

Bans of Pavement Sealers Have Demonstrably Absent Environmental Risk Reduction Benefits but Foreseeable and Knowable Economic Harms

Anne LeHuray
Pavement Coatings Technology Council

Managing for a Healthy and Sustainable Chesapeake Bay: Human and Ecological Risk
April 23-24, 2012 – The Atrium, Stamp Student Union, University of Maryland, College
Park, MD

Overview

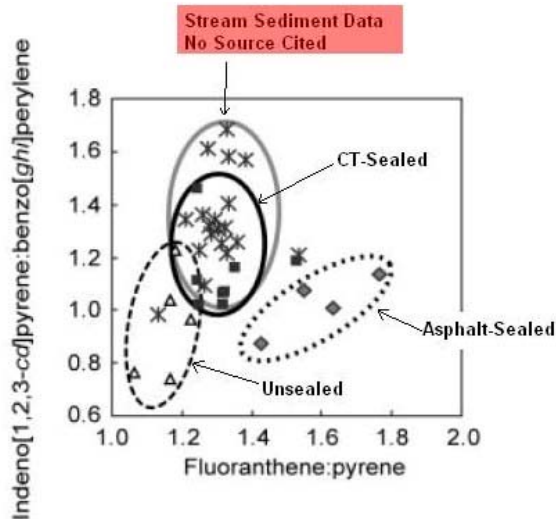
- A Hypothesis That Doesn't Hold Water & Regulation Based on Flawed Science
 - Pacific Northwest
 - Long Island
 - Austin, Texas
 - Washington, DC & Other Chesapeake Bay Watershed
- Risk Management: Misapplication of the Precautionary Principle
 - Managing a Hypothesized Harm Based on Flawed Science Results in Actual Harms

The Hypothesis (1)

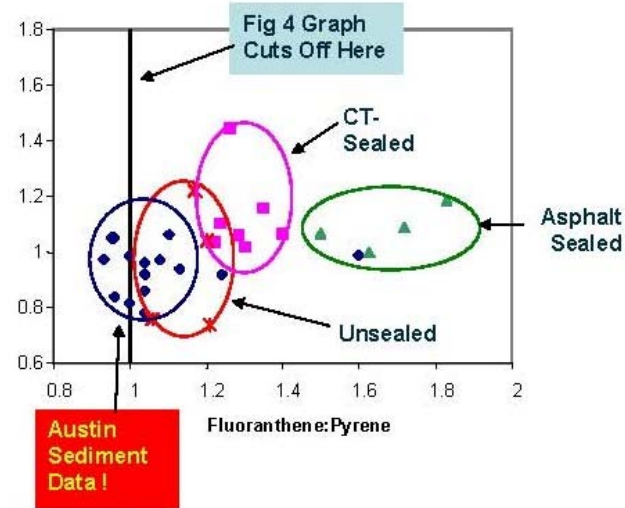
- Refined tar-based pavement sealcoat (RTS) is a significant – maybe the most significant – environmental source of a class of chemicals known collectively as polycyclic aromatic hydrocarbons (PAHs)

The Hypothesis (2)

- Double ratio plots used to suggest that RTS are a significant source of PAHs in urban sediments



ES&T Article – Figure 4



Re-Plot with Austin Sediments

The Hypothesis (3)

- Abandon data-centric forensic methods in favor of use of EPA's CMB air pollutant model (but not EPA's companion UNMIX model)

