

Long-Term Monitoring Record at Indiana Lake

Over the 21 years of the Indiana Volunteer Lake Monitoring Program's existence, 192 different Indiana lakes have been monitored. No lake in the program has more observations than Indiana Lake in Elkhart County. Indiana Lake is a 122-acre natural lake that straddles the Indiana-Michigan state line (Figure 1).

Ray Cacini began monitoring Indiana Lake in 1989, a job he continued until 1998. When we created the expanded monitoring program in 1992, Ray signed up for that, too. Upon Ray's retirement following the 1997 season, Larry Lehman became our official volunteer monitor on Indiana Lake.

Larry and his wife moved to Indiana Lake in 1985. Shortly thereafter, in August 1987, due to rising concerns about water quality degradation of the lake, the Indiana Lake Association was formed and Larry became its first president. With a degree in chemistry and a self-professed "fire in his belly," Larry had several aluminum Secchi disks made and began measuring Secchi disk transparency, initially unaware that Ray was also making similar measurements.

From April 1988 to November of last year, Larry made an astounding 1,023 Secchi disk transparency measurements at Indiana Lake. He has assembled one of the most impressive records of water clarity changes of any lake in the U.S. (Figure 2).



Figure 1. Indiana Lake. The line through the lake is the State Line. Source: Google Earth.

From this figure, you can see that there is a curvilinear relationship between Secchi disk transparency and time. Lower transparency in the late 1980s improved to better transparency in the early-mid 1990s. In recent years, transparency has returned to the levels of the late 1980s. There were two periods (May 2002 and May 2005) of exceptional clarity, where Secchi disk transparency nearly reached 35 feet.

Because of the frequent and extensive samples, seasonal trends are also evident, especially for 1988 (Figure 3). As lake residents and users know, lake clarity varies throughout the year – best during spring and fall when algae are not growing and worst during algae blooms, after large storm events, and during spring and fall turnover. These seasonal changes and their effects on Secchi disk transparency are seen clearly in Figure 3.

In addition to Secchi disk transparency, Larry also measured air and water temperatures on most days. Figure 4 includes water temperature measurements for April through September for each year, the period during which most measurements were made. Occasional early and late season temperature measurements were not included to prevent skewing the annual ranges. From these figures, it appears that between 1989 to 2009 water temperatures have risen from about 72°F to 75°F.

In 2006, the Michigan side of Indiana Lake was sewered. Lake residents hope that the Indiana side can also be sewered since the high water table likely leaves many septic system drainfields below the water table, where bacterial treatment of septic effluent is much less efficient. Larry continues his interest in monitoring Indiana Lake and hopes that land use improvements on farmlands, residential areas, and sewers will create a more transparent Indiana Lake.

