WaterColumn
Spring/Summer 2016
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Periphyton: The tiny Amazing Overlooked World that Clings

~ Melissa Laney

So, you are floating along the lake's edge maybe in a canoe, pontoon, or Jet Ski and you see the littoral vegetation: the beautiful spikes from the pickerel weed, the floating yellow lily leaves and flowers. You are aware that these are good fishing spots, but did you realize that clinging to all the surfaces, there are rich and diverse layers of organisms? You may already know about the benthos or the organisms associated with the lake bottom. Benthos is uniformly applied to animals, like mussels, scuds, mayflies. There's an entire microscopic world of microbial growth loving on all the littoral surface types: live, dead, plant, animal, and nonliving surfaces. This growth is **periphyton**. Often times you can see it or feel the periphyton on a submersed rock or along the stem of a plant (Figure 1).

Figure 1. Periphyton, attached algae, that is clinging to lake substrates.

Like with all communities, we like to create categories to differentiate between the types of plants based on where you'll find them or how they attach and cling to the surfaces. Following is a list with their corresponding locations (Figure 2):

- Epipelic: algae growing on sediments (fine, organic)
- Epilithic: algae growing on rock or stone surfaces
- Epiphytic: algae growing on macrophytic or aquatic plant surfaces
- Epizooic: algae growing on surfaces of animals
- Epipsammic: algae growing on or through sand

If you had the chance to zoom into these surfaces, the slick slimy layer would show you a full microscopic layering of plants, just as you see when you walk into the forest (Figure 3).

So, next time you pick up a rock or plant from the lake and feel that slick layer, you now know there's a tiny forest of attached plants providing a significant role in the lake for food chain dynamics and nutrient cycling.

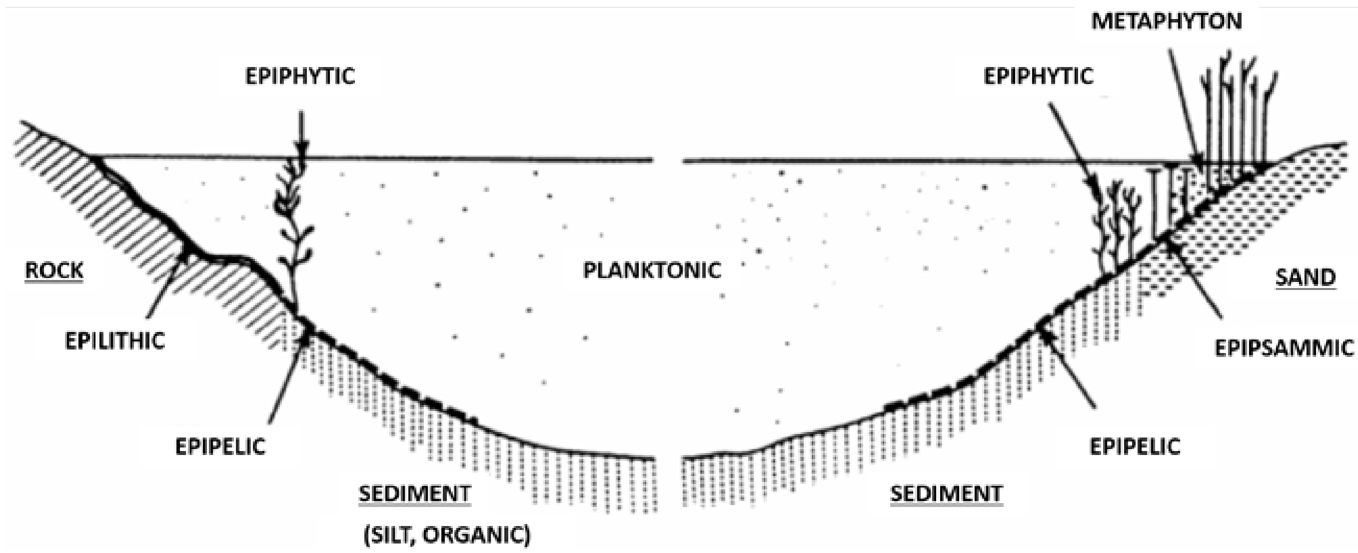

Figure 2. The major algal communities located within the littoral zone that live on different substrates (Wetzel 2001).

Epi: a prefix occurring in loanwords from Greek, where it meant "upon," "on," "over," "near," "at," "before."