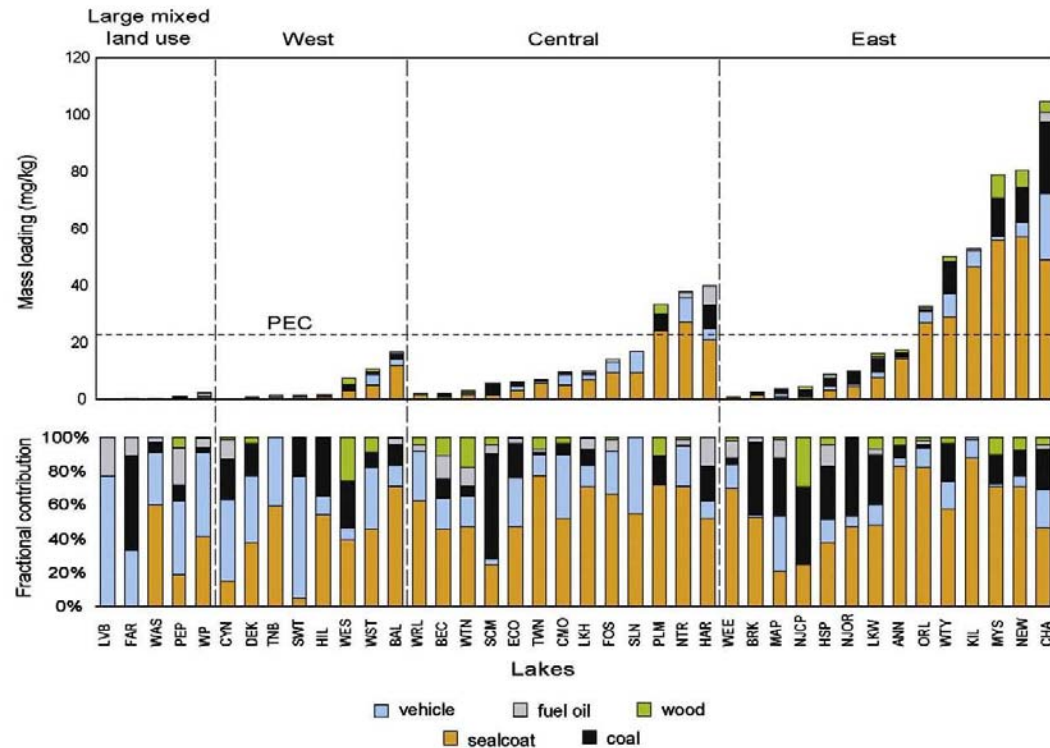


Fig. 4. PAH mass loading and fractional contribution from five source categories to ΣPAH (mean of four best CMB model runs). Lakes are grouped by region in order of increasing ΣPAH concentration. Horizontal dashed line indicates the probable effect concentration (PEC), the concentration of total PAH above which adverse effects to benthic biota are expected to occur (MacDonald et al., 2000).

This Application of CMB Model Can Not be Validated

- Reported CMB model results are inconsistent with the authors' previous results and with results using data-centric forensic methods

O'Reilly et al, 2011 Fig. 1A

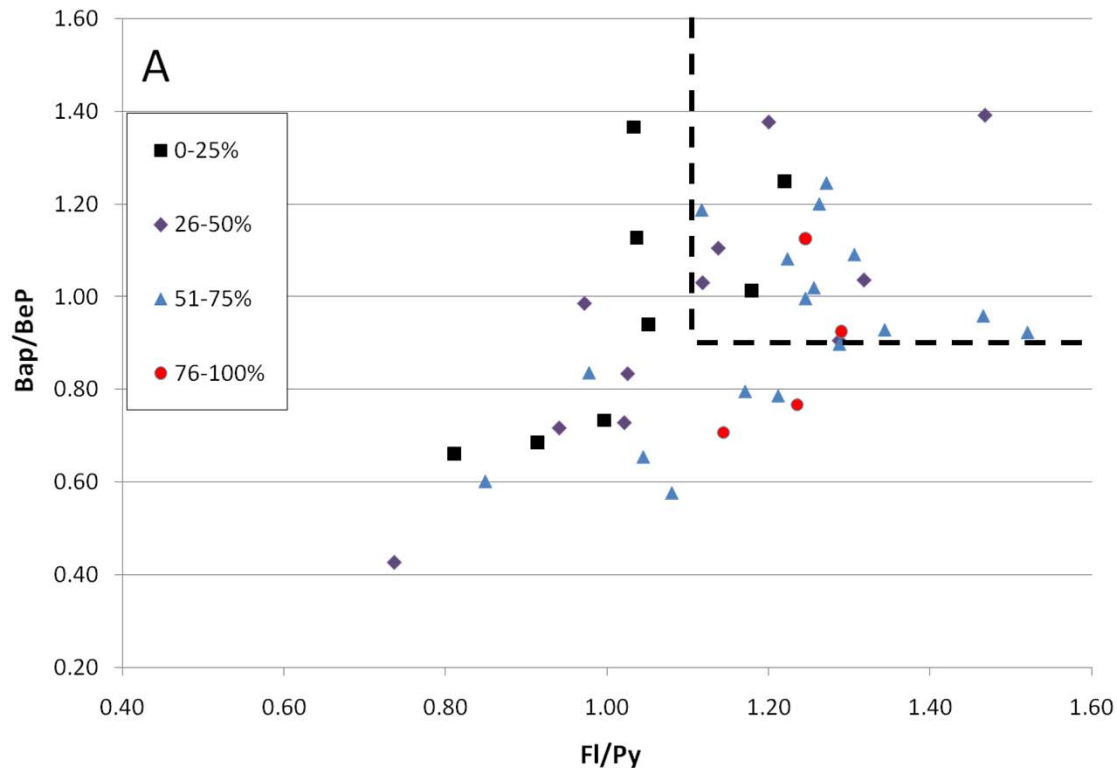


Figure 1. Two methods for plotting the FI / Py and BaP / BeP ratios as a function of the estimated sealant contribution (% PAHs) for the 40 lakes in Van Metre and Mahler (2010). **A:** Separation of groups of samples with similar calculated CT-sealant contribution would have supported the hypothesis presented in Van Metre et al. (2009). The dotted lines are used in Van Metre et al. (2009) to separate samples claimed to be influenced by coal tar sealants (above and to the right).

