Bass Lake

Eastern Marathon County Lake Study

Final Study Results 2013

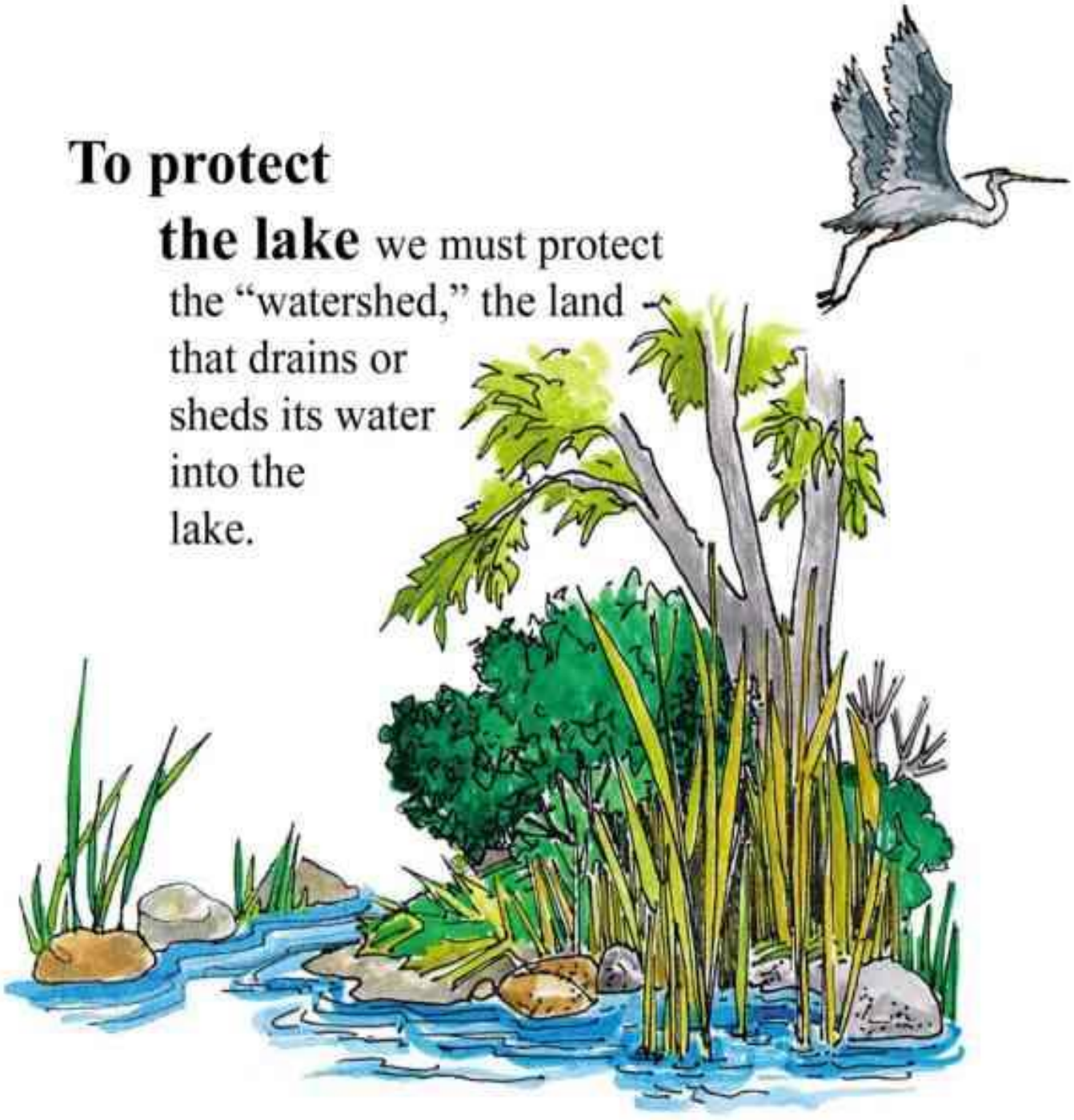
University of Wisconsin-Stevens Point
and
Marathon County Staff and Citizens

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.

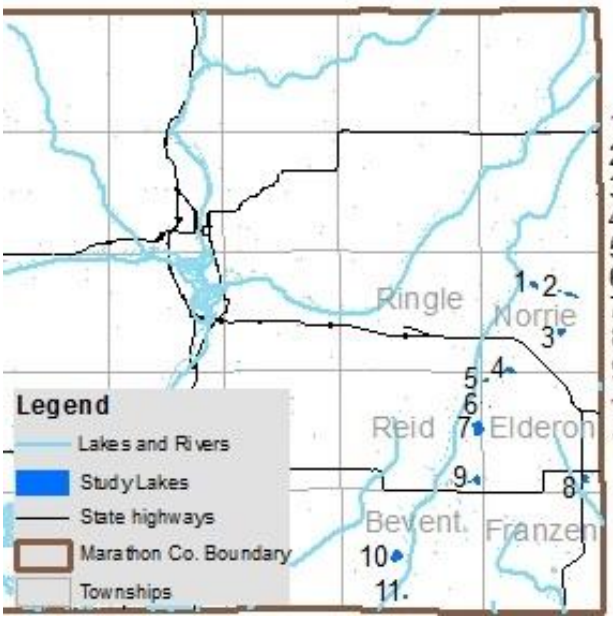
The purpose of this study is to learn about the current conditions of the fishery, habitat and aquatic ecosystems in order to help people make informed decisions to preserve what's good and correct any problems that exist.