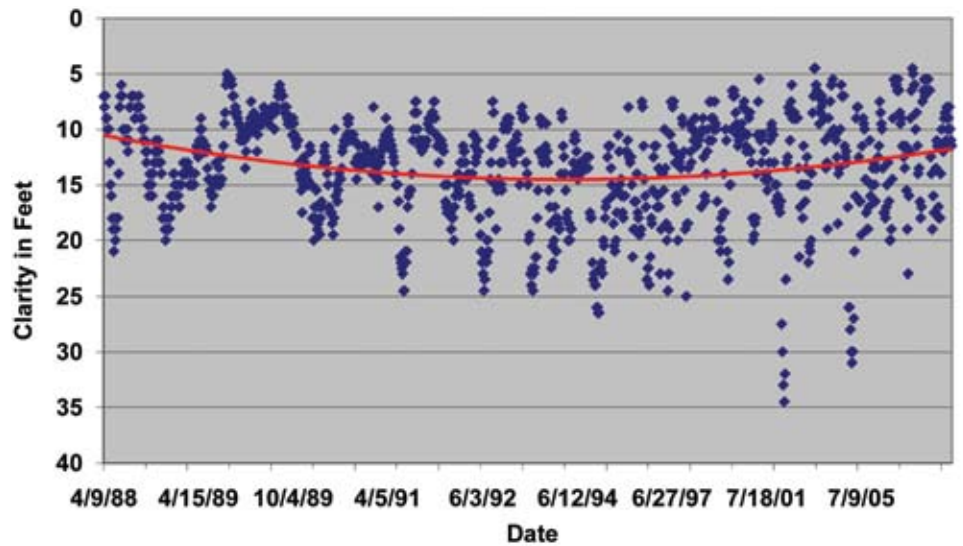


Figure 2. 1988 - 2009 Secchi Disk Transparency – Indiana Lake.

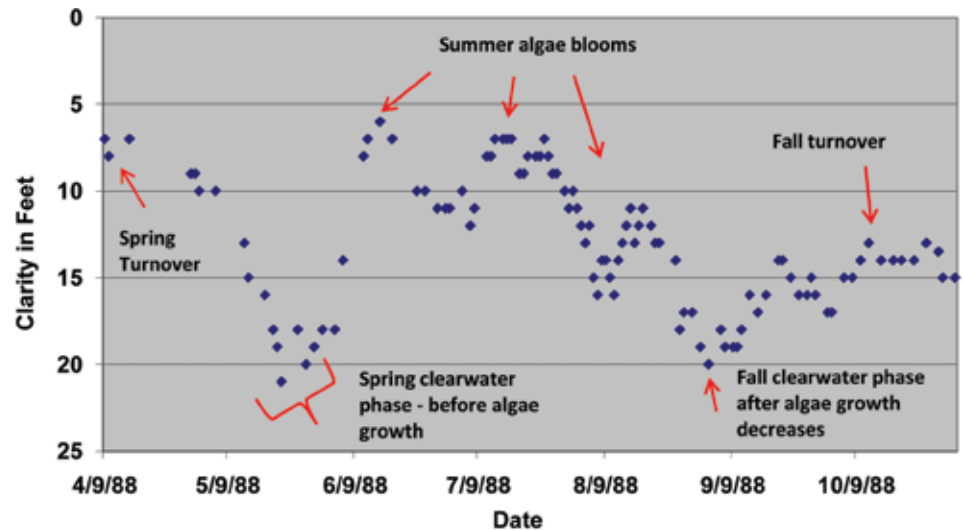


Figure 3. 1988 Secchi Disk Transparency – Indiana Lake.

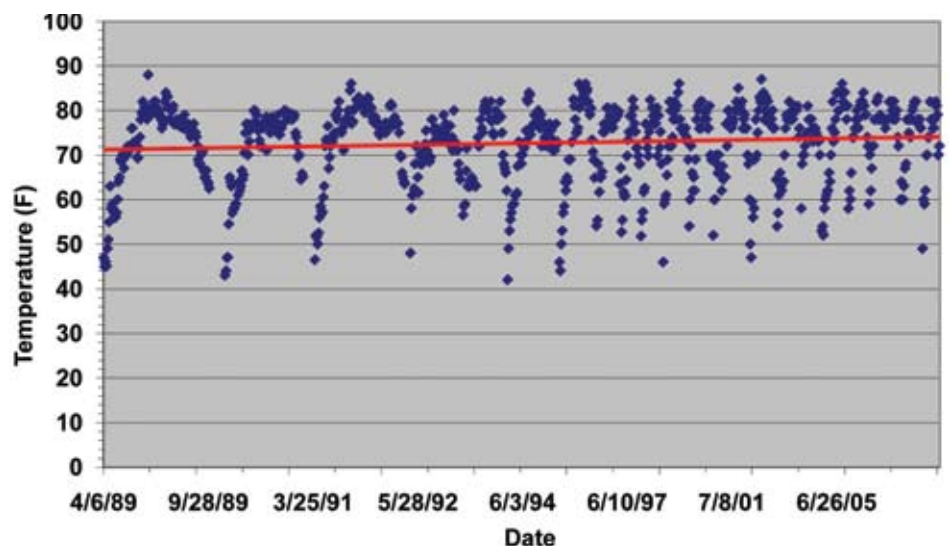


Figure 4. 1989 - 2009 April-October Water Temperature – Indiana Lake.

