

The Fish in My Lake

~ Cory Sauve

As the chill of winter dissipates, a slow march to the start of spring and summer has seemingly begun. Our forests will gradually become greener, our waters warmer, and the organisms found in both the terrestrial and aquatic worlds will become more active. I suppose that many of you reading this will gradually become more active, too, as the days become warmer and the nights shorter. Days spent hiking, camping, and fishing are just around the corner. The yearning for those warm summer days is how I landed on the topic for this column.

Many of you, along with thousands of individuals across the state of Indiana, will experience these warmer days on the water, rod in hand, looking to catch that trophy bass. If you have ever wondered why there are specific fish in a lake that you have been to, I hope you will find the remainder of this article intriguing.

Where did the fish come from?

Out of the approximately 27,000 living species of fish that we know of, around 200 of those species can be found in the waters of Indiana. That number becomes even smaller for those fishes found in Indiana's lakes and reservoirs. If you would go to a random lake in Indiana, you would likely find several species of piscivorous fish (those who eat other fish), species of planktivorous fish (those who eat zooplankton), and a few species of benthivorous fish (those who feed on the bottom) (Figure 1). These fish make up part of the food web in a lake, and the composition of fish in a lake food web can be influenced by a variety of factors, three of which will be the focus of this article: habitat, barriers to migration, and introduction.

Habitat is likely the primary determinate of the composition of fish in a lake. As mentioned before, different species of fish require certain habitats and occupy specific locations in the food web. Therefore, if these specific conditions are not met, a species of fish will simply be unable to have a viable population unless a substantial change occurs. For example, a lake located in a warmer area may primarily be dominated by largemouth bass and bluegill. In a colder climate, a lake may be dominated by walleye and yellow perch. These species are limited due to a habitat requirement, and in this case the limiting habitat are temperature regimes. There are exceptions to this broad example, but this can be seen as a clear illustration of the reliance on habitat.

While habitat type and availability both play crucial roles in determining the fish community in a lake, several others exist. First, barriers to migration can dictate the composition of fish in a particular lake. These barriers could be waterfalls or steep terrain, to name a few. The reason there are fishless lakes in the Rocky Mountains or how sea lamprey were once unable to populate the upper Great Lakes were due to these types of barriers. So why are they in those lakes now?

The answer lies in the next way fish enter lakes: through intentional and unintentional introductions by humans. There are countless avenues by which

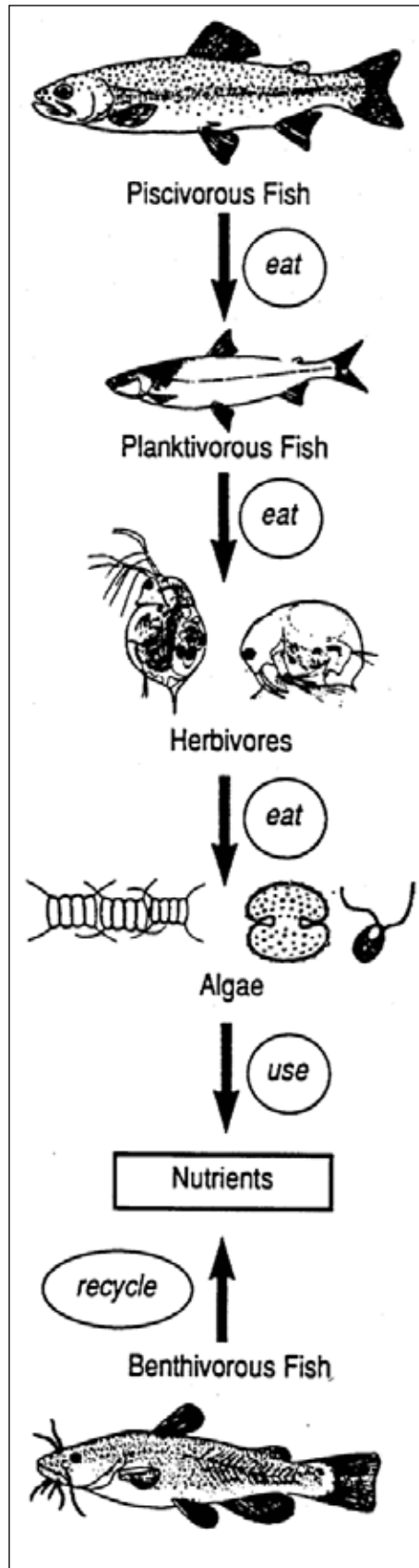
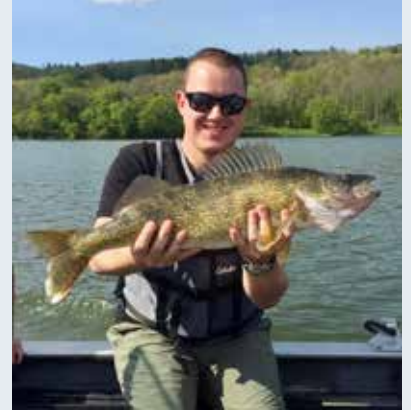