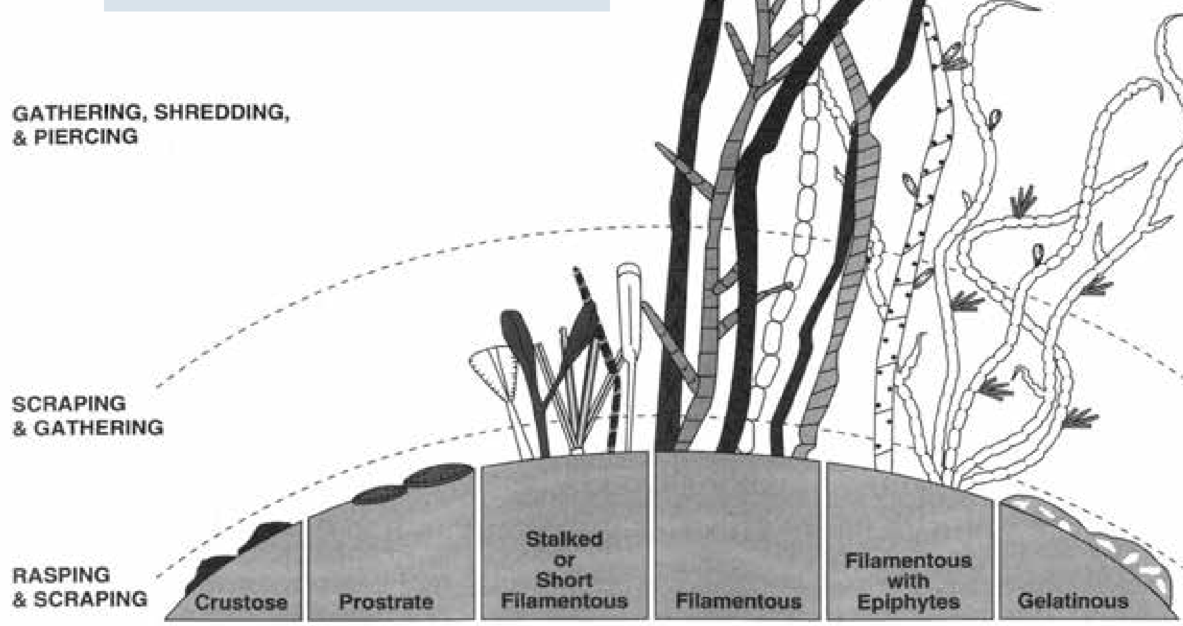

Figure 3. The major growth forms and layers of periphyton attached to substrates. The various layers offer different invertebrates food options based on their feeding style and group (Law 2011).

EPA Leads New Effort to Improve America's Aging Infrastructure

~ Joel Beauvais, Deputy Assistant Administrator for the Office of Water

Safe drinking water and effective wastewater management are basic building blocks of public health. Too often, we neglect our infrastructure until it fails. We need to invest in America's water infrastructure – and we need to be strategic about doing it right – especially in disadvantaged communities. We've known for years that our nation's investments in water and wastewater infrastructure weren't keeping up with the needs – which EPA estimates at $655 billion over the next 20 years. But those struggles are not the same everywhere – they are most acute in low-income and small communities. In the wealthiest country on Earth, clean water needs to be available to everyone – no matter what part of the country you live in, no matter how much or how little money you make, and no matter the color of your skin. To fix the problem, we'll not only need innovative financing to leverage more investment, but we'll also need to help these communities build capacity – so they can sustainably manage and operate their water systems, get access to those funds, and put them to good use. We have to start by confronting the same ingrained, systemic challenges that threaten our country's water resources – a resource that's essential to every human being on the planet.

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

Failing Infrastructure: Sanitary Sewer Overflows (SSOs)

Some communities have combined infrastructure for storm water and waste water, which cause many overflow problems during rain events. However, many places with separate systems still have infrastructure failures. Often it's due to aging and antiquated systems, and sometimes it's due to subsidence or land settling. When these separated systems fail, areas can experience a sanitary sewer overflow (SSO). A sanitary sewer overflow can spill raw sewage into basements or out of manholes and onto city streets, playgrounds, and into streams, before it can reach a treatment facility. They can also occur without obvious overflows through cracked pipelines.

SSOs occasionally occur in almost every sewer system even though systems are intended to collect and contain all the sewage that flows into them. When SSOs happen frequently, however, it means something is wrong with the system (Figure 4).

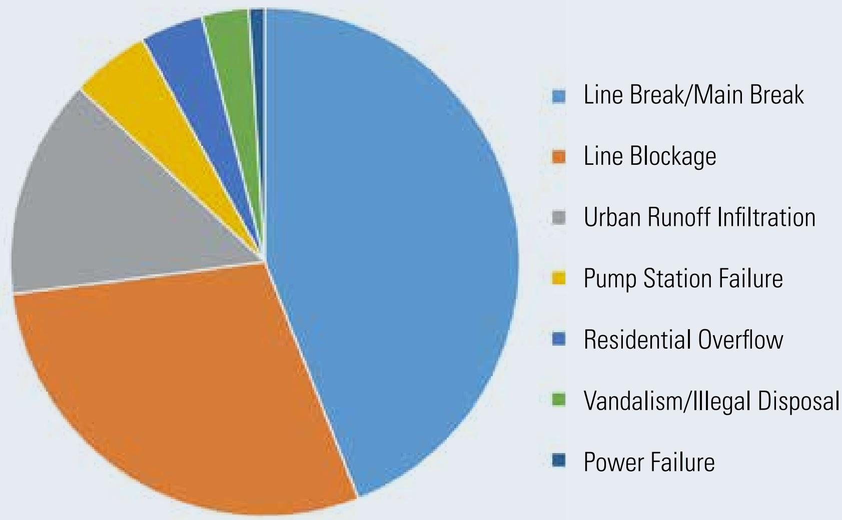

Figure 4. This chart summarizes the events that caused 105 SSOs that led to beach closures in 1999 (NRDC 2000). As the chart shows, more than 70 percent of the SSOs were attributed to line/main breaks or line blockages.

Problems that can cause chronic SSOs include:

- Too much rainfall or snowmelt infiltrating through the ground into leaky sanitary sewers, which are not intended to hold rainfall or to drain property. Excess water can also inflow through roof drains connected to sewers and broken or badly connected sewer service lines.
- Sewers and pumps too small to carry sewage from newly developed subdivisions or commercial areas.
- Blocked, broken, or cracked pipes and other equipment or power failures that keep the system from doing its job. Tree roots can grow into the sewer. Sections of pipe can settle or shift so that pipe joints no longer match. Sediment and other material can build up and cause pipes to break or collapse. This can also happen to sewer service connections to houses and other buildings. Some cities estimate that as much as 60 percent of the water over-filling their sewer systems comes from service lines. The chart above shows major types of problems that cause SSOs most frequently.
- A deteriorating sewer system. When sewers are not properly installed or maintained, widespread problems that can be expensive to fix develop over time. Some municipalities have found severe problems, necessitating billion-dollar correction programs. Often, communities have had to curtail new development until problems are corrected or system capacity is increased.

EPA and NEEF Launch Interactive Watershed Sleuth Challenge

Hey, citizen scientists! Want to be like Sherlock Holmes? Here's your chance. It's elementary! Become a *Watershed Sleuth* – or better yet, a *Watershed Guardian* or a *Watershed Hero* – by learning how to help solve water quality problems. Try your hand at building a model aquifer, or take an interactive quiz to find local water wasters. These are just some of the online activities offered by EPA and the National Environmental Education Foundation (NEEF). Children, families, K-12 school groups, and others can earn a different digital badge for each lesson they complete, and show off their watershed knowledge!

