

2015

Spring Lake Management Plan



Prepared by staff from the Center for Watershed Science and Education
University of Wisconsin-Stevens Point



Center for Watershed Science and Education
College of Natural Resources
University of Wisconsin - Stevens Point

Spring Lake Management Plan

The Spring Lake Management Plan was developed with input from residents and lake users at a series of four public planning sessions held at the Waushara County Courthouse in Wautoma, Wisconsin during January-May 2014. The inclusive community sessions were designed to identify key community concerns, assets, opportunities and priorities. Representatives of state and local agencies, as well as nonprofit organizations, also attended the planning sessions to offer their assistance to the group in developing a strategic lake management plan (LMP).

The plan was adopted by the Spring Lake Management District on: June 20, 2015.
Date

The plan was adopted by the Town of Marion on: February 12, 2015.
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 Spring Lake Management Plan and provided guidance during the plan's development.

Spring Lake Management Planning Committee Members and Resources

Planning Committee

Katherine Bogdanoff
Rick Dill
Vicki Dill
Candace Eiche
Len Narus
Arnie Wilke
Marty Wilke

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 Resources Specialists – Ryan Haney and Danielle Rupp
Water Resources 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 Council, Inc.

Regional Aquatic Invasive Species Education Specialist – Paul Skawinski
Regional Aquatic Invasive Species Specialist – Kaycie Stushek

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Waushara County Watershed Lakes Council

Waushara County Staff and Citizens

Wisconsin Department of Natural Resources Professionals,
Mark Sessing and Ted Johnson

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Overarching Vision for Spring Lake

Diverse plant, wildlife and fish communities will reflect excellent water quality and the presence of a variety of healthy native in-lake and shoreline habitat in Spring Lake. Lake use and the beauty and serenity of the lake will be balanced by supporting efforts, such as no-wake boating. Community members will work together to pursue lake protection efforts and maintain a healthy lake.

Introduction

Spring Lake is a two-lobed 50-acre lake located in the town of Marion in Waushara County, Wisconsin. Its maximum depth of 37 feet is found in the southwestern lobe. The lake receives water via numerous groundwater-fed springs, several small unnamed inlet streams and direct runoff. Water leaves Spring Lake via Sucker Creek on the eastern side of the northeastern lobe. The lake's quiet nature, wildlife and plant communities are highly valued by residents and visitors. A variety of interesting plants and animals have been observed around the northernmost inlet, including orchids, otters, mink, swans, woodpeckers, bald eagles, sandhill cranes, turtles, blue herons, brown herons and osprey.

The purpose of this plan is to provide a framework for the protection and improvement of Spring Lake. Implementing the content of this lake management plan (LMP) will enable citizens and other supporters to achieve the vision for Spring Lake now and in the years to come. The plan was developed by community members who learned about the lake and identified features important to the Spring Lake community to help guide the fate of the lake. 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 Spring Lake Management Plan, and what are some ways that it can be used?

- **Individuals:** Individuals can use this plan to learn about the lake they love and their connection to it. People living near Spring Lake and in its watershed can have the greatest influence on the lake by understanding and choosing lake-friendly options to manage their land and the lake.
- **Spring Lake Management District:** This plan provides the District with a list of options that can readily be prioritized. Annual review of the plan will also help the District to recognize its accomplishments. Resources and funding opportunities for District management activities are more accessible by identification of goals in the lake management plan, and the District can identify partners to help achieve their goals for Spring Lake.
- **Neighboring lake groups, conservation clubs, and sporting 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 enjoyable.

- **The Town of Marion:** The Town can use the visions, wishes, and goals documented in this lake management plan when considering town-level management planning, or individual decisions within the watershed that may affect the lake and lake community.
- **Waushara County:** County professionals can identify needs, provide support, base decisions, and allocate resources to assist with some of the lake-related actions 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 (WDNR):** 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

One of the first steps in creating 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. There was 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 data for use in the development of lake management plans. Data collected by citizens, consultants, and professionals at the Wisconsin Department of Natural Resources were also incorporated into the planning process to provide 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.

Several reports from the Spring 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 – Spring Lake 2010-2012*, University of Wisconsin-Stevens Point.

The Planning Process

The planning process included a series of four public planning sessions held between January and May 2014 at the Waushara County Courthouse. The Spring Lake Planning Committee consisted of property owners on or near Spring Lake. 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 and Development Council, 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 mailed to Spring Lake waterfront property owners and by press releases in local newspapers. In addition, members of the planning committee were provided with emails about upcoming meetings which could be forwarded to others. To involve and collect input from as many people as possible, a topic-specific survey related to the subject of each upcoming planning session was 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 could be filled out anonymously online, or paper copies were available upon request. Survey questions and responses were shared at the planning sessions and can be found in Appendix E: Lake User Survey Results.

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

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 and land use; shoreland health; and communication. After learning about the current conditions of each topic, planning committee members 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 interested in Spring Lake and members of the Spring Lake Management Planning Committee, as well as the known science about Spring Lake, its ecosystem and the landscape within its watershed. A lake management plan is a living document that changes over time to meet the current needs, challenges and desires of the lake and its community. Implementing and regularly updating the goals and actions in the Spring Lake Management Plan will ensure that the vision is supported and that changes or new challenges are incorporated into the plan. **The goals, objectives and actions listed in this plan should be reviewed annually and updated with any necessary changes.**

Although each lake is different, the Wisconsin Department of Natural Resources requires that each comprehensive lake management plan address a specific list of topics affecting the character of a lake, whether each topic has been identified as a priority or as simply something to preserve. In this way, every lake management plan considers the many aspects associated with lakes. These topics comprise the chapters in this plan and have been grouped as follows:

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

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

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, Lake District

The following goals were identified as 'high priority' by the Spring Lake Management District:

Goal 2. Maintain vegetated shorelands where they already exist, and encourage a vegetated buffer where the shoreland is mowed to the edge.

Objective 2.1. Show support for healthy shoreland maintenance and restoration.

Goal 4. Provide support to enhance the existing fish community in Spring Lake. (Fish Community)

Objective 4.2. Protect a balanced fish population in Spring Lake.

Goal 6. Diminish populations of aquatic invasive species in and around Spring Lake. (Aquatic Plants)

Objective 6.1. Reduce populations of curly-leaf pondweed and Eurasian watermilfoil in Spring 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.

Table 1. List of organizations and acronyms used in this plan.

Resource	Acronym
WDNR Citizen Lake Monitoring Network Program	CLMN
UWSP Center for Watershed Science and Education	CWSE
North Central Conservancy Trust	NCCT
USDA Natural Resources Conservation Service	NRCS
Golden Sands Resource Conservation and Development Council, Inc.	RC&D
Spring Lake Management District	SLMD
UW-Extension	UWEX
University of Wisconsin-Stevens Point	UWSP
Waushara County Watershed Lakes Council	WCWLC
Wisconsin Department of Natural Resources	WDNR
Waushara County Land Conservation Department	WLCD
UWSP Water and Environmental Analysis Laboratory	WEAL

Contact information for organizations and individuals who support lake management in Waushara County can be found in Appendix A: Waushara County Lakes Information Directory.

Landscapes and the Lake

Land use and land management practices within a lake's watershed can affect both its water quantity and quality. Forests, grasslands and wetlands allow 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 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, and 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 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, herbicides 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 mimic some of the natural processes, and the reduction or elimination of nutrients added to the landscape will help prevent 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 serve the lake by reducing contaminants, providing shelter for fish and wildlife, and decreasing shoreline erosion by providing deep roots that hold soil in place and provide a shoreland barrier from waves and wind.

The water quality in Spring Lake is the result of many factors, including the underlying geology, 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 Spring Lake was assessed by measuring different interrelated characteristics including temperature, dissolved oxygen, water clarity, water chemistry, and algae. All of these were taken into consideration when management planning decisions were made.

Water Quality

Citizen survey respondents indicated that water quality in Spring Lake has an impact on both their personal enjoyment and the economic value of the lake. Spring Lake's water quality was assessed during the 2010-2012 lake study using a number of measures including temperature, dissolved oxygen, water chemistry, and phosphorus. Water quality data collected in past years was also reviewed to determine trends in Spring Lake's water quality.

Dissolved oxygen is an important measure in Spring 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 by microbes reduces oxygen in the lake. During the 2010-2012 lake study, winter samples demonstrated that at times the dissolved oxygen concentrations can become very low in Spring Lake, which limits the types of fish and other aquatic organisms that can survive in the lake.

In Spring Lake, water clarity ranged from 6.5 feet to 15.5 feet. It is typical to have variability in a lake, often based on seasonal conditions. When compared with historic data, the average water clarity measured during the study was slightly better in May, June, July, August and October, and worse in September. Water clarity in Spring Lake is typically poorer in September. This corresponds with the period when algae growth is greatest.

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 contamination. Spring Lake had elevated potassium, chloride and sodium concentrations on average during the monitoring period. Although these elements are not harmful to the aquatic ecosystem, they indicate that road salt, fertilizer, animal waste and/or septic system effluent may be entering the lake from either surface runoff or via groundwater. Atrazine (DACT), an herbicide commonly used in corn production, averaged 0.12 ug/L in the samples that were analyzed from Spring Lake. The presence of this chemical suggests that agricultural activities in the surrounding area are impacting water quality. Some toxicity studies have indicated that reproductive system abnormalities can occur in frogs at these levels (Hayes et al., 2001 and Hayes et al., 2003).

Nutrients (phosphorus and nitrogen) are important measures of water quality because they are used for growth by algae and aquatic plants. 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, 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 gets the most 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 Spring Lake ranged from 3 ug/L to 22 ug/L during the study period. The summer median total phosphorus was 14 ug/L and 10.5 ug/L in 2011 and 2012, respectively. This is below Wisconsin’s phosphorus standard of 30 ug/L for deep drainage lakes. During the study, inorganic nitrogen concentrations were high enough in the spring to enhance algal blooms throughout the summer (Shaw et al., 2000).

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

Managing nitrogen, phosphorus and soil erosion throughout the Spring Lake watershed is one of the keys to protecting the lake itself. Over-application of chemicals and nutrients should be avoided. 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 Spring Lake can be controlled by using lake-friendly land management decisions, such as the 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 Spring Lake

Spring Lake will have minimal contaminants and a strong dataset to measure water quality trends.

Goal 1. Learn more about the water quality in Spring Lake and be aware of changes over time.

Objective 1.1. Routinely monitor water quality for lake and human health.