To protect

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



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

Bass Lake

Township of Norrie

East of County Road Y

North of Bevent

Southeast of Hatley

Surface Area: 79.7 acres

Maximum Depth: 4.9 feet

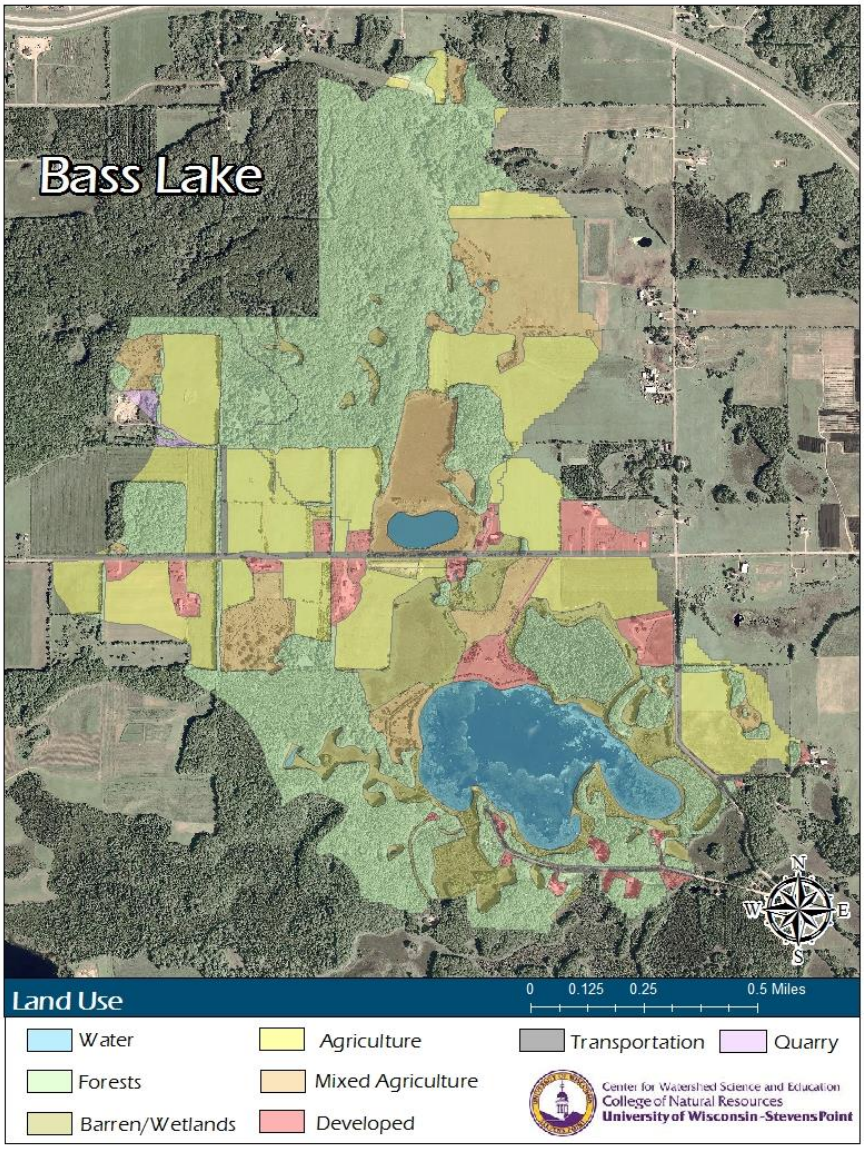
Water Flow

- 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 Bass Lake through groundwater.

Bass Lake, Marathon Co.

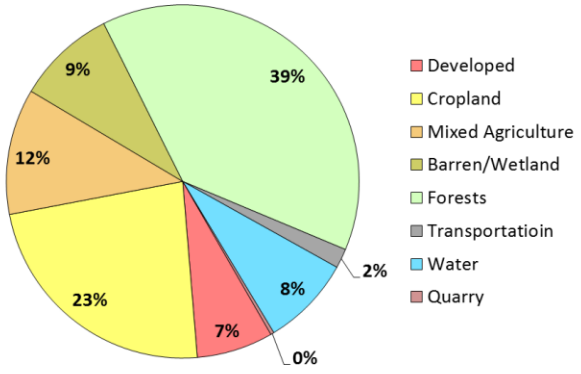
Bass Lake – Surface Watershed

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 Bass Lake is 1,083 acres.
- The primary land uses in the Bass Lake watershed are agriculture and forests.
- Bass Lake has residential development around part of its perimeter. In general, the land closest to the lake has the greatest immediate impact on water quality.