Check out: **www.neefusa.org/watershed-sleuth**!

Lake Closed Due to Weeds

We love our lakes, enjoy spending time near them, and expect to have access to them. So a lake being closed due to weeds seems like a foreign concept. Goose Lake Wildlife Management Area in Nebraska was closed this summer due to an infestation of the invasive aquatic plant Eurasian watermilfoil (Figure 5).

Milfoil can form very dense vegetation mats that grow to the surface of the water. These mats interfere with recreational activities such as swimming, fishing, water skiing, and boating (Figure 6). Because it is widely distributed and difficult to control, milfoil is considered to be one of the most problematic invasive plants in the United States. The introduction of milfoil can drastically alter a waterbody's ecology.

Figure 5. Eurasian watermilfoil – close up showing the whorled leaves.

Figure 6. Eurasian watermilfoil plant bed.

Eurasian milfoil has played a role in several lake closures, whether due to efforts to limit the spread, or until management practices could be instilled. Shadow Lake in Vermont, Lake Placid in New York, and Lake Washington in Washington State are a few of the affected lakes.

While Indiana has not closed any lakes due to Eurasian watermilfoil, this aquatic invasive species (AIS) has spread widely across the state.

COMMON NAME: Eurasian watermilfoil. Eurasian watermilfoil may also be referred to as spike or spiked watermilfoil.

SCIENTIFIC NAME: *Myriophyllum spicatum*
Eurasian watermilfoil is in the watermilfoil family, Haloragaceae. There are about 14 different species of watermilfoils.

DISTRIBUTION: Eurasian watermilfoil is native to Europe, Asia, and northern Africa. As of 2003, 45 states reported the presence of Eurasian watermilfoil.

Indiana: Of the approximately 616 lakes and reservoirs in the northern one-third of the state, Eurasian watermilfoil infested at least 175 of them as of the late 1990s. Throughout the state, approximately 126,000 acres of lakes and impoundments contain some level of Eurasian watermilfoil.

DESCRIPTION: Eurasian watermilfoil is a submersed perennial. It has a long underwater stem that branches profusely when it reaches the surface of the water. Leaves are whorled on the stem at each node, and there are generally four leaves per whorl. Leaves are finely divided and feather-like in appearance. There are usually 12 to 21 pairs of leaflets. Each leaflet is thin, fine, and about ½ inch long. It produces small reddish flowers that emerge several inches above the water on a spike grown from the tip of the stem.

Eurasian watermilfoil is often confused with a common Indiana native plant, northern watermilfoil (*M. sibiricum*), and it is sometimes difficult to tell the difference. If you rely on the characteristic that a mature Eurasian watermilfoil leaf has 12 to 21 pairs of leaflets and northern watermilfoil has 5 to 10 pairs, you will be correct in identification much of the time. The leaves of Eurasian watermilfoil are limp when held out of water, whereas the leaves of northern watermilfoil stay rigid.

LIFE CYCLE BIOLOGY: Eurasian watermilfoil can grow in a wide variety of habitats and conditions. It occurs in ponds, lakes, reservoirs, and slow-flowing rivers and streams. It will grow in shallow or deep water, fresh or brackish water, a wide temperature range, as well as a pH from 5.4 to 11. It tends to do well in waters that have had some sort of disturbance like intense plant management, overabundance of nutrients, or extensive motorboat use. It grows best in fine-textured inorganic soils where it can get plenty of sunlight.

Eurasian watermilfoil is capable of spreading by seeds and by vegetative means. Each plant is capable of producing over 100 seeds but germination of these seeds rarely takes place. Dispersal through vegetative means is Eurasian watermilfoil's main reproductive strategy. The plant goes through autofragmentation during the growing season, where roots will develop at the nodes and the plant will break off at these nodes on its own. Fragments can also be produced by wind, waves, and human activity. These fragments will set root to grow into a new plant. New shoots begin to grow from the overwintering root crowns when water temperature reaches about 60° F in the spring. Growth is rapid and when the plant nears the water's surface it will branch out creating a canopy. The fast growth and topped-out canopy generally occurs before native species peak in growth. Flowering generally occurs in July. Autofragmentation usually occurs after flowering. Plants die back to the roots in the fall. These roots store carbohydrates in order to initiate the rapid growth in the spring.

PATHWAYS/HISTORY: Eurasian watermilfoil was first introduced into the United States through the aquarium trade. The first documented identification of Eurasian watermilfoil in open water in the United States was in 1942 from a pond in Washington, DC. By 1950 the species was into the Midwest in Ohio and was also found in western states such as Arizona and California. Eurasian watermilfoil is now found throughout the continental United States with the exception of the northern Great Plains region and Maine (Figure 7).