EPA Releases First-Ever Baseline Study of U.S. Lakes

WASHINGTON. The U.S. Environmental Protection Agency released in December its most comprehensive study of the nation's lakes to date. The draft study, which rated the condition of 56 percent of the lakes in the United States as "good" and the remainder as "fair" or "poor," marked the first time EPA and its partners used a nationally consistent approach to survey the ecological and water quality of lakes. A total of 1,028 lakes were randomly sampled during 2007 by states, tribes, and EPA. All lakes larger than ten acres in area and deeper than three feet were included in the initial random draw – some 50,000 lakes and reservoirs, public and private, nationwide.

"This survey serves as a first step in evaluating the success of efforts to protect, preserve, and restore the quality of our nation's lakes," said Peter Silva, assistant administrator for EPA's Office of Water. "Future surveys will be able to track changes in lake water quality over time and advance our understanding of important regional and national patterns in lake water quality."

The National Lakes Assessment reveals that the remaining 44 percent of lakes are in fair or poor condition. Degraded lakeshore habitat, rated "poor" in 36 percent of lakes, was the most significant of the problems assessed. Removal of trees and shrubs and construction of docks, marinas, homes, and other structures along shorelines all contribute to degraded lakeshore habitat.

Nitrogen and phosphorous are found at high levels in 20 percent of lakes. Excess levels of these nutrients contribute to algae

blooms, weed growth, reduced water clarity, and other lake problems. EPA is very concerned about the adverse impacts of nutrients on aquatic life, drinking water, and recreation. The agency will continue to work with states to address water quality issues through effective nutrient management.

The survey included a comparison to a subset of lakes with wastewater impacts that were sampled in the 1970s. It finds that 75 percent show either improvements or no change in phosphorus levels. This suggests that the nation's investments in wastewater treatment and other pollution control activities are working despite population increases across the country.

The results of this study describe the target population of the nation's lakes as a whole and are not applicable to a particular lake.

To access the draft study, visit <http://www.epa.gov/lakessurvey>.

EPA Study Reveals Widespread Contamination of Fish in U.S. Lakes and Reservoirs

WASHINGTON. A new EPA study shows concentrations of toxic chemicals in fish tissue from lakes and reservoirs in nearly all 50 U.S. states. For the first time, EPA is able to estimate the percentage of lakes and reservoirs nationwide that have fish containing potentially harmful levels of chemicals such as mercury and PCBs.

"These results reinforce Administrator Jackson's strong call for revitalized protection of our nation's waterways and long-overdue action to protect the American people," said Peter

S. Silva, assistant administrator for EPA's Office of Water. "EPA is aggressively tackling the issues the report highlights. Before the results were even finalized, the agency initiated efforts to further reduce toxic mercury pollution and strengthen enforcement of the Clean Water Act – all part of a renewed effort to protect the nation's health and environment."

The data showed mercury concentrations in game fish exceeding EPA's recommended levels at 49 percent of lakes and reservoirs nationwide, and polychlorinated biphenyls (PCBs) in game fish at levels of potential concern at 17 percent of lakes and reservoirs. These findings are based on a comprehensive national study using more data on levels of contamination in fish tissue than any previous study.

Burning fossil fuels, primarily coal, accounts for nearly half of mercury air emissions caused by human activity in the U.S., and those emissions are a significant contributor to mercury in water bodies. From 1990 through 2005, emissions of mercury into the air decreased by 58 percent. EPA is committed to developing a new rule to substantially reduce mercury emissions from power plants, and the Obama Administration is actively supporting a new international agreement that will reduce mercury emissions worldwide.

