

Lake Monitoring Efforts – Season Wrap Up!

~ Melissa Clark

The 2012 summer sampling season was a whirlwind of lakes. We experienced new challenges brought on by the drought and much lowered water levels. Lake Wildwood dropped in lake level and partially emptied like a bathtub swirl due to the karst topography (sink hole) that lies beneath! Lake Wildwood and many others required that we pulled out the canoe for tricky launchings. Typical with fieldwork, we also experienced our share of equipment failure and troubleshooting including trailers snapping and “MacGyver-ing” our broken transom saver! We even had the opportunity to herd some exploring cattle back into their fields.

All and all, we had a wonderful and successful season. We sampled 80 lakes for the Indiana Clean Lakes Program (CLP), which covers Indiana’s monitoring efforts to report the water quality status and trends for public freshwater lakes. With IDEM’s coordination, the IU-SPEA field crews were also able to participate in the EPA’s National Lake Assessment (NLA) resulting in an additional 50 lakes. This was the second “Survey of the Nation’s Lakes,” with the first taking place in 2007. Nationwide, the NLA 2012 field season consisted of 1,133 individual lakes that were spread over 49 states (Figure 1). Fortunately, 23 of the randomly selected lakes for the CLP and NLA overlapped (Figure 2). This allowed us to double up on our sampling effort.

Now that the sampling season is complete, we are concluding our sample analysis for the CLP. The NLA samples have been shipped to EPA-

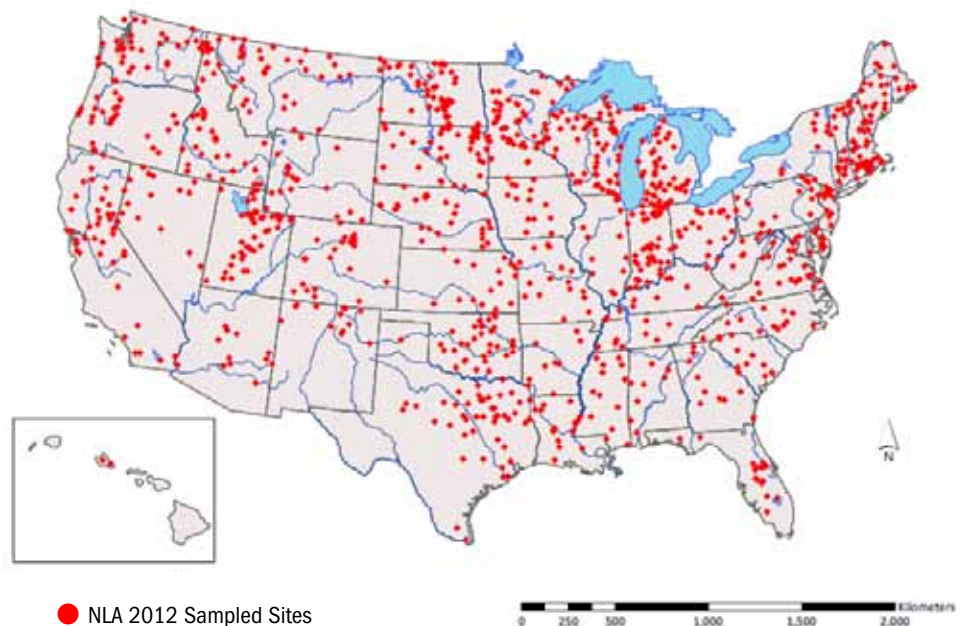


Figure 1. Sites Sampled for the 2012 National Lakes Assessment.