O'Reilly et al, 2011 Fig. 1B

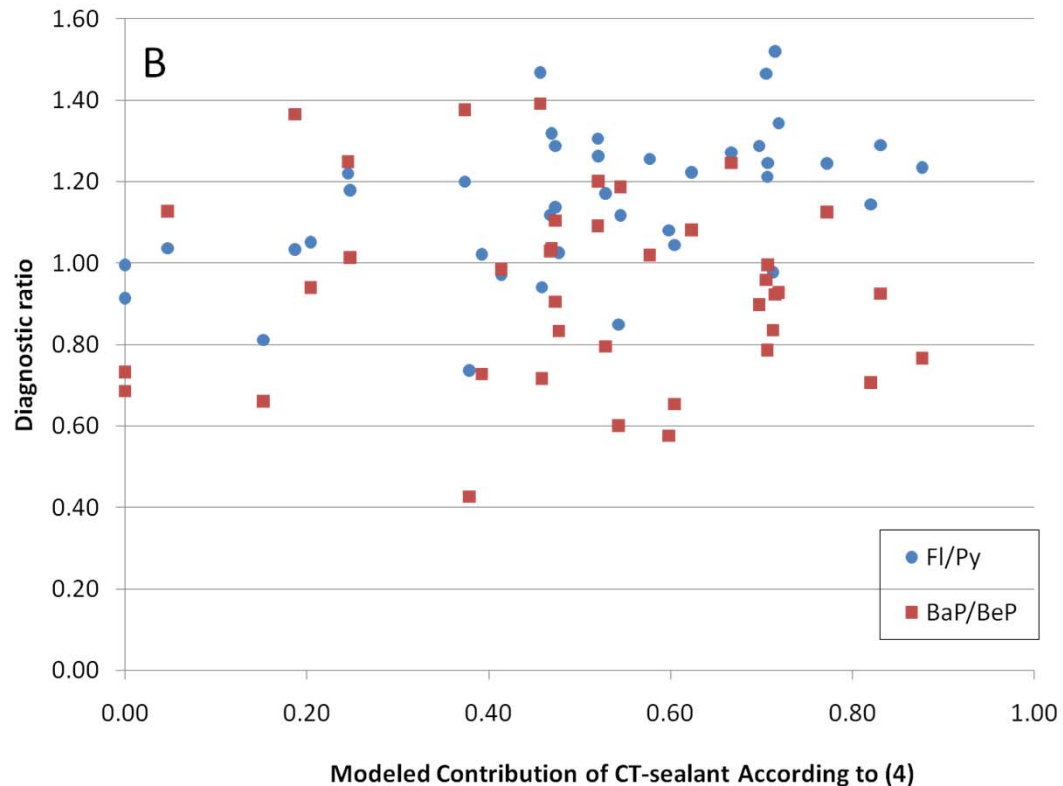


Figure 1. Two methods for plotting the FI / Py and BaP / BeP ratios as a function of the estimated sealant contribution (% PAHs) for the 40 lakes in Van Metre et al. (2010).

B: An increase in these PAH ratios with sealant contribution (Ahrens & Depree (2010)) would suggest consistency in the source characterization methods used in Van Metre and Mahler (2009) and Van Metre et al. (2010).

