# Lilly Lake

## Eastern Marathon County Lake Study

## Final Study Results 2013

University of Wisconsin-Stevens Point
and
Marathon County Staff and Citizens

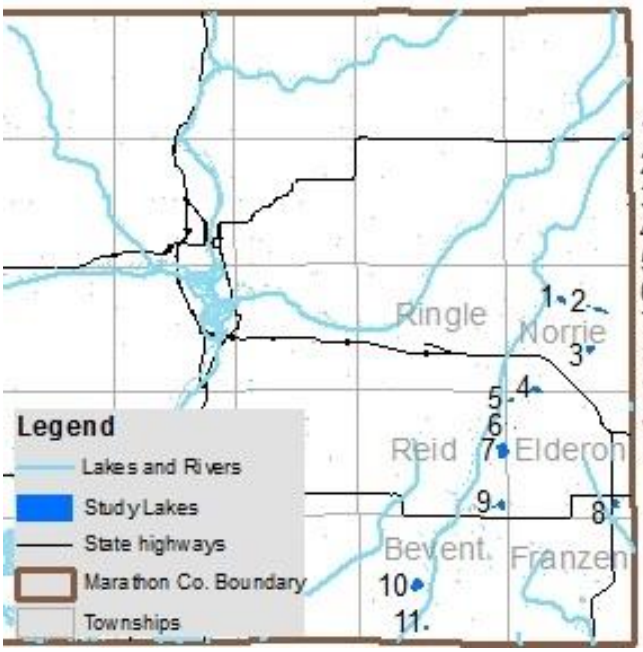
Healthy lakes add value to our communities. They provide a place to relax and recreate, and can stimulate tourism. Like any infrastructure, lakes require attention and good management practices to remain healthy in developed watersheds.

The purpose of this study is to learn about the current conditions of the fishery, habitat and aquatic ecosystems in order to help people make informed decisions to preserve what's good and correct any problems that exist.

**To protect**

**the lake** we must protect the "watershed," the land that drains or sheds its water into the lake.

# Lilly Lake – Location




1: Mud
2: Mayflower
3: Norrie
4: Bass
5: Lost
6: Rice
7: Pike
8: Lilly
9: Mission
10: Big Bass
11: Wadley

**Lilly Lake**

**Township of Reid**

East-northeast of Bevent

**Surface Area:** 85.2 acres

**Maximum Depth:** 5.8 feet

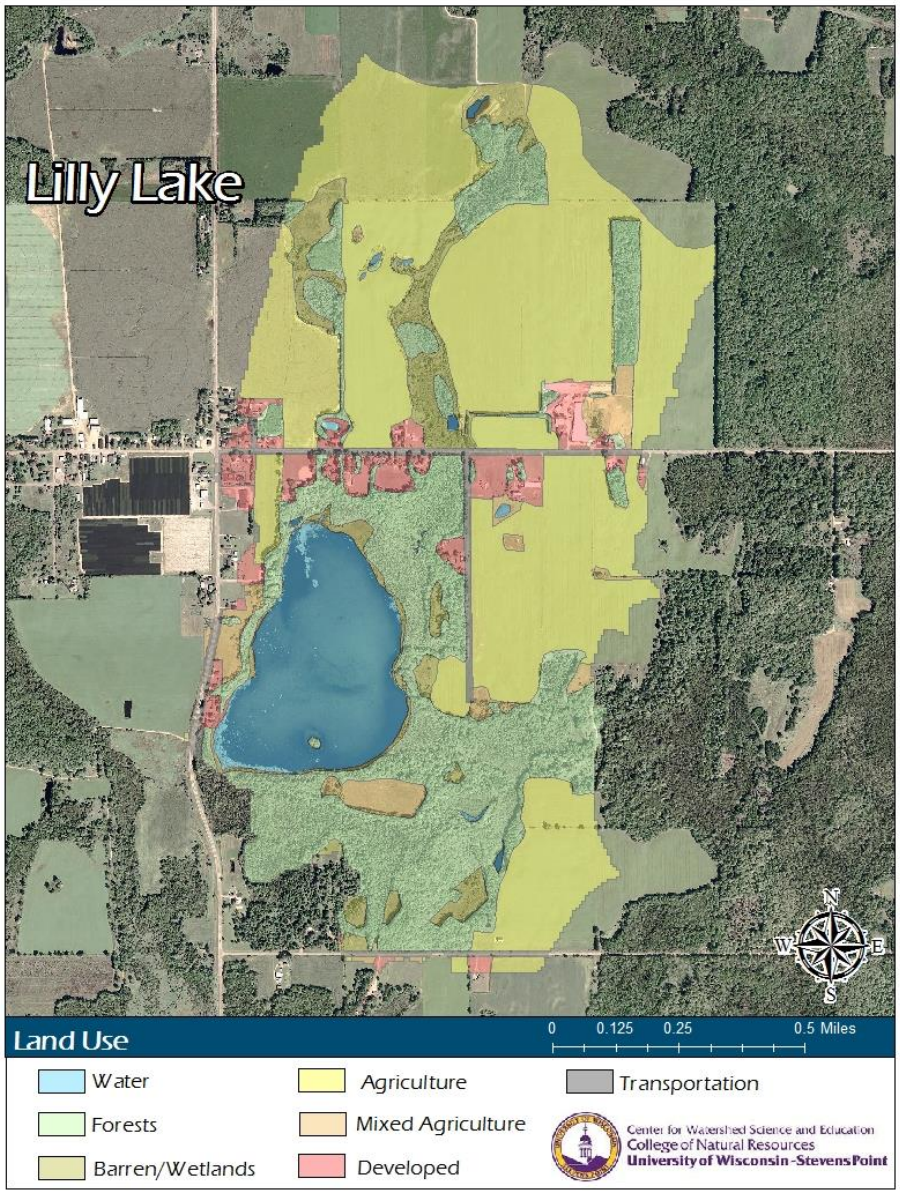
## Water Flow

- Lilly Lake is a seepage lake with most of the water entering the lake from groundwater.
- Surface water runoff and direct precipitation also contribute water, but to lesser extents.
- Water exits Lilly Lake through groundwater.

Lilly Lake, Marathon Co.

