Lake Lucerne

Final Study Results 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.
Lake Lucerne – Location

Lake Lucerne
Southeast of Wautoma
East of Highway 73
South of County Highway F
Township of Marion

Surface Area: 42 acres
Maximum Depth: 33 feet

Water Flow
♦ Lake Lucerne is a seepage lake; most water enters via groundwater. Surface water runoff and direct precipitation also contribute water, but to lesser extents.
♦ Most water exits Lake Lucerne 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 Lake Lucerne is 380 acres.
- Forests account for the primary land use in the watershed.
- Developed areas are located near the southwestern and southeastern portions of the lake. Generally, the land closest to the lake will have the greatest immediate impact on its 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 Lake Lucerne from the north.
Lake Lucerne – Shoreland Vegetation

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.

Many stretches of the shoreland around Lake Lucerne have fairly healthy shoreland vegetation (displayed in orange).
Aquatic plants are the forest landscape within a lake. They provide food and habitat for terrestrial and aquatic creatures such as fish, ducks, turtles, invertebrates and other animals. They increase oxygen in the water and utilize nutrients that would otherwise be used by algae. A healthy lake typically has a variety of aquatic plants creating diversity that can help to prevent the establishment of aquatic invasive species.

- The aquatic plant community in Lake Lucerne is characterized by a below-average diversity of plant species when compared to other lakes in the Waushara County Lakes Study.
- An aquatic plant survey in 2011 documented 11 species, with the greatest diversity of species found in shallow areas of the northern and southern sides of the lake.
- The 2012 aquatic plant survey of Lake Lucerne documented no curly-leaf pondweed, although it was identified in the lake prior to the 2012 survey.
During the 2011 aquatic plant survey of Lake Lucerne, 88% of the sites sampled had vegetative growth. The average depth of sampled sites was 14 feet, with a maximum depth of 28 feet. Because Lake Lucerne is a deep lake, over one-half of the assigned sample sites were too deep for plant growth. The most frequently encountered plant species was muskgrass, found in 90% of vegetated sites. Fries’ pondweed and slender naiad were found at 27% of vegetated sites. All three are native species commonly found in Wisconsin lakes.

**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.

The leaves, roots and seeds of white water lily are a food source for wildlife including beaver, muskrat and ducks. The leaves provide shelter and habitat for fish and invertebrates, as well as shade to cool the water.
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 remove. Prevention and early detection are the best ways to keep aquatic invasive species from establishing in a lake.

### Lakes with Aquatic Invasive Species in Waushara County, 2012

<table>
<thead>
<tr>
<th>Lake Name</th>
<th>Banded Mystery Snail</th>
<th>Chinese Mystery Snail</th>
<th>Rusty Crayfish</th>
<th>Curly Leaf Pondweed</th>
<th>Eurasian Water Milfoil</th>
<th>Hybrid Eurasian/Northern Water Milfoil</th>
<th>Zebra Mussel</th>
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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 2010-spring 2012, the average total phosphorus level indicated that Lake Lucerne was similar to earlier measurements and may be transitioning towards mesotrophic conditions.**

**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 Lake Lucerne was 11 feet in September and the best was 19 feet in August.**
Lake Lucerne – What can you do to help?

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 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.
Lake Lucerne – Primary Researchers

Aquatic Plants
Jen McNelly (UW-Stevens Point)

Sediment Core
Paul Garrison (Wisconsin DNR)
Samantha Kaplan (UW-Stevens Point)

Shoreland Assessments
Ed Hernandez and Waushara County Land Conservation Department Staff
Dan McFarlane (UW-Stevens Point)

Water Quality and Watersheds
Nancy Turyk, Paul McGinley, Danielle Rupp and Ryan Haney (UW-Stevens Point)
Ed Hernandez and Waushara County Land Conservation Department Staff

UW-Stevens Point Students

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Waushara County Staff and Citizens

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Drs. Samantha Kaplan and Paul McGinley

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