Water Column

Fall 2010
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It's Dry in Indiana

~ Bill Jones

It has been another "feast or famine" year with precipitation here in Indiana. Despite a spring and early summer with abundant rain, the lack of significant precipitation during the past three months had left much of Indiana either dry or in a drought condition. Conditions are worse in the south where parts of Lawrence, Jackson, Washington, Jennings, and Scott counties are listed as "extreme drought" in the October 19 version of the *Drought Monitor*, published by the U.S. Department of Agriculture (**http://www.drought.unl.edu/dm/monitor.html**). Much of the southern half of Indiana is listed as "severe drought" (Figure 1).

The lack of rain has caused some low reservoir levels in southern Indiana. The U.S. Army Corps of Engineers reports that Monroe Reservoir, Indiana's largest at 10,750 acres, is 2.4 feet below normal. So how much water is this, you may ask? A little calculation shows that the amount of

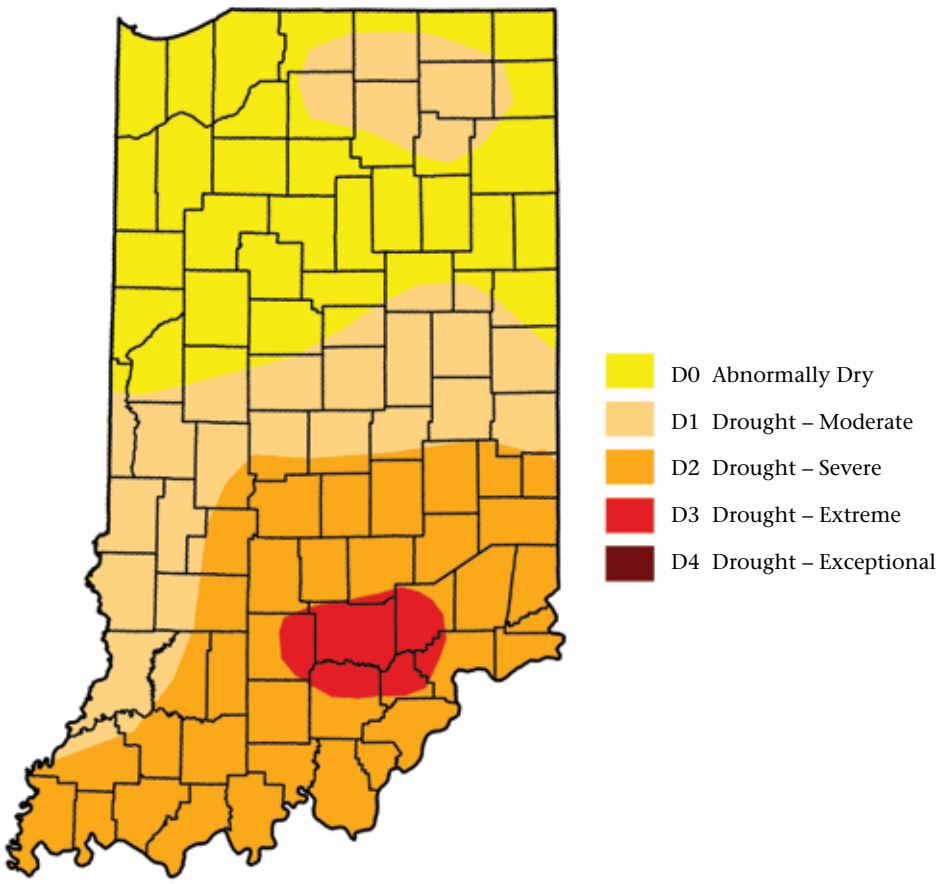

Figure 1. The Drought Monitor *shows that much of Indiana is dry or drought at this time.*

water needed to re-fill Lake Monroe would more than enough to fill 800-acre Clear Lake in Steuben County!

Salamonie Reservoir, a 2,600-acre reservoir in Wabash and Huntington counties is 4.4 feet below normal. Lake Lemon, a 1,200-acre reservoir in northeast Monroe County is about 2 feet down.

Griffy Lake, a 109-acre reservoir in Bloomington not only has suffered from the drought but also from an outlet structure stuck partially open. The lake is down some 6 feet and much of the lake bottom is exposed (Figure 2). The boat ramp is unusable (Figure 3). Bloomington's precipitation since July is some 8 inches below normal.

While northern Indiana isn't as droughty, according to USGS data for lakes and reservoirs (**http://in.water.usgs.gov/**) Lake Maxinkuckee in Marshall County has dropped 1 foot in the past two months. Over the same time period, Waldron Lake in Noble County is down nearly 3.5 feet from high levels following the wet spring.

For the year, precipitation amounts in Indiana are near average, however, the irregular timing of precipitation events is causing the lake level problems.

