

# Mercury Deposition in Central Indiana

The impacts of local mercury deposition on soils and  
stream sediments in central Indiana

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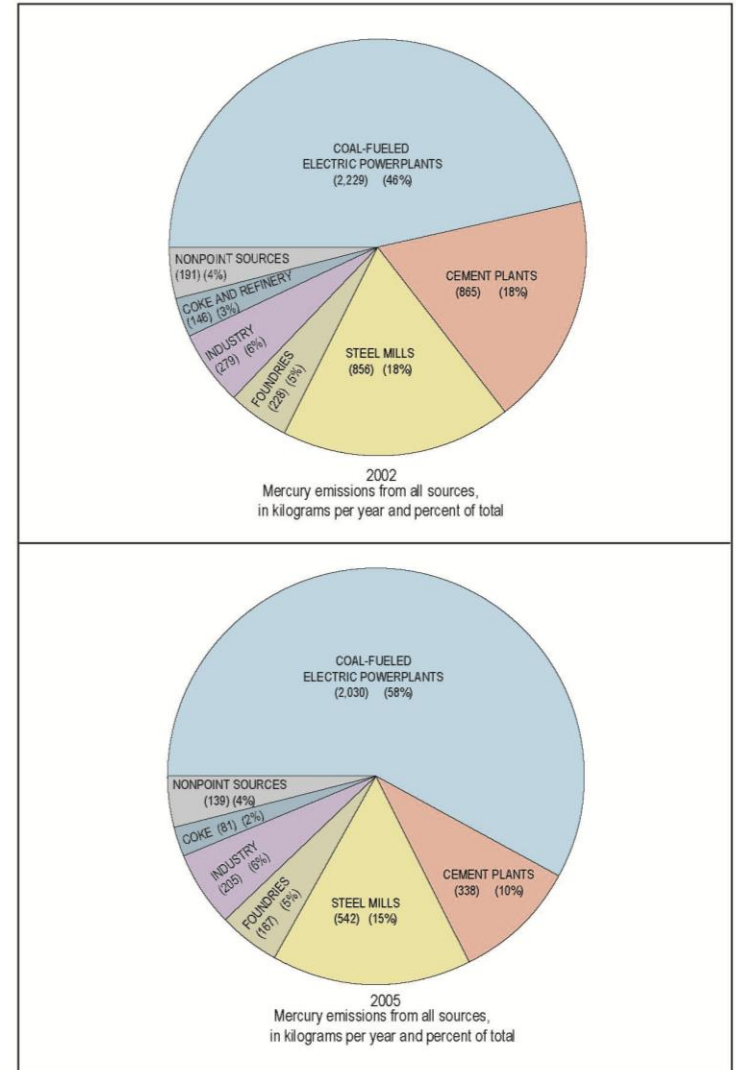
and

Martin Risch

U.S. Geological Survey

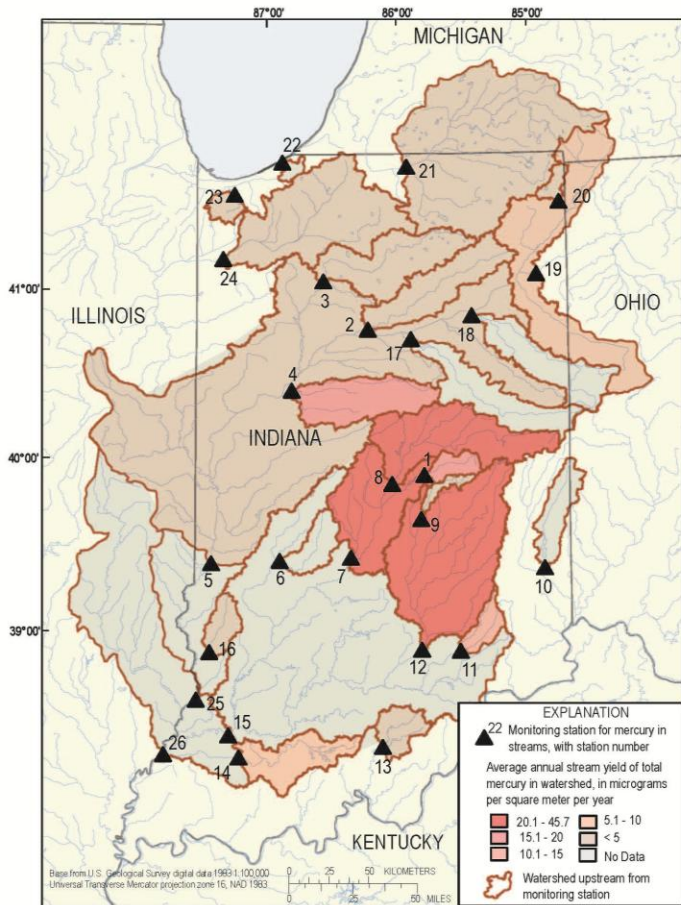
# Background

- Mercury cycle has global and local components
- Impending EPA mercury rule
- Much of the mercury emissions come from coal, a portion of the emissions pie that has been increasing in Indiana
  - Do these local emissions result in local deposition?
  - If so, what is the spatial extent of this deposition?
  - What happens to mercury after it is deposited?