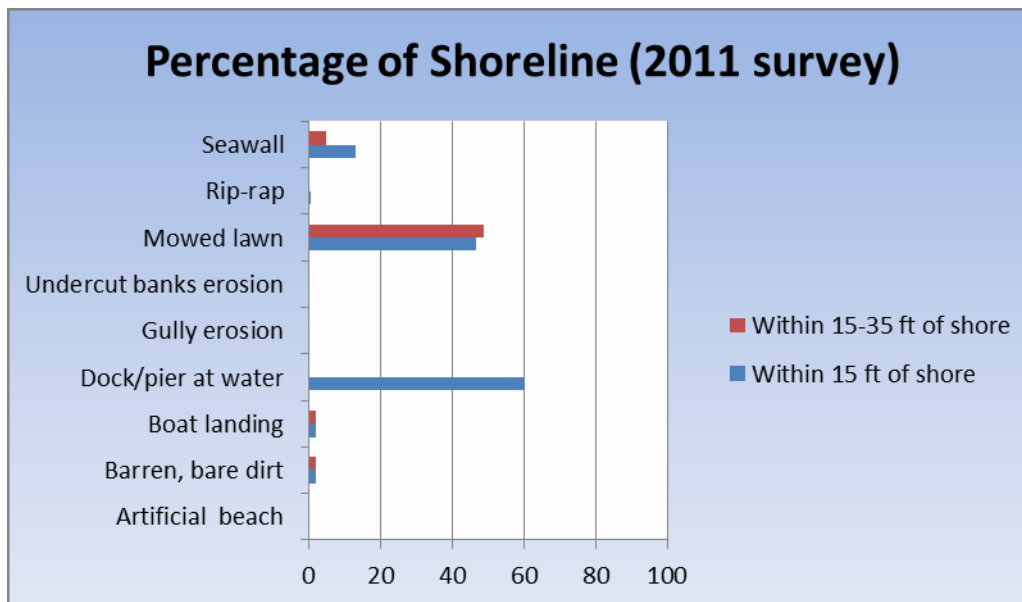
Actions	Lead person/group	Resources	Start/end dates
Continue spring and fall water sampling efforts, including water sample collection, Secchi measurements.	SLMD	CLMN WEAL	Ongoing
Monitor dates of ice on/ice off and submit the information to the state database.	SLMD	CLMN	2014, Ongoing
Monitor Secchi depth and if indicated by changes in Spring/Fall sampling reports, consider adding Summer sample for additional water quality data.	SLMD	CLMN WEAL WLCD	Ongoing
Encourage private well owners around Spring Lake to test their water for nitrates and atrazine.		WLCD UWEX WEAL or other laboratories	2016
Explore possibilities for further monitoring initiatives such as surface and groundwater monitoring for contaminants and other Waushara County Lakes through public/government sector with findings provided to stakeholders.		WLCD WDNR Lake Manager WEAL or other laboratories WCWLC Consultants	As needed

Shorelands

Shoreland vegetation is critical to a healthy lake’s ecosystem. It provides habitat for many aquatic and terrestrial animals including birds, frogs, turtles, and many small and large mammals. It also helps to improve the quality of the runoff that is flowing across the landscape towards the lake. Healthy shoreland vegetation includes a mix of tall grasses/flowers, shrubs and trees which extend 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, seawalls, 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 Spring Lake is displayed on the map in Appendix B: Shoreland Survey – 2010. Large stretches of Spring Lake’s shorelands are in good shape, but some portions have challenges that should be addressed. There were no stretches of Spring Lake shoreland that ranked as poor. 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 66 lakefront lots, 1,980 feet (16%) of disturbed shoreland is permitted. Based on the 2011 shoreland inventory, 49% (6,197 feet) of Spring Lake’s shoreland was mowed lawn. Although some properties were grandfathered in when the ordinance was adopted in 1966, following this guidance will benefit the health of the lake and its inhabitants.



Guiding Vision for Spring Lake's Shorelands

Spring Lake will have as much natural shoreland habitat as possible to encourage a healthy lake ecosystem for aquatic and terrestrial wildlife and to minimize runoff.

Goal 2. Maintain vegetated shorelands where they already exist, and encourage a vegetated buffer where the shoreland is mowed to the edge.

Objective 2.1. Show support for healthy shoreland maintenance and restoration.

Actions	Lead person/group	Resources	Start/end dates
Provide materials to property owners re: shoreland buffer vegetation in welcome packets, at the annual meeting, and on the website.	SLMD	Educational materials from: WLCD, UWEX, WCWLC	Ongoing
Maintain information and get assistance re: shoreland vegetation, help with restoration/plantings for interested property owners.	SLMD	WLCD WDNR Consultants SLMD members	2015, Ongoing
Commend property owners who maintain/restore a shoreland vegetation buffer using website to post information re: permitted information on locations.	SLMD	SLMD	2015, Ongoing
Explore posting specific locations/dates/times on website that can be viewed for examples of shoreland vegetation buffers	SLMD	WLCD Consultants Waushara Co Garden Clubs	2015, Ongoing
Explore obtaining a grant to conduct a beginning phase of a demonstration shoreland restoration project. Continue project through stages if possible with grant/landowner permission.	SLMD/SLMD member	WLCD WDNR Consultants	2016

Watershed Land Use

It is important to understand where Spring 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 Spring 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 and/or rain barrels; and routing drainage from pavement and roofs away from the lake. Other practices help reduce nutrients 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. These best practices of land management will require collaborative work between all the property owners and local government within the Spring Lake watershed to minimize contaminants entering the lake.

The surface watershed of Spring Lake is 1,229 acres (Figure 1). Primary land uses are agriculture with forest and developed land scattered throughout. The lake's shoreland is comprised primarily of residential development, wetlands, and forest. In general, the land closest to the lake has the greatest immediate impact on the lake, but the cumulative impacts of surrounding land use surrounding Spring Lake also play a large role in water quality.

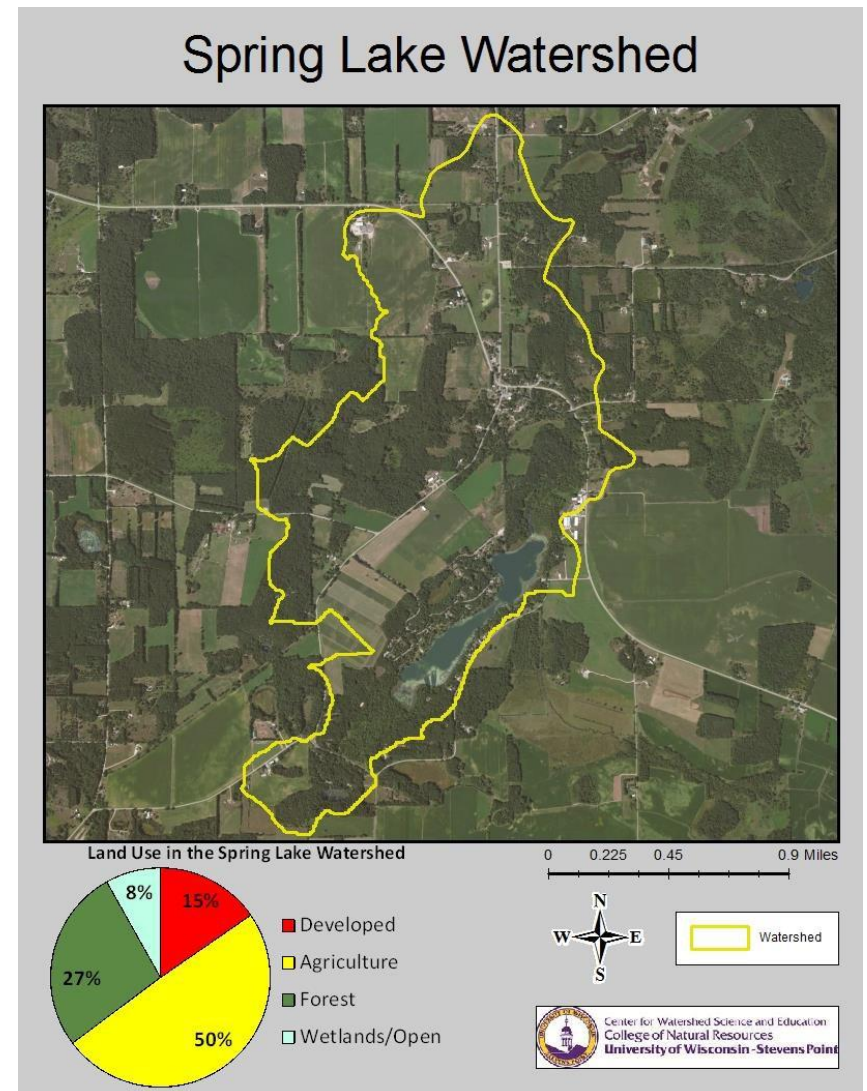


Figure 1. Spring Lake surface watershed.

Guiding Vision for Spring Lake’s Watershed

The land around Spring Lake will be managed in a way that supports clean water and a healthy lake.

Goal 3. Know about and utilize resources for healthy land management.

Objective 3.1. Support healthy land management activities around Spring Lake.

Actions	Lead person/group	Resources	Start/end dates
Encourage the County to support and follow-up with water quality based Best Management Practices (BMPs) within the watershed.		WLCD NRCS	Ongoing
Continue to use WLCD as a resource for land management activities.		WLCD	Ongoing
Support any landowners interested in the protection of their land via a conservation program (i.e. Conservation Easement or Purchase of Development Rights) by referring them to WLCD.		NCCT NRCS WDNR Lake Protection Grants	Ongoing

In-Lake Habitat and a Healthy Lake

Many lake users value Spring Lake for its fishing, wildlife and good water quality. These attributes are all interrelated, as the health of one part of the lake system may affect the health of the rest of the plant/animal community, the quality/quantity of water in the lake, and the experiences of the people spending time at the lake.

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 fallen tree limbs 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 Spring Lake includes the aquatic plants, branches and tree limbs above and below the water.

Fish Community

A balanced fish community has a mix of predator and prey species, each of which has different needs to flourish including sufficient food, habitat, appropriate nesting substrate, and water quality. A sustainable fishery is one that seeks to be in balance with the lake's natural ability to support the fish community, and in which populations do not noticeably decline over time because of fishing practices or other human activity. Ideally, the fish community can adapt to fishing without additional stocking or input because its reproductive and growth needs are met within the lake.

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 critical habitat areas.

People are an important part of a balanced fish community; their actions on the landscape and the numbers and sizes of fish added to or removed from 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. Regulations can also be adjusted as the fish community changes, and can provide for improved fishing.

Managing a lake for a sustainable 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, they usually do not have to be repeated on a frequent basis. Protecting existing habitat such as emergent, aquatic and shoreland vegetation, and allowing trees that naturally fall into the lake to remain in the lake are free of cost. Alternatively, restoring habitat in and around a lake can have an up-front cost, but the benefits 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 that are present and provide fishing opportunities without requiring a lot of supplemental effort and associated expense to maintain these conditions.

The Wisconsin Department of Natural Resources conducted an electroshocking survey on Spring Lake in the spring of 2013 to determine current size structures, growth rates and abundances of the fish community. At the time of the survey, largemouth bass were present in above average abundance, which was an increase from a 2005 electroshocking survey; however, their growth rate was below average. Bluegill were also noted in numbers above average, with an average size structure. Recommendations given by the Wisconsin Department of Natural Resources fisheries biologist included the protection of existing habitat, improvement of areas of concern, continued monitoring for invasive species, and the use of large woody habitat in the littoral (near shore) area of Spring Lake.

According to survey responses received as part of the Spring Lake planning process, fishing is enjoyed throughout the year, with more people fishing the lake spring through fall. Northern pike, largemouth bass, panfish and trout were among the species that were commonly caught in Spring Lake by respondents. Planning participants expressed concern regarding overfishing in Spring Lake, especially during the winter months. Exploring changes to specific fishing rules to benefit the fish community was discussed with the Wisconsin Department of Natural Resources fisheries biologist, and several meeting participants either expressed interest in or attended the 2014 Conservation Congress hearing during the planning process to pursue rule changes

regarding bag limits on panfish. A carp weir located at the outlet to Sucker Creek was installed years ago to help prevent carp from traveling upstream into the lake, and has started to deteriorate with time. Concerns surrounding its deterioration and support for its replacement were voiced during several of the planning meetings.

