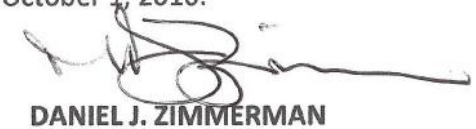
2016

Big Hills Lake Management Plan

The Big Hills Lake Management District adopted the lake management plan on October 1, 2016.



DANIEL J. ZIMMERMAN
CHAIRMAN

The plan was adopted by the Town of Mt. Morris on _____.
Date

The plan was adopted by Waushara County on _____.
Date

The plan was approved by the Wisconsin Department of Natural Resources on _____.
Date

A special thanks to all who helped to create the Big Hills Lake Management Plan and provided guidance during the plan's development.

Big Hills Management Planning Committee Members and Resources

Planning Committee

Bob Gustison

Nancy Erickson

Tom Erickson

Waushara County

County Conservationist – Ed Hernandez
Land Conservation Department
Community, Natural Resources and Economic Development Agent—
Patrick Nehring
University of Wisconsin-Extension

University of Wisconsin – Stevens Point
Center for Watershed Science and Education

Water Resource Specialists – Ryan Haney, Sarah Hull and Danielle Rupp
Water Resource Scientist – Nancy Turyk

Wisconsin Department of Natural Resources

Water Resources Management Specialist – Ted Johnson
Fisheries Biologists – Dave Bartz and Scott Bunde

Golden Sands Resource Conservation & Development, Inc.

Regional Aquatic Invasive Species Specialist – Kaycie Stushek

We are grateful to many for providing funding, support and insight to this planning process:

Waushara County Watershed Lakes Council

Waushara County Staff and Citizens

Wisconsin Department of Natural Resources Lake Manager, Ted Johnson

Wisconsin Department of Natural Resources Lake Protection Grant

UW-Extension

Contents

Overarching Vision for Big Hills Lake

Big Hills Lake will remain a beautiful, healthy lake and will be a place for great swimming, boating and fishing amongst good neighbors who value their lake and property.

Introduction

Big Hills Lake is a 125 acre seepage lake with a maximum depth of 22 feet located in the township of Mount Morris, southwest of Saxeville and southeast of Wild Rose. Land in the towns of Springwater and Mount Morris are included in the Big Hills Lake watershed. The average water depth is 12 feet and its bottom sediments are mostly sand along the lake's perimeter, with some muck found in the deeper, central areas of the lake. The dominant types of land use in the watershed are developed land (57%) and forests (38%). Big Hills Lake's shoreland is surrounded primarily by development, wetlands and forest. One public boat launch is located on its southwestern side. The lake is enjoyed by people who swim, boat, fish and appreciate its beauty

The purpose of this plan is to provide a framework for the protection and improvement of Big Hills Lake. Implementing the content within this lake management plan (LMP) will enable citizens and other supporters to achieve the visions for Big Hills Lake now and in the years to come. It is a dynamic document that identifies goals and action items for the purpose of maintaining, protecting and/or creating desired conditions in a lake and identifies steps to correct past problems, improve on current conditions, and provide guidance for future boards, lake users, and technical experts. Because many entities are involved in lake and land management, it can be challenging to navigate the roles, partnerships and resources that are available; the planning process and content of this plan have been designed to identify where some key assistance exists. The actions identified in this LMP can serve as a gateway for obtaining grant funding and other resources to help implement activities outlined in the plan.

Who can use the Big Hills Lake Management Plan, and how can it be used?

- **Individuals**: Individuals can use this plan to learn about the lake they love and their connection to it. People living near Big Hills Lake can have the greatest influence on the lake by understanding and choosing lake-friendly options to manage their land and the lake.

- **Big Hills Lake Management District:** This plan provides the Big Hills Lake Management District with a plan for the whole lake and lists options that can easily be prioritized. Annual review of the plan will also help the Big Hills Lake Management District to realize its accomplishments as well as identify priorities for the upcoming year. Resources and funding opportunities for Big Hills Lake Management District management activities are made more available by placement of goals into the lake management plan, and the Big Hills Lake Management District can identify partners to help achieve their goals for Big Hills Lake.
- **Neighboring lake groups, sporting and conservation clubs**: Neighboring groups with similar goals for lake stewardship can combine their efforts and provide each other with support, improve competitiveness for funding opportunities, and make efforts more fun.
- **The towns of Mount Morris and Springwater:** Municipalities should understand their connection/impact to lake water quality and can utilize the visions, wishes and goals documented in this lake management plan when considering municipal-level management planning or decisions within the watershed that may affect the lake. The towns can utilize the visions, wishes, and goals documented in this lake management plan when considering town-level management planning or decisions within the watershed that may affect the lake.
- **Waushara County:** County professionals will better know how to identify needs, provide support, base decisions, and allocate resources to assist in lake-related efforts documented in this plan. This plan can also inform county board supervisors in decisions related to Waushara County lakes, streams, wetlands, and groundwater.
- **Wisconsin Department of Natural Resources**: Professionals working with lakes in Waushara County can use this plan as guidance for management activities and decisions related to the management of the resource, including the fishery, and invasive species. Lake management plans help the Wisconsin Department of Natural Resources to identify and prioritize needs within Wisconsin's lake community, and decide where to apply resources and funding. A well thought out lake management plan increases an application's competitiveness for funding from the State – if multiple Waushara County lakes have similar goals in their lake management plans, they can join together when seeking grant support to increase competitiveness for statewide resources.

Background

The residents of Big Hills Lake have a tradition of stewardship which has been documented in various lake studies and plans dating back to aquatic macrophyte surveys in the 1970s. Where appropriate, relevant information from some of these past reports has been incorporated into this plan including the 2003 *Big Hills Lake Comprehensive Lake Management Plan* prepared by NES Ecological Services and the *Comprehensive Lake Management Plan for Big Hills Lake 2011-2015* prepared by Cason & Associates, LLC.

One of the first steps in developing this plan was to gather and compile data about the lake and its ecosystem to understand past and current lake conditions. This was done alongside 32 other lakes as part of the Waushara County Lakes Project. The Waushara County Lakes Project was initiated by citizens in the Waushara County Watershed Lakes Council who encouraged Waushara County to work in partnership with personnel from UW-Stevens Point to assess 33 lakes in the county. This effort received funding from the Wisconsin Department of Natural Resources' Lake Protection Grant Program. Previously, there were insufficient data available for many of the lakes to evaluate current water quality, aquatic plant communities, invasive species, and shorelands. The data that were available had been collected at differing frequencies or periods of time, making it difficult to compare lake conditions. Professionals and students from UW-Stevens Point and the Waushara County Land Conservation Department conducted the Waushara County Lakes Study and interpreted the gathered data for use in the development of lake management plans. Data collected by citizens, consultants and Wisconsin Department of Natural Resources professionals were also incorporated into the planning process, helping to create a robust set of information from which informed decisions could be made. Sources of information used in the planning process are listed at the end of this document.

Implementing the content of this lake management plan will enable citizens and other supporters to achieve the vision for Big Hills Lake now and in the years to come.

Several reports from the Big Hills Lake Study and the materials associated with the planning process and reports can be found on the Waushara County website: http://www.co.waushara.wi.us/ (select "Departments", "Zoning and Land Conservation", "Land Conservation", and "Lake Management Planning"). Unless otherwise noted, data used in the development of this plan were detailed in the report *Waushara County Lakes Study – Big Hills Lake 2010-2012*, University of Wisconsin-Stevens Point.

The Planning Process

The planning process included a series of four public planning sessions held between April 2014 and April 2015 at the Waushara County Courthouse and the Wild Rose Village Hall. The Big Hills Lake Planning Committee consisted of lake district members and property owners. Technical assistance during the planning process was provided by the Waushara County Conservationist, the Waushara County Community, Natural Resources and Economic Development Extension Agent, and professionals from the Wisconsin Department of Natural Resources (WDNR), Golden Sands Resource Conservation & Development, Inc. (RC&D), University of Wisconsin-Extension (UWEX), and the University of Wisconsin-Stevens Point Center for Watershed Science and Education (CWSE).

Participation in the planning process was open to everyone and was encouraged by letters sent directly to Big Hills Lake waterfront property owners and by press releases in local newspapers. In addition, planning committee members were provided with emails about upcoming meetings which could be forwarded to others. To involve and collect input from as many people as possible, topic-specific surveys related to the subject of each upcoming planning session were made available prior to each planning session. Property owners and interested lake users were notified about the surveys and how to access them (via postcards mailed to waterfront property owners and press releases in local newspapers). The surveys were filled out anonymously online or on

paper upon request. For Big Hills Lake, a low number of responses were received. Survey questions and responses were shared at the planning sessions and can be found in the Appendix.

Guest experts and professionals attended the planning sessions. They presented information and participated in discussions with participants to provide context, insight and recommendations for the lake management plan, including environmental and regulatory considerations. This information was organized with the survey results into discussion topics, which included: the fishery and recreation; the aquatic plant community; water quality, quantity, and land use; shoreland health; and communication. After learning about the current conditions of each topic, participants identified goals, objectives, and actions for the lake management plan that were recorded by professionals from UW-Stevens Point. Planning session notes and presentations are available on the Waushara County website.

Goals, Objectives and Actions

The following goals, objectives, and associated actions were derived from the values and concerns of citizens and members of the Big Hills Lake Management Planning Committee, and the known science about Big Hills Lake, its ecosystem and the landscape within its watershed. Implementing and regularly updating the goals and actions in the Big Hills Lake Management Plan will ensure that the vision is supported and that changes or new challenges are incorporated into the plan. A management plan is a living document that changes over time to meet the current needs, challenges and desires of the lake and its community. **The goals, objectives and actions listed in this plan should be reviewed annually and updated with any necessary changes.**

Although each lake is different, to ensure a lake management plan considers the many aspects associated with a lake, the Wisconsin Department of Natural Resources requires that a comprehensive lake management plan address, at a minimum, a list of topics that affect the character of a lake, whether each topic has been identified as a priority or as simply something to preserve. These topics comprise the chapters in this plan. For the purposes of this plan, the chapters have been grouped as follows:

In-Lake Habitat and a Healthy Lake

Fish Community—fish species, abundance, size, important habitat and other needs
Aquatic Plant Community—habitat, food, health, native species, and invasive species
Critical Habitat—areas of special importance to the wildlife, fish, water quality, and aesthetics of the lake

Landscapes and the Lake

Water Quality and Quantity—water chemistry, clarity, contaminants, lake levels
Shorelands—habitat, erosion, contaminant filtering, water quality, vegetation, access
Watershed Land Use—land use, management practices, conservation programs

People and the Lake

Recreation—access, sharing the lake, informing lake users, rules

Communication and Organization—maintaining connections for partnerships, implementation, community involvement

Updates and Revisions—continuing the process

Governance—protection of the lake, constitution, state, county, local municipalities, Big Hills Lake Management District

The following goals have been identified as 'high priority':

Goal 3. Sustainably control or eliminate Aquatic Invasive Species (AIS) in Big Hills Lake.

[Control and manage EWM and other aquatic invasive species to the extent that the lake can maintain a healthy, balanced ecosystem and lake users can continue to enjoy and recreate on the lake as is currently done.]

Goal 8. Protect and restore healthy, stable shoreland habitats near and around Big Hills Lake.

[Provide ongoing education and assistance to encourage lakeshore property owners to increase establishment of near-shore and shoreline, native aquatic vegetation, which will help improve the aquatic ecosystem, lead to a healthier fishery, and maintain excellent water quality for all lake users to enjoy.]

Goal 5. Maintain or improve water quality in Big Hills Lake.

Lead persons and resources are given under each objective of this plan. These individuals and organizations are able to provide information, suggestions, or services to accomplish objectives and achieve goals. The following table lists organization names and their common acronyms used in this plan. This list should not be considered all-inclusive – assistance may also be provided by other entities, consultants, and organizations.

Resource	Acronym
Big Hills Lake Management District	BHLMD
Center for Watershed Science and Education	CWSE
Citizen Lake Monitoring Network	CLMN
Golden Sands Resource Conservation and Development	RC&D
University of Wisconsin-Stevens Point	UWSP
UW Extension	UWEX
Waushara County Watershed Lakes Council	WCWLC
Wisconsin Environmental Analysis Lab	WEAL
Wisconsin Department of Natural Resources	WDNR

Contact information for organizations and individuals who support lake management in Waushara County can be found in **Error! Reference source not found.**.

In-Lake Habitat and a Healthy Lake

Lake users value Big Hills Lake for its good water quality, sandy bottom, fishing and boating. These attributes are all interrelated; the health of one part of the lake system affects the health of the rest of the plant and animal community, the experiences of the people seeking pleasure at the lake, and the quality and quantity of water in the lake. Habitat is the structure for a healthy fishery and wildlife community. It can provide shelter for some animals and food for others.

Lake habitat occurs within the lake, along all of its shorelands, and even extends into its watershed for some species. Many animals that live in and near the lake are only successful if their needs – food, a healthy environment, and shelter – are met. Native vegetation including wetlands along the shoreline and adjacent to the lake provides habitat for safety, reproduction, and food, and can improve water quality and balance water quantity. Some lake visitors such as birds, frogs, and turtles use limbs from trees that are sticking out of the water for perches or to warm themselves in the sun. Aquatic plants infuse oxygen into the water and provide food and shelter for waterfowl, small mammals, and people. The types and abundance of plants and animals that

comprise the lake community also vary based on the water quality, and the health and characteristics of the shoreland and watershed. Healthy habitat in Big Hills Lake includes the aquatic plants, branches, and tree limbs above and below the water.

The Fish Community

A balanced fish community has a mix of predator and prey species, each with different food, habitat, nesting substrate, and water quality needs in order to flourish. Activities in and around a lake that can affect a fishery may involve disturbances to the native aquatic plant community or substrate, excessive additions of nutrients or harmful chemicals, removal of woody habitat, shoreline alterations, and/or an imbalance in the fishery. Shoreland erosion can cause sediment to settle onto the substrate, causing the deterioration of spawning habitat. Habitat can be improved by allowing shoreland vegetation to grow, minimizing the removal of aquatic plants, providing fallen trees or limbs in suitable areas, and protecting wetlands and other areas of critical habitat.

People are an important part of a sustainable fish community; their actions on the landscape and the numbers and sizes of fish taken out of the lake can influence the entire lake ecosystem. Putting appropriate fishing regulations in place and adhering to them can help to balance the fishery with healthy prey and predatory species, can be adjusted as the fish community changes, and can provide for excellent fishing.

Managing a lake for a balanced fishery can result in fewer expenses to lake stewards and the public. While some efforts may be needed to provide a more suitable environment to meet the needs of the fish, these efforts usually do not have to be repeated frequently. Protecting existing habitat such as emergent, aquatic, and shoreland vegetation, and leaving trees that naturally fall into the lake are free of cost. Alternatively, restoring habitat in and around a lake can have an up-front cost, but the effects will often continue for decades. Costs in time, travel, and other expenses are associated with routine efforts such as fish stocking and aeration. Ideally, a lake contains the habitat, water quality, and food necessary to support the fish communities present within the lake and provide fishing opportunities for people without needing a lot of supplemental effort and associated expenses to maintain these conditions

Big Hills Lake has been stocked with fish nearly annually since 1999 (Table 1). This has been in large part due to efforts of We Really Kare, Inc., a fishing club based in Wild Rose, Wisconsin in partnership with the Big Hills Lake P & R District. Prior to 1999, the walleye were the primary stocking species. Since 1999, stocked species have included walleye, yellow perch, black crappies, fathead minnows and golden shiners. Stocking has not been conducted by WDNR since 2010.

According to WDNR fishery biologist Dave Bartz, in 2010, fishery biologists with the WDNR conducted a survey of the fishery in Big Hills Lake. This survey utilized fyke and seine nets and boom shocking. Results of the survey indicated that largemouth bass are the dominant predator fish with an abundant population exhibiting poor size structures and growth rates. This is likely due to limited habitat and cover. Other predator species including northern pike and walleye are also present but at low populations. The 14 inch size limit on largemouth bass was recently removed by the WDNR and replaced with a no size limit, bag of 5 fish regulation. The WDNR fishery biologists are scheduled to monitor these populations annually to determine the effectiveness of the new regulations. During the 2010 survey, bluegills and yellow perch were found to be in fair abundance in Big Hills Lake with above average growth rates. According to the WDNR Fisheries Biologist, habitat (particularly near-shore) and forage are most needed to help balance the fishery.

Six wooden fish cribs were placed in Big Hills Lake in winter 2011 and winter 2012. While cribs provide structure for larger fish, near shore habitat provides cover for young fish and their prey. In the citizen opinion survey, ten of 15 respondents

Table 1. History of fish stocking in Big Hills Lake by the Wisconsin Department of Natural Resources since 1972 (Carson, 2011).

Year	Species	Age Class	Number Fish Stocked	Avg Fish Length (in.)	Source Type
1972	Walleye	Yearling	1,350	10	Federal Hatchery
1987	Walleye	Fingerling	1,140	7	Field Transfer
1989	Walleye	Fingerling	5,400	7	DNR Hatchery
1990	Walleye	Fingerling	2,000	5	DNR Hatchery
1996	Walleye	Fingerling	693	5.6	DNR Co-op Ponds
1999	Golden Shiner	Large Fingerling	10,400	4.1	Private Hatchery
1999	Walleye	Large Fingerling	1,200	7.1	Private Hatchery
2000	Black Crappie	Large Fingerling	1,000	4.9	Private Hatchery
2000	Fathead Minnow	Adult	49,000	2.1	Private Hatchery
2000	Yellow Perch	Adult (Broodstock)	3,000	4.4	Field Transfer
2001	Fathead Minnow	Unknown	N/A	N/A	Private Hatchery
2001	Walleye	Large Fingerling	N/A	7.2	Private Hatchery
2002	Fathead Minnow	Adult (Broodstock)	60,000	1.5	Private Hatchery
2003	Fathead Minnow	Adult (Broodstock)	90,000	N/A	Private Hatchery
2003	Yellow Perch	Adult (Broodstock)	1,000	N/A	Private Hatchery
2004	Black Crappie	Fall Yearling	200	4.1	Private Hatchery
2004	Black Crappie	Unknown	500	8.2	Private Hatchery
2004	Walleye	Fall Yearling	1,200	7.2	Private Hatchery
2005	Fathead Minnow	Adult	60,000	N/A	Private Hatchery
2005	Walleye	Large Fingerling	1,000	6.5	Private Hatchery
2006	Fathead Minnow	Adult	120,000	N/A	Private Hatchery
2007	Black Crappie	Adult	1,200	7	Private Hatchery
2007	Fathead Minnow	Yearling	60,000	N/A	Private Hatchery
2008	Fathead Minnow	Adult	60,000	1.5	Private Hatchery
2008	Walleye	Large Fingerling	1,300	7	Private Hatchery
2009	Black Crappie	Adult	500	6	Private Hatchery
2009	Fathead Minnow	Adult	60,000	2	Private Hatchery
2010	Black Crappie	Adult	1,000	6	Private Hatchery
2010	Fathead Minnow	Adult	150,000	2	Private Hatchery
2010	Walleye	Fall Yearling	750	5	Private Hatchery

indicated they were willing to provide better habitat for fish and wildlife. Of the twelve citizens responding to the opinion survey about the fishery, about 69% (9/13) said they had fished Big Hill Lake for more than 11 years.

Guiding Vision for the Fish Community

Big Hills Lake will be home to a robust, well-structured fishery.

Goal 1. Improve the structure of the fishery, including the reduction of largemouth bass populations and increase of perch populations.

Objective 1.1. Enhance near-shore fish habitat and foraging opportunities.

Actions	Lead person/group	Resources	Timeline
Include information about the importance of good fishery habitat (native aquatic plants and woody habitat) in welcome packets for new (and/or existing) shoreland property owners.	WC	UWEX Lakes (educational material) WCWLC	Ongoing
Leave existing woody habitat (trees, stumps, branches, etc.) in the lake, especially in near-shore (littoral) areas.	Shoreland property owners	UWEX Lakes (educational material)	Ongoing
Communicate with WDNR Fisheries Biologist to explore options for supplemental woody habitat such as tree drops and “fish sticks”.	Shoreland property owners	WDNR Fisheries Biologist Local fishing clubs WDNR Healthy Habitat Grants	Ongoing
Work with willing property owners to place more woody structure in areas that will not impede recreation.	WDNR	WDNR Fisheries Biologist Local fishing clubs	Ongoing
Explore the installation of woody habitat under and around docks.	Shoreland property owners	Fisheries Biologists - WDNR	Ongoing
Protect emergent beds of bulrush and prevent disturbance in those areas via distribution of educational materials.	Shoreland property owners	UWEX Lakes (educational materials) Local fishing clubs	Ongoing

Aquatic Plants

Aquatic plants provide the forested landscape within Big Hills Lake. They provide food and habitat for spawning, breeding, and survival for a wide range of inhabitants and lake visitors including fish, waterfowl, turtles, amphibians, as well as invertebrates and other animals. They improve water quality by releasing oxygen into the water and utilizing nutrients that would otherwise be used by algae. A healthy lake typically has a variety of aquatic plant species which creates diversity that makes the aquatic plant community more resilient and can help to prevent the establishment of non-native aquatic species.

Aquatic plants near shore and in shallows provide food, shelter and nesting material for shoreland mammals, shorebirds and waterfowl. It is not unusual for otters, beavers, muskrats, weasels, and deer to be seen along a shoreline in their search for food, water, or nesting material. The aquatic plants that attract the animals to these areas contribute to the beauty of the shoreland and lake.

During the aquatic plant survey conducted in September 2013 by Golden Sands RC&D, a total of 16 species were observed with a moderate amount of diversity (SDI=0.77). This is up from a survey conducted in 2010 identifying 12 species. Included are three high quality species, with C values of 8: southern naiad, white-stem pondweed and white water crowfoot. Muskgrass was the dominant species occurring at 63% of the sites sampled and variable pondweed occurred at 22% of the sites. Eurasian watermilfoil was the only exotic species observed and was only found in the southwest bay near the boat landing.

More detailed information can be found in the 2013 Big Hills Lake Aquatic Plant Report or the Big Hills Lake 2010-2012 Lake Study Report.