Figure 1. A typical lake food chain.

Staff Spotlight – Cory Sauve

Looking back on my childhood in Pennsylvania, being outdoors was a common occurrence. I remember hiking portions of the Appalachian Trail, going on our annual fishing trip to northern PA, and kayaking through the Pennsylvania Grand Canyon. Exploring and enjoying the outdoors have formulated some of my fondest and most vivid memories. I would have never imagined that my constant exploration of the outdoors would lead me to pursue a career in water management. However, it did just that.



After I graduated high school in central Pennsylvania, I attended Mansfield University of Pennsylvania and graduated in 2017 with a degree in fisheries biology. During my senior year, I decided I wanted to broaden my knowledge in the fields of biology and water management, and the program here at Indiana University – Bloomington seemed to be the perfect fit. I am currently in my first year at IU pursuing masters' degrees in environmental science and public affairs, with a concentration in water management.

I am excited to be working with the Indiana Clean Lakes Program as a plankton (phycology) intern. This position will allow for me to enumerate the 2017 and 2018 plankton samples collected by the Indiana Clean Lakes Program, as well as to contribute to the 2015-2018 Indiana Water Quality Assessment report. I am certain that my time with the Indiana Clean Lakes Program will provide me with the skills required to successfully manage and conserve our freshwater resources.

humans can, and have introduced fish to lake in which they would not normally reside, two of which have been mentioned previously: trout stocking of fishless lakes in the western United States and the introduction of sea lamprey to the upper Great Lakes. Stocking fish is obviously an intentional introduction, as was the situation in the western United States where state agencies stocked non-native trout species into fishless lakes. Stocking is by no means always a negative introduction, as stocking programs have led to the conservation and re-introduction of endangered or extirpated species of fish across the United States. Nevertheless, any form of stocking is an intentional introduction of fish to a specific location (Figure 2).



Figure 2. Aerial stocking of fish. Source: the wiredangler.com.

However, the introduction of sea lamprey in to the upper Great Lakes was not intentional. In an effort to allow ships to access the upper Great Lakes, the Welland Canal opened in 1829, connecting Lake Erie and Lake Ontario (Figure 3). Not only did this connect shipping lanes, but allowed for

sea lamprey to invade the upper Great Lakes, and are causing issues with native lake trout to this day.



Figure 3. Welland Canal, connecting Lake Erie and Lake Ontario. Source: worldatlas.com.

This article was a brief exploration on how fish have entered lakes throughout the United States. Many have dedicated their entire careers to studying these concepts, and thus a more thorough study is required. My hope is that this article served as a concise introduction to these concepts, and that it will propel you to read further.

Sedges Around the Edges

~ Erica Walker

You may not be able to identify the sedges growing in the littoral zone of your favorite lake, but this flowering family of plants has been an important cultural staple for centuries. Sedges were used by the ancient Egyptians to manufacture paper. In fact, we derived the English word “paper” from the Latin papyrus, a sedge species native to the African continent. Bulrushes were used as funeral wreaths and provided food

for native Americans. Certain cultures continue to use sedge stems for weaving. Carex species were used as shoe insulation during the first human expeditions of the South Pole in the early 19th century. In the culinary world, popular Chinese water

chestnuts are the tubers of the spike rush. Horchata, a delicious Mexican beverage with origins in Egypt, was historically made from the roots of the yellow nutsedge.

From a distance, a sedge may look like a perennial tall grass or rush. This elementary rhyme has been used to help plant lovers distinguish between the grass-like families: “Sedges have edges, rushes are round and grasses are hollow right up from the ground” (Figure 4). Sedges grow in tall clusters or hummocks and can grow to about four feet tall. There are thousands of varieties and keying them out can be difficult even for the trained individual.

