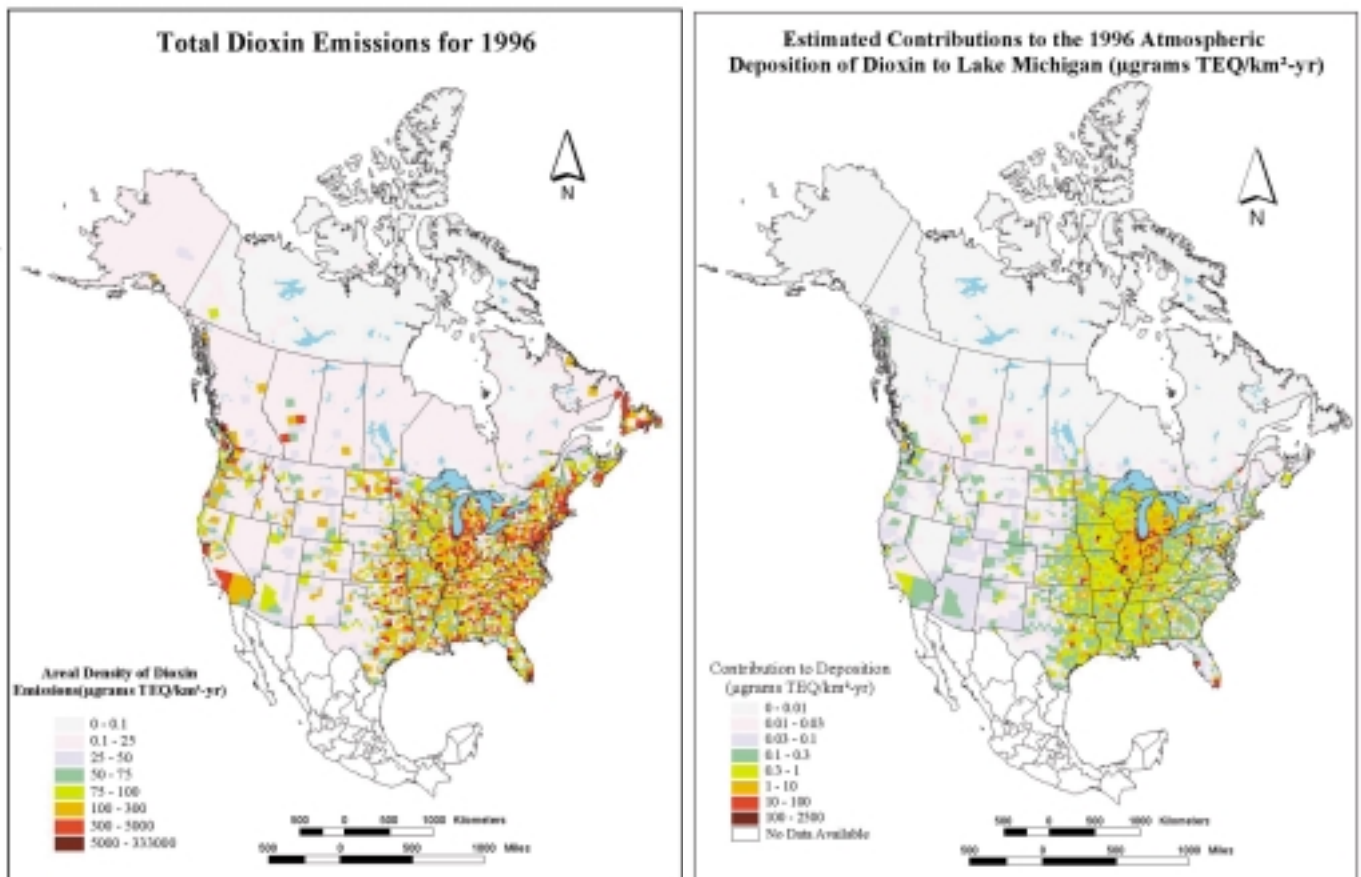


Dioxin

Dioxin is a bioaccumulative, persistent, and highly toxic byproduct of combustion and chemical processing. Based on a modeling analysis conducted with a 1996 emissions inventory, the latest year for which a comprehensive inventory was available, the estimated atmospheric deposition of dioxin to Lake Michigan was approximately 17 grams/year^{1,2}. Although this may seem like a very small amount, 17 grams of dioxin is equivalent to one year of the World Health Organization's Tolerable Daily Intake of dioxin for 310 million people³. The atmosphere appears to account for the majority of the dioxin that enters Lake Michigan⁴.

