# Big Bass Lake

## Eastern Marathon County Lake Study

## Final Study Results 2013

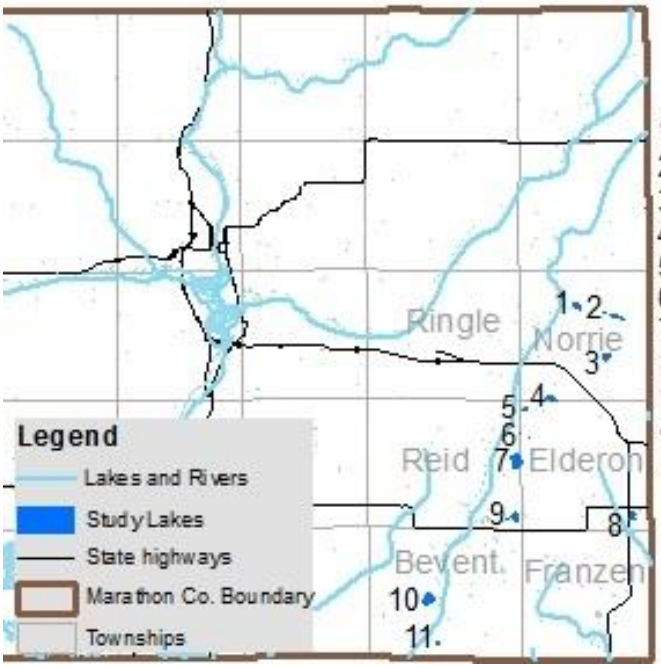
University of Wisconsin-Stevens Point
and
Marathon County Staff and Citizens

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.

# Big Bass 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

**Big Bass Lake**

**Township of Bevent**

Intersection of County Road Y

and County Road C

**Surface Area:** 180 acres

**Maximum Depth:** 10 feet

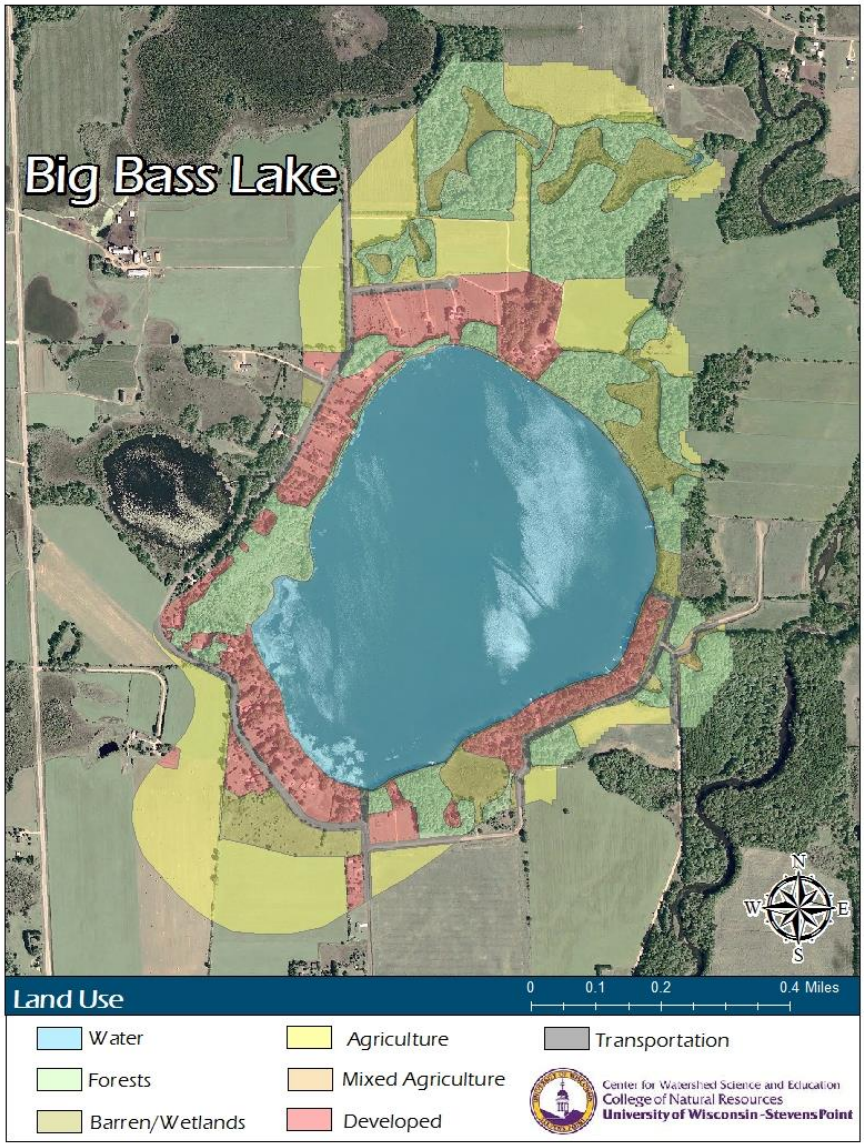
## Water Flow

- Big Bass 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 Big Bass Lake through groundwater.

