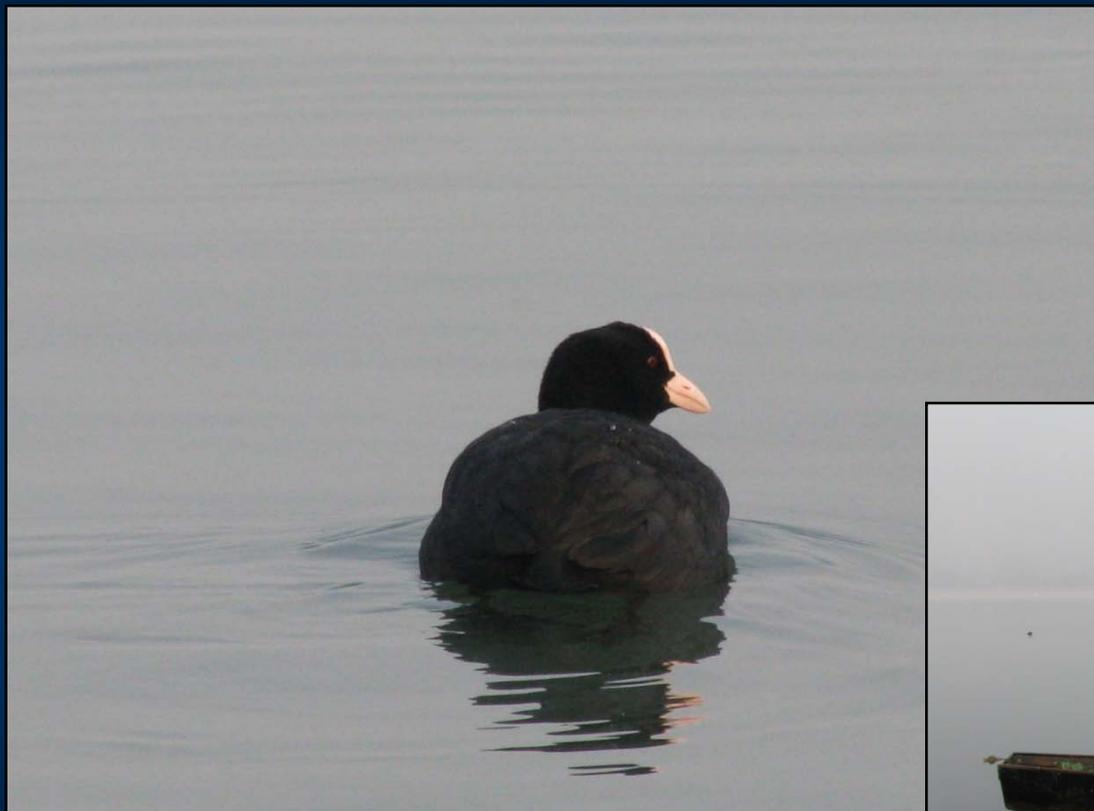


Increased Atmospheric Mercury Deposition near Major Urban Areas



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%.

