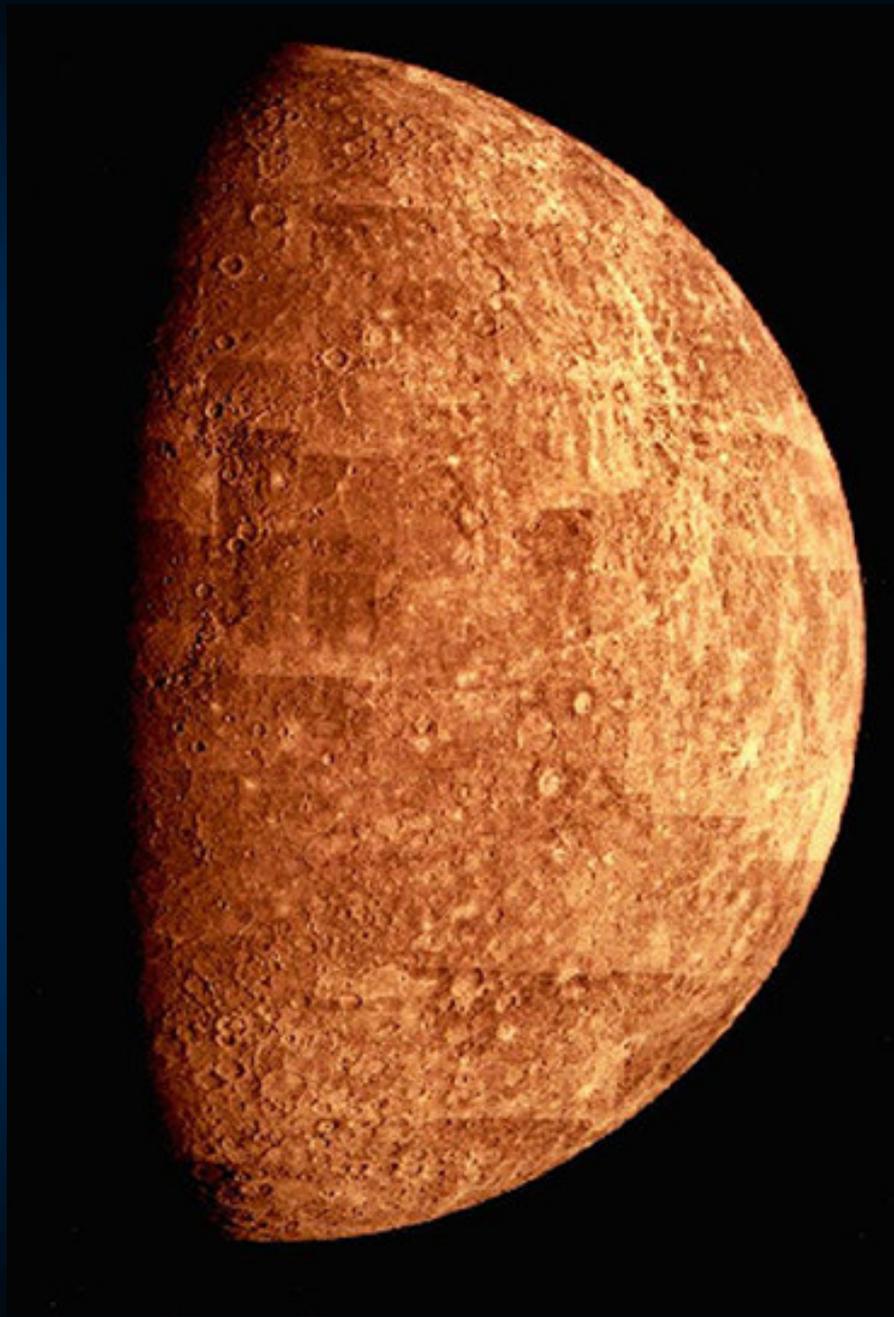


# Increased Atmospheric Mercury Deposition near Major Urban Areas



Peter Van Metre





# Comments to the TCEQ Advisory Group on Hg Impaired Waters

## Association of Electric Companies of Texas

- Global surveys of annual mercury emissions from all industrial and energy activities show that Asia emits roughly half, and an increasing percentage, of the anthropogenic mercury emissions emitted.
- The U.S., on the other hand, altogether emits 5% of the annual global anthropogenic mercury emissions, of which U.S. power plants emit less than 2%.

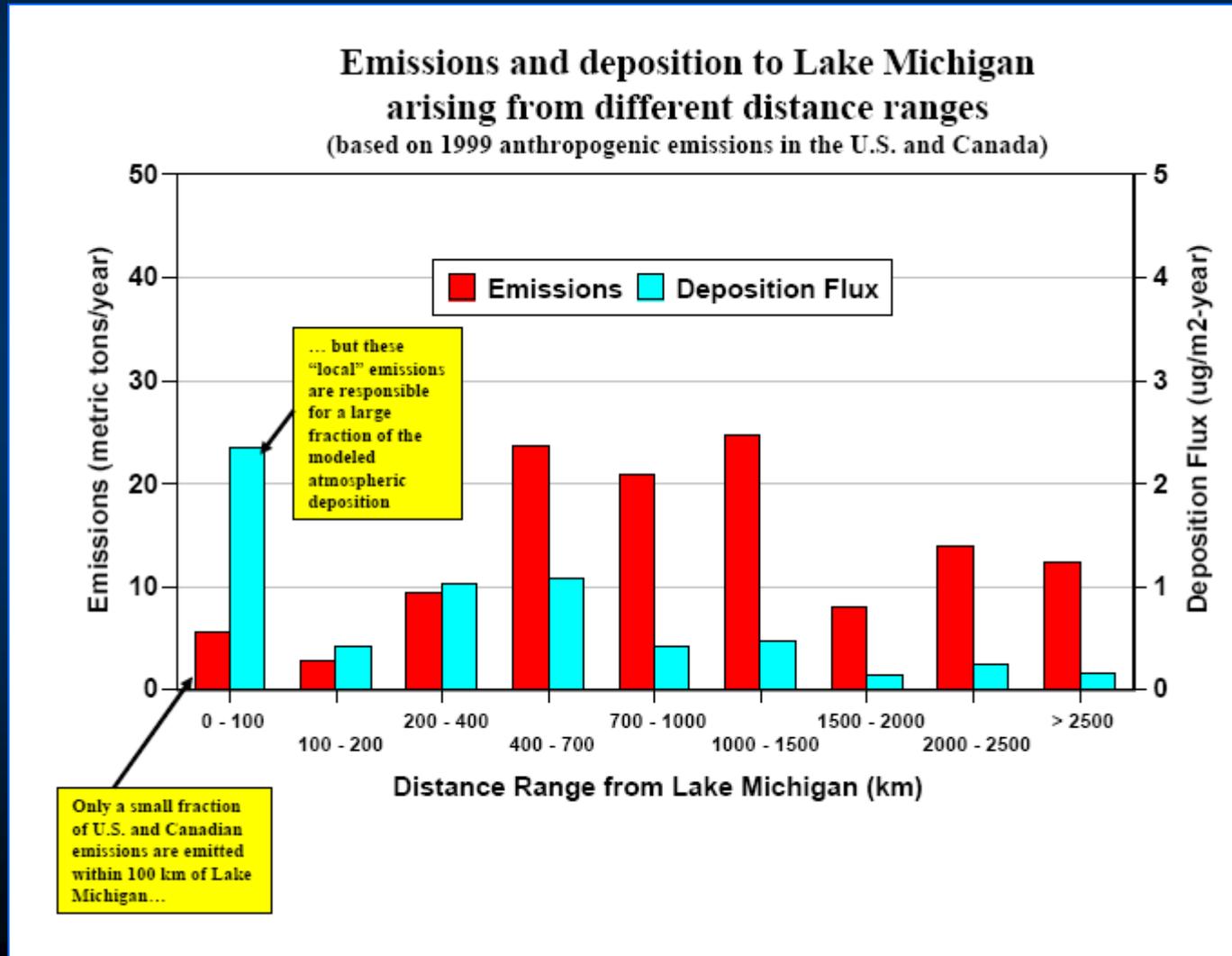
## Portland Cement Association

Because such a large majority of the mercury deposited in Texas is from non-Texas sources, it is likely that eliminating all mercury emissions from Texas sources would have little to no impact on the levels of mercury in Texas fish and ultimately people. Moreover, based on