Modeled Contribution vs. Data-Centric Evaluation of Contribution

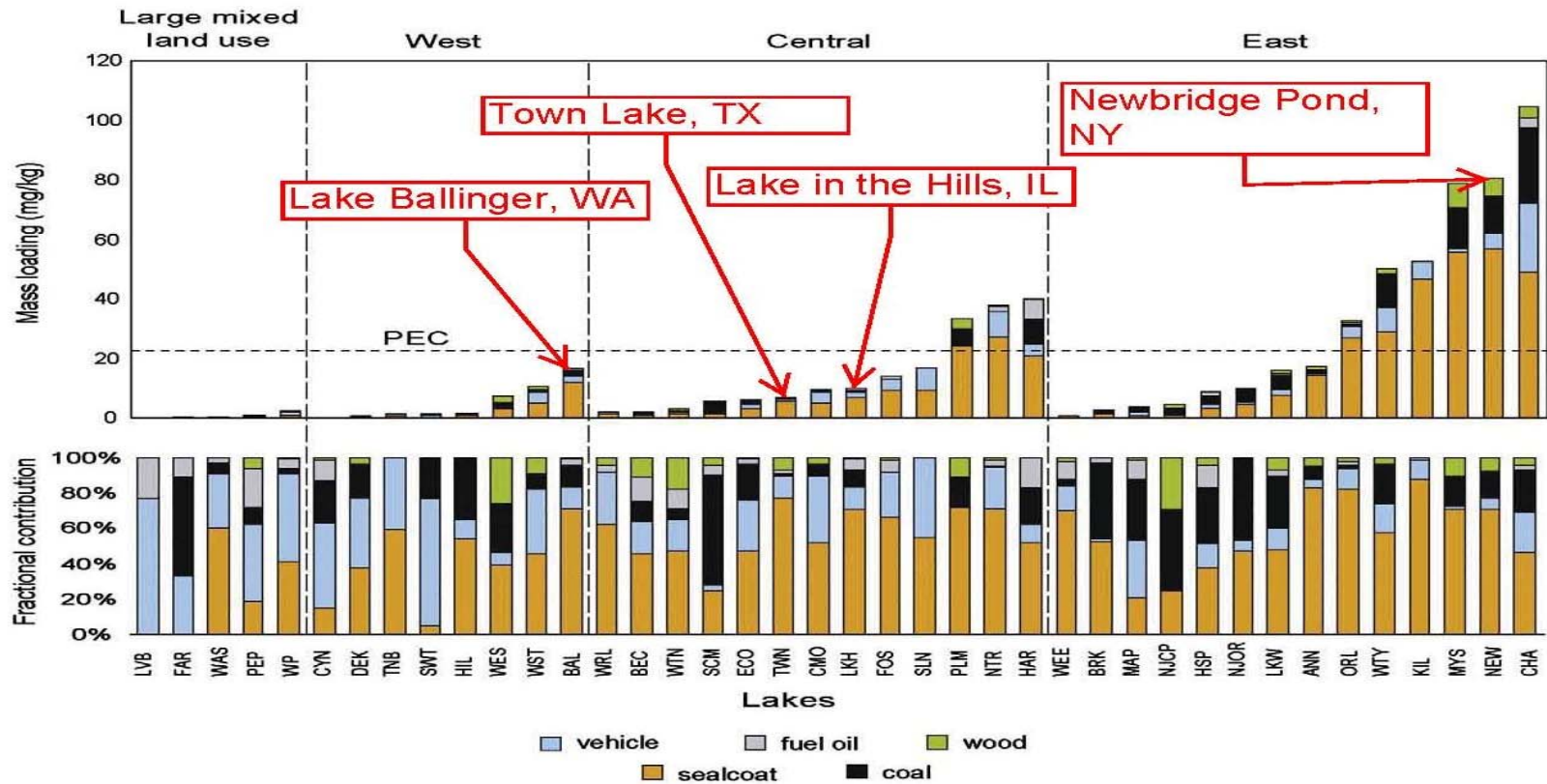
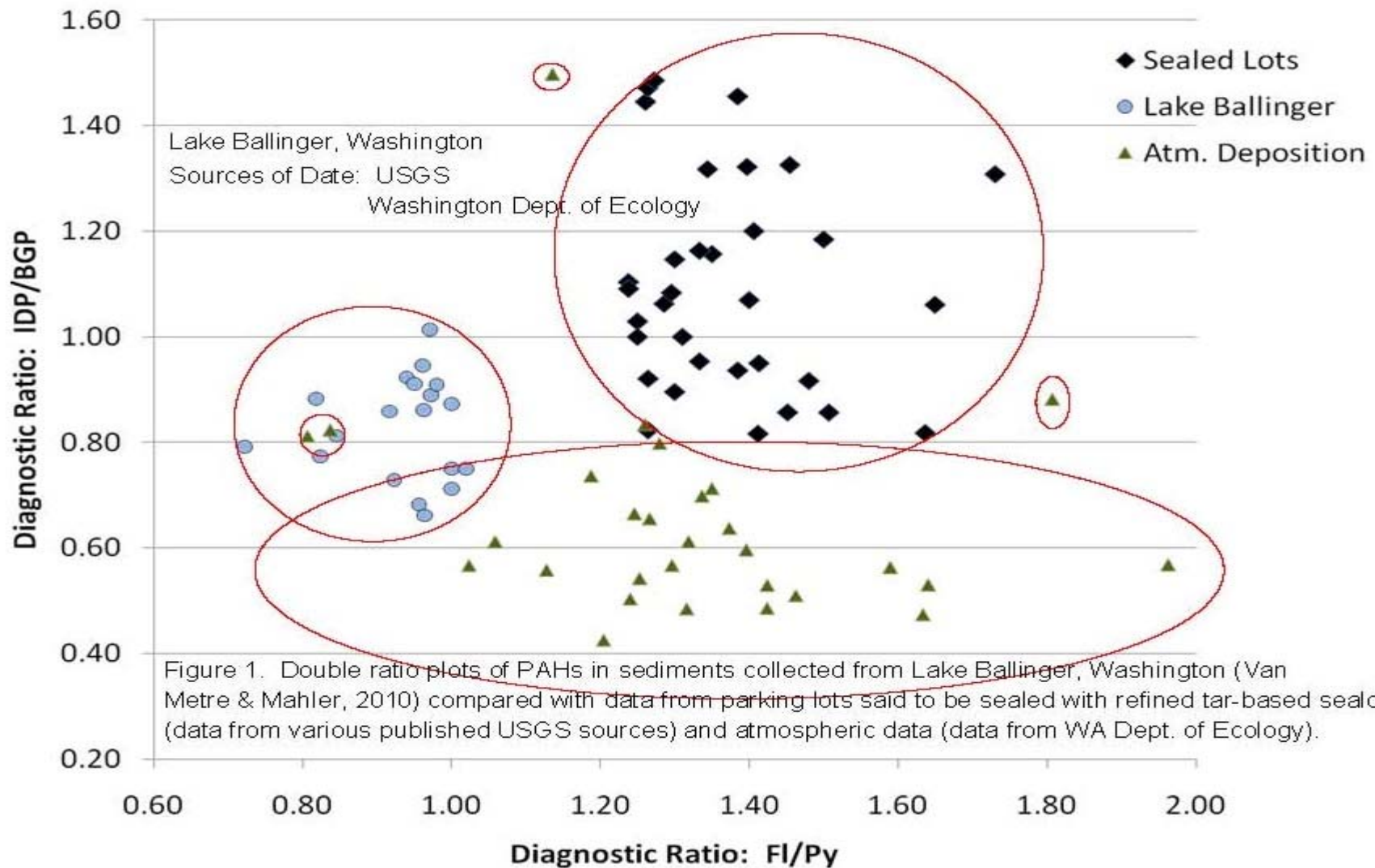