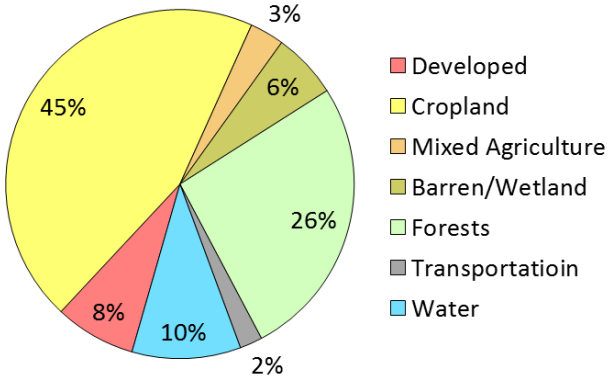
# Lilly Lake – Surface Watershed

**Surface Watershed:** The area where water runs off the surface of the land and drains toward the lake.




- **Land uses** and land management practices occurring in the watershed affect the water quality in the lake.
- Land uses and land management also play major roles in how water moves across the landscape and how much water soaks into the ground (for long-term storage) or quickly runs off the land.
- The surface watershed of Lilly Lake is 6,480 acres.
- The primary land uses in the Lilly Lake watershed are agriculture and forests.
- Residential development is scattered throughout the watershed, mainly in the town of Elderon.
- Land use around the perimeter of the lake is primarily forests. In general, the land closest to the lake has the greatest immediate impact on water quality.

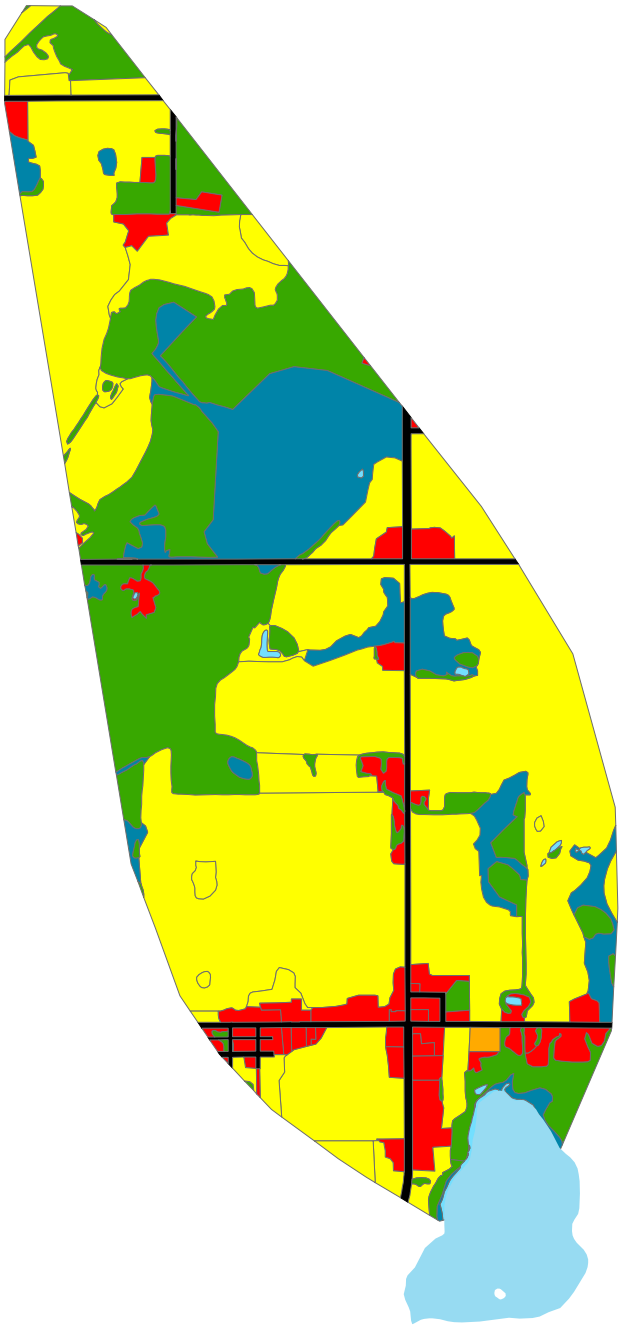
**Land Use in the Lilly Lake Watershed**



# Lilly Lake – Groundwater Watershed

**Groundwater Watershed:** The area where water soaks into the ground and travels below ground to the lake.

- **Groundwater** slowly contributes water to our lakes throughout the year. Hard surfaces on the landscape prevent water from soaking into the ground and becoming groundwater. This results in less water flowing to the lake during the winter and between rains.
- The quality of groundwater reflects what is happening on the land surface. Precipitation falling on forested land produces clean groundwater, whereas precipitation falling on lands that have chemical use can leach contaminants to groundwater. Groundwater contamination in central Wisconsin may include nitrogen, pesticides, herbicides and other soluble chemicals originating from septic systems, crops, barnyards, road maintenance, etc. Once in the groundwater, these chemicals slowly move towards a lake or river.
- The groundwater watershed for Lilly Lake is 1,236 acres.
- The primary land uses in the Lilly Lake groundwater watershed are agriculture and forests.
- Lilly Lake has residential development, forests and wetlands around its perimeter. In general, the land closest to the lake has the greatest immediate impact on water quality.