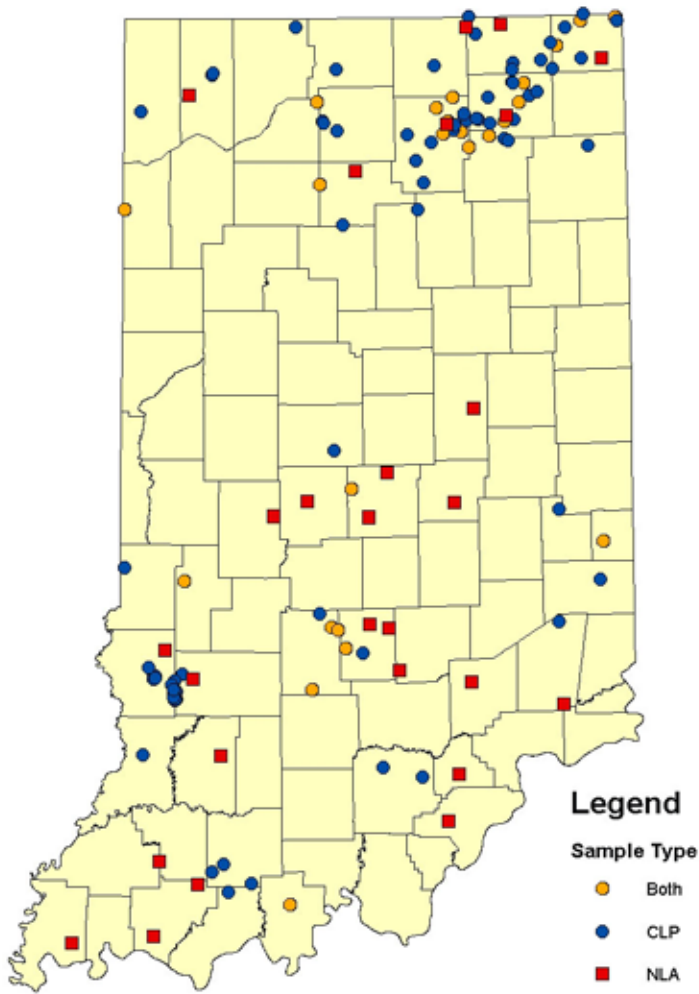


Figure 2. Randomly Selected Lakes for both the Clean Lakes Program and the National Lakes Assessment, Showing Site Overlap.

contracted labs and will be processed over the next year. Interpretation will follow. Many of you may be eager to uncover the data from your lakes; however, the final national assessment indicating the number

of lakes that are in good, fair, or poor condition is not expected until 2014.

Indiana sampled enough lakes to qualify as a state intensification survey. The extra lakes will allow for a robust statistical analysis of Indiana lakes in addition to the national report. The Indiana data and report will follow the EPA deadlines as well. So, please stay tuned for more National Lakes Assessment results in the years to come.

I do want to give a very big *thank-you* to all the private landowners, lake associations, citizen groups, State Parks, and fish and wildlife areas for assisting in making such a successful and productive year!

To check in on the status on NLA data and for more information on the nationwide survey, see http://water.epa.gov/type/lakes/lakessurvey_


DNR Prohibits the Sale of Invasive Aquatic Plants

~ Eric Fischer

The spread of invasive aquatic plants in Indiana has reduced boating, angling, and other aquatic recreation opportunities, negatively impacted native aquatic plant communities, and has reduced property values around lakes and ponds. In addition, the management or eradication of these species easily exceeds one million dollars annually when DNR and lake association costs are combined.

In reaction to the frequency of which invasive aquatic plants are being found throughout the state, the DNR has taken steps to evaluate the invasiveness of aquatic plants known to occur in trade. A risk assessment tool was developed by a working group composed of DNR, Illinois-Indiana Sea Grant, University of Notre Dame, The Nature Conservancy, and most importantly, members representing the aquatic plant industry (aquarium trade, aquatic plant growers, and water garden design and retail). This risk assessment tool will continue to identify species that should be of concern to Indiana, especially if those species have shown invasive tendencies in areas of the world with a climate similar to Indiana.

To protect Indiana waters and wetlands, DNR has used the results of the risk-assessment process and passed a rule that declares 28 aquatic plants as pests (Table 1). This rule prevents the sale, gift, barter, exchange, or distribution of any of these species in Indiana without a permit issued by the State Entomologist. Not only are these species not to be used in outdoor water features, they also cannot be used in aquariums or other indoor features. Of the 28 species listed in the regulation, currently five species have a considerable presence in trade. Those with the greatest volume in trade include flowering rush, Brazilian elodea (*Anacharis*),



WATER COLUMN

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Table 1. Aquatic Plants Declared pests.