Fig. 4. PAH mass loading and fractional contribution from five source categories to Σ PAH (mean of four best CMB model runs). Lakes are grouped by region in order of increasing Σ PAH concentration. Horizontal dashed line indicates the probable effect concentration (PEC), the concentration of total PAH above which adverse effects to benthic biota are expected to occur (MacDonald et al., 2000).

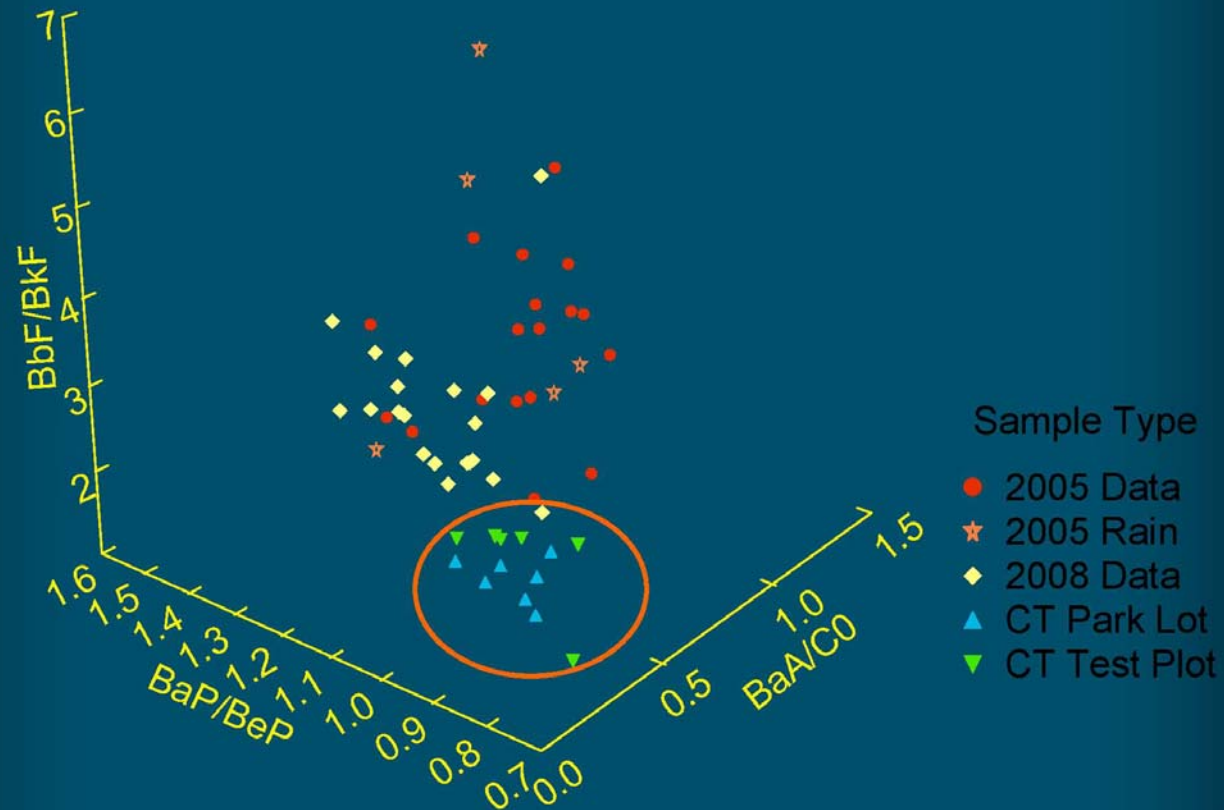
Lake Ballinger, WA



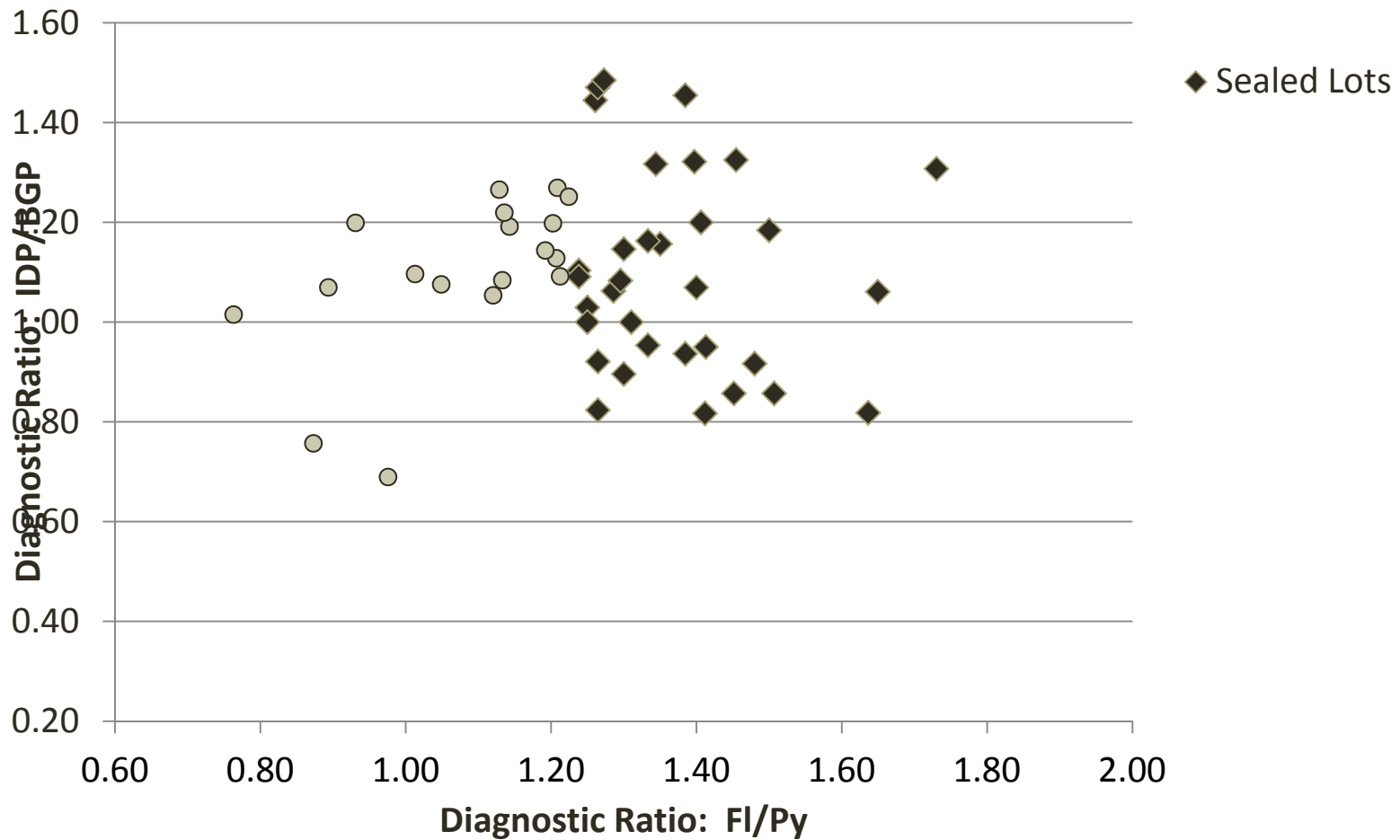
Austin, Texas



PAH Fingerprinting Shows Austin Sediments Do Not Match Coal Tar Signature



Long Island, NY

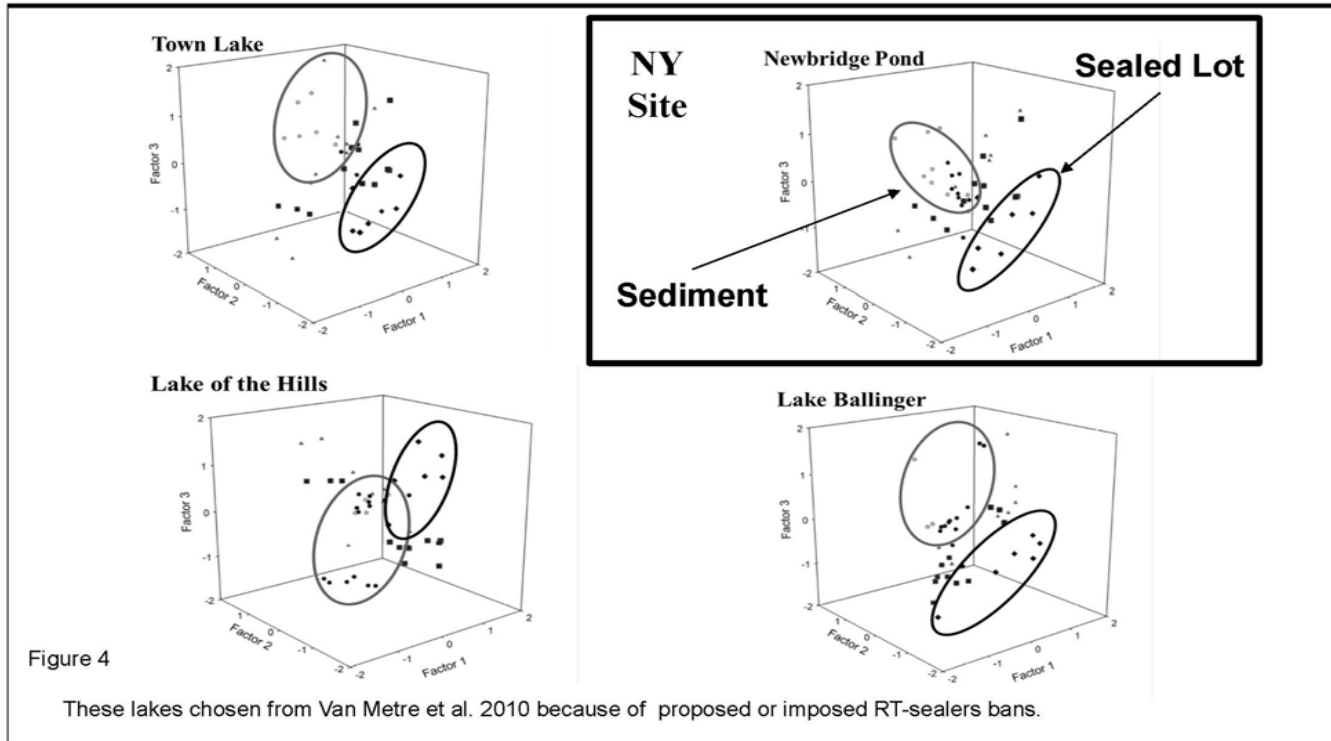


Principle Component Analysis (PCA) of Same Data

Exponent*

14

PCA Suggest Little or No Overlap between Urban Sediments and Sealed Parking Lots



Percent Contribution: CMB Model versus Data-Centric Methods

Water Body	Percentage RTS, Multiple Forensic Methods	Percentage RTS, USGS Model
Lake Ballinger, WA	Little to None	~70%
Lake in the Hills, IL	Little to None	~70%
Newbridge Pond, NY	Little to None	~65%
Town Lake, TX	Little to None	~80%

Washington, D.C. & Other Chesapeake Bay Data