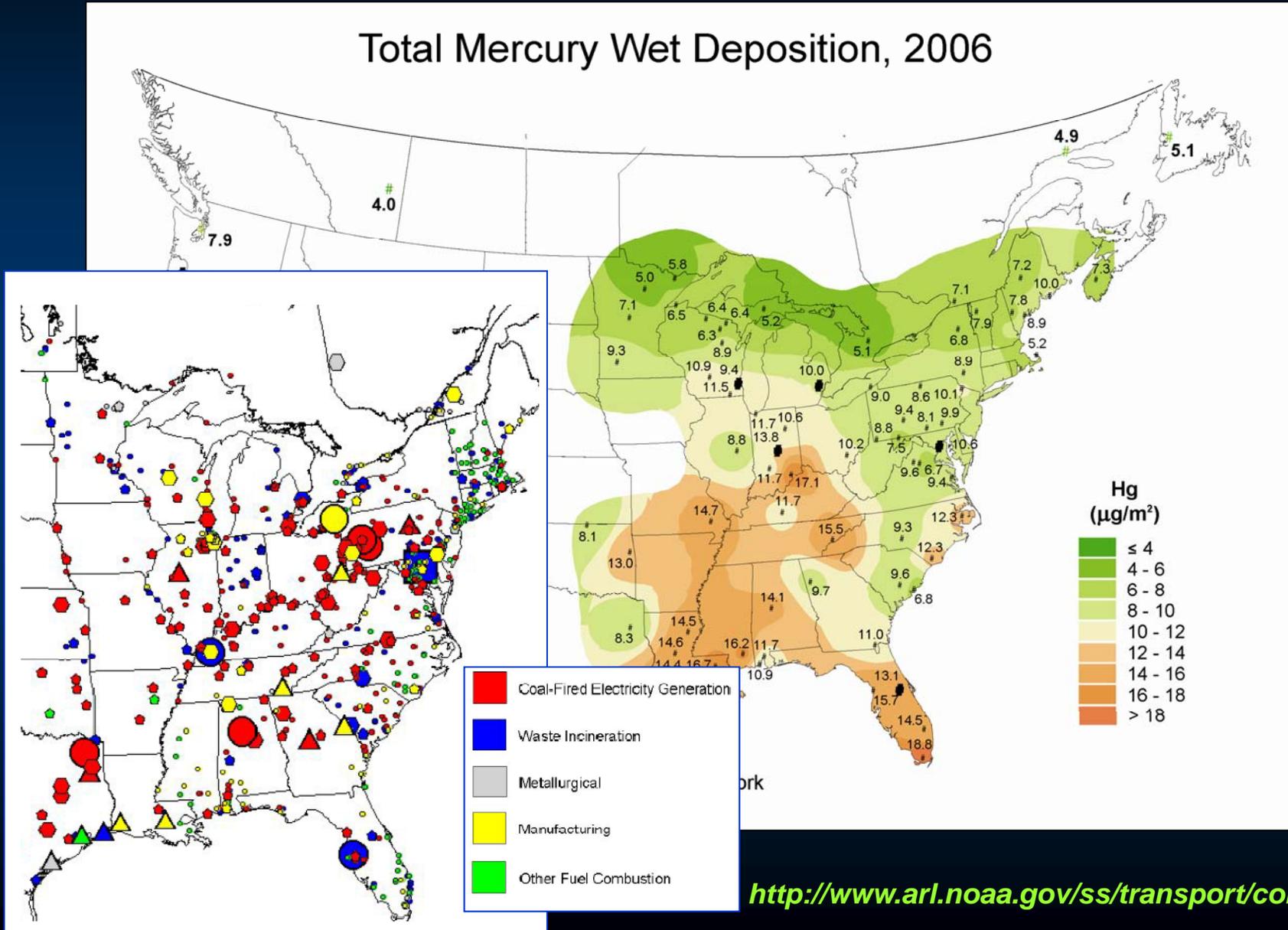
# HYSPLIT

Hybrid Single Particle Lagrangian Integrated Trajectory Model  
NOAA: [http://www.arl.noaa.gov/Mercury\\_modeling.php](http://www.arl.noaa.gov/Mercury_modeling.php)



# Mercury Deposition Network

Total Mercury Wet Deposition, 2006

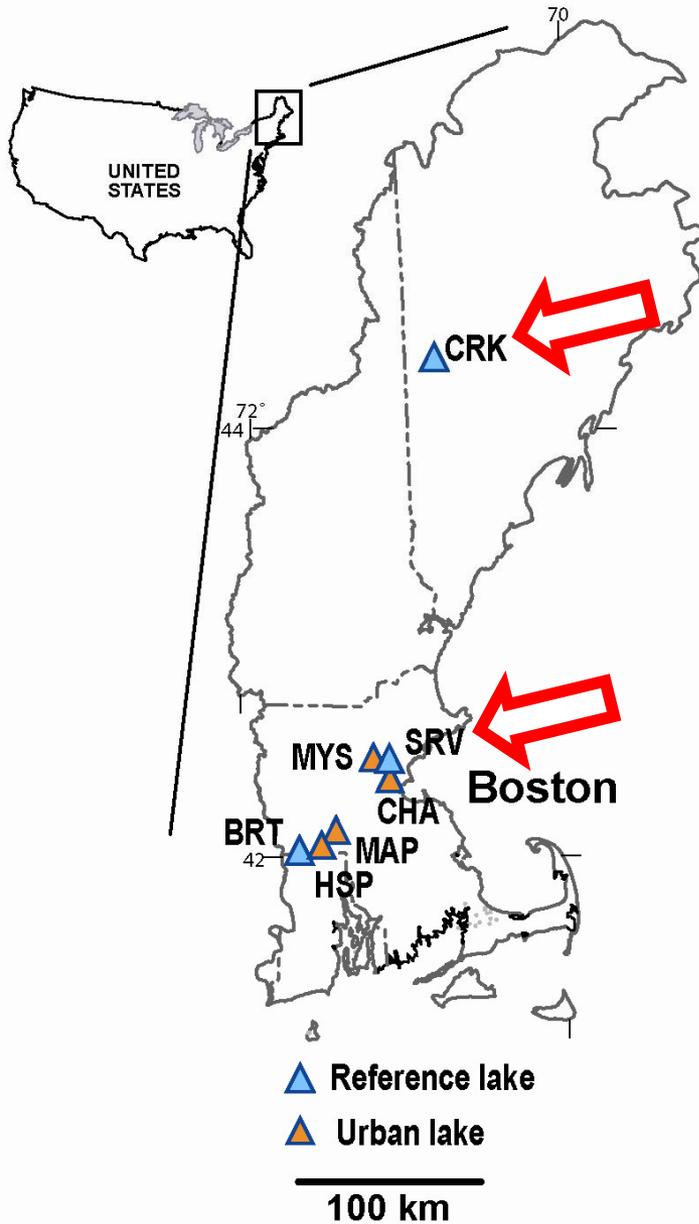


# NAWQA – National Water Quality Assessment Program



- ❑ **STATUS** – characterize water quality nationally
- ❑ **TRENDS** – describe trends, or lack of trends
- ❑ **UNDERSTANDING** – identify and explain major factors controlling water quality

