

NESCAUM Mercury Inventory and Atmospheric Modeling



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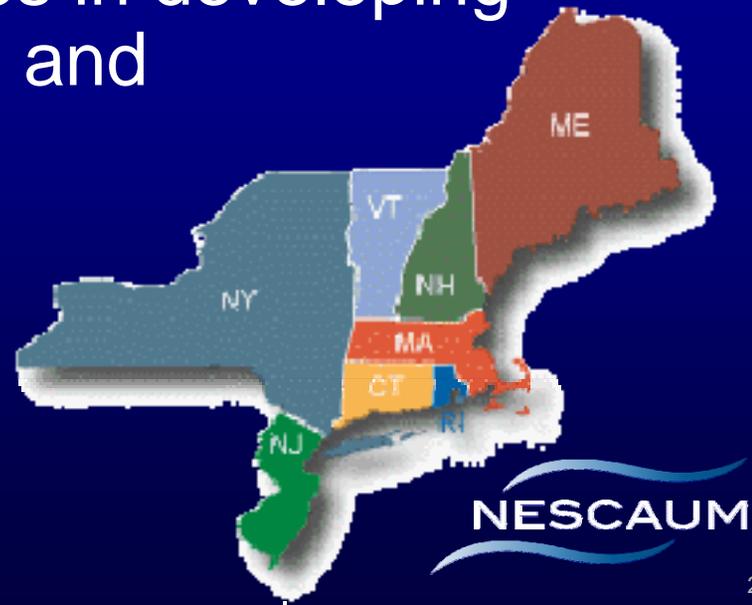
CT DEP SIPRAC Meeting

Hartford, CT

June 14, 2007

NESCAUM

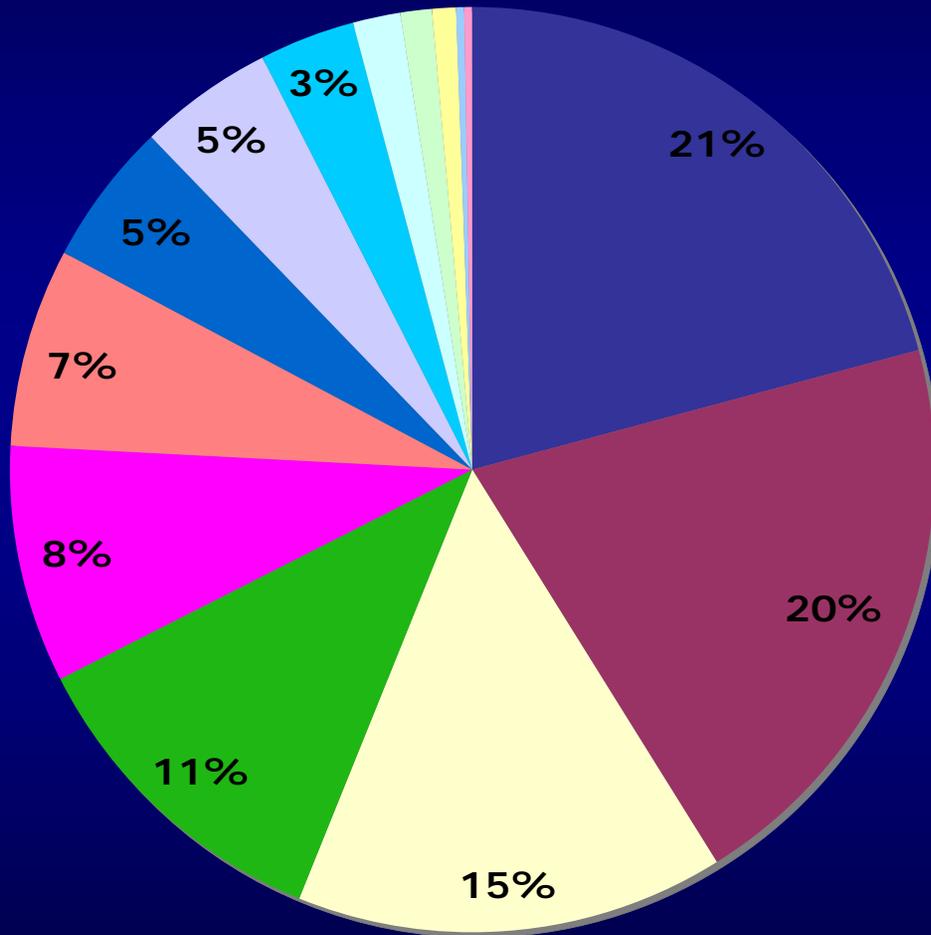
- NESCAUM (Northeast States for Coordinated Air Use Management)
- The Clean Air Association of the Northeast States
- A nonprofit organization founded in 1967 to assist the New England states in developing air pollution policy, technical, and management programs.
- Our Members include:
 - CT, MA, ME, NH,
 - NJ, NY, RI and VT