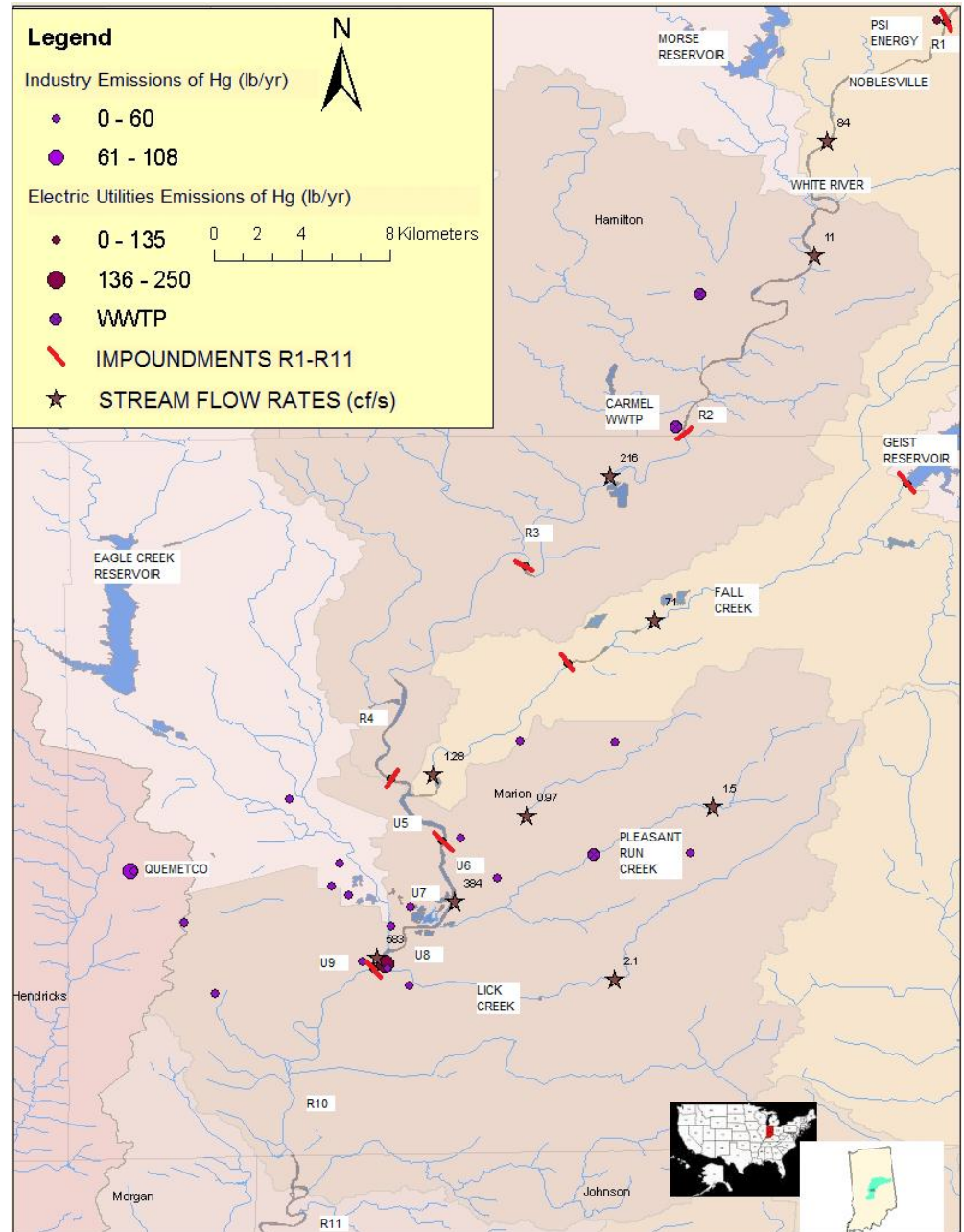


Annual emissions of mercury to the atmosphere from all categories of sources in Indiana in 2002 and 2005 based on data from Regional Air Pollutant Inventory Development System, Indiana Department of Environmental Management, 2005, 2008). Figure from U.S. Geological Survey Professional Paper 1780 by Risch and others, 2010.

# White River Watershed



Average annual stream yields of total mercury in watershed upstream from monitoring stations on Indiana streams, 2002-2006. Figure from U.S. Geological Survey Professional Paper 1780 by Risch and others, 2010.



# Objectives

- To characterize net depositional patterns from a geospatial perspective using soil samples
  - Inexpensive, easy to collect and measure
  - May provide landscape-based data on mercury transport to riparian zones
- To monitor transport of mercury along an impounded and urbanized river system
  - Impoundments may enhance methylation processes
  - Mercury content of sediments one component of methylmercury fluxes
  - Many urban anglers

# Soil Mercury

- Analyzed hundreds of soil mercury samples
- Kriged data model
- Indicates strong urban concentration