In the below maps, the first shows the total dioxin emissions in the United States and Canada and the second demonstrates the amount of dioxin from those sources that ends up in Lake Michigan. There are important source areas for dioxin concentrated in a broad region around the Lake Michigan Basin. The top source categories appear to be municipal and medical waste incineration, cement kilns burning hazardous waste, barrel burning, and secondary aluminum and copper smelting¹. According to EPA's draft Dioxin Reassessment, barrel burning of household or construction waste, which is an uncontrolled source of dioxin, is tied with municipal waste incineration as the top sources of emis-

Total Dioxin Emissions and Deposition to Lake Michigan

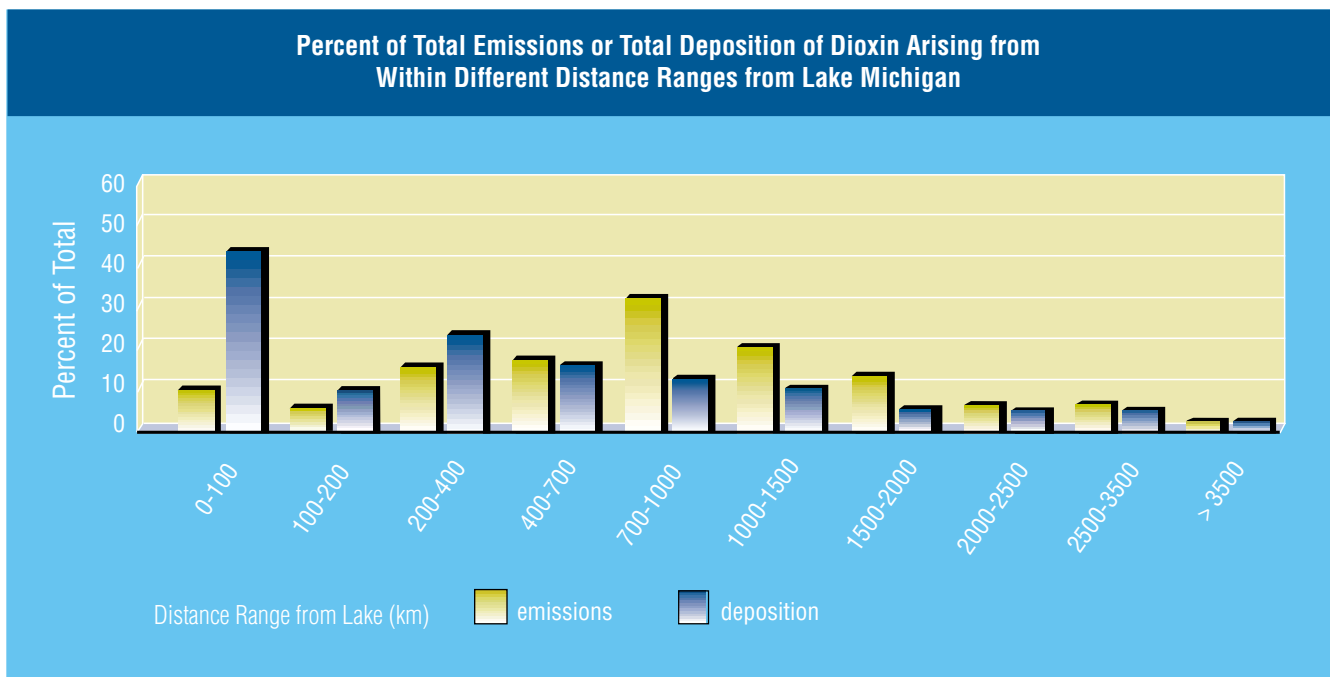




sions⁵. Iron sintering and other metals production appear to be less important in EPA's draft Dioxin Reassessment but are considered to be major sources by other inventories, including the European Dioxin Inventory^{1,6}.

While dioxin is transported through the atmosphere from sources throughout the continent, closer sources are generally more important for deposition to the lake. Approximately 40% of the deposition of dioxin to Lake Michigan, a much higher

portion than for any of the other Great Lakes, originates within 100km of the lake. Dioxin can also be transported great distances, with approximately 30% of the total deposited to Lake Michigan originating over 400 km from the lake. This chart provides a breakdown of the percentage of total emissions and total deposition to Lake Michigan that originates from varying distances from the lake. The chart demonstrates that although near sources are less important for total emissions, they have a greater impact on the lake⁷.



¹ Cohen, M. 2000. *The Transport and Deposition of Dioxin to Lake Michigan: A Case Study* (Unpublished). NOAA Air Resources Library. October.

² This figure is based upon toxic equivalents (TEQ), which measures dioxin congeners multiplied by their toxic equivalency factors to arrive at a total that is relative to toxicity rather than amount.

³ The World Health Organization has determined that the Tolerable Daily Intake of dioxin is 1 to 4 pg per kg total body weight per day. This number was arrived at by multiplying the midrange estimate of 2.5 pg by an average weight of 60 kg and then by 365 days. The estimated 17 grams is then divided by this number.

⁴ Cohen, M., et al. 1995. *Quantitative estimation of the entry of dioxins, furans, and hexachlorobenzene into the Great Lakes from airborne and waterborne sources*. Center for the Biology of Natural Systems. Queens College, CUNY. Flushing, New York. May.

⁵ EPA. 2000. *Dioxin Reassessment Documents* (Draft). June. 6. European Commission. 1997. *European Dioxin Inventory*. October.

⁶ Pearson, R.F. et al. 1998. *Atmospheric Inputs of Polychlorinated Dibenzo-p-dioxins and Dibenzofurans to the Great Lakes: Compositional Comparisons of PCDD and PCDF in Sediments*. *Journal of Great Lakes Research*. 24(1)65-82.

⁷ Cohen, M. 2001. *The Atmospheric Transport and Deposition of Dioxin to the Great Lakes for 1996: Revised Estimates*. NOAA Air Resources Laboratory. March.