- Many studies of PAHs in Chesapeake Bay Watershed
- Several Studies of Possible Sources of PAHs in DC, e.g.:
 - Anacostia Watershed Restoration Partnership. White Paper on PCB and PAH Contaminated Sediment in the Anacostia River Draft Final. February 23, 2009. 27 pp. Available at <http://www.anacostia.net/Archives/AWSC/documents/WhitePaper.pdf>
 - Hwang, H-M and Foster, GD. Characterization of polycyclic aromatic hydrocarbons in urban stormwater runoff flowing into the tidal Anacostia River, Washington, DC, USA. Environmental Pollution 140 (2006) 416-426.
 - Phelps, HL. 2005. Identification of PCB, PAH and Chlordane Source Areas in the Anacostia River Watershed. DC Water Resources Research Center Report. 9p.
 - Velinsky, DJ, Riedel, GF, Ashley, JTF and Cornwell, JC. Historical contamination of the Anacostia River, Washington, D.C. [Environmental Monitoring and Assessment](#), 2011, [Volume 183, Numbers 1-4](#), Pages 307-328

Clean Water Act Section 303(d) Reports: Maryland 2010 Causes of Impairment

<u>Cause of Impairment Group Name</u>	<u>Number of Causes of Impairment Reported</u>
<u>Nutrients</u>	<u>109</u>
<u>Cause Unknown</u>	<u>77</u>
<u>Turbidity</u>	<u>52</u>