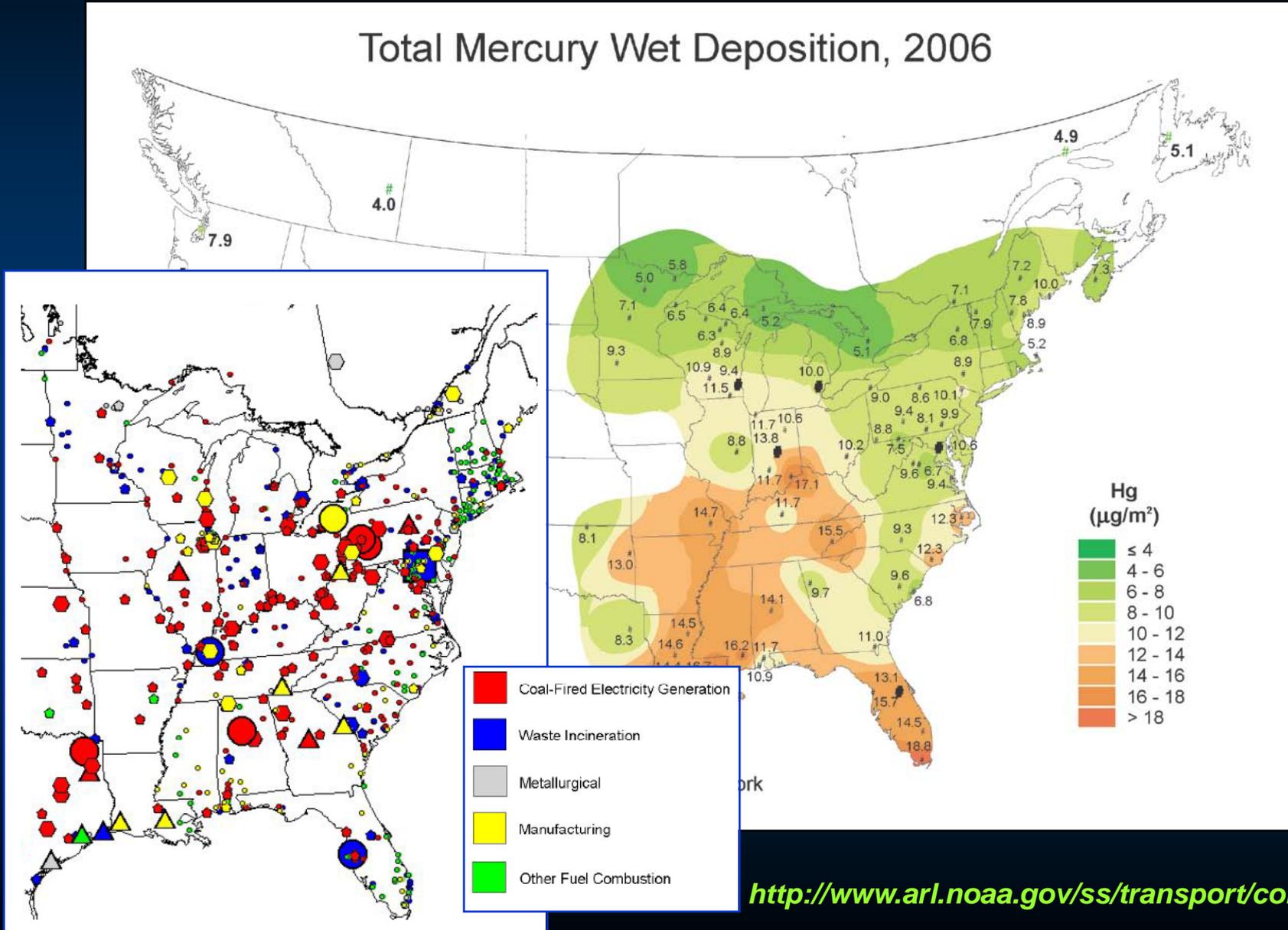
Portland Cement Association

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



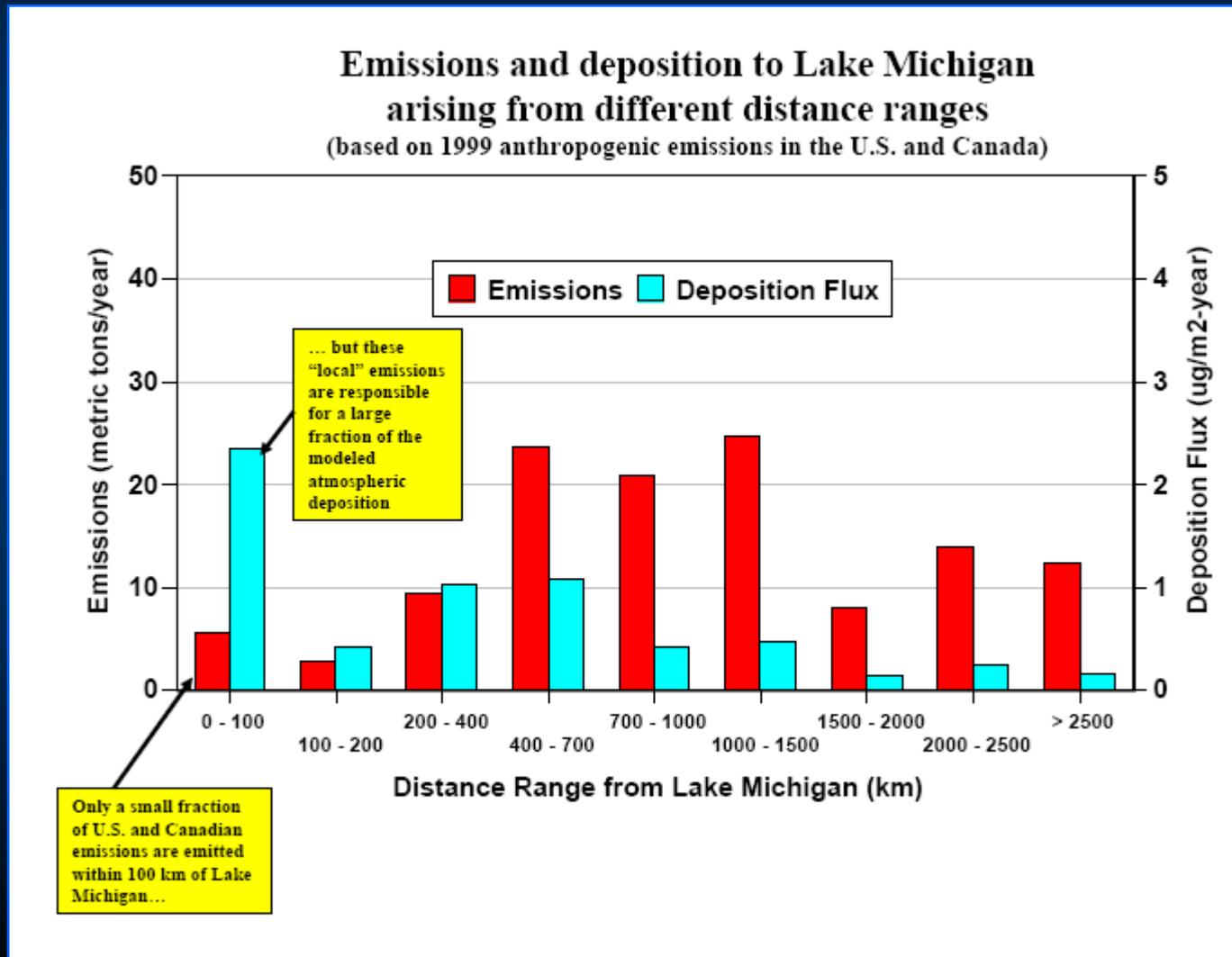
Mercury Deposition Network

Total Mercury Wet Deposition, 2006



HYSPLIT

Hybrid Single Particle Lagrangian Integrated Trajectory Model
NOAA: http://www.arl.noaa.gov/Mercury_modeling.php



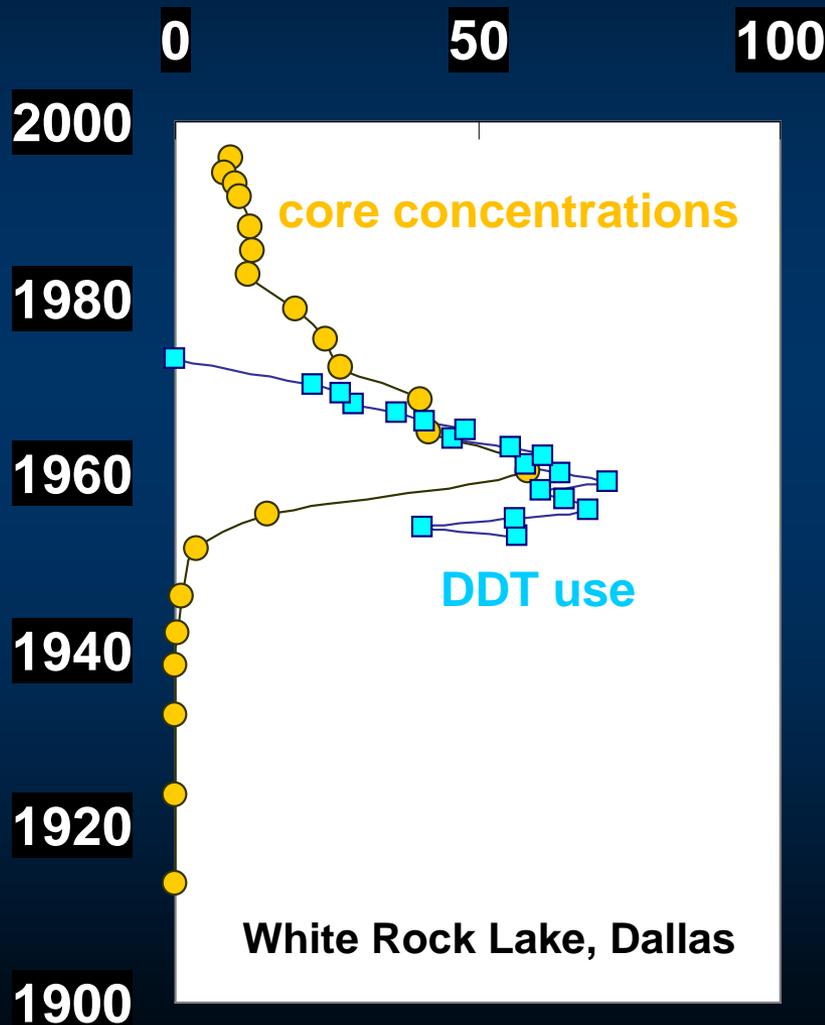
NAWQA – National Water Quality Assessment Program



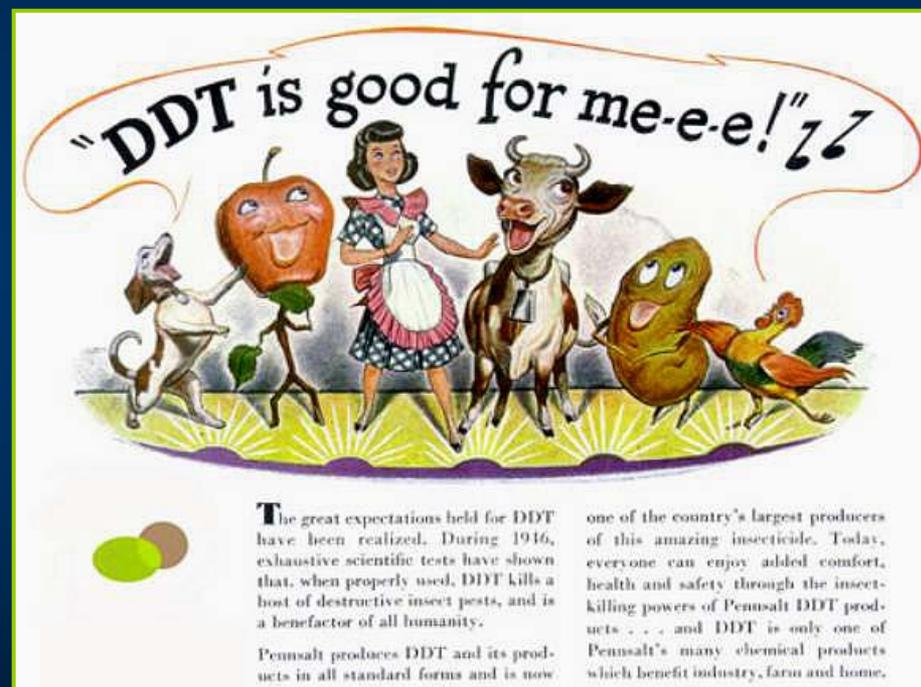
- ❑ **STATUS** – characterize water quality nationally
- ❑ **TRENDS** – describe trends, or lack of trends
- ❑ **UNDERSTANDING** – identify and explain major factors controlling water quality

Contaminant Trends in Lake Sediments (CTLs)

Total DDT (ppb)

