



Executive Summary
**Monitoring Bioaccumulative Contaminants in Fish and
Dragonfly Larvae at Indiana Dunes National Lakeshore**
February 2009



In Indiana, Illinois, and Michigan, 291-million pounds of toxic waste was reported released into the air, discharged into the water, or disposed on land in 2006¹. Some of this toxic waste ultimately enters aquatic systems through direct discharge, atmospheric deposition, or ground water inflow. Many of these chemicals, and the by-products that result from their degradation, are highly persistent and tend to accumulate, or biomagnify, as they are ingested by progressively larger individuals or species higher in aquatic food webs. Some of these persistent and bioaccumulative chemicals are also highly toxic to fish, wildlife, and humans.

The National Park Service has a responsibility to understand the levels and potential effects of these chemicals on the natural resources it manages and to inform the visiting public about the potential human health hazards. Indiana Dunes National Lakeshore has been involved in a number of investigations to document the levels of environmental contaminants in the park^{2,3,4}. In 2008 the NPS Great Lakes Inventory and Monitoring Network (GLKN) began a program aimed at monitoring trends in selected toxic metals and synthetic chemicals that are known to be persistent, bioaccumulative, and toxic. These chemicals have either caused water bodies in park units to be listed as impaired under the Water Quality Act, or they are listed as substances of concern under the Great Lakes Binational Toxics Strategy. The chemicals we hope to monitor are:

- Mercury (Hg), a heavy metal that, when converted to methylmercury (an organic form), is highly toxic and one of the most widespread toxic chemicals in Great Lakes region ecosystems;
- DDT (dichlorodiphenyltrichloroethane and derivatives DDE and DDD), though banned in 1972, continues to persist in the environment due to its inherent long-life and its continued use in other countries;
- PCBs (polychlorinated biphenyls; 95 formulations), which, though also banned in the 1970s, continues to persist in the environment;
- PFCs (perfluorinated compounds; 11 formulations), a group of related chemicals used as water and stain repellents (3M ScotchGard™, GoreTex™) and non-stick surfaces (Teflon); and
- PBDEs (polybrominated diphenyl ethers; 9 formulations), a group of related chemicals that are widely used as flame retardants in textiles and plastics.

At Indiana Dunes National Lakeshore, we are sampling and analyzing prey fish and dragonfly larvae to monitor the levels of these contaminants in the aquatic food webs. The program is being developed under a Cooperative Agreement between the Network, the Great Lakes Research and Education Center, the park, and the River Studies Center at the University of Wisconsin-La Crosse.

Methods – The University of Wisconsin-La Crosse and Network staff began sampling in 2008 and will resample at Indiana Dunes every three years. Park, GLREC, and Network staff will provide additional samples during the intervening years. Prey fish for mercury analysis were collected by electrofishing, dip netting, and seining. Prey fish and dragonfly larvae are being

analyzed to monitor mercury levels in aquatic food webs. Variable mesh gill nets and angling in Great Marsh and Long Lake did not yield any adult predatory fish for analyses of organic contaminants. A single, small grass pickerel (*Esox americanus*) collected from Great Marsh is being analyzed for mercury, but sample mass was insufficient to determine organics.

In the laboratory, fish and dragonfly larvae are grouped by water body, species, and sampling date, then weighed and measured. For fish, 8-20 scales are collected to estimate age. Total mercury content in the whole bodies of these organisms is used as an index to evaluate methylmercury contamination of the aquatic food web. The mercury determinations are being done at the University of Wisconsin-La Crosse.

Results - During two days of intensive sampling in 2008, investigators collected larval dragonflies and two species of prey fish for monitoring mercury levels (Table 1). Identification of larval dragonflies to species and laboratory determinations of mercury levels in these samples is underway. We expect results from laboratory analysis in summer 2009.

Table 1. Fish and dragonfly larvae collected for monitoring mercury in selected aquatic food webs at Indiana Dunes National Lakeshore, May 2008.

Water body	Date sampled	No. of sites	Fish		Dragonfly Larvae	
			Species (Scientific name)	No.	Family(ies)	No.
Long Lake	5/20/08	1	green sunfish (<i>Lepomis cyanellus</i>)	15	Libellulidae and Corduliidae	29
Subtotal				15		29
Grand Marsh	5/21/08	3	central mudminnow (<i>Umbra limi</i>)	57	Libellulidae and Corduliidae	12
			green sunfish	2		
			grass pickerel	1		
Subtotal				60		12
Total samples from park unit				75		41

For more information about this project, contact:

Bill Route
NPS Great Lakes Inventory and Monitoring Network
2800 Lakeshore Drive East, Suite D
Ashland, WI 54806
(715) 682-0631 x21
Email: bill_route@nps.gov

or

Dr. James Wiener
University of Wisconsin-La Crosse
River Studies Center
1725 State Street
La Crosse, WI 54601
(608) 785-6454
Email: wiener.jame@uwlax.edu

References

- ¹U. S. Environmental Protection Agency. 2008. Toxic Release Database. Available on-line at <http://www.epa.gov/triexplorer/statefactsheet.htm>. Accessed 15 January 2009.
- ²Custer, W. T., R. K. Hines, P. M. Stewart, M. J. Melancon, D. S. Hensel, and D. W. Sparks. 1998. Organochlorines, mercury, and selenium in great blue heron eggs from Indiana Dunes National Lakeshore, Indiana. *Journal of Great Lakes Research* **24**:1-11.
- ³Custer, W. T., K. Kannan, L. Tao, A. R. Saxena, and B. Route. *In review*. Perfluorinated compounds and polybrominated diphenyl ethers in great blue heron eggs from Indiana Dunes National Lakeshore, Indiana. *Journal of Great Lakes Research*.
- ⁴Vermillion, B. R., and R. J. Hudson. 2008. Investigation of the bioavailability of methylmercury in the Great Marsh, Indiana Dunes National Lakeshore, Porter, Indiana. Unpublished report.