Guiding Vision for the Fish Community

Spring Lake will host healthy, abundant fish communities and the habitat to support them.

Goal 4. Provide support to enhance the existing fish community in Spring Lake.

Objective 4.1. Enhance fish habitat near shore and in Spring Lake.

Actions	Lead person/group	Resources	Start/end dates
Protect existing natural habitat including downed trees and woody features throughout the lake by informing landowners about their importance, depth of woody features placement to ensure boating safety, and by providing educational materials through SLMD annual mailing and on the Town of Marion’s Spring Lake webpage (http://townshipofmarion.com).	SLMD Town of Marion	UWEX educational materials	Ongoing
Work with WDNR to explore permitting for tree drops and fish sticks.	Shoreland property owners SLMD	Fisheries Biologists - WDNR	As needed, ongoing
Explore the installation of woody habitat under and around docks.	Shoreland property owners SLMD	Fisheries Biologists - WDNR	Ongoing
Protect emergent beds of bulrush and prevent disturbance in those areas via distribution of educational materials.	Shoreland property owners SLMD	UWEX educational materials Local fishing clubs	Ongoing

Objective 4.2. Protect a balanced fish population in Spring Lake.

Actions	Lead person/group	Resources	Start/end dates
Consider proposing a resolution to reduce the bag limit on pan fish to 10 for submission to annual Conservation Congress, depending on DNR pan fish review and potential updates.	SLMD	Fisheries Biologists – WDNR Local fishing clubs Waushara County Conservation Congress representatives	Conservation Congress hearings are held annually in April.
Consider the eventual deterioration of the existing carp weir, and explore actions and resources for its replacement.	SLMD	Fisheries Biologists – WDNR Local fishing clubs Spring Lake Farms, Inc	Ongoing
Manage the grasses/cattails around carp weir since buildup of these plants causes higher water levels at carp weir (which makes it easier for carp to get over into the lake).	SLMD	WDNR Lake Manager SLMD Consultants RC&D Spring Lake Farms, Inc	Ongoing
Maintain open communication with WDNR regarding regulation non-compliance concerns.	Town of Marion	WDNR Warden (see directory of lake contacts in Appendix A)	Ongoing
Inform area lake users of information and updates on any future fishing rule changes via e-mail, website, newsletter, and posting at public landings.	WDNR	WDNR	Ongoing

Aquatic Plants

Aquatic plants provide the forested landscape within Spring Lake. They provide food and habitat for spawning, breeding and survival for a wide range of inhabitants and lake visitors including fish, waterfowl, turtles and 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 create 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 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 August 2013 aquatic plant survey, twenty-five species of aquatic plants were found in Spring Lake, which was above average when compared with other lakes in the Waushara County Lakes Study (Golden Sands Resource Conservation and Development Council, Inc., 2014). The most common plants encountered were muskgrasses (*Chara* spp.) and coontail (*Ceratophyllum demersum*). One species, small purple bladderwort (*Utricularia resupinata*) is a species of special concern in Wisconsin. The areas in which this species was found should be treated with great care when considering aquatic plant management options. Another species of special concern, horsetail spikerush (*Eleocharis equisetoides*), has also been documented within the township of Marion (Wisconsin Department of Natural Resources, 2014). There is concern that additional rare plants may exist in this area, but are yet to be documented. Two aquatic invasive plant species (AIS) were observed: Eurasian watermilfoil and curly-leaf pondweed. More detailed information can be found in the Spring Lake Aquatic Plant Management Plan, Spring Lake Aquatic Plant Report, or the Spring Lake 2010-2012 Lake Study Report.

Guiding Vision for Aquatic Plants in Spring Lake

Spring Lake's native aquatic plant community will continue to include sensitive and rare species of plants with minimal disturbance by aquatic invasive species.

Goal 5. Protect native plants in and around Spring Lake.

Objective 5.1. Avoid disturbing the native aquatic plant community when possible.

Actions	Lead person/group	Resources	Start/end dates
Refer to the Spring Lake Aquatic Plant Management Plan (Appendix D) for more detailed aquatic plant information, management options, and chosen actions.	SLMD	WLCD RC&D WDNR Lakes Manager Consultants	Ongoing

<p>Minimize removal and disturbance of native vegetation via educational materials provided in annual mailing, WLCD webpage re: mitigation methods available https://waushara.municipalcms.com/pView/asp?id=13678&catid=636.</p>	SLMD	UWEX WDNR Lakes Manager WLCD WCWLC	Ongoing
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Aquatic Invasive Species (AIS)

Aquatic invasive species are non-native aquatic plants and animals that are most often unintentionally introduced to the lake by lake users. This most commonly occurs on trailers, boats, equipment and from the release of bait.



Curly-leaf pondweed (CLP) was originally identified in Spring Lake in 2003, and was found again in August 2013 in two locations (Appendix D: Aquatic Plant Management Plan 2015). This plant can live in harmony with the rest of the aquatic plant community, but can become invasive. The die-off of large beds of CLP in June can contribute to nuisance algae blooms throughout the summer. In Spring Lake, CLP should be monitored annually in early June and management should be considered if the beds expand.

Eurasian watermilfoil (EWM) was first identified in Spring Lake in 1994. The locations of observed EWM populations in 2013 are displayed in the map in Appendix D: Aquatic Plant Management Plan 2015. In some lakes, EWM can exist as part of the plant community, while in others it can create dense beds that can damage boat motors, make areas non-navigable, and inhibit swimming and fishing. This plant can produce viable seeds, but it often spreads by fragmentation. Just a small stem fragment 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.



If an invasive plant species not previously documented in Spring Lake is observed by any lake user, the lake user is encouraged to refer to Appendix C: Rapid Response Plan for more information on how to report it.

Summary of Aquatic Plant Management Planning Session Discussion – April 17, 2014

Various aquatic plan management options involving the control of aquatic invasive species (CLP and EWM) were discussed at a lake management planning session on April 17, 2014. The Spring Lake Management District has been active in implementing a monitoring strategy for aquatic invasive species. Beginning in 2002, a contracted vendor has surveyed the lake each fall for invasive species, along with three summer surveys conducted by Golden Sands Resource Conservation and Development Council, Inc. Records of these surveys can be found in Spring Lake Management District files.

Attendees considered responses given to the aquatic plant survey questions about EWM control. The majority of survey respondents wanted to do something to control AIS in Spring Lake, with the most popular control option identified as manual removal by property owners. Respondents were nearly split on their support for the use of herbicides (chemical control), hand removal of EWM by divers, harvesting, and biological control by the native milfoil weevil, *Euhrychiopsis lecontei*. In addition, attendees conversed with aquatic plant specialists and learned that, based on new science, lake managers with the Wisconsin Department of Natural Resources are changing their recommendations for the control of EWM. For more details on aquatic plant management strategies and aquatic plant management in Spring Lake, refer to the Spring Lake Aquatic Plant Management Plan. Detailed survey results regarding aquatic plants can be found in the Aquatic Plant Management Plan in the appendices or on the Waushara County website.

Guiding Vision for Aquatic Invasive Species

Spring Lake will not be detrimentally affected by aquatic invasive species.

Goal 6. Diminish populations of aquatic invasive species in and around Spring Lake.

Objective 6.1. Reduce populations of curly-leaf pondweed and Eurasian watermilfoil in Spring Lake.

Actions	Lead person/group	Resources	Start/end dates
In summer 2014, continue a combination of chemical spot treatments and hand pulling. Follow up at least 30 days after the treatment.	SLMD	Aquatic plant specialist – WDNR Consultants RC&D	Summer 2014, ongoing
Beginning in 2015, consider working with other area lakes to apply for a grant to hire divers to hand-pull AIS plants.	SLMD	Other local lake groups RC&D Consultants	2015
Test the DNA of milfoil plants to evaluate the presence of hybrid watermilfoil.	SLMD	RC&D	2014

Objective 6.2. Inform lake residents and visitors about the spread of aquatic invasive species.

Actions	Lead person/group	Resources	Start/end dates
Include information on AIS in welcome packets.	SLMD	UWEX Lakes – educational materials	Ongoing
Obtain information re: non-native narrowleaf and hybrid cattails to determine if it presents an invasive problem on Spring Lake requiring monitoring/intervention.	SLMD	RC&D WDNR UWEX Lakes Consultants	Fall 2014, Ongoing

Objective 6.3. Learn how to identify and monitor aquatic invasive species.

Actions	Lead person/group	Resources	Start/end dates
Provide opportunities for volunteers to review how to identify aquatic invasive species in the field.	SLMD	RC&D Nearby lake groups	Ongoing
Continue to connect with RC&D when they survey Spring Lake to expand opportunities to learn about invasive species.	SLMD	RC&D Aquatic Plant Biologist – WDNR	Ongoing
Continue to monitor for AIS	SLMD	RC&D Aquatic plant specialist – WDNR Consultants	Ongoing
Continue implementation of a monitoring strategy (contracted vendor, SLMD member reports, etc.) for aquatic invasive species.	SLMD	RC&D Aquatic Plant Biologist – WDNR Consultants	Ongoing
Work with RC&D to coordinate volunteer monitoring shared with other area lakes through the Clean Boats, Clean Waters Program.	SLMD	RC&D WDNR AIS Grants (funds) Waushara County (funds)	Ongoing

Critical Habitat

Special areas harbor habitat essential to the health of a lake and its inhabitants. In Wisconsin, critical habitat areas are identified by biologists and other lake professionals from the Wisconsin Department of Natural Resources. Designating areas of the lake as critical habitat enables these areas to be located on maps and information about their importance to aquatic plants, animals and the overall health and integrity of the lake to be shared. Identifying critical habitat areas can help lake groups and landowners plan waterfront projects that will minimize impacts to important habitat and help ensure the long-term health of the lake.

Although Spring Lake does not currently have any officially designated critical habitat areas, there are areas within Spring 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, and areas with overhanging vegetation, and wetlands are elements of good quality habitat. The Spring Lake planning committee participants identified the area surrounding the northern inlet to the lake and the plants and wildlife that can be found there as exceptional habitat in Spring Lake. 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 for Spring Lake’s Critical Habitat

Sensitive areas in and around Spring Lake will remain intact and protected.

Goal 7. Protect unique areas that are valuable to the water quality and habitat in Spring Lake

Objective 7.1. Raise awareness for the importance of healthy habitat and intact land around Spring Lake.

Actions	Lead person/group	Resources	Start/end dates
Obtain information re: official critical habitat designation, significance/impact for member discussion.	SLMD	WDNR Lakes Specialist, WDNR Fisheries Biologist, WDNR Wildlife Biologist	2017, as needed
Protect near-shore vegetation and woody habitat by distributing information about the importance of fish habitat.	SLMD	UWEX educational materials	2015, Ongoing
Educate landowners re: Spring Lake property conservancy options (i.e. could offer protection of the northern inlet and undeveloped land parcels with their varied plant/animal wildlife habitat).	SLMD	NCCT NRCS WDNR Lake Protection Grants Wisconsin Stewardship Program	2017, as needed

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. This plan summarizes the decisions of people to take proactive steps to improve and protect their lake and their community. Good decisions by lake shore residents and visitors can have a positive impact on the lake and on those who enjoy this common resource. Collaborative efforts can increase the positive impacts; therefore, communication and cooperation between the lake district, community, and suite of lake users are essential to maximize the effects of the implementation of this plan.