The study also confirms the widespread occurrence of PCBs and dioxins in fish, illustrating the need for federal, state, and local government to continue efforts to reduce the presence of these harmful chemicals in our lakes and reservoirs and ensure that fish advisory information is readily available.

It is important that women of child-bearing age and children continue to follow the advice of EPA and the Food

Have you checked out the Indiana Clean Lakes Program Web page lately? Take a look at <http://www.indiana.edu/~clp/> and see what's new and happening with the program and with Indiana lakes!

and Drug Administration on fish consumption as it relates to mercury. This study is also a strong message to state and local governments to redouble their efforts in looking for opportunities to reduce mercury discharges, as well as developing fish advisories, especially to reach those in sensitive and vulnerable populations.

Results from the four-year National Study of Chemical Residues in Lake Fish Tissue show that mercury and PCBs are widely distributed in U.S. lakes and reservoirs. Mercury and PCBs were detected in all of the fish samples collected from the nationally representative sample of 500 lakes and reservoirs in the study. Because these findings apply to fish caught in lakes and reservoirs, it is particularly important for recreational and subsistence fishers to follow their state and local fish advisories.

EPA is conducting other statistically based national aquatic surveys that include assessment of fish contamination, such as the National Rivers and Streams Assessment and the National Coastal Assessment.

For more information: <http://www.epa.gov/waterscience/fishstudy>.

For more information on fish advisories in Indiana: http://www.in.gov/isdh/files/2009_FCA_Booklet.pdf.

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Ordinance Improves Huron River Quality – Restrictions Spread Nationwide

Many government entities are finding ways to reduce residents' use of lawn fertilizers that contain phosphorus. Some governments choose to pass laws or ordinances prohibiting the use of fertilizers that contain phosphorus except in special cases, such as on new lawns or when a soil test indicates that phosphorus is needed. Others are increasing education efforts to help residents better understand that fertilizer with phosphorus is not always necessary. Evidence suggests that these endeavors are making a difference. The City of Ann Arbor, Michigan, for instance, has seen phosphorus levels in the Huron River drop an average of 28 percent after it enacted a phosphorus ordinance in 2006.

Numerous local governments across the country have phosphorus restrictions in place. For example, several counties in Michigan have passed countywide ordinances limiting or banning the use of fertilizer that contains phosphorus. The city of Ann Arbor, Michigan passed a strict phosphorus ordinance in 2006 after a total maximum daily load (TMDL) study on the Huron River showed that the city had to reduce the amount of phosphorus discharged from the city's watershed. Ann Arbor's ordinance prohibits application of phosphorus except when a soil test shows that it is needed, or when planting a new lawn. It prohibits applying fertilizer within 25 feet of any waterbody. Ann Arbor also prohibits any manufactured fertilizer application prior to April 1 or after November 15 unless the soil temperature at a depth of 2 inches has been measured, and is greater than 37° Fahrenheit. Additionally, the city requires all commercial fertilizer applicators to register annually; plus, the applicators must

provide at least one copy of a city-published manufactured fertilizer informational pamphlet to each customer.

Similarly, to comply with phosphorus TMDLs requirements, the New Jersey Department of Environmental Protection (NJDEP) is mandating that more than 100 New Jersey municipalities adopt local ordinances prohibiting the use of fertilizers containing phosphorus except under special circumstances (see ordinance details at www.state.nj.us/dep/watershedmgmt/DOCS/TMDL/Fertilizer_Application_Model_Ordinance.pdf).

Annapolis, Maryland recently became the first municipality in the Chesapeake Bay watershed to adopt an ordinance banning the use of fertilizer that contains phosphorus. Since January 1, 2009, residents have been required to use only phosphorus-free fertilizer, except in gardens, on newly established turf, and in cases where a soil test shows a phosphorus deficiency. For more information, see www.annapolis.gov/upload/images/government/council/Adopted/o1008.pdf.