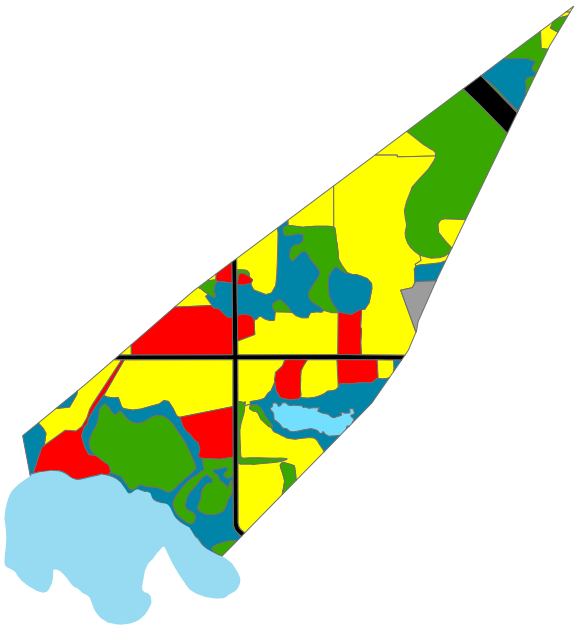
Land Use in the Bass Lake Watershed



Bass Lake – Groundwater Watershed

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

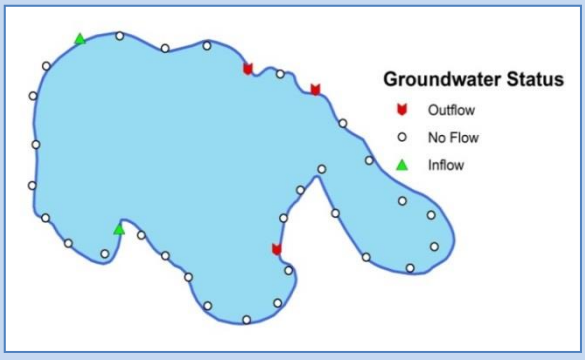
- **Groundwater** slowly contributes water to our lakes throughout the year. Hard surfaces on the landscape prevent water from soaking into the ground and becoming groundwater. This results in less water flowing to the lake during the winter and between rains.
- The quality of groundwater reflects what 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 Bass Lake is 384 acres.
- The primary land uses in the 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, forests and wetlands are adjacent to Bass Lake where most of the groundwater enters.



Land Use	Acres
Agriculture	142
Developed	46
Forested	86
Quarry	3
Roads	16
Water	28
Wetland	63

Looking at Groundwater Up Close:

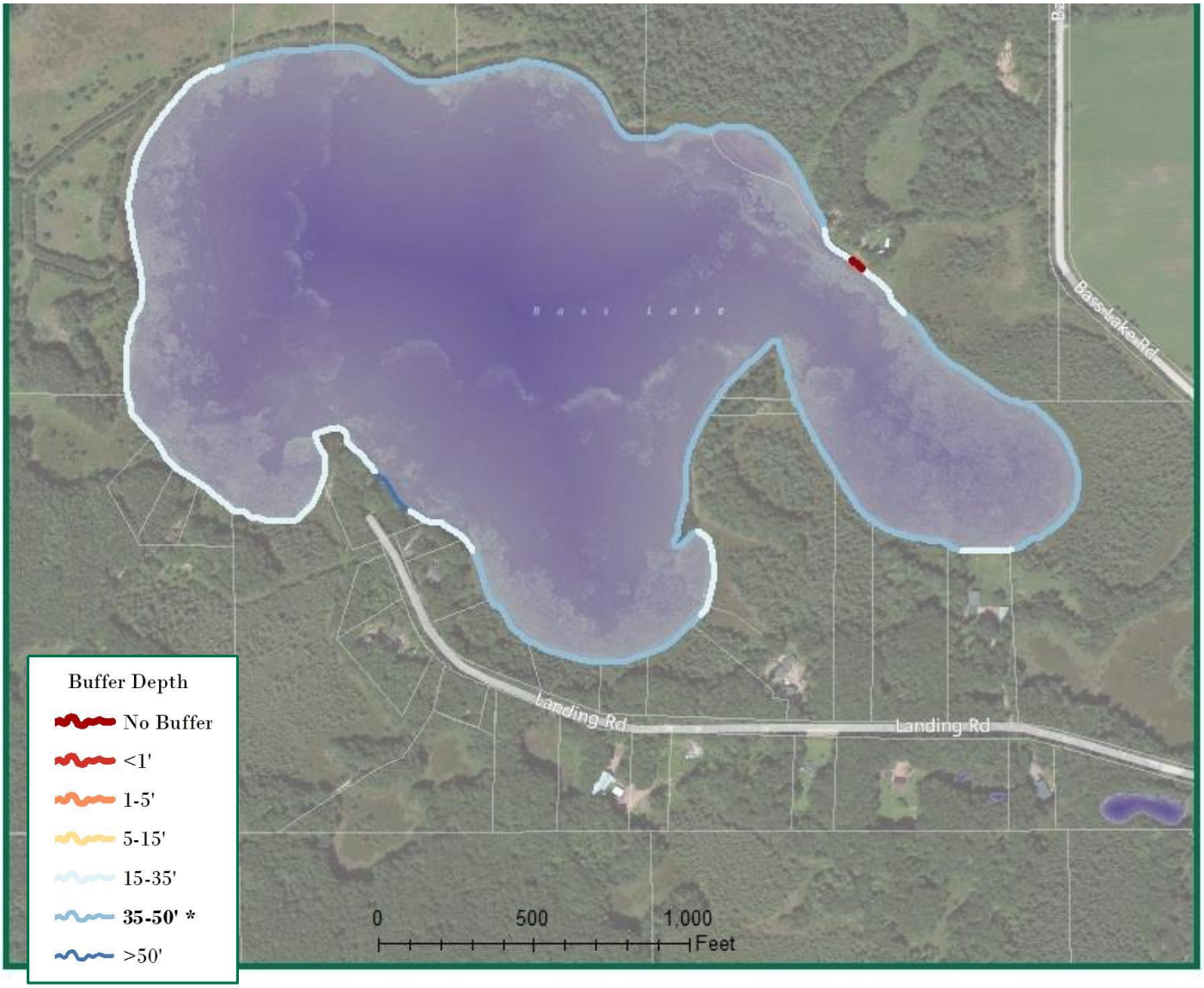
Most of the groundwater enters Bass Lake from the north and exits at various points around the lake.