People are drawn to Spring Lake for many reasons, but most frequently the view, peace and calmness are cited. They enjoy spending time on the lake with family, friends and alone. With a variety of uses and interests, conflicts of use may arise on a lake from time to time. Discussions about potential or existing conflicts and identifying ways to resolve them can make a visit to the lake pleasant for everyone. Sometimes verbal agreements are enough, but at other times written guidance helps to reduce conflicts. Boating hours and fishing rules are examples of written guidance that are put into place to minimize conflicts between lake users and to balance human activities with environmental considerations for the lake.

Recreation

Spring Lake is enjoyed by residents and visitors who swim, boat, fish and appreciate its beauty. The lake is used and enjoyed year-round. Spring Lake is a 'No Wake' lake, with two public boat landings on the northwestern side of the southwestern end of the lake, and one on the southeastern side of the northeastern end of the lake.

Guiding Vision for Recreation

***The majority of visitors to Spring Lake will know about, appreciate and respect the lake and recreate responsibly.
Spring Lake will remain a no-wake lake.***

Goal 8. Facilitate the availability of important lake information to the public.

Objective 8.1. Provide lake users with information and rules necessary to make responsible decisions.

Actions	Lead person/group	Resources	Start/end dates
Maintain signage at boat landings and around the lake with important lake, recreation, and habitat information.	Town of Marion SLMD	WDNR, Town of Marion, volunteer property owners	Ongoing
Support the no-wake designation on Spring Lake.	Town of Marion	Town of Marion	Ongoing
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 Warden Town of Marion Boat Officer	WDNR Warden Town of Marion	Ongoing

Communication and Organization

Many of the goals outlined in this plan focus on distributing information to lake and watershed residents and lake users in order to help them make informed decisions that will result in a healthy ecosystem in Spring Lake 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

The Spring Lake Management District and planning committee will maintain and build communications internally and within the community.

Goal 9. Maintain open communications with lake users to keep visitors and residents informed about responsible lake stewardship and encourage involvement.

Objective 9.1. Distribute important lake information to residents and lake visitors.

Actions	Lead person/group	Resources	Start/end dates
Continue the distribution of a welcome packet to all new and current residents of Spring Lake via the WCWLC.	SLMD	WCWLC	Ongoing
Announce lake happenings and management activities, events, at the annual meeting and on the Town of Marion’s Spring Lake webpage (http://townshipofmarion.com).	SLMD	SLMD	Ongoing, Annually
Continue annual newsletter distribution in May; continue posting this information on the town website.	SLMD	Town of Marion	Ongoing, Annually
Plan post annual meeting “coffee hour”.	SLMD	SLMD members	2015, Ongoing

Implementation

The implementation of the Spring Lake Management Plan will require the involvement of watershed residents, riparian landowners and lake users, and land use decisions made by Waushara County officials and the Town of Marion Board. The involvement of these multiple parties will ultimately help to make informed decisions that will result in a healthy ecosystem in Spring Lake that is enjoyed by many people.

Guiding Vision for Implementation

The Spring Lake Management Plan will be referenced during county and local land management and comprehensive planning decisions.

Goal 10. Incorporate goals, objectives and actions outlined in the Spring Lake Management Plan into local land management and comprehensive plans.

Objective 10.1. Incorporate goals, objectives and actions outlined in the Spring Lake Management Plan into local land management and comprehensive plans.

Actions	Lead person/group	Resources	Start/end dates
Incorporate Spring Lake Management Plan into the Waushara County Comprehensive Plan and the Waushara County Land Management Plan and other relevant county plans and decision making processes.	WLCD SLMD	Waushara County , copies to WDNR, other appropriate officials	2015/2016
Incorporate Spring Lake Management Plan into the Town of Marion Comprehensive Plan.	WLCD SLMD	Town of Marion, copies to WDNR, other appropriate officials	2015, ongoing

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 updated with any necessary changes.

Guiding Vision for Updates and Revisions

Spring Lake will have a living, regularly updated plan in place to adaptively protect and improve lake health.

Goal 11. Review plan annually and update as needed.

Objective 11.1. Receive input from and communicate updates with community members.

Actions	Lead person/group	Resources	Start/end dates
Review updates to the plan at the annual meeting.	SLMD Board	SLMD WDNR Lakes Manager WDNR Fisheries Biologist WLCD RC&D Consultants	Annually

Governance

Written by Patrick Nehring, Community Agent, UW-Extension Waushara County.

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 Resource Conservation and Development Council, Inc., 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 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.

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Appendices

Appendix A: Waushara County Lakes 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.

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/>

Conservation Easements (cont'd)

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 Street, PO Box 487, Wautoma, WI 54982
Phone: 920-787-0416
E-mail: ken.williams@ces.uwex.edu
Website: <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

Groundwater Levels/Quantity (cont'd)

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

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\\$.st](http://prodoasext.dnr.wi.gov/inter1/hicap$.st)
artup

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/uwexplakes/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/uwexplakes/organizations/>

Lake Groups (cont'd)

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/>

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

Contact: UWSP Wisconsin Environmental Analysis Laboratory
TNR 200, 800 Reserve St., Stevens Point, WI 54481
Stevens Point, WI 54481
Phone: 715-346-3209
E-mail: weal@uwsp.edu
Website: <http://www.uwsp.edu/cnr-ap/weal/Pages/default.aspx>

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: Scott Koehnke
Wisconsin Department of Natural Resources
647 Lakeland Road, Shawano, WI 54166
Phone: 715-526-4232
E-mail: scott.koehnke@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

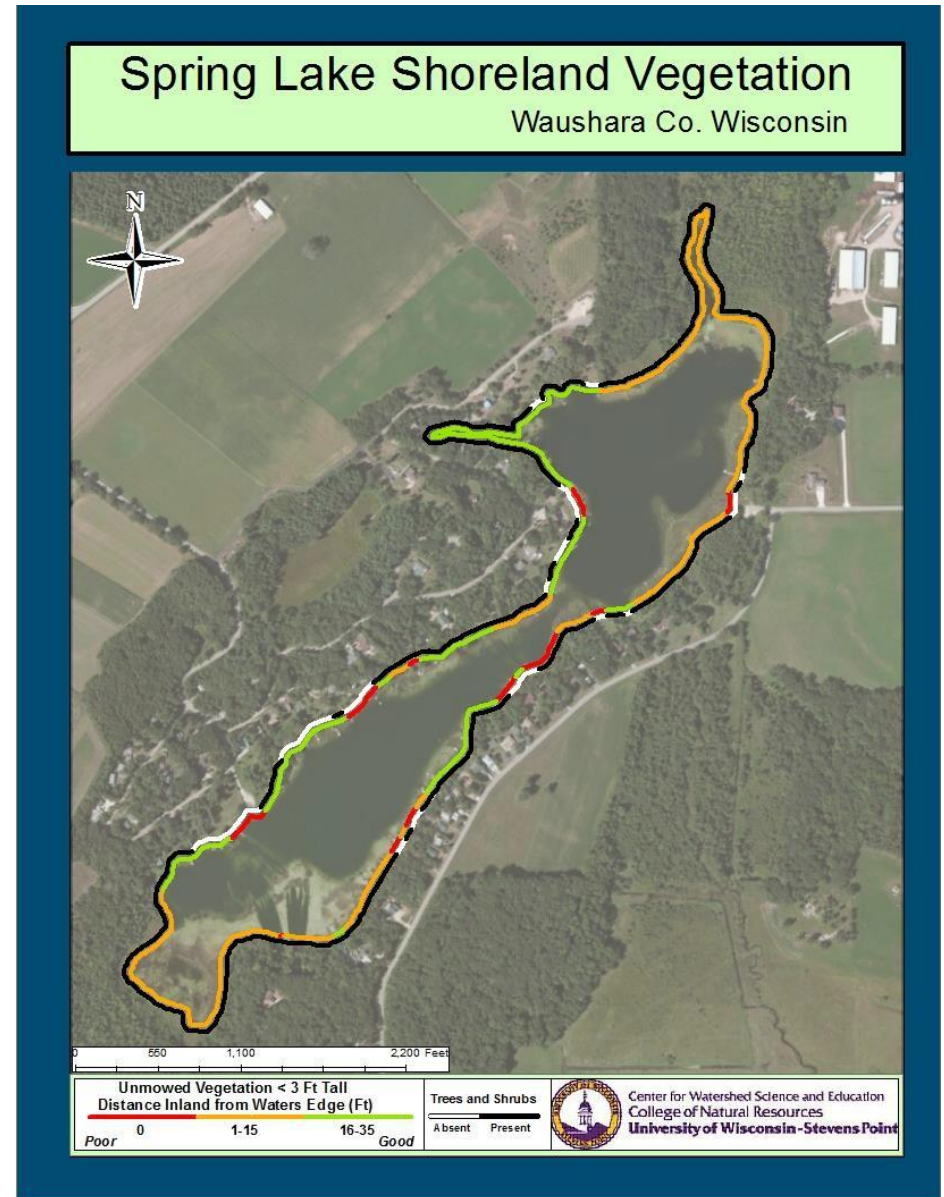
Contact: Dave Bartz
Wisconsin Department of Natural Resources
Phone: 608-635-4989
Address: Hwy 22N Box 430, Montello, WI 53949
E-mail: David.Bartz@wisconsin.gov

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: 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.