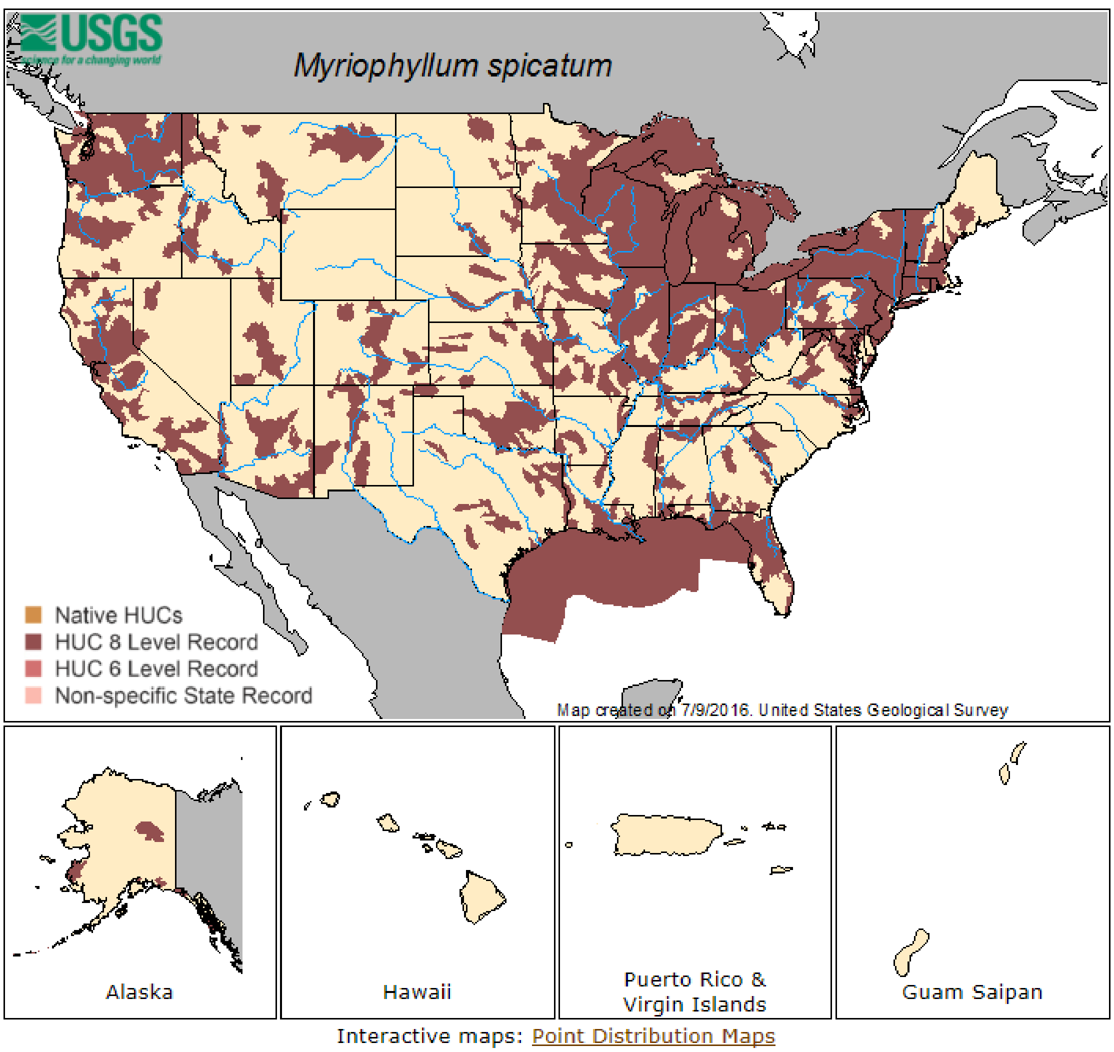

Figure 7. Eurasian watermilfoil distribution map.

DISPERSAL/SPREAD: Eurasian watermilfoil has spread through accidental and intentional introductions. Pond owners intentionally introduced the plant into their ponds to provide fish habitat. Since Eurasian watermilfoil is capable of reproducing by vegetative means it is likely that the spread into most new bodies of water has been by fragments. Aquatic equipment that was used at Eurasian watermilfoil-infested waters may have fragments attached; these fragments can be transported to other waters and start a whole new infestation. This plant can stay alive for weeks out of water if kept moist.

RISKS/IMPACTS: Eurasian watermilfoil negatively affects the water bodies it invades in several ways. Due to its tendency to branch profusely and form a dense canopy over the waters surface, it will shade out the native vegetation. This can alter the species composition of the water, which can result in a near monoculture of Eurasian watermilfoil. This plant is not a valuable food source for waterfowl unlike some of the native submersed aquatic plants. Plant biomass can become so dense that predator fish will lose their foraging space and will be less effective at controlling prey species resulting in an imbalanced fish community. Dense beds of Eurasian watermilfoil make recreational activities such as boating, fishing, and swimming nearly impossible. Residential or industrial water intakes can become clogged with Eurasian watermilfoil. Dense plant beds can be nursery areas for mosquito larvae. A lake heavily infested with Eurasian watermilfoil will be aesthetically displeasing, which results in reduced property values. In 1998, 160 permits were issued for herbicide treatments on public waters in Indiana. Approximately four of every five permits issued targeted Eurasian watermilfoil. A conservative estimate of the cost of controlling exotic plants that interfere with recreation and drinking water supplies in Indiana is in the neighborhood of $1.2 million per year.

MANAGEMENT/ PREVENTION: The best management is prevention. Preventing the introduction and spread of Eurasian watermilfoil is the easiest and cheapest way to control it. If it is too late to prevent the establishment of this invasive, there are a few techniques that can be used to control it.

Mechanical: Mechanical removal of this plant should only be considered if the Eurasian watermilfoil has become widespread and all available niches have become occupied by this plant. This is important because mechanical techniques usually result in fragmentation, which can actually help the plant spread. Cut stems can also branch abundantly, which can result in even denser plant beds if harvesting does not occur frequently through the growing season. Harvesters and hand-cutting are the most common mechanical removal methods. All fragments must be collected and disposed of properly for this to be effective. To dispose of the remnants, composting, burning, burying, or trash disposal are all acceptable methods.

Habitat Alteration: The most common habitat alteration used for aquatic vegetation control is a winter lake drawdown. A drawdown can be effective in reducing nuisance vegetation if you allow several weeks of drying time and expose the Eurasian watermilfoil root crowns to sub-freezing temperatures. Careful consideration must be given to the effect on the fish community as a result of a drawdown. You should consult with a fisheries biologist before implementing this control method so as to not put the fishery at risk.