Big Bass Lake, Marathon Co.

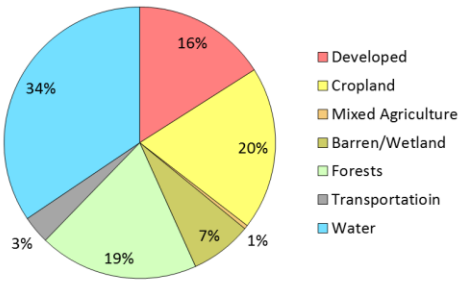
# Big Bass Lake – Surface Watershed

**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 Big Bass Lake is 1,568 acres.
- The primary land uses in the Big Bass Lake watershed are agriculture and forests.
- Big Bass Lake has residential development around much of its perimeter. In general, the land closest to the lake has the greatest immediate impact on water quality.

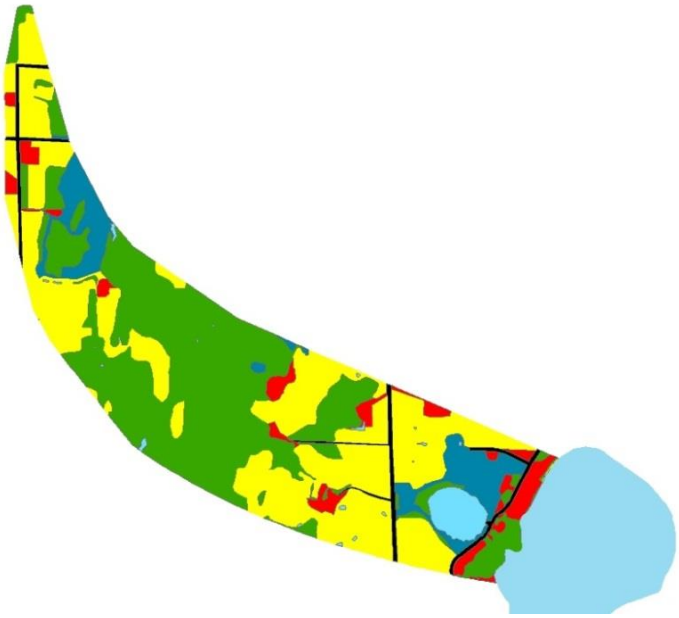
**Land Use in the Big Bass Lake Watershed**



# Big Bass Lake – Groundwater Watershed

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

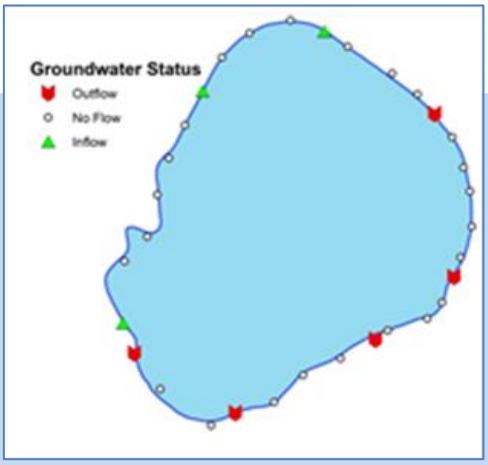
- **Groundwater** slowly contributes water to our lakes throughout the year. Hard surfaces on the landscape prevent water from soaking into the ground and becoming groundwater. This results in less water flowing to the lake during the winter and between rains.
- The quality of groundwater reflects what 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 Big Bass Lake is 463 acres.
- The primary land uses in the Big Bass Lake groundwater watershed are agriculture and forests.
- In general, the land adjacent to the lake where groundwater is flowing into the lake has the greatest immediate impact on water quality. Residential development and forests are adjacent to Big Bass Lake where most of the groundwater enters.



| Land Use | Acres |
|---|---|
| Agriculture | 147 |
| Developed | 36 |
| Forested | 202 |
| Roads | 14 |
| Recreational | 4 |
| Water | 34 |
| Wetland | 26 |

## *Looking at Groundwater Up Close:*

**Groundwater enters Big Bass Lake from the northwest and exits at various points around the lake.**



# Big Bass 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 Big Bass Lake. A greater vegetative buffer produces more habitat and better water quality. There are many areas around Big Bass Lake with minimal or no vegetative buffer. Restoring these areas would provide habitat and improve water quality.