Guiding Vision for Aquatic Plants in Big Hills Lake

Big Hills Lake will host a diverse aquatic plant community that supports good water quality, and a balanced fishery, while striving to maintain current recreational opportunities.

Goal 2. Protect the native plant community in and around Big Hills Lake.

Objective 2.1. Maintain the native aquatic plant community in Big Hills Lake.

Actions	Lead person/group	Resources	Timeline
Minimize removal and disturbance of native vegetation (to impede establishment of additional AIS) via educational materials provided in annual mailing, website re: mitigation methods available.	WC	WCLWC	Ongoing
Obtain the appropriate permit for harvesting of any native plants beyond 30 feet from docks.	BHLMD	WDNR	
Conduct an aquatic plant survey for the entire plant community (using point-intercept methodology) prior to LMP updates.	BHLMD	Consultant	Summer 2019 (for 2020 update)

Aquatic Invasive Species (AIS)

Aquatic invasives species are non-native aquatic plants and animals that are most often unintentionally introduced into a lake by lake users. This most commonly occurs on trailers, boats, equipment, and from the release of bait. In some lakes, aquatic invasive plant species can exist as a part of the plant community, while in other lakes populations explode, creating dense beds that can damage boat motors, make areas non-navigable, inhibit activities like swimming and fishing, and disrupt the lakes' ecosystems.

EWM has been the only exotic plant species identified in Big Hills Lake. According to the DNR, it was first reported in the lake in 1979. During the 2013 aquatic plant survey, EWM was found in one location in the west bay near the boat landing (see Appendix B). Hybrid watermilfoil (HWM) results from a hybridization of native watermilfoils with Eurasian watermilfoil. HWM tends to be more resilient and less effected by chemical treatment. Hybrid Eurasian/northern watermilfoil (HWM) was confirmed in Big Hills Lake in 2013.

EWM/HWM can exist as part of the plant community or it can create dense beds that can damage boat motors, make areas non-navigable, and inhibit activities like swimming and fishing. This plant produces viable seeds; however, it often spreads by fragmentation. Just a small fragment of the stem is enough to start a new plant, so spread can occur quickly if plants are located near points of activity such as beaches and boat launches.

After a large-scale treatment for EWM conducted in 2004, a subsequent treatment was not needed until spring 2010. This treatment utilized Navigate (granular 2,4-D) applied at a rate of 150 lbs per acre. Subsequent treatments in May 2009 (1 acre), May 2010 (1 acre), May 2011 (2 acres), May 2012 (2 acres) and May 2013 (2.4 acres) have been conducted.

In 2015, the invasive zebra mussel was identified in BHL. Zebra mussels can cause economic and environmental damage to a lake's ecosystem by disrupting the traditional aquatic food chains of many inland lakes. Regardless of their size, inland lakes represent unique ecological systems. When zebra mussels enter into these fragile systems, their voracious filter feeding depletes the availability of microscopic organisms that play a critical part in each lake's ecological food web. As a result, valued sportfish are impacted. Zebra mussels consume considerable amounts of these beneficial microscopic organisms and this creates less food for larval and juvenile fishes that support sport and commercial fisheries.

As significant filter feeders, zebra mussels may increase human and wildlife exposure to organic pollutants (PCBs and PAHs). Early research shows that zebra mussels can rapidly accumulate organic pollutants within their tissues to levels more than 300,000 times greater than concentrations in the

environment. They also deposit these pollutants in their pseudofeces. These contaminants can be passed up the food chain so that any fish or waterfowl consuming zebra mussels will also accumulate these organic pollutants. Likewise, human consumption of these same fish and waterfowl could result in further risk of exposure. Zebra mussels' filtration of the water column also results in clearer water where the sun can reach to greater depths, and thus can create more desirable conditions for invasive plant species, such as Eurasian water milfoil, to grow and thrive.

Floating docks, boat bottoms, and engine outdrives can be colonized by zebra mussels, resulting in boat engines overheating due to colonies of zebra mussels clogging cooling water inlets and mussels colonizing boat hulls. Beaches are also affected by zebra mussels. The sharp-edged mussel shells along swimming beaches can be a hazard to bare feet.

Once zebra mussels have invaded a lake, it is not likely that they will be eliminated. However, lake users can control their spread by the following efforts:

-Remove any visible vegetation from items that were in the water, including the boat, trailer, and all equipment.

-Flush engine cooling system, live wells, and bilge with tap water. If possible, use hot water.

-Do not re-use bait if exposed to infested waters.

-Dry boat and other equipment for at least 48 hours before using in uninfested waters.

-Examine boat exterior for mussels if it has been docked in infested waters; if mussels are found or exterior is heavily fouled by algae, either clean fouled surfaces or leave boat out of the water for at least 5 days before entering uninfested waters.

Summary of Aquatic Plant Management Planning Session Discussion – March 10, 2015

Each lake is different and its response to control of EWM may differ from lake to lake. No single approach will be appropriate for all lakes. Often multiple approaches and adaptive year-to-year changes in approach are most successful. The population of EWM should be evaluated using a 'point-intercept' method (accompanied by more thorough observations) before and after chemical treatments to determine the effectiveness of an approach in a given year. Strategies for the subsequent year should be adjusted accordingly. EWM management involves evolving scientific knowledge; therefore the management strategies for the management of EWM in Big Hills Lake should be adapted as EWM populations in the lake change and as new information becomes available.

Boat Launch Inspections and AIS Monitoring

Coordinating volunteers or hiring someone to inform boaters about the spread of aquatic invasive species at boat launches raises awareness of AIS and can help prevent the entry of aquatic invasive plants into the lake. In addition to informing visitors, developing a program to monitor for AIS within the lake is an important way to identify and report new outbreaks before AIS become established.

Action: Work with RC&D to learn how to identify invasive species and coordinate volunteers or paid individuals to conduct boat launch inspections through the Clean Boats, Clean Waters program. If AIS are found, refer to the *Invasive Species Rapid Response Plan 2014* in the Appendix.

The following EWM control options were identified for Big Hills Lake:

No Action

EWM has difficulty becoming established in lakes with well-established populations of native plants. In some lakes, the plants appear to coexist with native flora and have little impact on fish and other aquatic animals. Removing native vegetation, whether physically or with herbicides, creates the perfect opportunity for invasive species. A 'no action' approach coupled with thorough monitoring as a low cost alternative that can be tried until monitoring results indicate the need for more aggressive management.

Action: Monitor EWM in late summer to track population density and distribution and see if the populations stabilize. EWM primarily spreads via fragmentation and is particularly adept at taking root in disturbed lakebed.

Hand Pulling and/or Hand Pulling using Suction

Hand pulling is a non-toxic management technique that is the preferred method in areas of the lake with smaller populations of aquatic invasive species or where other control methods cannot be employed. Properly trained individuals and divers (for deep areas) can target EWM and avoid damage to native species. Proper removal by hand can result in a healthy native plant community that will help to provide a barrier for the re-establishment of non-native species, while providing habitat for fish and other lake inhabitants and helping to maintain a balance with the algal populations. Hand pulling also removes dead plants from the water, lessening the amount of nutrients released by decaying plant tissue.

Action: Conduct hand pulling in 2015. If warranted, work with RC&D and other lake groups in the area to apply for a grant to obtain funding to hire divers who are trained to hand-pull EWM. Following this effort, monitoring for the target species should be conducted and documented at the beginning of each season. This approach can be coupled with chemical treatments as well.

Chemical Spot/Whole-Lake Treatment

Studies of the effectiveness of chemical spot treatment for EWM control have been conducted in recent years by scientists with the WDNR and Army Corps of Engineers. The results suggest that chemical spot treatment is less effective at controlling EWM than previously thought and may result in chemically resistant strains. Although chemical spot treatment may not be as detrimental to the native aquatic plant population in a lake as a full-lake treatment, studies have shown that applied at label rates, there are negative effects to native vegetation (Johnson, 2014). In

addition, chemicals may kill aquatic invasive plants, but the aquatic plant tissue remains in the lake. The decaying plants result in increased nutrients in the water column which may enhance algal blooms can increase buildup of organic sediments. Although the chemicals used are approved for use in aquatic environments by the US Environmental Protection Agency and the WDNR, the full impacts to the aquatic ecosystem are still unknown (WDNR 2012). More information about 2,4-D can be found in the Appendix.

If chemical application is desired, an appropriate herbicide, concentration, and contact time should be determined as part of the permit application process. Since HWM is present in Big Hills Lake, a *challenge test* should be conducted to determine which combination of chemicals will be effective in controlling that particular strain of HWM. Over 13 combinations of chemicals can potentially be used to treat HWM; the only way to know the appropriate combination is by sending samples to be challenge tested. Treating HWM without knowing the appropriate combination of chemicals can result in an even more resilient strain in the lake, damage to the native aquatic plant population, and a waste of money.

Chemical control of EWM beds that are less than 5 acres should be done using a contact herbicide (examples: endothall or diquat). Systemic herbicides should not be used. Treatment should occur early in the season, prior to emersion of native plants. To reduce the chance of developing resilient strains of EWM; different treatments should be used each year.

Action: Monitor results of various manual removal techniques. If EWM population exceeds a threshold of 5-10% of the lake surface area, consider chemical treatments. Following a treatment, monitoring for the target species should be conducted during that summer at least 30 days after the treatment, and the results of its effectiveness on the target and non-target species should be documented. When possible, use additional caution when applying chemicals to high quality aquatic plant species and species of special concern.

Follow guidelines to inform lake users of the use of chemicals in the lake and provide documentation about the chemical to all property owners around the lake. Work with the WDNR Water Resource Biologist and the applicant (if appropriate) for specific requirements.

Guiding Vision for Aquatic Invasive Species

The waters and shorelands of Big Hills Lake will contain a variety of native species with few or no invasive species.

Goal 3. Sustainably control or eliminate aquatic invasive species in Big Hills Lake.

Objective 3.1. Monitor and apply Best Management Practices (BMPs) toward Eliminating populations of EWM/HWM and other aquatic invasive species from Big Hills Lake.

Actions	Lead person/group	Resources	Timeline
Inform property owners about refraining from removing native aquatic vegetation to reduce the possibility of invasive species colonization.	BHLMD	WCWLC UWEX (educational materials)	Ongoing
Re-evaluate the aquatic plant community to determine the next steps needed for EWM/HWM reduction/elimination. Review strategies for control/elimination of EWM (based on options laid out above) each year and adjust if needed.	BHLMD	Consultant WDNR Aquatic Plant Specialist	Annually
If EWM/HWM populations exceed what is manageable by hand pulling, consider using herbicides in areas of denser infestation. (manageability is dependent on the extent of growth, depth of plants, and visibility when plants are being removed).	BHLMD	RC&D Consultant	As needed
Work with area lakes to apply jointly for a grant to hire divers to hand pull EWM.	BHLMD	WCWLC	As needed

Objective 3.2. Prevent the recurrence of EWM/HWM or the introduction of other aquatic invasive species.

Actions	Lead person/group	Resources	Timeline
Use signs (at boat landing), newsletters, and other methods to educate lake visitors about invasives and removing aquatic hitchhikers.	BHLMD	RC&D CBCW	Ongoing
Inform property owners of the importance of aquatic vegetation and to refrain from removing native aquatic vegetation to diminish the possibility of AIS colonization.	BHLMD	WCWLC RC&D	Ongoing
Learn to identify AIS and routinely look for them	Volunteers	RC&D	Ongoing spring through fall
Reestablish a CBCW program on busy lake use days and holiday weekends.	BHLMD	RC&D	

Critical Habitat

Special areas harbor habitat that is essential to the health of a lake and its inhabitants. While every lake contains important natural features, not all lakes have official critical habitat designations. Designating areas of the lake as critical habitat enables these areas to be located on maps and information about their importance to be shared. Having a critical habitat designation on a lake can help lake groups and landowners plan waterfront projects that will minimize impact to important habitat, ultimately helping to ensure the long-term health of the lake. In Wisconsin, critical habitat areas are identified by

biologists and other lake professionals from the Wisconsin Department of Natural Resources in order to protect features that are important to the overall health and integrity of the lake, including aquatic plants and animals.

Although Big Hills Lake does not have an official critical habitat area designation, there are areas within Big Hills Lake that are important for fish and wildlife. Natural, minimally impacted areas with woody habitat such as logs, branches, and stumps; areas with emergent and other forms of aquatic vegetation; areas with overhanging vegetation; and wetlands are elements of good quality habitat. Identifying other important areas around the lake that are important habitat and informing lake users of their value can help raise awareness for the protection of these areas.

Guiding Vision Big Hills Lake's Critical Habitat

Sensitive areas in and around Big Hills Lake remain intact and protected.

Goal 4. Protect unique areas that are valuable to the habitat and water quality in and near Big Hills Lake.

Objective 4.1. Identify potentially critical habitat on Big Hills Lake.

Actions	Lead person/group	Resources	Timeline
If critical habitat is designated on Big Hills Lake, communicate to shoreland property owners why these areas are important.	WDNR, BHLMD	Consultants RC&D WDNR Fishery Biologists, Wildlife Specialists, and Lake Managers	

Landscapes and the Lake

Land use and land management practices within a lake's watershed can affect both its water quantity and quality. While forests, grasslands, and wetlands allow a fair amount of precipitation to soak into the ground, resulting in more groundwater and good water quality, other types of land uses may result in increased runoff and less groundwater recharge, and may also be sources of pollutants that can impact the lake and its inhabitants. Areas of land with exposed soil can produce soil erosion. Soil entering the lake can make the water cloudy and cover fish spawning beds. Soil also contains nutrients that increase the growth of algae and aquatic plants. Development on the land may result in changes to natural drainage patterns and alterations to vegetation on the landscape, and may be a source of pollutants. Impervious (hard) surfaces such as roads, rooftops, and compacted soil prevent rainfall from soaking into the ground, which may result in more runoff that carries pollutants to the lake. Wastewater, animal waste, and fertilizers used on lawns, gardens and crops can contribute nutrients that enhance the growth of algae and aquatic plants in our lakes. Land management practices can be put into place that better mimic some of the natural processes, and reduction or elimination of nutrients added to the landscape will help prevent the nutrients from reaching the water. In general, the land nearest the lake has the greatest impact on the lake water quality and habitat.

Shoreland vegetation is critical to a healthy lake's ecosystem. It helps improve the quality of the runoff that is flowing across the landscape towards the lake. It also provides habitat for many aquatic and terrestrial animals including birds, frogs, turtles, and many small and large mammals. Healthy shoreland vegetation includes a mix of tall grasses/flowers, shrubs, and trees which extend at least 35 feet landward from the water's edge. Shorelands include adjacent wetlands, which also serve the lake by allowing contaminants to settle out, providing shelter for fish and wildlife, and decreasing the hazard of shoreline erosion by providing a shoreland barrier from waves and wind.

The water quality in Big Hills Lake is the result of many factors, including the underlying geology, the climate, and land management practices. Since we have little control over the climate and cannot change the geology, changes to land management practices are the primary actions that can have positive impacts on the lake's water quality. The water quality in Big Hills Lake was assessed by measuring different characteristics including temperature, dissolved oxygen, water clarity, water chemistry, and algae. All of these factors were taken into consideration when management planning decisions were made.

Water Quality

The most mentioned citizen survey response to the question, "What do you think is the best feature of Big Hills Lake?" was water quality and water clarity. Seventy-seven percent of the respondents felt that water clarity was poorest during and following heavy boat and jet ski use.

A variety of water chemistry measurements were used to characterize the water quality in Big Hills Lake. Water quality was assessed during the 2010-2012 lake study and involved a number of measures including temperature, dissolved oxygen, water chemistry, and nutrients (phosphorus and nitrogen). Nutrients are important measures of water quality in lakes because they are used for growth by algae and aquatic plants. Each of these interrelated measures plays a part in the lake's overall water quality. In addition, water quality data collected in past years was also reviewed to determine trends in Big Hills Lake's water quality.

Dissolved oxygen is an important measure in Big Hills Lake because a majority of organisms in the water depend on oxygen to survive. Oxygen is dissolved into the water from contact with air, which is increased by wind and wave action. Algae and aquatic plants also produce oxygen when sunlight enters the water, but the decomposition of dead plants and algae reduces oxygen in the lake. Big Hills Lake has oxygen concentrations greater than 5 mg/L in the upper part of the water column throughout the year, which indicates that low oxygen is not a stressor to fish in this lake.

Water clarity is a measure of the depth that light can penetrate into the water. It is an aesthetic measure and is also related to the depth that rooted aquatic plants can grow. Water clarity is affected by water color, turbidity (suspended sediment), and algae, so it is normal for water clarity to change throughout the year and from year-to-year.

In Big Hills Lake, color and turbidity were relatively low, so the variability in transparency throughout the year is primarily due to fluctuating algae concentrations and re-suspended sediment following storms and/or heavy boating. Big Hills Lake water clarity measurements were taken in two locations (east and west bays) at each sampling event during the study. Water clarity has always been quite similar between the east and west bays based on

historical data dating back to 1976. The water clarity measured in the two Big Hills Lake bays is considered good. For Big Hills Lake, water clarity ranged from a low of 7 feet in East Bay in May-June 2012 to 22.5 feet in West Bay in June 2011. When compared with historic data, the average water clarity measured during the study was slightly better in June, July and August in the east bay, and in May through September in the west bay. Clarity was poorer in April, May, October, and November in the east bay and in April and October in the west bay. Water clarity in Big Hills Lake is typically poorer during the summer months with the shallowest Secchi depth recorded in late summer.

One pound of phosphorus entering a lake can result in up to 500 pounds of algal growth! (Vallentyne, 1974)

Chloride, sodium and potassium concentrations are commonly used as indicators of how a lake is being impacted by human activity. The presence of these compounds where they do not naturally occur indicates sources of water contaminants. Big Hills Lake had a moderate average chloride concentration of 4.1 mg/l and a moderate average sodium concentration of 2 mg/l over the monitoring period). Chloride sources include animal waste, septic systems, fertilizer, and road-salting chemicals. Although these elements are not detrimental to the aquatic ecosystem, they indicate that sources of contaminants such as road salt, fertilizer, animal waste and/or septic system effluent may be entering the lake from either surface runoff or via groundwater.

Atrazine, an herbicide commonly used on corn, was detected in the samples that were analyzed from Big Hills Lake (0.11 µg/L DACT), indicating that lake water is being impacted by agricultural activities in the surrounding area. Some toxicity studies have indicated that reproductive system abnormalities can occur in frogs at these levels (Hayes, 2003). It is recommended to test private well water for this herbicide.

Phosphorus is an element that is essential in trace amounts to most living organisms, including aquatic plants and algae. Sources of phosphorus can include naturally-occurring phosphorus in soils and wetlands, and groundwater. Common sources from human activities include soil erosion, animal waste, fertilizers, and septic systems. Although a variety of compounds are important to biological growth, phosphorus receives so much attention because it is commonly the “limiting nutrient” in many Wisconsin lakes. Due to its relatively short supply compared to other substances necessary for growth, relatively small increases in phosphorus result in significant increases in aquatic plants and algae.

Total phosphorus concentrations for Big Hills Lake ranged from a high of 33 ug/L in June 2012 to a low of 7 ug/L in August 2012. The summer mean total phosphorus for Big Hills Lake was 14 and 15 ug/L in 2011 and 2012, respectively. This is below Wisconsin’s phosphorus water quality standard for deep seepage lakes (20 ug/L), but at the 15 ug/L flag value. Inorganic nitrogen was 0.27 mg/L, near the level of 0.3 mg/L that is sufficient to fuel algal blooms throughout the summer (Shaw et al., 2000). Testing private well water for nitrate is recommended.

Managing nitrogen, phosphorus and soil erosion throughout the Big Hills Lake watershed is one of the keys to protecting the lake itself. Near shore activities that may increase the input of phosphorus to the lake include applying fertilizer, removing native vegetation (trees, bushes and grasses), mowing vegetation, and increasing the amount of exposed soil. Nitrogen inputs to Big Hills Lake can be controlled by using lake-friendly land management decisions, such as the restoration of shoreland vegetation, elimination/reduction of fertilizers, proper management of animal waste and septic systems, and the use of water quality-based management practices.

Guiding Vision for Water Quality in Big Hills Lake

Big Hills Lake will have excellent water quality and clarity that supports a healthy fishery and excellent swimming and recreation.

Goal 5. Maintain or improve water quality in Big Hills Lake.

Objective 5.1. Maintain median summer phosphorus concentrations below 16 ppb and spring inorganic nitrogen concentrations below 3 ppm.

Actions	Lead person/group	Resources	Timeline
Encourage homeowners to test their drinking water for nitrates and atrazine.	BHLMD	State certified water testing lab	Ongoing - annually
Inform others around the lake about the impacts of nutrients and land management on water quality through the distribution of a District newsletter.	BHLMD	WCWLC	
Refrain from the use of fertilizers on shoreland properties (see Shorelands section). Encourage soil testing to determine if fertilizer is necessary.	Shoreland property owners	WC UWEX	
Encourage the restoration of unmowed vegetation to slow and absorb runoff and pollutants from the road (see Shorelands section).	BHLMD	WCWLC UWEX Lakes (educational materials)	

Goal 6. Collect long term data on Big Hills Lake to monitor trends, declines, and improvements over time.

Objective 6.1. Continue any current monitoring initiatives and begin collecting data that is not routinely recorded.

Actions	Lead person/group	Resources	Timeline
Regularly monitor water clarity (5 times a summer).	Volunteers	CLMN Coordinator	Ongoing – summer
Continue monitoring water chemistry (total phosphorus, chlorophyll-*a*).	Volunteers	CLMN Coordinator	Ongoing - summer
Test for inorganic nitrogen in lake water during spring overturn.	Volunteers	State certified water testing lab (for N)	Ongoing - spring
Submit any collected data to WDNR for long term storage, interpretation, and use.	Volunteers	CLMN Coordinator	As needed

Water Levels

Fluctuating water levels in lakes are natural responses to changes in climate and weather patterns. Some lakes experience these fluctuations in water levels periodically. The plant and animal life in these lakes have adapted and sometimes depend on these fluctuations for survival; however, a large withdrawal of groundwater can potentially enhance these natural fluctuations, affecting the extent and duration of low water levels.