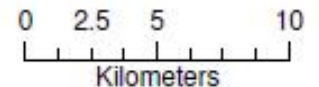


Hg Concentration, ppb

Kriging

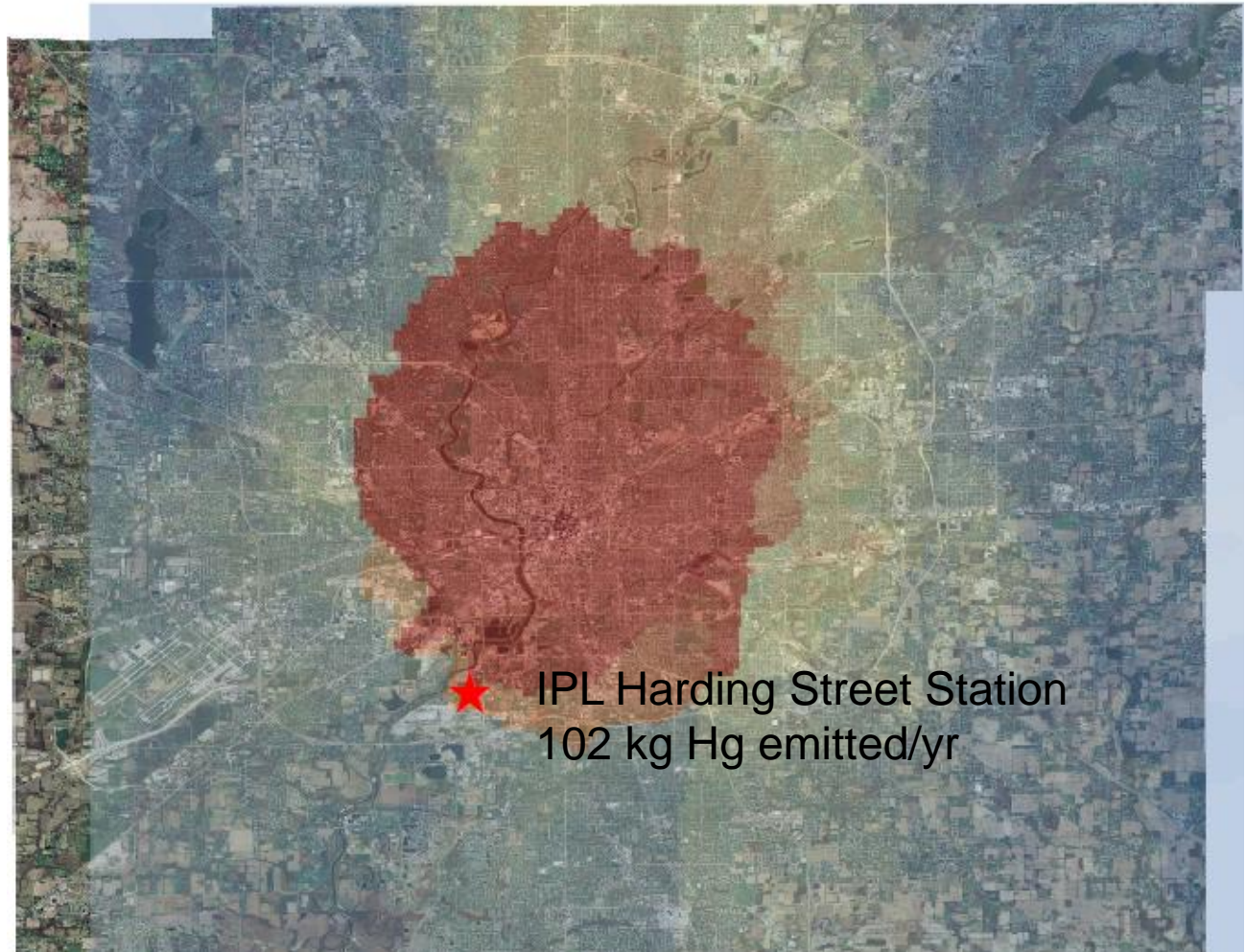
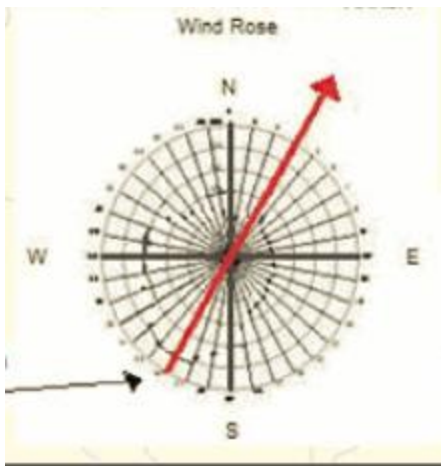
High : 711