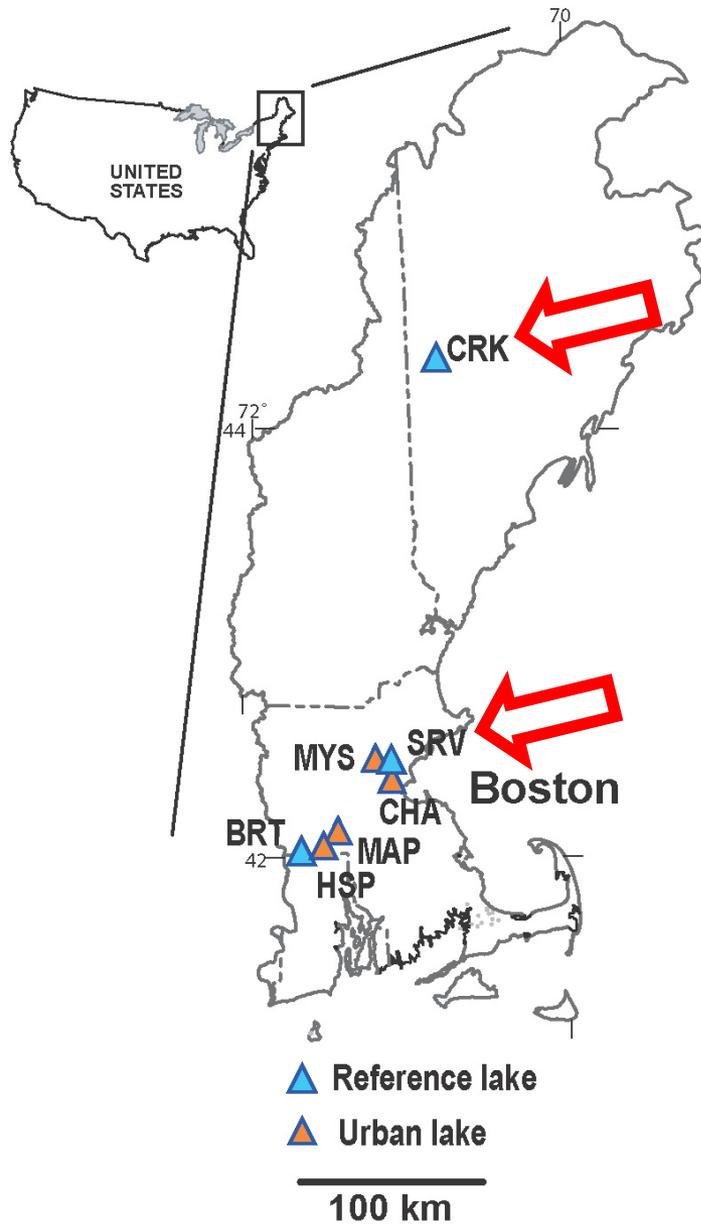


Time Magazine Ad, 1950s



CTLs: <http://tx.usgs.gov/coring/index.html>

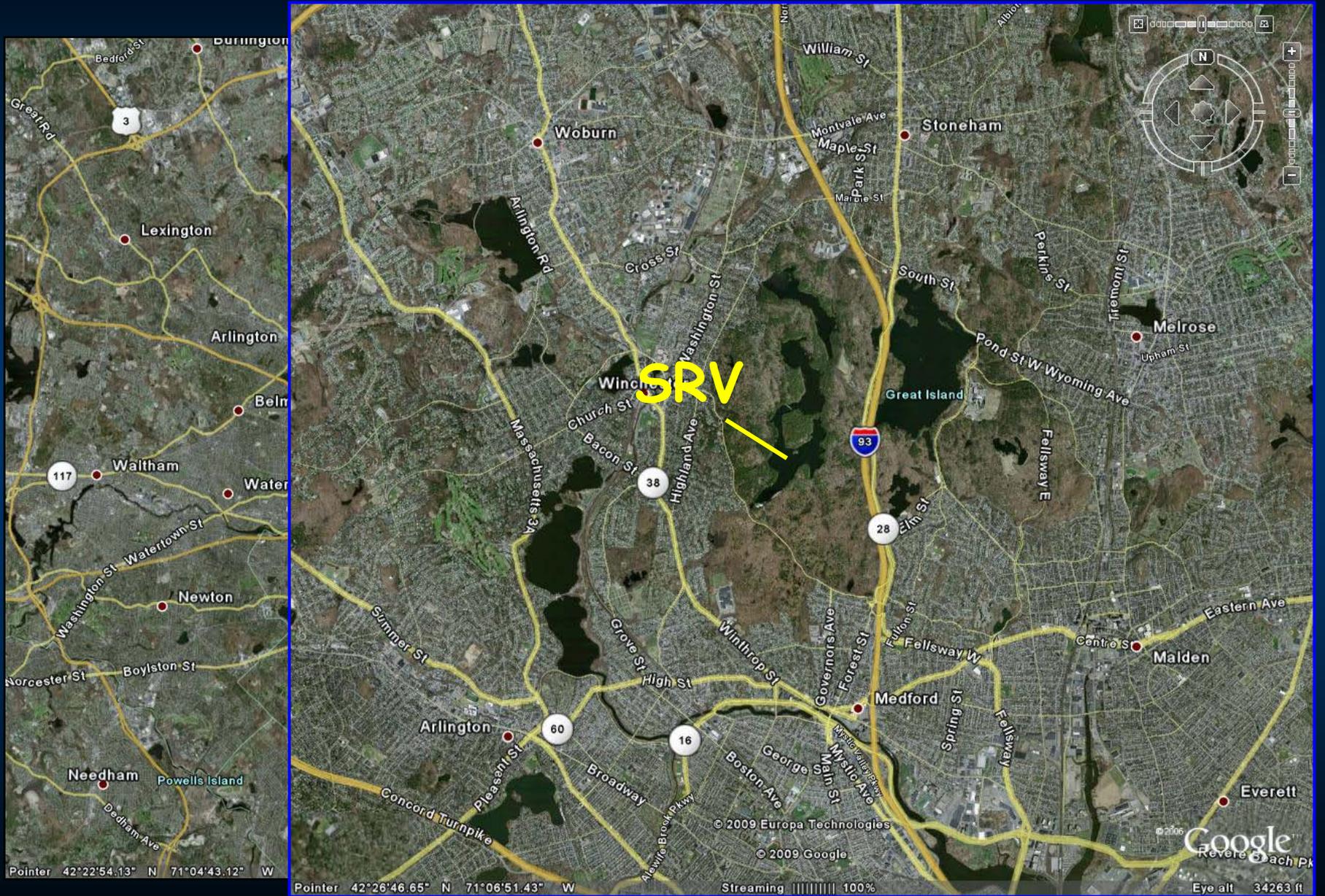
Crocker Pond, ME



South Reservoir, Medford, MA

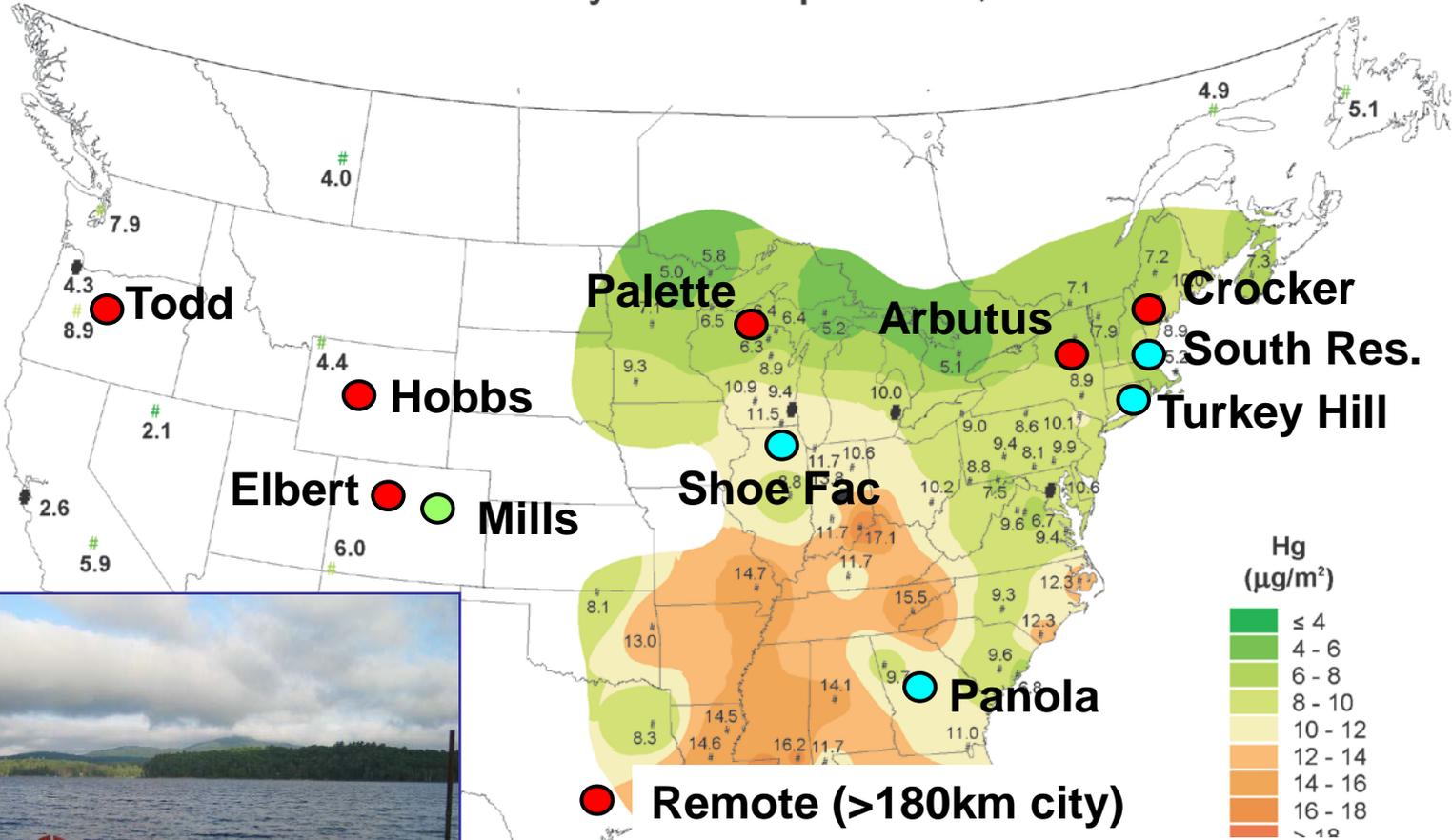


South Reservoir, MA



Lakes Sampled

Total Mercury Wet Deposition, 2006



Todd

Palette

Arbutus

Crocker

South Res.