Biological: Biological control methods are highly sought since they are viewed as "environmentally friendly." To be most effective, a biological control should be target-specific and not cause harm to unintended species. The most common biological control used for aquatic plant control in Indiana is the grass carp or white amur. Unfortunately, grass carp do not prefer Eurasian watermilfoil and may only turn to it as food only after may of the native plants have been consumed. Plant pathogens have also been sought out as a biological control for Eurasian watermilfoil. Laboratory research has shown that the fungus *Mycoleptodiscus terrestris* reduces the plants biomass significantly. The U.S. Army Corps of Engineers is continuing research with this possible biological control. The most effective biological control method discovered so far for the control of Eurasian watermilfoil has been the North American weevil, *Euhrychiopsis lecontei*. This species seems to only attack milfoil and causes a high level of damage to the plant. The adults feed on the stems and leaves of the plant and the larvae bore into the stem causing extensive damage.

Chemical: Until recently, chemical control targeting milfoil usually resulted in extensive collateral damage to non-target native species. Fortunately, advances have been made with chemical types, application rates, and timing of application that can selectively control Eurasian watermilfoil. The active ingredient Fluridone has been used at low rates to selectively control Eurasian watermilfoil. Aquatic herbicides containing Triclopyr or 2,4-D have also proven effective for Eurasian watermilfoil control while impacting few other native submersed aquatic plants. To determine the most effective herbicide to control Eurasian watermilfoil in your particular body of water, you should contact an aquatic herbicide applicator. Only herbicides labeled for aquatic use may be used to treat aquatic plants. An Aquatic Vegetation Control Permit is required for weed control efforts on Indiana's public waters. To help stop the spread of aquatic invasive plants including Eurasian watermilfoil, here are some simple steps you can follow.

- Rinse any mud and/or debris from equipment and wading gear and drain any water from your boat before leaving the access area.
- Remove all plant fragments from the boat, propeller, and boat trailer. The transportation of plant material on boats, trailers, and in livewells is the main introduction route to new lakes and rivers.
- Allow all equipment to thoroughly dry for at least five days before transporting it into a new body of water
- Do not release aquarium or water garden plants into the wild, rather seal them in a plastic bag and dispose in the trash.

NATIVE SPECIES AND HYBRIDS: Eurasian milfoil is not the only type of milfoil found in Indiana. There are several native milfoil species, such as northern milfoil (*Myriophyllum spicatum*) (Figures 8-10). Some native species closely resemble Eurasian milfoil and are commonly mistaken for it. However, the native milfoils rarely form dense, impenetrable plant beds like Eurasian milfoil often does. In some lakes, hybridization between exotic Eurasian milfoil (*M. spicatum*) and native northern milfoil (*M. sibiricum)*) is occurring. Genetic testing has found milfoil hybrids to be widely dispersed across the northern portion of the United States and hybrid milfoil appears to be widespread in Michigan. The documentation of the presence of hybrid milfoil is important because hybridity in plants

Figure 8-10. Comparison of Eurasian watermilfoil (INVASIVE) and Northern watermilfoil (NATIVE).

Fig. 10

is often linked to invasive traits. In fact, hybrid milfoil may be more invasive than Eurasian milfoil. There is concern in the scientific community that hybrids could have a competitive advantage over, and ultimately displace both northern milfoil and Eurasian milfoil.

In terms of physical appearance, hybrid milfoil is difficult to distinguish from Eurasian milfoil. For positive identification, genetic testing is required. Further, not all hybrid milfoils are the same. There is considerable genetic variability within hybrids.

The Indiana Lakes Management Annual Conference Update

~Sara Peel

The Indiana Lakes Management Society hosted the 29th Annual Indiana Lake Management Conference on March 11 and 12 at the Swan Lake Resort. Unfortunately, there were no lakes at beautiful Swan Lake! More than 150 individuals attended the conference, being treated to great presentations about local lakes, invasive plant management, pond management and rain garden design. More importantly, they spent time networking with other lake residents, managers, and professionals.

This year, ILMS honored three Indiana individuals and groups for the tireless work they do to improve conditions within their own backyard and throughout Indiana's lakes (Figure 11).

- Jane Loomis with The Watershed Foundation and Upper Lakes of the Tippecanoe River Association. Jane was recognized for her tireless work to launch and manage daily operations of the Upper Lakes of the Tippecanoe River, developing many projects to educate lake residents, engage individuals in water quality testing and improving water quality throughout northeast Indiana. For these efforts, Jane was recognized as the *Volunteer of the Year*.

- After intense blue-green algae blooms impacted the Salamonie Reservoir, the Upper and Lower Salamonie watershed groups, coordinated by the Huntington County SWCD and the Jay County Commissioners/SWCD, worked with the Army Corp and other local stakeholders to develop two watershed management plans for the Salamonie Reservoir watershed. The Lower Salamonie watershed group is implementing their WMP with a current 319 grant, and the Upper Salamonie watershed group is implementing their WMP with a Clean Water Indiana grant and will continue with a 319 grant this coming year. The nutrient issues in the Salamonie and subsequent blooms in the reservoir became a high profile issue when two dogs died after swimming in a blue-green bloom in 2012. Both watershed groups worked hard to bring together local stakeholders to drive the planning process and continue to do so now in implementation. For their effort, the Upper and Lower Salamonie watershed groups were recognized as the *Outstanding Lake Association/Group*.

- ILMS awarded the *Outstanding Implementation Project Award* to the Indiana University School of Public and Environmental Affairs (SPEA). SPEA, under the direction of Melissa Laney, has worked to gather information over the last two years at Griffy Lake in Bloomington, Indiana. Griffy Lake refilled in 2014, after an extended drawdown and Indiana University researchers saw this as an opportunity to study the impacts of full lake drawdown. Their research has included aquatic vegetation mapping, phytoplankton and zooplankton sampling, and extensive water quality data collection. With the help of students and volunteers data has been collected on a monthly basis since the lake refilled. Data have been analyzed to compare how the trophic levels will recover and the impact on aquatic invasive plants. The lake has always been a plant dominated lake and the question remains if that state will persist or if the lake will shift to an algal dominated system.