In Indiana, common lake species include the Three Way Sedge (*Dulichium arundinaceum*) and the Lake Sedge (*Carex lucustris*). The Three Way Sedge has spiral leaves that wrap around the stem in a three-leaf cycle (Figure 5). From the top it will appear to have three distinct columns. The spike of the Lake Sedge is tall and its base is often a dark red in color (Figure 6).

Sedges provide a number of important ecosystem services to lakes and wetlands. They stabilize shorelines by absorbing the energy of incoming waves, which cuts down on erosion and provides still shallow

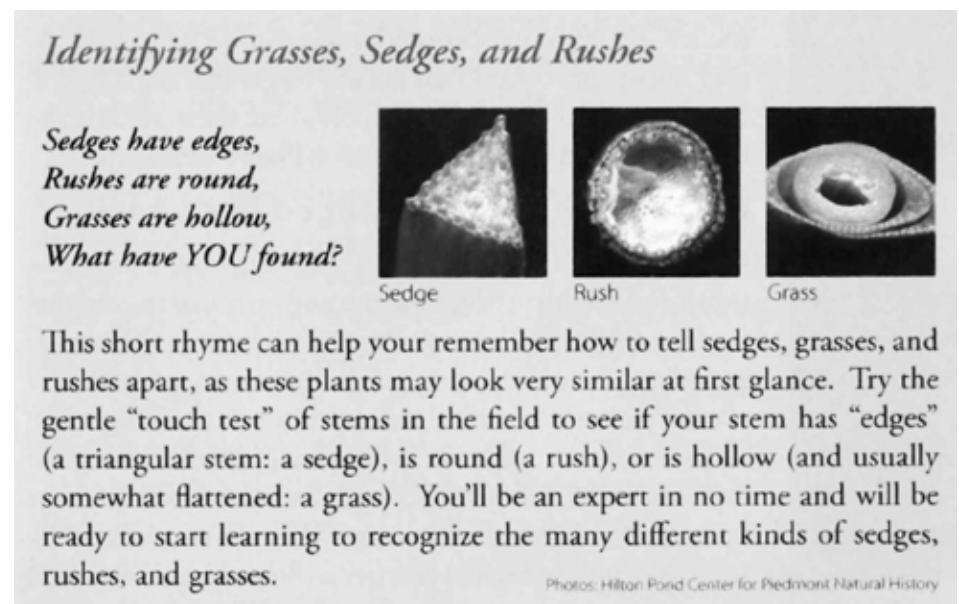


Figure 4. Edge characteristics and differences between a sedge, a rush, and a grass.

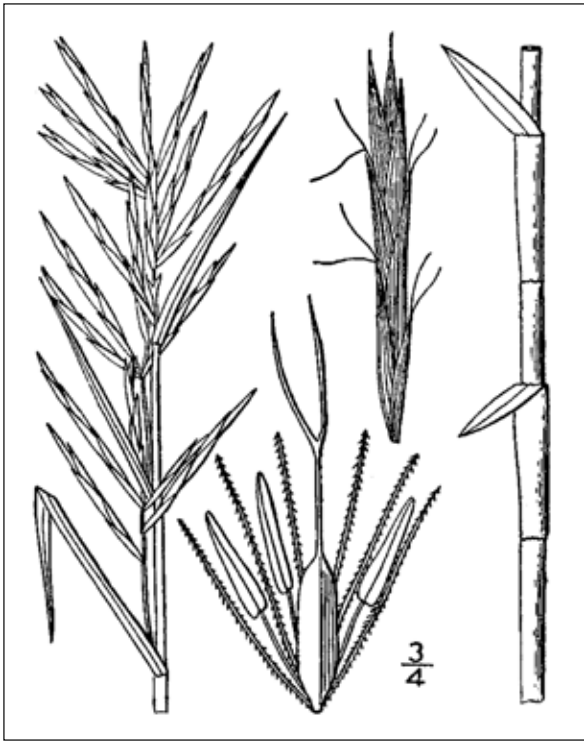


Figure 5. Three Way Sedge, *Dulichium arundinaceum*. Source: N.L.Britton and A. Brown (1913).



Figure 6. Lake Sedge, *Carex lacustris*. Source: N.L.Britton and A. Brown (1913).

habitat for macroinvertebrates, wading birds and fish. These emergent plants serve as a filtering ground for incoming sediments often introduced during runoff events. As water runs into the lake, sedges and other littoral plants slow the flow of runoff and allow larger particles to settle out.