Turkey Hill

Hobbs

Elbert

Mills

Shoe Fac

Panola

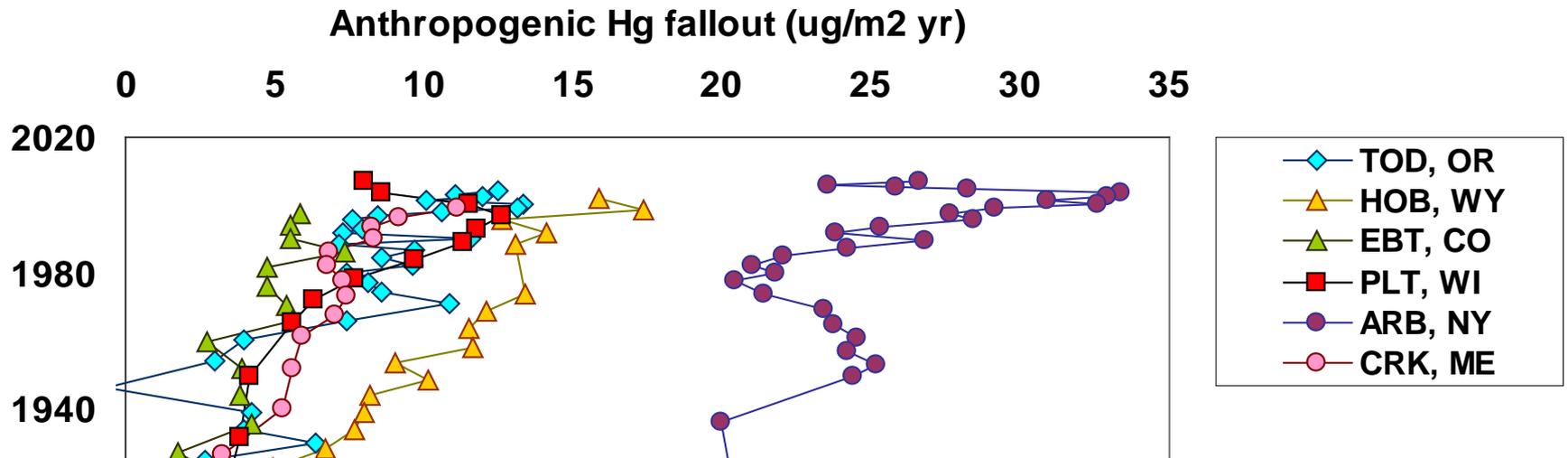
Remote (>180km city)

Near Urban (<50km city center)

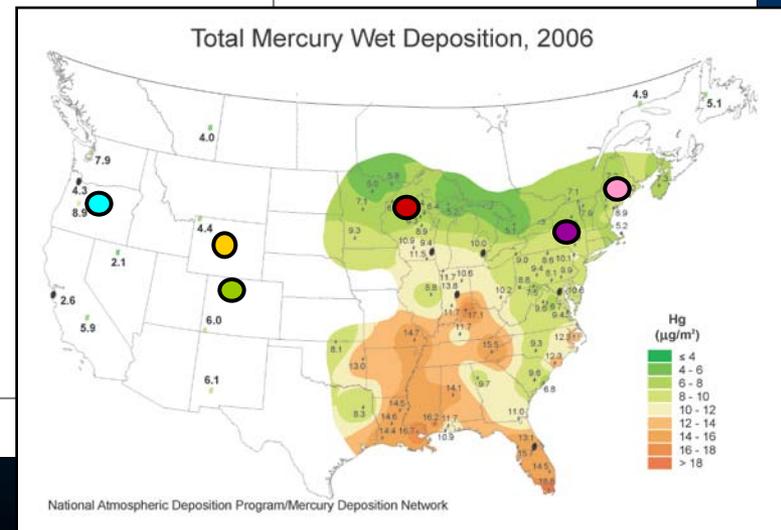
Mills (90 km)



Anthropogenic Hg fallout to Remote Lakes



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

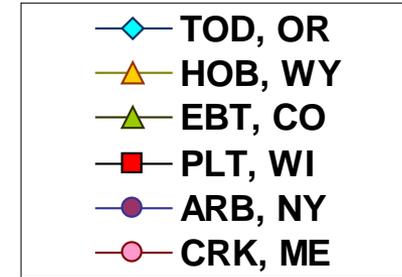
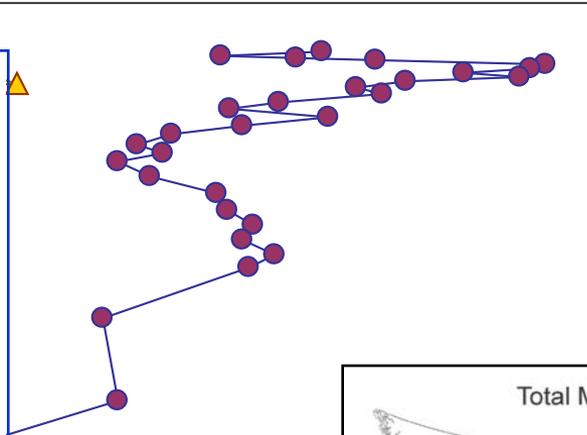
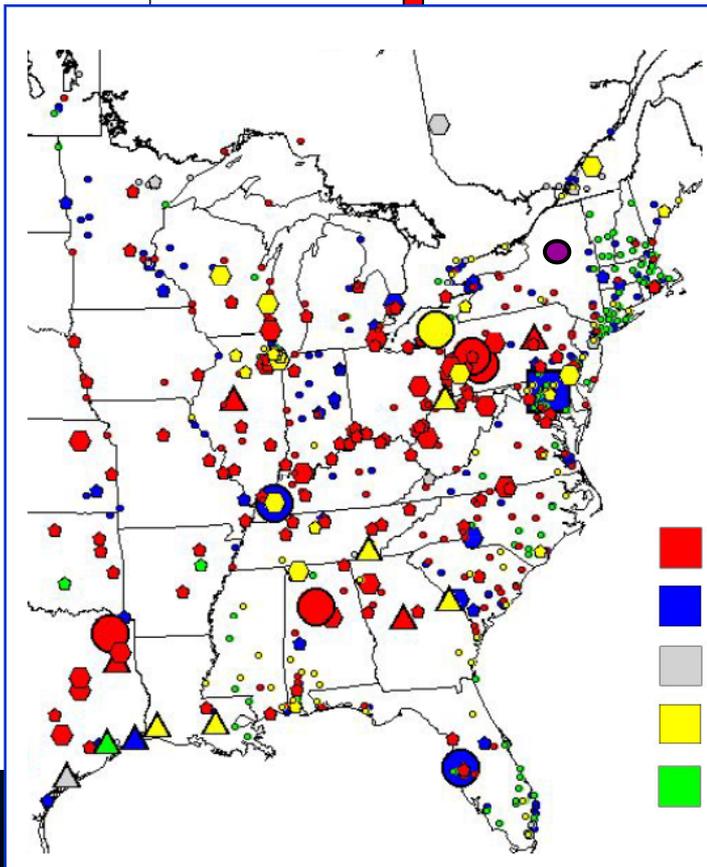


Anthropogenic Hg fallout Remote Lakes

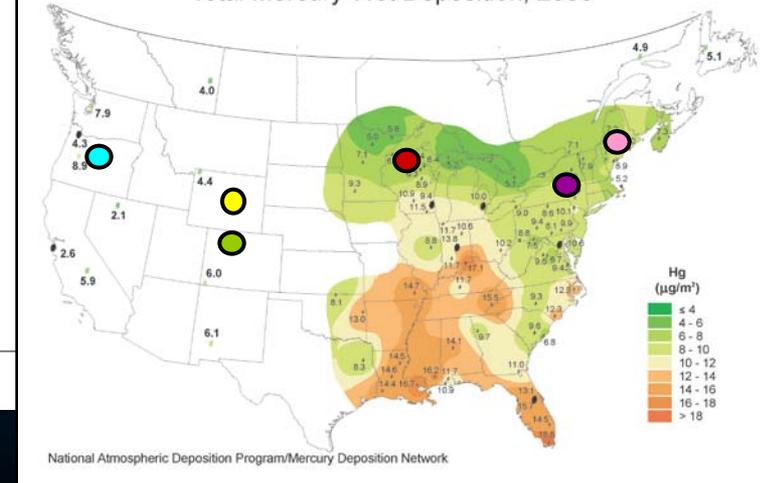
Anthropogenic Hg fallout ($\mu\text{g}/\text{m}^2 \text{ yr}$)