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 extends landward from the edge of Bass Lake. A greater vegetative buffer produces more habitat and better water quality.



*NR 115 requires at least a 35 foot wide shoreline buffer

Bass Lake – Lake Map

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

- Where aquatic plants can and cannot grow
- Species 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

MARATHON COUNTY, WISCONSIN

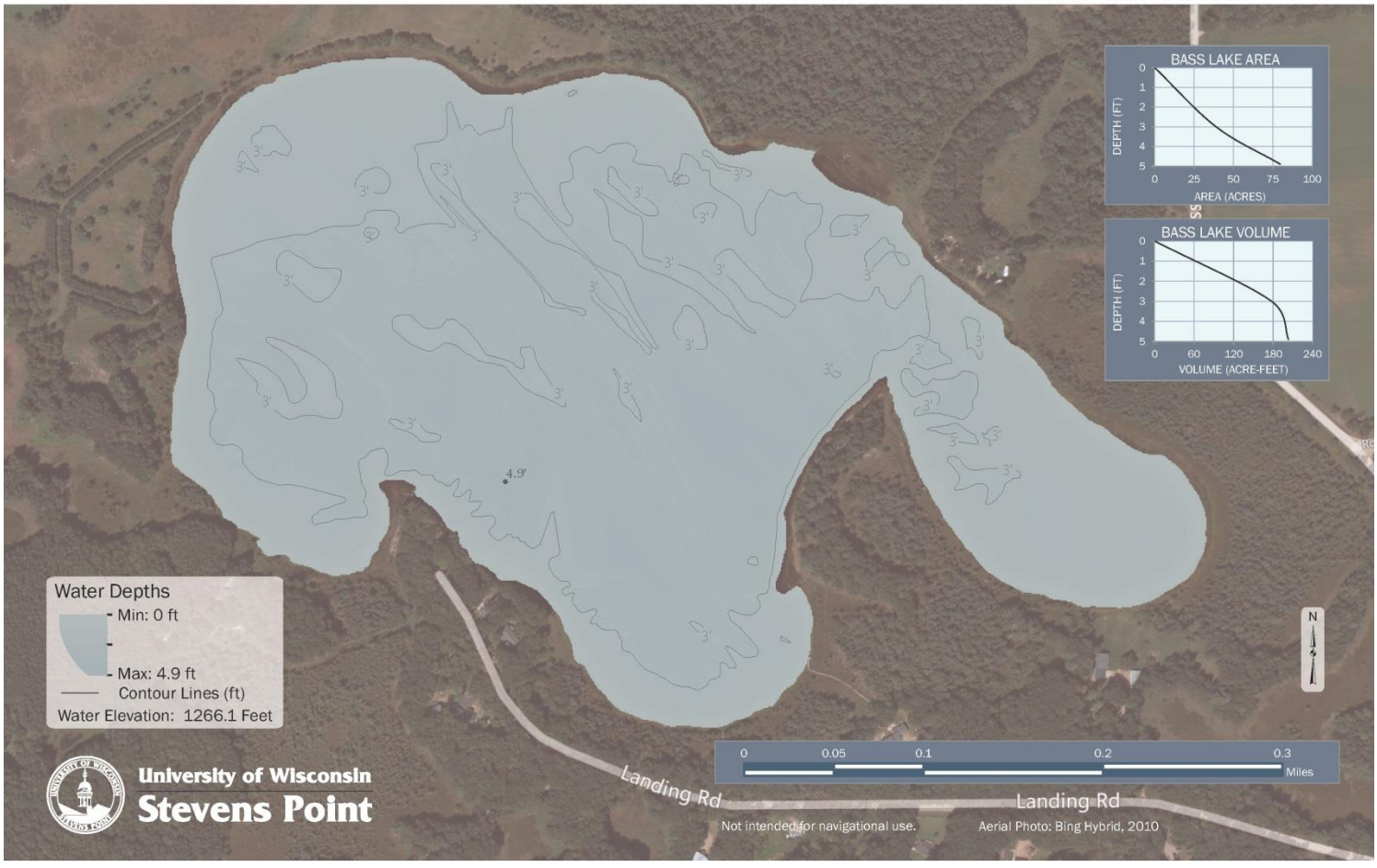
University of Wisconsin-Stevens Point
Center for Watershed Science and Education,
College of Natural Resources. GIS Center,
College of Letters and Science.

Map Cartography by Christine Koeller

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.

LAKE AREA	79.7 Acres	
Under 3 Feet	38.9 Acres	(48.8%)
Over 20 Feet	0 Acres	(0%)
VOLUME	203 Acre-feet	
SHORELINE	1.9 Miles	
MAX DEPTH	4.9 Feet	

GPS and Sonar Survey June, 2012



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 Bass Lake during the 2012 survey

Species	Min Length (in)	Max Length (in)	Average Length (in)	Total Catch
Black Bullhead	1.2	7.9	4.1	124
Bluegill	1.4	8.3	4.9	71
Black Crappie	8.8	12.2	10.9	4
Pumpkinseed	7.0	7.5	7.2	2
Central Mudminnow	2.4	2.4	2.4	1

- Bass Lake supports a warm water fish community.
- In 2012, five fish species were sampled and identified out of the seven total species that have been recorded in Wisconsin DNR surveys dating back to 1967.
- Central mudminnow was newly documented in the 2012 survey.
- Fish stocking records for Bass Lake date back to 1977 in Wisconsin DNR files. Stocking has been primarily for adult northern pike, but brown trout and largemouth bass have also been stocked.
- Since Bass Lake is a shallow seepage lake, it is unlikely to support a naturally reproducing population of brown trout.