Summary of Management Planning Session Discussion – March 10, 2015

Citizens who attended the management planning session expressed concern about potentially low water levels in the future for Big Hills Lake. Dr. George Kraft from the UW-Stevens Point Center for Watershed Science and Education (CWSE) provided the group with a presentation on groundwater pumping and lake levels. The following management strategies and actions as suggested by Dr. Kraft are listed below.

Guiding Vision for Big Hills Lake's Water Levels

Big Hills Lake will not be adversely impacted by fluctuating water levels.

Goal 7. Proactively understand and monitor water fluctuations in and near Big Hills Lake.

Objective 7.1. Proactively understand and monitor water quantity related to natural and human-induced reductions in and near Big Hills Lake.

Actions	Lead person/group	Resources	Timeline
Continue or begin monitoring water levels in and/or near the lake. Install a monitoring well to monitor water levels in Big Hills Lake, and collect measurements on a routine basis. Report annual monitoring to Waushara County/ WDNR.	WCLCD WCWLC	WCLCD WDNR	Summer 2016
Work with lakes in the nearby area to monitor the high capacity well development and use in and near the Town of Wild Rose.	WCLCD WCWLC	WCWLC	Ongoing
Disseminate information about groundwater pumping and lake levels to shoreland property owners through emails/mailings.	WCWLC UWEX Lakes	WCWLC UWEX Lakes	Ongoing

Shorelands

Shoreland vegetation is critical to a healthy lake ecosystem. It provides habitat for many aquatic and terrestrial animals including birds, frogs, turtles, and 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 unmowed grasses/flowers, shrubs, trees, and wetlands which extends at least 35 feet landward from the water's edge.

To better understand the health of the Waushara County lakes, shorelands were evaluated. The survey inventoried the type and extent of shoreland vegetation. Areas with erosion, rip-rap, barren ground, sea walls, structures and docks were also inventoried. A scoring system was developed for the collected data to provide a more holistic assessment. Areas that are healthy will need strategies to keep them healthy, and areas with potential problem areas and where management and conservation may be warranted may need strategies for improvement. The scoring system is based on the presence/absence and abundance of shoreline features, as well as their proximity to the water's edge. Values were tallied for each shoreline category and then summed to produce an overall score. Higher scores denote a healthier shoreline with good land management practices. These are areas where protection and/or conservation should be targeted. On the other hand, lower scores signify an ecologically unhealthy shoreline. These are areas where management and/or mitigation practices may be desirable for improving water quality and habitat.

The summary of scores for shorelands around Big Hills Lake is displayed on the map in the Appendix and summarized in Figure 1. Large stretches of Big Hills Lake's shorelands are in good shape. However, several portions have challenges that should be addressed, including segments ranked as poor.

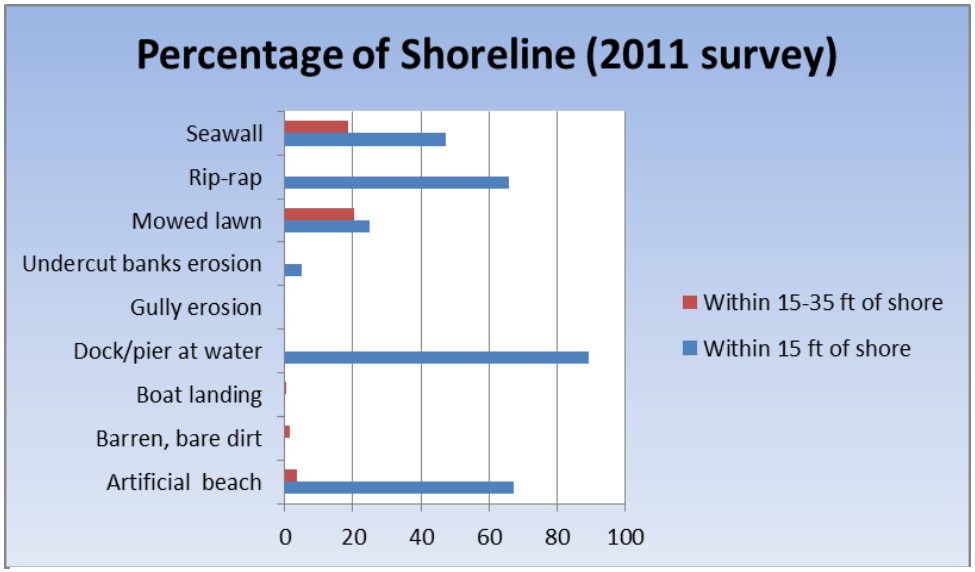


Figure 1. Percentage of shoreline disturbances around Big Hills Lake, 2011.

Shoreland ordinances were enacted to improve water quality and habitat, and to protect our lakes. To protect our lakes, county and state (NR 115) shoreland ordinances state that vegetation should extend at least 35 feet inland from the water's edge, with the exception of an optional 30 foot viewing corridor for each shoreland lot. With a total of 87 lakefront lots, 2,610 feet (19%) of disturbed shoreland is permitted. Based on the 2011 shoreland inventory included, 25% (3,483 feet) of Big Hills' shoreland was mowed lawn. Although some properties were grandfathered in when the ordinance was initiated in 1966, following this guidance will benefit the health of the lake and its inhabitants.

Guiding Vision for Big Hills Lake's Shorelands

Big Hills Lake will have healthy, stable shorelands to provide a suitable lake ecosystem for aquatic and terrestrial wildlife and to improve the quality of runoff while balanced with use by property owners.

Goal 8. Protect and restore healthy, stable shoreland habitats near and around Big Hills Lake. **Restore a minimum of 30% (approximately 262 feet) of the currently mowed shoreland over the next 5 years.**

Objective 8.1. Maintain and protect vegetated shorelands where they already exist, and encourage allowing vegetation to grow where shorelands are mowed to the edge.

Actions	Lead person/group	Resources	Timeline
Provide information to shoreland property owners about healthy shorelands and their benefits to the lake though welcome packet, annual meeting, demonstration sites, open houses, etc.	WCLCD WCWLC	WCLCD WCWLC Consultant	Ongoing
Get assistance for restoration of shoreland vegetation, help with restoration/planting projects and cost-sharing for interested property owners.	WCLCD WCWLC	WCLCD Consultants WDNR Healthy Lakes Grants	As needed
Protect and restore shoreland areas prone to erosion.	Shoreland property owners	WCLCD WDNR Lake Protection Grants	As needed

Objective 8.2. Shoreland property owners around Big Hills Lake and local decision-makers will understand their roles in protecting and restoring shoreland vegetation and will make informed land management decisions.

Actions	Lead person/group	Resources	Timeline
Distribute welcome packets to new shoreland property owners. Packets could contain information regarding the importance of healthy shoreland habitat and steps to restore areas near or surrounding the lake.	WC	WCLCD	Ongoing
Explore options to increase rental property participation in healthy shoreland practices: by disseminating brochures, pamphlets.	WC	WCWLC	

Watershed Land Use

It is important to understand where Big Hills Lake's water originates in order to understand the lake's health. During snowmelt or rainstorms, water moves across the surface of the landscape (runoff) towards lower elevations such as lakes, streams, and wetlands. The land area that contributes runoff to a lake is called the surface watershed. Groundwater also feeds Big Hills Lake; its land area may be slightly different than the surface watershed.

The capacity of the landscape to shed or hold water and contribute or filter particles determines the amount of erosion that may occur, the amount of groundwater feeding a lake, and ultimately, the lake's water quality and quantity. Essentially, landscapes with greater capacities to hold water during rain events and snowmelt slow the delivery of the water to the lake. Less runoff is desirable because it allows more water to recharge the groundwater, which feeds the lake year-round - even during dry periods or when the lake is covered with ice. A variety of land management practices can be put in place to help reduce impacts to our lakes. Some practices are designed to reduce runoff. These include protecting/restoring wetlands, installing rain gardens, swales, rain barrels, and routing drainage from pavement and roofs away from the lake. Some practices are used to help reduce nutrients from moving across the landscape towards the lake. Examples include manure management practices, eliminating/reducing the use of fertilizers, increasing the distance between the lake and a septic drainfield, protecting/restoring wetlands and native vegetation in the shoreland, and using erosion control practices.

The surface watershed for Big Hills Lake is 599 acres. Primary land use within the surface watershed is forest and developed land (Figure 2). The land near the lake is primarily residential development. In general, the land closest to the lake has the greatest immediate impact on water quality. Modeling results indicate that approximately 88% of the lake's phosphorus load is coming from developed areas (Table 2 and Figure 3).

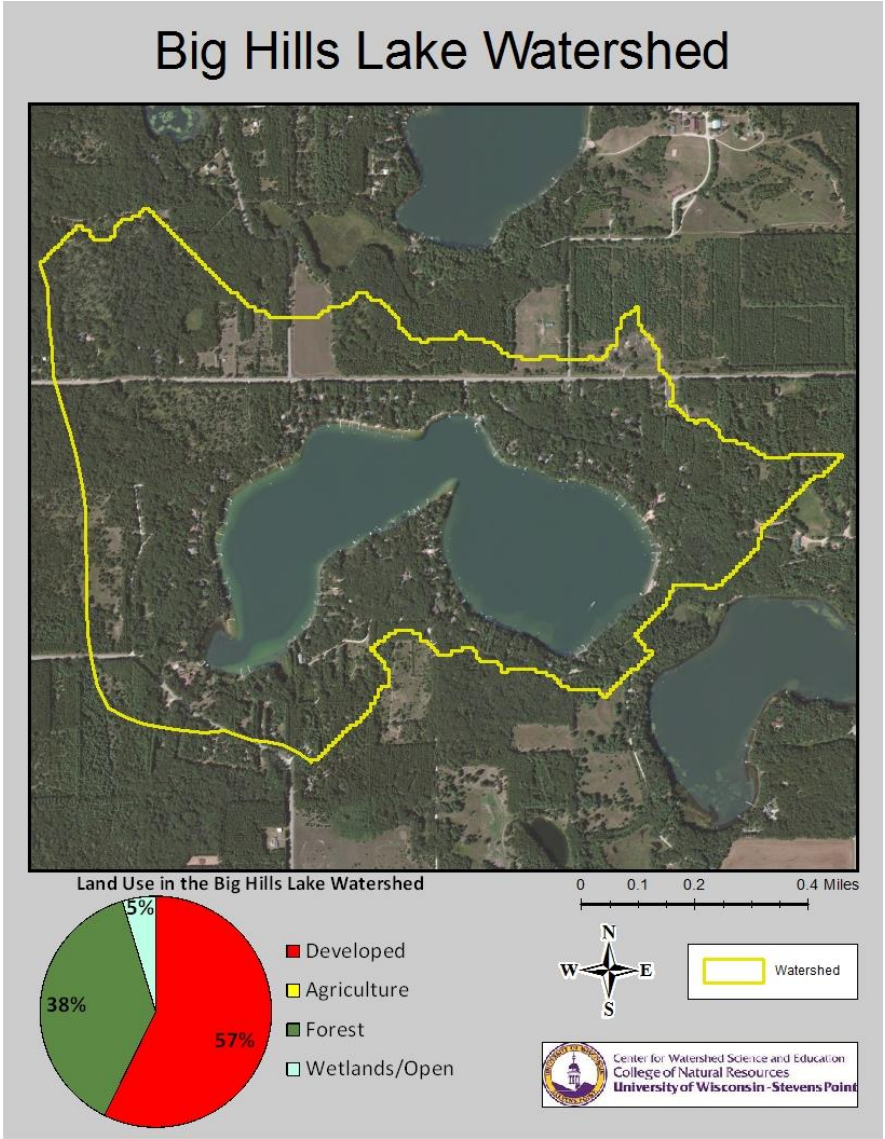


Figure 2. Surface watershed of Big Hills Lake.

Table 2. Modeling data used to estimate phosphorus inputs from land uses in the Big Hills Lake watershed (low and most likely coefficients used to calculate range in pounds).

Big Hills Lake Land Use	Phosphorus Export Coefficient (lbs/acre-yr)	Land Use Area Within the Watershed		Estimated Phosphorus Load	
		Acres	Percent	Pounds	Percent
Water	0.1	125	**21**	11-33	**13**
Developed	0.27	272	**45**	73-146	**88**
Barren/Herbaceous/Wetland	0.09	22	**4**	2-7	**2**
Forest	0.04	181	**30**	8-15	**10**
Cultivated Agriculture	0.45	0	**0**	0	**0**
*Values are not exact due to rounding and conversion.					

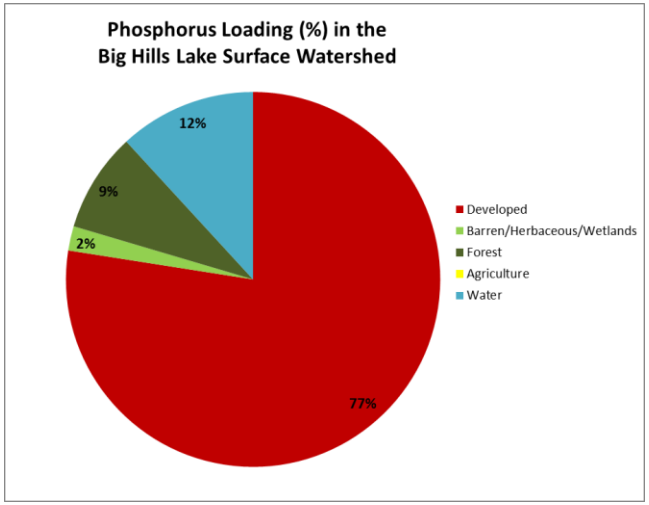


Figure 3. Estimated phosphorus loads from land uses in the Big Hills Lake watershed.

Guiding Vision for Big Hills Lake's Watershed

Land within the Big Hills Lake watershed will be managed in a way that supports clean water and a healthy lake.

Goal 9. Watershed property owners and municipal board members will know about and utilize resources for healthy land management practices.

Objective 9.1. Support healthy land management activities in the Big Hills Lake watershed.

Actions	Lead person/group	Resources	Timeline
Encourage the County to support and follow-up with water quality-based Best Management Practices (BMPs) within the watershed. Include BMPs that reduce application of excess nitrogen and pesticides that leach to groundwater.	WCLCD	NRCS DATCP	Ongoing
Support landowners interested in the protection of their land via a land conservation program (i.e. Conservation Easement, Purchase of Development Rights, or sale of land for protection).	BHLMD	NCCT Lake Protection Grants Knowles-Nelson Stewardship Funds	As needed

Encourage subdivisions and other new developments to manage stormwater on site and consider ways to minimize impacts from septic systems on Big Hills Lake.	WC	Towns of Mt Morris and Springwater Developers	As needed
Protect wetlands to maintain the water budget of Big Hills Lake. Any altered wetlands should be mitigated within the lake's watershed.	Shoreland property owners WC WDNR	WDNR	As needed
Encourage design of road and construction projects that will minimize impacts to Big Hills Lake.	Towns of Mt. Morris and Springwater WC Shoreland property owners	Towns of Mt Morris and Springwater WC Highway Dept. WI DOT	As needed
The Town of Mount Morris is categorized as being a Very High Community at Risk to wildfire. Many stakeholders in the Town collaborated in 2015 to create a Community Wildfire Protection Plan to document risks and identify mitigation projects. Educating landowners on the high fire risk nature of the town, promoting fire prevention and encouraging Firewise practices are key objectives of the Plan.	Town of Mt. Morris	Town of Mt Morris	Ongoing

People and the Lake

The people that interact with the lake are a key component of the lake and its management. In essence, a lake management plan is a venue by which people decide how they would like people to positively impact the lake. The plan summarizes the decisions of the people to take proactive steps to improve their lake and their community. Individual decisions by lake residents and visitors can have a positive impact on the lake and on those who enjoy this common resource. Collaborative efforts may have a bigger positive impact; therefore, communication and cooperation between a lake district, community, and suite of lake users are essential to maximize the effects of plan implementation.

Boating hours, regulations, and fishing limits are examples of principles that are put into place to minimize conflicts between lake users and balance human activities with environmental considerations for the lake.

A postcard and email survey of citizens owning or renting property around or near Big Hills Lake was conducted in 2015 by (??, Appendix D). The return rate of this survey was very small: only 15 respondents who did not answer all questions, and therefore, results may not be representative of the property owners around the lake as a whole.

A more representative survey of property owners on Big Hills Lake was conducted in May 2010 by Leede Research, a marketing research firm in Minnesota

and Wisconsin. In total, 22 questions were included in the survey. The survey evaluated the health and usage of the lake and helped identify issues to be addressed as part of the 2011-2015 Lake Management Plan, to which results were attached. A large proportion of residents (total of 100) returned their surveys. Respondents indicated that water quality is the best feature of Big Hills Lake, and that water quality, tranquility, quality of property, and recreational opportunities are the top reasons they purchased their property. As far as concerns about the lake, respondents answered with a variety of issues, but there did appear to be some concern with the size and types of watercraft that are accessing the lake. Activities respondents participated in tied strongly to the water and related quality. Non-powered boat travel was higher than motored forms. This response tied well to the prior question regarding most important activities for lake users, and indicated that respondents used more non-powered watercraft. This may also be a factor in concerns over the size of boats on the lake and outside access.

The Executive Summary of the 2010 survey is attached as Appendix D. For more details regarding the 2010 survey, refer to the 2011-2015 Big Hills Lake Management Plan.

Recreation

As identified by the 2010 survey mentioned above, Big Hills Lake is enjoyed by many people who swim, boat, fish, and appreciate its beauty. Big Hills Lake County Park, located on the west end of the lake, provides a public boat launch, picnic area, and restrooms. No-wake boating hours on the lake are from 5:30 pm to 9:30 am each day. No wake hours help to reduce user conflicts; however, because of the range of uses on Big Hills Lake the potential exists for user conflicts, particularly on busy summer days. Challenges most often occur in areas such as the narrows in Big Hills Lake. It is important to routinely discuss potential conflicts, and if they arise, develop solutions to ensure the public's safety.

Guiding Vision for Recreation

Big Hills Lake will be a place for responsible, multi-use recreation.

Goal 10. Important lake-related information is available to lake users.

Objective 10.1. Provide lake users with information and rules necessary to make responsible decisions.

Actions	Lead person/group	Resources	Timeline
Maintain signage at boat landings and around the lake with important slow no-wake hours, fishery, AIS and other relevant information.	BHLMD	WC WDNR CBCW RC&D UWEX Lakes	
Support enforcement of current fishing regulations (i.e. valid fishing license, bag limits, ice fishing regulations re: fish shanties, bag limit, tip-ups, etc.).	WDNR Shoreland property owners	WDNR Warden	Ongoing

Communication and Organization

Many of the goals outlined in this plan focus on distributing information to lake and watershed residents and lake users to help them make informed decisions that will result in a healthy ecosystem in Big Hills Lake which can be enjoyed by many people. Working together on common values will help to achieve the goals that are outlined in this plan.

Guiding Vision for Communication

Good communication will exist among shoreland property owners and within the community.

Goal 11. Maintain open communications to keep visitors, residents, and lake users informed about lake management and stewardship.

Objective 11.1. Distribute important lake and related land management information to residents and lake visitors.

Actions	Lead person/group	Resources	Timeline
Continue the distribution of a welcome packet to all new and current residents of Big Hills Lake.	WC	WCLWC	Ongoing
Host an annual District meeting. Announce lake happenings and management activities, events, at the annual meeting.	BHLMD		Annually
Host a speaker or demonstration at the annual District meeting	BHLMD	UWEX-Lakes WCLWC Central Sands	Annually
Develop an annual newsletter and post information on the town website.	BHLMD	Town of Mt Morris	
Communicate with other lake groups in Waushara County by having representation at the WCLWC.	BHLMD		

Updates and Revisions

A management plan is a living document that changes over time to meet the current needs, challenges and desires of the lake and its community. The goals, objectives and actions listed in this plan should be reviewed annually and adjusted with any necessary changes.

Goal 12. Review LMP annually and update every five years or more frequently, if needed.

Objective 12.1. LPM will be reviewed to identify goals for upcoming year and reflect on achievements.

Actions	Lead person/group	Resources	Timeline
Include LPM updates as a regular agenda item at the annual meeting.	BHLMD		Annually
Notify lake district members of any potential changes in the LMP.	BHLMD		As needed
Notify organizations that adopted this Big Hills Lake Management Plan of proposed changes to the LMP.	BHLMD	WCLCD Town of Springwater Town of Mount Morris WDNR Lake Manager	As needed
If aquatic plant management is occurring, update the Big Hills LMP every five years.	BHLMD	Consultant	2020

Governance

Lake Management Plan Approval

The draft lake management plan will be completed by the lake association/district board, a committee, or a committee of the whole. The final draft of the lake management plan will be approved through a vote of the lake association/district membership or board. The final draft will be approved by the Wisconsin Department of Natural Resources (DNR) to have met the lake management plan requirements and grant requirements. If the DNR requires modifications or additional information before approving the plan, the plan will be changed to meet DNR requirements that are acceptable to the lake association/district. The completed plan that has been approved by the lake association/district and the DNR will be presented to the municipalities containing the lake and Waushara County. The municipality may reference the lake management plan or parts of the plan in their comprehensive plan to guide municipal or county decisions.

Lake Assistance

The lake management plan will enhance the ability of the lake to apply for financial assistance. The lake management plan will be considered as part of the application for grants through the Wisconsin Department of Natural Resources. Current listings of grants available from the DNR can be found at http://dnr.wi.gov/aid/. Waushara County offers technical and financial assistance through the Land Conservation and Zoning Department and University

of Wisconsin-Extension Department. Additional assistance may be available from other agencies and organizations, including DNR, UW-Extension Lakes Program, Golden Sands RC&D, Wisconsin Wetlands Association, and Wisconsin Trout Unlimited.