Zooplankton – A Lake's Best Friend

~ Dana Wilkinson

As an employee of the Indiana Clean Lakes Program, I have the opportunity to view hundreds of plankton samples from around the state. Some of my favorite organisms to see are zooplankton. So often as lake enthusiasts, we think of the fish we love to catch or the algal blooms we hate to see, but what about all the other microscopic organisms swimming around in the water? What role do they play in the health of our lakes?

Zooplankton have an important and essential role in a lake's ecosystem and food chain (Figure 1). Unlike algae, or phytoplankton, zooplankton are microscopic animals – shrimp-like crustaceans that are responsible for eating millions of tiny algae that may otherwise grow to an out-of-control state. Zooplankton are grazers, having the same function as rabbits or cows on the land. The big difference is that they are very tiny.

Zooplankton are primarily filter feeders. They passively filter lake water, extracting small food particles from it. They ingest edible particles and reject non-edible particles. A community of zooplankton can filter through the volume of an entire lake in a matter of days! However, not all algae are edible and oftentimes it is the nuisance blue-green algae that zooplankton may avoid eating. For example, some blue-green algae are too large or have slimy, unpalatable coatings that zooplankton grazers do not like.

Zooplankton are also a valuable food source for minnows and young gamefish that are too small to eat insects or other fish. The presence or absence of healthy zooplankton populations are essential for a healthy fishery in a lake or even the ocean. By insuring that the lower parts of the food chain are healthy, we can protect the higher ordered organisms, like fish, whales, and even us humans.

Below I've shared a little bit about some specific zooplankton groups that I often see in Indiana lakes.

Rotifers

There are over 2,000 species of rotifers in freshwater systems. They are so named for their distinct mouth, called a corona. It is used

Figure 2. The drought and a leaky outlet have left much of Griffy Lake in Monroe County dry.

Figure 3. Boats have no place to go in Griffy Lake.

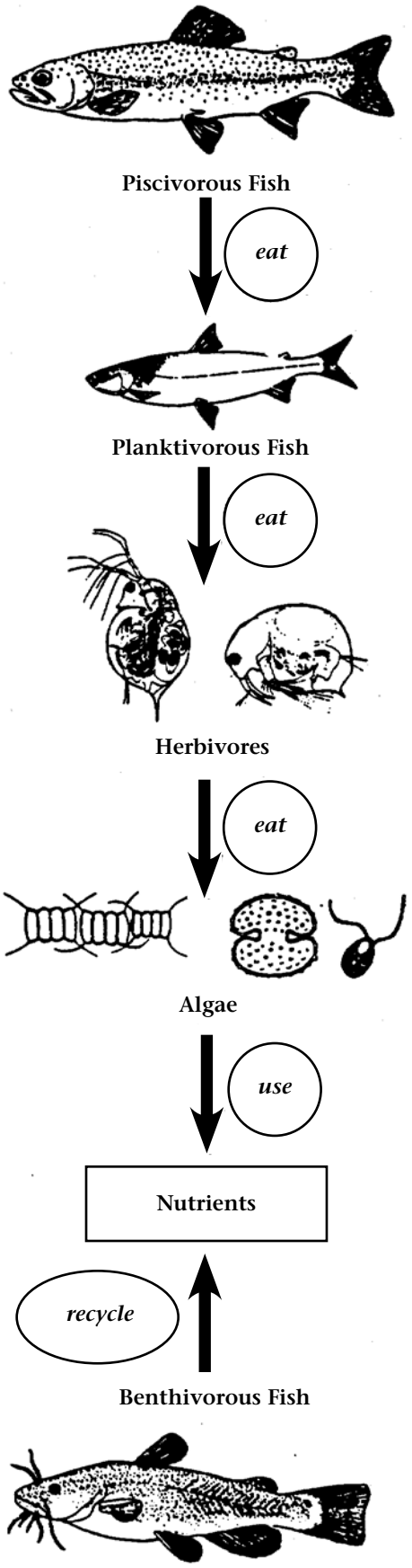

Figure 1. A typical aquatic food chain.

for both locomotion and filter feeding (Figure 2). Fine cilia (hairs) in the corona rotate to create water currents that bring food to the mouth. Because they are so small, less than 1 millimeter (mm) in size, they can only consume very small particles. (A millimeter is the width of an "e" on this page.)

Rotifers serve as a food source for larger organisms, including other zooplankton. Most do not swim and must simply drift along with the water, as many plankton do. Others have a single foot and remain attached to the lake bottom or to plants. Rotifers are very efficient reproducers and can multiply asexually when conditions are suitable. They eat bacteria, detritus, other rotifers, algae, and protozoa.