## Crocker Pond, ME

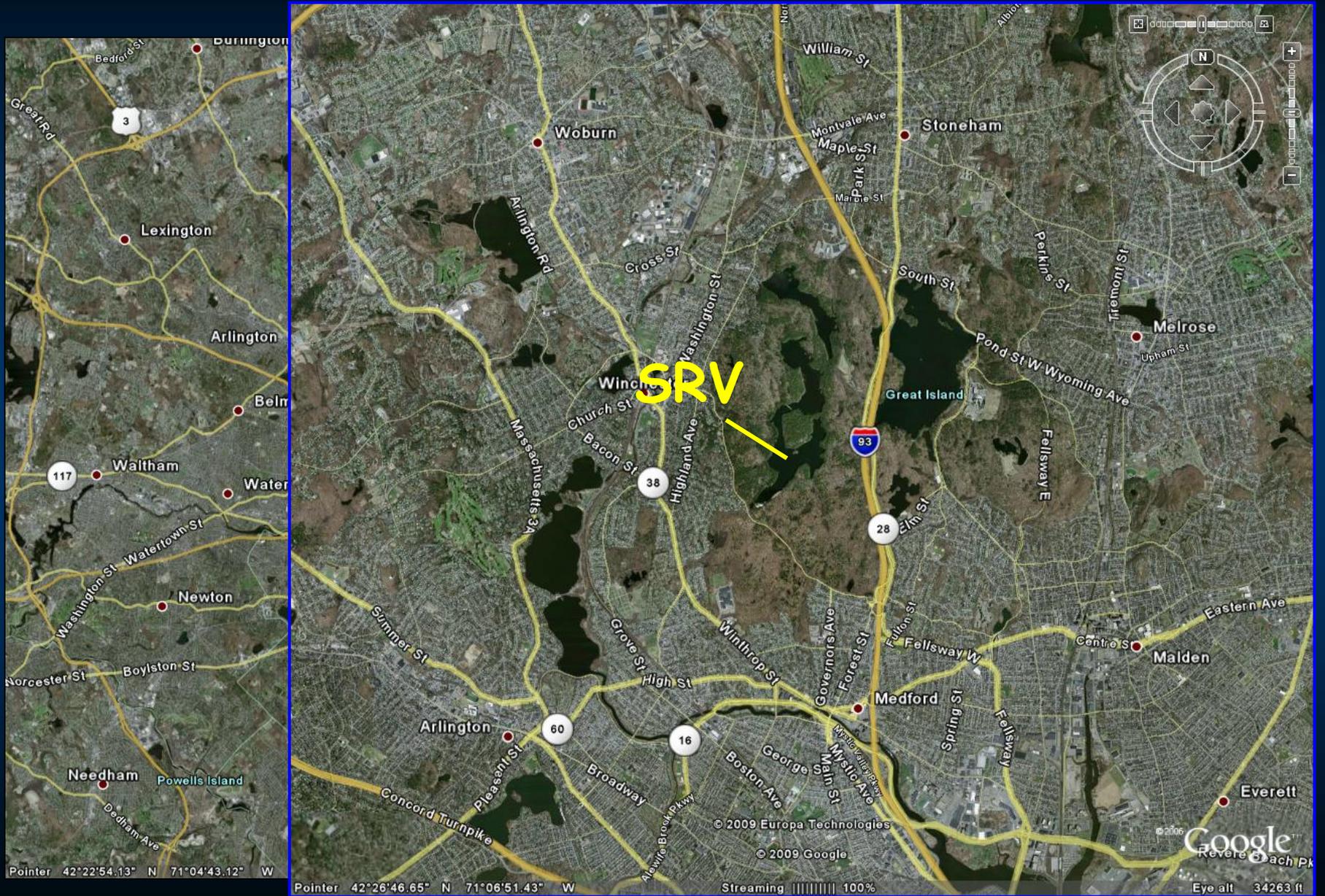


## South Reservoir, Medford, MA



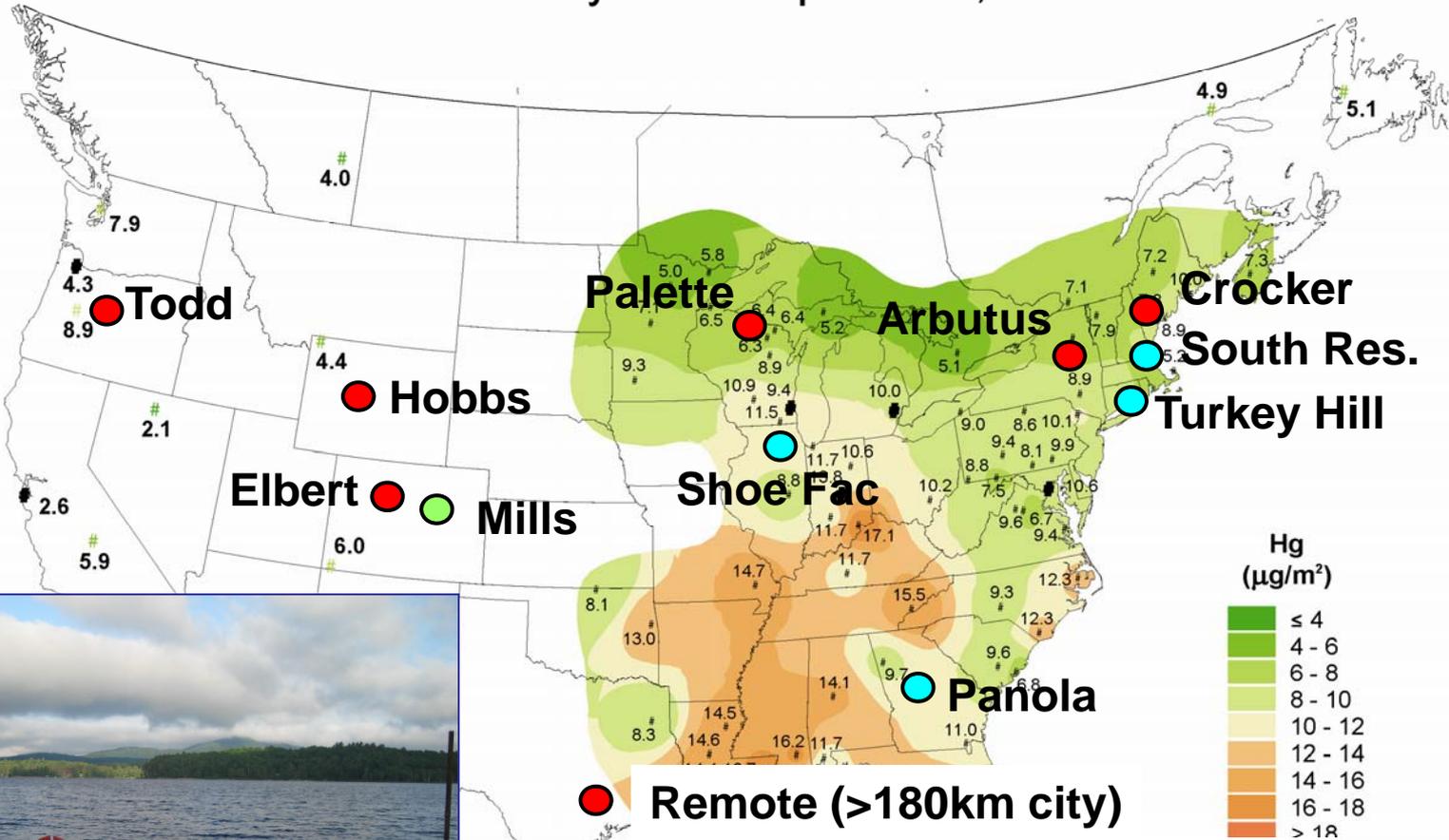
9/1/2000

# South Reservoir, MA



# Lakes Sampled

Total Mercury Wet Deposition, 2006



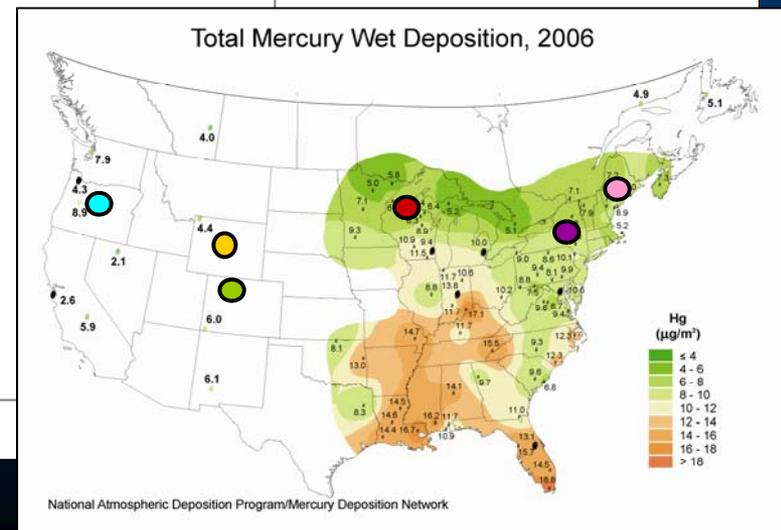