Lake Regulations

The lake management plan is superseded by federal, state, county, and municipal laws and court rulings. However, the lake management plan may influence county and municipal ordinances and enforcement, which is why the lake management plan will be reviewed and included or referenced in the county and related municipal comprehensive plans. Federal laws contain regulations related to water quality, wetlands, dredging, and filling. State laws contain regulations related to water quality, water and lake use, aquatic plants and animals, shoreline vegetation, safety, and development. County laws contain regulations related to development, safety, use, and aquatic plants and animals. Municipal laws contain regulation of use and safety. The court system interprets these rules and regulations. The rules and regulations are primarily enforced by the US Army Corps of Engineers, the Wisconsin Department of Natural Resources, the Waushara County Sheriff Department, and the Waushara County Land Conservation and Zoning Office. If considering development near or on a lake, addressing problem plants or animals, or changing the lake bottom contact the Waushara County Land Conservation & Zoning Department at the Waushara County Courthouse (920) 787-0443 and/or the Wisconsin Department of Natural Resources (888) 936-7463.

Comprehensive Plans

The lake management plan and changes to the plan will be presented to the County and the Municipality for review and possible incorporation into their comprehensive plans. The comprehensive plan is intended to be used to guide future decision. Zoning, subdivision, and official mapping decisions must be consistent with the comprehensive plan.

Process for Inclusion in the Municipal Comprehensive Plan

The Municipal Plan Commission will review the lake management plan to determine if it is consistent with the municipality's comprehensive plan. If the lake management plan is found by the Municipal Plan Commission to not be consistent with the municipality's comprehensive plan, the plan commission may (a) recommend changes to the comprehensive plan or (b) ask that an aspect of the lake management plan be revisited. When the Municipal Plan Commission has reached a consensus that the lake management plan aligns with the municipality's vision, the Municipal Plan Commission will develop an amendment to the comprehensive plan referencing the lake management plan. This could include a reference to the lake management plan under local policies in the agricultural, natural and cultural resources background information and the addition of a recommendation to support the lake management plan and to implement the applicable recommendations contained in the lake management. The Municipal Plan Commission will recommend by resolution that the amendment to the comprehensive plan be adopted by the Municipal Board. A public hearing on the changes to the comprehensive plan will be held with a thirty-day class one notice. The Municipal Board will consider the recommendations from the Municipal Plan Commission. The Municipal Board may (a) adopt the recommendations to the comprehensive plan by ordinance, (b) adopt by ordinance the recommendations with changes, or (c) request the plan commission revisit the changes to the comprehensive plan.

Process for Inclusion in the County Comprehensive Plan

Waushara County Land Use Committee will review the updates to the municipality's comprehensive plan and the lake management plan as referenced by the municipality's comprehensive plan to determine if they are consistent with the County's comprehensive plan. If they are found by the land use committee to not be consistent with the municipality's comprehensive plan, the land use committee may (a) recommend changes to the County's comprehensive plan or (b) ask that an aspect of the lake management plan or municipality's comprehensive plan be revisited. When the Land Use Committee has reached a consensus that the updates to the municipality's comprehensive plan and the lake management plan aligns with the county's vision, and if it is not already consistent, it will develop an amendment to the County's comprehensive plan. The amendment may be include a reference to the lake management plan under local policies in the agricultural, natural and cultural resources background information and the addition of a recommendation to support the lake management plan and to implement the applicable recommendations contained in the lake management. The Land Use Committee will recommend the amendment to the comprehensive plan to the Land, Water, and Education Committee.

The Land, Water, and Education Committee will review the amendment and if it concurs with the recommendation from the Land Use Committee, it will make a recommendation to the Planning & Zoning Committee. The Planning & Zoning Committee will hold a public hearing with a thirty-day class one notice. The Planning & Zoning Committee will recommend by resolution the amendment to the comprehensive plan or the amendment with changes be adopted by the County Board.

The County Board will consider the recommendations from the Planning & Zoning Committee. The County Board may (a) adopt the amendment to the comprehensive plan by ordinance, (b) adopt the amendment with changes, or (c) request the Land Use Committee or Planning & Zoning Committee revisit the changes to the comprehensive plan.

Use of the Comprehensive Plan

The lake management plans as referenced in the comprehensive plans will be used by the County and the Municipality to consider certain actions or in the implementation of zoning and other applicable regulations. The County Board of Adjustments and the County Planning and Zoning Committee may reference the lake management plans as referenced in the comprehensive plan when considering zone changes, variances, conditional uses, and suitable mitigation measures. The Municipality and County may take action as called for in the lake management plan as referenced in the comprehensive plan, including changes to zoning and other applicable regulations, shortly after the County's comprehensive plan has been updated or may take action as needed.

The lake organization, lake residents, riparian property owners, or other citizens may request that the Municipality or County take a specific action to implement aspects of the lake management plan as referenced in the comprehensive plan. The lake organization lake residents, riparian property owners, or other citizens may provide written or oral support to encourage the Municipality and County to reference the lake management plan when considering regulation or action that may impact the lake. The lake organization will inform the Municipality and the County when the lake management plan is updated and allow the Municipality and County an opportunity to participate in the update process.

References

Bartz, David, 2015. The Fisheries of Beans, Big Hills and Little Silver Lakes. Presentation given at the Wild Rose Community Center on April 28, 2015.

Boat Ed, 2013. The Handbook of Wisconsin Boating Laws and Responsibilities. Approved by Wisconsin Department of Natural Resources. www.boat-ed.com

Borman, Susan, Robert Korth, and Jo Temte, 2001. Through the looking glass, a field guide to aquatic plants. Reindl Printing, Inc. Merrill, Wisconsin.

Cason & Associates, LLC, 2011. Comprehensive Lake Management Plan for Big Hills Lake, Waushara County, Wisconsin 2011-2015.

Haney, Ryan, 2015. Water Quality in Beans, Big Hills and Little Silver Lakes. Presentation given at the Wild Rose Community Center on April 28, 2015.

Kraft, George, 2015. Groundwater Pumping and Lake Water Levels. Presentation given at the Wild Rose Village Hall on March 10, 2015.

NES Ecological Services, 2003. Big Hills Lake Comprehensive Lake Management Plan.

Panuska and Lillie, 1995. Phosphorus Loadings from Wisconsin Watershed: Recommended Phosphorus Export Coefficients for Agricultural and Forested Watersheds. Bulletin Number 38, Bureau of Research, Wisconsin Department of Natural Resources.

Shaw, B., C. Mechenich, and L. Klessig, 2000. *Understanding Lake Data*. University of Wisconsin-Extension, Stevens Point. 20 pp.

Stushek, Kaycie, 2015. Aquatic Invasive Species in Beans, Big Hills and Little Silver Lakes. Presentation given at the Wild Rose Village Hall on March 10, 2015.

Turyk, Nancy, 2015. The Aquatic Plants of Beans, Big Hills and Little Silver Lakes. Presentation given at the Wild Rose Village Hall on March 10, 2015.

Turyk, Nancy, 2015. Healthy Land = Healthy Water. Presentation given at the Wild Rose Community Center on April 28, 2015.

UW-Stevens Point Center for Watershed Science and Education, 2014. Waushara County Lake Study - Big Hills Lake 2010-2012. Final Report to Waushara County and Wisconsin Department of Natural Resources.

UW-Stevens Point Center for Watershed Science and Education, 2013. Waushara County Lake Study - Big Hills Lake 2010-2012 Mini-Report. Report to Waushara County and Wisconsin Department of Natural Resources. Planning Meeting Presentations

Vallentyne, J.R., 1974. The Algal Bowl-Lakes and Man. Ottawa Department of the Environment.

Wetzel, R.G., 2001. Limnology, Lake and River Ecosystems, Third Edition. Academic Press. San Diego, California.

Appendices

Appendix A: Waushara County Lake Information Directory

Algae - Blue-Green

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/lakes/bluegreenalgae/

Contact: Wisconsin Department of Health Services
1 West Wilson Street, Madison, WI 53703
Phone: 608-267-3242
Website:
http://www.dhs.wisconsin.gov/eh/bluegreenalgae/contactus.htm

Aquatic Invasive Species/Clean Boats Clean Water

Contact: Golden Sands RC&D
1100 Main St., Suite 150, Stevens Point, WI 54481
Phone: 715-343-6215
Websites: www.goldensandsrcd.org
http://dnr.wi.gov/invasives/

Aquatic Plant Management (Native and Invasive)

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/lakes/plants/

Aquatic Plant Identification

Contact: Golden Sands RC&D
1100 Main St., Suite 150, Stevens Point, WI 54481
Phone: 715-343-6215
Website: www.goldensandsrcd.org

Contact: Dr. Emmet Judziewicz
UWSP Freckmann Herbarium
TNR 301, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-4248
E-mail: ejudziew@uwsp.edu

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov

Aquatic Plant Surveys/Management

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/lakes/plants/

Best Management Practices (rain gardens, shoreland buffers, agricultural practices, runoff controls)

Contact: Ed Hernandez
Waushara County Land Conservation Department
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Boat Landings, Signage, Permissions (County)

Contact: Scott Schuman
Waushara County Parks
PO Box 300, Wautoma, WI 54982
Phone: 920-787-7037
E-mail: wcparks.parks@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/parks.htm

Boat Landings (State)

Contact: Dave Bartz
Wisconsin Department of Natural Resources
Hwy 22N, Box 430, Montello, WI 53949
Phone: 608-635-4989
E-mail: David.Bartz@wisconsin.gov
Website:
http://dnr.wi.gov/org/land/facilities/boataccess/

Boat Landings (Town)

Contact the clerk for the specific town/village in which the boat landing is located.

Citizen Lake Monitoring Network

Contact: Brenda Nordin, Wisconsin Department of Natural Resources
Phone: 920-662-5141
E-mail: brenda.nordin@wisconsin.gov

Conservation Easements

Contact: Gathering Waters Conservancy
211 S. Paterson St., Suite 270, Madison, WI 53703
Phone: 608-251-9131
E-mail: info@gatheringwaters.org
Website: http://gatheringwaters.org/

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov

Contact: Patrick Sorge
Wisconsin Department of Natural Resources
PO Box 4001, Eau Claire, WI 54702
Phone: 715-839-3794
E-mail: Patrick.Sorge@wisconsin.gov

Contact: North Central Conservancy Trust
PO Box 124, Stevens Point, WI 54481
Phone: 715-344-1910
E-mail: info@ncctwi.org
Website: http://www.ncctwi.org/

Contact: NRCS Stevens Point Service Center
1462 Strongs Ave., Stevens Point, WI 54481
Phone: 715-346-1325

Critical Habitat and Sensitive Areas

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/lakes/criticalhabitat/

Dams

Contact: Joe Behlen
Wisconsin Department of Natural Resources
473 Griffith Ave., Wisconsin Rapids, WI 54494
Phone: 715-421-9940
E-mail: joseph.behlen@wisconsin.gov
Website: http://dnr.wi.gov/org/water/wm/dsfm/dams/

Fertilizers/Soil Testing

Contact: Ken Williams
Waushara County UW- Extension
209 S St. Marie St., PO Box 487, Wautoma, 54982
Phone: 920-787-0416
E-mail: ken.williams@ces.uwex.edu
http://waushara.uwex.edu/agriculture/services

Fisheries Biologist (management, habitat)

Contact: Dave Bartz
Wisconsin Department of Natural Resources
Hwy 22N, Box 430, Montello, WI 53949
Phone: 608-635-4989
E-mail: David.Bartz@wisconsin.gov
Website: http://dnr.wi.gov/fish/

Frog Monitoring—Citizen Based

Contact: Andrew Badje, Wisconsin Department of Natural Resources
Phone: 608-266-3336
E-mail: Andrew.badje@wisconsin.gov
E-mail: WFTS@wisconsin.gov

Grants

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/Aid/Grants.html#tabx8

Contact: Ed Hernandez
Waushara County Land Conservation Department
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Groundwater Quality

Contact: Kevin Masarik
UWSP Center for Watershed Science & Education
TNR 224, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-4276
E-mail: kmasarik@uwsp.edu
Website: http://www.uwsp.edu/cnr/watersheds/

Groundwater Levels/Quantity

Contact: Ed Hernandez
Waushara County Land Conservation Department
Address: PO Box 1109 Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us

Contact: George Kraft
UWSP Center for Watershed Science & Education
TNR 224, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-2984
E-mail: george.kraft@uwsp.edu

Groundwater Levels/Quantity (Cont'd)

Contact: Scott Provost
Wisconsin Department of Natural Resources
473 Griffith Ave., Wisconsin Rapids, WI 54494
Phone: 715-421-7881
E-mail: scott.provost@wisconsin.gov
Website:
http://prodoasext.dnr.wi.gov/inter1/hicap$.startup

Informational Packets

Contact: UWSP Center for Watershed Science & Education
TNR 224, 800 Reserve St. Stevens Point, WI 54481
Phone: 715-346-2497
E-mail: pclakes@uwsp.edu

Lake Groups – Friends, Associations, Districts

Contact: Patrick Nehring
UWEX Economic Resource Development Agent
PO Box 487, Wautoma, WI 54982
Phone: 920-787-0416
E-mail: Patrick.nehring@ces.uwex.edu

Contact: Patrick Goggin
UWEX Lakes
TNR 203, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-365-8943
E-mail: pgoggin@uwsp.edu
Website:
http://www.uwsp.edu/cnr/uwexlakes/organizations/

Contact: Eric Olson
UWEX Lakes
TNR 206, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-2192
E-mail: eolson@uwsp.edu
Website:
http://www.uwsp.edu/cnr/uwexlakes/organizations/

Contact: Susan Tesarik
Wisconsin Lakes
4513 Vernon Blvd., Suite 101, Madison, WI 53705
Phone: 1-800-542-5253
E-mail: lakeinfo@wisconsinlakes.org
Website: http://wisconsinlakes.org/

Lake Levels

See: Groundwater

Lake-Related Law Enforcement (no-wake, transporting invasives, etc.)

Contact: Ben Mott, State Conservation Warden
Wisconsin Department of Natural Resources
427 E. Tower Drive, Suite 100, Wautoma, WI 54982
Phone: 920-896-3383
Website: http://www.wigamewarden.com/

Land Use Plans and Zoning Ordinances

Contact: Terri Dopp-Paukstat
Waushara County Planning and Zoning
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Land Use Plans and Zoning Ordinances (cont'd)

Contact: UWSP Center for Land Use Education
TNR 208, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-3783
E-mail: Center.for.Land.Use.Education@uwsp.edu
Website: http://www.uwsp.edu/cnr/landcenter/

Nutrient Management Plans

Contact: Ed Hernandez
Waushara County Land Conservation Department
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Contact: NRCS Stevens Point Service Center
1462 Strongs Ave., Stevens Point, WI 54481
Phone: 715-346-1325

Parks (County)

Contact: Scott Schuman
Waushara County Parks
PO Box 300, Wautoma, WI 54982
Phone: 920-787-7037
E-mail: wcparks.parks@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/parks.htm

Purchase of Development Rights

Contact: North Central Conservancy Trust
PO Box 124, Stevens Point, WI 54481
Phone: 715-341-7741
E-mail: info@ncctwi.org
Website: http://www.ncctwi.org/

APPROVED OCTOBER 1, 2016

Purchase of Land

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov
Website: http://dnr.wi.gov/topic/stewardship/

Rain Barrels – Order

Contact: Golden Sands RC&D
1100 Main St., Suite 150, Stevens Point, WI 54481
Phone: 715-343-6215
Website: http://www.goldensandsrcd.org/store

Rain Gardens and Stormwater Runoff

Contact: Ed Hernandez
Waushara County Land Conservation Department
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Septic Systems/Onsite Waste

Contact: Terri Dopp-Paukstat
Waushara County Planning and Zoning
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Shoreland Management

Contact: Ed Hernandez
Waushara County Land Conservation Department
PO Box 1109, Wautoma, WI 54982
Phone: 920-787-0453
E-mail: lcdzoning.courthouse@co.waushara.wi.us
Website: http://www.co.waushara.wi.us/zoning.htm

Shoreland Vegetation

http://dnr.wi.gov/topic/ShorelandZoning/

Shoreland Zoning Ordinances

See: Land Use Plans and Zoning Ordinances

Soil Fertility Testing

Contact: Ken Williams
Waushara County UW- Extension
209 S St. Marie Street, PO Box 487, Wautoma, WI 54982
Phone: 920-787-0416
E-mail: Ken.williams@ces.uwex.edu
Website: http://waushara.uwex.edu/index.html

Water Quality Monitoring

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov

Water Quality Problems

Contact: Ted Johnson
Wisconsin Department of Natural Resources
Phone: 920-424-2104
E-mail: TedM.Johnson@wisconsin.gov

Contact: Nancy Turyk
UWSP Center for Watershed Science and Education
TNR 216, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-4155
E-mail: nturyk@uwsp.edu

Wetlands

Contact: Keith Patrick
Wisconsin Department of Natural Resources
5301 Rib Mountain Drive, Wausau, WI 54401
Phone: 715-241-7502
E-mail: keith.patrick@wisconsin.gov
Website: http://dnr.wi.gov/wetlands/

Contact: Wisconsin Wetlands Association
214 N. Hamilton Street, #201, Madison, WI 53703
Phone: 608-250-9971
Email: info@wisconsinwetlands.org

Wetland Inventory

Contact: Dr. Emmet Judziewicz
UWSP Freckmann Herbarium
TNR 301, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-4248
E-mail: ejudziew@uwsp.edu

Woody Habitat

Contact: Dave Bartz, Wisconsin Department of Natural Resources
Phone:608-635-4989
Address: Hwy 22N Box 430, Montello, WI 53949
E-mail: David.Bartz@wisconsin.gov

If you are looking for any information that is not listed in this directory, please contact:
Ryan Haney (wclakes@uwsp.edu)
UWSP Center for Watershed Science and Education
TNR 224, 800 Reserve St., Stevens Point, WI 54481
Phone: 715-346-2497

Appendix B: Aquatic Plant Management Strategies and 2013 Map of EWM in Big Hills Lake

General recommendations:

- Reduce nutrients traveling to the lake from the landscape.
- Avoid increasing algal blooms by maintaining a healthy amount of aquatic plants.
- Don't denude the lakebed.
    - Increases potential for aquatic invasive species establishment.
    - Sediments can add phosphorus to the water which may lead to increased algal growth.
- Choose options that are appropriate for your lake's situation.
- Monitor and adjust your strategies if you are not making headway!

List of Aquatic Plant Management Options (selection of options varies with situation):

No Action (option for Big Hills Lake)

ADVANTAGES

- No associated cost.
- Least disruptive to lake ecosystem.

LIMITATIONS

- May not be effective in achieving aquatic plant management objectives.

Hand Pulling (option for Big Hills Lake)

ADVANTAGES

- Can be used for thinning aquatic plants around docks.
- Can target specific plants - with proper training.
- Can be effective in controlling small infestations of aquatic invasive species.
- No associated cost.

LIMITATIONS

- Removes near-shore wildlife and fish habitat.
- Opens up areas where invasives can become established.
- If aquatic invasive species are not pulled properly, could worsen the problem.
- Cost associated with hiring diver for deep areas.

Hand Pulling Using Suction (option for Big Hills Lake)

ADVANTAGES

- Can be used for thinning plants around docks.
- Can be used in deeper areas (with divers).
- Can target specific plants with proper training.
- Can be effective in controlling small infestations of aquatic invasive species.
- May be useful in helping to remove upper root mass of aquatic invasive species.

LIMITATIONS

- Costs associated with hiring a diver may be comparable to chemical treatment expenses.
- Currently an experimental treatment – not readily available.
- If aquatic invasive species are not pulled properly, could worsen the problem.

Mechanical Harvesting (not a good option for EWM in Big Hills Lake)

ADVANTAGES

∗ Removes plant material and nutrients.
∗ Can target specific locations.
∗ Used to manage larger areas for recreational access or fishery management.

LIMITATIONS

∗ Not used in water depths less than 3 feet.
∗ Some harm to aquatic organisms.
∗ Is a temporary control.
∗ Risk of introduction of new aquatic invasive species (on a hired harvester) or spread of some existing invasive species.
∗ Hired cost at least $150/hr.

Water Level Manipulation (not an option for Big Hills Lake)

ADVANTAGES

∗ Controls aquatic plants in shallower, near-shore areas.
∗ Can be low cost.

LIMITATIONS

∗ Requires a controlling structure on the lake.
∗ May cause undesired stress on ecosystem.
∗ Cannot be used frequently.

Milfoil Weevils (may be an option for Big Hills Lake)

ADVANTAGES

∗ Natural, native maintenance of native and exotic milfoils.
∗ Prefers the aquatic invasive Eurasian Watermilfoil.
∗ Some lakes may already have a native populations; need a professional stem count and assessment of shoreland health, structure of fishery, etc.
∗ Doesn't harm lake ecosystem.

LIMITATIONS

∗ Require healthy shoreline habitat for overwintering.
∗ Cannot survive in areas of mechanical harvesting or herbicide application.
∗ Effectiveness highly variable between lakes (only works well for some lakes).
∗ Limited access to weevils for purchase in WI.
∗ Still considered experimental.

Chemical Treatment: Spot (option for Big Hills Lake)

ADVANTAGES

∗ May be less destructive to lake ecosystem than lake-wide treatment.

LIMITATIONS

∗ Only considered in lakes with aquatic invasive plants.
∗ Usually not fully effective in eradicating target species.
∗ Contaminants may remain in sediment.
∗ Effects on lake ecosystem not fully understood.
∗ Does not remove dead vegetation, which depletes oxygen and releases nutrients, adds to build-up of muck.
∗ Extra nutrients may spur additional aquatic plant and algae growth.