Low : 23



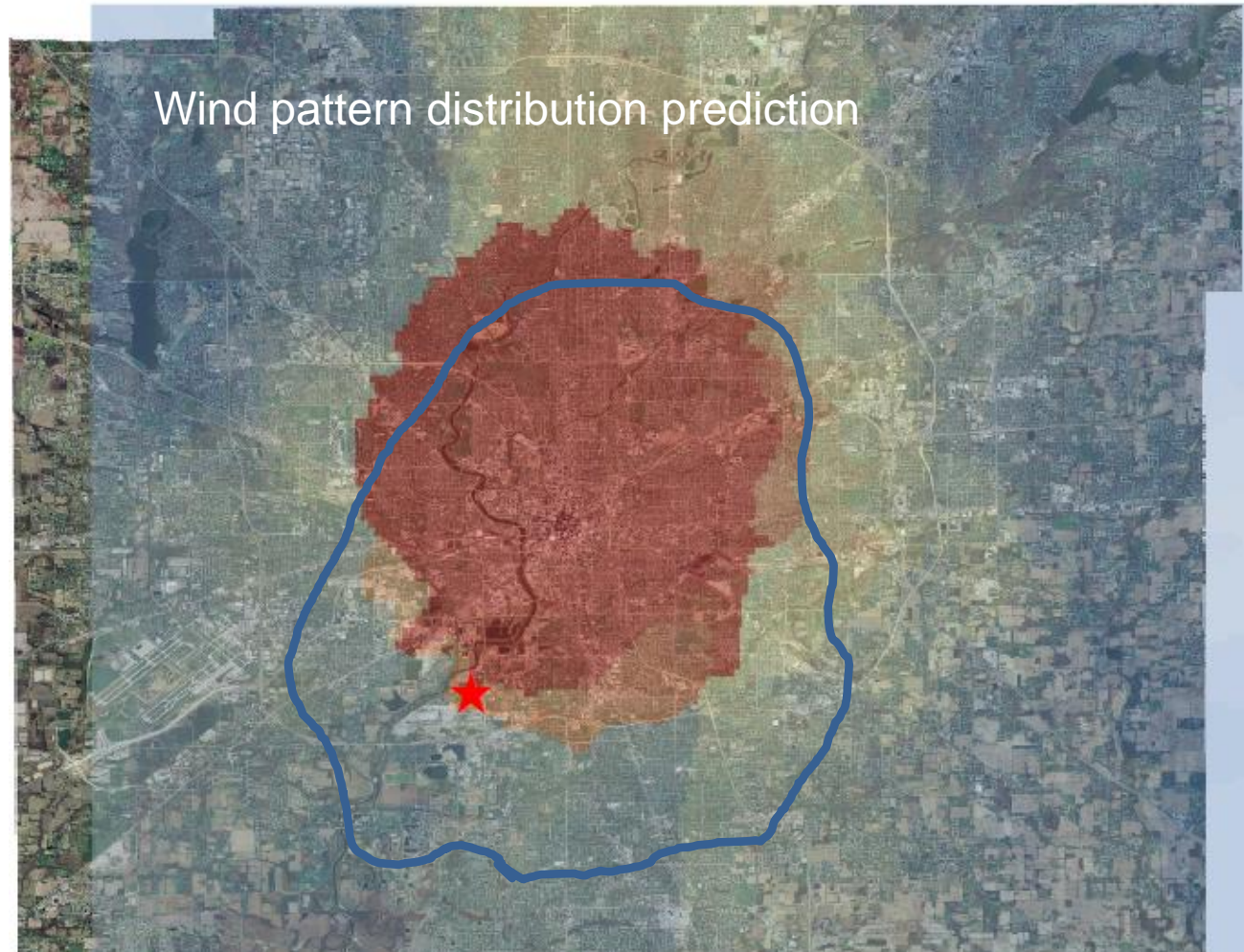
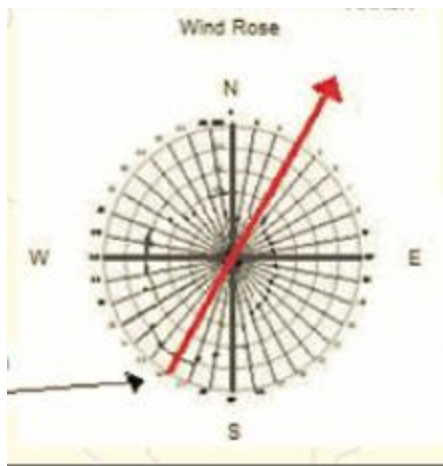
# Soil Mercury