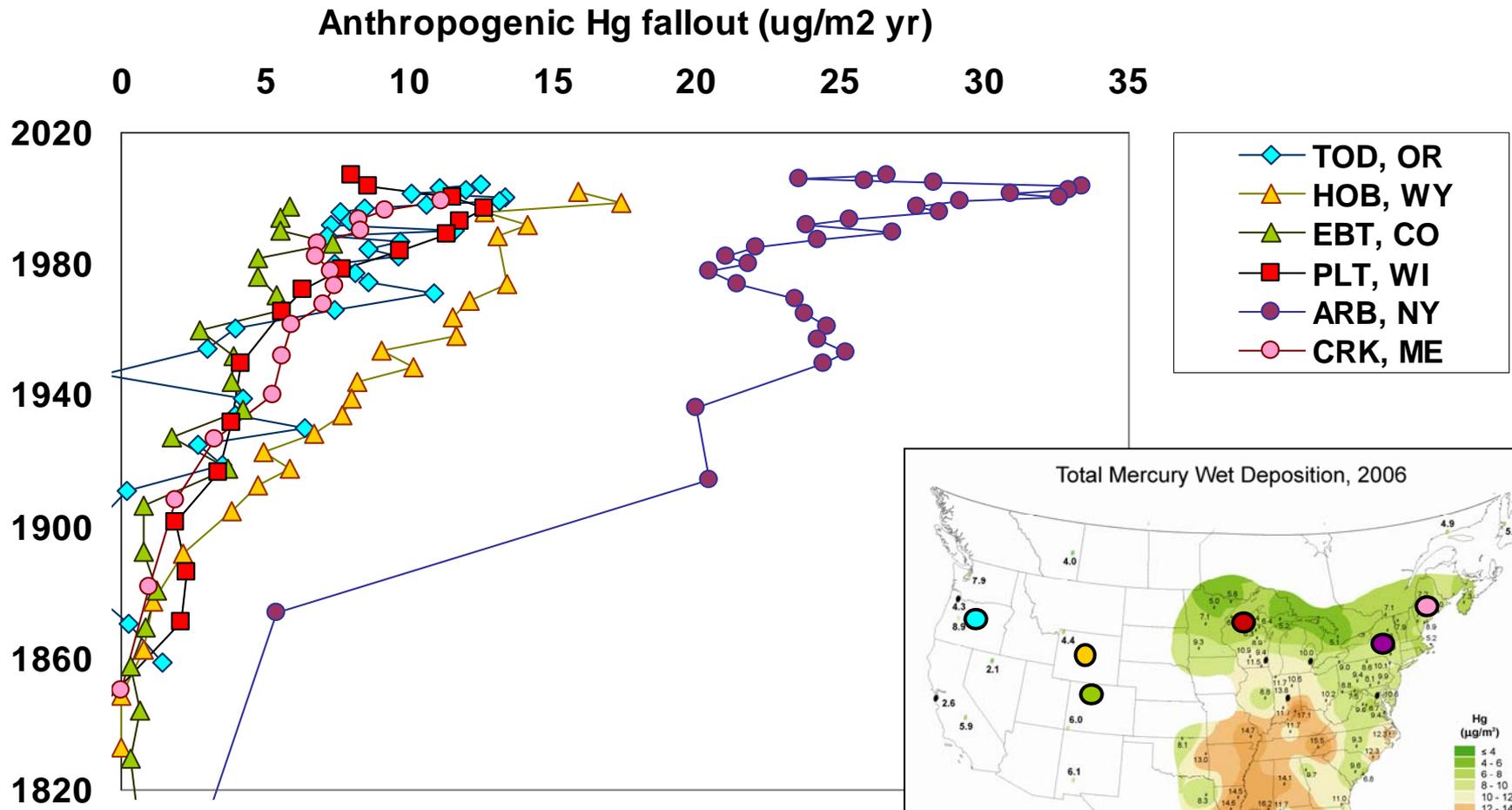
am/Mercury De

● Remote (>180km city)

● Near Urban (<50km city center)

● Mills (90 km)

# Anthropogenic Hg fallout to Remote Lakes

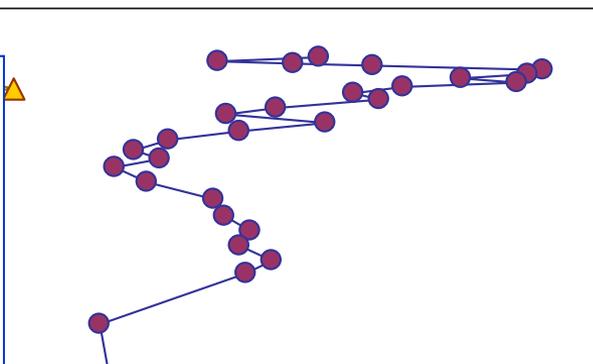
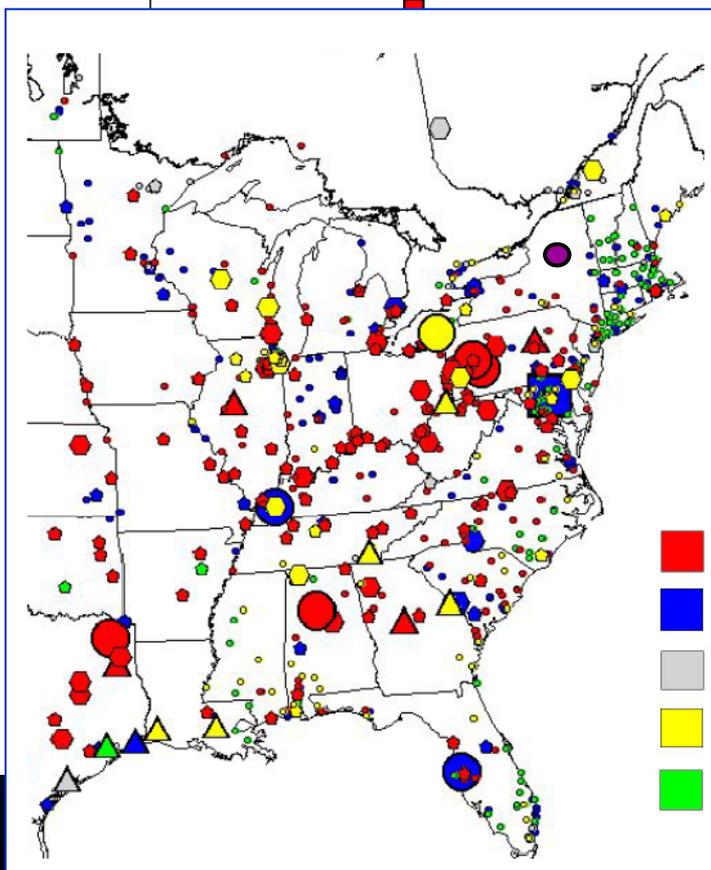