# Big Bass Lake – Lake Map

Big Bass 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


**BIG BASS 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.

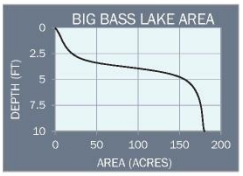
MARATHON COUNTY, WISCONSIN

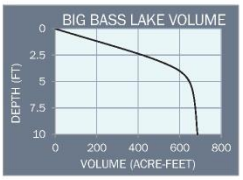
GPS and Sonar Survey
May, 2012

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

Cartography by Christine Koeller

| | | |
|---|---|---|
| LAKE AREA | 180 | Acres |
| Under 3 Feet | 31.6 | Acres (17.6%) |
| Over 20 Feet | 0 | Acres (0%) |
| VOLUME | 686 | Acre-feet |
| SHORELINE | 2.1 | Miles |
| MAX DEPTH | 10 | Feet |



# Big Bass 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 species in Big Bass Lake during the 2012 survey**

| Species | Min Length (in) | Max Length (in) | Average Length (in) | Total Catch |
|---|---|---|---|---|
| Bluegill | 0.9 | 10.0 | 3.7 | 345 |
| Largemouth Bass | 1.2 | 14.8 | 4.4 | 166 |
| Black Crappie | 2.5 | 7.0 | 5.8 | 51 |
| Iowa Darter | 1.3 | 2.4 | 2.0 | 26 |
| Yellow Bullhead | 5.1 | 15.4 | 11.9 | 21 |
| Yellow Perch | 3.9 | 12.4 | 9.5 | 17 |
| Walleye | 20.6 | 25.3 | 23.7 | 3 |
| Black Bullhead | 15.2 | 15.2 | 15.2 | 1 |
| Golden Shiner | 5.7 | 5.7 | 5.7 | 1 |

- Big Bass Lake supports a warm water fish community.
- In 2012, nine fish species were identified out of the seventeen total species that have been recorded in Wisconsin DNR surveys dating back to 1955.
- Yellow bullhead and Iowa darter were newly documented species in the 2012 survey.
- The presence of young bass and abundant sunfish indicates successful reproduction is occurring in Big Bass Lake.
- Conclusions cannot be made about walleye and northern pike reproductive success without additional sampling efforts.

# Big Bass Lake – Fishery

**Species occurrence in Big Bass Lake in 2012 and historical Wisconsin DNR records**

| Species | 1955 | 1957 | 1985 | 1986 | 1968 | 1993 | 2000 | 2002 | 2005 | 2006 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Black bullhead | | | | x | x | | x | | | | x |
| Black crappie | x | x | x | | | x | x | | x | x | x |
| Blacknose dace | | | | | | | x | | | | |
| Bluegill | | | x | x | x | x | x | x | x | x | x |
| Brown bullhead | | | | | x | | | | | | |
| Bullheads | | x | x | | x | | | | | | |
| Golden shiner | x | x | | x | | x | x | | | | x |
| Green sunfish | | | | | | | x | | x | | |
| Iowa darter | | | | | | | | | | | x |
| Largemouth bass | | x | x | x | x | x | x | x | x | x | x |
| Northern pike | | | x | | x | x | x | | | x | |
| Pumpkinseed | x | x | x | x | x | x | x | x | | x | |
| Rainbow Darter | | | | | | | x | | | | |
| Walleye | x | | | | | x | x | | | x | x |
| White sucker | x | x | x | x | x | x | x | | | | |
| Yellow bullhead | | | | | | | | | | | x |
| Yellow perch | x | | x | x | x | x | x | | x | x | x |