Scientific name	Common name(s)
<i>Azolla pinnata</i>	mosquito fern
<i>Butomus umbellatus</i>	flowering rush
<i>Caulerpa taxifolia</i>	caulerpa or Mediterranean killer algae
<i>Egeria densa</i>	Brazilian elodea, Brazilian waterweed, Anacharis, or Egeria
<i>Eichhornia azurea</i>	anchored water hyacinth
<i>Hydrilla verticillata</i>	Hydrilla or water thyme
<i>Hydrocharis morsus-ranae</i>	European frogbit or common frogbit
<i>Hygrophilia polysperma</i>	miramar weed, Indiana swampweed, or hygro
<i>Ipomoea aquatica</i>	Chinese waterspinach or swamp morning-glory
<i>Iris pseudacorus</i>	yellow flag iris or tall yellow iris
<i>Lagarosiphon major</i>	oxygen weed or African elodea
<i>Limnophila sessiliflora</i>	Asian marshweed or ambulia
<i>Monochoria hastata</i>	monochoria, arrowleaf, or false pickerelweed
<i>Monochoria vaginalis</i>	heartshape or false pickerelweed
<i>Myriophyllum aquaticum</i>	parrot feather or parrot feather watermilfoil
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil
<i>Najas minor</i>	brittle naiad or brittle water nymph
<i>Nymphoides peltata</i>	yellow floating heart
<i>Ottelia alismoides</i>	duck lettuce
<i>Potamogeton crispus</i>	curlyleaf pondweed
<i>Sagittaria sagittifolia</i>	arrowhead
<i>Salvinia auriculata</i>	giant salvinia
<i>Salvinia biloba</i>	giant salvinia
<i>Salvinia herzogii</i>	giant salvinia
<i>Salvinia molesta</i>	giant salvinia
<i>Sparganium erectum</i>	exotic bur-reed
<i>Trapa natans</i>	water chestnut
<i>Typha angustifolia</i>	narrow-leaf cattail

yellow flag iris, parrot feather, and yellow floating heart. The majority of the regulated species are already federally regulated noxious aquatic plants that should not be in trade because by federal rule they cannot cross state lines. To view the new prohibited invasive aquatic plant rule, please go to <http://www.in.gov/legislative/iac/20120411-IR-312120050PRA.xml.pdf>.

Since taking effect August 31, the prohibition of sale of these

plants began with the immediate elimination of restricted plants from in-state wholesale and retail outlets. Out-of-state suppliers and online retailers are also regulated and were notified that these particular species are not to be sold to Indiana customers.

Simply prohibiting certain aquatic plants is not the entire answer; property owners still need to do their part. For those who have water features there are a number

of best management practices that should be adopted to prevent unintended consequences. First, a water feature should be situated in a location that is not prone to flooding and any water that escapes the feature should not have direct access to a stream, pond, lake, or wetland. Second, learn about the growth habits of a plant before purchasing these materials because even a species that is not considered highly invasive could quickly overtake a water garden that is not sized for the type of plant being considered. Third, and most important, when aquatic plants are removed, never release them into a body of water; they should be discarded with household trash or composted in an area away from water. Aquatic gardeners should know the rules and regulations for the state of Indiana and never purchase a species prohibited in Indiana from a local or online source.

If you have any questions or would like additional information regarding the department's prohibited list, please contact Eric Fischer, Aquatic Invasive Species Coordinator at 317/234-3883. Or go to the Indiana DNR's Invasive species website at <http://www.in.gov/dnr/3123.htm>.

The World's Fastest Predator: Bladderwort

~ Dan Warner

Lake ecosystems are host to a variety of predators, from tiny insects to Great Blue Herons. While not as majestic and easily overlooked, the members of the bladderwort family (genus *Utricularia*) are perhaps the most efficient and impressive of all of them (Figure 3).

They appear commonly in Indiana in shallow waters in dense mats and have branching leaves lined with strange, knobby bladders, and can live in extremely murky and nutrient-poor habitats. Their resilience is due to their



Figure 3. *Utricularia* sp. (bladderwort). From U.S. Forest Service.

ability to access nutrients from zooplankton as a carnivorous plant. Bladderworts gain some carbon through photosynthesis, but where most macrophytes depend on ambient water and soil nitrogen and phosphorous stocks, bladderworts capture and digest free-swimming zooplankton. In addition to nitrogen and phosphorous, the prey also supplement a portion of the plant's carbon demand (1).

Bladderworts employ a complex strategy to be excellent predators. Each bladder consists of a water pumping mechanism, spherical "stomach" for digestion, and trapdoor lined with pressure sensitive hairs (2). While the trapdoor is sealed, the pumping mechanism pumps water from the bladder, causing the internal pressure to become much lower than the surrounding water. When a zooplankton touches a hair, the trapdoor springs open, pulling water in at over one meter per second, about 100 times faster than filter feeding fish. The plankton cannot escape such an enormous current, and is trapped in less than a millisecond. In fact, bladderworts have recorded the fastest strike of any predator at 0.3 milliseconds (3).