Cladocerans

These small crustaceans are characterized by a two-valve carapace, or outer shell, covering most of their body (Figure 3). Examples of this group include *Daphnia, Bosmina, Ceriodaphnia,* and *Diaphanosoma;* all of which look very similar except for very small differences in body shape. Some of them grow large enough (2-3 mm) to be spotted with the naked eye when captured in a light-colored container. They feed

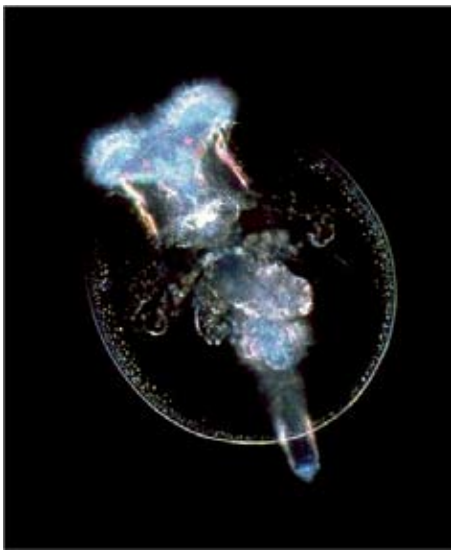

Figure 2. A rotifer, Testudinella. Photo by Micrographia.

Figure 3. A Daphnia *female with three embryos in its brood chamber.* Photo by Bill Jones.

on algae, detritus, and bacteria, and can take larger particles than can the rotifers. As filter feeders, they use their legs to create a flow of water past their mouths to then suck up food particles. The fine hairs on their legs also act as filters and can catch food drifting by.

Daphnia, also known as water fleas, are able to move in the water, in a very unique, jerky manner by moving their large antennas in a paddling motion. When viewing live specimens on the microscope, it can be very frustrating to keep them in the field of view!

Several different genera of Cladocerans are seen in most lake samples that I count in the Clean Lakes laboratory. For instance, I saw quite an abundance of *Daphnia longiremis*, among many other zooplankton genera, in Lake Cicott of Cass County this past summer. The number of zooplankton we catch in one sample can often be determined by the quality or quantity of current algal food sources, time of day, or sampling technique.

Daphnia, and several other zooplankton, perform what is known as "diurnal migration." This is a daily routine of migrating from the darker, deeper waters of the lake during the day and up to the surface waters during the night. Scientists believe they do this to avoid predators. By spending daylight hours in the dark, deeper waters, *Daphnia* can avoid being

eaten by sight-feeding fish. They then migrate up to the surface waters at night to filter feed on the algae. Most fish don't feed at night. For this diurnal migration strategy to succeed, there needs to be plenty of oxygen in the dark, deep-water refuge. Unfortunately, many lakes don't contain enough oxygen at depth.

Copepods

Two notable copepods that I see often are calanoids and cyclopoids (Figure 4). As larva they are known as nauplii (Figure 5). A copepod egg hatches into a nauplius larva and the life cycle typically includes six stages as a nauplii and six stages as a copepod, the last of which is the adult stage. Developing copepods shed their old, small exoskeleton (outer shell) at each stage and grow a new, larger one. As filter feeders, they feed mainly on phytoplankton and protozoans, but some species are predatory. Copepods can be strong swimmers and will also undergo diurnal migration. They are an important link that connects food webs between small, algal cells all the way up to large fish.

Next time you're out on a sunny, summer day, dip a white cup into the water, and see if you can't spy any tiny organisms moving about in the water.

Figure 4. A typical calanoid copepod. Photo by Severson Bay Plankton.

Figure 5. A nauplius is a developmental stage of a copepod. Photo by Jasper Nance.

LARE Reports Available Online

Greg Biberdorf of the Indiana DNR Lake and River Enhancement Program (LARE) tells us that all LARE final reports, nearly 400 in all, are now available in a searchable database at: **http://www.in.gov/dnr/fishwild/3303.htm**. To find pertinent reports by county, water body, type of report, or year, just use the drop-down menus to quickly find the correct link to the report PDFs. New reports will be added as they are produced.

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Announcement of Watershed Networking Sessions

Seeking Grants to Meet Your Goals and Leveraging Funding Sources is the title of three sessions that have been set up to discuss this timely topic. They will cover the same material, so just choose the session closest to you. They will be held from 10:00 a.m. to 3:00 p.m. each day.

Topics will include: Getting Ready to Seek Funding; Seeking the Right Grants and Other Funding Sources; Grants and Funding in General; and Specific Grants and Other Funding Sources

December 1, 2010:
Potato Creek State Park
North Liberty, Indiana
(574) 656-8186

December 8, 2010:
Spring Mill State Park
Mitchell, Indiana
(812) 849-4129

December 9, 2010:
Fort Harrison
Indianapolis, Indiana
(317) 591-0904

An agenda will be sent out shortly describing the day's topics in more detail, along with information about registration and cost. We are doing everything we can to keep costs as low as possible while still providing a comfortable day. As always, there will be plenty of time for networking and asking questions. Please join us for one of these informative and helpful sessions.