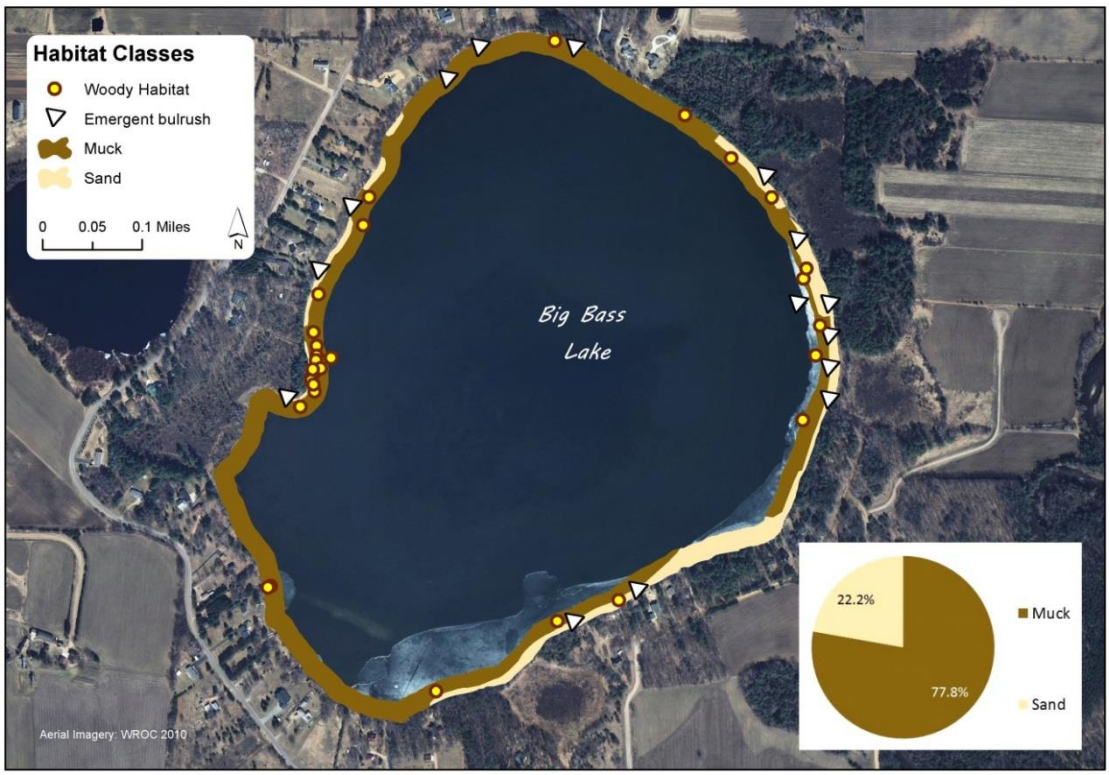
- A variety of fish management techniques have been attempted at Big Bass Lake. In 1952, Wisconsin DNR fisheries biologists stocked the lake with walleye fry in an attempt to make Big Bass Lake into a walleye rearing pond. The effort was noted as a success and remaining walleye have done well.
- In 1957, the entire lake was treated with toxaphene to reset the system. The goal was to destroy the small panfish community then present and stock the lake with golden shiners, followed by northern pike (stocked in 1959). Historic stocking also included largemouth bass, smallmouth bass and black crappie.
- Winter kill events struck Big Bass Lake in 1964, 1975 and 1986, after which stocking efforts were discontinued.
- As a result of frequent winter fish kills, an aerator system was installed in 1988 to help maintain healthy dissolved oxygen levels during the winter months.

# Big Bass Lake – Fishery

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, such as turtles, frogs, birds and mammals.

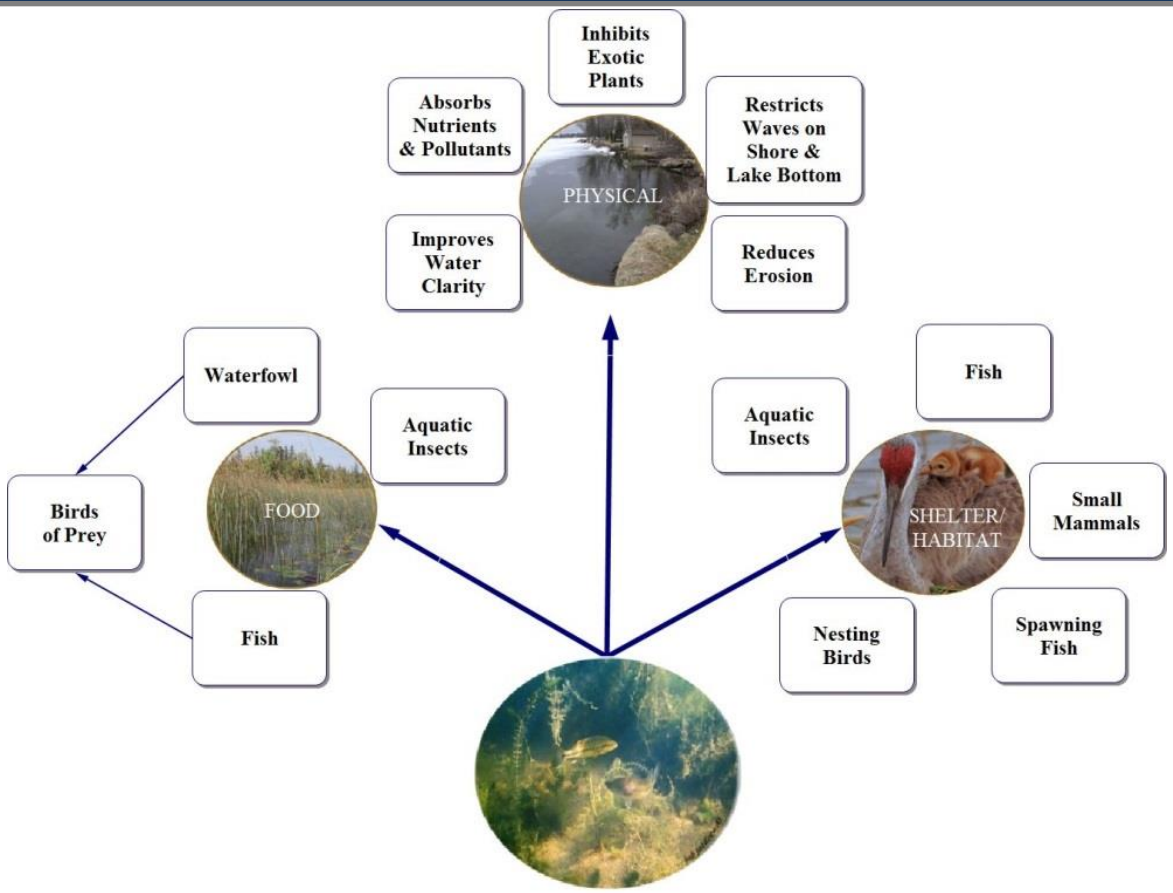
**Big Bass Lake Habitat**
**Marathon County, WI 2012**