# Anthropogenic Hg fallout Remote Lakes

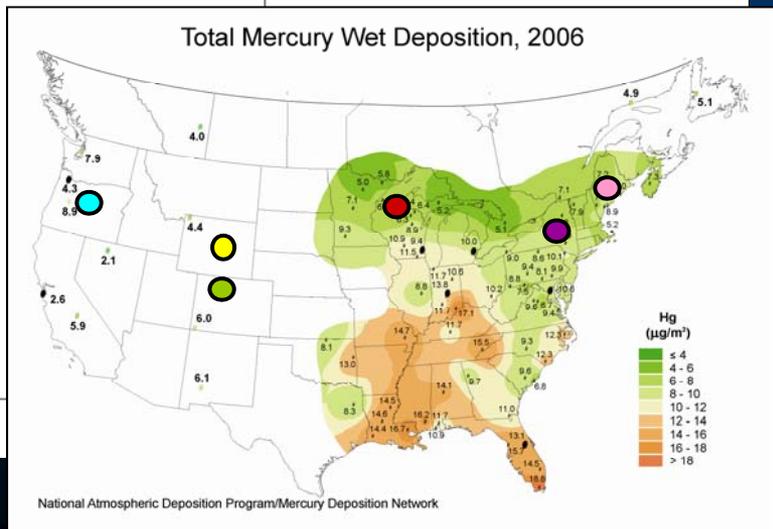
Anthropogenic Hg fallout ( $\mu\text{g}/\text{m}^2 \text{ yr}$ )

0 5 10 15 20 25 30 35

2020



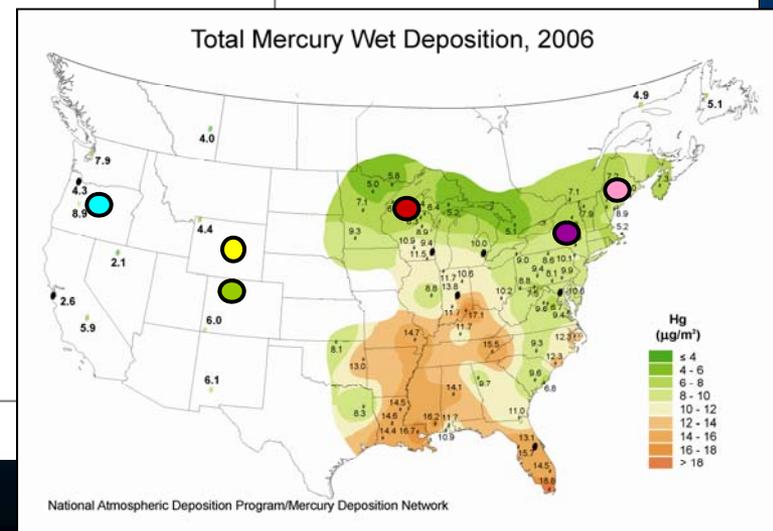
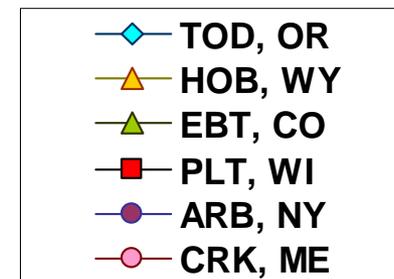
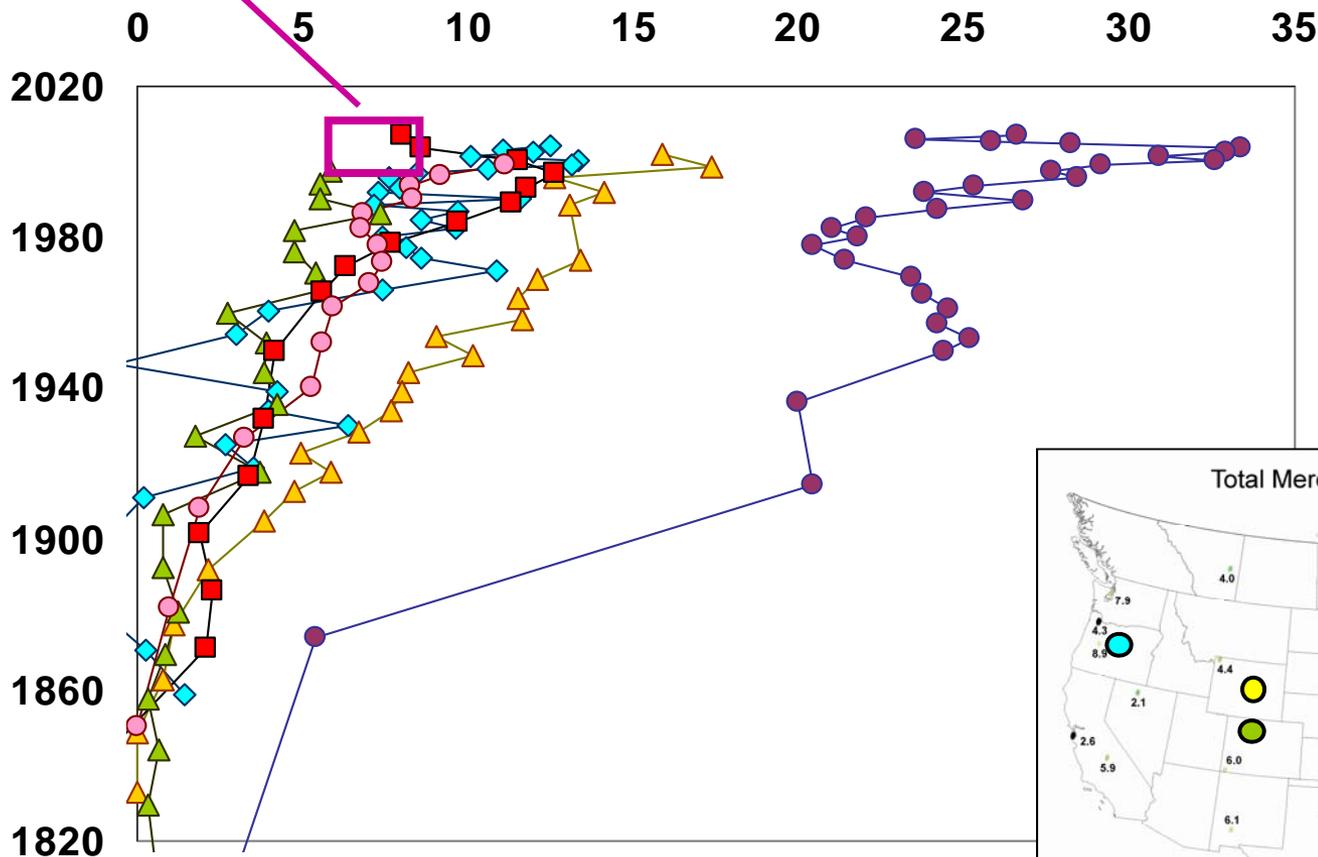
- ◆ TOD, OR
- ▲ HOB, WY
- ▲ EBT, CO
- PLT, WI
- ARB, NY
- CRK, ME