Species occurrence in Bass Lake in 2012 and in Wisconsin DNR records

Species	1967	2012
Bluegill	x	x
Black bullhead	x	x
Black Crappie		x
Largemouth bass	x	
Central Mudminnow		x
Yellow Perch	x	
Pumpkinseed	x	x

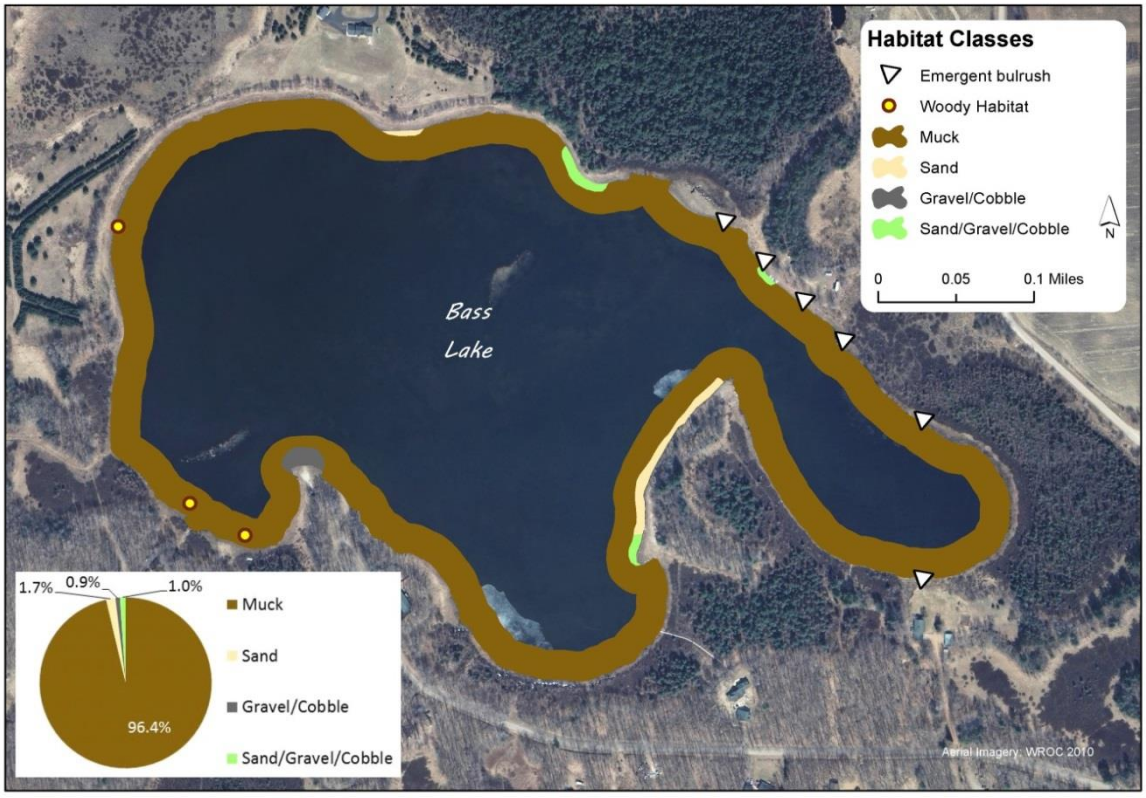
In 1967, reports of winter fish kills were noted, likely due to low oxygen levels in shallower waters across the lake. Bullhead biomass dominance is another indication of winterkill as they are more tolerant of low dissolved oxygen than many other species.

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.