Your networking partners include The Indiana Association of Soil and Water Conservation Districts, The Indiana Department of Environmental Management, The Indiana Department of Natural Resources, The Indiana State Department of Agriculture, The Natural Resource Conservation Service, and Purdue University.

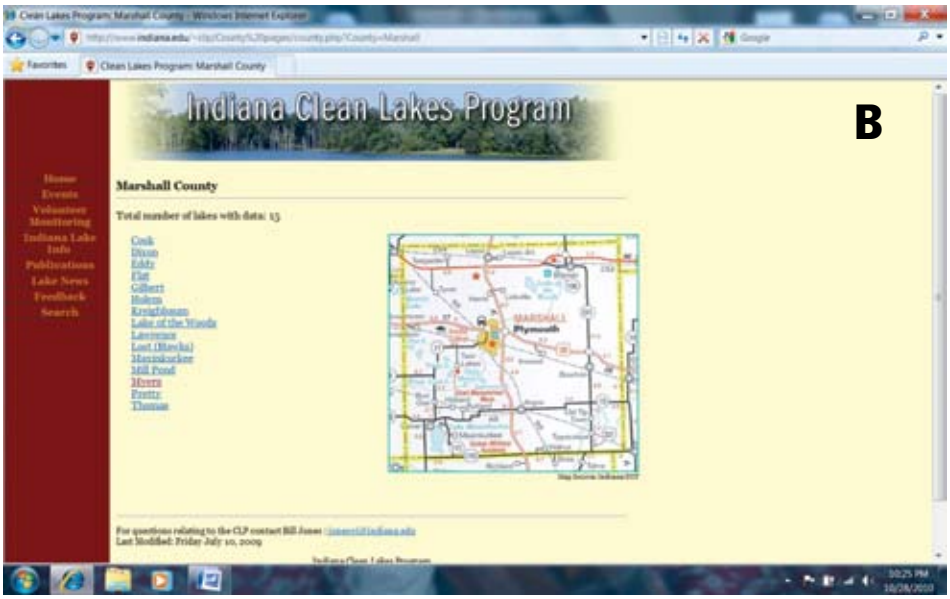
Indiana Lake Data On-Line

Lake data and information collected by the Indiana Clean Lakes Program are now available on-line in an easy-to-use map-based format. From the Indiana Clean Lakes Program home page (**http://www.indiana.edu/~clp/index.html**), select the "Indiana Lake Info" button along the left-hand margin. This opens up an interactive map of Indiana (see A, at right).

Place the cursor over the county of interest to open up a page for that county that lists the lakes in that county for which we have data. In the example here, we selected Marshall County (B).

Select a lake, in our example Myers Lake, and a page for that lake opens up containing a Google map of the lake, some useful lake information, the years for which we have data, and a link to the data tables (C).

A fact sheet under the "Publications" button called "Interpreting Lake Data" contains information to help you understand what the lake data mean. Use the "Feedback" button if you have any questions or comments for us.



New Web Clearinghouse of Information for Lake Shoreland Protection Resources

EPA's Office of Water launched a new Web clearinghouse of lake shoreland protection resources that provides practitioners with links to key resources to protect and restore fragile lake shorelands and to promote better stewardship by lakeside property owners and others who recreate on lakes. The clearinghouse, which includes links to fact sheets, Webcasts, videos, and other helpful resources for lakeshore protection, is part of

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an outreach campaign to educate the public and others about the key findings of the National Lakes Assessment (NLA). You can access this lake shorelands protection clearinghouse at: **http://water.epa.gov/type/lakes/shoreland.cfm**.

According to the NLA, poor lakeshore habitat and high levels of nutrients are leading stressors affecting the biological health of lakes. Among the key findings:

- 56 percent of our lakes are in good biological condition.
- More than one-third of our lakes exhibit poor shoreline condition.
- Poor biological health is three times more in lakes with poor lakeshore habitat.
- Nearly 20 percent of lakes have high levels of nutrients. Lakes with excess nutrients are 2.5 times more likely to have poor biological health.

In 2007, EPA, the states, tribes, and others partners sampled more than 1,000 lakes as part of this first-ever, national assessment of the ecological condition of the nation's lakes. You can learn more about the National Lakes Assessment at: **http://water.epa.gov/type/lakes/lakessurvey_index.cfm**.

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!

Perspectives

When the well is dry, we know the worth of water.

~ *Benjamin Franklin*, Poor Richard's Almanac, *1746*