APPROVED OCTOBER 1, 2016

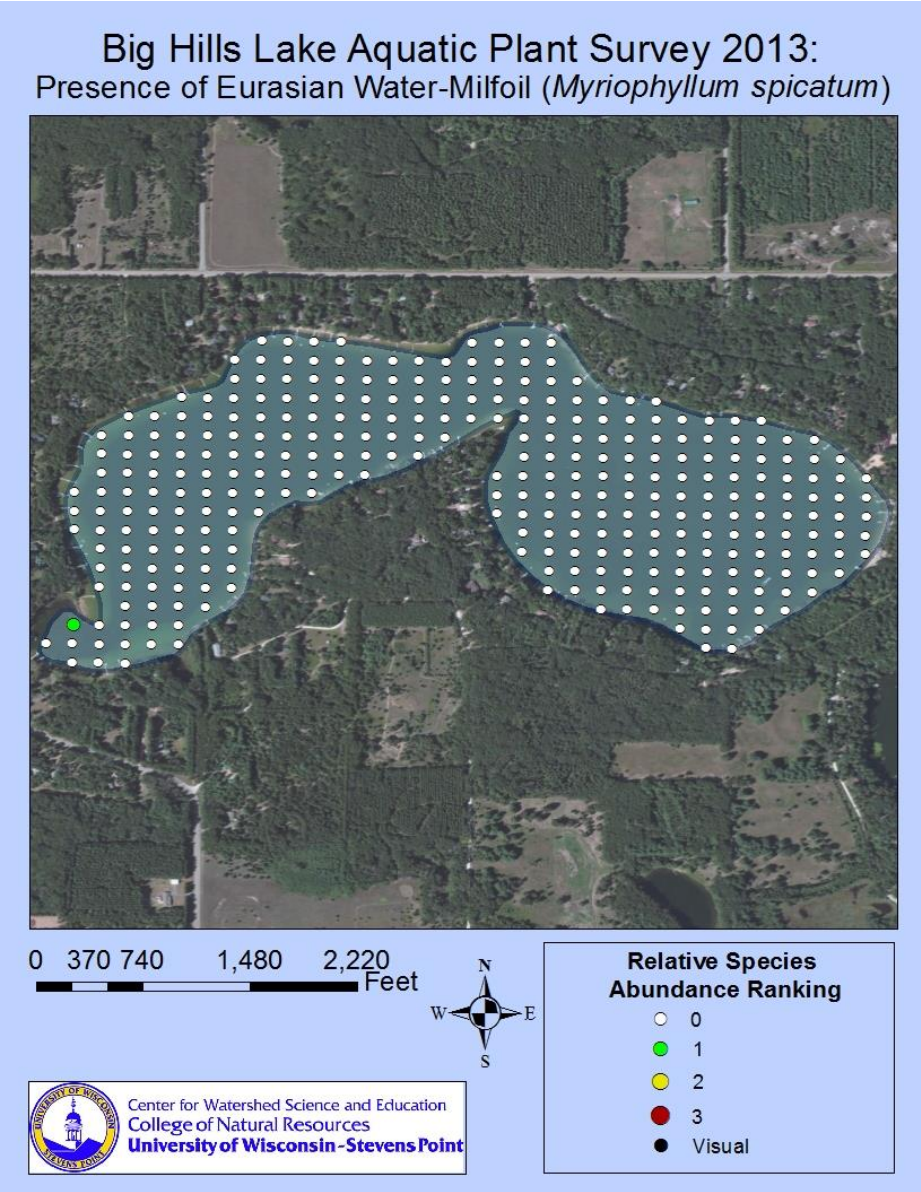
Chemical Treatment: Lake-wide (option for Big Hills Lake)

ADVANTAGES

* May reduce aquatic invasives for a time.
* Treatment not needed as frequently.

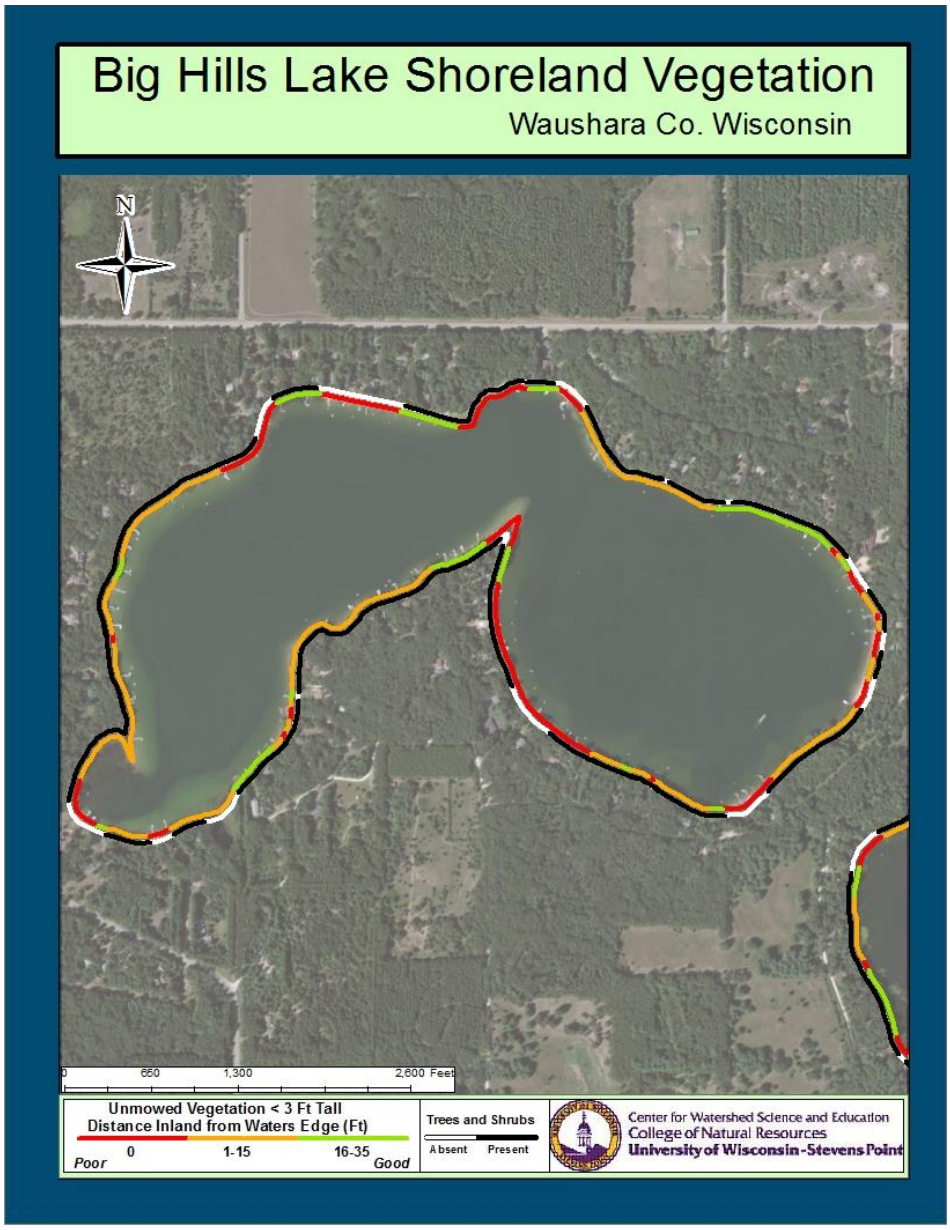
LIMITATIONS

* Only considered in lakes with aquatic invasive plants.
* Usually not fully effective in eradicating target species.
* Contaminants may remain in sediment.
* Does not remove dead vegetation, which depletes oxygen and releases nutrients, adds to build-up of muck.
* Extra nutrients may spur additional aquatic plant and algae growth.
* Negatively affects native vegetation.
* Effects on lake ecosystem not fully understood.
* Opens up space once taken up by natives for invasive species to colonize once again.
* ~$4000 per 5 acres.



Appendix C: Shoreland Survey – 2010

A scoring system was developed for the collected data to provide a more holistic assessment. Areas that are healthy will need strategies to keep them healthy, and areas with potential problem areas and where management and conservation may be warranted may need a different set of strategies for improvement. The scoring system is based on the presence/absence and abundance of shoreline features, as well as their proximity to the water's edge. Values were tallied for each shoreline category and then summed to produce an overall score. Higher scores denote a healthier shoreline with good land management practices. These are areas where protection and/or conservation should be targeted. On the other hand, lower scores signify an ecologically unhealthy shoreline. These are areas where management and/or mitigation practices may be desirable for improving water quality.

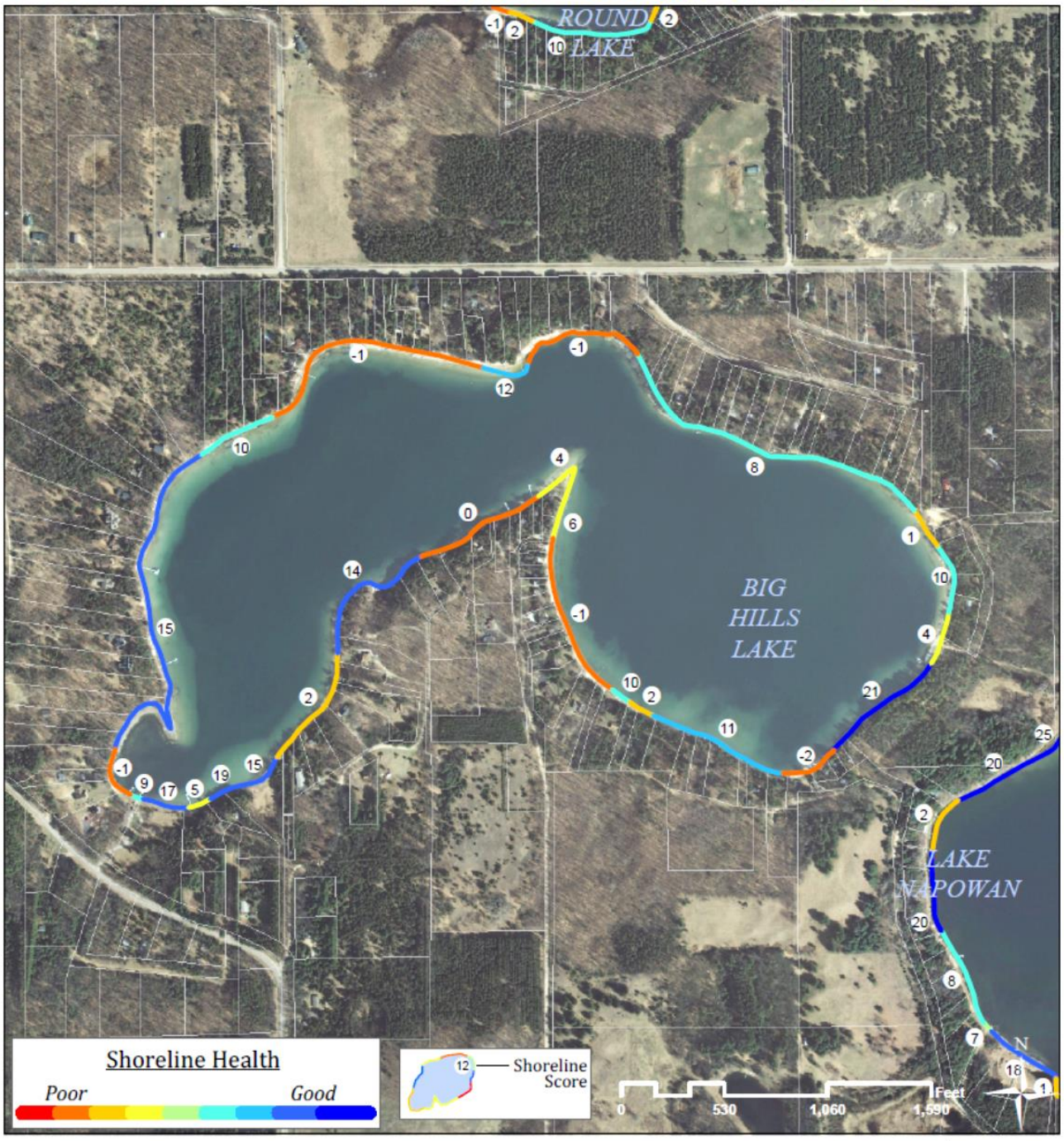


The summary of scores for shorelands around Big Hills Lake is displayed to the right. The shorelands were color-coded to show their overall health based on natural and physical characteristics. Blue shorelands identify healthy shorelands with sufficient vegetation and few disturbances. Red shorelands indicate locations where changes in management or mitigation may be warranted. Large stretches of Big Hills Lake's shorelands are in fair shape with challenges that should be addressed. Some stretches were ranked as poor. For a more complete understanding of the ranking, an interactive map showing results of the shoreland surveys can be found on Waushara County's website at http://gis.co.waushara.wi.us/ShorelineViewer/.

Waushara County Shoreline Assessment

Map Date -- July, 2011
Aerial Date -- April, 2010

BIG HILLS LAKE



Summary

Shorelines are color-coded to show their overall health based on natural and physical characteristics. For example, shorelines shown in red indicate locations where management or mitigation may be warrented. Blue shorelines mark healthy riparian areas with natural vegetation and few human influences.

Calculating Shoreline Scores

Scores are based on the presence/absence of:

+ Natural vegetation
+ Human influences (docks, boathouses, etc)
+ Erosion
+ Structures

Center for Land Use Education

Map created by Dan McFarlane
Center for Land Use Education

Appendix D: Lake User Survey Results

Big Hills Lake District

2010 Lake Study – Owner Survey

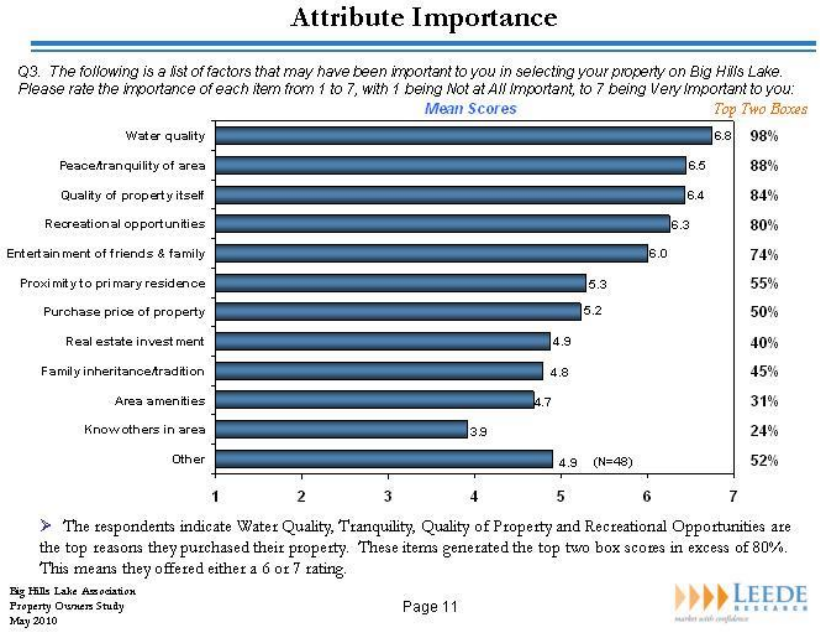
Executive Summary:

The following is the summary of the Owner's Survey completed for the Big Hills Lake Management District in 2010. Leede Research, a Manitowoc marketing information company, completed the study. It should be noted that the CEO of Leede is a property owner on the lake and that this study was donated as part of the overall Lake Study completed by Cason Associates. Information in this summary is part of a full report presented to the district.

Study Methodology

The 2010 Owner Study was part of the overall Lake Study completed in the district. Cason Associates was the firm selected to complete the Lake Study and Leede Research offered to donate the required Owner's Survey to aid in the process. This is a required portion of the study process and is designed to provide district management with information on how the property owners in the district use the lake and feel about its management and future operations.

Leede Research is pleased to be able to donate this program to the Big Hills Lake Management District and the related property owners. While we do this work everyday for a living it is always great to support work that you believe in and can add value to. We offer this survey as a professionally done research program using the same techniques and standards used by business and government. We have prepared reporting that should both meet the needs of the consultants and the owners. We welcome any comments and questions regarding this work.



Leede was pleased with the owner participation in the study. Completing 100 of 134 completed interviews is very solid and indicates a high level of interest and involvement by property owners in the district. The response has generated a statistically valid sample with a reasonable error factor. The study clearly represents the views of the owners on Big Hills Lake.

Study Results

The following is a summary of the results of the full study. Please note this hits some of the highlights of the survey and is not meant to replace a full review of the study information. There is an email contact for Leede Research at the end of this document. For more information please contact our offices.

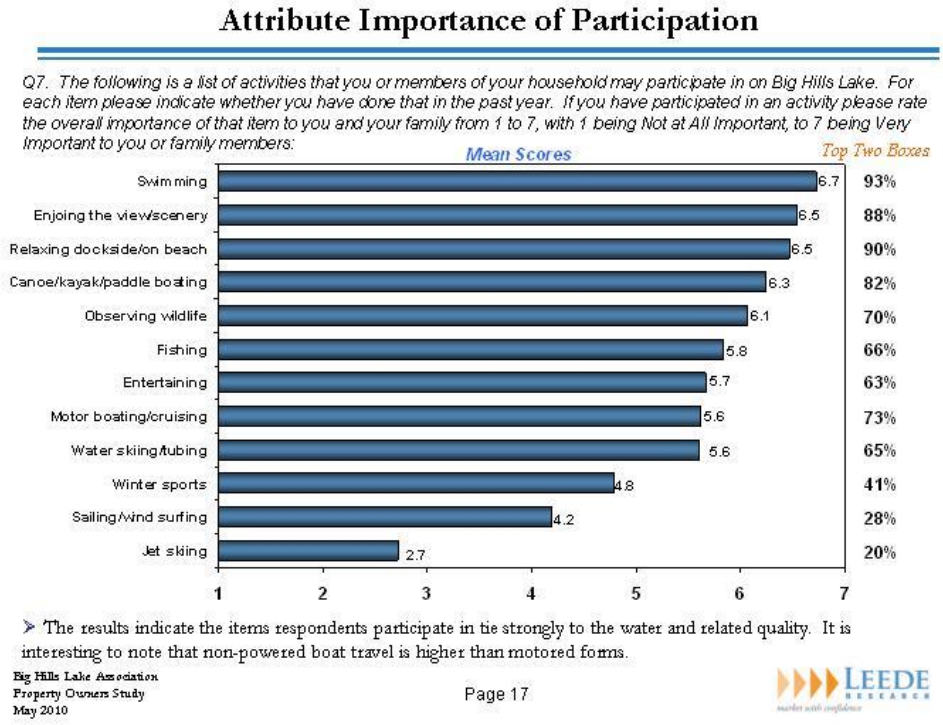
The strong response seen to the survey means that the results presented in this summary should represent the overall property owners of the district within ±5%, based on 95% confidence. The results indicate that 48% of respondents were Seasonal. There were 35% that were Year Round Occasional and 17% that were Permanent residents.

For those who were not permanent, 75% were from cities in Wisconsin. They spent a mean of 68 days at the property and were generally over 55 years of age. They have owned the property for a mean of 21 years. We find that 66% of respondents have children on their property either Often or Always. This should be considered when reviewing the results.

The graphic above indicates the relative importance of key attributes in their purchase and ownership of the property. We see that Water Quality, Peace and Tranquility and the Quality of the Property are the top items. Knowing Others in the Area had the lowest mean at just below 4.0. There were several questions in the study that reinforced the importance of maintaining water quality on Big Hills Lake.

Respondents indicate that Sand Beach, Piers and Boat Hoists are the most common features of lake frontage on their properties. There are 38% who indicate sparse vegetation an a quarter indicate having rock or retaining walls. There are also a quarter of respondents indicating heavy vegetation.

When asked what they would change about Big Hills Lake if they were in charge of things the largest response was for Boat Size Restrictions at 16%. Ten percent would Not Allow Jet Skis. There are 7% who would Stock More Fish, with the same percentage indicating they would Close the Public Landing.



The chart to the right references the importance of different activities to respondents overall use of the lake. We see that Swimming is the top feature with a 6.7 on the 7-point measurement scale. Four items rate above a 6.0 and we see another four are between 5.5 and 6.0. These are

all of strong importance and most are tied specifically to the water. This reinforces the importance of water quality in the overall experience.

While we tend to take the most notice of the larger, motorized watercraft on the lake the largest response in the survey was for Canoe/Kayak at 71% followed by Rowboat at 61%. The different types of motorize craft follow with 41% have an Inboard Runabout. There are 31% with Runabouts with 25hp+. The strong use of non-motorized craft may be a factor in the earlier desire to limit boat size.

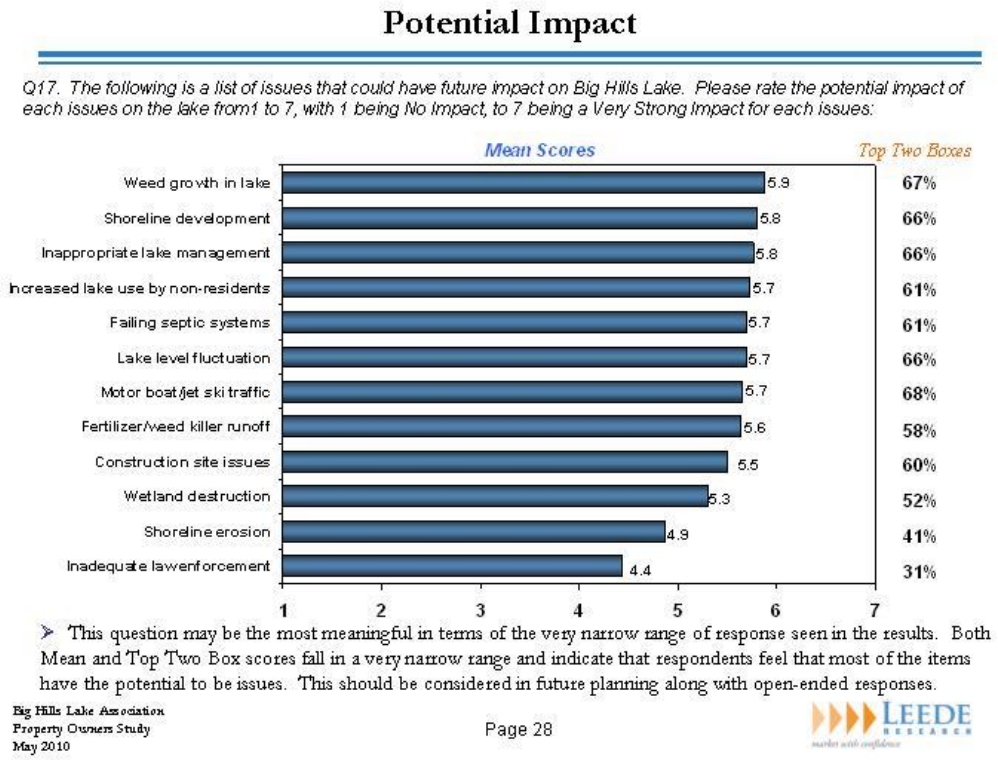
A section of the study looked at the use of fertilizers and weed killers and we see that 11% use fertilizers and 16% use weed killers. Of those using products we see that 70% indicate there is not phosphorus in them. This indicates a general awareness of related issues and concerns for the impact it can have on the lake.