# Anthropogenic Hg fallout Remote Lakes

MDN >150 km city  
6.9 ug/m<sup>2</sup> yr +/-1.4

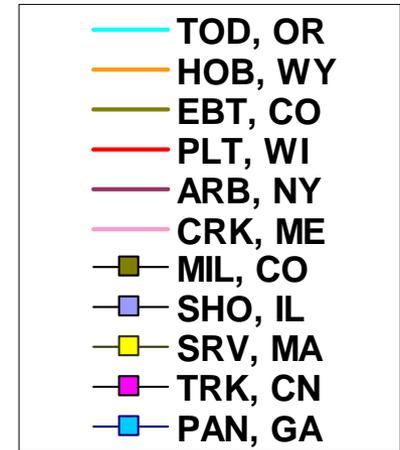
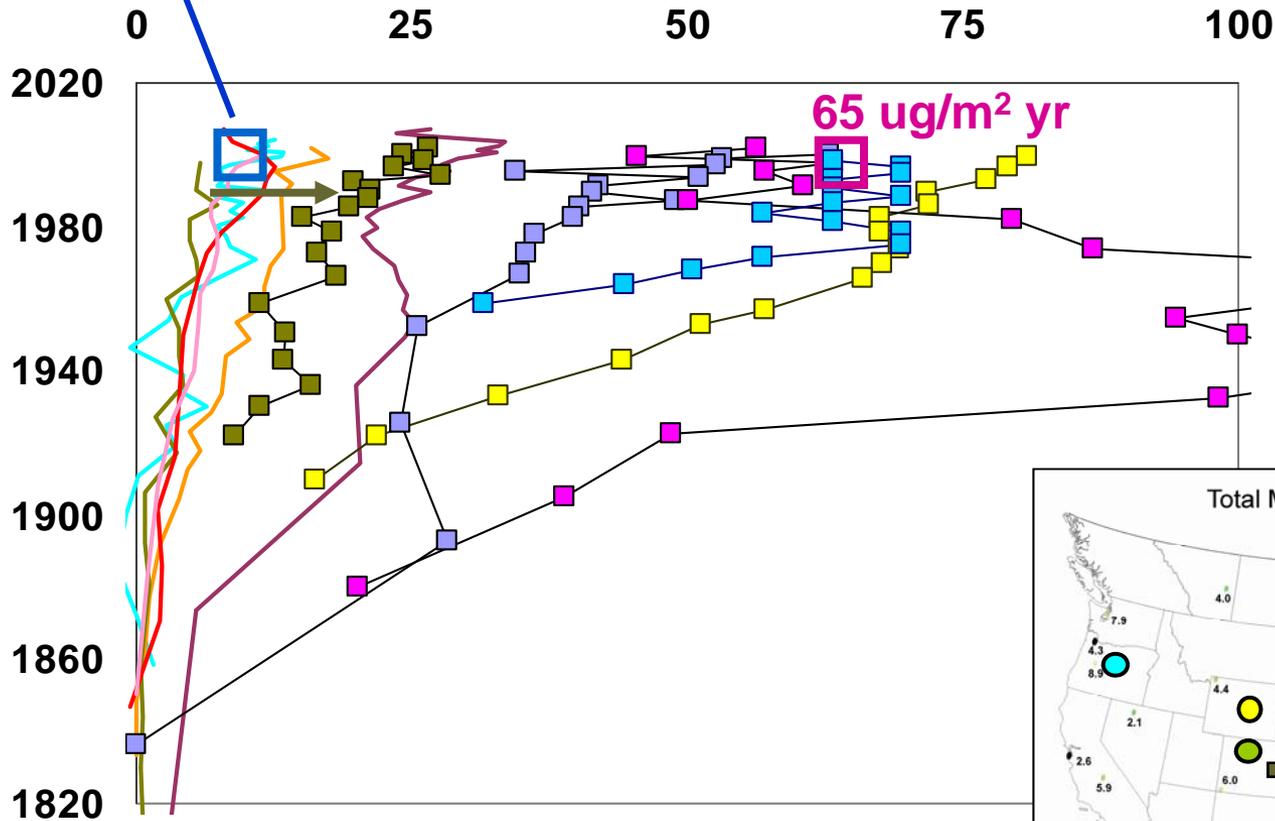
Anthropogenic Hg fallout (ug/m<sup>2</sup> yr)



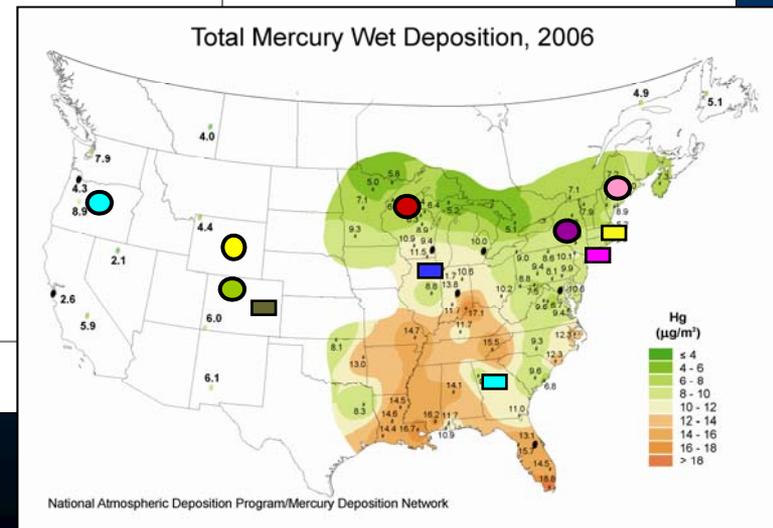
# Urban airshed effect?

MDN <150 km city  
9 ug/m<sup>2</sup> yr +/-2

Biogenic Hg fallout (ug/m<sup>2</sup> yr)

