Pine Lake (Hancock)

Summary Report 2013

University of Wisconsin-Stevens Point
and
Waushara County Staff and Citizens
To protect the lake we must protect the “watershed,” the land that drains or sheds its water into the lake.
Water Flow

- Pine Lake is a seepage lake; most water enters via groundwater. Surface water runoff and direct precipitation also contribute water to lesser extents.
- Water exits Pine Lake via groundwater.
Land uses and land management practices occurring in a watershed can affect the water quality in a 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 Pine Lake is 5,667 acres. The primary land use in the watershed is agriculture. Wetlands, development, and forests surround Pine Lake’s border. Generally, the land closest to the lake has the greatest immediate impact on water quality.
Groundwater provides water to lakes in Waushara County throughout the entire 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. Groundwater pumping can also reduce the amount of water entering lakes.

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.

On the map below, arrows indicate the direction of groundwater flow to and from the lakes. Most of the groundwater flows to Pine Lake from the north.
Shoreland vegetation is critical to a healthy lake’s ecosystem. It provides habitat for many 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.

Few stretches of the shoreland around Pine Lake have healthy shoreland vegetation (displayed in green); most stretches could benefit the lake by being restored.
The aquatic plant community in Pine Lake (Hancock) is characterized by an above-average diversity of plant species when compared to other lakes in the Waushara County Lakes Study, with a total of 23 species in the survey. Much of the diversity observed in Pine Lake (Hancock) was found on the eastern side. Freshwater sponges were observed in Pine Lake (Hancock). Sponges are actually primitive animals (not plants), and are excellent water quality indicators.
During the 2013 aquatic plant survey of Pine Lake (Hancock), aquatic vegetation was sampled at 96% of the sampled sites. The greatest depth at which aquatic plant growth was found was 13 feet.

Eurasian watermilfoil (EWM), found at 84% of vegetated sites, was the most frequently encountered plant species. It is especially abundant in the western half of the lake. EWM can create dense beds which can stall or damage boat motors, make areas non-navigable, and prevent activities like swimming and fishing.

Northern watermilfoil (NWM), a native milfoil species, was documented at 6% of sample sites. NWM can look very similar to its invasive counterpart, EWM; however, NWM tends to be less abundant.

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.

Eurasian watermilfoil (EWM) is an exotic species which forms dense colonies. EWM competes aggressively to displace and reduce the diversity of native aquatic plants. It has a lower food value than the plants it replaces.

Eurasian watermilfoil (above) typically has 12 to 21 pairs of leaflets. The native northern watermilfoil (below), with which it is often confused, usually has 5 to 9 pairs.
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.
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 in 500 pounds of algal growth. All Waushara 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 the lake was well-mixed during spring and fall are displayed in the graph to the left.
- During fall and spring 2010-2012, the average total phosphorus level was similar to earlier averages.

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 measurements taken between April and November. It is typical for water clarity to vary throughout the year.
- During the summers of 2011 and 2012, on average, the poorest water clarity in Pine Lake was 10 feet in July and the best was 13.8 feet in August. In comparison to measurements prior to 2011, water clarity was slightly poorer in July and better in August.
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 disturbance 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 Pine Lake’s sediment core suggests increased disturbance in the lake basin since the time of land clearing.
- These activities have peaked in recent decades, as indicated by sand accumulation and a diatom community that favors nutrient-rich water.
- There has likely been an increase in nutrients to the lake over this time period. The addition of nutrients such as phosphorus supports an increased growth of aquatic plants and algae, resulting in a loss of water clarity.

This sediment core was collected from Pine Lake. The darker layers indicate organic-rich sediments that are often due to abundant aquatic plants and/or soil erosion from the landscape. Additional analysis of this layer can help to confirm the source.

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.
Pine Lake (Hancock) – What can you do to help?

Stop the Spread of Aquatic Invasive Species!

**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

**Wetlands and Shorelands:**
- LEARN how to identify invasive plants and animals, and know 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.
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