Despite lack of funding, monitoring continues as an in-kind project fueled by students, a City of Bloomington partnership, and personal research interest of SPEA faculty and staff. This unique opportunity to study drawdown effects on a lake system will help create a better understanding of the potential impacts of this management strategy. ILMS would also like to recognize the *Student Scholarship Winner* – Brynne Taylor of Indiana University. Brynne represents the future of lake management in Indiana. All student scholarship funding is provided through the conference silent auction – attendee donations totaled more than $1500 at the 2015 conference, which will allow ILMS to award three student scholarships at our 2016 conference!

Figure 11. ILMS Award Recipients: Robin Saywitz and Lori Lovell (Best Student Presentation); Brynne Taylor (Student Scholarship); Melissa Laney and Sarah Powers (Outstanding Implementation); Jane Loomis (Volunteer of the Year); Cheryl Jarrett and Tim Kroeker (Outstanding Lake Association).

CLEAN LAKES PROGRAM

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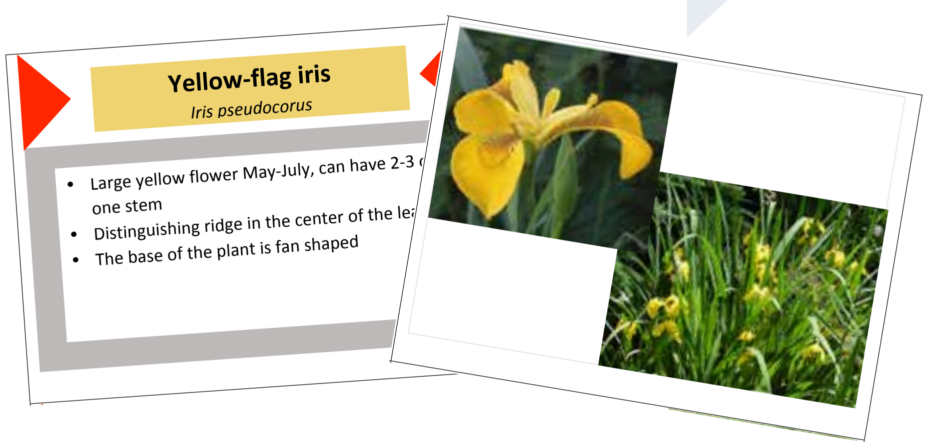
Flashcards!

With the fall and winter months approaching, you can print out these flashcards (on the following pages) and cut out along the lines. You might consider taking them to a print shop to print, laminate, and hole-punch on the corner so you can clip them together and use the next boat trip out. Enjoy and sharpen you identification skills for next year!



Yellow-flag iris

Iris pseudocorus

- Large yellow flower May-July, can have 2-3 on one stem
- Distinguishing ridge in the center of the leaf
- The base of the plant is fan shaped

Common reed

Phraqmites australis

- Up to 12 foot tall grass
- hollow woody stems
- wide stiff leaves
- large feathery flower head purplish when young, brown in seed

Purple loosestrife

Lythrum salicaria

- Purple flowers
- Branched stems are square, can root at nodes
- leaves opposite, lanceolate
- up to 2.5 million tiny seeds/plant

Reed canary grass

Phalaris arundinacaea

- Grows 2-9 feet tall
- Blades flat and rough on both sides, alternate
- hairless









Eurasian watermilfoil

Myriophyllum spicatum

- 14 or more leaflet pairs
- leaves whorled
- leaves collapse against stem when pulled from water
- flower spike held above water

Hydrilla

Hydrilla verticillata

- Leaves in whorls of 5
- Leaf margins distinctly visible saw-toothed; often with one or more sharp teeth along the underside midrib

Brazilian elodea

Egeria densa

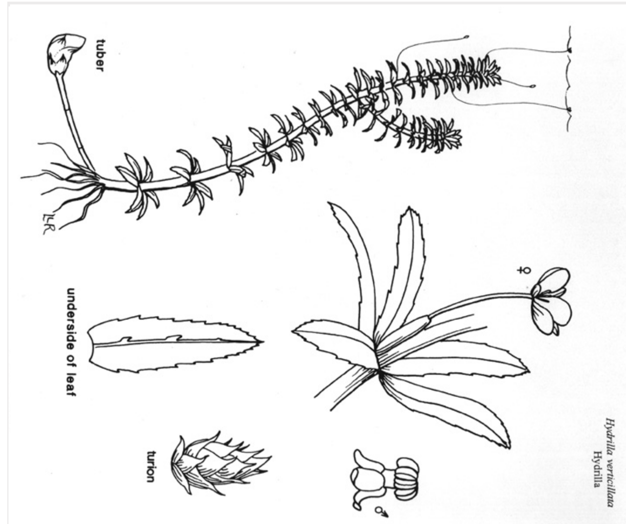
- smooth leaf edges
- leaves in whorls of 4 (up to 6)
- relatively showy flower
- grows in up to 20 feet of water