Once trapped, the zooplankton are digested by bacterial communities that live symbiotically in each bladder. In exchange for carbon that the plant derives from photosynthesis, the bacteria produce enzymes that accelerate digestion. Researchers believe that the bacteria also secrete chemicals that attract zooplankton to further enhance capture rates, and some have even suggested that the attraction is increased by the fact that the bladders closely resemble the tiny crustaceans that they prey on (1). However, these theories are still under investigation. Following digestion, the trapdoor remains tightly sealed as the pressure gradient is reset over 20-30 minutes (2).

All of these mechanisms require a great amount of energy, far more than most plant species. To meet the energy demand, bladderworts

have evolved to possess more mitochondria (the "cellular power plants" because they generate most of the cell's chemical energy) in their cells, and a special, more efficient cytochrome c oxidase enzyme (last enzyme in the respiratory electron transport chain) in their cellular respiration cycle. Both of these adaptations increase their metabolism. Though bladderworts have relatively low rates of photosynthesis, the carbon provided by prey allows them to sustain this elevated metabolism (1).

Beyond the species common to lakes and ponds, members of the bladderwort family grow in a wide range of habitats. Some cling to rocks in streams, inhabit the shallows of swamps, or hang high in tropical rainforest canopies. All of the diverse members of the taxa are outstanding illustrations of ecological adaptation at work.

- (1) Albert, Victor A., Richard W. Jobson, Todd P. Michael, and Derek J. Taylor. 2010. "The Carnivorous Bladderwort (*Utricularia*, Lentibulariaceae): A System Inflates." *Journal of Experimental Botany* 61:1, 5-9.
- (2) Singh, A.K., S. Prabhakar, and S.P. Sane. 2011. "The Biomechanics of Fast Prey Capture in Aquatic Bladderworts." *Biology Letters*.
- (3) Brown, M.D., R. Holzman, O. Berg, U.K. Muller. 2012. "Sub-millisecond Flow Fields Induced by Bladderwort, the Fastest Known Suction Feeder." *Abstracts of Society of Integrative and Comparative Biology Annual Meeting 1/4/2012*.

Perspectives

"The largest pond is as sensitive to atmospheric changes as the globule of mercury in its tube."

~ Henry David Thoreau

The Volunteer Lake Monitoring Corner

~ Sarah Powers

The unseasonably warm temperatures this fall have allowed us to continue our work on the lakes this fall. We have



had several enthusiastic volunteers continue to submit data and we encourage you to continue to take measurements as long as you are still out on the lake. We appreciate all your hard work!

While I am sure many of you have been pulling your boats from the lake and winterizing your motors, I have been here in Bloomington processing your samples and preparing the data. I will hopefully have a report to the volunteers before the end of the year. Volunteer lake monitors will be receiving an annual survey in the mail in the next few weeks. Please return these as soon as possible. These surveys allow us to get feedback on the program and make improvements as necessary.

Some of you may or may not know that I was previously a student here at IU studying Environmental Science. I am happy to announce that I have accepted a position here at the university working under the direction of Melissa Clark in the Clean Lakes Program Lab. In my current position I am now the volunteer coordinator and lab manager for the Indiana Clean Lakes Program.

As the volunteer coordinator I will be doing much of the same work I have been doing in the past (i.e., communicating with volunteers, maintaining the volunteer data, training new volunteers, etc.). This new role will hopefully allow me to have more time to expand and grow the Volunteer Lake Monitoring Program and work directly with

citizens to increase our monitoring efforts.

As the lab manager I assist in overseeing the day to day operations in the lab whether it be ordering supplies or making sure samples meet our quality control standards. I look forward to working in both roles as well as the many other tasks I am currently taking on.

We are actively seeking more volunteer monitors as well as new

lakes to add to the program. The pilot Invasive Weed Watchers program will also continue this spring and we hope to have several workshops lined up to train volunteers for this program. I will also be working this winter to add several resources to the website to aid in plant identification. If you are interested in these programs please contact me at indianaclp@gmail.com.