- Coarse woody habitat is sparse in Big Bass Lake. The addition of CWH cover could benefit the fish community.
- Northern pike use areas with emergent and floating-leaf vegetation in shallow or flooded areas for spawning.
- Black crappie use bulrush habitat on gravel or sand substrates to construct nests and guard young.
- In the absence of sand and coarser substrates such as gravel, largemouth bass and sunfish are known to build nests on marl. Depressions are deepened until small amounts of coarser substrate, mostly fragments of snail shells, accumulate in the bottom of the nests.

# Big Bass 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**

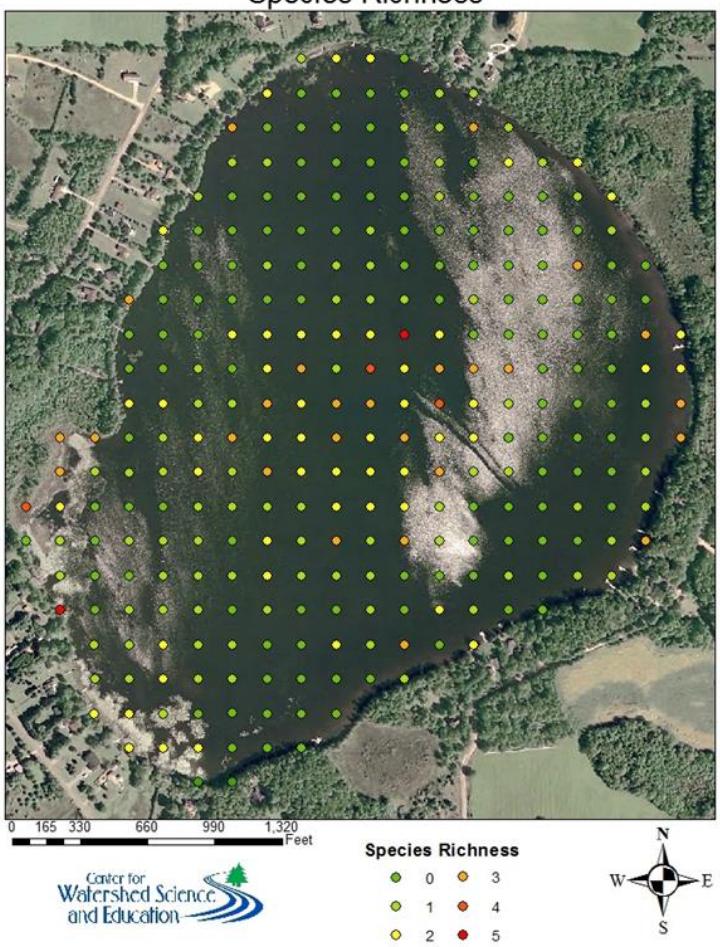
- The 2012 aquatic plant survey of Big Bass Lake found no non-native plant species. This is a good indicator of overall aquatic health within the lake and demonstrates diligence by lake users in cleaning watercraft before entering the lake to prevent non-native species transfer.
- The aquatic plant community in Big Bass Lake is characterized by an above average diversity when compared to other lakes in the Marathon County study.
- The habitat, food source, and water quality benefits of this diverse plant community should be the focal points in future decision-making concerning lake management strategies.