0 5 10 15 20 25 30 35

2020



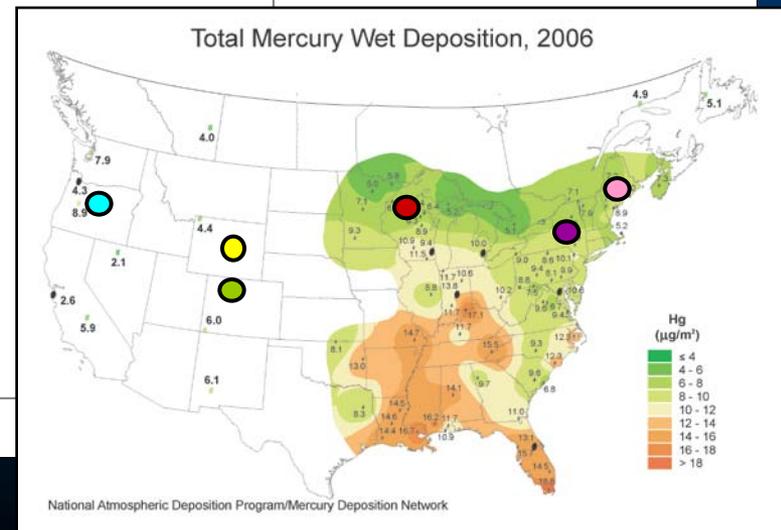
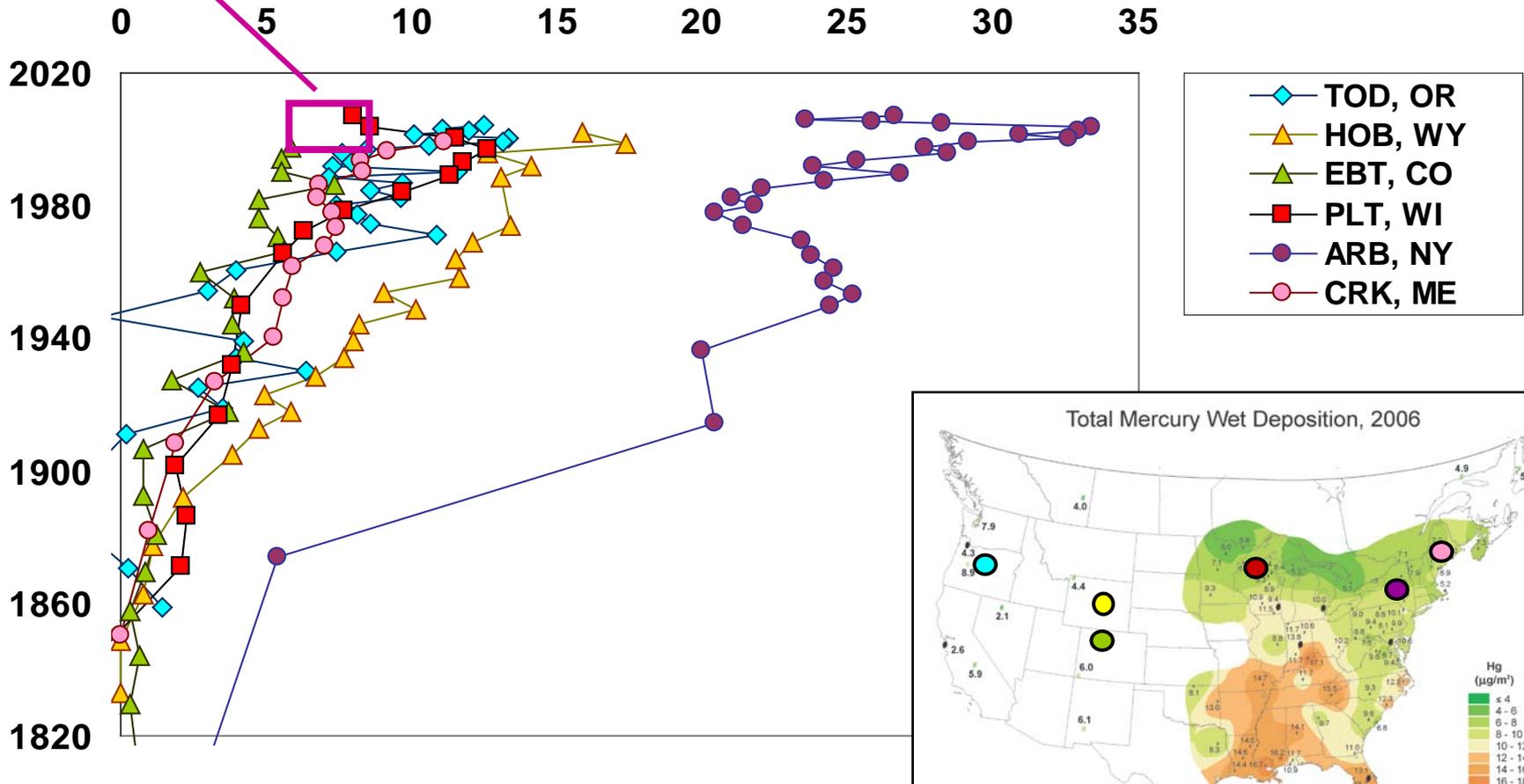
Total Mercury Wet Deposition, 2006



Anthropogenic Hg fallout Remote Lakes

MDN >150 km city
6.9 ug/m² yr +/-1.4

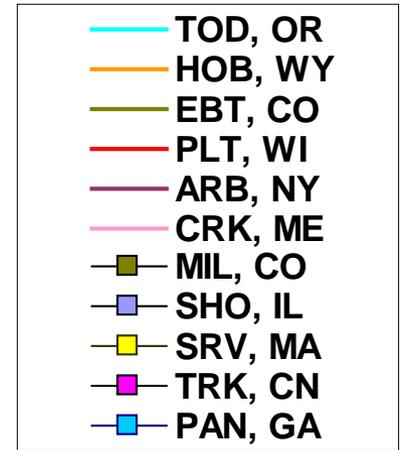
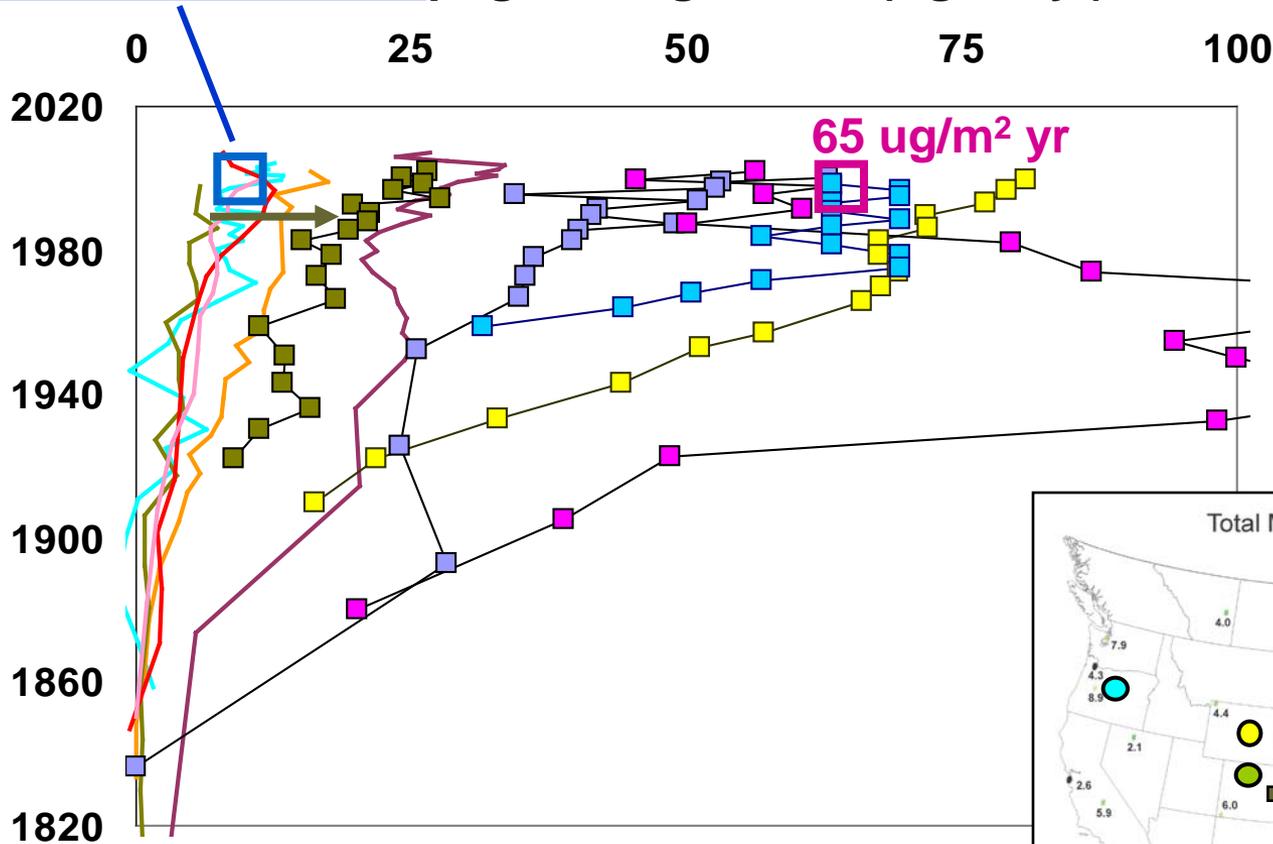
Anthropogenic Hg fallout (ug/m² yr)