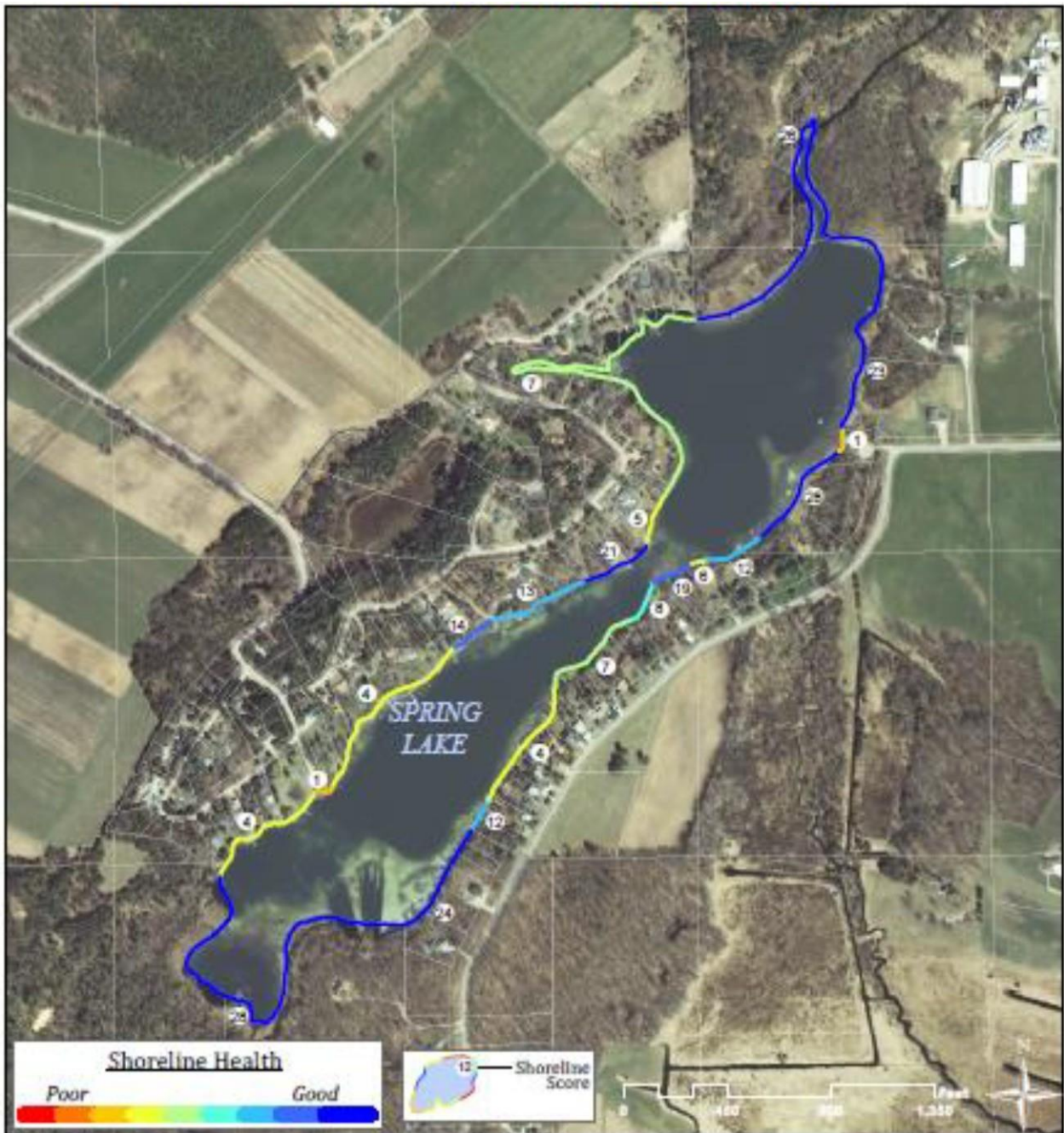
The summary of scores for shorelands around Spring Lake is displayed on the next page. The shorelands were color-coded to show their overall health based on natural and physical characteristics. Blue shorelands identify healthy shorelands with sufficient vegetation and few disturbances. Red shorelands indicate locations where changes in management or mitigation may be warranted. Large stretches of Spring Lake's shorelands are in good shape, but some portions have challenges that should be addressed. There were no stretches of Spring Lake shoreland that 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

M DII&! :20i1
Al:l D.i Apr11, 2010

SPRING 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 warranted. 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
 - Kiww, i:11... (d boathouses,)
 - In*taa
 Structures

Center for Land Use Education
 Map created by Dan McFarlane
 Center for Land Use Education

Appendix C: Rapid Response Plan

SURVEY/MONITOR

1. Learn how to survey/monitor the lake.	Contacts: Water Resource Management Specialist Wisconsin Department of Natural Resources Phone: 920-424-2104 E-Mail: TedM.Johnson@wisconsin.gov Regional Aquatic Invasive Species (AIS) Coordinator Golden Sands RC&D 1100 Main St., Suite #150 Stevens Point, WI 54481 Phone: 715-343-6278 E-Mail: info@goldensandsrccd.org
2. Survey/monitor the lake monthly/seasonally/annually.	If you find a suspected invasive species, report it as soon as possible using the procedure below.

REPORTING A SUSPECTED INVASIVE SPECIES

1. Collect specimens or take photos. Regardless of the method used, provide as much information as possible. Try to include flowers, seeds or fruit, buds, full leaves, stems, roots and other distinctive features. In photos, place a coin, pencil or ruler for scale. Deliver or send specimen ASAP.	Collect, press and dry a complete sample. This method is best because a plant expert can then examine the specimen. -OR- Collect a fresh sample. Enclose in a plastic bag with a moist paper towel and refrigerate. -OR- Take detailed photos (digital or film).
2. Note the location where the specimen was found. If possible, give the exact geographic location using a GPS (global positioning system) unit, topographic map, or the Wisconsin Gazetteer map book. If using a map, include a photocopy with a dot showing the plant's location. You can use TopoZone.com to find the precise location on a digital topographic map. Click the cursor on the exact collection site and note the coordinates (choose UTM or Latitude/Longitude).	Provide one or more of the following: <ul style="list-style-type: none">• Latitude & Longitude• UTM (Universal Transverse Mercator) coordinates• County, Township, Range, Section, Part-section• Precise written site description, noting nearest city & road names, landmarks, local topography

<p>3. Gather information to aid in positive species identification.</p>	<ul style="list-style-type: none"> • Collection date and county • Your name, address, phone, email • Exact location (Latitude/Longitude or UTM preferred, or Township/Range/Section) • Plant name (common or scientific) • Land ownership (if known) • Population description (estimated number of plants and area covered) • Habitat type(s) where found (forest, field, prairie, wetland, open water)
<p>4. Mail or bring specimens and information to any of the following locations:</p> <p>Digital photos may be emailed.</p>	<p>Wisconsin Dept. Natural Resources 427 E. Tower Drive, Suite 100 Wautoma, WI 54982 Phone: (920) 787-4686</p> <p>Regional AIS Coordinator Golden Sands RC&D 1100 Main St., Suite #150 Stevens Point, WI 54481 Phone: 715-343-6214 E-Mail : info@goldensandsrcd.org</p> <p>UW-Stevens Point Herbarium 301 Trainer Natural Resources Building 800 Reserve Street Stevens Point, WI 54481 Phone: 715-346-4248 E-Mail: ejudziew@uwsp.edu</p> <p>Wisconsin Invasive Plants Reporting & Prevention Project Herbarium-UW-Madison 430 Lincoln Drive Madison, WI 53706 Phone: (608) 267-7612 E-Mail: invasiveplants@mailplus.wisc.edu</p>
<p>5. Once the specimen is dropped off or sent for positive identification, be sure to contact:</p>	<p>Regional AIS Coordinator Golden Sands RC&D 1100 Main St., Suite #150 Stevens Point, WI 54481 Phone: 715-343-6214 E-Mail : info@goldensandsrcd.org</p>

If an invasive species is confirmed, the Regional AIS Coordinator will make the following public information contacts:

- **Wisconsin Department of Natural Resources**
427 E. Tower Drive, Suite 100
Wautoma, WI 54982
Phone: (920) 787-4686

The town board(s) in which the water body is located

Town of: Marion

- **The Lake District** in which the waterbody is located.
Spring Lake Management District
Contact: Marty Wilke, Chair
Phone: 920-566-4605
- **University of Wisconsin-Stevens Point**
Water Resource Scientist
Nancy Turyk
Trainer Natural Resources Building
800 Reserve Street
Stevens Point, WI 54481 Telephone: 715-346-4155
E-mail: nturyk@uwsp.edu
- **Local Residents**
- **Spring Lake Management District**

If an invasive species is confirmed the secretary of the Spring Lake Management District will make the following public information contacts:

- **Newspapers:** The Argus, The Resorter

Contact the WDNR to post notice(s) at the access point(s) to the water body.

Appendix D: Aquatic Plant Management Plan 2015

The aquatic plant management plan is available in a separate file:

[Spring Lake Aquatic Plant Management Plan](#)

Appendix E: Lake User Survey Results

Survey results are available in a separate file:

[Spring Lake 2014 Lake User Survey Results](#)

Waushara County Lakes Project - Spring Lake Survey #1

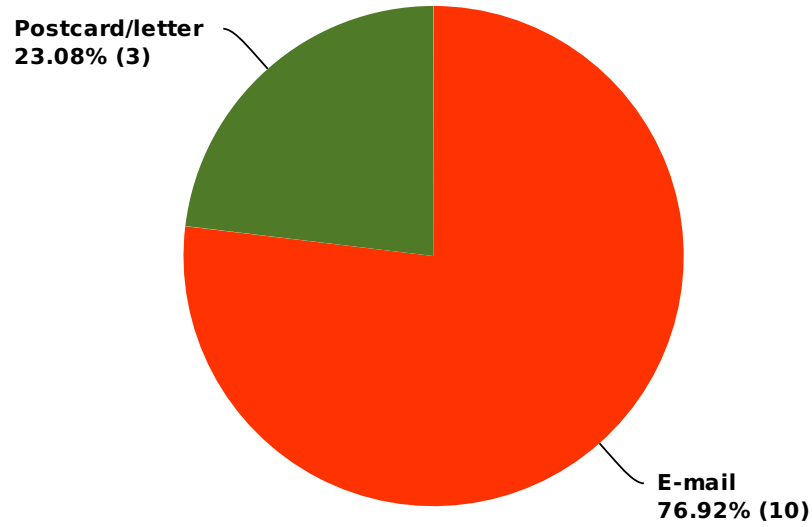
Q1 What is your Waushara County Lakes Survey ID?

Answered: 14 Skipped: 0

#	Responses	Date
1	[REDACTED]	2/26/2014 6:05 PM
2	[REDACTED]	2/4/2014 2:07 PM
3	[REDACTED]	2/1/2014 2:54 PM
4	[REDACTED]	1/30/2014 5:48 PM
5	[REDACTED]	1/30/2014 5:04 PM
6	[REDACTED]	1/30/2014 5:00 PM
7	[REDACTED]	1/30/2014 3:49 PM
8	[REDACTED]	1/30/2014 2:03 PM
9	[REDACTED]	1/30/2014 12:49 PM
10	[REDACTED]	1/25/2014 3:57 PM
11	[REDACTED]	1/23/2014 2:39 PM
12	[REDACTED]	1/22/2014 3:58 PM
13	[REDACTED]	1/22/2014 7:31 AM
14	[REDACTED]	1/21/2014 7:44 PM

Q2 How did you hear about this survey?

Answered: 13 Skipped: 1



Answer Choices	Responses	
E-mail	76.92%	10
Newspaper	0%	0
Postcard/letter	23.08%	3
Facebook	0%	0
Radio	0%	0
Total		13

#	Other (please specify)	Date
1	From Lake District President	2/1/2014 2:54 PM
2	assoc.officer	1/30/2014 5:04 PM
3	local community group	1/25/2014 3:57 PM

Q3 Do you own or rent property...

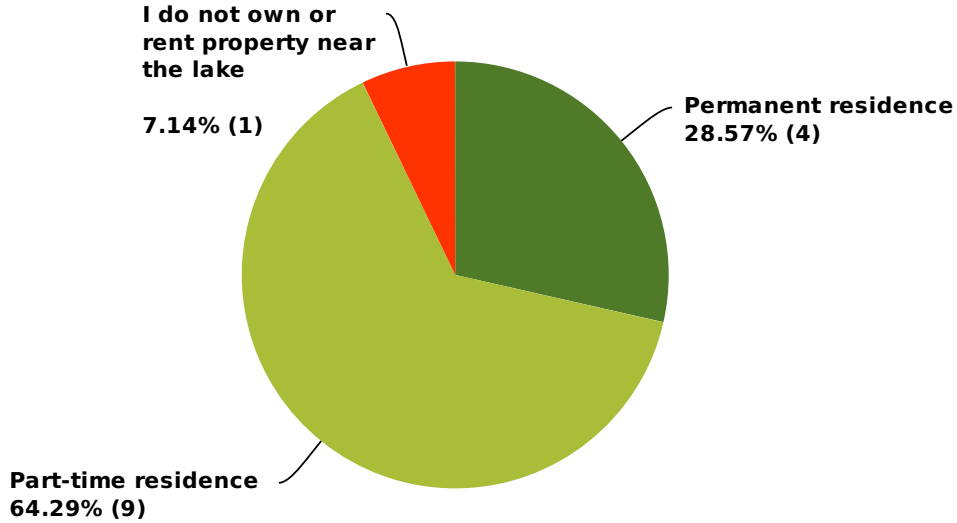
Answered: 14 Skipped: 0



Answer Choices	Responses	
Around the lake	92.86%	13
Less than 1/2 mile from the lake	0%	0
1/2 mile to 1 mile of the lake	0%	0
More than 1 mile from the lake	7.14%	1
I do not own or rent property near the lake	0%	0
Total		14

Q4 If you own or rent property near the lake, is this property your permanent residence, a part-time residence (such as a vacation home, rental, etc.), or other?