# Big Bass Lake – Aquatic Plants

- During the 2012 aquatic plant survey of Big Bass Lake, 55% of the sites sampled had vegetative growth.
- The average depth of sampled sites was 4 feet, with a maximum of 9 feet.
- The most common plant species in the survey was white-stem pondweed (*Potamogeton praelongus*), which is a good quality, native aquatic plant in Wisconsin.
- The greatest diversity in Big Bass Lake was found in the middle of the lake.

**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 food sources are available.

Big Bass Lake 2012 Aquatic Plant Survey:
Species Richness




**White-stem pondweed** is an important source of food for waterfowl, muskrat, beaver and trout and also provides valuable habitat for muskellunge. This presence of this aquatic plant indicates good water quality due to its sensitivity to disturbances within the aquatic system.

# Big Bass 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.

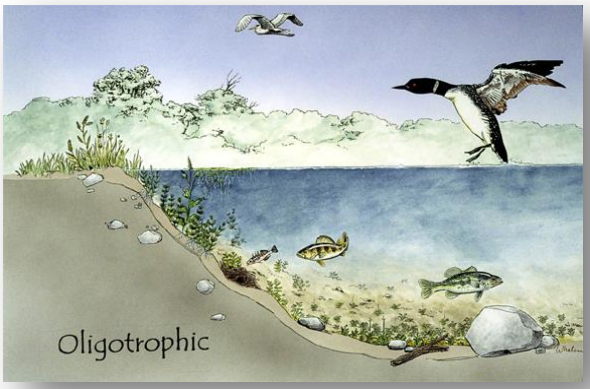
**Lakes With Aquatic Invasive Species in Marathon and Northern Portage County, 2012**

| 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!**

# Big Bass 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.



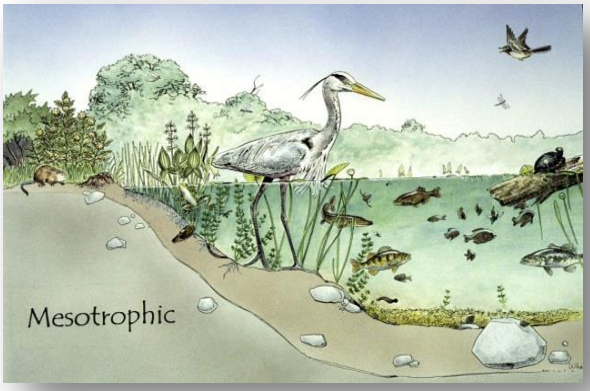

**Oligotrophic Lakes**

*Common uses*:

- ✓ Swimming
- ✓ Skiing
- ✓ Boating

*Vegetation of oligotrophic lakes*:

- ✓ Very little vegetation



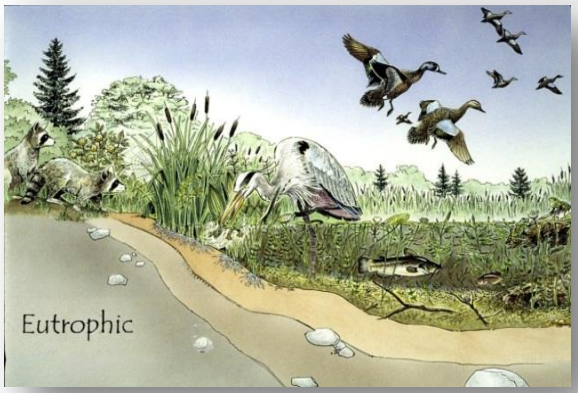

**Mesotrophic Lakes**

*Common uses*:

- ✓ Boating
- ✓ Fishing

*Vegetation of mesotrophic lakes*:

- ✓ Increased vegetation
- ✓ Occasional algal blooms




**Eutrophic Lakes**

*Common uses*:

- ✓ Fishing
- ✓ Wildlife watching

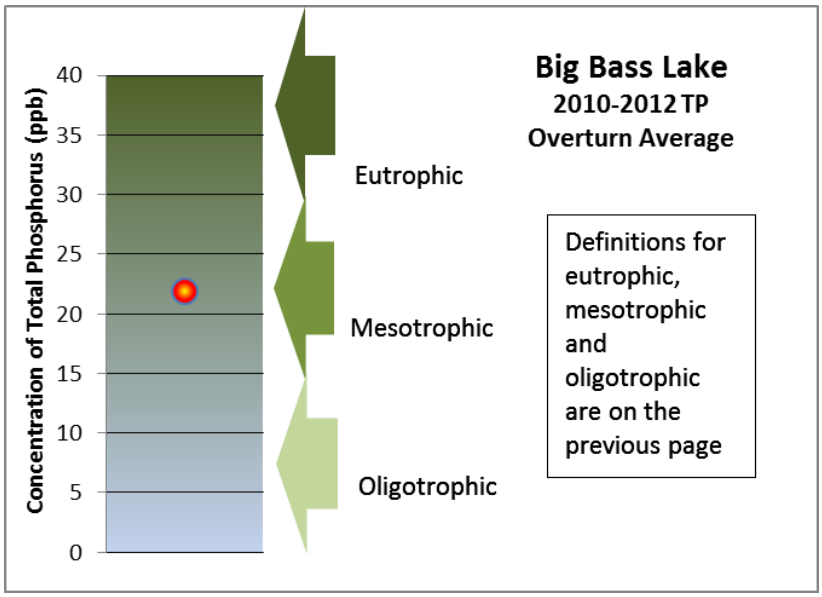
*Vegetation of eutrophic lakes*:

- ✓ Lots of aquatic plants
- ✓ Frequent algal blooms

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

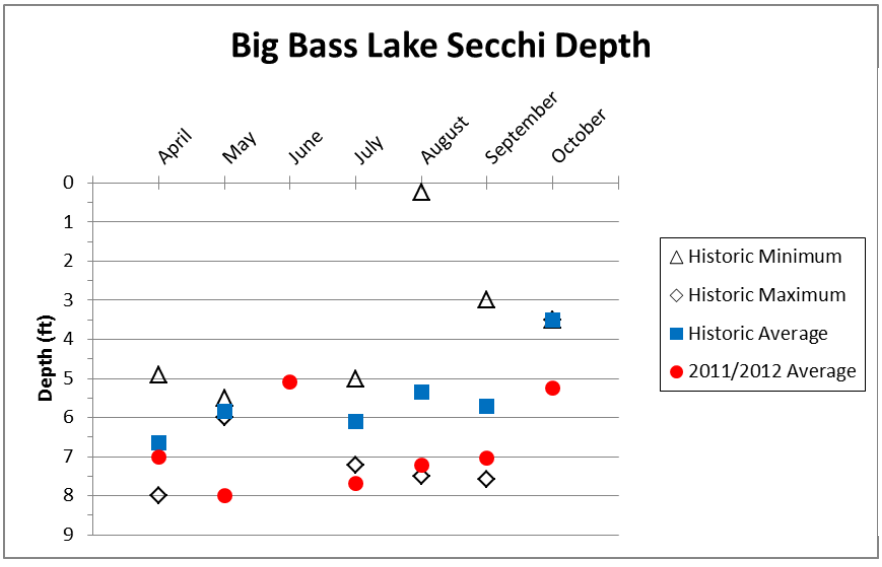
# Big Bass Lake – Water Quality

**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 Big Bass Lake was well-mixed (overturn) are displayed in the graph to the left.
- Overturn sampling during the 2010-2012 monitoring period indicate that Big Bass Lake is a mesotrophic lake with an average concentration of total phosphorus in the mid-range.