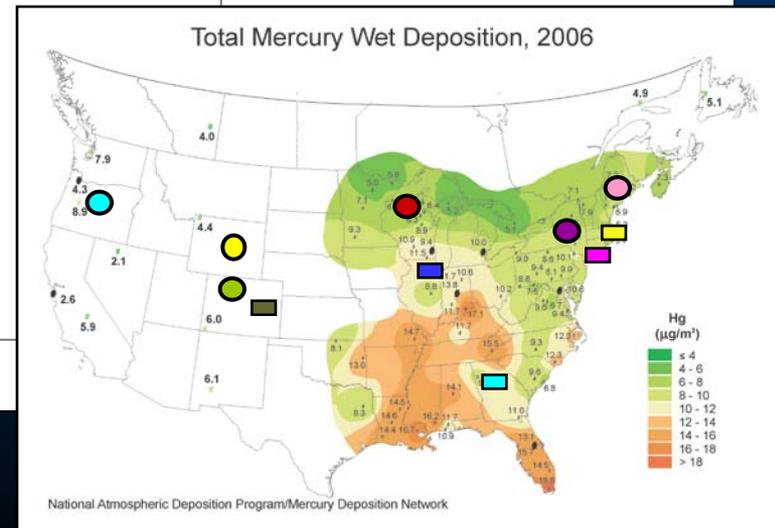
Urban airshed effect?

MDN <150 km city
9 ug/m² yr +/-2

Biogenic Hg fallout (ug/m² yr)