- Explanation for pattern
  - Sources
  - Wind rose



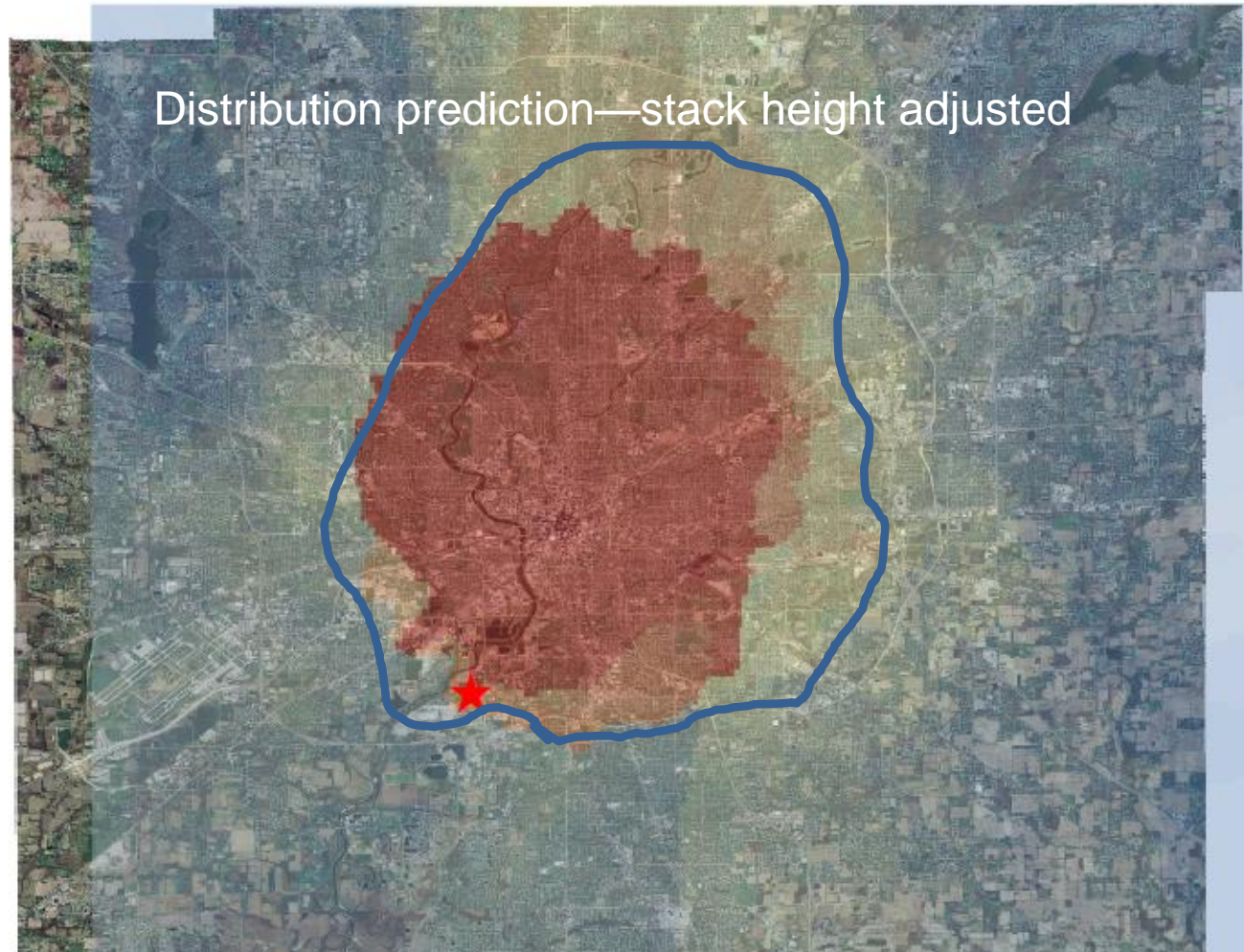
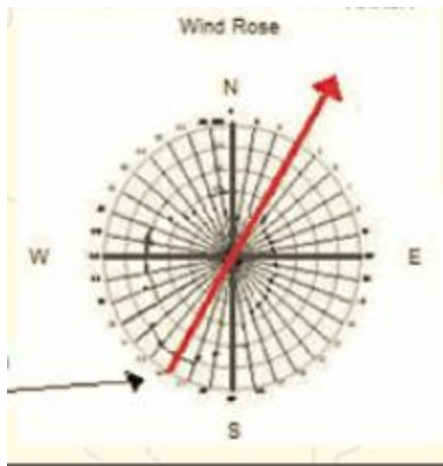
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