Overview

- Recent NESCAUM mercury (Hg) work:
 - 2002 Emission Inventory (EI) Development
 - Track Progress
 - Model input
 - Modeling of 1996 and 2002 EI
 - Rationale:
 - Update old modeling
 - Demonstrate impact of emission reductions
 - Provide input for other model applications
 - Deposition Results for Connecticut

Updated 2002 NESCAUM Region Hg Emission Inventory

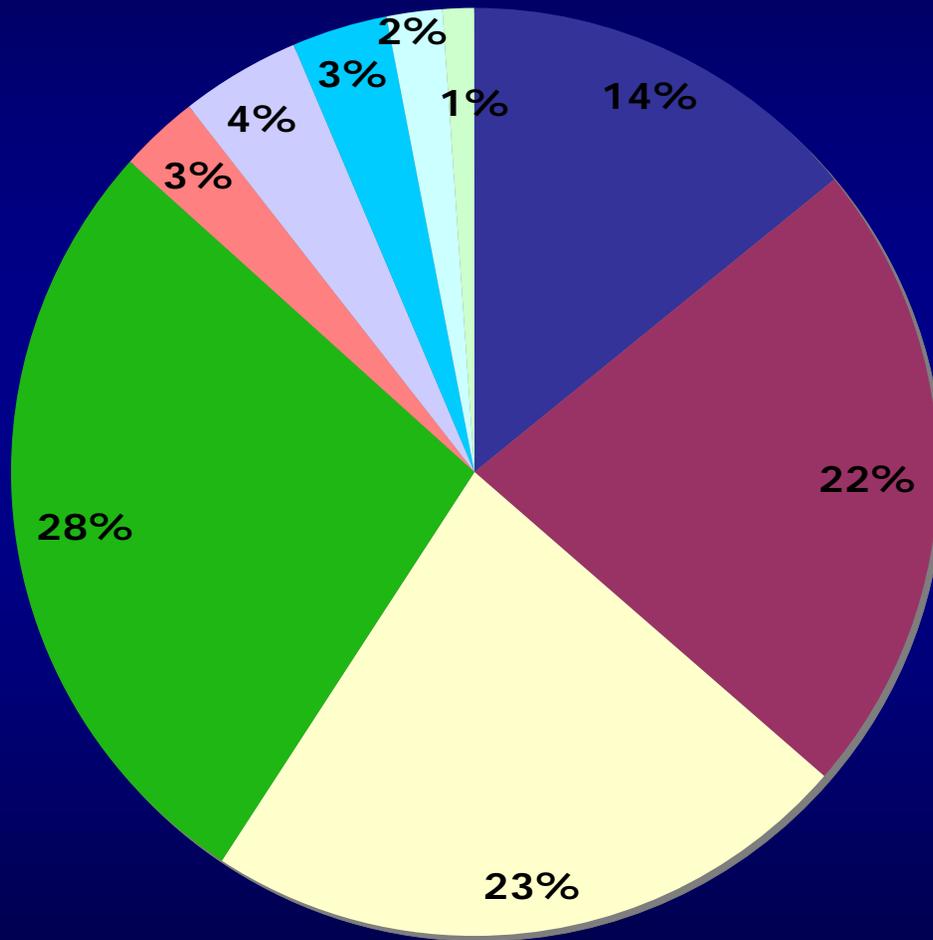


- Electric Utility
- Municipal Waste Combustors
- Residential Heating