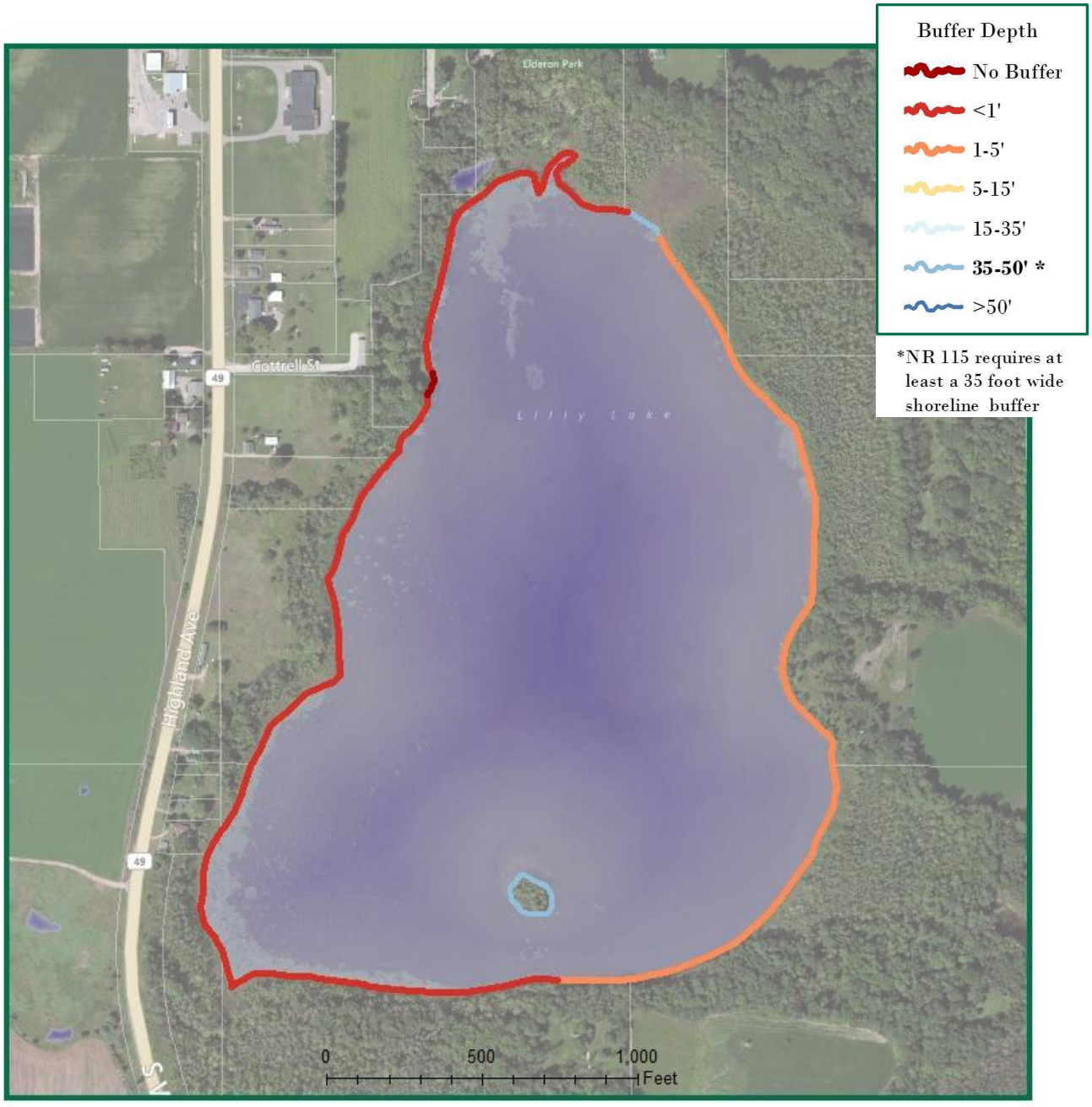


| Land Use | Acres |
|---|---|
| Agriculture | 671 |
| Developed | 77 |
| Forested | 275 |
| Recreational | 2 |
| Roads | 38 |
| Water | 30 |
| Wetland | 142 |

# Lilly Lake – Shoreland Vegetation

**Shoreland vegetation** is critical to a healthy lake's ecosystem. It provides habitat for aquatic and terrestrial animals including birds, frogs, turtles, and many small and large mammals. It also helps to improve the quality of the runoff that is flowing across the landscape towards the lake. Healthy shoreland vegetation includes a mix of tall grasses/flowers, shrubs and trees.

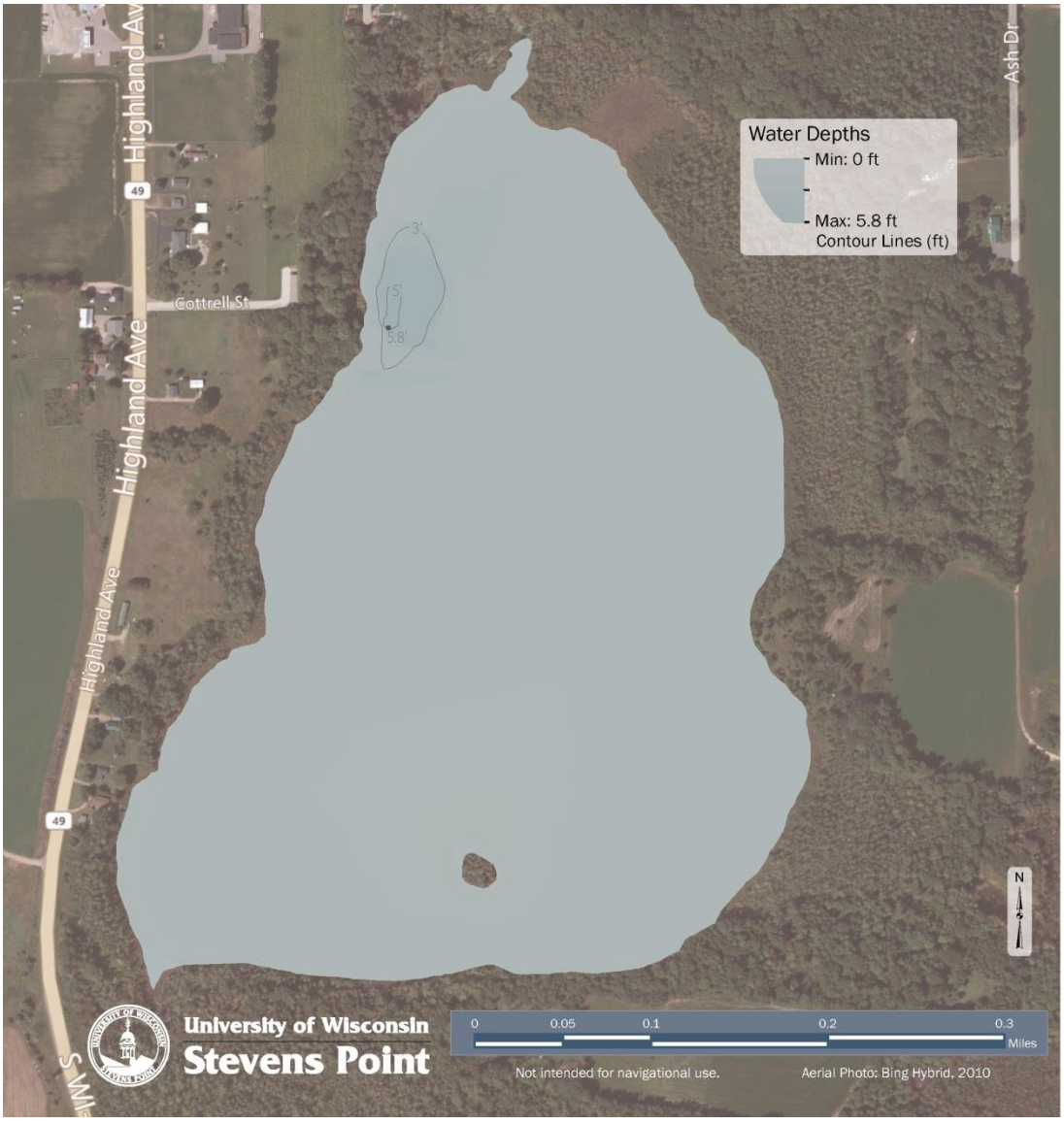
The map below shows how far the 0.5 to 3 foot tall vegetation exists landward from the edge of Lilly Lake. A greater vegetative buffer produces more habitat and better water quality.



# Lilly Lake – Lake Map

Lilly Lake's shape and depth play major roles in determining:

- Where aquatic plants can and cannot grow
- Types of fish and where they live
- How fast water in the lake warms up and cools down
- The water quality of the lake
- Abundance of habitat for species living in the water and on the land




**LILLY LAKE**
**BATHYMETRIC MAP**

Map funded by the Wisconsin Department of Natural Resources Lake Planning Grant Program, Marathon County, Marathon County citizens, and lake and fishing groups.