<u>Polychlorinated Biphenyls (PCBs)</u>	<u>35</u>
<u>Pathogens</u>	<u>17</u>
<u>Metals (other than Mercury)</u>	<u>15</u>
<u>Salinity/Total Dissolved Solids/Chlorides/Sulfates</u>	<u>13</u>
<u>Mercury</u>	<u>5</u>
<u>Trash</u>	<u>3</u>
<u>pH/Acidity/Caustic Conditions</u>	<u>2</u>
<u>Sediment</u>	<u>2</u>
<u>Pesticides</u>	<u>1</u>
<u>Total Toxics</u>	<u>1</u>
<u>Ammonia</u>	<u>1</u>

Clean Water Act Section 303(d) Reports: Virginia 2010 TMDLs Since Oct. 1995

- Total: 1,358 TMDLs
- 1,376 Causes of Impairment Addressed
- 6 Addressed PAHs as Cause of Impairment
- 5 of 6 in Smith River (south central VA, drains to a NC river system)
- 1 of 6 in a tributary stream in Shenandoah River drainage

Clean Water Act Section 303(d) Reports: DC 2010 TMDLs Since Oct. 1995

- Total: 369 TMDLs
- 369 Causes of Impairment Addressed

<u>Pollutant</u>	<u>Number of TMDLs</u>	<u>Number of Causes of Impairment Addressed</u>
<u>PAH1 - 2 & 3 Ring Polycyclic Aromatic Hydrocarbons</u>	<u>25</u>	25
<u>PAH2 - 4 Ring Polycyclic Aromatic Hydrocarbons</u>	<u>25</u>	25
<u>PAH3 - 5 & 6 Ring Polycyclic Aromatic Hydrocarbons</u>	<u>25</u>	25
<u>Oil and Grease</u>	<u>4</u>	4