- Sewage Sludge Incinerators
- Steel Foundries
- ICI Boilers
- Cement Manufacturing
- Electric Lamp Breakage
- Crematories
- Dental Preparation and Use
- General Lab Use
- Petroleum Refineries
- Medical Waste Incinerators
- Lime Manufacturing
- Misc. Industrial Processes

Regional Total Annual Emissions: 4784 Kg



2002 Connecticut Hg Emission Inventory



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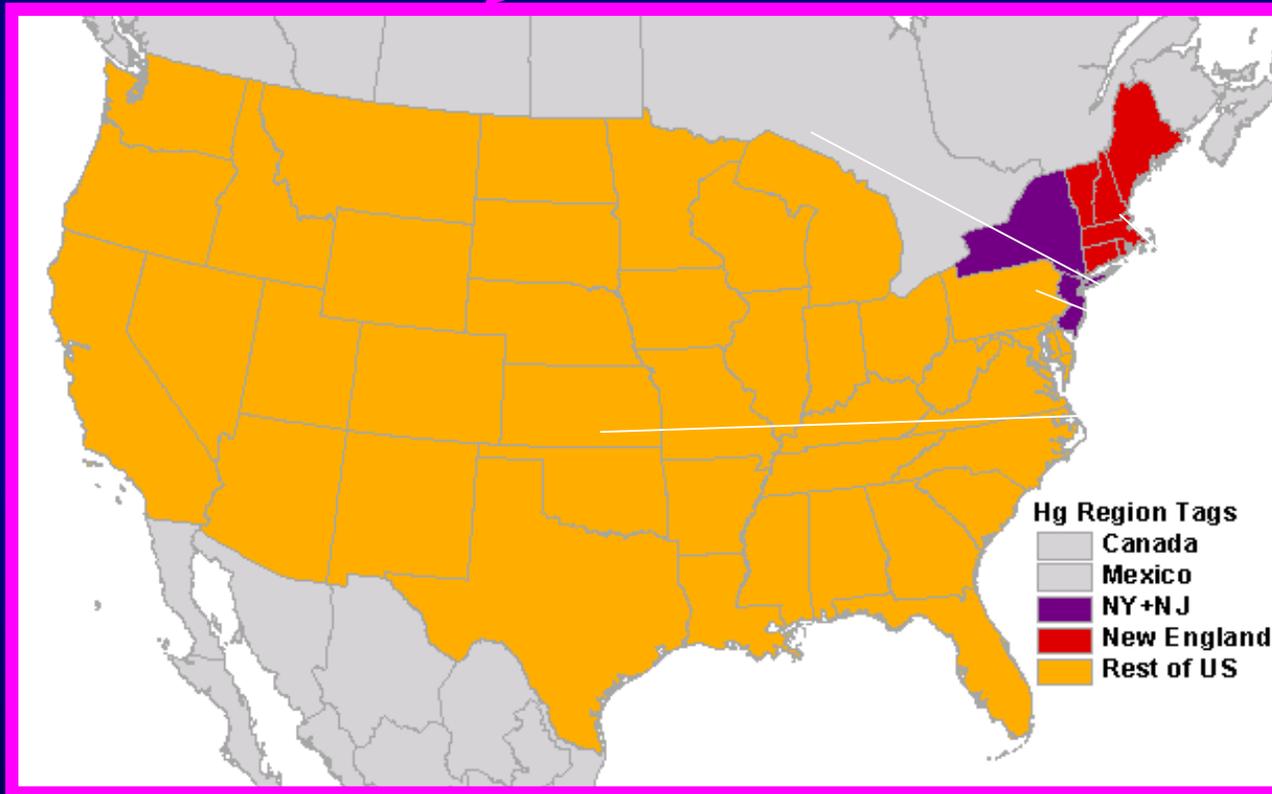
State Total Annual Emissions: 450 Kg