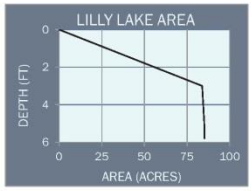
MARATHON COUNTY, WISCONSIN

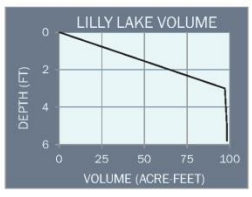
GPS and Sonar Survey
October, 2012

University of Wisconsin-Stevens Point
Center for Watershed Science and Education, College of Natural Resources

Cartography by Christine Koeller

| | | |
|---|---|---|
| LAKE AREA | 85.2 | Acres |
| Under 3 Feet | 84.2 | Acres (98.9%) |
| Over 20 Feet | 0 | Acres ( 0%) |
| VOLUME | 98.4 | Acre-feet |
| SHORELINE | 1.7 | Miles |
| MAX DEPTH | 5.8 | Feet |



# Lilly Lake – Fishery

Many factors determine which fish species thrive in a lake. Physical factors include the lake's type, depth, surface area, geology and lake bed materials. Water quality in the lake also plays a role: water clouded with sediment or algae reduces the success of visual feeders, while low levels of dissolved oxygen will limit the fish population to those that can tolerate periods with low oxygen.

**Total catch and length of fish species in Lilly Lake, 2012**

| Species | Min Length (in) | Max Length (in) | Average Length (in) | Total Catch |
|---|---|---|---|---|
| Bluegill | 1.1 | 8.6 | 3.3 | 199 |
| Largemouth Bass | 0.8 | 4.0 | 1.4 | 103 |
| Iowa Darter | 1.1 | 2.4 | 1.8 | 29 |
| Pumpkinseed | 2.5 | 6.9 | 4.1 | 8 |
| Black Crappie | 2.5 | 10.6 | 7.1 | 8 |
| Bluegill x Pumpkinseed hybrid | 4.8 | 7.8 | 6.0 | 4 |
| Yellow Perch | 1.5 | 2.6 | 2.0 | 2 |
| Northern Pike | 26 | 26 | 26 | 1 |

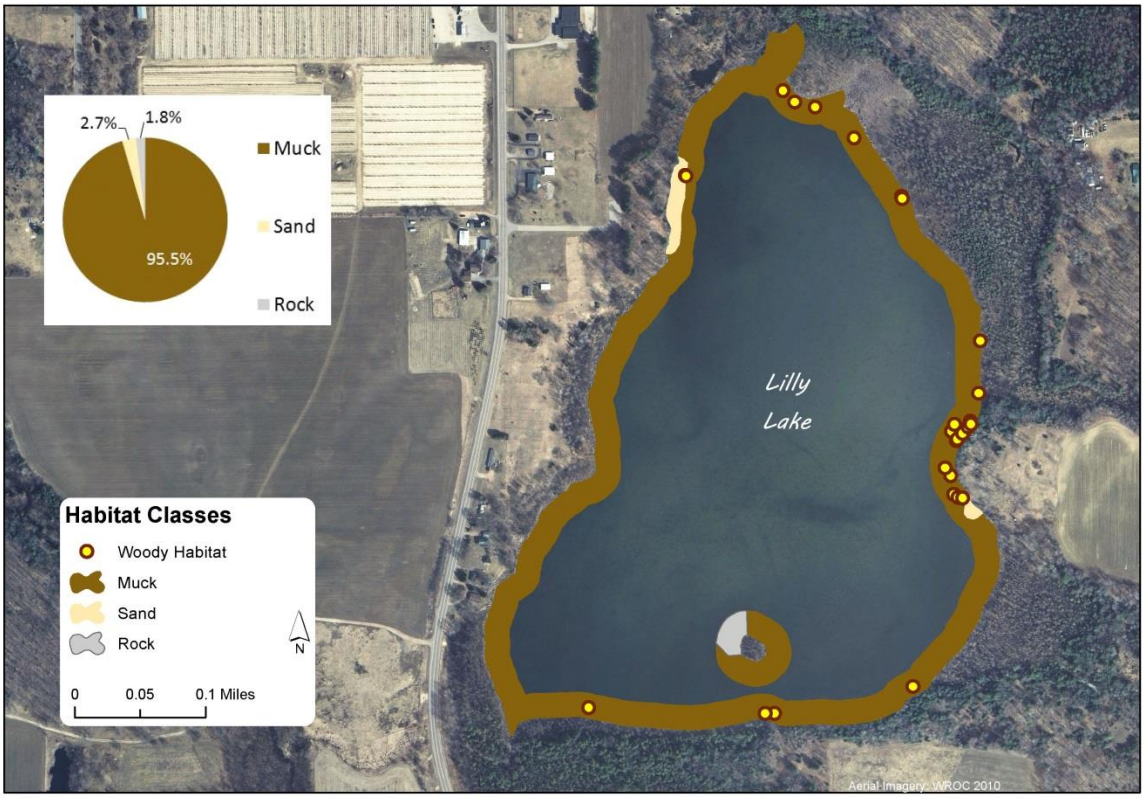
- Lilly Lake supports a warm water fish community.
- In 2012, eight fish species were identified in samples collected by UW-Stevens Point. According to Wisconsin DNR fishery biologists and records, these were the first netting surveys done on Lilly Lake.
- Due to the shallow depth of Lilly Lake, dip netting was approved and opened to the public after reports of winter fish kills in 1967 and 1975, but no records exist regarding catch.
- After numerous reports of winter fish kills, the Lilly Lake Protection and Rehabilitation District dredged 44,000 cubic yards of material. A five-foot hole remains near the public beach area of Elderon County Park.
- No fish stocking records for Lilly Lake were found in the Wisconsin DNR records that were reviewed.
- The ability to successfully manage the fish populations in Lilly Lake in the future will be limited because of its shallow depth and tendency to winterkill.
- The presence of young sunfish during sampling indicates successful reproduction is occurring in Lilly Lake. Reproductive success of northern pike could not be determined with the limited sampling data.

# Lilly Lake – Lake Map

Habitat in and near the lake plays a major role in the composition of a fish community. Habitat is a combination of aquatic plants, woody structure and lake substrate. Near the shore is found some of the most important fishery habitat.

**Coarse woody habitat (CWH)** is an important component of a healthy and balanced fishery, playing a key role in the life histories of many fish species. Downed trees, logs and branches along with aquatic plants offer refuge from predators, sheltered substrates for spawning, nurseries for young, and feeding grounds to forage for insects and algae. CWH is very important to other animals that live in or visit a lake including turtles, frogs, birds and mammals.