The fruits of sedges provide food for waterfowl and the tubers are eaten by a variety of herbivores. Dense root stands provide excellent cover for young fish. As sedges die down, they provide organic matter to the macroinvertebrate and microbial communities living in lake sediments.

Sedges and other littoral plants can act as nutrient sinks through the uptake of nutrients and the storage of nutrients sequestered in organic matter. The uptake of soluble nitrogen and phosphorus may be important in eutrophic or highly productive water bodies. However, littoral plants can introduce the nutrients stored in their cells back into water bodies as they die off in the fall. Importantly, this release often occurs

at the end of the growing season, which decreases the likelihood that the burst of nutrients will spur an algal bloom.

So the next time you're strolling along the edge of your favorite lake, take a moment to appreciate the sedges in the littoral zone. These unassuming plants can play a defining role in the physical, biological, and chemical characteristics of lakes and wetlands.

Soil Health Practices for Mitigating Natural Disasters

~Posted by Elizabeth Creech, *Natural Resources Conservation Service in Disaster*, Feb. 28, 2018

The Federal Emergency Management Agency (FEMA) reports that more than 25 million Americans – almost 8 percent of the population – were affected by major disasters in 2017. From severe

flooding in Puerto Rico and Texas to mudslides and wildfires in California, major natural disasters in 2017 cost over \$306 billion nationally. According to the National Oceanic and Atmospheric Administration's National Centers for Environmental Information, this is a new annual record (Figure 7).

Dr. Daniel Kaniewski, FEMA's Deputy Administrator for Protection and National Preparedness, said, "Investing in mitigation activities *before* the next disaster is the key to building a more resilient nation." We

cannot prevent natural disasters, but we do have the power to prepare for and potentially reduce their impacts through advanced planning.

What is the role of soil health in natural disaster mitigation?

There is no one-size-fits-all solution to preparing for natural disasters. Steps for planning ahead will engage our nation's infrastructure, emergency responders, private citizens and members of every level of government. Dr. Bianca Moebius-Clune, Soil Health Division Director with the Natural Resources Conservation Service (NRCS), believes our nation's farms, ranches, forests and even backyards have a role to play in providing mitigation benefits as well.

"We can't make it rain, nor can we prevent a hurricane," says Moebius-Clune. "But land managers *can* manage their land to increase the soil's ability to take in, or infiltrate and drain, rainwater." Increasing the amount of rainwater that infiltrates into the ground across



Figure 7. U.S. Secretary of Agriculture Sonny Perdue surveyed agricultural damage from Hurricane Harvey from Houston to El Campo, Texas, on September 21, 2017.

the landscape ultimately decreases soil erosion and the potential for flooding by giving rain that could become flood water a place to go. “Soils that hold more water are also beneficial to crops in periods of drought,” adds Moebius-Clune. “That is another significant benefit of soil health management practices.”

By building healthier soils, land managers across the nation can increase human safety and protect critical infrastructure for all Americans when disaster events occur. Natural disasters impact us all. Improving the health of our nation’s soils is one step we can take to prepare for and ultimately mitigate those impacts.

What does managing for soil health look like?

Soil health is the capacity of the soil to function as a vital living ecosystem to support plants, animals and humans.

Whether managing an urban backyard or 1,000 acres of cropland, Moebius-Clune notes that key soil health management principles remain largely unchanged. “Healthy soils are generally undisturbed with abundant

and diverse life, no compaction and relatively high levels of organic matter and stable aggregates.”

NRCS recommends four major principles for building healthy soils: minimize soil disturbance, maximize soil cover, maximize biodiversity and maximize the presence of living roots.

Farmers are encouraged to adopt conservation practices like no-till, crop rotations and cover crops to achieve these goals, but farmers aren’t the only ones able to make a difference. Soil health management principles can apply in nearly all human managed landscapes when properly adapted, even in small backyards.

How do soil health management practices apply to suburban and urban environments?

“Many of us are land managers around our own homes,” says Moebius-Clune. “If we can maintain a diversity of organisms – including plants that provide living roots throughout most of the year – and if we can refrain from disturbing and compacting our soils as much as possible, we can ultimately improve the ability of our backyard soils to take in water” (Figure 8).