Regional Modeling System for Aerosols and Deposition (REMSAD)

- Eulerian Grid Model
 - Includes atmospheric transport and chemistry
 - 36 km grid size; 12 vertical layers
 - Boundary conditions from Global Hg model (GEOS-CHEM)
- “tagging”
 - Allows tracking of emissions through space and time; can choose individual source, source type, source region

Modeling Design

The boundary conditions are tagged, too



Source Sector
Tags

EGUs

MWCs & MWIs

SSI

Rest of point
sources

Area source

Mobile sources

Note : 1. Northeast = New England + (NY+NJ) 2. All Canadian point sources are treated as one tag 3. Mobile sources = On-road + Non-road

Emission Prep for Modeling- Speciation and Hg properties

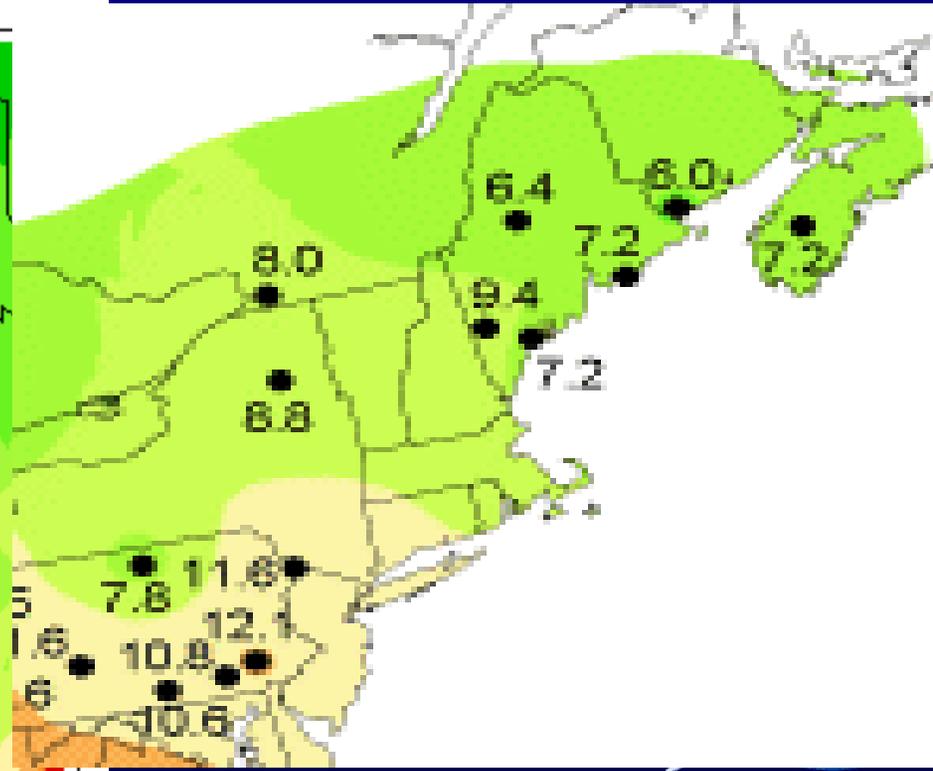
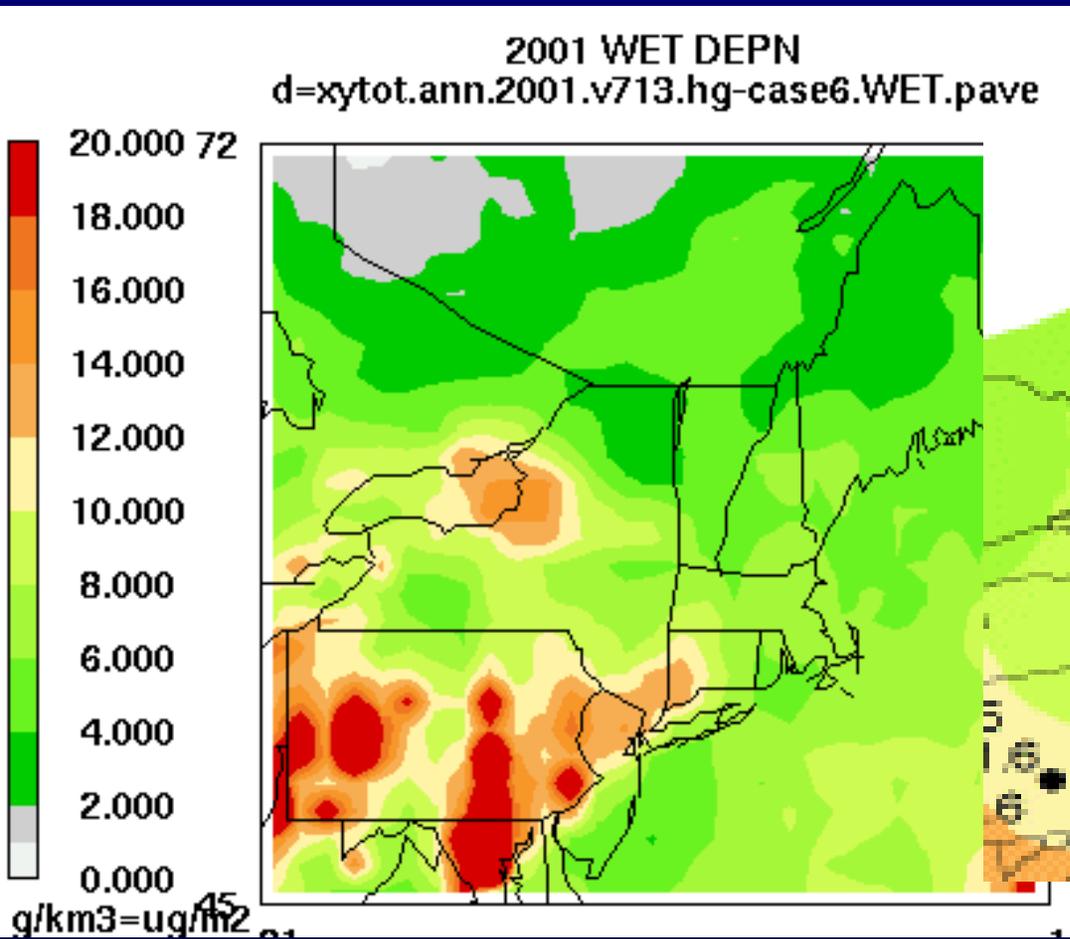
- Inventory Processed through the **S**parse **M**atrix **O**perator **K**ernel **E**missions (SMOKE)
- Emissions processing / atmospheric modeling relies on speciation profiles for each source category
- Three modeled forms of mercury
 - Elemental Mercury (Hg^0)
 - Particulate Mercury
 - Reactive Gaseous Mercury (Hg^{2+})
- Transport scale varies from *Global* to *Local*

