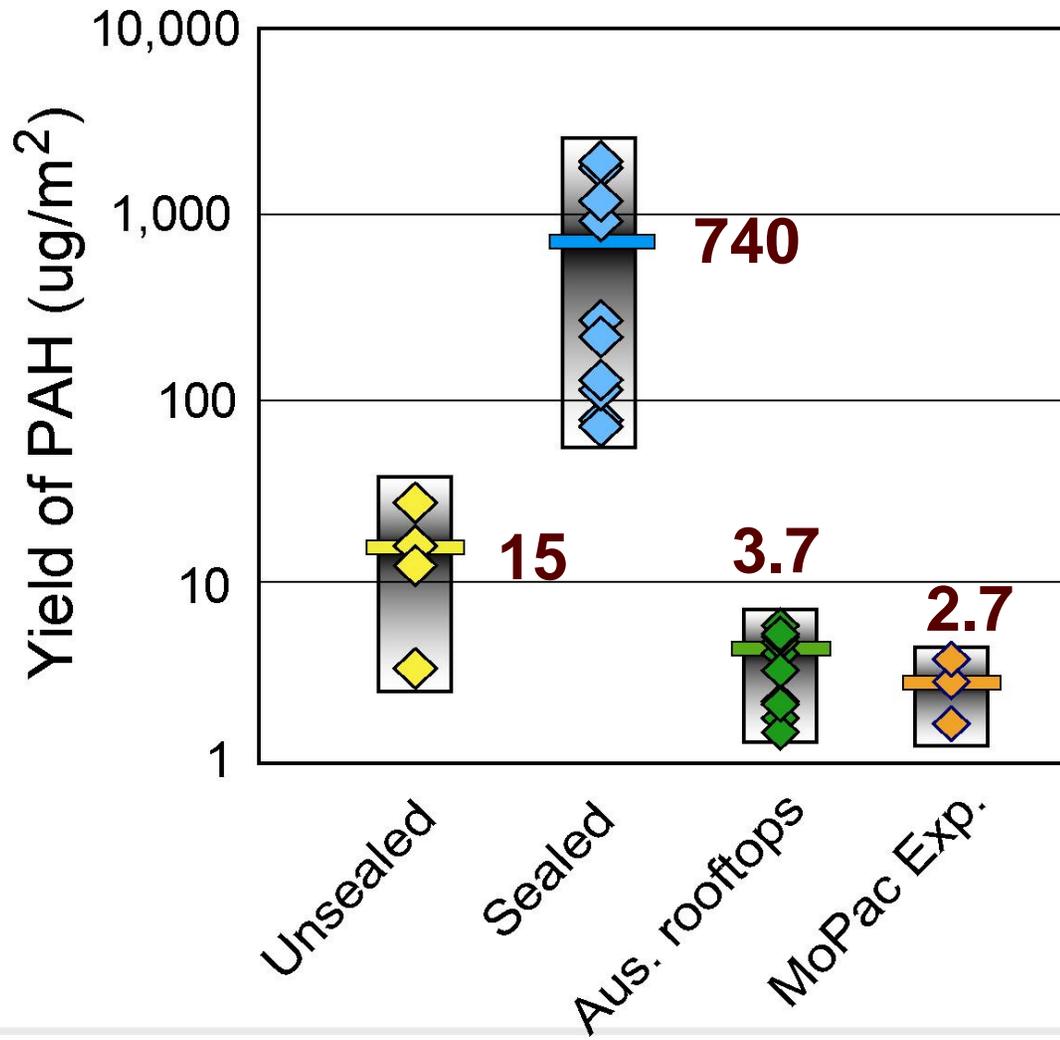
Coal tar sealcoat

=

Used motor oil



Sealed vs Unsealed Mass Yields



Potential sources

Exhaust

Tires

Asphalt

Motor Oil

Emissions to air

Sealcoat

Is abraded sealcoat getting into streams?