Answered: 14 Skipped: 0

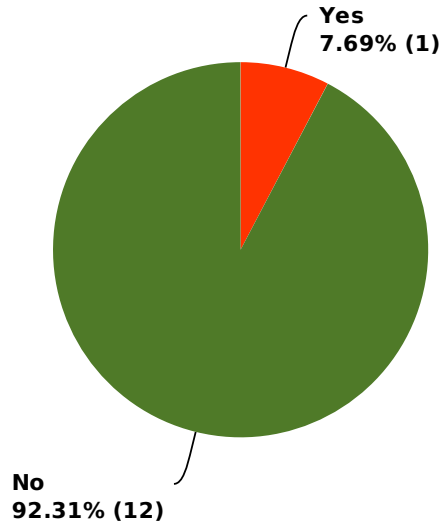


Answer Choices	Responses
Permanent residence	28.57% 4
Part-time residence	64.29% 9
I do not own or rent property near the lake	7.14% 1
Total	14

#	Other (please specify)	Date
	There are no responses.	

Q5 I own property on or near the lake because I inherited it.

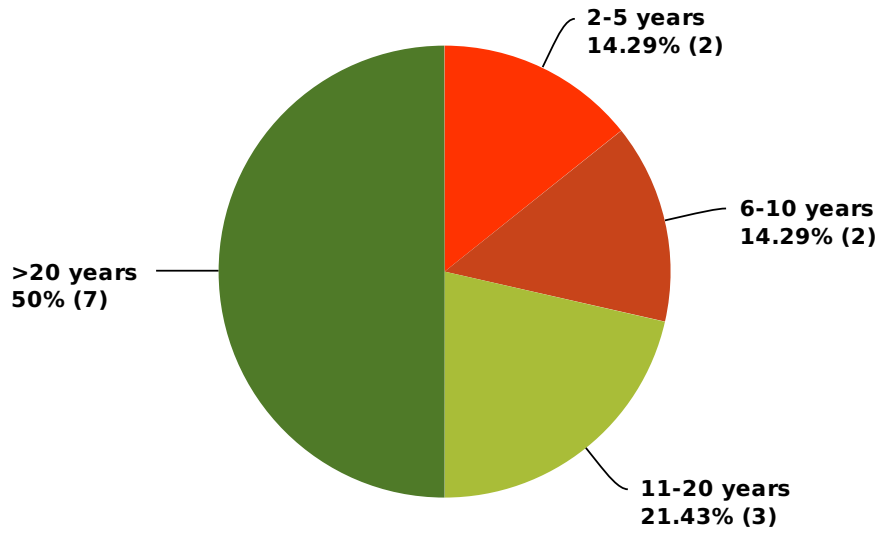
Answered: 13 Skipped: 1



Answer Choices	Responses	
Yes	7.69%	1
No	92.31%	12
Total		13

**Q6 How long have you lived on, visited or
recreated on the lake?**

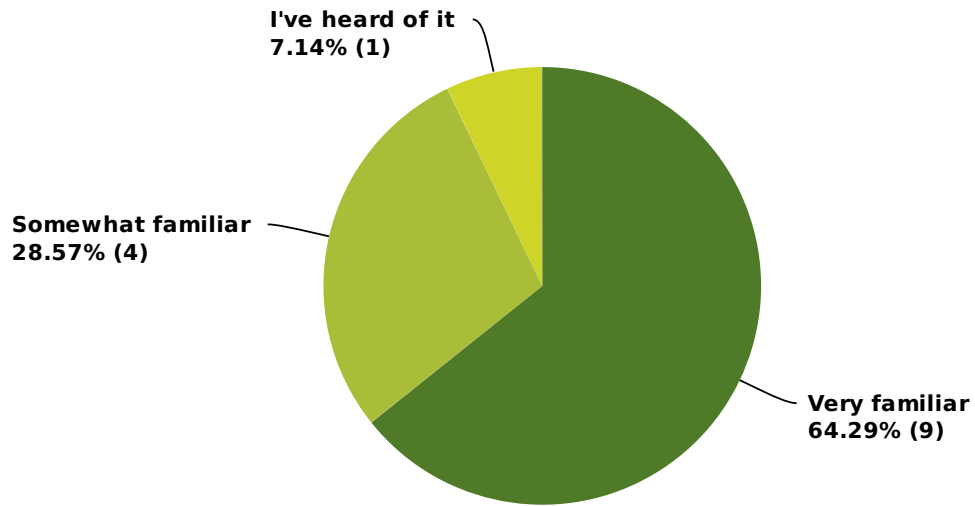
Answered: 14 Skipped: 0



Answer Choices	Responses	
<2 years	0%	0
2-5 years	14.29%	2
6-10 years	14.29%	2
11-20 years	21.43%	3
>20 years	50%	7
Total		14

Q7 Are you familiar with the Spring Lake Management District (SLMD)?

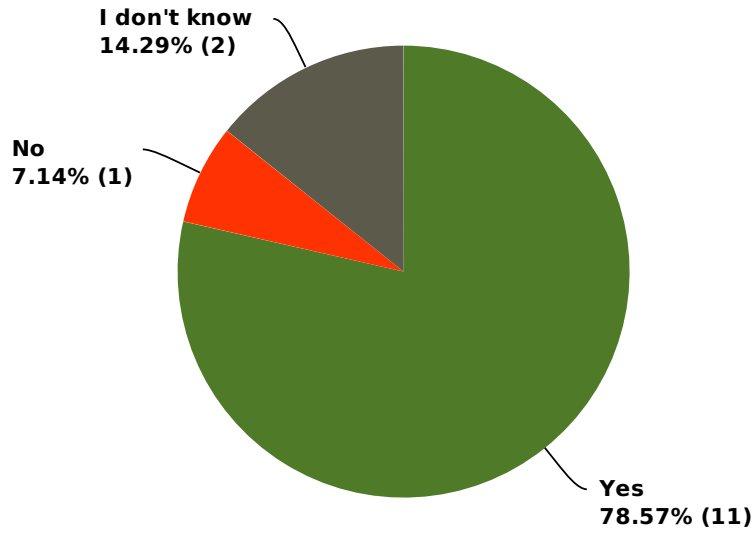
Answered: 14 Skipped: 0



Answer Choices	Responses	
Very familiar	64.29%	9
Somewhat familiar	28.57%	4
I've heard of it	7.14%	1
Never heard of it	0%	0
Total		14

Q8 Are you a member of the Spring Lake Management District?

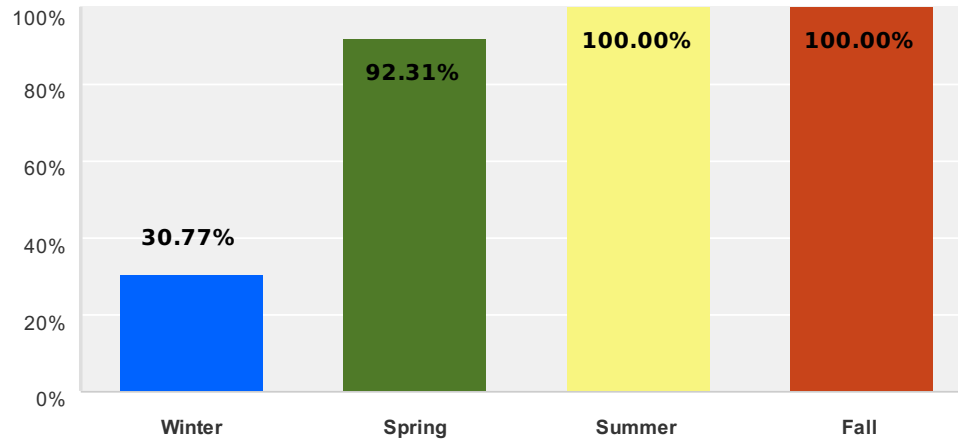
Answered: 14 Skipped: 0



Answer Choices	Responses	
Yes	78.57%	11
No	7.14%	1
I don't know	14.29%	2
Total		14

Q9 What time of year do you generally use the lake? Select all that apply.

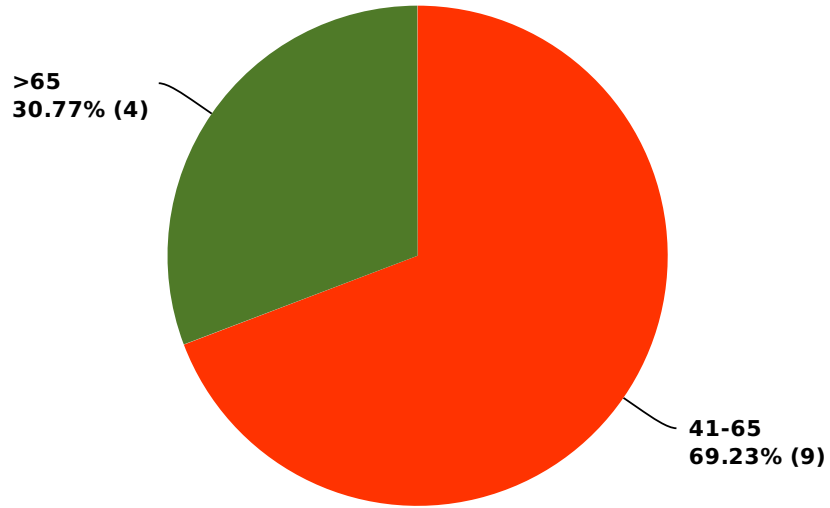
Answered: 13 Skipped: 1



Answer Choices	Responses
Winter	30.77% 4
Spring	92.31% 12
Summer	100% 13
Fall	100% 13
Total Respondents: 13	

Q10 Which category below includes your age?

