An Alternate Method for Creating a Statewide Isopleth Map of Total Mercury Wet Deposition with an Example for Indiana

**TRADITIONAL METHOD**

Data on mercury in precipitation are collected by the National Atmospheric Deposition Program (NADP) at more than 100 Mercury Deposition Network (MDN) sites in North America. Each year, the data from NADN sites with a record of more than 75 percent completeness are used by the NADP to create county-scale maps of average annual precipitation-weighted total mercury concentrations. The NADP prepares these maps using geographic information systems (GIS) software that amalgamates distance-weighted interpolation algorithms, residual mercury concentrations or deposition, for each cell in a grid that covers North America. In addition, health data generated by the GIS software for selected ranges of mercury concentrations or deposition. These maps illustrate an interpretation of the spatial distribution of mercury concentrations in precipitation and mercury wet deposition.

**NEED FOR AN ALTERNATE METHOD**

Isopleth maps of mercury wet deposition for an individual state derived from the NADP North America maps may lack the detail needed at local levels because the spatial distribution of monitoring sites is too sparse, and because the isopleth maps are too broad to depict isopleths at a state or local scale. The alternate method is presented here as an example for Indiana. The alternate method uses a GIS software to perform an isopleth map of annual precipitation-weighted average total mercury concentrations and precipitation (fig. 1), a more detailed wet deposition isopleth is based on using precipitation data from a series of US National Weather Service Cooperative Observer Program sites in Indiana. The traditional NADP method uses data from approximately 10 NADN sites in North America (fig. 2), of which six sites are in Indiana.

**THE ALTERNATE METHOD**

The alternate method for creating isopleth maps of annual mercury wet deposition was used in Indiana is different from the traditional NADP method in three ways. First, average data for the period 2001–2006 were used. Second, a concentration isopleth map of annual precipitation-weighted average total mercury concentrations in Indiana, 2001–2006, fig. 1. It was prepared with data from more than 10 NADP sites in Indiana and from surrounding states. Third, the wet deposition isopleth map was prepared using annual precipitation data from Cooper sites in Indiana, 2001–2006. The isopleth map of total mercury wet deposition was created using a GIS software to perform an isopleth map of annual precipitation-weighted average total mercury concentrations and wet deposition in Indiana with the NADP method. The resulting map was made into a grid and used in an example for Indiana for the years 2001–2006. This isopleth map was prepared with data from more than 10 NADP sites in Indiana, 2001–2006. This isopleth map was prepared using annual precipitation data from nine MDN sites (five in Indiana and four from surrounding states) and the traditional NADP method was used for the rest of the states.

**COMPARISON OF ISOPLETH MAPS MADE WITH TRADITIONAL AND ALTERNATE METHODS**

The traditional method for depicting annual total mercury wet deposition utilizes data from approximately 10 NADP sites in North America. This array of sites gives a good general representation of the spatial distribution of mercury deposition. Figures 3, 4, and 5 of the Indiana portion of the NADP North America map (fig. 2) are total mercury weight deposition for years 2001, 2002, 2003, and 2004. Figures 3, 4, and 5 show the same general isopleths, but the isopleths were compared and mapped with the isopleths method using precipitation-weighted mercury concentrations from 10 NADP sites.

The same general relationship between years are apparent in both sets of figures. 2000 has less of higher total deposition values than 2001 and 2002. These isopleths were not prepared with a concentration isopleth method using annual precipitation data from Cooper sites in Indiana, 2001–2006, and the isopleths were compared and mapped with the alternate method using precipitation-weighted mercury concentrations.

**EXPLANATION**

Based on this example from Indiana, the alternate method is used for preparing annual total mercury wet deposition maps at a state- and local-scale assessment of mercury deposition. The main requirements for the alternate method are the result of using isopleth maps as an alternative to maps showing precipitation-weighted mercury concentrations and reliable long-term precipitation data from a dispersed and comprehensive network of locations can be used in the alternate method.


1. **Isopleth map of annual total mercury wet deposition in Indiana, 2002,** based on estimated deposition at 127 National Atmospheric Deposition Program sites in Indiana, 2001–2006.
2. **Isopleth map of annual total mercury wet deposition in Indiana, 2004,** based on estimated deposition at 127 National Atmospheric Deposition Program sites in Indiana, 2001–2006.
3. **Isopleth map of annual total mercury wet deposition in Indiana, 2005,** based on estimated deposition at 127 National Atmospheric Deposition Program sites in Indiana, 2001–2006.

**Alt." method used for creating isopleth maps of annual mercury wet deposition in Indiana is different from the traditional NADP method in three ways. First, average data for the period 2001–2006 were used. Second, a concentration isopleth map of annual precipitation-weighted average total mercury concentrations in Indiana, 2001–2006, fig. 1. It was prepared with data from more than 10 NADP sites in Indiana and from surrounding states. Third, the wet deposition isopleth map was prepared using annual precipitation data from Cooper sites in Indiana, 2001–2006. The isopleth map of total mercury wet deposition was created using a GIS software to perform an isopleth map of annual precipitation-weighted average total mercury concentrations and wet deposition in Indiana with the NADP method. The resulting map was made into a grid and used in an example for Indiana for the years 2001–2006. This isopleth map was prepared with data from more than 10 NADP sites in Indiana, 2001–2006. This isopleth map was prepared using annual precipitation data from nine MDN sites (five in Indiana and four from surrounding states) and the traditional NADP method was used for the rest of the states.

**PRELIMINARIES IN INDIANA

The National Weather Service (NWS) Cooperative Observer Program site was established in North Carolina in 1934, and Indiana has more than 130 such sites. These stations are used to collect precipitation data on an annual basis. The NWS Cooperative Observer Program sites in Indiana has approximately 390 COOP sites. Some sites have records from as far back as 1893. For the years 2001–2006 there were a total of 134 cooperative observer sites in Indiana.

The traditional NWS Cooperative Observer Program was created in 1890 under the Organic Act which established the Weather Bureau. A cooperative station is a site where observations are taken by volunteers or contractors. The National Weather Service (NWS) Cooperative Observer Program was created in 1890 under the Organic Act which established the Weather Bureau. A cooperative station is a site where observations are taken by volunteers or contractors. The NWS Cooperative Observer Program was established in 1890 under the Organic Act which established the Weather Bureau. A cooperative station is a site where observations are taken by volunteers or contractors.