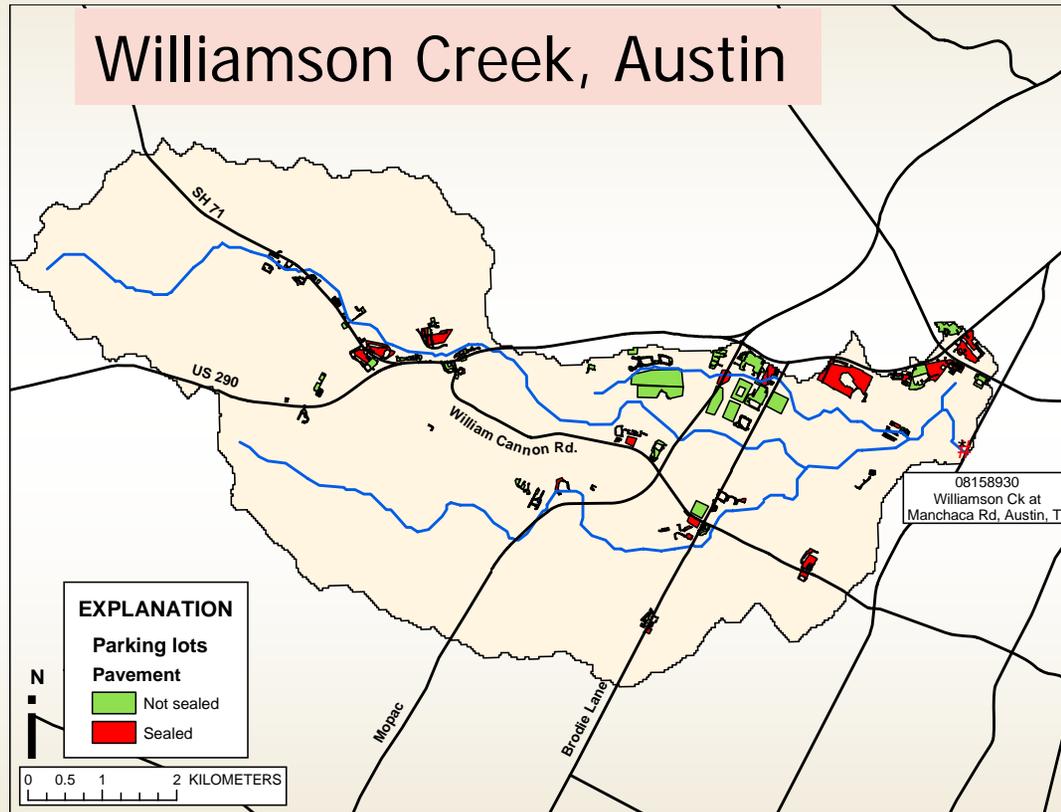


Do **PAH mixtures** in streams match sealcoat?

Are **PAH yields** from sealed lots large enough to account for stream loads?