Respondents rate the clarity of the lake a 5.7 on the 7-point scale used. There are 63% who give a 6 or 7 for clarity. Heavy Boat Use is seen as the main issue when clarity is poor with a 77% response. Summer season and Low Lake Levels are seen as secondary factors.

Seventy percent of respondents believe that Big Hills currently has a "Healthy Amount of Plants". There is almost an even split between the balance of people as to whether there are too many or too few. It should be noted that this is most likely based on experience during 2009 as the survey was completed prior to weeds being in full bloom in 2010. Just under 45% of respondents feel that there is a need for Aquatic Plant Control on the lake with over two-thirds favoring both Cutting and Chemical solutions to the issue.

There are mixed feelings expressed on the issue of Law Enforcement on the lake. We see 44% believe there is adequate enforcement but there are 27% who feel there is not. The remaining 28% are not sure and this would generally indicate there are at least some concerns on the issue. Regulations do not appear to be the issue as 72% feel the lake is sufficiently regulated. Those who feel the lake is under regulated feel there needs to be size restrictions, changes in the no-wake hours and more enforcement. There are a few responses for eliminating jet skis.

A set of questions asked respondents to rate the potential impact that certain situations and events could have on the future of Big Hills Lake. The chart on this page references those results and shows that many of these issues fall in a very narrow range of both mean scores and top-two box ratings. The tight response may be an indication that there is generally strong concern about the future of the lake and that the issues brought out in the questionnaire are real items for the respondents.



When asked whether they they have the ability to offer input into the management of the Lake fell District we see that 71% believe they do. For the group that does not, there were no significant barriers that were a factor of the district or its management. Age and home location were seen as the biggest barriers. This is positive and demonstrates that property owners feel they can bring issues to the management group.

The respondents were asked to rate their Overall Satisfaction with the management of Big Hills Lake. We see the mean score is a solid 5.5, with 62% giving one of the top-two ratings. There are only three responses that fall below average. While this is positive there is room for improvement in this rating.

There are 60% of respondents who have attended an Annual Meeting of the Big Hills Lake District in the past three years. This group was reviewed to determine differences in thoughts or satisfaction between those property owners attending meetings and those who do not. This showed that those who attend these meetings tend to have greater involvement with the lake and their property. They tend to be older and have been on the lake a greater number of years. There are some other interesting differences that can be reviewed in the full tabular reporting of the project. Leede also segmented a number of other respondent groups from the survey. This is designed to provide the district with more detailed information for future decisions. Question and response in the survey can be analyzed through cross tabulation to provide detailed information.

Leede's Perspective on Results

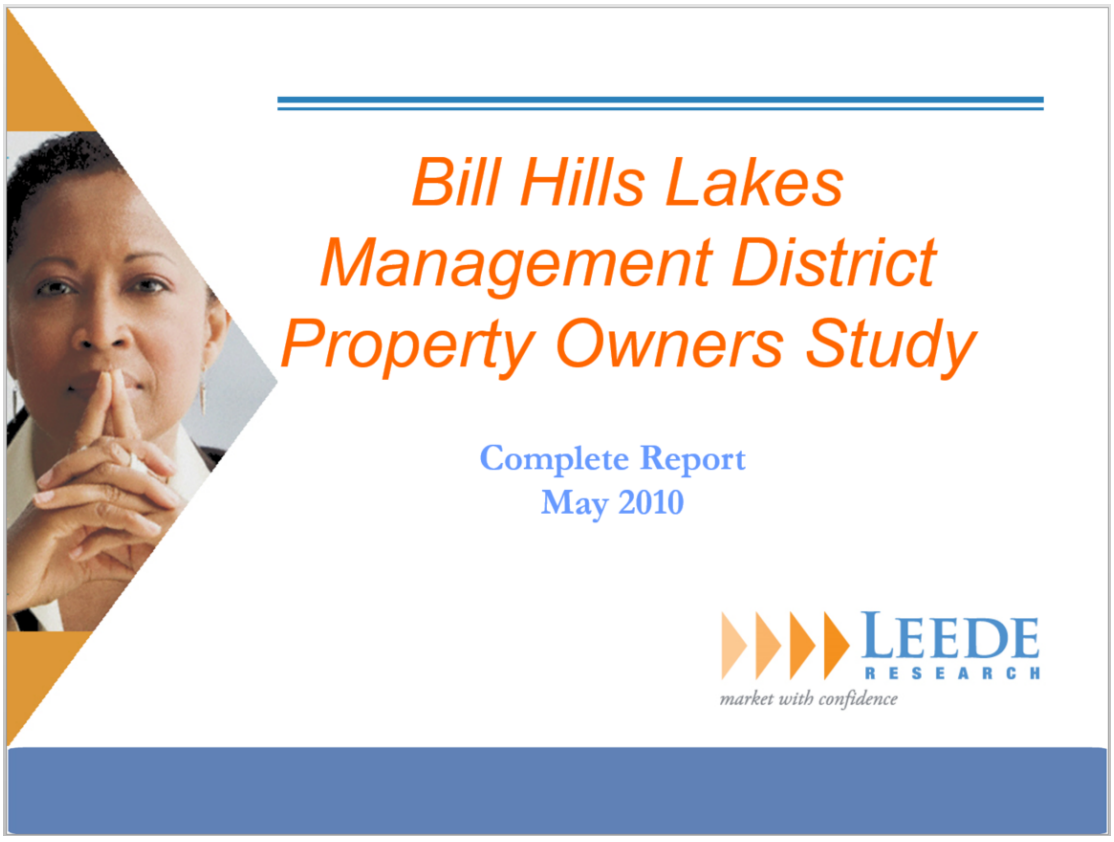
Leede Research has been conducting consumer surveys since 1982 and has interviewed over 4 million people in its history. This deep experience has given Leede a unique perspective in reviewing results. It appears there is a singular,

over-whelming message for district management. That is to TAKE CARE OF THE LAKE! The water, its quality, access and use are the driving issues in this study. That should be noted in future decision-making.

Taking care of the lake may, at times, involve decisions that are not popular in the general public. Decisions must be balanced to address public use based on the lake's public access and the government involvement and funding of the lake. It is clear that public lake access is an important recreational feature of Waushara County and contributes to tourism and the overall economy.

Leede Research is pleased to be able to donate this survey and additional information is available by request through contact with dean@leede.com.

Complete survey results are imbedded below.

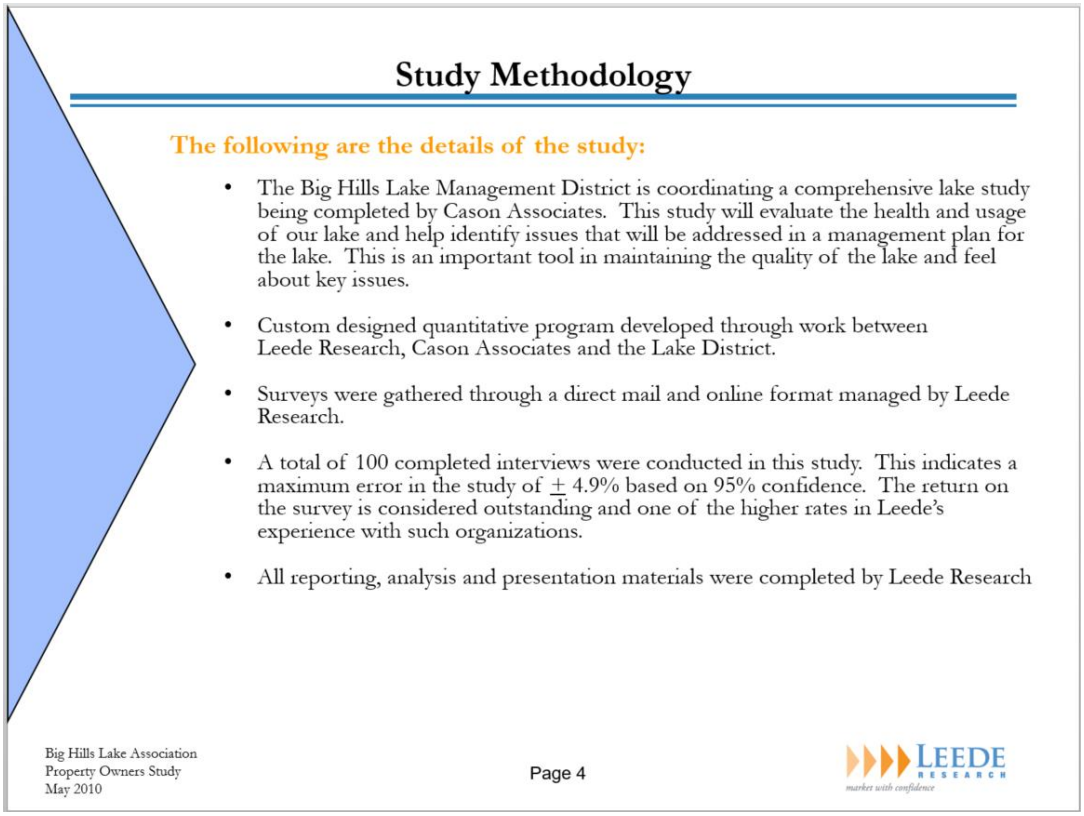


Leede Research

Who we are:

- Leede Research was founded in 1982 by current CEO, Dean Halverson based on computer software written as a college student.
- The company has grown to a staff of 85 information professionals with offices in Minneapolis and Manitowoc, Wisconsin. Leede offers full-service qualitative and quantitative research programs and is a nationally recognized leader in website usability testing. We also have experience in ethnography and persona development.
- Leede Research has a strong base in customer satisfaction, loyalty and marketing tracking systems.
- Leede Research has worked with a wide range of nationally recognized consumer packaged goods, financial services and healthcare. Our experience includes work with a variety of government entities and non-profit organizations.
- Leede's work is custom designed, bringing to the table over 27 years of market research experience.


Some of Our Consumer Goods Clients
Andersen Windows • Doors
KI Furnishing Knowledge
Fellowes The World's Toughest Shredders
ROCKLINE INDUSTRIES
SHOPKO my life. my style. my store.
Verlo Mattress Factory Stores
BEST BUY
Gillette
BEMIS
TARGET
Weyerhaeuser
3M
LEVOLOR
General Mills
Ariens
SC Johnson A Family Company
Kimberly-Clark
KWIK TRIP
THE BOLD LOOK OF KOHLER
CELLULARONE
OshKosh B'gosh
RUUD LIGHTING
Anchor Hocking
Master Lock
LEEDE RESEARCH
market with confidence
May 2010


Study Methodology
The following are the details of the study:
• The Big Hills Lake Management District is coordinating a comprehensive lake study being completed by Cason Associates. This study will evaluate the health and usage of our lake and help identify issues that will be addressed in a management plan for the lake. This is an important tool in maintaining the quality of the lake and feel about key issues.
• Custom designed quantitative program developed through work between Leede Research, Cason Associates and the Lake District.
• Surveys were gathered through a direct mail and online format managed by Leede Research.
• A total of 100 completed interviews were conducted in this study. This indicates a maximum error in the study of ± 4.9% based on 95% confidence. The return on the survey is considered outstanding and one of the higher rates in Leede's experience with such organizations.
• All reporting, analysis and presentation materials were completed by Leede Research
Big Hills Lake Association
Property Owners Study
May 2010
Page 4
LEEDE RESEARCH
market with confidence

Study Details

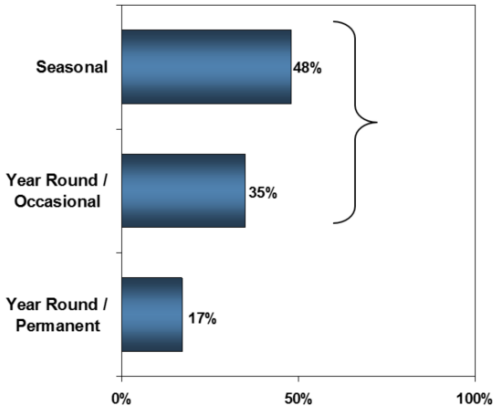
Big Hills Lake Association
Property Owners Study
May 2010

Page 5

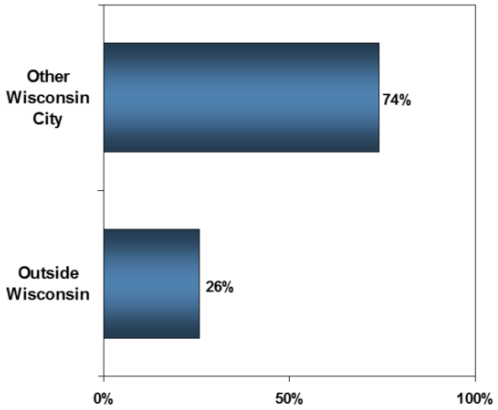
LEEDE RESEARCH
market with confidence

Residency Status

Q1. Which of the following best describes your residency status?



Q1b. If not permanent, Which of the following best describes the location of your primary residence?



➢ Respondents were primarily Seasonal Residents but there is a significant portion that are Year Round Occasional. There are 17% of respondents who consider themselves Permanent. Most are from some area of Wisconsin, though a full quarter are from outside.

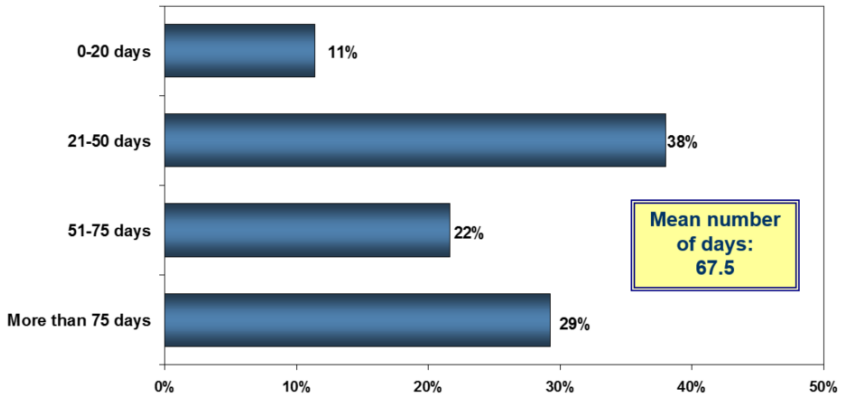
Big Hills Lake Association
Property Owners Study
May 2010

Page 6

LEEDE RESEARCH
market with confidence

Number of Days at Property

Q1a. Approximately how many days per year are you at the property?



➢ There is a significant variation in the number of days spent on the respondent's properties. The mean is 67 days with almost 30% of respondents spending more than 75 days per year at their property.

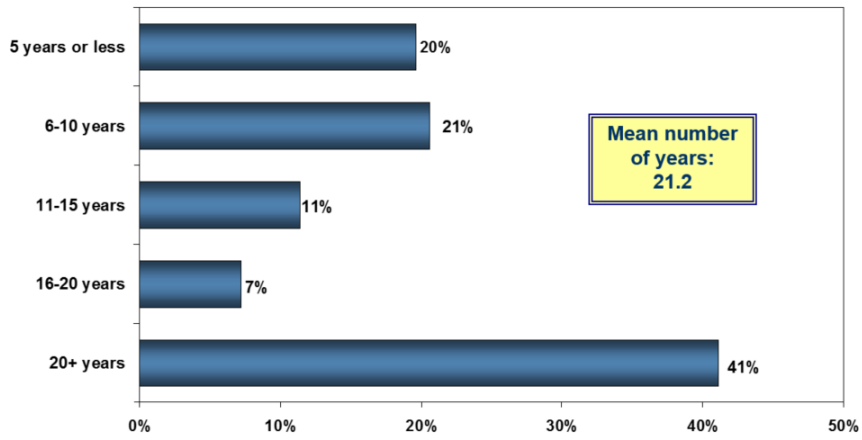
Big Hills Lake Association
Property Owners Study
May 2010

Page 7

LEEDE RESEARCH
market with confidence

Length of Ownership

Q2. How long have you owned the property?



➢ There are many long-term property owners generating a mean response of 21years. This means there were as many respondents above that number as below. We see there are about one in five respondents who are recent owners and have been on the lake five years or less. This may be a factor of further analysis.

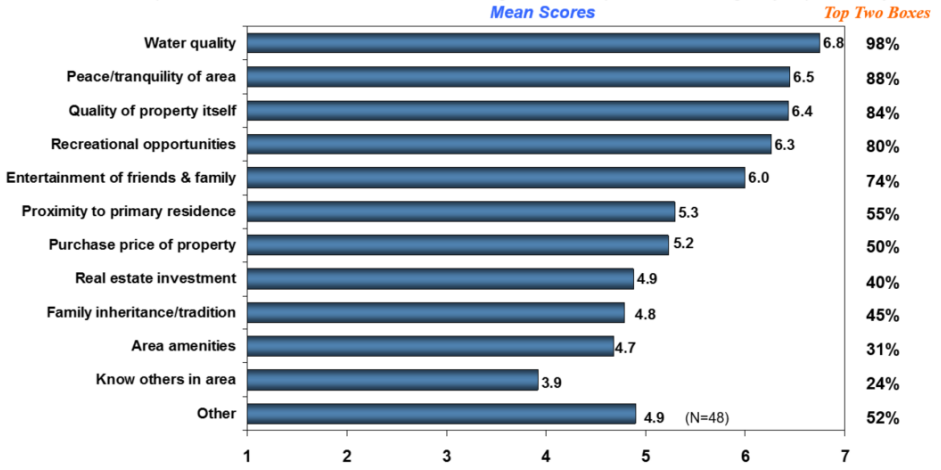
Big Hills Lake Association
Property Owners Study
May 2010

Page 8

LEEDE RESEARCH
market with confidence

Attribute Importance

Q3. The following is a list of factors that may have been important to you in selecting your property on Big Hills Lake. Please rate the importance of each item from 1 to 7, with 1 being Not at All Important, to 7 being Very Important to you:



➢ The respondents indicate Water Quality, Tranquility, Quality of Property and Recreational Opportunities are the top reasons they purchased their property. These items generated the top two box scores in excess of 80%. This means they offered either a 6 or 7 rating.

Big Hills Lake Association
Property Owners Study
May 2010

Page 9

LEEDE RESEARCH
market with confidence

Response by Type of Owner

		Q1. Residency status			
		Base	Seasonal	Year round/permanent	Year-round/Occasional
Q3a. Quality of property itself	Base	100	48	17	35
	Not at all important	-	-	-	-
	2	1%	2%	-	-
	3	-	-	-	-
	Neither Important or Unimportant	5%	4%	12%	3%
	5	10%	8%	18%	9%
	6	16%	19%	6%	17%
	7-Very Important	67%	67%	59%	71%
	Don't Know	1%	-	6%	-
Q3b. Real estate investment	Base	100	48	17	35
	Not at all important	7%	10%	6%	3%
	2	5%	4%	12%	3%
	3	4%	2%	6%	6%
	Neither Important or Unimportant	21%	23%	18%	20%
	5	21%	27%	6%	20%
	6	16%	17%	18%	14%
	7-Very Important	22%	12%	29%	31%
	Don't Know	4%	4%	6%	3%
Q3c. Recreational opportunities	Base	100	48	17	35
	Not at all important	-	-	-	-
	2	-	-	-	-
	3	1%	2%	-	-
	Neither Important or Unimportant	6%	2%	24%	3%
	5	13%	8%	6%	23%
	6	25%	21%	35%	26%
	7-Very Important	53%	65%	29%	49%
	Don't Know	2%	2%	6%	-
Q3d. Purchase price of property	Base	100	48	17	35
	Not at all important	6%	8%	12%	-
	2	2%	-	-	6%
	3	1%	2%	-	-
	Neither Important or Unimportant	21%	17%	24%	26%
	5	16%	27%	-	9%
	6	16%	12%	18%	20%
	7-Very Important	29%	27%	29%	31%
	Don't Know	9%	6%	18%	9%

		Q1. Residency status			
		Base	Seasonal	Year round/permanent	Year-round/Occasional
Q3e. Proximity to primary residence	Base	100	48	17	35
	Not at all important	9%	4%	24%	9%
	2	1%	2%	-	-
	3	2%	4%	-	-
	Neither Important or Unimportant	9%	6%	18%	9%
	5	20%	27%	6%	17%
	6	23%	31%	6%	20%
	7-Very Important	28%	21%	24%	40%
	Don't Know	8%	4%	24%	6%
Q3f. Area amenities	Base	100	48	17	35
	Not at all important	7%	10%	12%	-
	2	4%	6%	6%	-
	3	4%	4%	-	6%
	Neither Important or Unimportant	25%	29%	6%	29%
	5	26%	29%	12%	29%
	6	15%	10%	24%	17%
	7-Very Important	14%	8%	18%	20%
	Don't Know	5%	2%	24%	-
Q3g. Peace/tranquility of area	Base	100	48	17	35
	Not at all important	1%	2%	-	-
	2	-	-	-	-
	3	1%	-	6%	-
	Neither Important or Unimportant	3%	-	-	9%
	5	7%	12%	-	3%
	6	20%	25%	12%	17%
	7-Very Important	65%	60%	65%	71%
	Don't Know	3%	-	18%	-
Q3h. Entertainment of friends and family	Base	100	48	17	35
	Not at all important	1%	-	6%	-
	2	1%	-	-	3%
	3	-	-	-	-
	Neither Important or Unimportant	7%	6%	18%	3%
	5	17%	17%	18%	17%
	6	32%	38%	24%	29%
	7-Very Important	40%	38%	29%	49%
	Don't Know	2%	2%	6%	-

Big Hills Lake Association
Property Owners Study
May 2010

Page 10

LEEDE RESEARCH
market with confidence

Response by Type of Owner

		Q1. Residency status			
		Base	Seasonal	Year round/permanent	Year-round/Occasional
Q3i. Family inheritance/tradition	Base	100	48	17	35
	Not at all important	13%	10%	24%	11%
	2	4%	6%	-	3%
	3	5%	4%	6%	6%
	Neither Important or Unimportant	15%	12%	18%	17%
	5	15%	12%	12%	20%
	6	15%	23%	12%	6%
	7-Very Important	27%	31%	12%	29%
	Don't Know	6%	-	18%	9%
Q3j. Know others in the area	Base	100	48	17	35
	Not at all important	20%	25%	12%	17%
	2	8%	2%	6%	17%
	3	4%	2%	-	9%
	Neither Important or Unimportant	26%	29%	18%	26%
	5	15%	17%	24%	9%
	6	12%	12%	12%	11%
	7-Very Important	11%	12%	12%	9%
	Don't Know	4%	-	18%	3%
Q3k. Water Quality	Base	100	48	17	35
	Not at all important	-	-	-	-
	2	-	-	-	-
	3	-	-	-	-
	Neither Important or Unimportant	2%	-	-	6%
	5	-	-	-	-
	6	18%	23%	12%	14%
	7-Very Important	76%	75%	71%	80%
	Don't Know	4%	2%	18%	-
Q3l. Other	Base	100	48	17	35
	Not at all important	9%	4%	24%	9%
	2	-	-	-	-
	3	-	-	-	-
	Neither Important or Unimportant	14%	12%	12%	17%
	5	-	-	-	-
	6	5%	4%	-	9%
	7-Very Important	20%	23%	12%	20%
	Don't Know	52%	56%	53%	46%

- There are some variations by the type of owner that should be noted. Seasonal user place less importance on the Real Estate Investment and more on Recreational Opportunities and Family Tradition. The Year Round Occasional respondents indicate a stronger importance on the Quality of the Property, Real Estate Investment, Proximity to Primary Residence, Peace and Tranquility, and Entertaining Friends/Family. They also show the highest rating for Water Quality. This demonstrates some difference that may tie to greater exposure to the lake and their property over time.