MODEL vs. MONITOR Performance Test

REMSAD RUN

2003 MDN

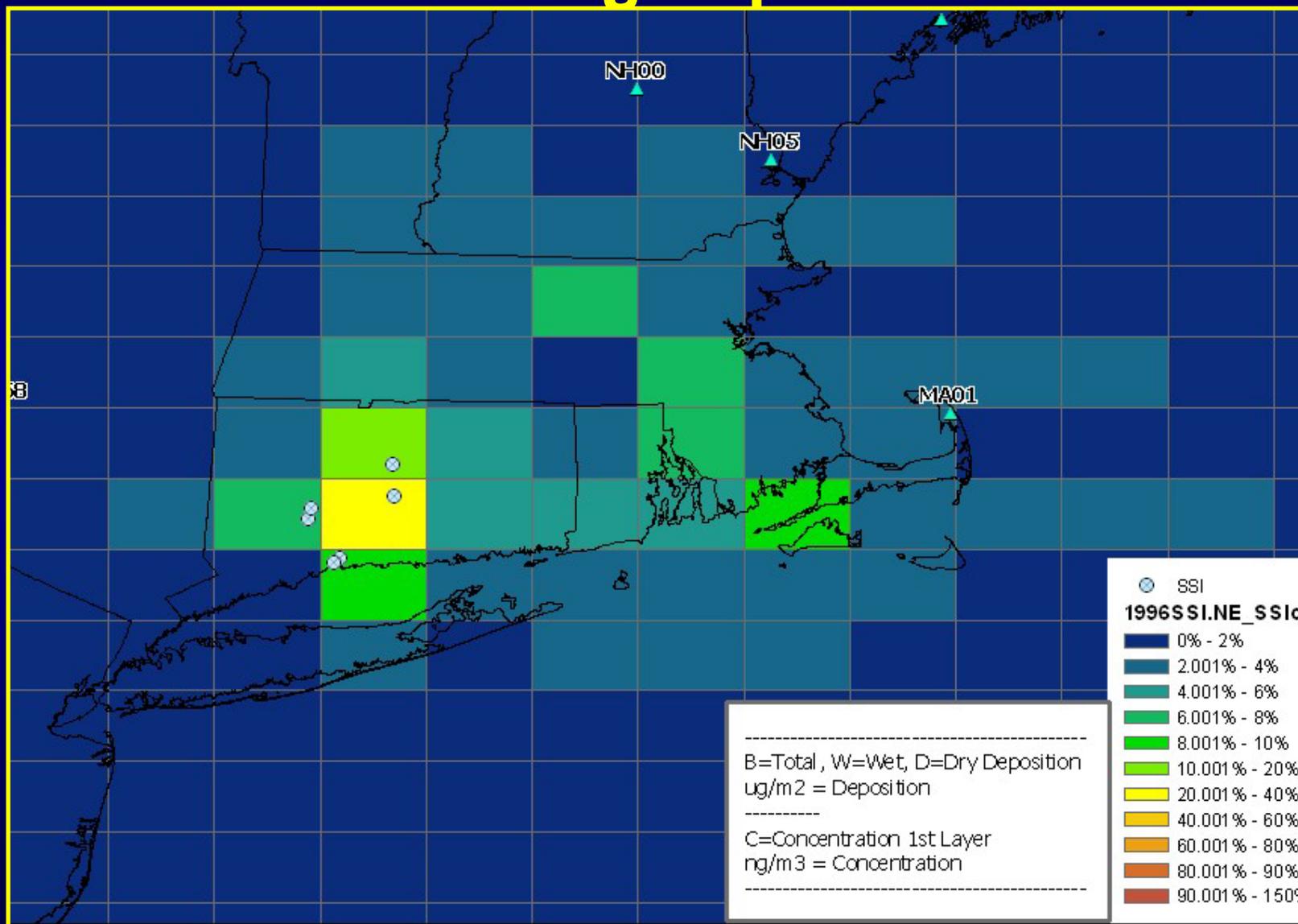
Monitored Deposition



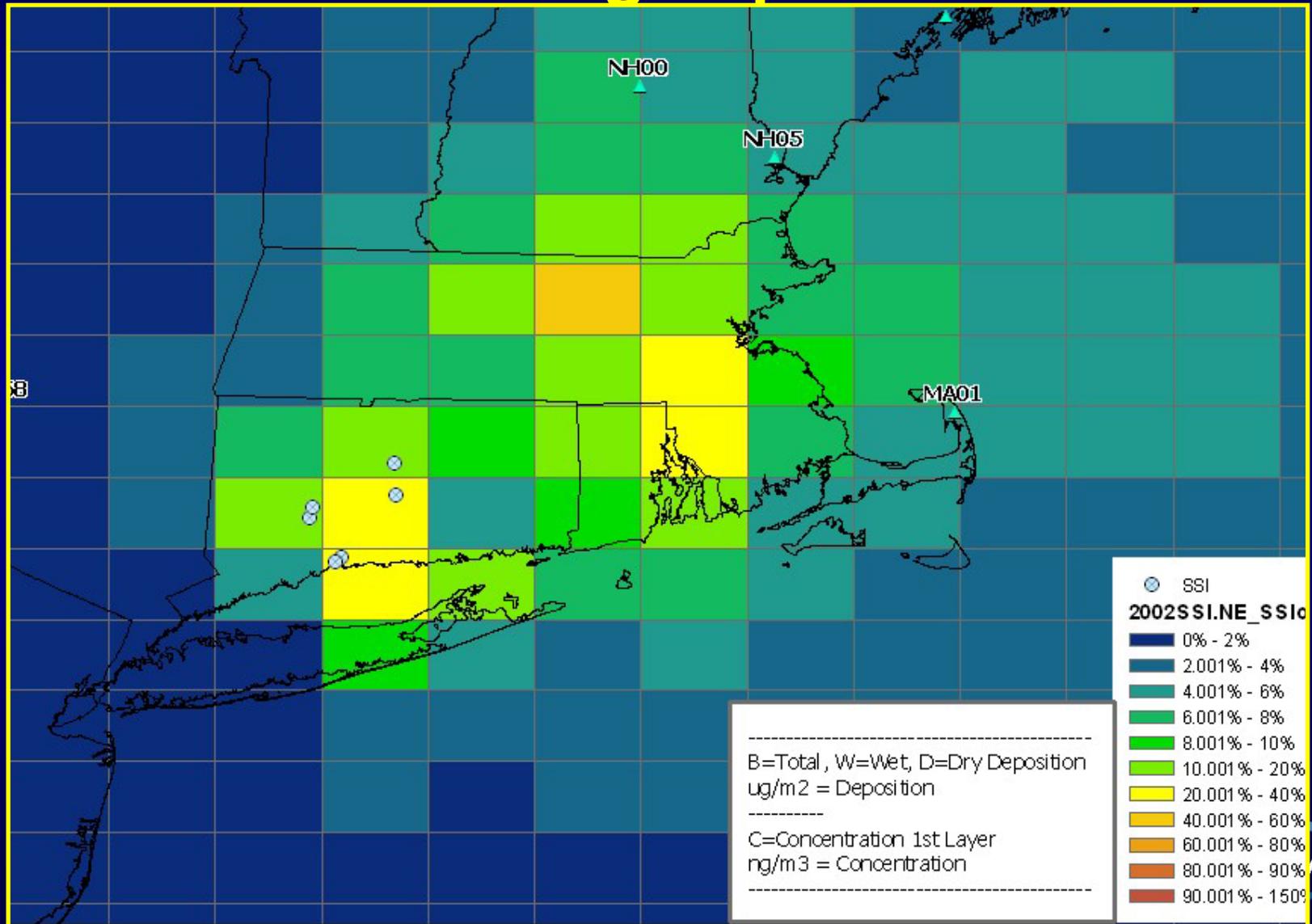
Modeled Hg Deposition in Connecticut

| | Year | Source Region | | | |
|---|------|---------------|---------|------------|------------|
| | | New England | NY & NJ | Rest of US | outside US |
| Deposition mass ($\mu\text{g}/\text{m}^2$) | 1998 | 10.16 | 12.05 | 3.05 | 7.96 |
| | 2002 | 4.51 | 2.38 | 3.05 | 7.96 |
| Percent Contribution | 1998 | 31% | 36% | 9% | 24% |
| | 2002 | 25% | 13% | 17% | 44% |

New England SSI percent contribution to 1998 Hg Deposition



New England SSI percent contribution to 2002 Hg Deposition



Summary

- Emission inventories are useful tools for assessment of pollution sources and for tracking progress
- SSIs represent a significant source of Hg emissions in the northeast, especially so in Connecticut
- Mercury deposition modeling shows:
 - the local, regional and global nature of mercury pollution
 - Local emission reductions may lead to local deposition reductions

Thank You!

Questions?