With the amount of urban land in the United States more than quadrupling over the past 70 years, the land stewardship of private homeowners can contribute more to mitigation now than ever before. “Roughly two-thirds of the land



Figure 8. Rain gardens are depressed areas planted with perennial flowers and native vegetation that are meant to infiltrate rainwater. Rain gardens can be planted in yards or curb strips to provide plant diversity and living roots and ultimately improved water infiltration.

in the lower 48 states is privately owned, says Moebius-Clune. “The management decisions we make across every piece of that land contributes to the impact of those rainfall events that can either recharge the soil and groundwater, or contribute to the next flood.”

For more information on how you can build healthy soils, visit our website at www.nrcs.usda.gov.

Tippecanoe Area Flooding Highlight

~ Courtesy of *The Watershed Foundation* (WatershedFoundation.org)

Worst Flooding since 2009 Poses Threat to Area Homes & Lakes

After the past week of intense rainfall on frozen ground, our area lakes and rivers are now at or near the 100-year flood stage. Water levels peaked, as water moves into the Tippecanoe River from across the watershed (Figures 9-11).

A watershed works like a funnel, moving water downstream and draining to a particular body of water. The Tippecanoe River watershed begins north of Columbia City. Eventually, the water in the green area all passes through the Dam at Oswego then, down the Tippecanoe River to the Warsaw-area (Figure 12).

The Tippecanoe River at Oswego is at 8.77' which is the fifth- highest level recorded since 1943.

Historic Crests Recorded by USGS:

- (1) 9.40 ft on 05/21/1943
- (2) 9.25 ft on 03/21/1982
- (3) 8.96 ft on 03/15/2009
- (4) 8.89 ft on 03/04/1985
- (5) 8.77 ft on 02/26/2018

Homeowners, renters, businesses and private non-profit organizations that sustained uninsured damage caused by severe storms and flooding starting on or after February 15 can report damage online at: <https://tinyurl.com/GovDamage>. This



Figure 9. Flooded houses in Lantzing Bay, taken 2/25/18.

information is used for damage assessment purposes only and is part of the state's process to determine if damage is sufficient enough to request a disaster declaration from the president.

The highest amounts of polluted runoff drain into our lakes and rivers during heavy rains. This runoff carries soil, nutrients, and bacteria into our waterways. TWF works with landowners to reduce this type of pollution at its source in the watershed – before causing problems like siltation and weed and algae growth.



Figure 10. Flooded houses on Barbee Chain. Photo by John Labriola.



Figure 11. Gas station in Patona Bay, taken 2/25/18.

Flooding can also pose a health risk to humans and animals. Residents of local lakes and other rural areas that do not have a sewer system need to be aware that if your household uses a typical septic system, heavy rains and floods can halt its ability to treat wastewater from your home.

When flood waters pond over the septic drainfield, there is no place for wastewater from the household plumbing to drain because the drainfield and soil beneath are saturated. When septic drain fields are saturated, contaminants from your wastewater can enter and pollute ground water (your source of drinking water), as well as lakes and other surface waters. The less water sent to the system, the better.