**Water clarity** is a measure of how deeply 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.



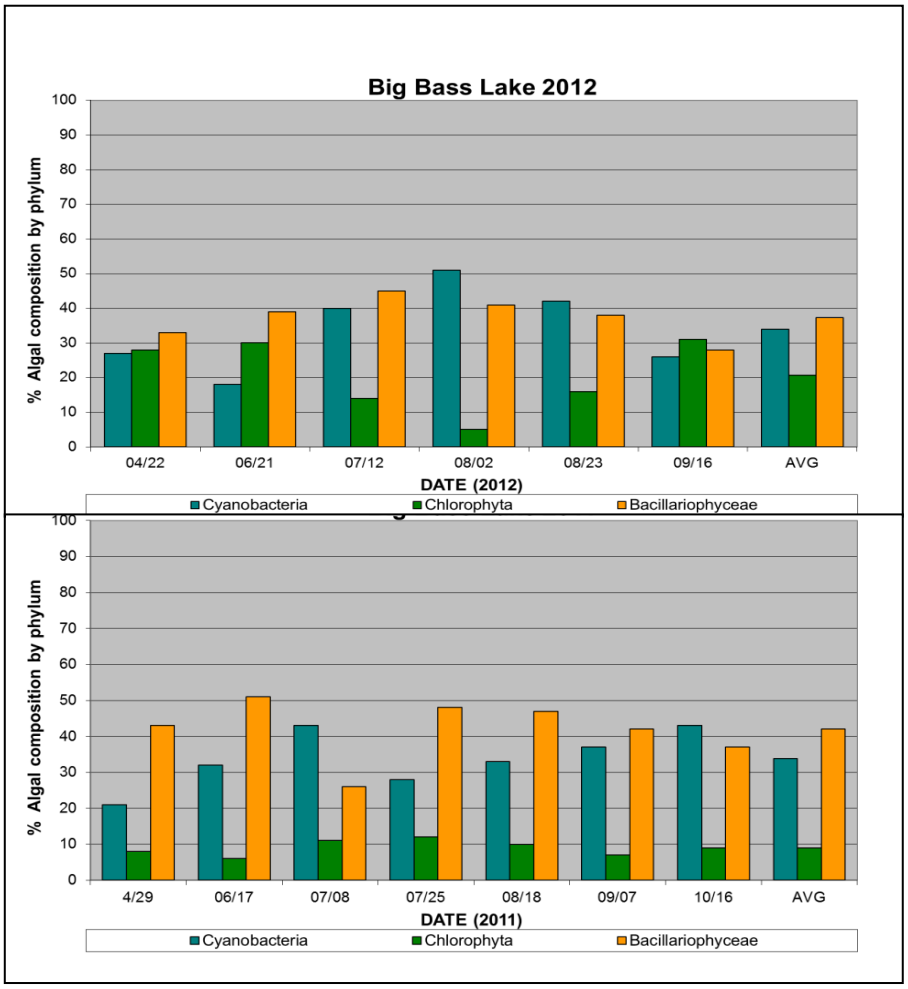

- The graph to the left shows water clarity data collected during the growing seasons in 2011 and 2012. It is typical for water clarity to vary throughout the year.
- The 2011/2012 average Secchi depth readings were slightly deeper than historic averages, suggesting a possible recent improvement in water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

# Big Bass Lake – Algae

**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).

- The 2011 and 2012 algal communities were diverse and primarily dominated by diatoms.
- The algal data found during the study period may indicate one of two possible shifts in water quality. The first possibility, supported by the lake's moderate total phosphorus value, is of a late-stage oligotrophic lake that is transitioning into a mildly mesotrophic lake. The second possibility, supported by the increase in water clarity, is that this is a moderately mesotrophic lake that is seeing some improvement in water quality conditions.
- Big Bass Lake displays many indicators of good or improving water quality. Two small but troubling indicators were identified that deserve continued attention: an increase in blue-green algae and a small green algae community of relatively few species.




**PERCENT ALGAL COMPOSITION FOR BIG BASS LAKE IN 2011 AND 2012**

**Blue-green algae** have the widest tolerance range for temperatures and nutrient concentrations. A few varieties of blue-greens can produce toxins that are potentially harmful to livestock, pets and humans.

# Big Bass Lake – Sediment Core Analysis

**Lake sediment** can help to tell the history of a lake and changes that may have affected the lake related to water quality, the abundance of aquatic plants, and sedimentation or land use changes in the watershed. These changes are assessed by evaluating the content of the upper layer of the sediment versus lower layers. This information can help to guide management decisions for a lake.

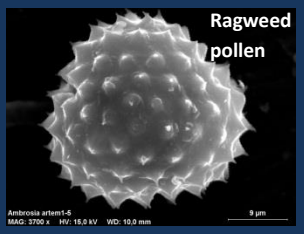
- Analysis of Big Bass Lake's sediment core suggests increased disturbance in the lake basin since the time of European land clearing.
- Over this time period, there have been increases in nutrients to the lake, including phosphorus, and substantial habitat changes.
- Elevated ragweed pollen counts found deeper in the core probably reflect early logging in the area; the peak of ragweed higher in the core indicates widespread transition to farming near the turn of the 20th century.
- Diatom species communities and sediment properties reflect an increase in phosphorus, aquatic plants and filamentous algae in the top of the sediment core.
- Properties at the top of the sediment core indicate that some shoreline stabilization has occurred in recent years.

**Diatom species found in lake sediments in Marathon County.**

**Diatoms** are a type of algae commonly found in sediment. They are well-preserved in sediments due to silica-based cell walls which resist degradation.

Different species of diatoms are sensitive to water quality; thus, changes in the diatom community from the bottom to the top of the sediment core can reveal how water quality in the lake has changed over time.

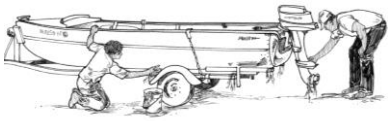
This sediment core was collected from Big Bass Lake. The darker layers indicate organic-rich sediments often due to increased growth of aquatic plants and/or soil erosion. Additional analysis of these layers can help to confirm the source(s).



# Big Bass 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.

# Big Bass 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**

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