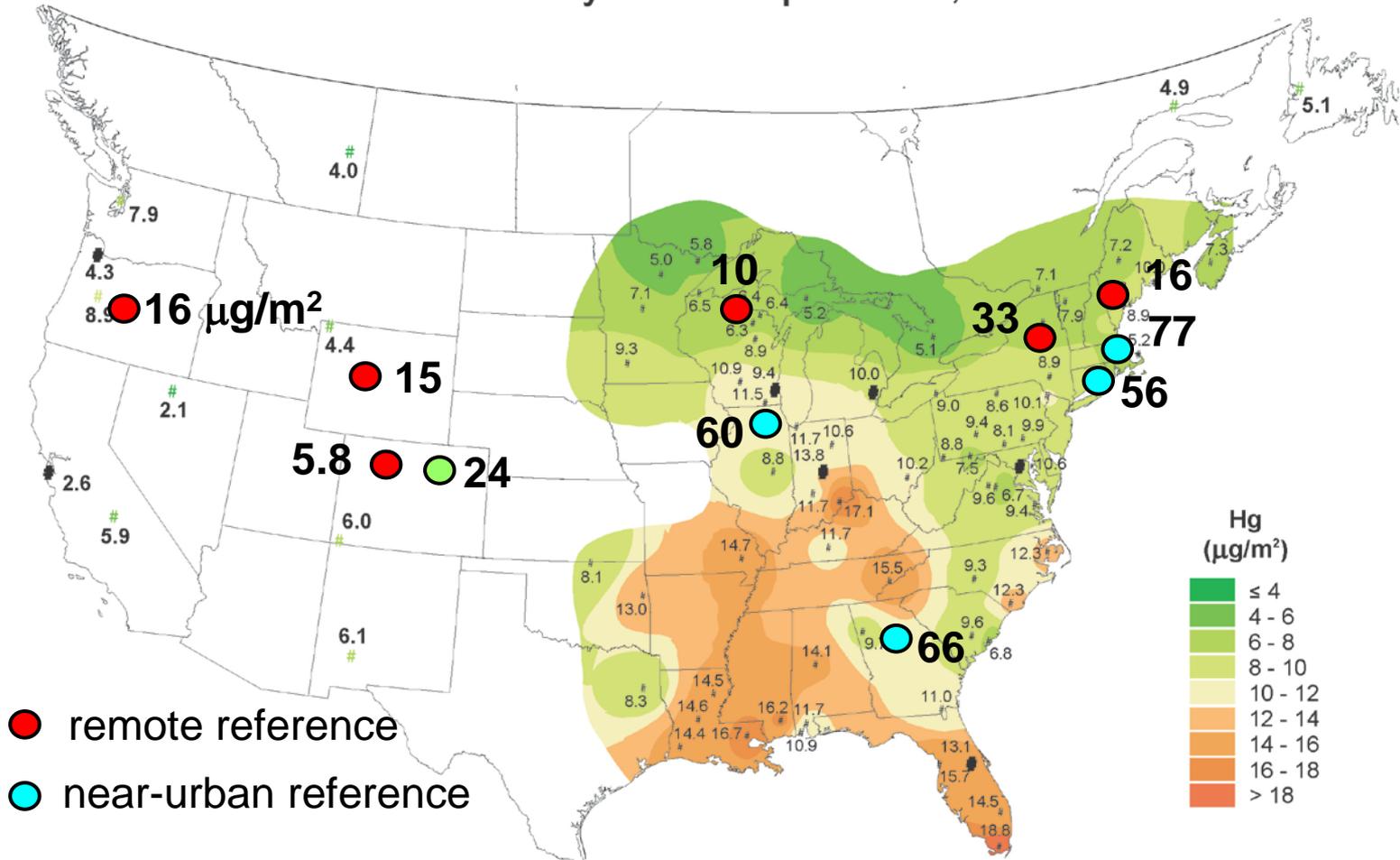


Near urban lakes



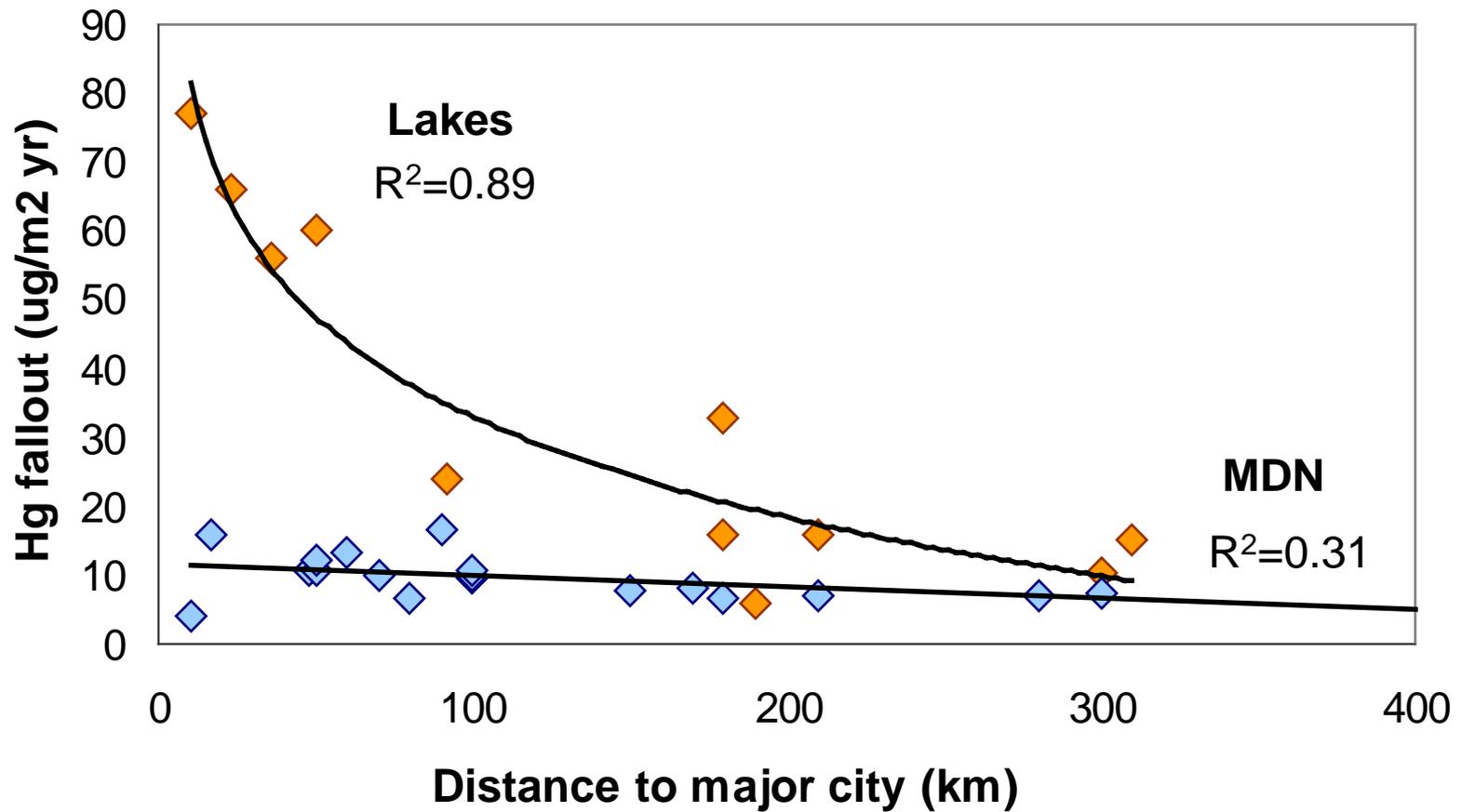
Cores vs MDN

Total Mercury Wet Deposition, 2006

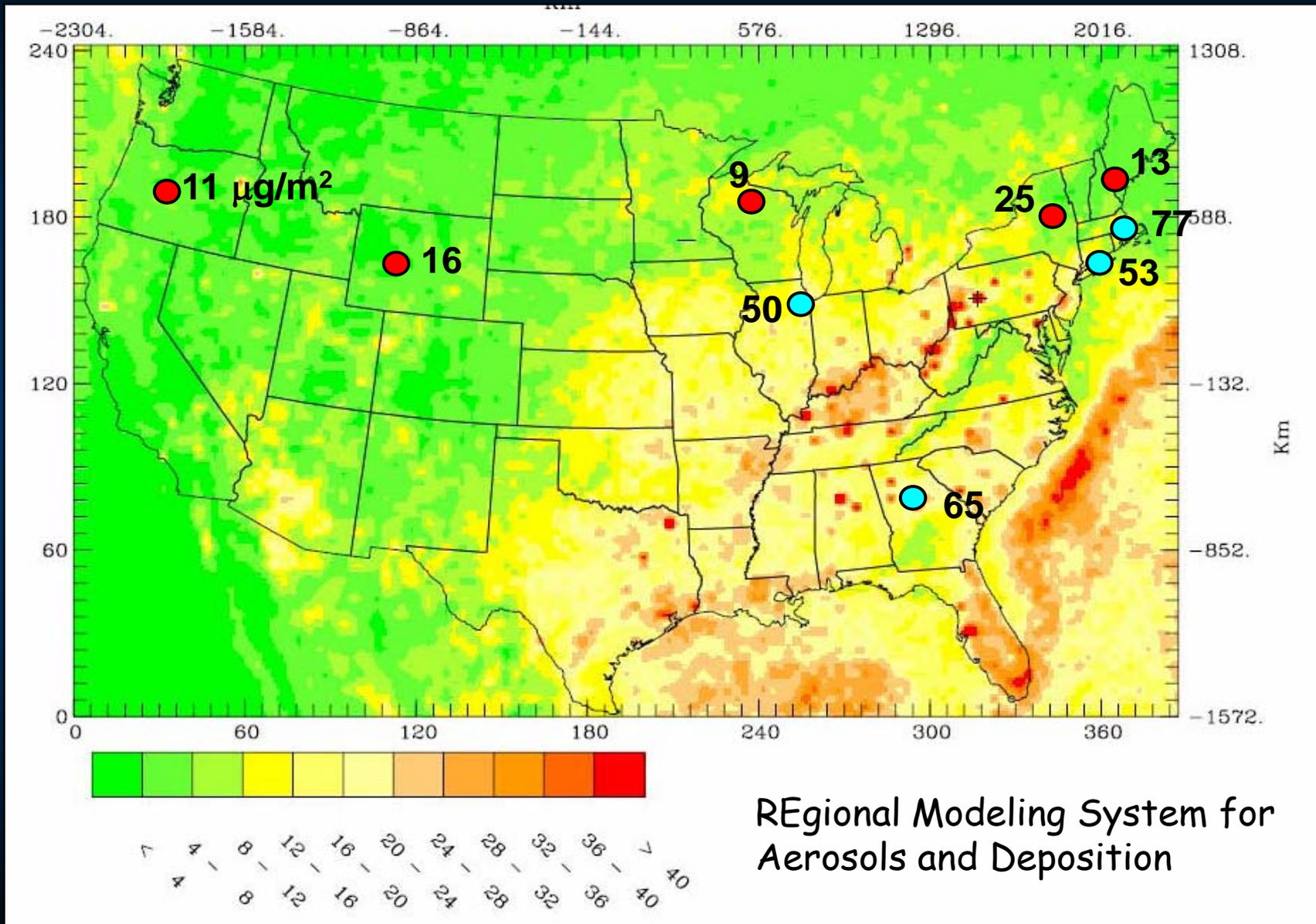


National Atmospheric Deposition Program/Mercury Deposition Network

versus distance to city

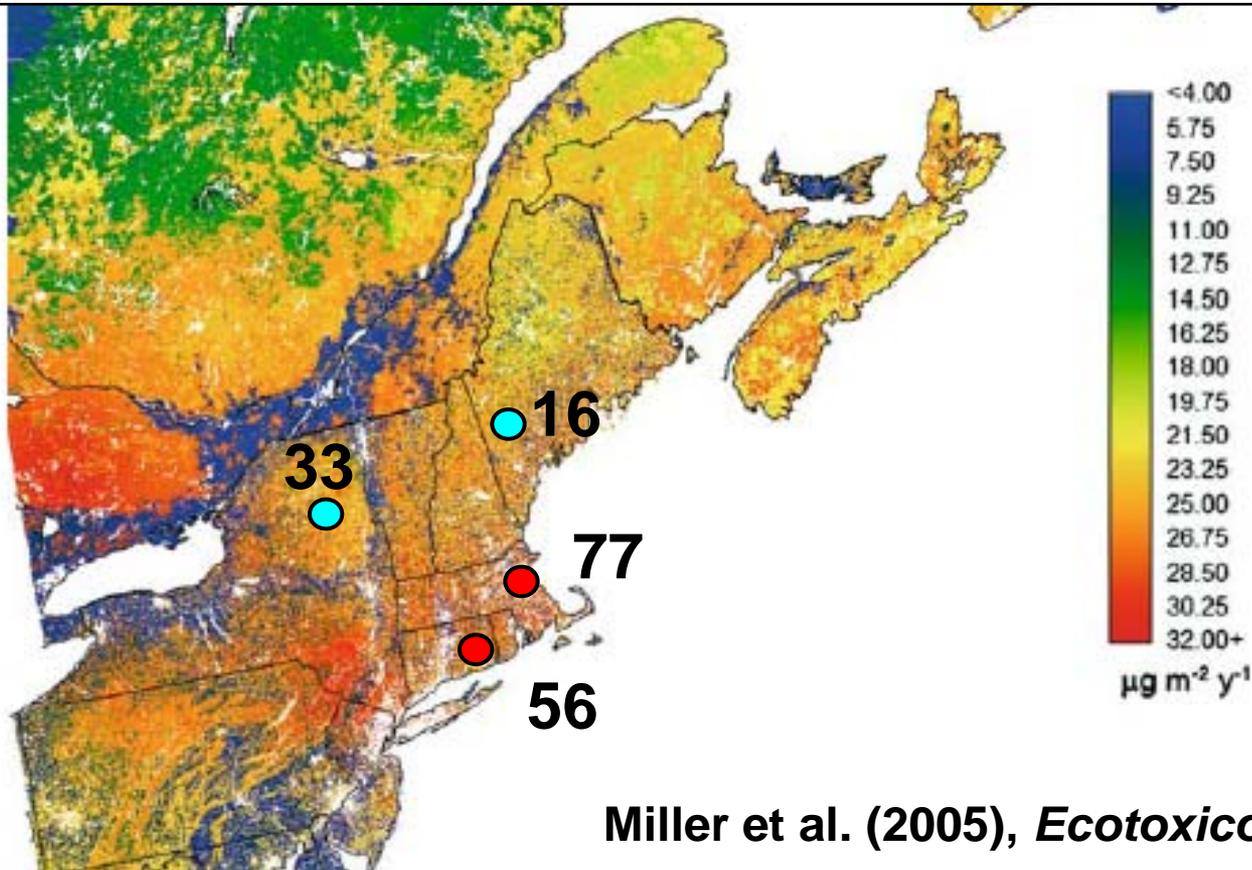


Top of Cores vs REMSAD Model



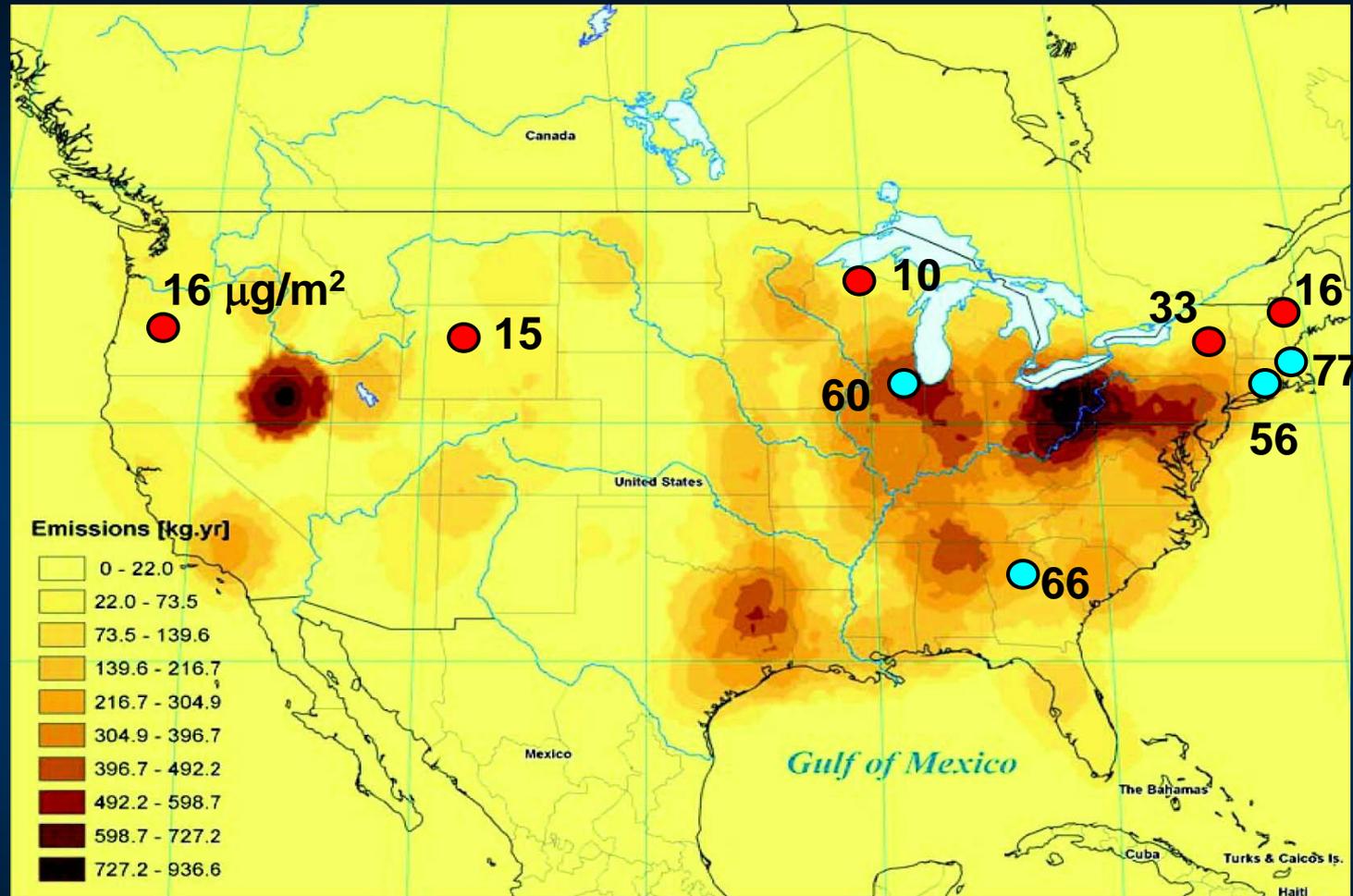
Modeled total Hg fallout

“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*

Cores vs Major Emissions

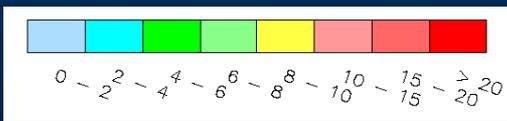
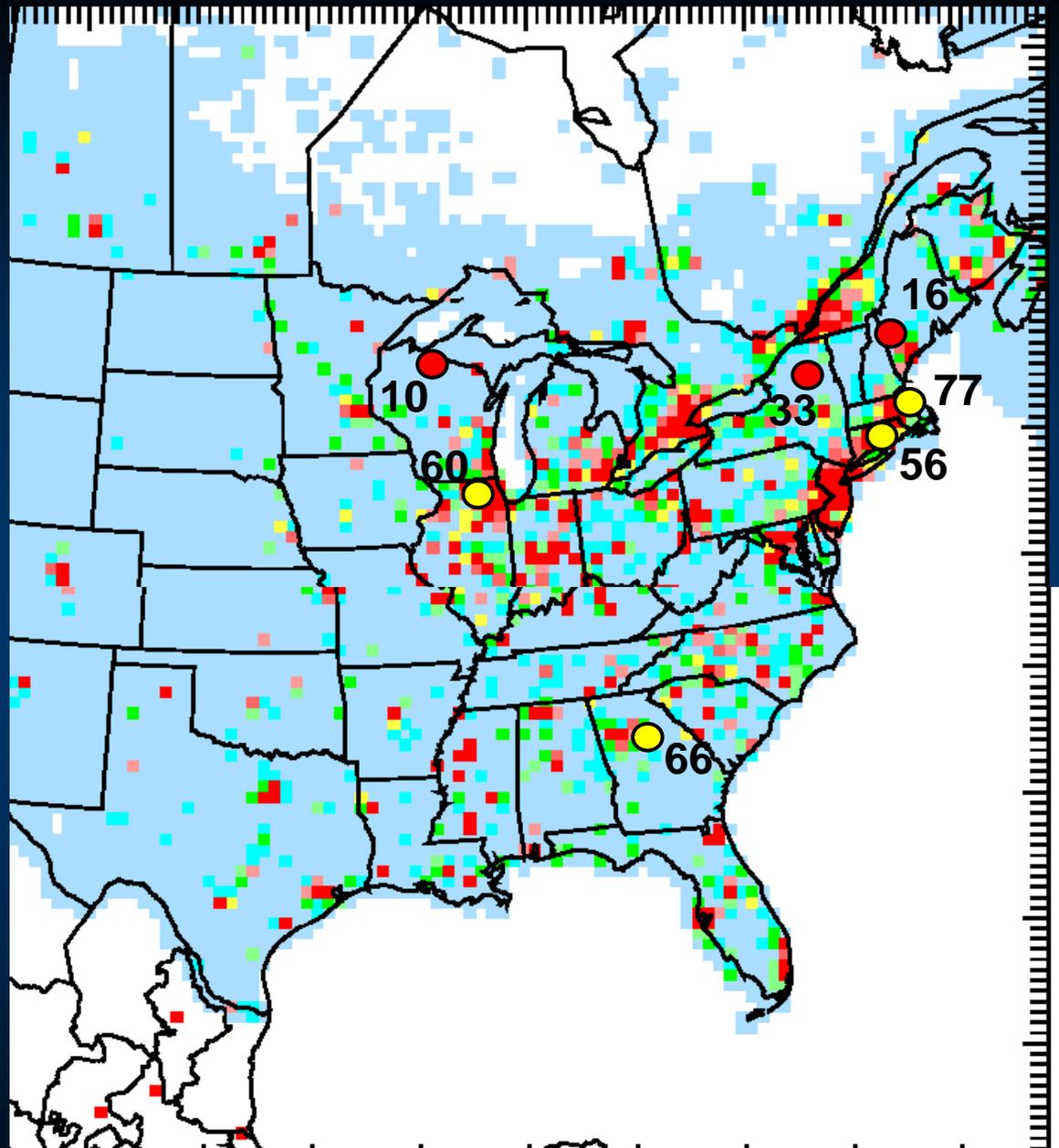


Total Hg emissions of point sources in the United States in 2002.

REMSAD

low-level emissions

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



emissions (Mg)

Implications/Questions

Portland Cement Association

- ❑ **What processes are controlling increased Hg deposition in urban airsheds?**
 - ❑ Low level urban emissions are greater than thought to be
 - ❑ Dry fall is greater in/near urban areas than thought to be
 - ❑ Hg speciation in urban air a factor
- ❑ **Is there increased fallout near major stationary (e.g. power plants) sources?**
- ❑ **What are the effects on urban and near-urban waters and fish?**