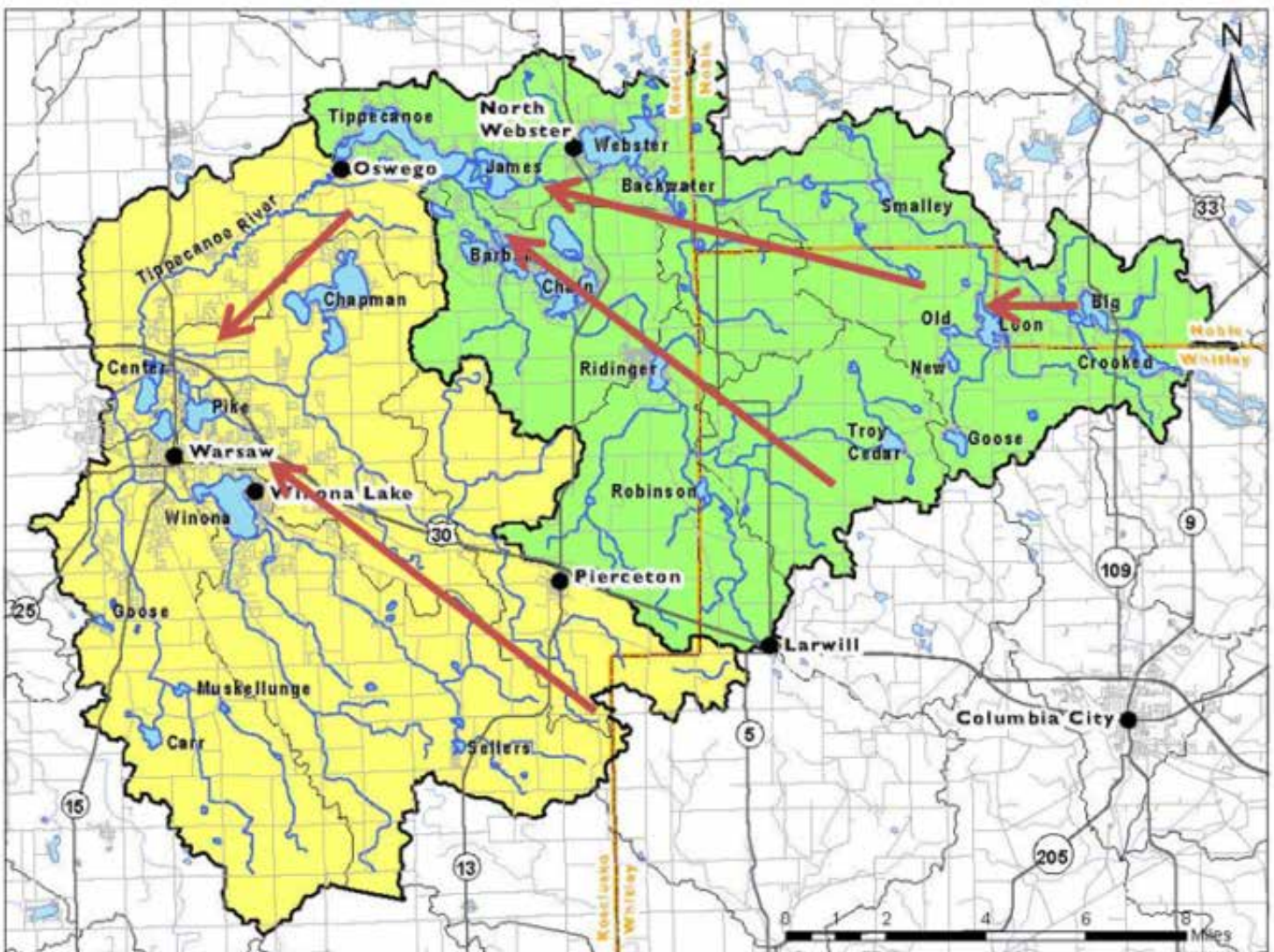


Figure 12. Tippecanoe River Watershed and lakes experiencing flooding



THE WATERSHED FOUNDATION

A few tips: (more information at <https://tinyurl.com/SepticFirstAid>):

- Re-route water from gutters away from the drainfield.
- Don't use the dishwasher or garbage disposal.
- Reduce the number of showers or baths.
- Wash clothes at a laundromat.
- Turn off the water softener, so it does not regenerate.
- Consider drinking bottled water.

After flooding has receded, it is important to remember that if a septic system has been flooded, nearby wells may also have been inundated. If water IS OVER YOUR WELL, contact the Health Department at (574) 372-2349 for well testing. Use an alternate drinking water source until you can test and disinfect your water supply.

TWF was founded in 1997 to protect and improve water quality in the Upper Tippecanoe River Watershed, spanning from Crooked Lake in Whitley County to the Warsaw-Winona area. Over the past 20 years, TWF has worked with farmers and lake residents to implement over 200 water quality improvement projects. In the last four years alone, these efforts have prevented over 815 million pounds of weeds and algae from growing in area lakes and rivers. Much more information is available at WatershedFoundation.org.

Flood Levels Threaten Homes

The IDNR has just released an emergency order. No motorized watercrafts may operate on Lake Tippecanoe (including Oswego and James Lakes). No motorized watercrafts may operate on the Barbee Chain (including Big Barbee,

Little Barbee, Sawmill, Kuhn, Irish, Banning, and Sechrist Lakes). Lake Wawasee is restricted to idle speed only.

Please be safe! This order isn't only for the surrounding homes, but also the people on the boats. We've had reports on Tippy and Barbee of boats operating close to homes at high speeds.

Property Owners Encouraged to Report Damage

If your home or property has been affected by flooding, you should report it at <https://tinyurl.com/GovDamage>. All damage reports will be used by the State to attempt to acquire federal disaster assistance. Currently only 36 reports have been filed, even though hundreds of homes have been affected by this 100-year flood. Make sure to take detailed notes and pictures of all damage!