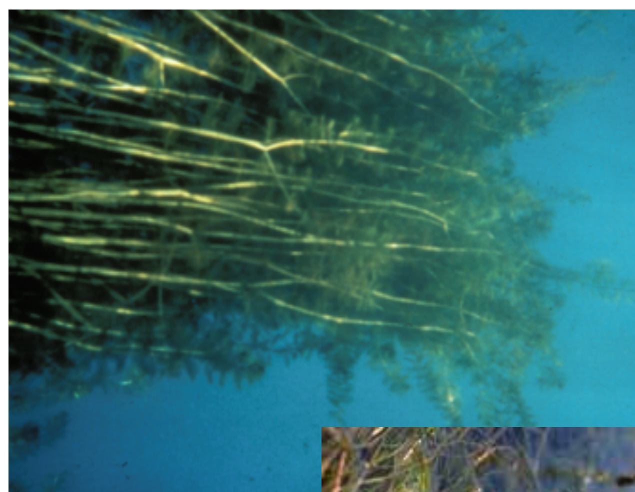
Curly leaf pondweed

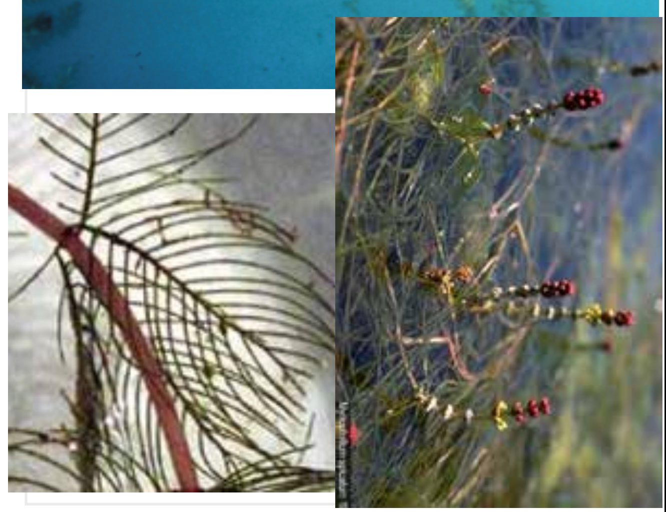
Potamogeton crispus

- leaves distinctly wavy and stiff
- olive green


Curly pondweed
Potamogeton crispus


tuber
underside of leaf
turion
Hydrilla verticillata
Hydrilla





Starry Stonewort

Nitellopsis obtuse L.

- Large algae in the Characeae family
- Whorls of 4-6 long branchlets
- Star shaped bulbils
- Prefers marl sediments in up to 9 meters deep water

Brittle naiad

Najas minor

- Brittle up to about 0.5 m long, often branched toward the upward portion, conspicuous, brownish, prickly teeth at internodes
- Opposite or sometimes in pairs along stem, may appear to be in whorls on ends, leaves are 1 to 2in long, toothed, stiff and pointed

Brittlewort species

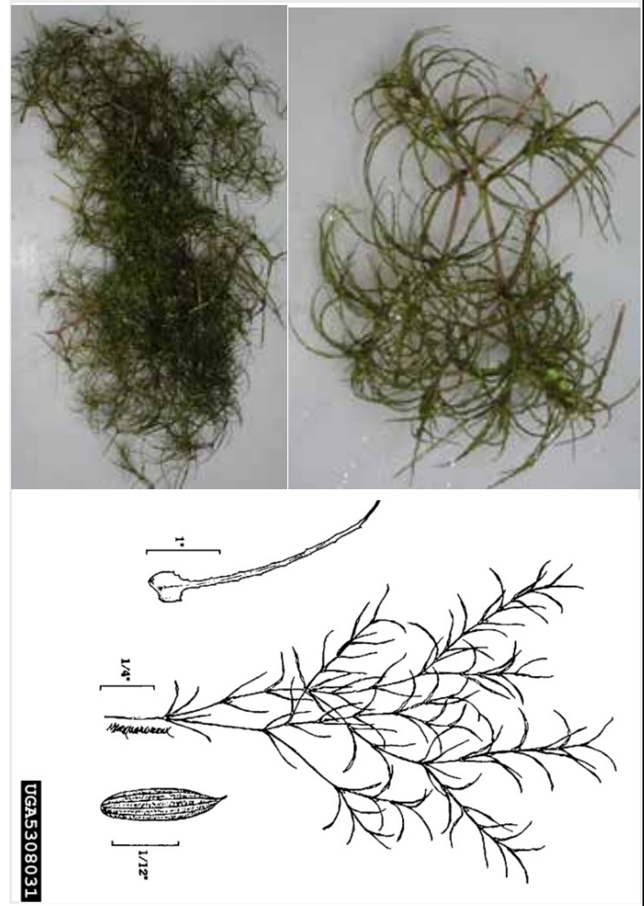
Nitella species

- Large algae –Macro-alga, having no true leaves
- Branches and branchlets of single column shaped cells that whorl from stem
- Translucent and smooth to the touch

Spiny naiad

Najas marina

- Brittle up to about 0.5 m long, often branched toward the upward portion, conspicuous, brownish, prickly teeth at internodes
- Leaves- opposite or sometimes in whorls of three, -triangular teeth along the leaf margins, - prickles along the midrib on the underside
- Flowers: - solitary in the leaf axils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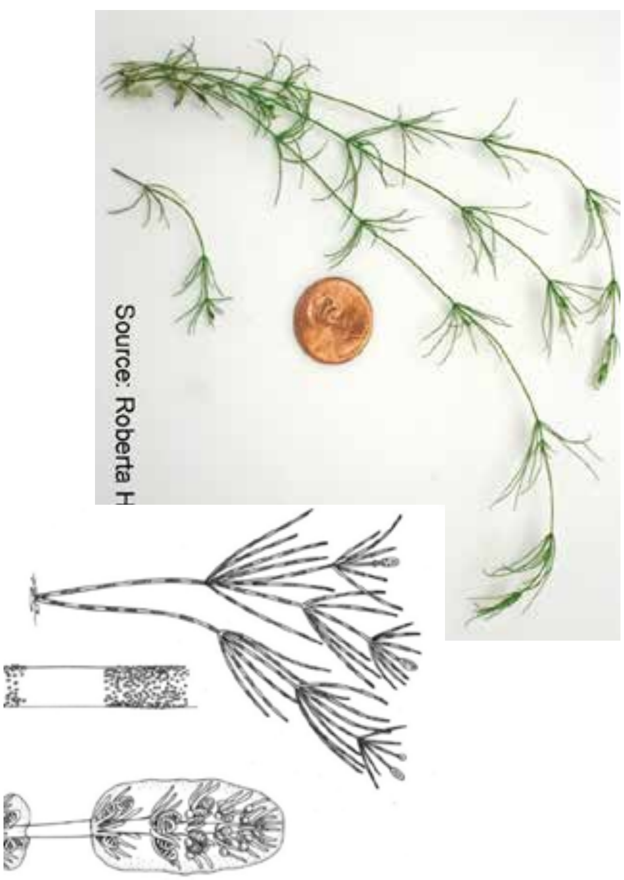