Big Hills Lake Association
Property Owners Study
May 2010

Page 11

LEEDE RESEARCH
market with confidence

Other Important Factors

Q3. What other factors are important:

1. Accessibility to other lakes. We are not on the lake. We do have lake access.
2. Close to owned recreational land.
3. Family summer home since 1952
4. Had to check every line, think the list has it pretty well covered. Tranquil, woodsy, very nice lake, beautiful nighttime skies; close enough to amenities, though I often park the car for the entire visit; scout camp to east is a nice buffer and fine neighbors; attitude of all our neighbors is great.
5. I find the larger motored boats very invasive to this smaller lake and mostly the ski machines that have no clue about rules...now these may be coming off the public landing but a survey on my part in my quiet boat shows many newer homes own them. Also there should be rules about dogs running loose on other peoples property. We have a leash on ours all the time even when playing in the water as a safety feature, however on the south side of the lake dogs run loose and visit whomever they please. I love our lake/lake home and the purity of the water...my husband died two years ago but when we bought this property together in 58 we rented a boat and looked at the lake...and that's what sold us, the clean lake. Thanks for helping out with this survey. Dorothy
6. Nice, sandy beach
7. No tavern
8. No wake to remain the way it is, fishing quality, shoreline beauty
9. Non wake hours
10. Northern Wisconsin feel without the drive. Size of lake (wanted 100 acre minimum).
11. Property has been in my wife's family since the mid 1950's. My father-in-law inherited from his father and we purchased it from my father-in-law. We intend to keep it in the family.
12. Retirement location, interrupted by death of spouse.
13. Sandy beach

Big Hills Lake Association
Property Owners Study
May 2010

Page 12

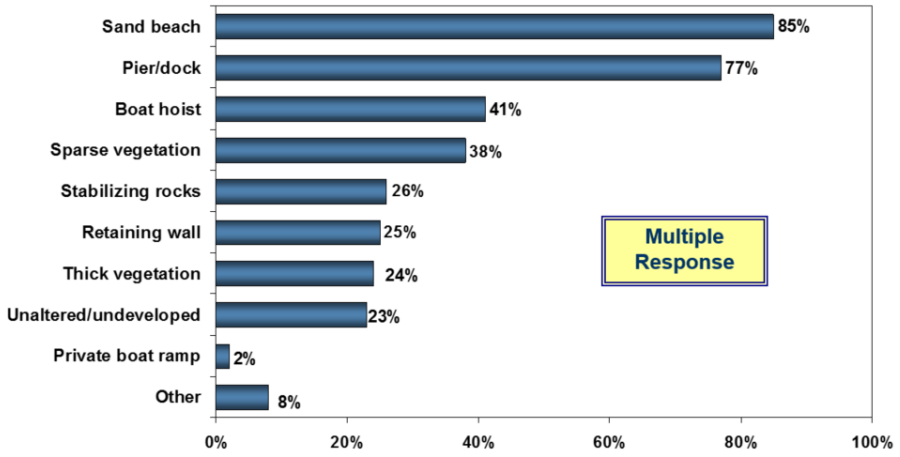
LEEDE RESEARCH
market with confidence

Other Important Factors, continued

14. Swim-able, sandy bottom, little to no weeds
15. Swimming area/sandy beach
16. The beauty of the setting
17. The cottage was income property when we purchased it. Rented it out for 17 years.
18. The lake home offers a sanctuary from the complexities of modern life and a bridge to a simpler time and way of life, even on summer weekends when the lake is vibrating with the force or dozens of water crafts.
19. Tree quality
20. Upkeep of the lake
21. Water ski lake
22. Water ski/wakeboard lake
23. Water-skiing/sports
24. We inherited this property, and before that we owned the cottage next door, which my grandfather and his sons built in 1929 and which is still owned by family. Some of our roots are here in this land and in this lake.
25. When purchased, the property was near where we worked. We chose a place to work and live that provided a rural lifestyle.
26. Wildlife
27. Wonderful friendly neighbors next to us and also around the lake who observe lake rules. What a blessing!

Type of Lake Frontage

Q4. Which of the following describes your lake frontage within 25 feet of the waters edge?



➢ This table indicates that Sand Beach is a key feature as are Piers. There is a strong penetration of Boat Hoists and Sparse Vegetation. This should be compared against other lakes that Cason has worked with.

Best Feature of Big Hills Lake

Q5. What do you think is the best feature of Big Hills Lake? – Open Responses

The most often mentioned responses were:

Water Quality / Clear Water – 54 Responses

Beauty / Peaceful – 11 Responses

Please see all of the responses in the "Open Responses" section of the report.

➢ These items, though in an open format, tie to the earlier measurement of why the respondent selected their property. Water is clearly a key component and the results indicate the need for activities of the Lake District to focus on the protection and development of the water.

Change About Big Hills Lake

Q6. If you were in charge of the lake and could change one thing, what would it be? – Open Responses

The most often mentioned responses were:

Have Boat Size Restrictions – 16 responses

Allow no jet skis – 10 responses

More fish stocked – 7 responses

Close public beach / landing – 7 responses

More enforcement – 6 responses

Raise water levels – 6 responses

Change no wake hours – 6 responses

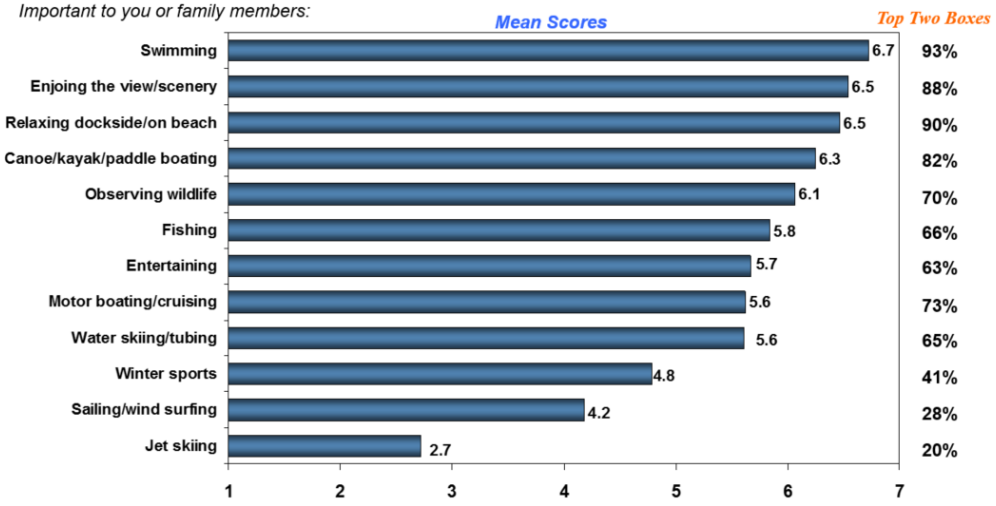
Clean up beach / properties – 3 responses

Please see all of the responses in the "Open Responses" section of the report.

➢ The results indicate concern with a variety of issues but there does appear to be some issue with the size and types of watercraft that are accessing the lake.

Attribute Importance of Participation

Q7. The following is a list of activities that you or members of your household may participate in on Big Hills Lake. For each item please indicate whether you have done that in the past year. If you have participated in an activity please rate the overall importance of that item to you and your family from 1 to 7, with 1 being Not at All Important, to 7 being Very Important to you or family members:



➢ The results indicate the items respondents participate in tie strongly to the water and related quality. It is interesting to note that non-powered boat travel is higher than motored forms.

Response by Type of Owner

		Q1. Residency status			
		Base	Seasonal	Year round/permanent	Year-round/Occasional
Q7a. Swimming	Base	100	48	17	35
	Not at all important	-	-	-	-
	2	-	-	-	-
	3	-	-	-	-
	Neither Important or Unimportant	1%	-	6%	-
	5	6%	6%	6%	6%
	6	11%	8%	6%	17%
	7-Very Important	80%	83%	76%	77%
	Do Not Participate	2%	2%	6%	-
Q7b. Fishing	Base	100	48	17	35
	Not at all important	-	-	-	-
	2	2%	-	6%	3%
	3	2%	2%	-	3%
	Neither Important or Unimportant	11%	15%	6%	9%
	5	17%	15%	12%	23%
	6	24%	25%	18%	26%
	7-Very Important	38%	38%	53%	31%
	Do Not Participate	6%	6%	6%	6%
Q7c. Observing Wildlife	Base	100	48	17	35
	Not at all important	1%	2%	-	-
	2	-	-	-	-
	3	-	-	-	-
	Neither Important or Unimportant	6%	10%	-	3%
	5	23%	27%	29%	14%
	6	22%	21%	18%	26%
	7-Very Important	47%	40%	47%	57%
	Do Not Participate	1%	-	6%	-
Q7d. Enjoying the View/Scenery	Base	100	48	17	35
	Not at all important	-	-	-	-
	2	-	-	-	-
	3	-	-	-	-
	Neither Important or Unimportant	1%	2%	-	-
	5	11%	17%	12%	3%
	6	20%	19%	18%	23%
	7-Very Important	66%	62%	59%	74%
	Do Not Participate	2%	-	12%	-

		Q1. Residency status			
		Base	Seasonal	Year round/permanent	Year-round/Occasional
Q7e. Water Skiing/Tubing	Base	100	48	17	35
	Not at all important	8%	4%	24%	6%
	2	2%	-	6%	3%
	3	2%	2%	-	3%
	Neither Important or Unimportant	4%	4%	6%	3%
	5	18%	15%	18%	23%
	6	19%	21%	12%	20%
	7-Very Important	43%	50%	29%	40%
	Do Not Participate	4%	4%	6%	3%
Q7f. Canoe/Kayak/Paddle boating	Base	100	48	17	35
	Not at all important	2%	2%	6%	-
	2	-	-	-	-
	3	-	-	-	-
	Neither Important or Unimportant	3%	4%	6%	-
	5	12%	12%	18%	9%
	6	24%	23%	18%	29%
	7-Very Important	51%	52%	47%	51%
	Do Not Participate	8%	6%	6%	11%
Q7g. Motor Boating/Cruising	Base	100	48	17	35
	Not at all important	7%	8%	12%	3%
	2	1%	2%	-	-
	3	3%	2%	-	6%
	Neither Important or Unimportant	8%	6%	18%	6%
	5	7%	6%	12%	6%
	6	34%	40%	18%	34%
	7-Very Important	35%	31%	35%	40%
	Do Not Participate	5%	4%	6%	6%
Q7h. Entertaining	Base	100	48	17	35
	Not at all important	4%	2%	18%	-
	2	-	-	-	-
	3	2%	4%	-	-
	Neither Important or Unimportant	13%	15%	12%	11%
	5	17%	17%	29%	11%
	6	25%	29%	12%	26%
	7-Very Important	37%	29%	29%	51%
	Do Not Participate	2%	4%	-	-

Response by Type of Owner

		Q1. Residency status			
		Base	Seasonal	Year round/permanent	Year-round/Occasional
Q7i. Sailing/Wind Surfing	Base	100	48	17	35
	Not at all important	14%	8%	29%	14%
	2	5%	2%	6%	9%
	3	5%	6%	6%	3%
	Neither Important or Unimportant	13%	17%	12%	9%
	5	16%	25%	-	11%
	6	9%	6%	12%	11%
	7-Very Important	12%	10%	18%	11%
	Do Not Participate	26%	25%	18%	31%
Q7j. Relaxing Dockside or on Beach	Base	100	48	17	35
	Not at all important	1%	-	6%	-
	2	-	-	-	-
	3	1%	-	6%	-
	Neither Important or Unimportant	1%	-	6%	-
	5	7%	10%	-	6%
	6	24%	23%	24%	26%
	7-Very Important	63%	62%	59%	66%
	Do Not Participate	3%	4%	-	3%
Q7k. Jet Skiing	Base	100	48	17	35
	Not at all important	44%	44%	47%	43%
	2	-	-	-	-
	3	1%	2%	-	-
	Neither Important or Unimportant	6%	6%	-	9%
	5	6%	6%	-	9%
	6	6%	8%	-	6%
	7-Very Important	8%	6%	12%	9%
	Do Not Participate	29%	27%	41%	26%
Q7l. Winter Sports	Base	100	48	17	35
	Not at all important	9%	12%	12%	3%
	2	4%	2%	6%	6%
	3	4%	8%	-	-
	Neither Important or Unimportant	15%	17%	24%	9%
	5	21%	19%	24%	23%
	6	20%	17%	12%	29%
	7-Very Important	16%	6%	12%	31%
	Do Not Participate	11%	19%	12%	-

- There are some variations by the type of owner that should be noted. Here we see the Seasonal respondents place greater importance on Swimming and Water Skiing and Tubing. We see the Permanent residents place greater importance on Fishing and are comparable in all other areas. We see the Year Round Occasional having the most variation with the strongest response for; Observing Wildlife, Enjoying Scenery, Motor Boating, Entertaining, Relaxing Dockside and Winter Sports. These differences impact the overall results and offer perspective on the differences in use.

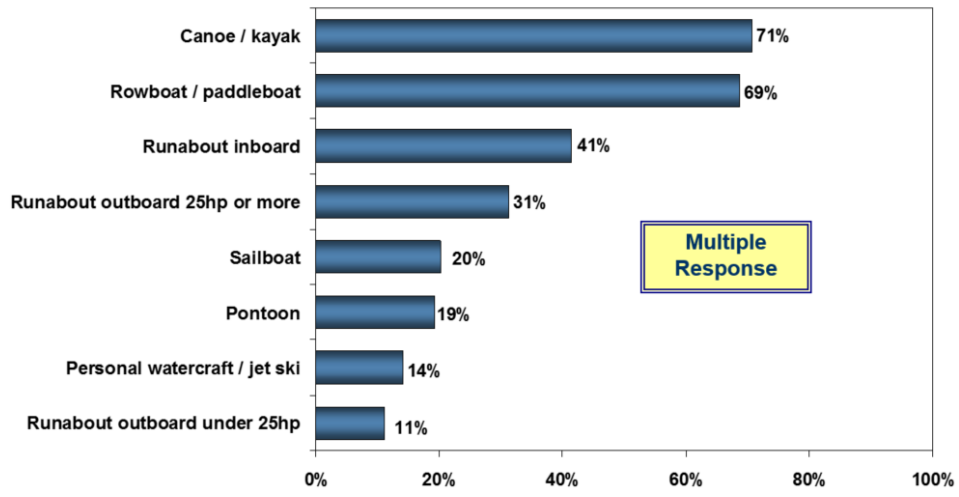
Big Hills Lake Association
Property Owners Study
May 2010

Page 19

LEEDE RESEARCH
market with confidence

Types of Watercraft Use

Q8. What types of watercraft do you use on Big Hills Lake?



- This response ties well to the prior question and indicates that respondents have a high degree of non-powered watercraft. This may also be a factor in concerns over the size of boats on the lake and outside access.

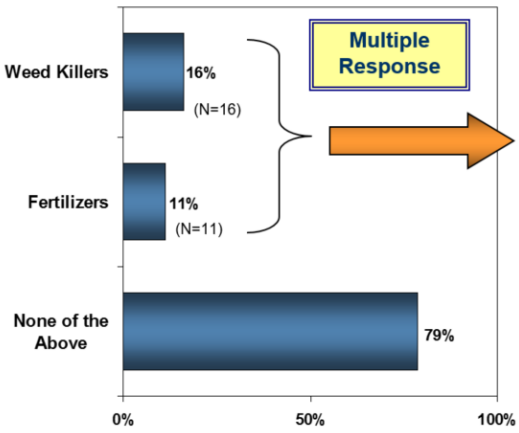
Big Hills Lake Association
Property Owners Study
May 2010

Page 20

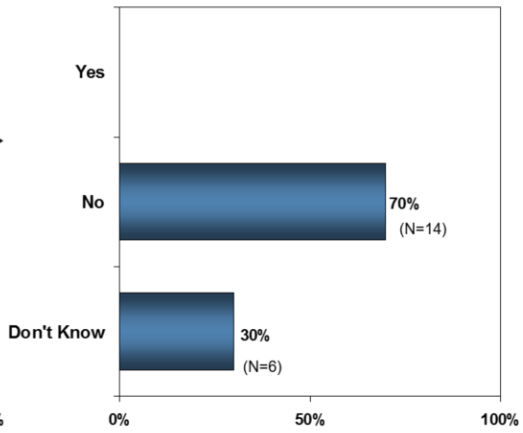
LEEDE RESEARCH
market with confidence

Use Products

Q9. Do you use any of the following on your property?



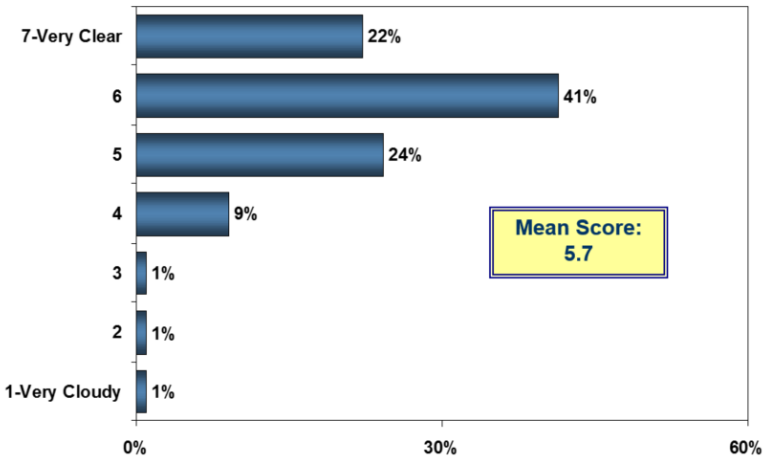
Q9a. Does the product(s) used contain phosphorus?



➢ It is positive to see only limited use of weed killers or fertilizers. Those using such products do not believe them to contain phosphorus. It should be noted this is based on self reporting and does not guarantee that such products are not being used.

Water Clarity

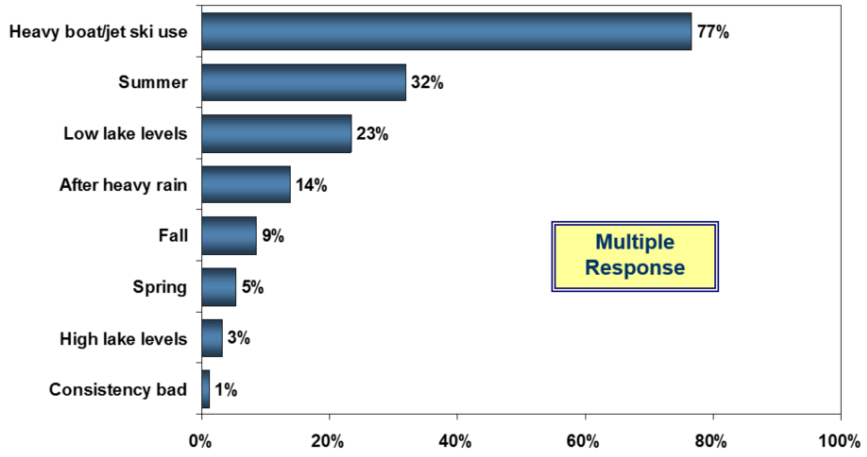
Q10. On a scale from 1 to 7, with 1 being Very Cloudy, to 7 being Very Clear, how would you describe the water clarity in Big Hills Lake during the summer months?



➢ The respondents view the clarity of the lake to be a 5.7 on the 7 point rating scale. The largest single response is a 6 rating. There are almost two-thirds of respondents that give one of the top two ratings. This is strong and ties well to earlier items related to water quality.

When Water Clarity is Poor

Q11. When is water clarity on the lake poor?



➢ The results indicate property owners feel that heavy boat traffic has the most significant impact on water clarity. This is consistent with earlier findings on concerns for the size and number of boats that are coming onto the lake.