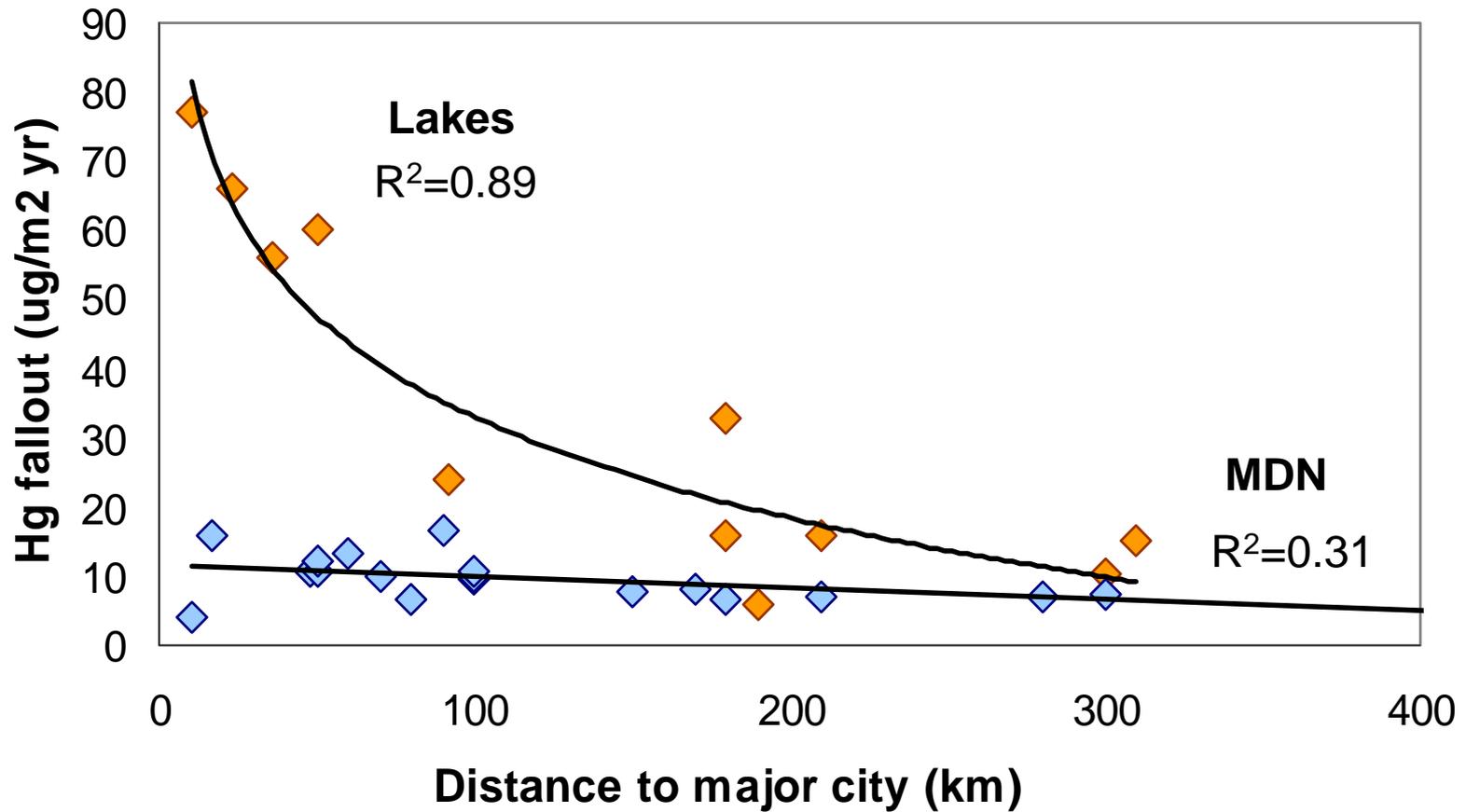


Near urban lakes

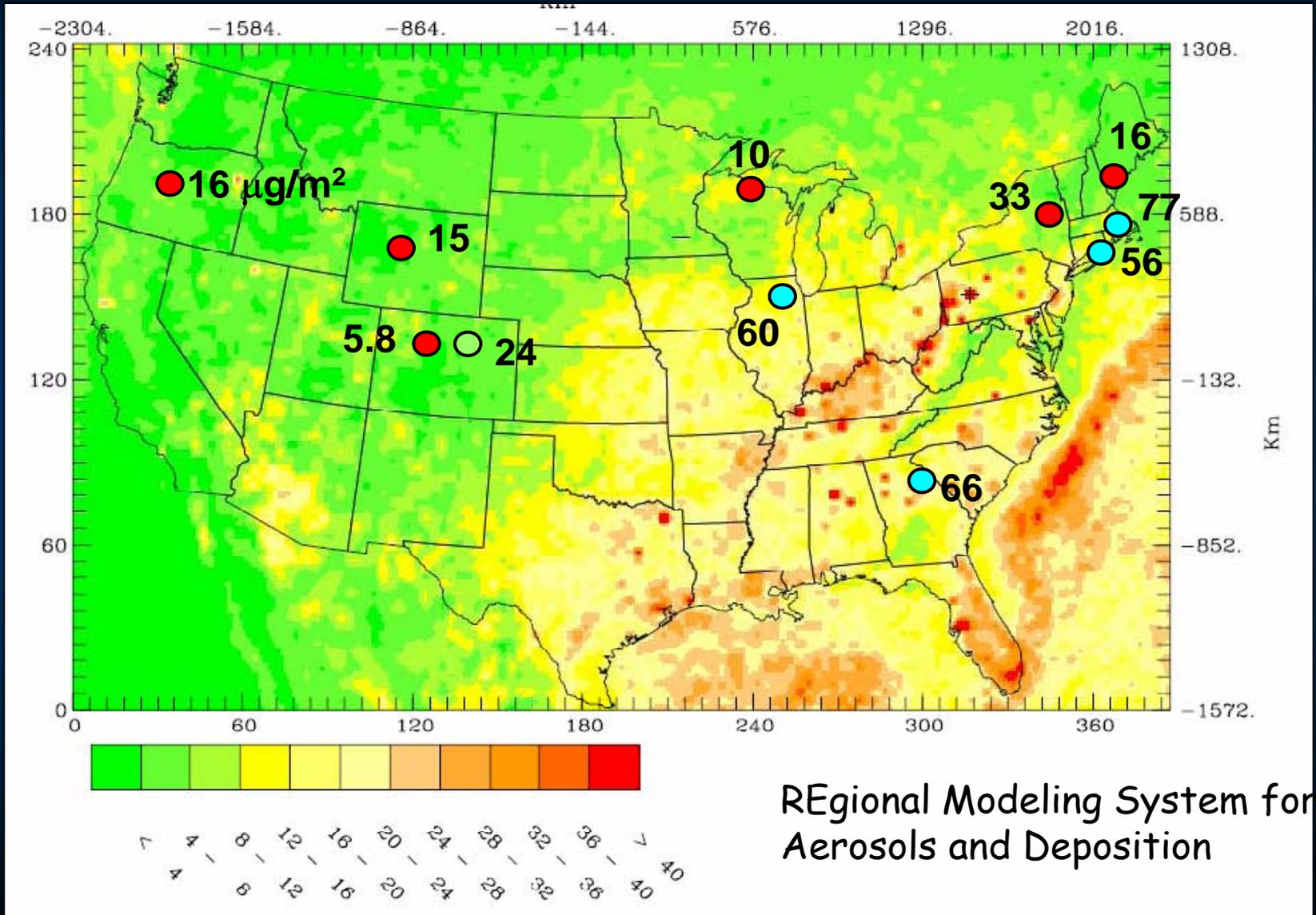




# versus distance to city

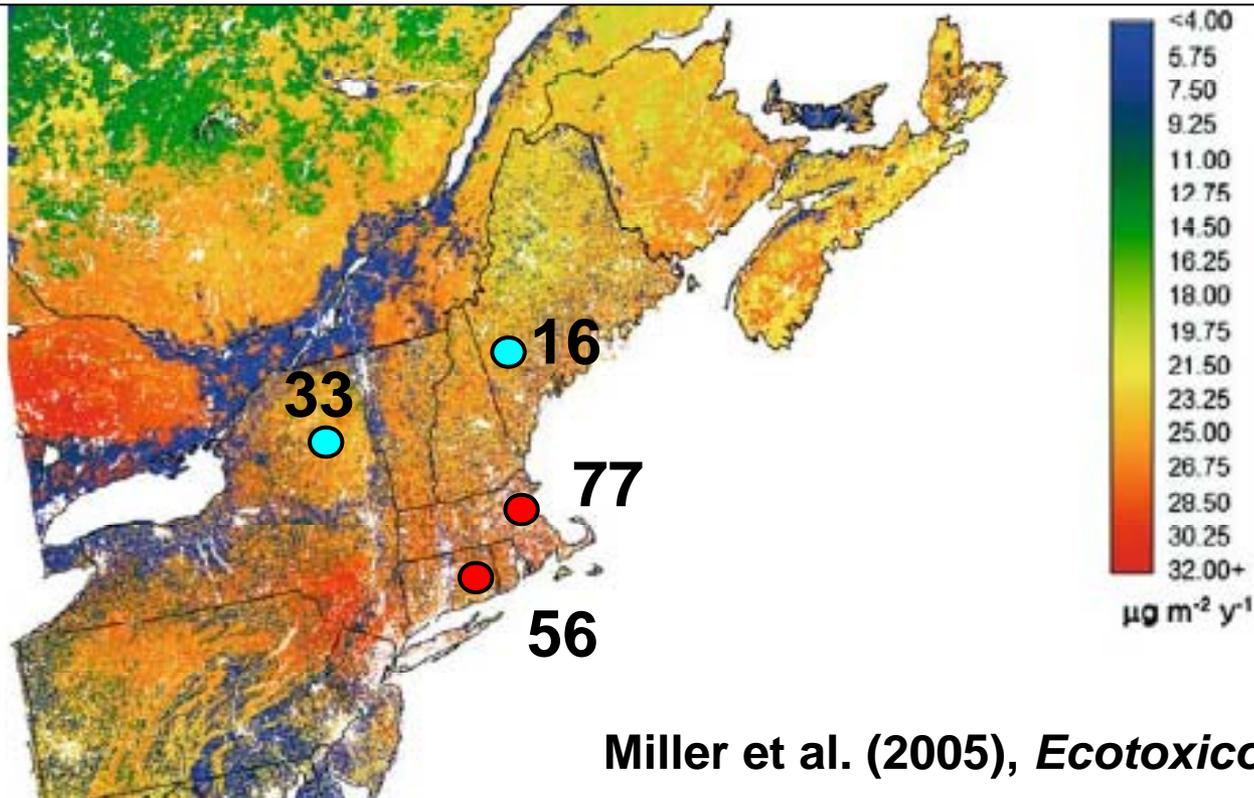


# Top of Cores vs REMSAD Model



# Modeled total Hg fallout

- Deposition was not estimated for areas with urban or residential land cover.
- **Mercury deposition is likely to be much greater than depicted here in the immediate vicinity of urban areas and emissions sources.**
- The effects of urban and point emissions sources are not well captured by the sparse, rural mercury observation network.

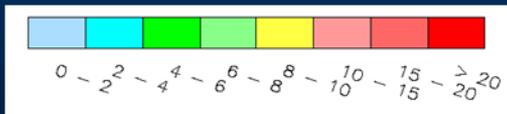
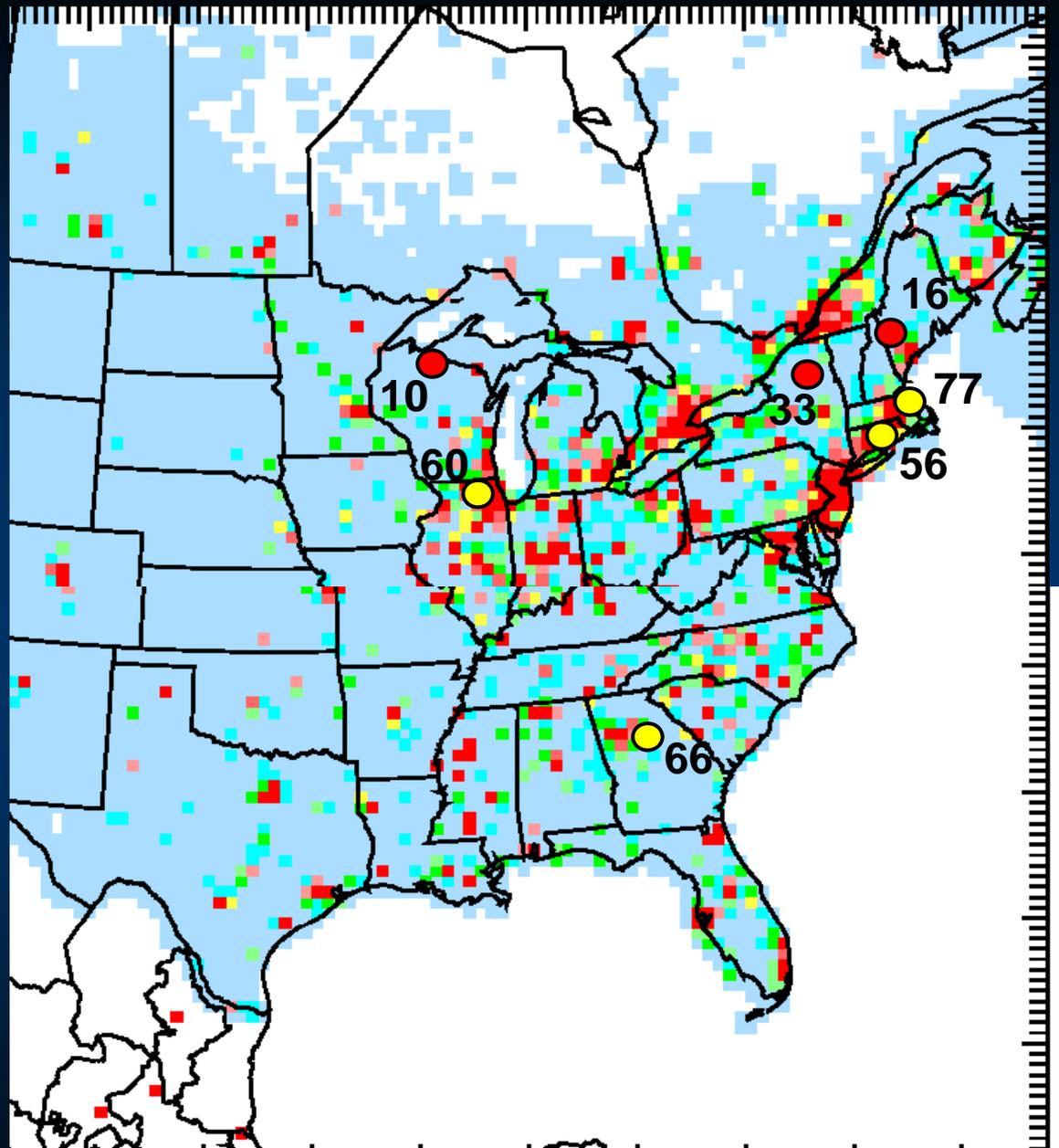


Miller et al. (2005), *Ecotoxicology*

# REMSAD

## low-level emissions

Low-level (surface-layer) emissions for area, mobile, low-level point, non-road, and biogenic sources



emissions (Mg)

# Implications/Questions

- ❑ **What processes are controlling increased Hg deposition in urban airsheds?**
  - ❑ Large low-level emissions from contaminated soils (Eckley and Branfireun, 2008; Linde et al., 2001)
  - ❑ Increased Hg oxidation from  $O^3$  and OH (Shona et al., 2008)
  - ❑ High Hg(P) in urban air (Keeler et al., 1995); urban aerosol composition a factor (Rutter and Schauer, 2007)
- ❑ **Is there increased fallout near major stationary (e.g., power plants) sources?**
- ❑ **What are the effects on urban and near-urban waters and fish?**

