

# ATMOSPHERIC DEPOSITION

## TRENDS IN ATMOSPHERIC DEPOSITION

Pollution in the form of acids and acid-forming compounds (such as sulfur dioxide [ $\text{SO}_2$ ] and oxides of nitrogen [ $\text{NO}_x$ ]) can deposit from the atmosphere to the Earth's surface. Between the 1989-1991 and 2005-2007 time periods, sulfate deposition decreased over 30 percent in the Northeast and the Midwest, as shown in Figure 28. In addition, nitrate deposition decreased by about 30 percent in the Mid-Atlantic and Northeast, and 20 percent in the Midwest. These reductions have led to improving water quality in lakes and streams.

Most of these improvements are due to reductions in  $\text{SO}_2$  and  $\text{NO}_x$  emissions from electric utilities and industrial boilers. The Acid Rain Program and the  $\text{NO}_x$  SIP Call in the East have led to significant reductions in  $\text{SO}_2$  and  $\text{NO}_x$  emissions.

- $\text{SO}_2$  emissions have been reduced by more than 6.7 million tons from 1990 levels, or about 43 percent. Compared to 1980 levels,  $\text{SO}_2$  emissions from power plants have dropped by more than 8 million tons, or about 48 percent. In 2007, annual  $\text{SO}_2$  emissions fell by over 400,000 tons from 2006 levels.
- $\text{NO}_x$  emissions have been reduced by about 3 million tons from 1990 levels, so that emissions in 2007 were less than half the level anticipated without the Acid Rain and  $\text{NO}_x$  SIP Call programs.

Ongoing review of the  $\text{NO}_2$  and  $\text{SO}_2$  secondary standards, which is scheduled to be completed in 2010, is addressing residual atmospheric deposition.