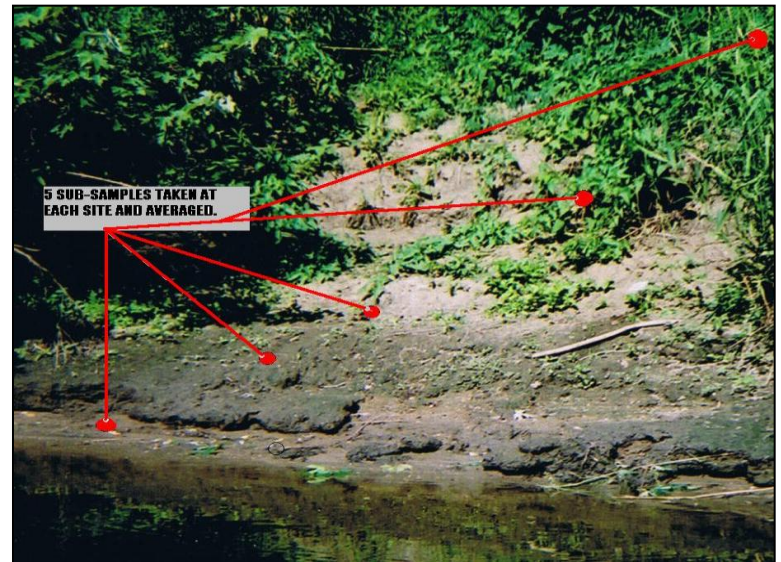
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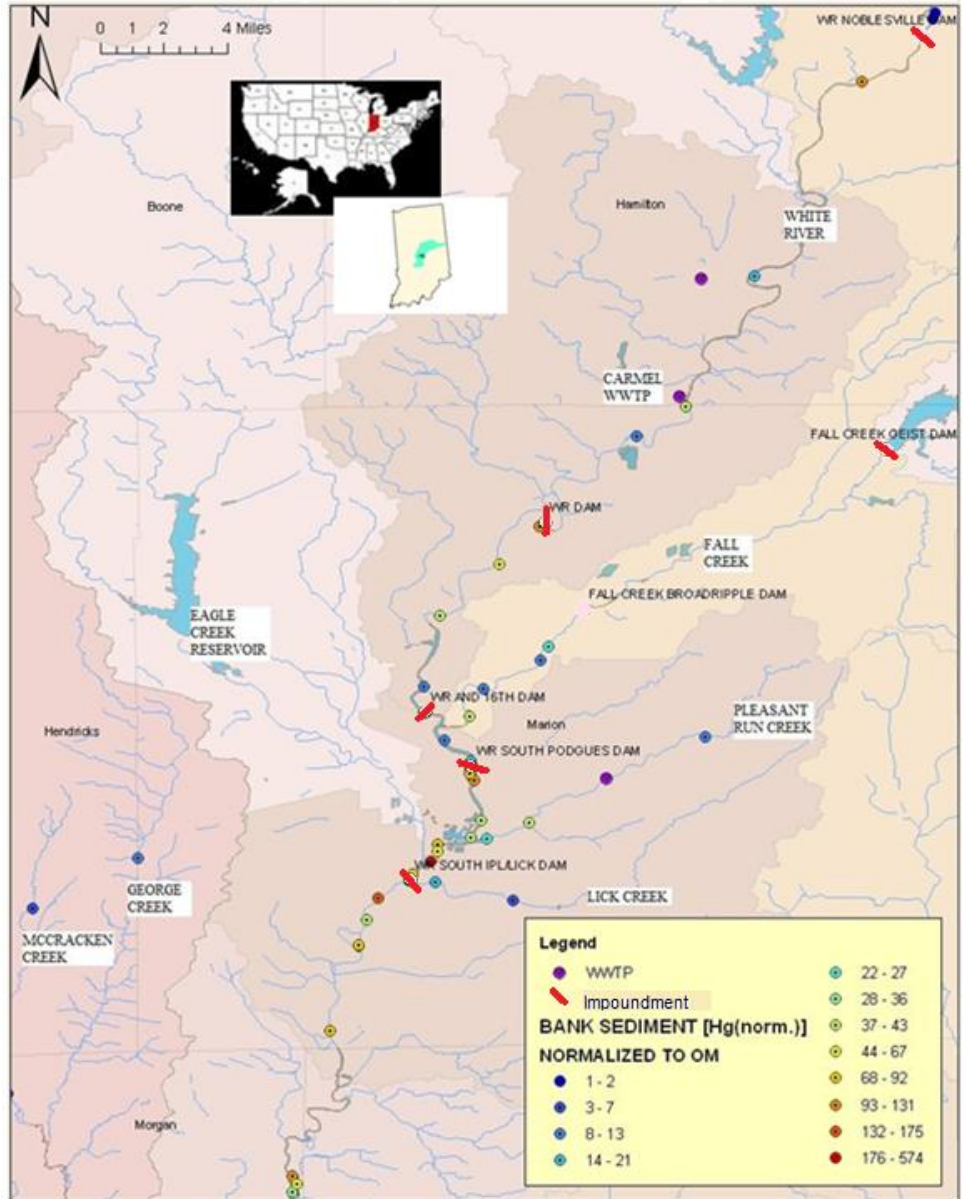
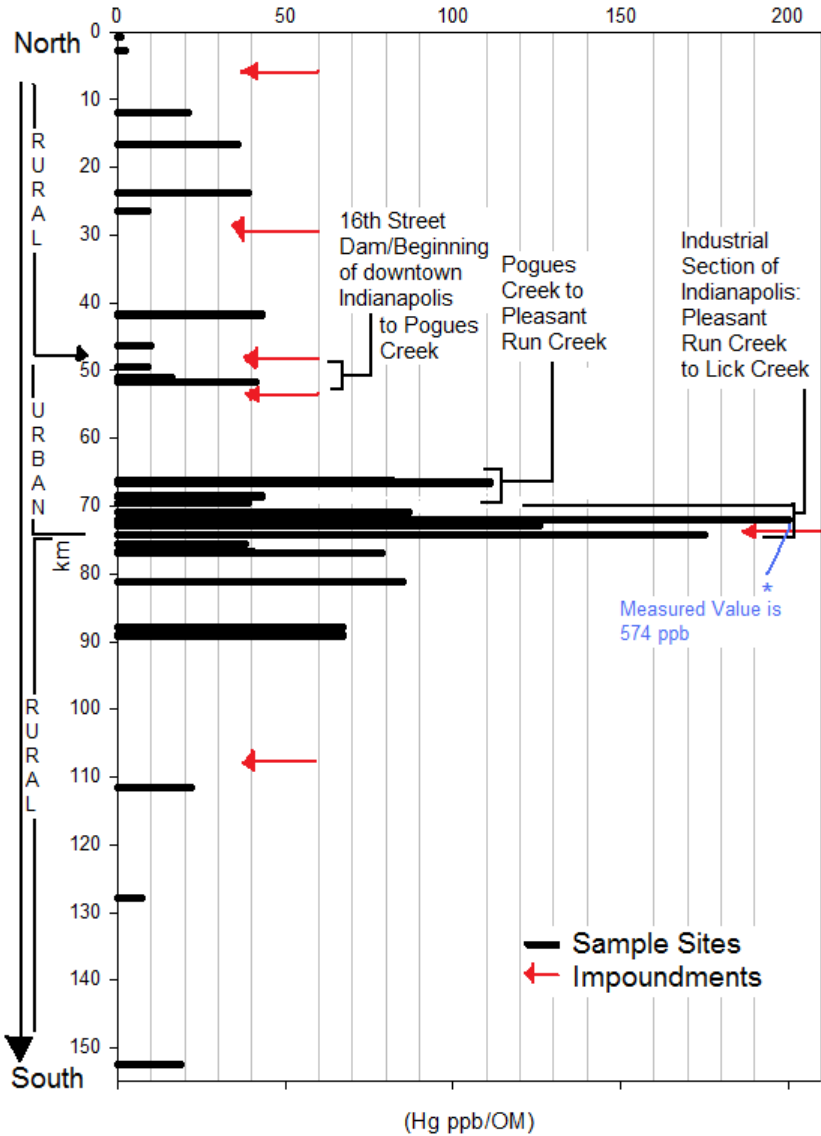