Damage assessment crews made up of local and state employees are

surveying homes and businesses affected by the recent storms and flooding. This is a first step in gaining federal assistance for the affected residents of Kosciusko County. Contact Kosciusko County's Emergency Management Director Ed Rock at (574) 371-2602 if you would like them to come to your home.

Residents may be approached by these crews and asked questions relating to ownership of the property, insurance and extent of damage. The crews may ask to see and photograph damage. There is no charge or fee for the service the crews are providing for the residents.

Perspectives

The lake and the mountains have become my landscape, my real world.

~ Georges Simenon



Please save the date for ILMS'30th Annual Conference, March 22 and 23, 2018 at Pokagon State Park on the beautiful Lake James.

Volunteer Corner

~ Heather Bearnes-Loza, Volunteer Assistant Coordinator

Hello, all:

I am excited to begin work at the new assistant volunteer coordinator with the Indiana Clean Lakes Program (CLP) this year! I am a master's student at the School of Public and Environmental Affairs at IU, and am pursuing a dual master's in public affairs and environmental science. I hail from rural Nebraska, and received my bachelor's degrees in biology and art at Nebraska Wesleyan University in Lincoln, Nebraska. My past work experience is in surface water quality monitoring for the State of Nebraska, and I am looking forward to working with our volunteer monitors to learn all about Indiana's many lakes.

I may be new to the program, but I can already see how important our volunteer monitors are. There is no way that CLP could collect so much data without our volunteers acting as our eyes and our ears across the state. This year, we are hoping to gather even more information by asking anyone who is interested to help us get a better picture (literally) of cyanobacterial blooms, known as harmful algal blooms (HABs), around the state.

Bloomwatch is an app that can easily be downloaded onto a smartphone or tablet. The app is designed for citizen scientists who want to help report what they find. With minimal training, just about anyone can learn how to spot potential HABs on their lake or the lakes they visit.

Although a photo submitted through Bloomwatch is not considered a formal report, submissions do alert the Indiana Department of Environmental Management. The data is submitted through an anonymous alias and is publicly accessible once submitted. In order to help CLP gather data



from our monitors, we are asking participants to create an alias beginning with "INCLP_". As an example, my alias would be **INCLP_hbearnes**.

The Bloomwatch app and additional information can be found at: https://cyanos.org/bloomwatch/#bloomwatch_how. Please help us spread the word about volunteer monitoring! We are always interested in adding new lakes to our program. I will be happy to answer questions about it and Bloomwatch as we work together to gather information from around the state.

I am looking forward to working with everyone this season!



WATER COLUMN

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Aquatic Invasive Monitoring Plant Highlight

This will be the 21st plant in the plant highlight series. We will be featuring one aquatic plant in each *Water Column* issue. We will feature both native and invasive plants to improve our plant identification skills.

Whitetinge Sedge (*Carex albicans*), NATIVE

Carex albicans, sometimes commonly called white-tinged sedge or oak sedge, is a rhizomatous perennial sedge that grows in a clump to 15-20" tall. It is native to North America from Quebec and Ontario south to Florida and Texas.

Genus name from Latin means cutter in reference to the sharp leaves and stem edges (rushes are round but sedges have edges) found on most species' plants.

Specific epithet comes from Latin meaning whitish.

DISTRIBUTION: Easily grown in medium moisture soils in part shade to full shade. Will grow in full sun. This species tolerates dry soil conditions better than most species of *Carex*, making this an ideal plant for residents that have fluctuating water elevations along their shoreline. Plants will slowly spread by rhizomes and will self-seed in optimum growing conditions.

Narrow, grass-like, upright-arching, bright green leaf blades (to 16" long and 1/10" wide) grow in either dense tufts or loose colonies of tufts. Flowers bloom in late spring (May) on flowering stems rising to as much as 20" tall.

DISPERSAL/SPREAD: Over 1500 species of *Carex* grow in a variety of habitats (often moist to wet areas) throughout the world. Identification of individual species can be very difficult.

Identification tips:

- Narrow, grass-like,
- Upright-arching, bright green leaf blades (to 16" long and 1/10" wide)
- Grow in either dense tufts or loose colonies of tufts.
- Flowers bloom in late spring (May) on flowering stems rising to as much as 20" tall.
- Fruits are trigonous, one-seeded achenes enclosed in sac-like bracts (perigynia).