Numerous local governments in Florida have passed fertilizer ordinances over the past decade to reduce nutrient pollution of surface waters. Building on the success of these ordinances, Florida passed a statewide law in June 2009 that requires all local governments to adopt a model fertilizer use ordinance as a minimum standard. This ordinance restricts or prohibits the application of fertilizer that contains nitrogen and phosphorus in certain areas and during certain times of the year.

Two other states have also passed laws prohibiting phosphorus in most fertilizer. Minnesota enacted a statewide law in 2005 prohibiting the use of phosphorus lawn fertilizer unless new turf is being established or a soil test shows a need for phosphorus (see www.mda.state.mn.us/protecting/waterprotection/lawncwaterq.htm). In April 2009, Wisconsin Governor Doyle signed the "Clean Lakes"

bill (2009 Wisconsin Act 9). The bill established a statewide law prohibiting the display, sale, and use of lawn fertilizer containing phosphorus, with certain reasonable exceptions (e.g., when establishing grass or when a soil test shows that phosphorus is needed). The law takes effect in April 2010, which gives retailers time to prepare. Although retailers will not be permitted to display turf fertilizer that is labeled as containing phosphorus, they may post a sign advising customers that turf fertilizer containing phosphorus is available upon request for qualified uses. To read the statute, see www.legis.state.wi.us/2009/data/AB-3.pdf.

Educating People about Fertilizer

Reluctant to prohibit its residents from using fertilizer with phosphorus, Maine instead passed a statewide law that it hopes will raise people's awareness and change their behavior. The law requires all fertilizer retailers to post educational signs. The signs, approved by the Maine Department of Environment, explain the link between phosphorus use and algae growth and discourage people from using phosphorus-containing



Maine fertilizer retailers are required by law to post this educational sign near fertilizer displays.



Many fertilizer retailers in the Lake Champlain watershed ask their salespeople to wear these "P-free" buttons to encourage consumers to ask questions.

fertilizer except on new or reseeded lawns. See www.maine.gov/dep/blwq/doclake/fert/phospage.htm for more information on Maine's law.

Some localities still rely completely on education to reduce the use of fertilizers that contain phosphorus. In 2006 the Lake Champlain Basin Program (www.lcbp.org) in Vermont, New York, and Quebec began working with several partners in the watershed to pool resources and ideas to create a coordinated outreach message for both fertilizer consumers and retailers. In addition to promoting the use of phosphorus-free fertilizer with a "Don't 'P' on Your Lawn" message, this partnership has created other healthy lawn tips and encouraged local retailers to stock phosphorus-free fertilizers (see www.lawntolake.org).

These educational efforts appear to be making a difference.

In Maine, a 2009 follow-up survey indicates that most fertilizer retailers are complying with the law – 87 percent of surveyed stores had posted the educational signs as required. Plus, 97 percent of stores now offer phosphorus-free products. Anecdotal evidence suggests that more consumers are purchasing phosphorus-free products as a result. For more details on the survey, see the spring 2009 issue of Maine's *Nonpoint Source Times* at www.maine.gov/dep/blwq/newslet/npstimes/spring2009.pdf.

In Indiana, an ordinance by the Steuben County Commissioners to ban the use of fertilizers containing phosphorus was rejected recently by the Indiana State Chemist's Office. The county commissioners had hoped that their ban would help improve water quality in the abundant lakes within Steuben County. State Chemist Robert Waltz accepted the scientific evidence showing that fertilizers with phosphorus can cause algal blooms in waters. However, Indiana law specifies that special circumstances must exist for the State Chemist's Office to approve such an ordinance, and Waltz said that Steuben County didn't demonstrate that their needs were different from any other county.

Adapted from EPA Nonpoint News and Notes, October 2009

Perspectives

"I like to walk on fresh fallen snow
The kind that whispers and speaks.
It sings a song as I walk along
With crackles and scrunches and squeaks."

*From Winter Morning Poem
by Ogden Nash*



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