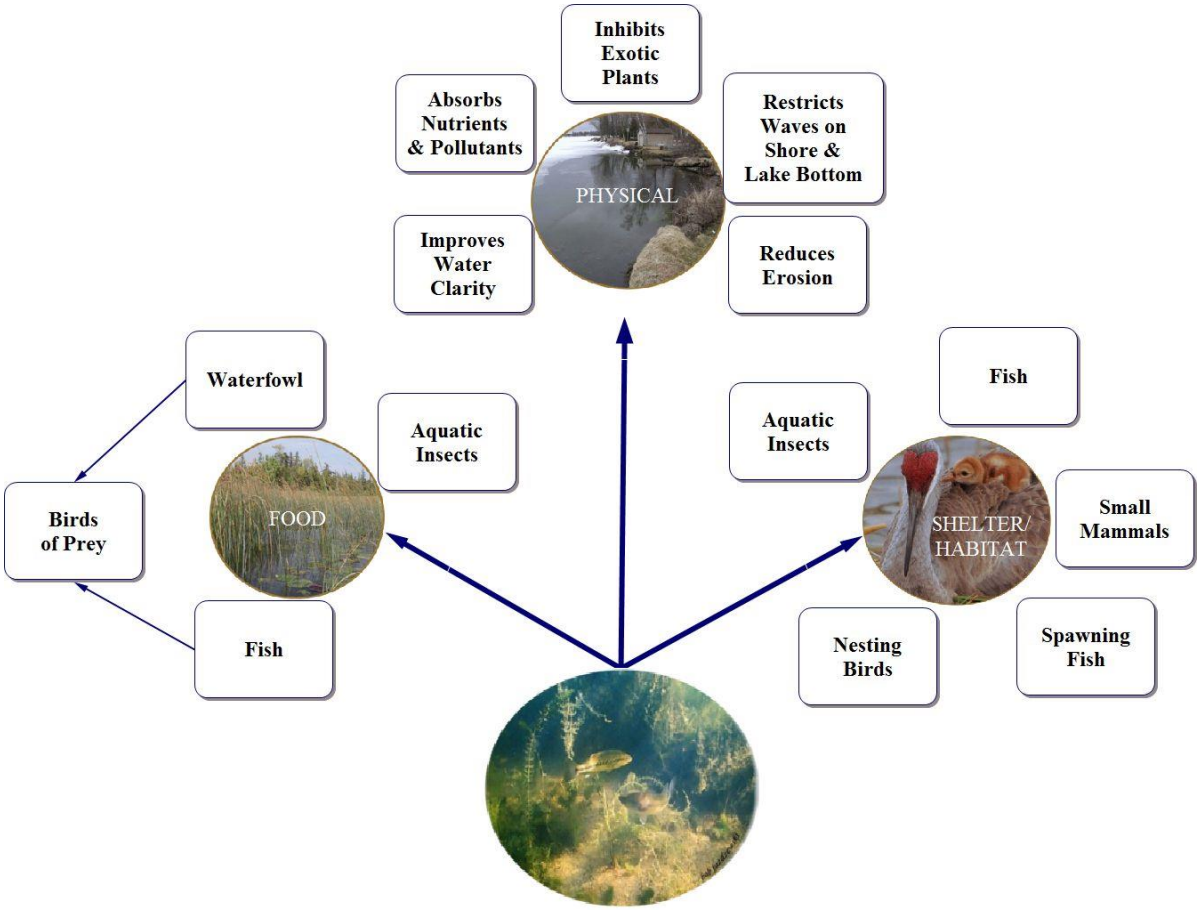
**Substrate and Coarse Woody Habitat - Lilly Lake**
**Marathon County, WI 2012**




- Coarse woody habitat is sparse in Lilly Lake compared to surrounding water bodies in the county. The fish community would benefit from the addition of CWH.
- Substrate in Lilly Lake is dominated by marl. In the absence of sand and coarser substrates such as gravel, largemouth bass and sunfish are known to build spawning nests on marl. Depressions are deepened until small amounts of coarser substrate, mostly fragments of snail shells, accumulate in the bottom of the nests.
- In areas of soft substrate, largemouth bass are also reported to spawn on woody habitat swept clear of sediments.

# Lilly Lake – Aquatic Plants

**Aquatic plants** are the forest landscape within a lake. They provide food for creatures including fish, ducks and turtles, and habitat for fish, invertebrates and other aquatic animals. They create oxygen in the water and utilize nutrients that would otherwise be used by algae. A healthy lake typically has a variety of aquatic plant species creating diversity that can help to prevent the establishment of aquatic invasive species.




**AQUATIC PLANTS**
**Food and Refuge for Aquatic Life**

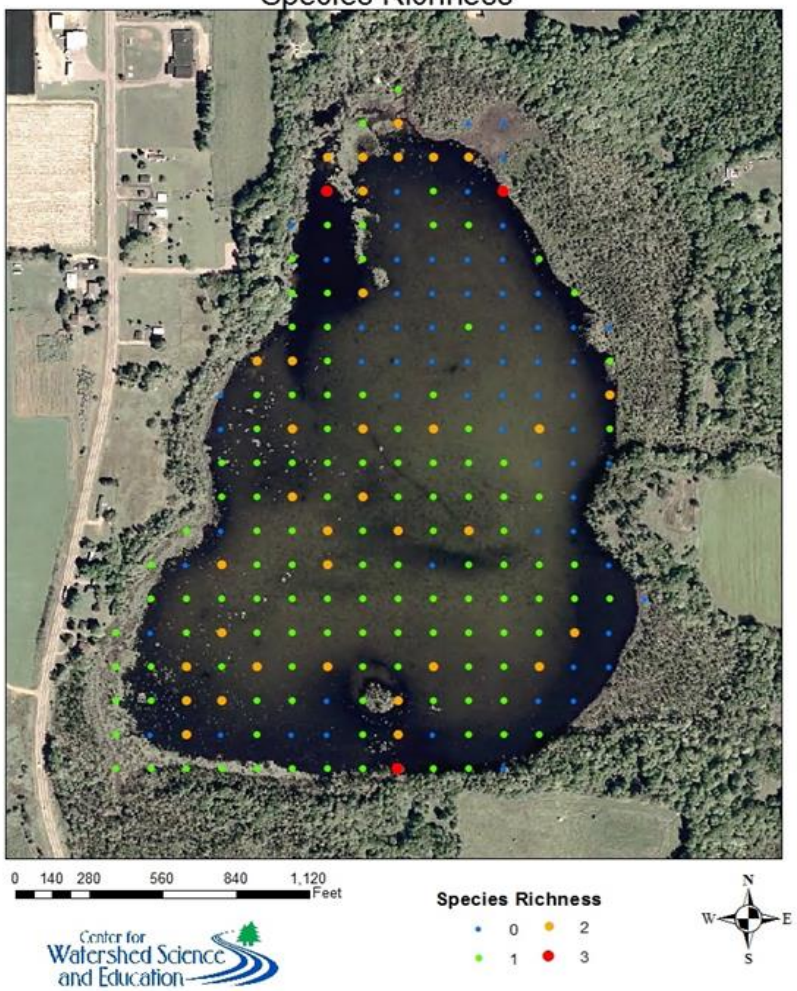
- The aquatic plant community of Lilly Lake is characterized by a below average diversity when compared to other lakes in the Marathon County study. At the time of sampling, water temperatures were warm and most growth had started to die back, possibly contributing to the low species count. Shallow lake depths and thick deposits of muck on the bottom may also be factors.
- Aquatic plants are distributed throughout the lake, with the greatest species richness on the northern end of the lake.
- The undeveloped shorelines of Lilly Lake, an asset to the lake and to the plant communities, should remain protected.