Source: Roberta

Southern naiad

Najas guadalupensis

- Submersed, very long, slender and very branched
- Leaves opposite or whorls of 3, very narrow (~2mm wide), 1 inch and very small teeth on leaf margins
- Flowers are very small on axils inconspicuous

Eel grass

Valisneria americana

- Long leaves can be several feet long a 1 in wide.
- Leaves have rounded tips
- Leaves have 5 distinct raised ridges

Sago pondweed

Stuckenia pectinata

- Perennial, grows 1-3' long
- leaves 1½-5" long, up to 1.0 mm. across, mostly alternate, and needle like
- sheath-like stipules grow at the leaf base about ½-1½" long and up to 1.0 mm. across
- Flowers above the water surface

Common bladderwort

Utricularia vulgaris

- branched leaves
- conspicuous bulbous bladders green when young and turn black further down the stem
- carnivorous plant
- small yellow snapdragon-like flower is held above the water

Spatterdock

Nuphar lutea

- very large heart-shaped leaves
- ball-shaped yellow flowers
- stems rigid enough to hold leaves out of water when water level drops

Whirled loosestrife

Decadon verticillatus

- Shrubby
- Purple/pink flower above leaves on stem
- Opposite leaves

Pickerel weed

Pontedaria cordata

- Rounded lance shaped leaves that stick out of the water
- Purple flowers
- Forms dense mats

American waterweed

Elodea canadensis

- leaves linear
- whorls of 3 (sometimes 2-4) on the stem




Coontail

Ceratophyllum demersum

- leaves narrow, forked and whorled on the stem
- inconspicuous flowers
- plant is stiff and holds its shape out of water

Water shield

Brasenia schreberi

- Floating leaves with rooted, purplish stems attached to leaf center
- Leaf entire with no cut or lobes, oblong shape
- Small red flowers that resemble a sunburst
- Gelatinous slime coating on underside of young leaves

Illinois Pondweed

Potamogeton illinoensis

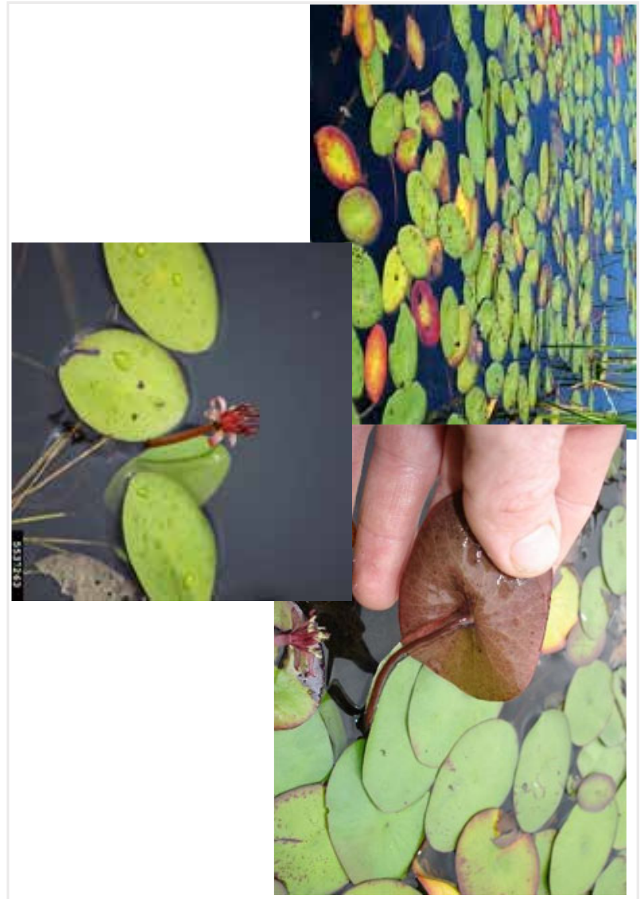
- Leaves alternate, both submerged floating
- Leaves 1.5 – 2.5 inches wide and 1-7 inches long
- Leaves elliptic and pointed
- Produces thick spikes of greenish flowers above water surface

Parrot feather

Myriophyllum aquaticum

- Divided leaves arranged in whorls of 4 -6 and feathery
- Leaf color is bright blue-green
- Stems can be up to five feet long and trail becoming erect above the water surface


Myriophyllum aquaticum
Parrot feather
Illustration provided by:
IFAS, Center for Aquatic Plants
University of Florida, Gainesville, 1990




Potamogeton illinoensis
1995 Allison Fox
Dan Busemeyer, Illinois Natural History Survey

Aquatic Invasive Monitoring Plant Highlight

This will be the 16th 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.

Water Stargrass (*Heteranthera dubia*), NATIVE

Water stargrass is a submerged plant commonly found in freshwater rivers, streams, and lakes throughout North and Central America. Water stargrass is named for its small star-shaped yellow flowers that rise above the water's surface. The plant's dark-green leaves are long, narrow, and grass-like. The leaves are arranged alternately on freely branching stems and have no prominent midvein. The leaves are commonly 10-14 cm long and 2-6 mm wide and stems can grow up to 2 m long. Water stargrass is known to grow together into masses in shallow waters, up to 1m deep.

Water stargrass provides fish cover and good habitat for macroinvertevrates. Waterfowl, especially ducks, are attracted to the plant as a food source.

You can find more information about our Invasive Plant Monitoring Program and water stargrass on the Clean Lakes Program website **www.indiana.edu/~clp**. We will be updating the Invasive Plant Monitoring page to include links to several resources and tips on identification guides.

Identification tips:
- Long grass-like leaves
- Alternate leaf arrangement with no prominent midvein
- Small yellow flowers with 6 narrow petals