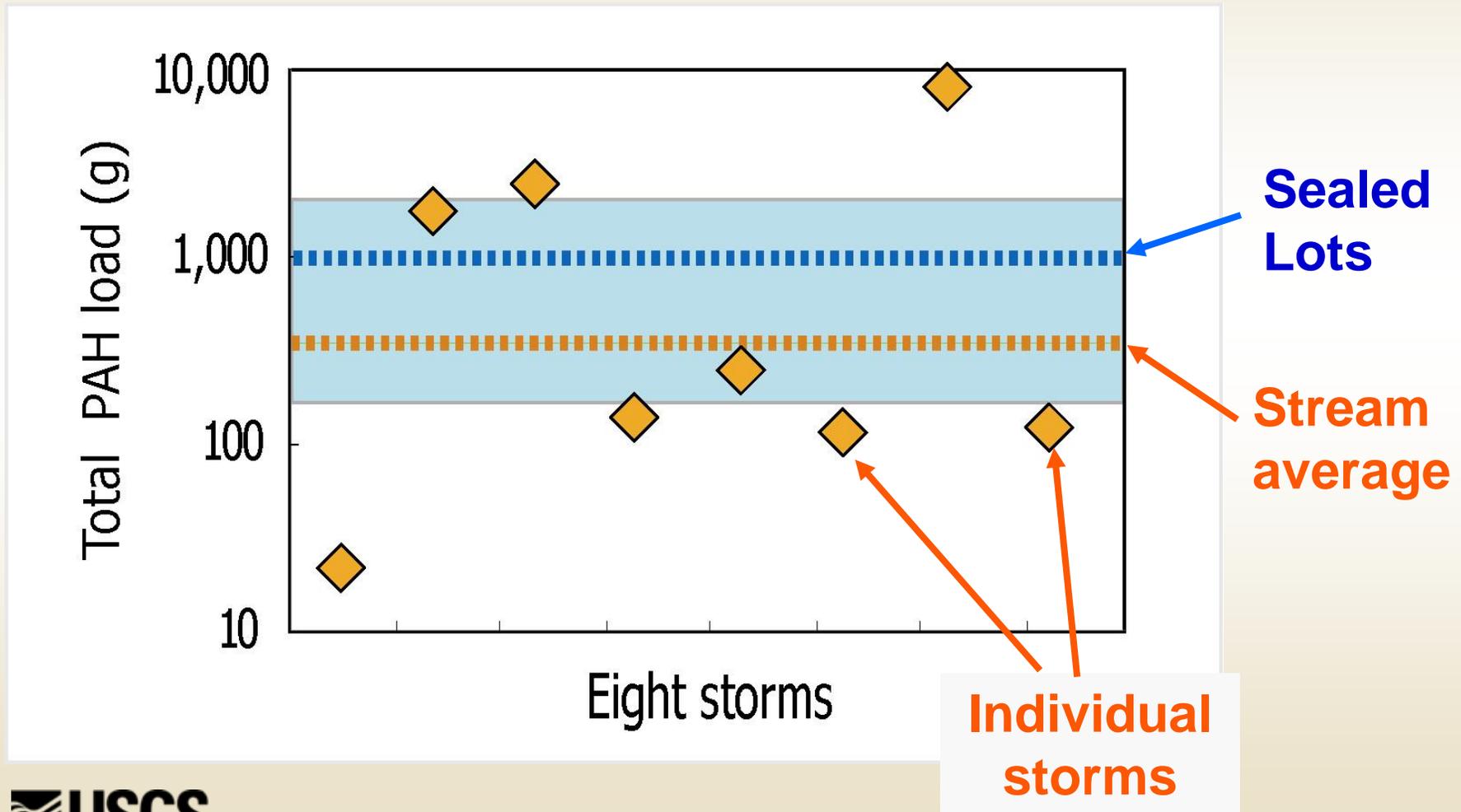


More evidence: Stream mass balance

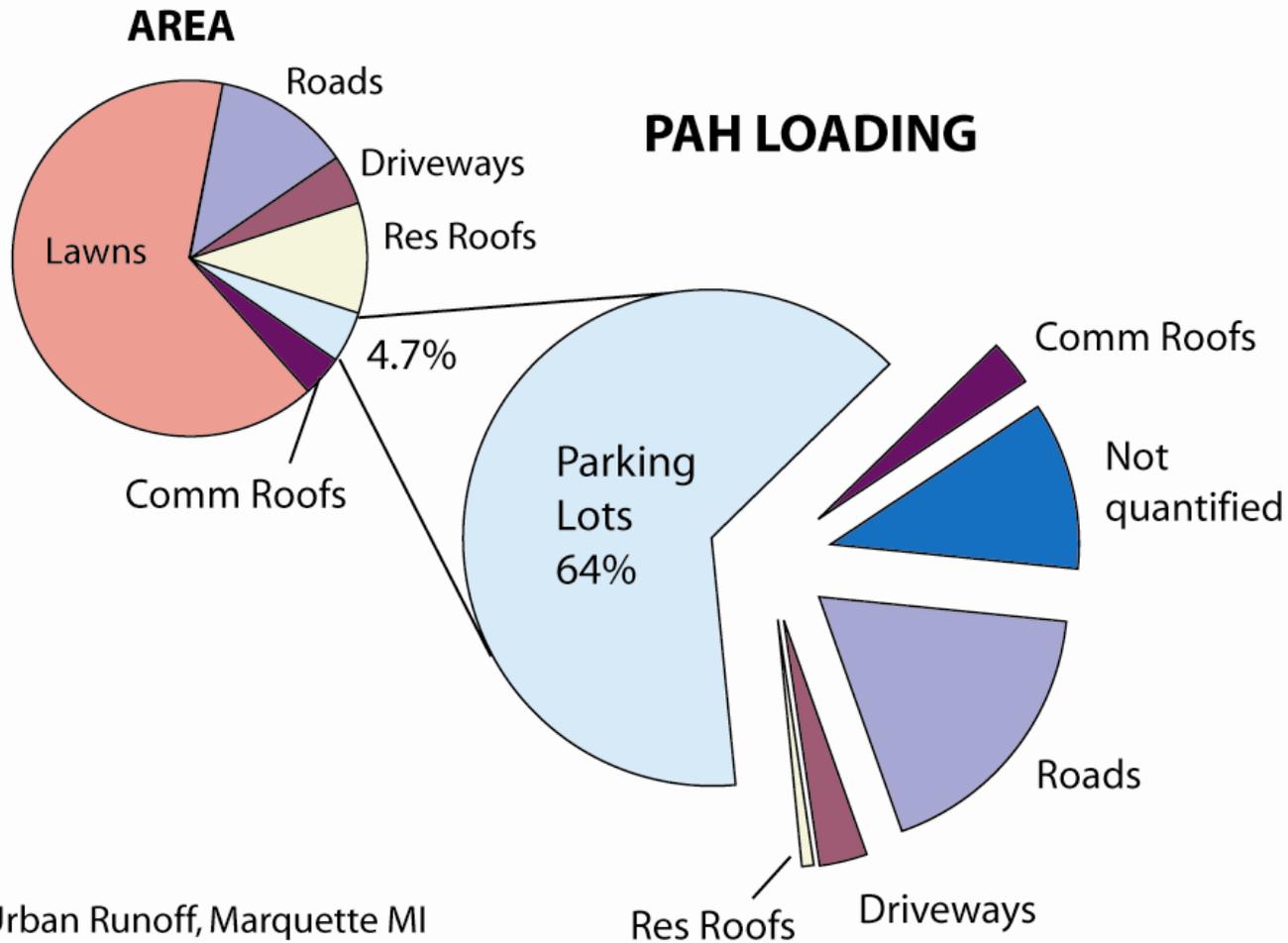


- 4.4% of watershed area is parking lots
- About 42% of those are sealed

Williamson Creek loads: runoff from sealcoat could be a big contributor



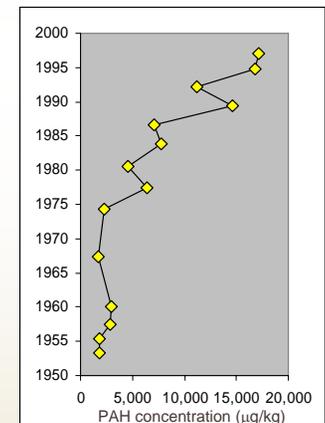
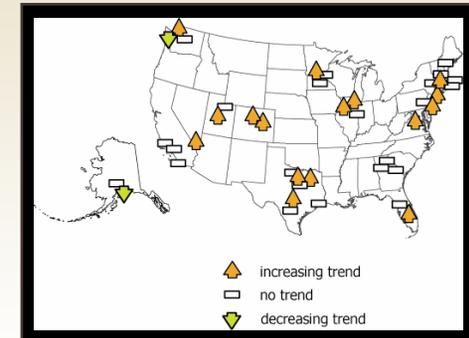
Urban PAHs in Michigan



Urban Runoff, Marquette MI
Steuer et al., 1997

What are the environmental implications?

- 300,000 metric tons applied annually in U.S.*
- Demonstrated effects on aquatic biota
- NAWQA: PAHs increasing nationally



Lake Fairfax, VA

Directions for further research

- ❑ Other geographic areas
- ❑ Scale up to watershed
- ❑ Atmospheric releases (volatilization, blown dust)
- ❑ Human exposure
- ❑ Biological/toxicity studies