# Lilly Lake – Aquatic Plants

- During the 2012 aquatic plant survey of Lilly Lake, 70 percent of sites sampled had vegetation. The average depth of sampled sites was 4 feet, with a maximum of 6 feet.
- Only seven species of aquatic plants were found during sampling; no non-native plant species were found. This demonstrates diligence by lake users in cleaning watercraft before entering the lake to prevent non-native species transfer.
- The dominant plant species in the survey was coontail (*Ceratophyllum demersum*), found at 76% of vegetated sites, followed by white water lily (*Nymphaea odorata*), found at 40% of vegetated sites. Both are native plants that benefit the lake ecosystem and are tolerant of disturbance.

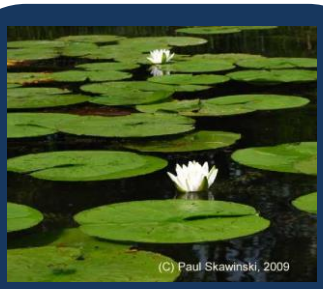
**Species Richness** is a count of the number of plant species found at a survey point. A greater number of species in a lake helps to make the aquatic plant community more resilient to year-to-year changes and aquatic invasive species. More plant species means more diverse habitat and available food sources.

Lily Lake 2012 Aquatic Plant Survey:
Species Richness





**Coontail** is an important food source for a wide range of waterfowl species. A number of invertebrate and fish species also use the bushy stems and stiff whorls of leaves as habitat, especially in the winter when other aquatic plants have died back.




The seeds of the **white water lily** provide food to waterfowl. The broad, floating leaves of this aquatic species offer shade and shelter to fish.

# Lilly Lake – Aquatic Invasive Species

**Aquatic Invasive Species** are non-native plants or animals that may cause significant harm to a lake's ecosystem. Typically, they are introduced to a lake by hitching a ride on clothing, boats, trailers and other water recreation equipment. Aquatic invasive species can be introduced to a lake accidentally or intentionally. Once in a lake, they may be impossible to completely remove and can be difficult and costly to control. Prevention and early detection are the best ways to keep aquatic invasive species from establishing in a lake.

**Lakes With Aquatic Invasive Species in Marathon and Northern Portage County, 2012**

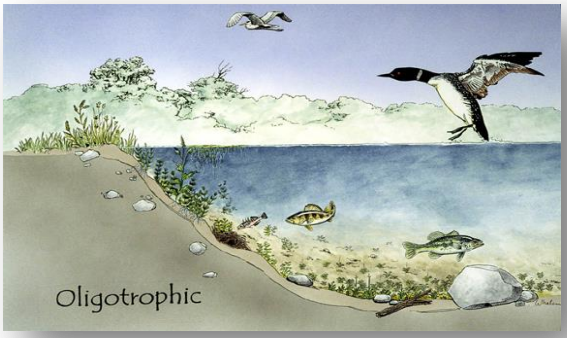
| Lake Name | Banded Mystery Snail | Chinese Mystery Snail | Rusty Crayfish | Curly-Leaf Pondweed | Eurasian Water Milfoil | Purple Loosestrife |
|---|---|---|---|---|---|---|
| *Marathon County (Shaded lakes are part of Eastern Marathon Co. Lake Study)* | | | | | | |
| **Big Bass Lake** | ✓ | | | | | |
| Big Rib River | | | ✓ | | ✓ | |
| Eau Claire Flowage | | ✓ | | | ✓ | |
| Flume Creek | | | ✓ | | | |
| Johnson Creek | | | ✓ | | | |
| Lake Wausau | | | | ✓ | | |
| Little Rib River | | | ✓ | | | |
| Little Trappe River | | | ✓ | | | |
| **Lost Lake** | | ✓ | | | | |
| **Mayflower Lake** | | ✓ | | ✓ | | |
| **Mission Lake** | ✓ | | | | ✓ | ✓ |
| **Pike Lake** | ✓ | | | ✓ | | |
| **Rice Lake** | ✓ | ✓ | | ✓ | | |
| South Branch Embarrass River | | | ✓ | | | |
| Spring Brook | | | ✓ | | | |
| Trappe River | | | ✓ | | | |
| **Wadley Lake** | ✓ | ✓ | | ✓ | ✓ | |
| Wausau Dam Lake | | | | | ✓ | |
| Wisconsin River | | | ✓ | | ✓ | |
| *Northern Portage County* | | | | | | |
| Tree Lake | ✓ | ✓ | | ✓ | | |
| Plover River | | | ✓ | | | |
| Lake Du Bay | | ✓ | ✓ | ✓ | ✓ | |

**Learn to identify invasive species & look for them in your lake!**



# Lilly Lake – Water Quality

Lakes go through a natural aging process that results in increased aquatic plant growth, fish and wildlife over time. Within a lake's watershed, human activity on the land, in a wetland, or in the lake can dramatically accelerate this process. Depending on land management practices, changes in a lake that may have normally taken centuries to occur may take place in decades or even years. The amounts of nutrients, algal growth, and water clarity measurements help to define the age of a lake. Based on these measures, lakes can be classified for comparison to one another.



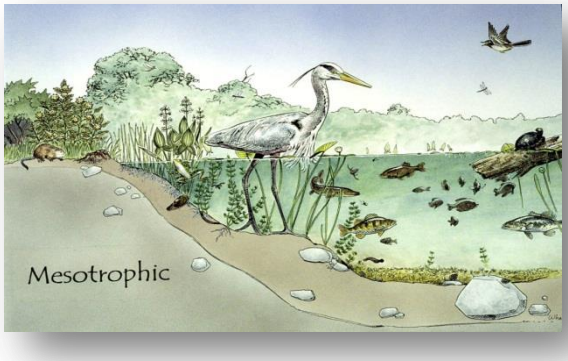

**Oligotrophic Lakes**

*Common uses*:

- ✓ Swimming
- ✓ Skiing
- ✓ Boating

*Vegetation of oligotrophic lakes*:

- ✓ Very little vegetation




**Mesotrophic Lakes**

*Common uses*:

- ✓ Boating
- ✓ Fishing

*Vegetation of mesotrophic lakes*:

- ✓ Increased vegetation
- ✓ Occasional algal blooms


**Eutrophic Lakes**

*Common uses*:

- ✓ Fishing
- ✓ Wildlife watching

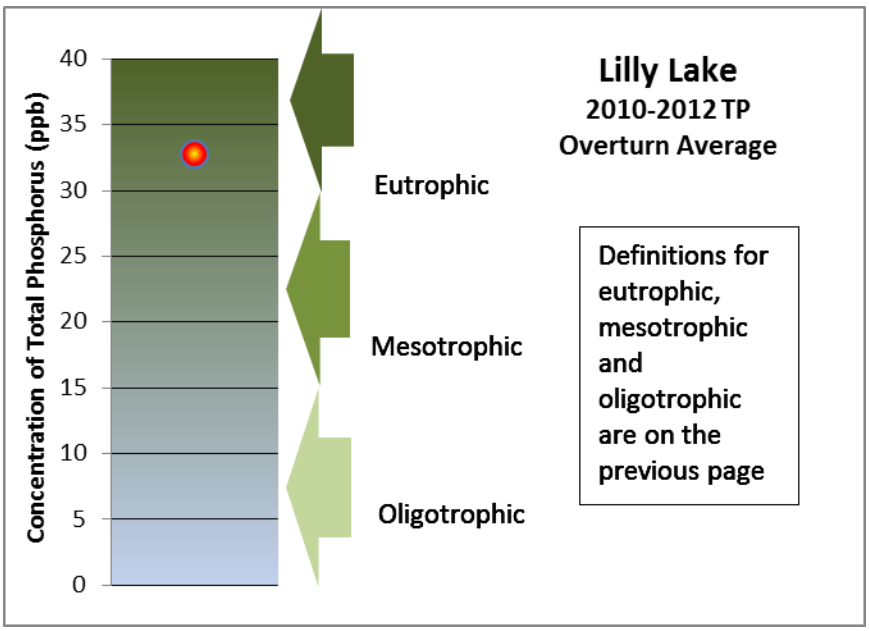
*Vegetation of eutrophic lakes*:

- ✓ Lots of aquatic plants
- ✓ Frequent algal blooms

*Winter fish kills can occur in shallow lakes due to low oxygen levels.*

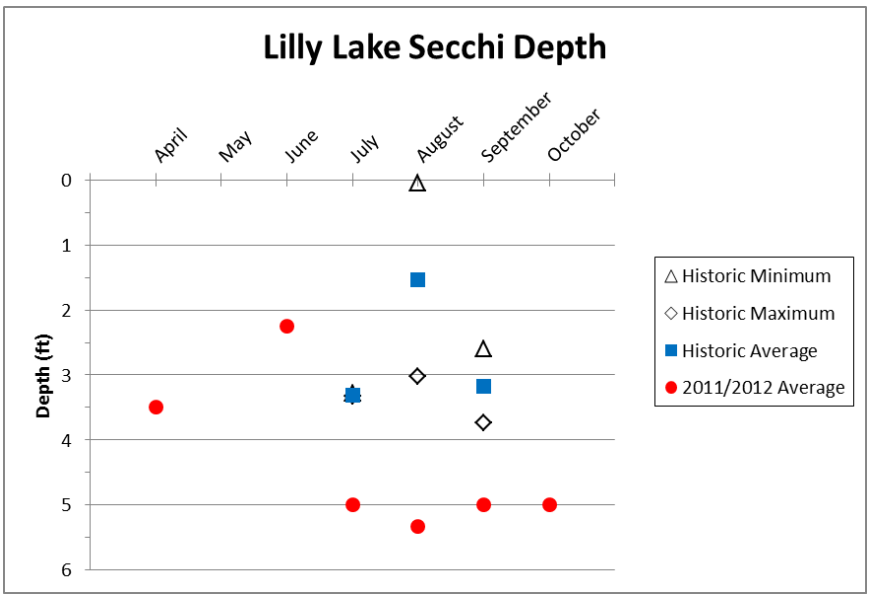
# Lilly Lake – Water Quality

**Phosphorus** is a major nutrient that can lead to excessive algae and rooted aquatic plant growth in lakes. In fact, one pound of phosphorus entering a lake can result 300 to 500 pounds of algal growth. All Marathon County lakes have either sufficient or excessive nutrients for aquatic plant growth, so these lakes will benefit from limiting the addition of more nutrients. Sources of phosphorus include septic systems, animal waste, storm water runoff, soil erosion, and fertilizers for lawns, gardens and agriculture.




- Total phosphorus levels measured when Lilly Lake was well-mixed (overturn) are displayed in the graph to the left.
- Overturn sampling during the 2010-2012 monitoring period indicate that Lilly Lake is a eutrophic lake with a high average total phosphorus level.

**Water clarity** is a measure of how deep light can penetrate (Secchi depth). Clarity is affected by water color, turbidity (suspended sediment), and algae. Water clarity helps determine where rooted aquatic plants can grow.