# Stream Sediment Mercury

- Sampled along White River and Fall Creek
  - Utilized transect sampling from waters edge
  - Normalized mercury values to organic matter to get “excess” mercury

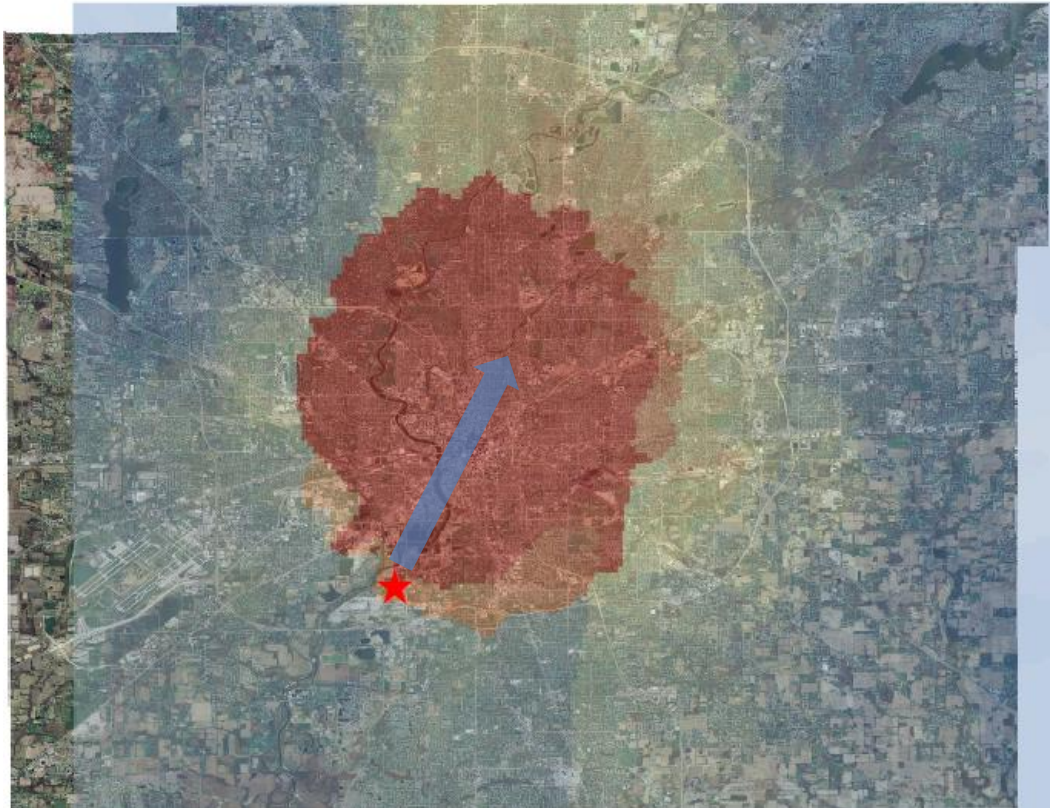


### Hg Bank Sediment Concentrations



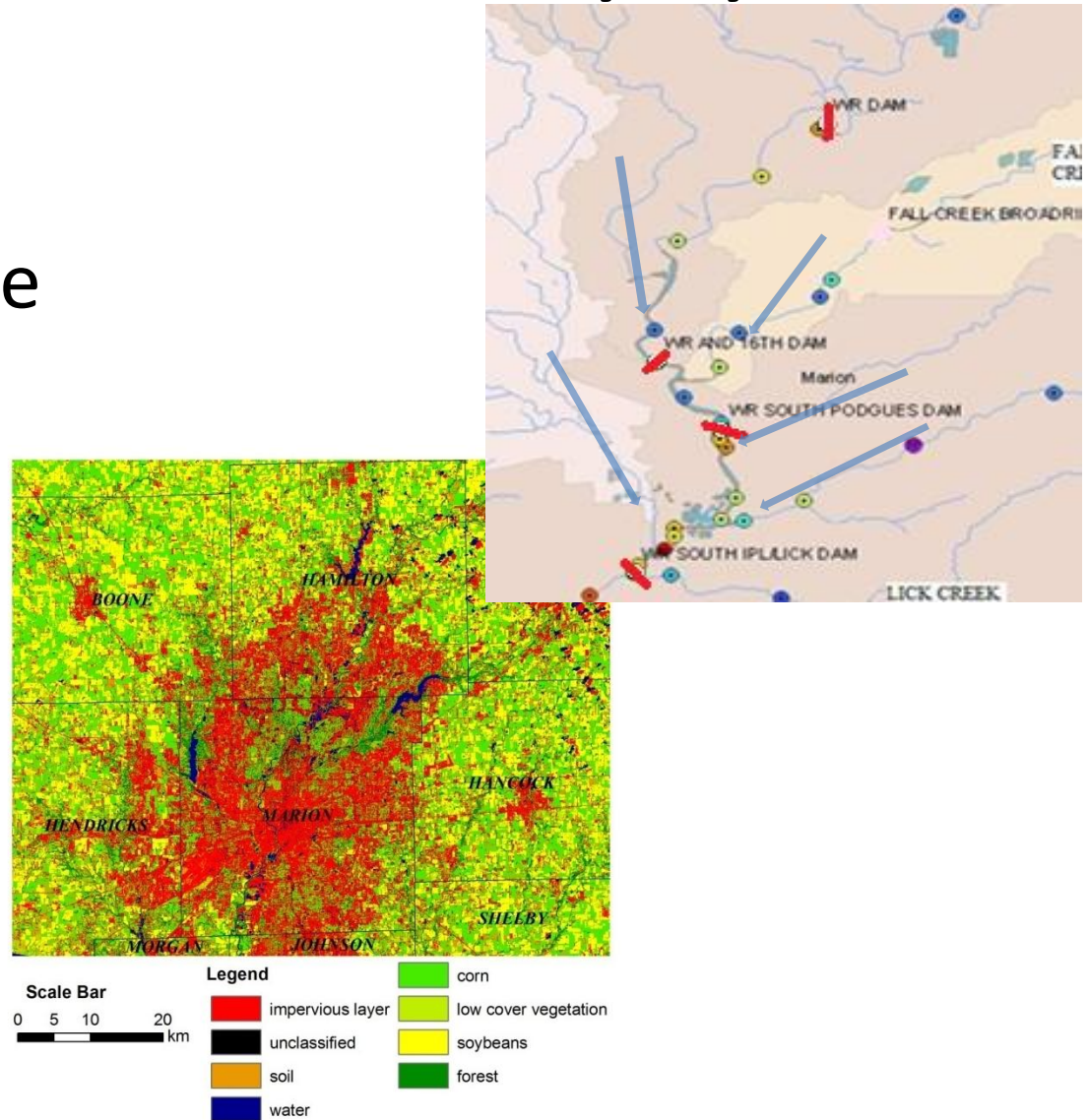
# Central Indiana Mercury cycle

- Links between
- **deposition on the landscape**
- transport in subwatersheds
- eventual transport downstream



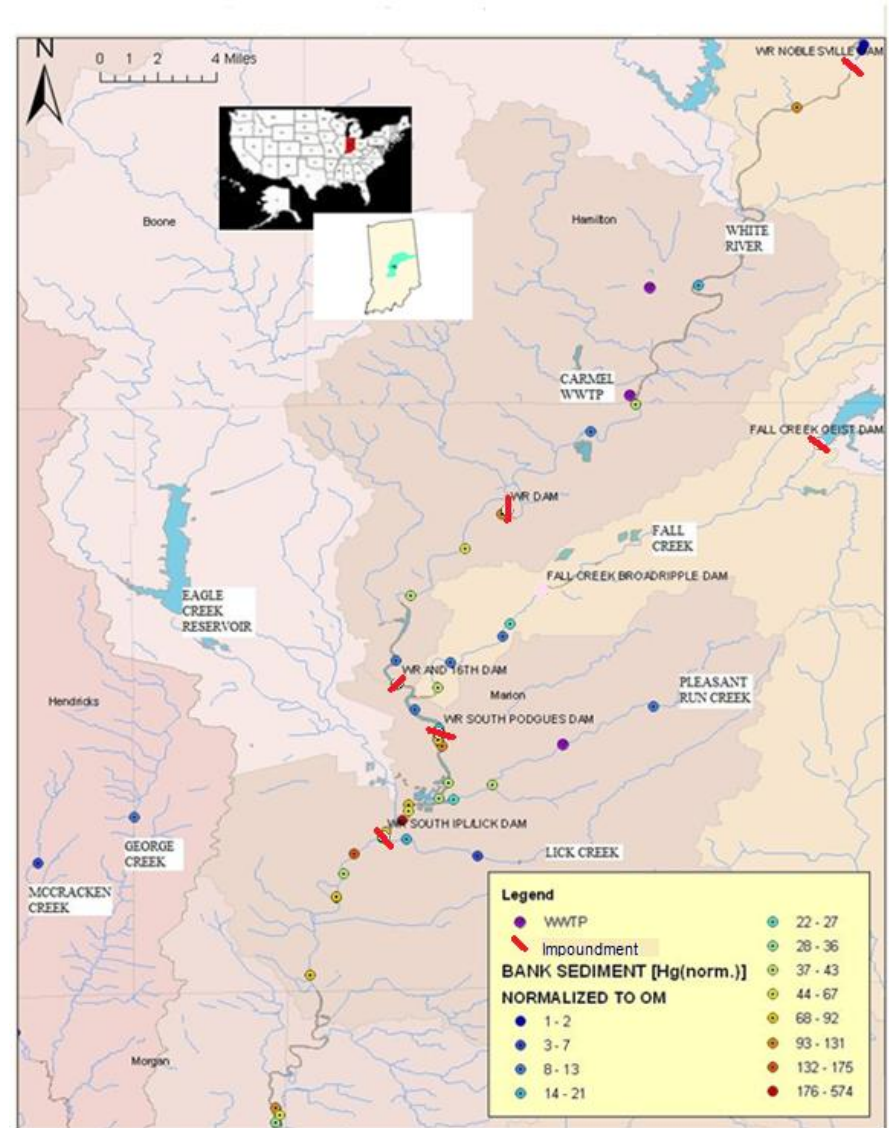
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# Conclusions

- Emission sources have a local depositional impact
- Atmospheric and hydrologic processes critical for risk analysis
  - Net northeastward atmospheric deposition pattern
  - Net southwestward riverine transport of mercury
- Urban sources persist well into rural localities via riverine transport
- Implications for anglers, their families collecting fish from “pristine” rural river stretches

A portion of this study published in Hatcher and Filippelli, July, 2011, Water, Air & Soil Pollution