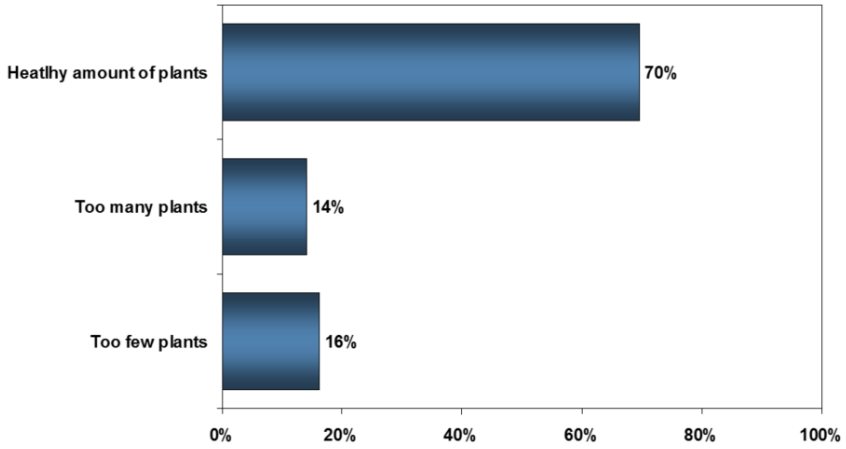
Big Hills Lake Association
Property Owners Study
May 2010

Page 23

LEEDE RESEARCH
market with confidence

Aquatic Plant Growth

Q12. Overall, how would you describe the Aquatic Plant growth in Big Hills Lake?



➢ The vast majority of respondents indicate they feel there is a healthy amount of weeds in the lake under current conditions. This would most likely be based on weed levels seen during the 2009 season as weeds would not have been in full growth at the actual time of the survey.

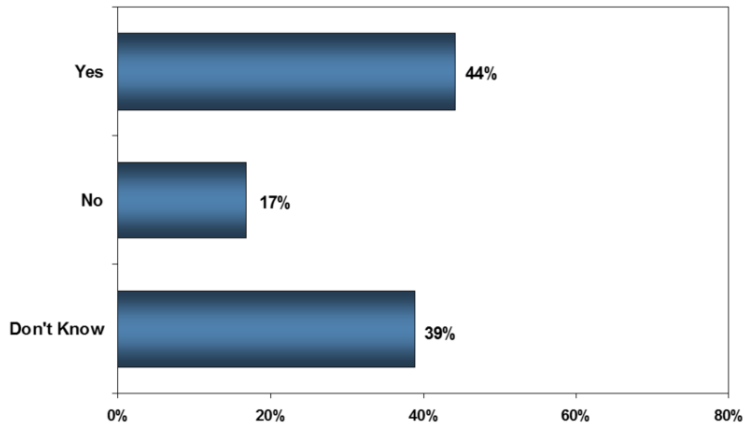
Big Hills Lake Association
Property Owners Study
May 2010

Page 24

LEEDE RESEARCH
market with confidence

Need for Aquatic Plant Control

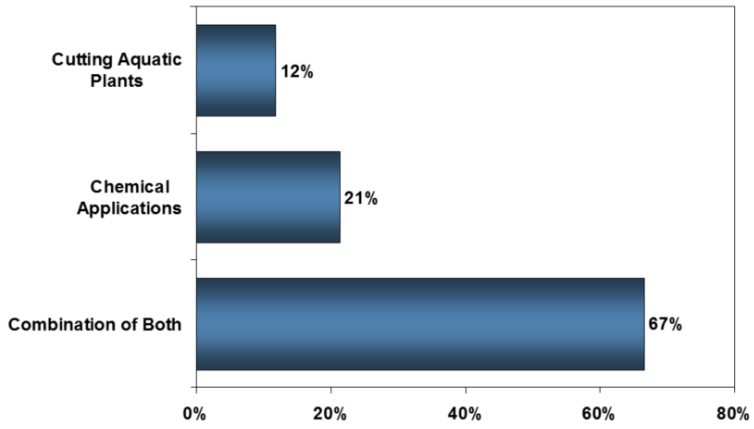
Q13. Do you feel there is a need for an aquatic plant control program on Big Hills Lake?



➢ There are mixed feelings on the need for weed control on the lake. We see that while only 17% feel there is no need for a control program the balance is split between seeing the need and not being sure. This may indicate that the Lake District needs to make decisions and inform and educate property owners on issues related to control.

Options for Aquatic Plant Control

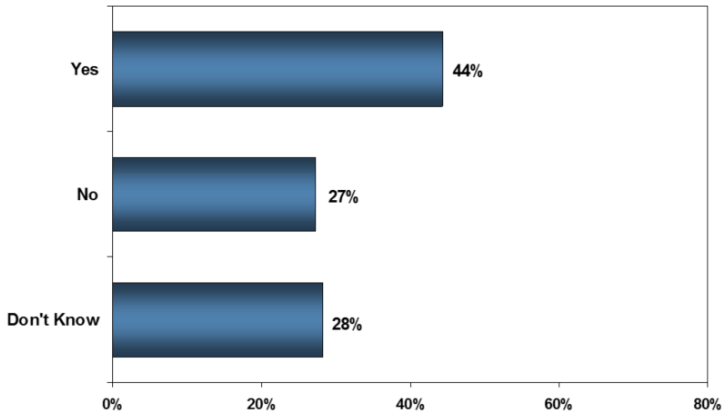
Q14. When there is a need for aquatic plant control on Big Hills Lake please indicate which of the following options should be considered to control the problem?



➢ It is clear that when control programs are used the respondents feel that both cutting and chemicals should be part of the program. This give the district the option of conducting programs to meet specific situations and needs.

Adequate Law Enforcement

Q15. Do you feel that there is adequate law enforcement on Big Hills Lake?



➢ There are some mixed feelings on law enforcement on Big Hills Lake but the largest single response is for Yes, indicating that there IS adequate enforcement on the water. This should be considered by district management.

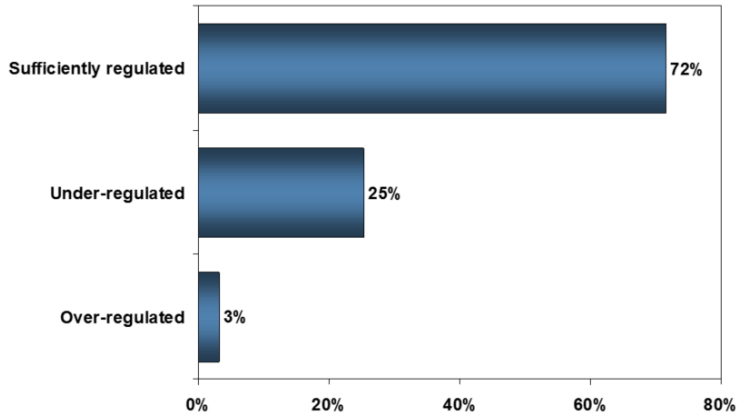
Big Hills Lake Association
Property Owners Study
May 2010

Page 27

LEEDE RESEARCH
market with confidence

Lake Use Regulations

Q16. What is your opinion regarding lake use regulations on Big Hills Lake in general?



➢ The vast majority of respondents feel that the lake regulations are generally sufficient in meeting the needs of property owners on the lake. There are a quarter of respondents that feel further action is needed.

Big Hills Lake Association
Property Owners Study
May 2010

Page 28

LEEDE RESEARCH
market with confidence

Like to See Changed in Rules

Q16. If Under or Over Regulated: What would you like to see changed in the rules? – Open Responses

The most often mentioned responses were:

UNDER REGULATED:

Have boat size restrictions – 9 responses

Change no wake hours – 4 responses

More enforcement – 5 responses

Allow no jet skis – 3 responses

OVER-REGULATED – Change no wake hours – 3 responses

Please see all of the responses in the "Open Responses" section of the report.

➢ Results indicate there are issues with the current no wake hours on both sides of the regulation question. The results indicate that boat size and jet ski issues are also a factor that should be considered.

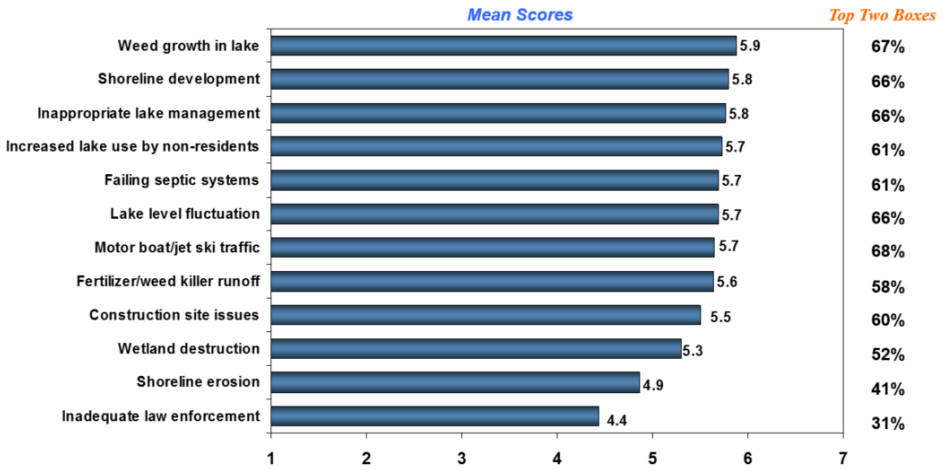
Big Hills Lake Association
Property Owners Study
May 2010

Page 29

LEEDE RESEARCH
market with confidence

Potential Impact

Q17. The following is a list of issues that could have future impact on Big Hills Lake. Please rate the potential impact of each issues on the lake from1 to 7, with 1 being No Impact, to 7 being a Very Strong Impact for each issues:



➢ This question may be the most meaningful in terms of the very narrow range of response seen in the results. Both Mean and Top Two Box scores fall in a very narrow range and indicate that respondents feel that most of the items have the potential to be issues. This should be considered in future planning along with open-ended responses.

Big Hills Lake Association
Property Owners Study
May 2010

Page 30

LEEDE RESEARCH
market with confidence

Response by Type of Owner

		Q1. Residency status			
		Base	Seasonal	Year round/permanent	Year-round/Occasional
Q17a. Motor boat/jet ski traffic	Base	100	48	17	35
	No Impact	4%	2%	6%	6%
	2	5%	8%	-	3%
	3	5%	6%	-	6%
	Neutral	8%	4%	12%	11%
	5	8%	8%	6%	9%
	6	17%	25%	18%	6%
	7-Very Strong Impact	46%	38%	53%	54%
	No Answer	7%	8%	6%	6%
Q17b. Shoreline erosion	Base	100	48	17	35
	No Impact	7%	4%	18%	6%
	2	4%	8%	-	-
	3	8%	8%	12%	6%
	Neutral	17%	10%	18%	26%
	5	18%	21%	6%	20%
	6	13%	23%	6%	3%
	7-Very Strong Impact	24%	15%	29%	34%
	No Answer	9%	10%	12%	6%
Q17c. Lake level fluctuation	Base	100	48	17	35
	No Impact	5%	-	18%	6%
	2	1%	2%	-	-
	3	-	-	-	-
	Neutral	17%	17%	18%	17%
	5	9%	6%	6%	14%
	6	19%	27%	12%	11%
	7-Very Strong Impact	43%	42%	35%	49%
	No Answer	6%	6%	12%	3%
Q17d. Inadequate law enforcement	Base	100	48	17	35
	No Impact	11%	6%	18%	14%
	2	5%	6%	-	6%
	3	7%	10%	-	6%
	Neutral	22%	21%	18%	26%
	5	15%	10%	18%	20%
	6	8%	12%	6%	3%
	7-Very Strong Impact	19%	19%	29%	14%
	No Answer	13%	15%	12%	11%

		Q1. Residency status			
		Base	Seasonal	Year round/permanent	Year-round/Occasional
Q17e. Failing septic systems	Base	100	48	17	35
	No Impact	4%	-	6%	9%
	2	1%	2%	-	-
	3	3%	4%	-	3%
	Neutral	10%	12%	6%	9%
	5	16%	19%	6%	17%
	6	12%	17%	18%	3%
	7-Very Strong Impact	42%	33%	53%	49%
	No Answer	12%	12%	12%	11%
Q17f. Fertilizer/Weed killer runoff	Base	100	48	17	35
	No Impact	1%	-	-	3%
	2	3%	4%	6%	-
	3	4%	4%	6%	3%
	Neutral	13%	8%	24%	14%
	5	17%	17%	6%	23%
	6	12%	10%	12%	14%
	7-Very Strong Impact	40%	46%	41%	31%
	No Answer	10%	10%	6%	11%
Q17g. Wetland destruction	Base	100	48	17	35
	No Impact	3%	2%	6%	3%
	2	2%	4%	-	-
	3	2%	2%	-	3%
	Neutral	24%	25%	29%	20%
	5	8%	6%	6%	11%
	6	13%	19%	-	11%
	7-Very Strong Impact	29%	21%	41%	34%
	No Answer	19%	21%	18%	17%
Q17h. Inappropriate lake management	Base	100	48	17	35
	No Impact	1%	-	-	3%
	2	4%	6%	6%	-
	3	2%	-	-	6%
	Neutral	16%	19%	12%	14%
	5	8%	6%	12%	9%
	6	13%	19%	6%	9%
	7-Very Strong Impact	46%	35%	59%	54%
	No Answer	10%	15%	6%	6%

Big Hills Lake Association
Property Owners Study
May 2010

Page 31

LEEDE RESEARCH
market with confidence

Response by Type of Owner

		Q1. Residency status			
		Base	Seasonal	Year round/permanent	Year-round/Occasional
Q17i. Shoreline development	Base	100	48	17	35
	No Impact	2%	-	-	6%
	2	1%	2%	-	-
	3	2%	4%	-	-
	Neutral	12%	15%	12%	9%
	5	14%	10%	18%	17%
	6	20%	21%	18%	20%
	7-Very Strong Impact	40%	33%	47%	46%
	No Answer	9%	15%	6%	3%
Q17j. Construction site issues	Base	100	48	17	35
	No Impact	3%	2%	-	6%
	2	2%	4%	-	-
	3	2%	2%	-	3%
	Neutral	19%	23%	12%	17%
	5	9%	4%	12%	14%
	6	21%	23%	18%	20%
	7-Very Strong Impact	32%	23%	53%	34%
	No Answer	12%	19%	6%	6%
Q17k. Weed growth in lake	Base	100	48	17	35
	No Impact	-	-	-	-
	2	1%	-	6%	-
	3	-	-	-	-
	Neutral	16%	19%	18%	11%
	5	13%	8%	24%	14%
	6	22%	23%	6%	29%
	7-Very Strong Impact	38%	38%	35%	40%
	No Answer	10%	12%	12%	6%
Q17l. Increased lake use by non-residents	Base	100	48	17	35
	No Impact	1%	-	-	3%
	2	2%	2%	6%	-
	3	-	-	-	-
	Neutral	16%	10%	24%	20%
	5	16%	17%	18%	14%
	6	18%	19%	-	26%
	7-Very Strong Impact	37%	42%	41%	29%
	No Answer	10%	10%	12%	9%

- There are some variations by the type of owner that should be noted. Seasonal users have greater concerns for Weed Killers & Fertilizers and Use by Non-Residents is generally lower than the other groups in most categories. We see Permanent residents feel more strongly about Inadequate Law Enforcement, Failing Septic Systems, Destruction of Wetlands, Inappropriate Lake Management, Construction Issues and Increased Use by Non-Residents. The Year Round Occasional have the strongest response for; Motorboat Traffic, Shoreline Erosion, Lake Level Fluctuations and Weed Growth. Much of this is logical from the perspective of their contact and use.

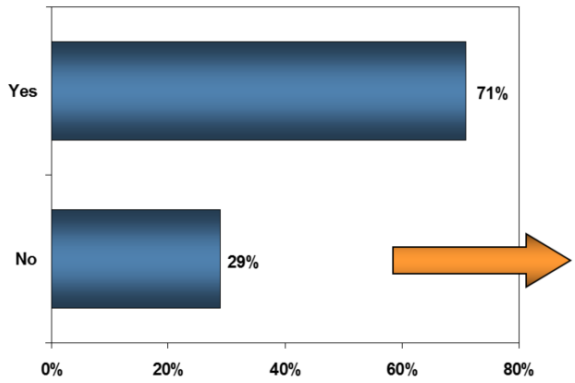
Big Hills Lake Association
Property Owners Study
May 2010

Page 32

LEEDE RESEARCH
market with confidence

Offer Input Into Matters

Q18. Do you feel that you can offer input into matters regarding the management of Big Hills Lake?



*Q4a. **If No**: Please explain why you feel that way? – Open Response Coded*

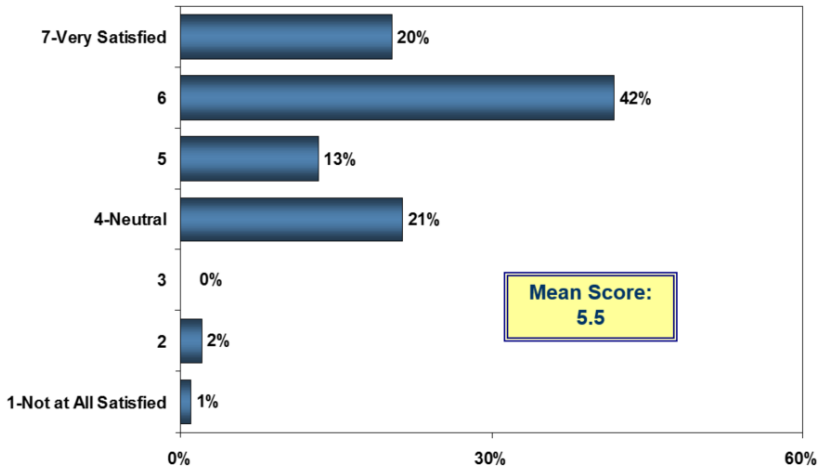
My age – 7 responses

Do not live here – 6 responses

➢ There are over 70% of respondents who feel they are able to offer input to the district and its management. There do not appear to be significant issues that are barriers to the balance of respondents.

Satisfaction With Management of Lake

Q19. On a scale from 1 to 7, with 1 being Not at All Satisfied, to 7 being Very Satisfied, how satisfied are you with the overall management of Big Hills Lake?



➢ Overall satisfaction shows a mean score of 5.5 on the 7 point rating scale. There are 62% of respondents who give one of the top two ratings. This is generally an indication of solid satisfaction but there is still some room for improvement. There are only 3% of respondents that fall below average ratings.

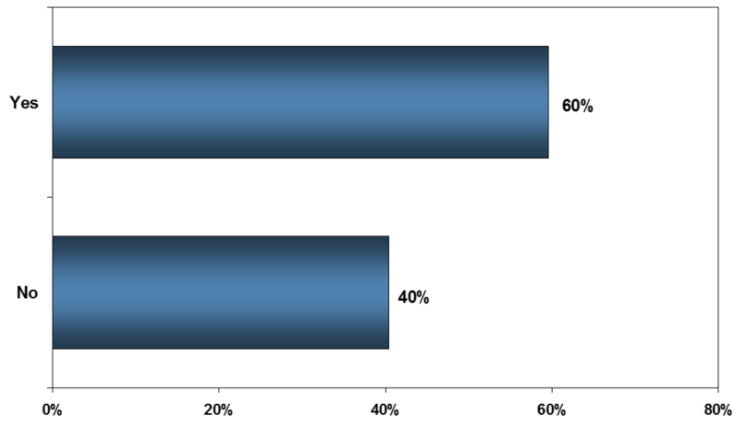
Response by Type of Owner

		Q1. Residency status			
		Base	Seasonal	Year round/permanent	Year-round/Occasional
Q18. Can you offer input?	Base	97	47	17	33
	Yes	71%	68%	59%	82%
	No	29%	32%	41%	18%
Q19. Overall Satisfaction with Management	Base	99	48	17	34
	Not at all Satisfied	1%	-	6%	-
	2	2%	-	6%	3%
	3	-	-	-	-
	Neutral	21%	19%	35%	18%
	5	13%	12%	12%	15%
	6	41%	42%	12%	56%
	Very Satisfied	20%	27%	24%	9%
	No Answer	1%	-	6%	-
Q20. Attended an Annual Meeting of the	Base	99	48	17	34
	Yes	60%	58%	65%	59%
	No	40%	42%	35%	41%
Q21. Age(s) of the primary owners of the property on Big	Base	98	48	17	33
	18 to 34	1%	-	6%	-
	35 to 54	34%	31%	-	55%
	55+	65%	69%	94%	45%

- The results indicate the Permanent Residents have a stronger concern about having input while the Year Round Occasional indicate the strongest level of acceptance. We see that the Permanent have a lower level of satisfaction overall. This may indicate a need to have stronger communication with this group who is older and but do attend Annual Meetings at a higher rate.

Attended Annual Meeting

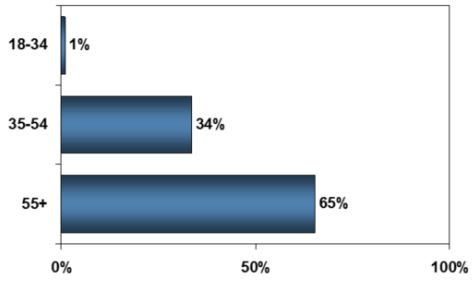
20. Have you attended an Annual Meeting of the Big Hills Lake Association in the past 3 years?



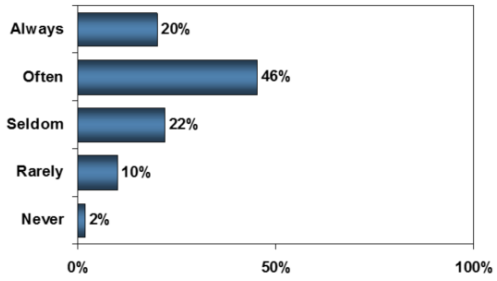
- There were six in ten respondents who had attended an Annual Meeting of the Lake District. This may be an area for further analysis to determine if there are differences between the groups and the information they receive. There could also be differences in needs that could be addressed through matters other than the meetings.

Age of Primary Owner/Have Children

Q21. Please check the age(s) of the primary owners of the property on Big Hills Lake.



Q22. Which of the following best describes how often you have children on your property?



- The majority of owners are over 55 years of age. This should be noted in reviewing the results and ties to the length of ownership seen earlier in the results. The results also indicate that there are commonly children present at the properties and that fact should be considered in actions taken by district management.

Thanks for Your Participation

LEEDE RESEARCH
market with confidence