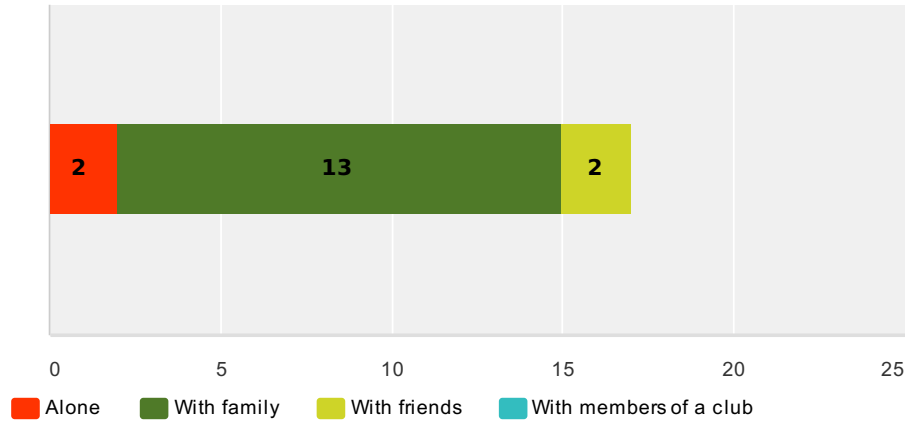
Answered: 13 Skipped: 1



Answer Choices	Responses	
Under 18	0%	0
18-40	0%	0
41-65	69.23%	9
>65	30.77%	4
Total		13

Q11 When you visit Spring Lake, are you typically...(check all that apply)

Answered: 13 Skipped: 1



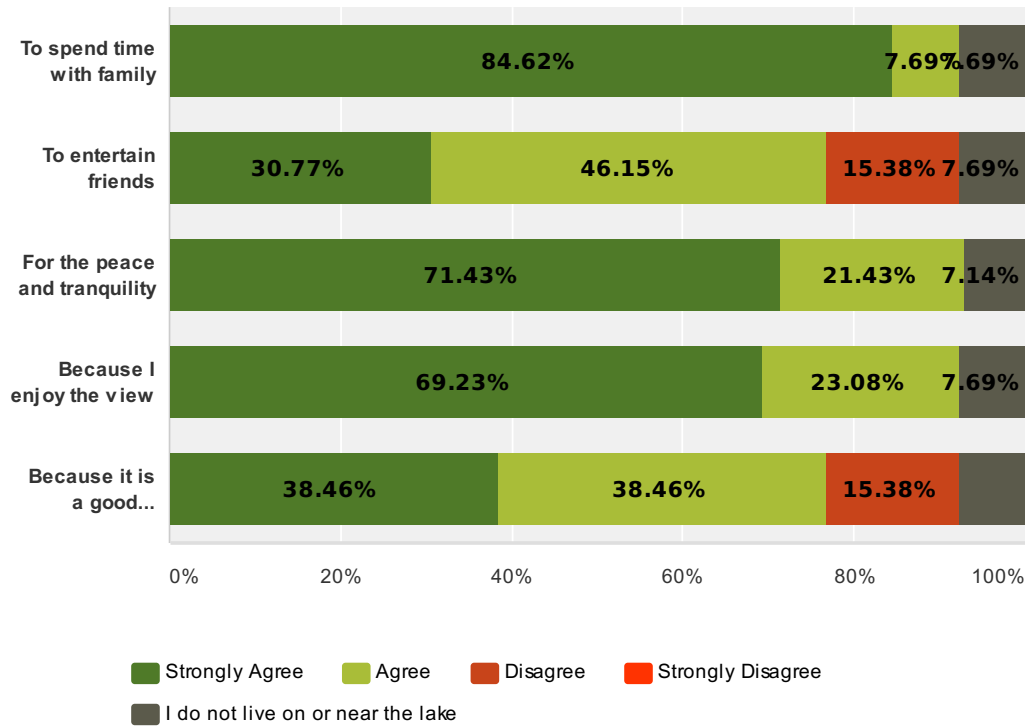
Answer Choices	Responses
Alone	15.38% 2
With family	100% 13
With friends	15.38% 2
With members of a club	0% 0
Total Respondents: 13	

#	Other (please specify)	Date
	There are no responses.	

Waushara County Lakes Project - Spring Lake Survey #1

Q12 I live on or near the lake...

Answered: 14 Skipped: 0



	Strongly Agree	Agree	Disagree	Strongly Disagree	I do not live on or near the lake	Total
To spend time with family	84.62% 11	7.69% 1	0% 0	0% 0	7.69% 1	13
To entertain friends	30.77% 4	46.15% 6	15.38% 2	0% 0	7.69% 1	13
For the peace and tranquility	71.43% 10	21.43% 3	0% 0	0% 0	7.14% 1	14
Because I enjoy the view	69.23% 9	23.08% 3	0% 0	0% 0	7.69% 1	13
Because it is a good investment	38.46% 5	38.46% 5	15.38% 2	0% 0	7.69% 1	13

Waushara County Lakes Project - Spring Lake Survey #1

Q13 What do you value most about Spring Lake?

Answered: 13 Skipped: 1

#	Responses	Date
1	Quiet	2/26/2014 6:08 PM
2	quite, peacefulness	2/4/2014 2:09 PM
3	remoteness while being close to needed services	2/1/2014 2:57 PM
4	The fishing	1/30/2014 5:50 PM
5	Spring Lake water activities with family have been our tradition since 1963.	1/30/2014 5:15 PM
6	the clear water	1/30/2014 5:10 PM
7	Water quality and "no wake" status	1/30/2014 3:52 PM
8	Water quality	1/30/2014 2:07 PM
9	Fishing, swimming, and the natural beauty of the lake.	1/30/2014 12:56 PM
10	No wake lake with fishing.	1/25/2014 3:59 PM
11	quiet and peaceful	1/22/2014 4:02 PM
12	Quite lake, no wake	1/22/2014 7:36 AM
13	nature - lake, fishing, wildlife, trails, plants	1/21/2014 7:49 PM

Waushara County Lakes Project - Spring Lake Survey #1

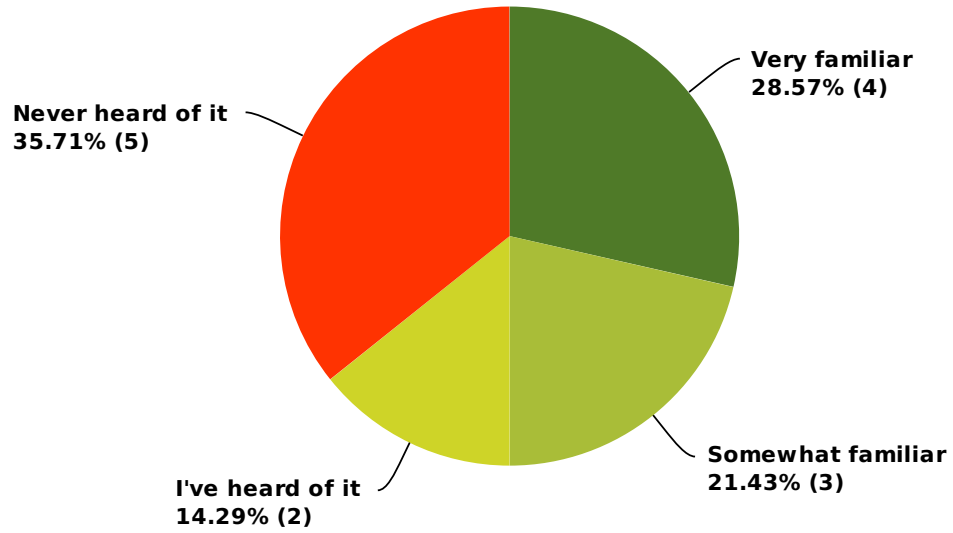
Q14 In your opinion, what should be done to restore, maintain, or improve Spring Lake?

Answered: 12 Skipped: 2

#	Responses	Date
1	This is NOT the responsibility of the people living on or near the lake. The Wisconsin DNR has total authority for all inland waters, and we pay taxes for that department to manage ALL water quality issues.	2/26/2014 6:08 PM
2	keep no wake; maybe remove gas motors	2/4/2014 2:09 PM
3	Continue to control weeds and maintain water quality. Monitor probable pollution sources.	2/1/2014 2:57 PM
4	Thoughtful discussions of problems should involve all stake holders. Decisions should be made that restore or maintain clean water. These decisions must be enforced.	1/30/2014 5:15 PM
5	catch and release and limit outside boats to decrease eurasian milfoil	1/30/2014 5:10 PM
6	Continue treating for aquatic invasive species; encourage shoreline owners to maintain buffer zone between lawn and lake	1/30/2014 3:52 PM
7	Control invasives (plants, carp), stock fish, monitor farm run-off.	1/30/2014 2:07 PM
8	Inact fishing restrictions to return a healthy fish population. Return more of the shoreline to a natural state.	1/30/2014 12:56 PM
9	Frequent removal of marl.	1/25/2014 3:59 PM
10	nothing. I like it the way it is managed	1/22/2014 4:02 PM
11	Leave lake and owners alone. The lake is quite and most owners are respectful of the lake.	1/22/2014 7:36 AM
12	treat AIS, monitor water quality, put limits on fish taken during ice fishing season so there are maturing fish present year round for all to enjoy	1/21/2014 7:49 PM

Q15 How familiar are you with Wisconsin's Public Trust Doctrine?

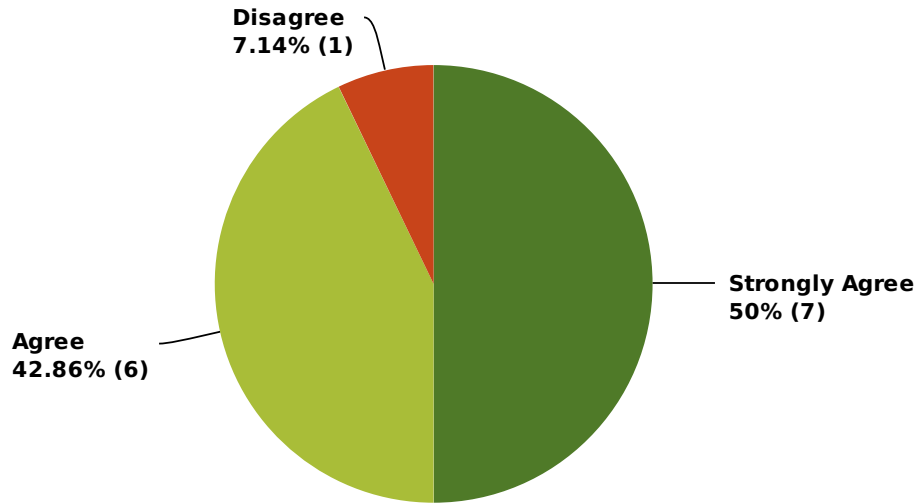
Answered: 14 Skipped: 0



Answer Choices	Responses	
Very familiar	28.57%	4
Somewhat familiar	21.43%	3
I've heard of it	14.29%	2
Never heard of it	35.71%	5
Total		14

Q16 How I recreate in and around the lake can affect other lake users.

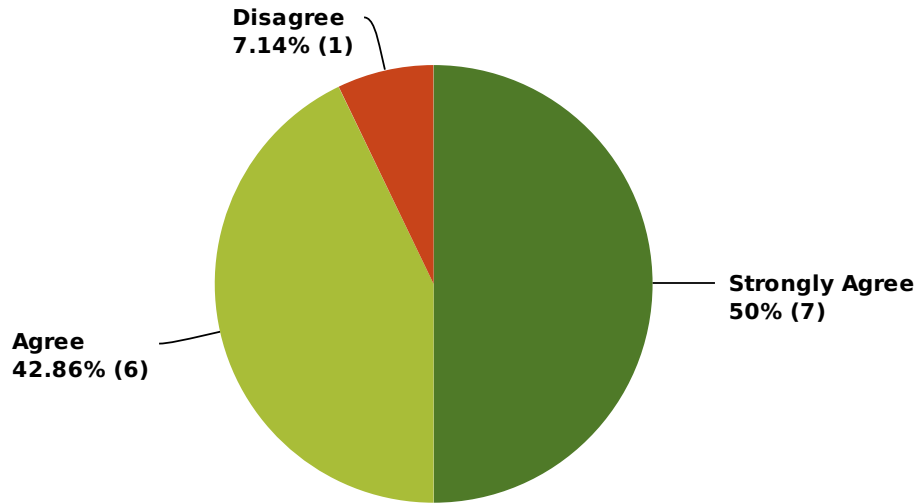
Answered: 14 Skipped: 0



Answer Choices	Responses	
Strongly Agree	50%	7
Agree	42.86%	6
Disagree	7.14%	1
Strongly Disagree	0%	0
Total		14

Q17 How I manage my land can affect other lake users.