Sources of PAHs in DC Sediments

- Superfund/Legacy Sites
 - Navy Yard
 - Large number of former manufactured gas plants
- PAH “Fingerprint” Studies
 - Hwang & Foster (2006): *Thus in the stormwater samples collected for this study, PAHs from wood and coal burning might be negligible compared to PAHs from traffic activity.*
 - Velinsky et al. (2011): *In deeper horizons of the cores, PAHs were composed largely of compounds derived from combustion further down the cores, but were dominated by petrogenic compounds higher up, reflecting a shift from a wood- and coal-based industry to petroleum in the early twentieth century.*

Summary of Conclusions Warranted by the Data

- Here's what the data show:
 - Samples taken before and 2.5 yrs after the ban in Austin, TX show no discernable change in amount or sources of PAHs entering sediments – if sealers were an important source of PAHs, some change would have been expected especially in the intermittent and engineered streams of Austin, TX;
 - Studies indicate that particles of refined tar-based sealer are not very mobile in the environment (e.g., Austin before & after study, UNH study) and are not very available to aquatic organisms (many studies);
 - An evaluation of PAH fingerprints (“environmental forensics”) shows that RTS are not an important source of PAHs in sediments in general
 - The forensics evaluation of actual data demonstrates clearly that RTS are not a source at all of PAHs in many of the localities identified by the USGS’ mathematical models.

Risk Management

Cases of Misapplication of the Precautionary Principle

Jurisdictions that Have Banned RTS: Benefits versus Harm (1)

- Washington State
 - Lake Ballinger data used as justification by legislators
 - For historical & cost-competitive reasons, RTS not widely used in Washington State
 - WA Department of Ecology has conducted a mass balance to identify all sources of PAH in Puget Sound; even using CMB model data for inputs, RTS is insignificant
- No environmental benefit
- Little local economic harm
- Harm to credibility of science as a regulatory tool
- Increased distrust of government & government-generated science

Jurisdictions that Have Banned RTS: Benefits versus Harm (2)

- Austin, Texas
 - Claim of PAH problem in urban sediments used to justify ban
 - PAH problem was known not to exist, based on ASTDR public health consultation
- No environmental benefit
- Economic harm
 - Overall decrease in pavement maintenance activities using any method; harms both pavement businesses and owners of paved lots
 - Smallest businesses likely disappeared
- Harm to credibility of science as a regulatory tool
- Increased distrust of government & government-generated science

Jurisdictions that Have Banned RTS: Benefits versus Harm (3)

- Suffolk County, New York
 - Possible PAH problem in groundwater & surface water used to justify ban, even though off-label use of product by marinas and boat-works exempted
 - No PAH problem known to exist in waters or sediments anywhere in the county; explicitly promoted on the basis of the precautionary principle
 - Legislation passed by the county contains “scientific findings” that are ludicrous by any measure
- No environmental benefit
- Economic harm
 - Overall decrease in pavement maintenance activities using any method; harms both pavement business and owners of paved lots
 - Smallest businesses likely disappeared
 - Local manufacturers & contractors in process of adapting
- Harm to credibility of science as a regulatory tool
- Increased distrust of government & government-generated science

Jurisdictions that Have Banned RTS: Benefits versus Harm (4)

- Washington, D.C.
 - “Low Hanging Fruit” – seems to be referring to anti-coal, anti-petroleum preference of some DC staff
 - No input from industry sought
 - PAH problem exists, but specific studies identify many other sources
- No environmental benefit
 - Pinkney et al. (2011) show absence of relationship between tumors in fish & PAH concentrations in Chesapeake Bay sediment
- Economic harm
 - Overall decrease in pavement maintenance activities using any method; harms both business and owners of paved lots
 - Smallest businesses likely disappeared
 - DC has issued citations even though unable to distinguish between RTS and other sealer materials
- Harm to credibility of science as a regulatory tool
- Increased distrust of government & government-generated science

Conclusions

- Use of the precautionary principle as a risk management tool can be thought of in two ways: in theory and in practice.
- In practice, the precautionary principle has been used arbitrarily & selectively to propose bans on products perceived by some interest group as “bad”.
- When the precautionary principle is promoted as overriding other risk management considerations, the reason seems to be an unwillingness to consider actual, knowable harms that should also be considered.
- Public policy abuse of the precautionary principle is apparent in the case of RTS: the precautionary principle has been used in the name of the environment in the absence of evidence of benefit to the environment.
- Risk Management avoids use of the precautionary principle because management should not be based on *hypothetical* environmental benefits when the “first, do no harm” element of precaution demands consideration of *actual, knowable* harm (for example societal costs)’.

Questions?

Anne P. LeHuray, Ph.D.

Pavement Coatings Technology Council

2308 Mount Vernon Avenue, Suite 134

Alexandria, VA 22301

Phone: (703) 299-8470

Fax: (703) 842-8850

Email: alehuray@pavementcouncil.org

Web Site: <http://www.pavementcouncil.org/>