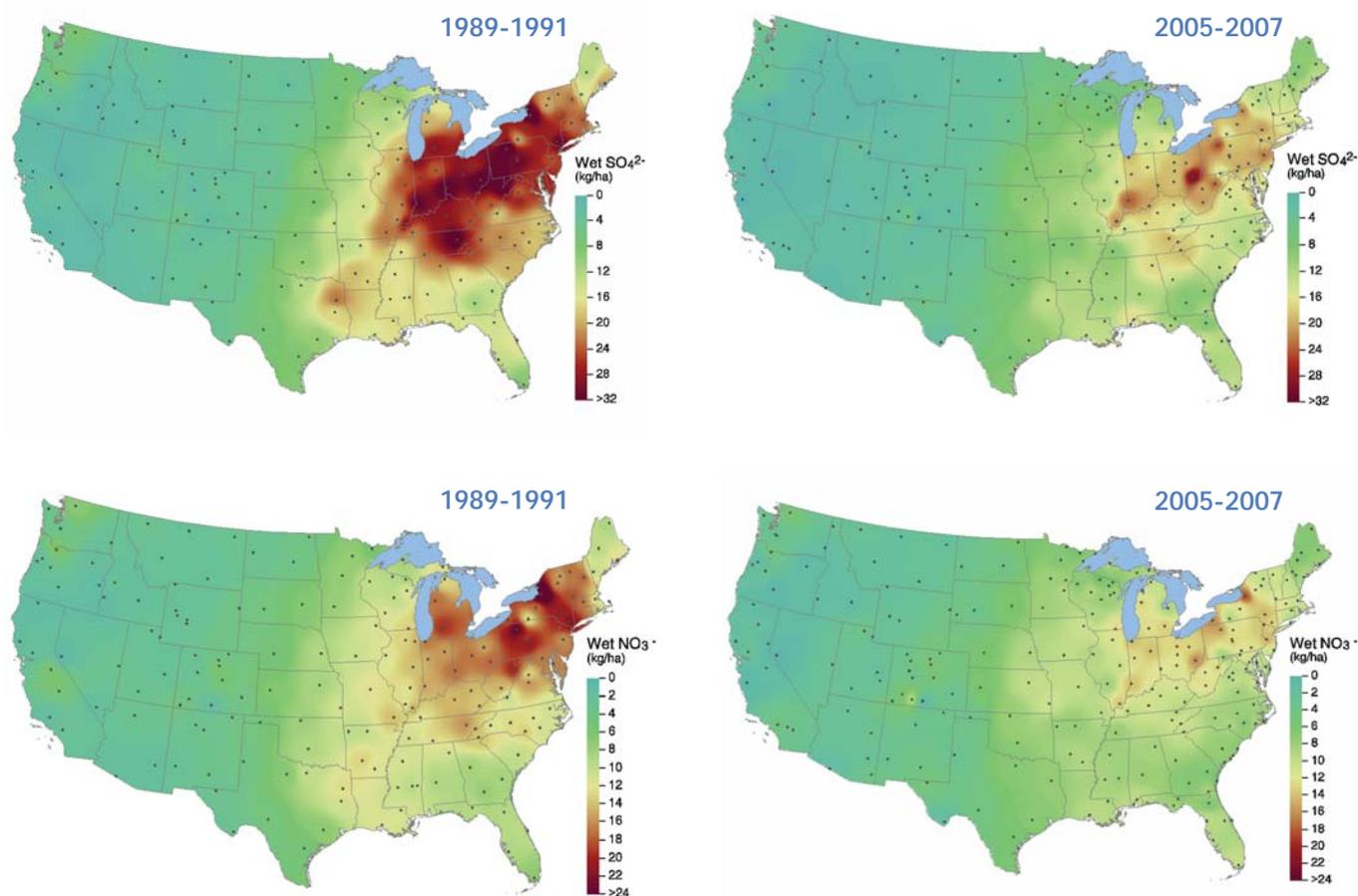


Figure 28. Three-year average deposition of sulfate (wet  $\text{SO}_4^{2-}$ ) and nitrate (wet  $\text{NO}_3^-$ ) in 1989-1991 and 2005-2007. Dots show monitoring locations. (Data source: National Atmospheric Deposition Program, <http://nadp.sws.uiuc.edu/>)

## Mercury in the Environment



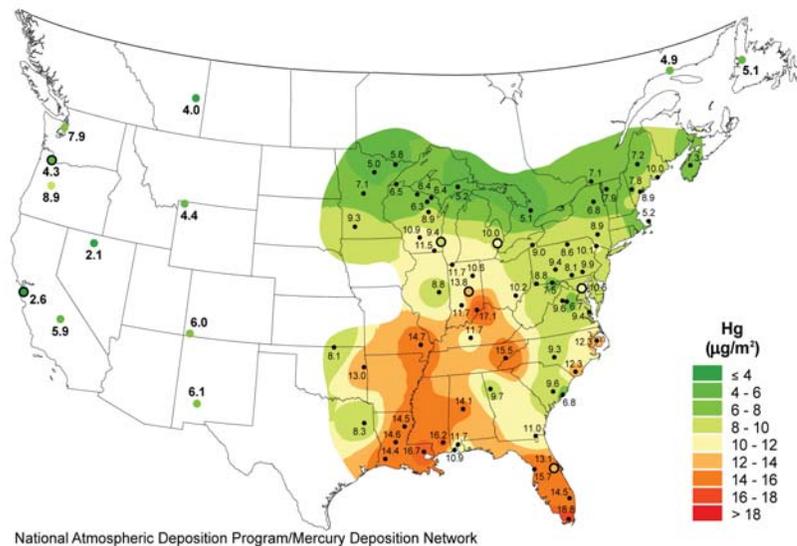
Mercury does not naturally occur as pure "quicksilver" but usually occurs as its principal ore cinnabar (HgS), one of 25 mercury-containing minerals that make up about 0.5 parts per million of the Earth's crust. Mercury is used in industry, commerce, mining, metallurgy, manufacturing, medicine, and dentistry. Human sources of atmospheric mercury include by-products of coal combustion, municipal and medical waste incineration, mining of metals for industry, and many others. Natural sources of atmospheric mercury include out-gassing from volcanoes and geothermal vents, and evaporation from naturally enriched soils, wetlands, and oceans. Atmospheric mercury concentrations can vary greatly depending on the location. Away from sources, elemental mercury concentrations are normally about 1.4 to 1.6 ng/m<sup>3</sup> and reactive gaseous and particle-bound mercury concentrations are normally below 0.05 ng/m<sup>3</sup>. Close to sources, and in unique environments, concentrations can range widely, from 0.1 to over 100 ng/L in some outliers. Wet deposition could be responsible for 50-90 percent of mercury loading to many inland water bodies.

Mercury in the air is usually of little direct concern. But when mercury is washed from the air by precipitation into our streams and lakes, it is transformed into highly toxic methyl-mercury that can build up in fish. People are then exposed to mercury by eating fish.

Tracking progress and results is a critical step in understanding mercury in the environment. Since 1996, the Mercury Deposition Network (MDN) provides measurements of the amount of mercury in precipitation; the network now has more than 100 sites. In 2006 the highest levels of mercury wet deposition are shown in the eastern U.S. Between 1996 and 2005, significant decreases in mercury wet deposition were found at about half of 49 selected sites. Several sites in the mid-Atlantic and northeast show decreases greater than 1.5 percent.

Through the National Atmospheric Deposition Program efforts are underway to develop and implement additional mercury monitoring, specifically to characterize ambient mercury species and dry deposition (i.e., beyond MDN). For more information, visit <http://nadp.sws.uiuc.edu/>.

Technologies used to remove NO<sub>x</sub>, SO<sub>x</sub>, and particles also reduce mercury emissions ("Control of Mercury Emissions from Coal-fired Electric Utility Boilers: Interim Report", EPA-600/R-01-109, April 2002).



National Atmospheric Deposition Program/Mercury Deposition Network