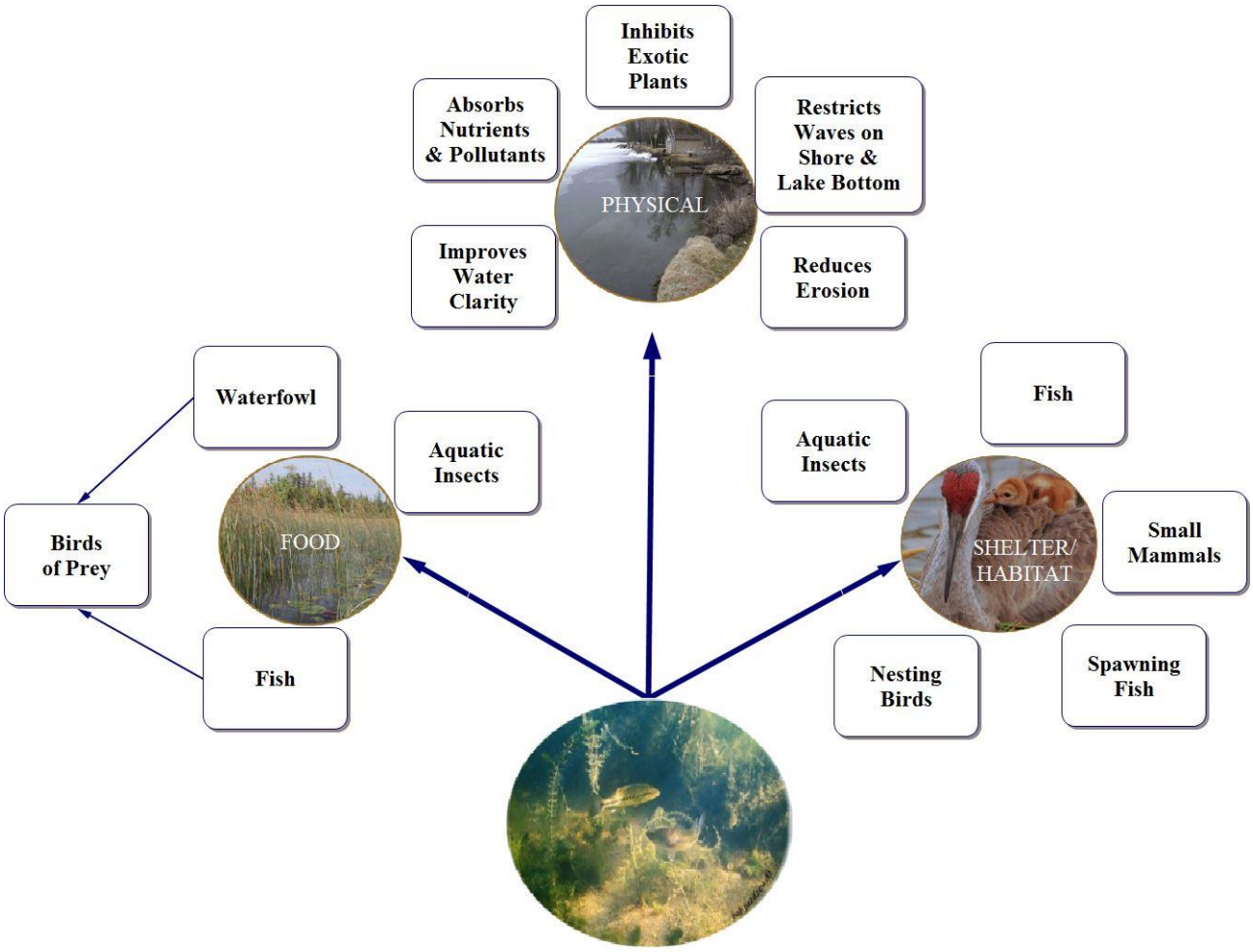
Bass Lake Habitat
Marathon County, WI 2012



- Coarse woody habitat (CWH) is sparse in Bass Lake; the fish community may benefit from the addition of CWH.
- Substrate in Bass Lake primarily consists of a soft bottom, muck (96.4%); however, harder substrates including gravel/cobble and sandy areas also exist.
- Wisconsin DNR files document a proposal to dredge areas of Bass Lake in 1969. Dredging was proposed again in 1988, but was denied due to historic use of chemicals in the lake and because then-current lake levels supported a variety of wildlife.
- Average lake depth remains low; maximum depth in Bass Lake was less than five feet in the 2012 survey.

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.



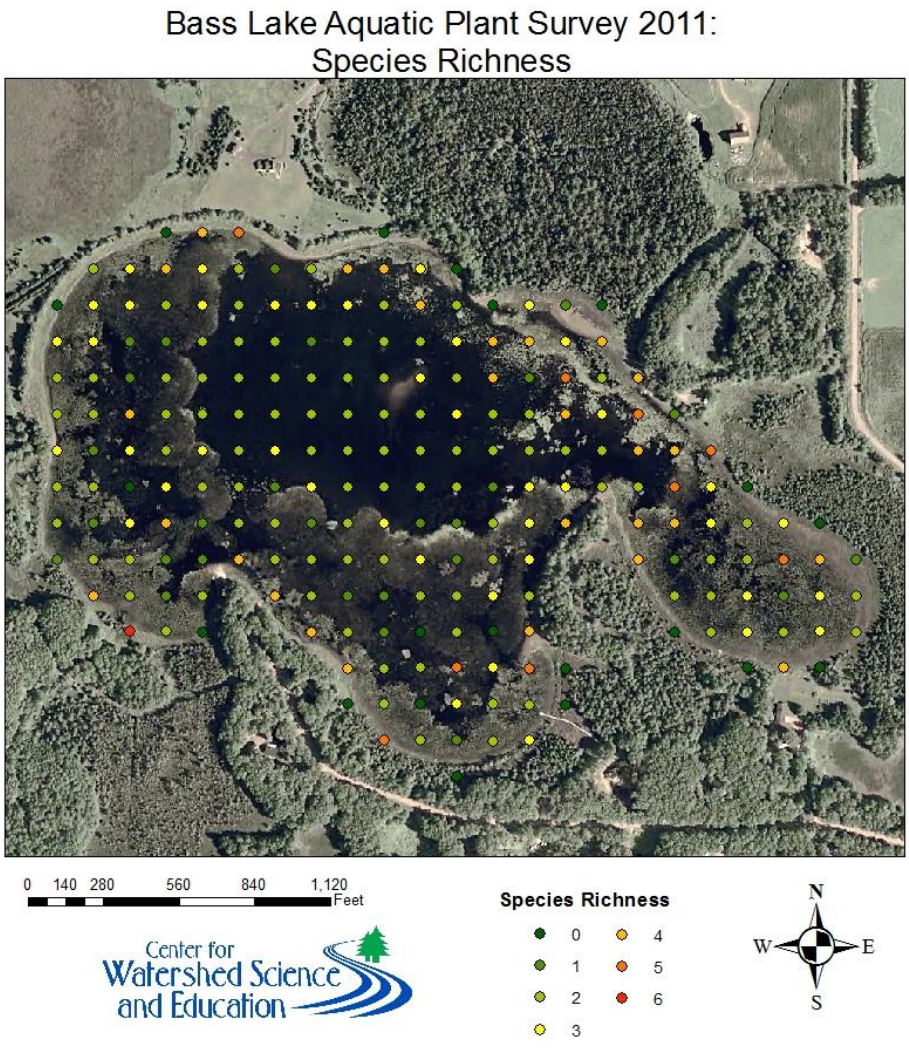
AQUATIC PLANTS
Food and Refuge for Aquatic Life

- The aquatic plant community in Bass Lake is characterized by a below average diversity when compared to all of the lakes in the Marathon County study, with a total of 20 species in the survey.
- The 2012 aquatic plant survey of 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.
- Bass Lake is impacted by minimal development on its shores, supporting the healthy aquatic plant communities that benefit water quality and in-lake fish and wildlife habitat.