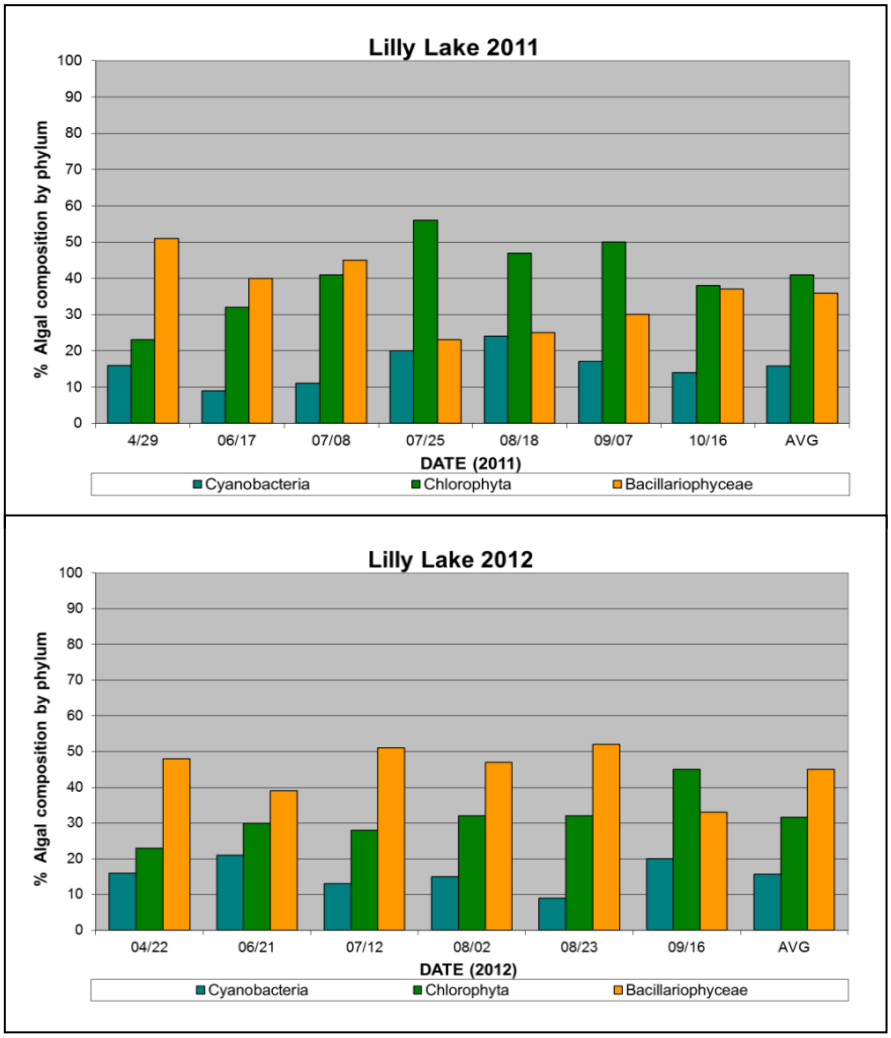

- The graph to the left shows water clarity data collected during the growing seasons in 2011 and 2012. It is typical for water clarity to vary throughout the year.
- The 2011/2012 average Secchi depth readings were deeper than historic averages, suggesting a recent improvement in water clarity.

# Lilly Lake – Water Quality

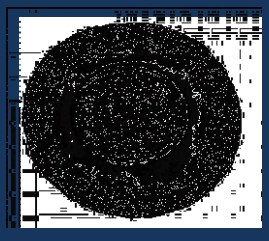
**Algae** are microscopic, photosynthetic organisms that are important food items in all aquatic ecosystems. Different algal groups increase or decrease during the year and they can be used to analyze a lake's water quality because there are more varieties of algae than fish or aquatic plants. Conclusions can be drawn about water temperature, nutrient availability, and overall water quality of a lake using algal populations.

In Marathon County lakes, there are three dominant groups of algae: blue-green algae (Cyanobacteria), green algae (Chlorophyta), and diatoms (Bacillariophyceae).

- Lilly Lake was dominated by diatoms and green algae during 2011 and 2012. The blue-green algae were only a small part of the community.
- The most common species of diatoms and green algae were small colonial forms that are easy for most small invertebrates and fish to ingest and digest. Additionally, these species do not have poor flavor and are nutritious. These conditions can support a moderate fishery.
- The total phosphorus value was relatively high and the water clarity was relatively low. This would point to a mildly eutrophic body of water; however, the algal community predicts a mildly to moderately mesotrophic lake.
- The data may be indicating that Lilly Lake is seeing a slow improvement in water quality conditions, reflected first in the algae populations.




**PERCENT ALGAL COMPOSITION IN LILLY LAKE IN 2011 AND 2012**



If you slip on a slimy, golden-fuzz-covered rock around the edge of your lake, you can blame **diatoms** (the ones with the glass covering).

These algae are preferred food items and they grow abundantly in many different types of water quality.

# Lilly Lake – What can you do?

**Lake Users:**

- ✓ Run boat engines efficiently
- ✓ Observe no/low wake zones
- ✓ Refuel away from water
- ✓ Dispose of trash properly
- ✓ Remove all aquatic plants from boats and trailers
- ✓ Respect wildlife and other lake users

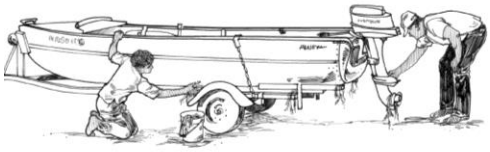
**Land Owners:**

- ✓ Control soil erosion
- ✓ Keep livestock out of lakes and streams
- ✓ Control manure runoff
- ✓ Carefully manage nutrients and pesticides
- ✓ Leave natural shoreland vegetation in place or restore if it has been removed
- ✓ Learn to identify and look for invasive species

**Home Owners:**

- ✓ Leave natural shoreland vegetation in place or restore if it has been removed
- ✓ Leave woody habitat for young fish, turtles and frogs
- ✓ Eliminate the use of fertilizer or use no phosphorus fertilizer

- ✓ Eliminate or minimize use of pesticides
- ✓ Control soil erosion
- ✓ Control runoff from rooftops and hard surfaces
- ✓ Clean up after pets
- ✓ Learn to identify and look for invasive species



## Stop the Spread of Aquatic Invasive Species!

**Wetlands and Shorelands:**

- LEARN how to identify invasive plants and animals, and who to contact if found.
- DO NOT PURCHASE prohibited and restricted species! Whenever possible purchase native plants.
- NEVER transplant water garden plants or aquarium plants into lakes, streams, wetlands, or storm water ponds. Properly dispose of unwanted plants and animals!
- REMOVE invasive exotic plants from your landscape and replace them with native plants or non-invasive exotic plants. Scout annually for new invasive plants.
- AVOID using garden plants from other regions whose invasive potential is poorly understood.

**Lakes and Rivers:**

- LEARN what Wisconsin invasive plants and animals look like and who to contact if seen in a lake or river.
- INSPECT your boat, trailer and equipment when traveling to different water bodies and REMOVE any attached aquatic plants or animals (before launching, after loading, and before transporting on a public highway).
- DRAIN all water from boats, motors, and all equipment after use at a lake.
- NEVER release live fish, bait or pets into a wetland or water body.
- BUY minnows from a Wisconsin bait dealer. Only use leftover minnows at that same water body.

Ed

# Lilly Lake – Primary Researchers

**Algae**

Dr. Bob Bell (UW-Stevens Point)

**Aquatic Plants**

Jen McNelly(UW-Stevens Point)

**Cultural Survey**

Dr. Kristin Floress (UW-Stevens Point)

**Fisheries and Lake Maps**

Dr. Ron Crunkilton (UW-Stevens Point) and Dr. Justin Sipiorski (UW-Stevens Point)

Christine Koeller (UW-Stevens Point)

**Sediment Core**

Dr. Samantha Kaplan (UW-Stevens Point) and Paul Garrison (Wisconsin DNR)

**Shoreland Assessments and Build Out**

Dan McFarlane (UW-Stevens Point)

**Water Quality and Watersheds**

Nancy Turyk (UW-Stevens Point)

**Zooplankton**

Dr. Chris Hartleb (UW-Stevens Point)

UW-Stevens Point Graduate and Undergraduate Students

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- *Wisconsin DNR Lake Protection grants*
- *UW-Stevens Point and UW-Stevens Point Faculty*
- *Marathon County*
- *Marathon County Citizens*

***For more information about the study:***

UW- Stevens Point: Nancy Turyk, 715-346-4155 Email: mclakes@uwsp.edu

Marathon County: Shawn Esser, 715-261-6010

http://www.co.marathon.wi.us/Departments/ConservationPlanningZoning/ConservationDivision/LakePrograms.aspx

Center for Watershed Science and Education
College of Natural Resources
University of Wisconsin-Stevens Point