Volunteer Lake Monitor Spotlight

Joy Kamradt

Joy Kamradt has been a volunteer lake monitor since the beginning of the program in 1989. Joy will be passing on her Secchi disk and retiring from the program this year. Joy volunteered at both Flint and Clear Lake in Porter County. Over the years she has collected 132 Secchi disk measurement and 58 total phosphorus and chlorophyll-*a* measurements. We appreciate all of her hard work. We would also like to thank Paul Kamradt, Joy's husband, for his rowing services and kind support. Without his help Joy would not have been able to continue monitoring as long as she has. I recently spoke with Joy regarding her time at the lake. This is what she had to share.

Joy is currently working as a substitute teacher and was a teacher for 45 years previously. She clearly enjoys her work. Joy's family had a cottage on Flint Lake till approximately 1996, and then her son purchased a different cottage on Clear Lake. When I asked what draws her to the lake and to be an active steward of the lake she explained that it is her overall appreciation of the outdoors. Joy believes that growing up as a Girl Scout and continuing as a den mother taught her great respect for the outdoors. She believes it is this appreciation of the outdoors that has drawn her to be a volunteer lake monitor. Joy is an active member of her lake association at Clear Lake, and while it is a small lake (approximately 10 land owners), it is still important to have this group to make decisions about the lake.

Joy said that one of her greatest pleasures over the years has been working with the DNR. She believes that while they may be overworked and stretched thin, they are always kind and helpful when they visit the lake. The DNR also helped identify some rare lily species on Clear Lake that if not pointed out, one might not even notice. Joy also discussed one of the greatest issues they have at Clear Lake is the goose population. When they moved to the lake in 1996 there were only three nesting pairs and this past summer there were a couple hundred geese living on the lake. As any lake property owner knows, this is never a good thing for the lake.

So, as Joy steps down we will be looking for someone to take over her role. While we cannot replace her kind presence and enthusiasm we can hopefully find someone to take over her monitoring efforts. Thank you again Joy for all your hard work and dedication. It is volunteers like you that keep this program going strong year after year!

Aquatic Weed Watchers Plant Highlight

This will be the second plant in our “Weed Watchers” plant highlight series. We will be featuring one aquatic plant in each Water Column issue to keep us all on the lookout for invasive plants.

Common bladderwort (*Utricularia vulgaris*) – NATIVE

Identification tips

- branched leaves
- conspicuous bulbous bladders green when young and turn black further down the stem
- carnivorous plant (the bulbs trap water fleas, mosquito larvae, and sometime fish)
- small yellow snapdragon-like flower that is held above the water



Indiana Water Monitoring Council

Maximizing resources through improved communication, coordination, data sharing, and collaboration



Save the Date for the

The Indiana Water Monitoring Council 2012 Symposium

“Drought: Is Indiana Ready for the Next One?”

When & Where

Date: Monday, December 3, 2012

Time: 9:00 a.m. to 3:00 p.m.

Location: Indiana Government Center South, Conference Rooms B&C

Address: 302 W. Washington St., Indianapolis, IN 46204

Web site: <http://www.inwmc.org/>

Details

This year's symposium will focus on the drought of 2012. Presentations followed by panel discussions in the morning and the afternoon will discuss the drought's impacts on Indiana's water resources and will explore the question of how Indiana will respond to future droughts.

The Indiana Water Monitoring Council will also hold its annual meeting immediately preceding the symposium from 8:15 to 9:00 a.m. All current and prospective members are encouraged to attend to learn more about InWMC activities and what the council can offer its members.

There are no fees to attend either the annual meeting or the symposium. However, registration will be required for the symposium. An agenda and registration will be available soon on the Indiana Water Monitoring Council events page. So, check back soon. In the meantime, we hope you will save the date for this informative event.

We look forward to seeing you there!

Student Participants Wanted!



Join the Indiana Water Monitoring Council (InWMC) to:

- Build networks with individuals interested in water resources
- Learn about careers and job opportunities
- Participate in collaborative water resource activities
- Get involved and make new friends!

The InWMC is currently seeking students interested in water resources to join the council and participate in council activities including annual meetings and collaborative retreats. Founded in 2008, The Indiana Water Monitoring Council (InWMC) serves as a broad-based, state-wide body to enhance the communication, collaboration and coordination of professionals, organizations, and individuals involved in water monitoring within Indiana.

For more information, see www.inwmc.org or contact Jeff Frey (jwfrey@usgs.gov).

