Big Hills Lake

Preliminary Results 2012

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.
Big Hills Lake

Southwest of Saxeville, East of County Road G, Township of Mount Morris

Surface Area: 133 acres
Maximum Depth: 22 feet

WAUSHARA COUNTY LAKE STUDY –

1 Pine (Springwater) 18 W. Branch Mill Pond
2 Twin 19 Porters
3 Gilbert 20 Pearl
4 Long (Saxeville) 21 Johns
5 Long (Oasis) 22 Bughs
6 Huron 23 Irogami
7 Wilson 24 Alpine
8 Kusel 25 Silver (Wautoma)
9 Silver (Springwater) 26 Deer
10 Round 27 Little Hills
11 Big Hills 28 White Riv. Flowage
12 Napowan 29 Witters
13 Beans 30 Lucerne
14 Morris 31 Spring
15 Pine (Hancock) 32 Curtis
16 Fish 33 Pleasant
17 Marl

Water Flow

- Big Hills Lake is a seepage lake; most of its water enters as groundwater. Surface water runoff and direct precipitation also contribute water to a lesser extent.
- Most water exits Big Hills Lake through groundwater outflow.
Land uses and land management practices occurring in a watershed affect the water quality in a lake.

Land uses and land management also play a large role 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 Hills Lake is 676 acres.

The primary land use of the watershed is forest

Wetlands, forest, and development surround Big Hills Lake. Generally, the land closest to the lake has the greatest immediate impact on water quality, especially the areas of development.

**Map Color** | **Land Use** | **Acres**
--- | --- | ---
**Blue** | Water | 139
**Red** | Developed | 68
**Green** | Herbaceous/Barren | 2
**Green** | Forest | 275
**Green** | Hay/Pasture/Grassland | 6
**Yellow** | Cultivated Crops | 108
**Yellow** | Wetland | 78
Groundwater provides water to lakes in Waushara County throughout the entire year. Hard surfaces on the landscape prevent water from sinking 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, cropping, 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 a lake.
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.
Aquatic plants are like 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 levels in the water, and utilize nutrients that would otherwise be used by algae. A healthy lake typically has a large variety of aquatic plants that provide many services which include helping to prevent the establishment of aquatic invasive species.

An aquatic plant survey has been conducted for Big Hills Lake through the Waushara County Lakes Study Project. The results will be included in the final report.

Please contact us if you need this information prior to summer 2013.
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 boats, trailers, clothing, and other water recreation equipment. Invasive species can be introduced to a lake accidentally or intentionally.

Once in a lake, aquatic invasive species can be difficult and costly to control or may even be impossible to remove. Prevention and early detection are the best ways to keep aquatic invasive species from establishing in a lake.

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<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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Big Hills Lake – Water Quality

Lakes go through a natural aging process over time which results in an increase of algae, aquatic plants, fish, and wildlife. Within a lake’s watershed, human activity on the land, in a wetland, or in the lake can dramatically accelerate this process. Changes in a lake that may have normally taken centuries to occur may take place in decades or even years. The amount of nutrients, algal growth, and water clarity measures 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 Waushara County lakes. All Waushara County lakes have either sufficient or excessive nutrients for aquatic plant growth, so all 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 that were measured when the lake was well mixed (overturn) are displayed in the graph to the left. During fall 2010/spring 2011 the average total phosphorus level indicated that Big Hills Lake was transitioning towards a mesotrophic lake.

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

The graph to the left shows water clarity data collected from April-October 2011. It is typical for water clarity to vary throughout the year. During this period, the poorest secchi depth measured in Big Hills Lake was 9 feet in late August and the best secchi depth was 19.5 feet in early June.
Big Hills Lake – 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 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 Hills Lake – Primary Researchers

Aquatic Plants
Jen McNelly (UWSP)

Paleolimnology
Dr. Samantha Kaplan (UWSP) and Paul Garrison (WDNR)

Shoreland Assessments
Dan McFarlane (UWSP)

Water Quality and Watersheds
Nancy Turyk (UWSP)
Ed Hernandez and Waushara County staff

UWSP Graduate and Undergraduate Students