Bass Lake – Aquatic Plants

- During the 2012 aquatic plant survey of Bass Lake, 98 percent of the sites sampled had vegetative growth. The average depth of sampled sites was 4 feet, with a maximum of 7 feet.
- The two most frequently encountered plant species are of special concern in Wisconsin: large purple bladderwort (*Utricularia purpurea*) and water-thread pondweed (*Potamogeton diversifolius*).
- Dwarf milfoil and Oakes' pondweed were both found in Bass Lake. These plants are only found in undisturbed areas and can indicate high quality habitat.

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.



Bladderworts are carnivorous plants. They use special trigger hairs to sense an insect, which is then drawn into digestive "bladders" in the plant. Large purple bladderwort is a species of special concern in Wisconsin and is found in Bass Lake!

Water-thread pondweed is also a species of special concern found in Bass Lake. It provides important habitat and food for fish and water birds.

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.

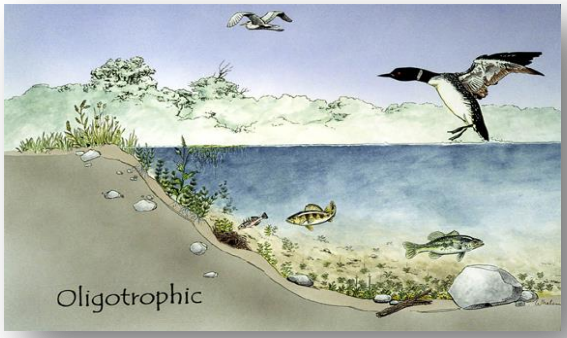
Lakes With Aquatic Invasive Species in Marathon and Northern Portage County, 2012

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!

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.



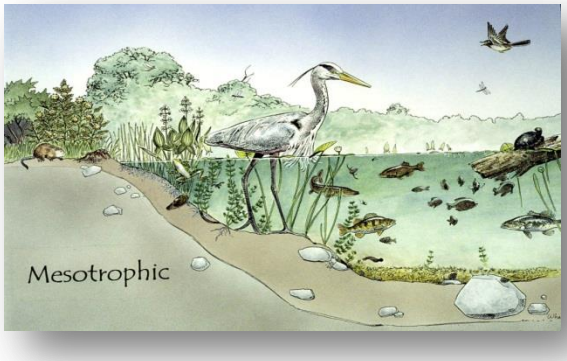
Oligotrophic Lakes

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

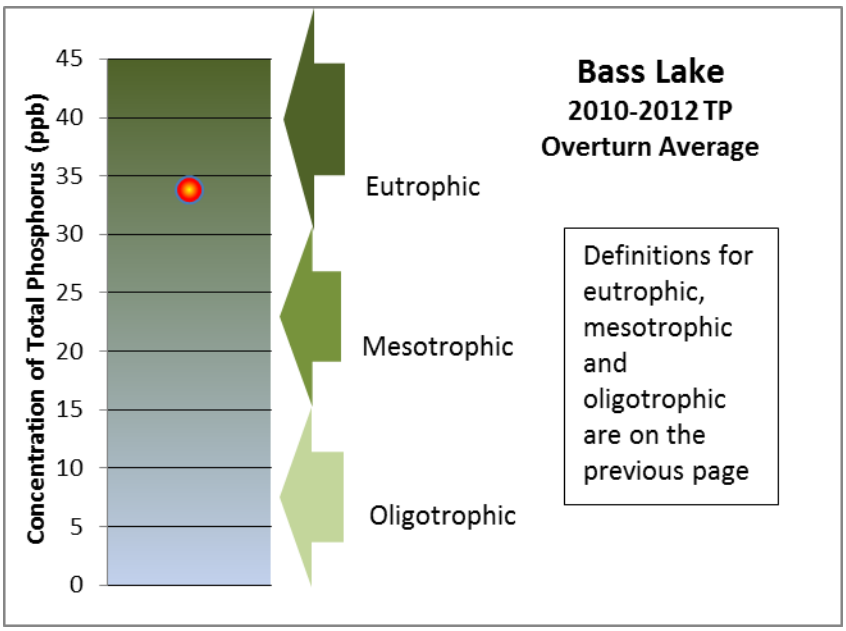
Vegetation of eutrophic lakes:

- ✓ Lots of aquatic plants
- ✓ Frequent algal blooms

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

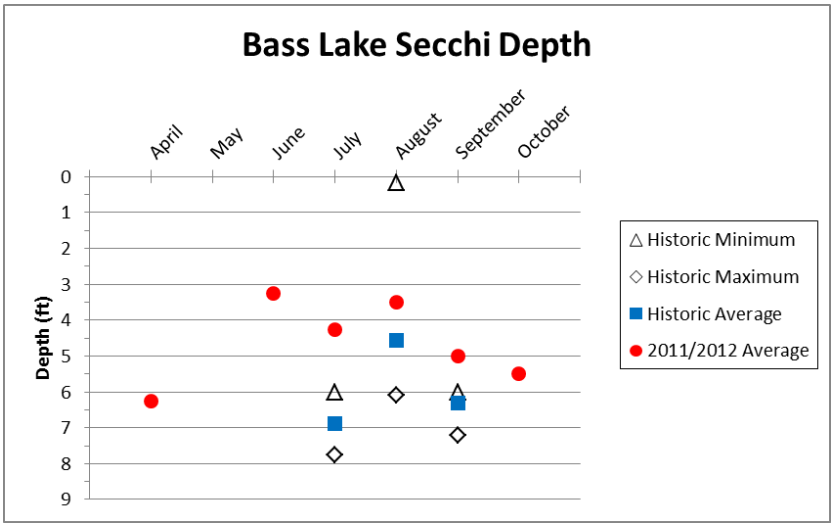
Bass Lake – Water Quality

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 Bass Lake was well-mixed (overturn) are displayed in the graph to the left.
- Overturn sampling during the 2010-2012 monitoring period indicate that Bass 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.



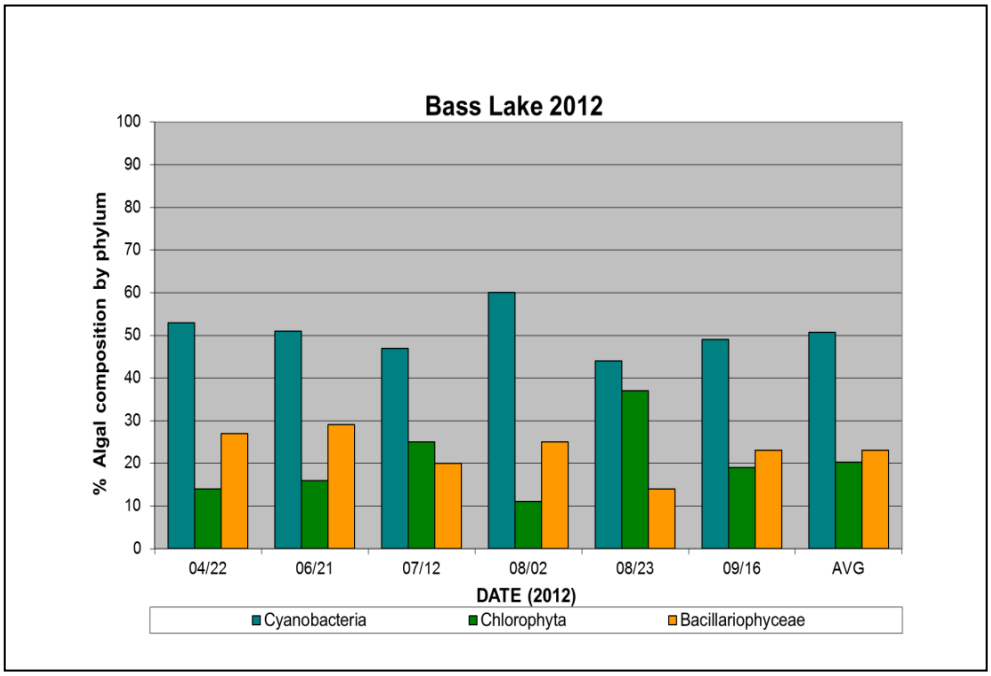
- The graph to the left shows water clarity data collected during the growing seasons in 2011 and 2012. It is typical for water clarity to vary throughout the year.
- The 2011/2012 average Secchi depth readings were slightly shallower than historic averages, suggesting a possible recent decline in water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

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 algal community of Bass Lake was similar in 2011 and 2012, dominated by blue-green algae, which is characteristic of eutrophic lakes. The blue-greens dominated early in both years with a small mid-summer depression before a dominating fall rebound.
- The diatoms displayed a typical early and late season distribution in Bass Lake. They are the most common species associated with eutrophic waters.
- The green algae made up a small percentage of the algal community. These species are typically present under high nutrient conditions.
- The high nutrient load, shallow depth, decreasing water clarity, and an algal community dominated by species historically associated with eutrophic lakes suggest the lake has transitioned into a eutrophic state and may continue to decline. These conditions could lead to oxygen depletion and possible fish kills.



PERCENT ALGAL COMPOSITION FOR BASS LAKE IN 2012

Blue-green algae have the widest tolerance range for temperatures and nutrient concentrations. A few varieties of Cyanobacteria can produce toxins that are potentially harmful to livestock, pets and humans. Once well established in a lake, blue-green algae are difficult to control and remove.

Bass Lake – What Can You Do?

Lake Users:

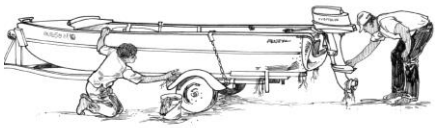
- ✓ Run boat engines efficiently
- ✓ Observe no/low wake zones
- ✓ Refuel away from water
- ✓ Dispose of trash properly
- ✓ Remove all aquatic plants from boats and trailers
- ✓ Respect wildlife and other lake users

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 phosphorus-free 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.

Easte.

Bass Lake – Primary Researchers

Algae

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Aquatic Plants

Jen McNelly (UW-Stevens Point)

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Shoreland Assessments and Build Out

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

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

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