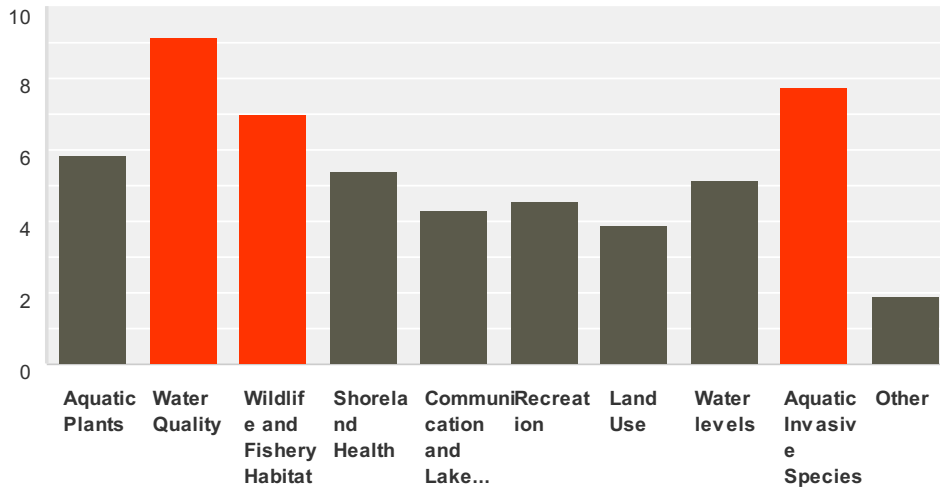
Answered: 14 Skipped: 0



Answer Choices	Responses	
Strongly Agree	50%	7
Agree	42.86%	6
Disagree	7.14%	1
Strongly Disagree	0%	0
Total		14

Q18 Which of the following meeting topics, in your opinion, are the most important to talk about regarding Spring Lake? (Please rank at least your top three.)

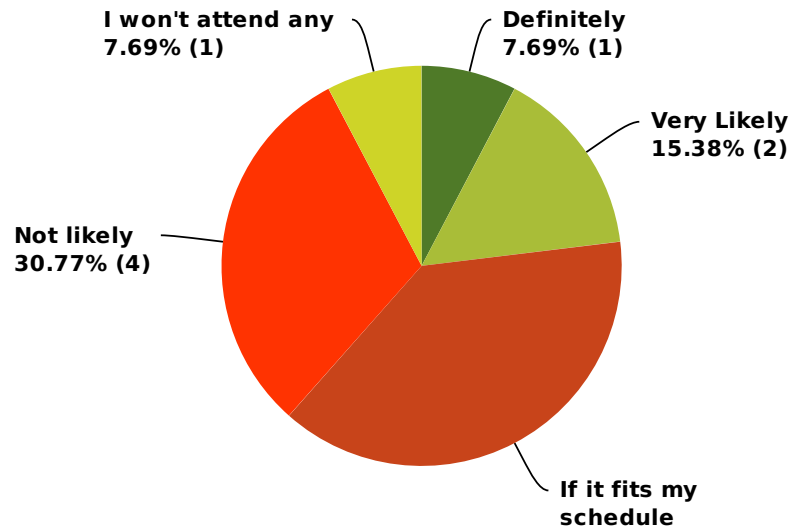
Answered: 13 Skipped: 1



	1	2	3	4	5	6	7	8	9	10	Total	Average Ranking
Aquatic Plants	15.38% 2	0% 0	0% 0	15.38% 2	30.77% 4	7.69% 1	15.38% 2	7.69% 1	7.69% 1	0% 0	13	5.85
Water Quality	38.46% 5	46.15% 6	7.69% 1	7.69% 1	0% 0	0% 0	0% 0	0% 0	0% 0	0% 0	13	9.15
Wildlife and Fishery Habitat	0% 0	23.08% 3	38.46% 5	7.69% 1	7.69% 1	0% 0	15.38% 2	7.69% 1	0% 0	0% 0	13	7.00
Shoreland Health	0% 0	0% 0	7.69% 1	7.69% 1	38.46% 5	30.77% 4	0% 0	7.69% 1	7.69% 1	0% 0	13	5.38
Communication and Lake Group Support	7.69% 1	0% 0	0% 0	0% 0	15.38% 2	15.38% 2	23.08% 3	23.08% 3	7.69% 1	7.69% 1	13	4.31
Recreation	0% 0	0% 0	23.08% 3	7.69% 1	0% 0	7.69% 1	23.08% 3	15.38% 2	15.38% 2	7.69% 1	13	4.54
Land Use	0% 0	0% 0	0% 0	7.69% 1	7.69% 1	23.08% 3	7.69% 1	38.46% 5	15.38% 2	0% 0	13	3.92
Water levels	7.69% 1	15.38% 2	7.69% 1	7.69% 1	0% 0	15.38% 2	7.69% 1	0% 0	38.46% 5	0% 0	13	5.15
Aquatic Invasive Species	23.08% 3	15.38% 2	15.38% 2	38.46% 5	0% 0	0% 0	0% 0	0% 0	7.69% 1	0% 0	13	7.77
Other	7.69% 1	0% 0	0% 0	0% 0	0% 0	0% 0	7.69% 1	0% 0	0% 0	84.62% 11	13	1.92

Q19 Many of the decisions determining the final lake management plan will be made at the planning sessions. Sessions will typically take place monthly on weeknights. How likely is it that you will attend one or more of the planning sessions?

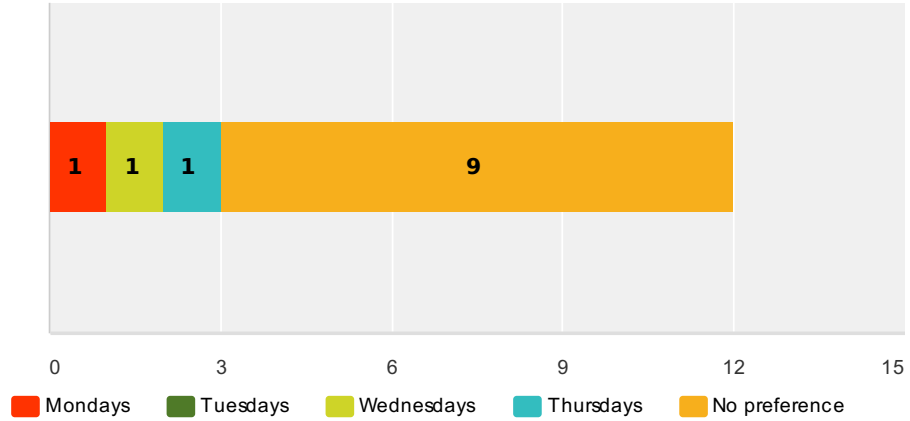
Answered: 13 Skipped: 1



Answer Choices	Responses	
Definitely	7.69%	1
Very Likely	15.38%	2
If it fits my schedule	38.46%	5
Not likely	30.77%	4
I won't attend any	7.69%	1
Total		13

Q20 Previous experience has shown that weekday evenings work best for most people. If you will attend the planning sessions, which weeknights do you prefer?

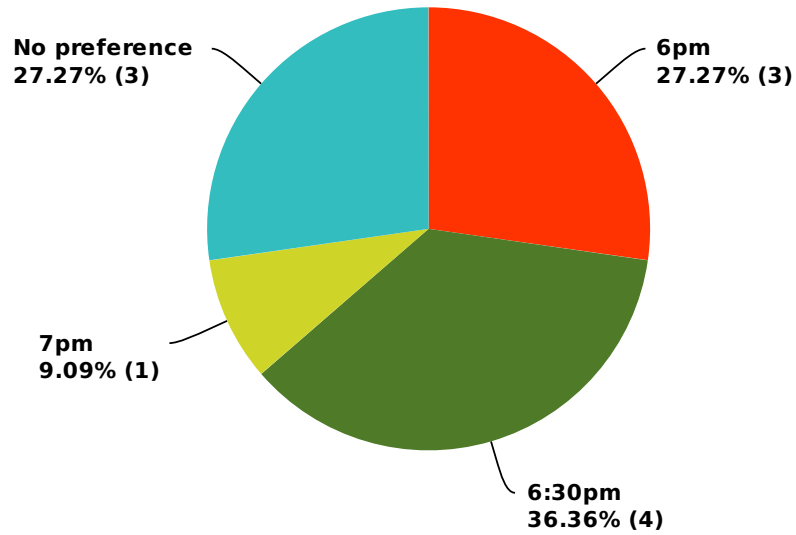
Answered: 12 Skipped: 2



Answer Choices	Responses
Mondays	8.33% 1
Tuesdays	0% 0
Wednesdays	8.33% 1
Thursdays	8.33% 1
No preference	75% 9
Total Respondents: 12	

**Q21 Most sessions will last around 2 hours.
If you will attend the planning sessions,
which times do you prefer to start?**

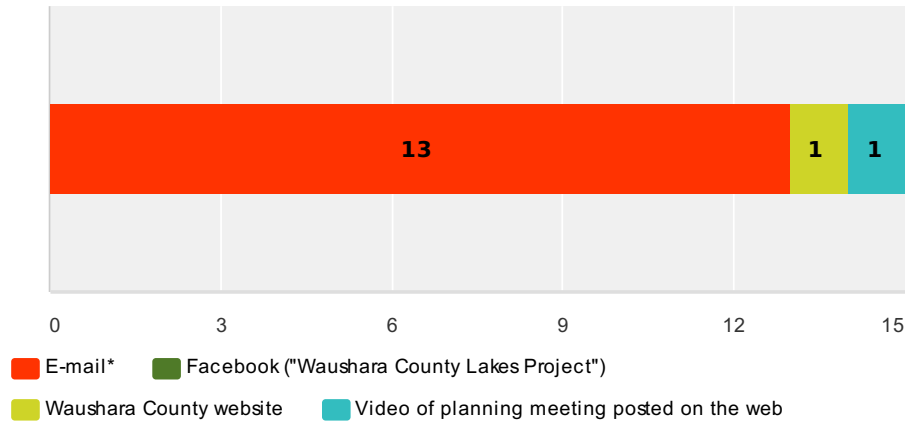
Answered: 11 Skipped: 3



Answer Choices	Responses	
6pm	27.27%	3
6:30pm	36.36%	4
7pm	9.09%	1
7:30pm	0%	0
No preference	27.27%	3
Total		11

Q22 How would you like to receive information about meetings (agendas, minutes), the planning process, and updates? (Select all that apply)

Answered: 13 Skipped: 1



Answer Choices	Responses
E-mail*	100% 13
Facebook ("Waushara County Lakes Project")	0% 0
Waushara County website	7.69% 1
Video of planning meeting posted on the web	7.69% 1
Total Respondents: 13	

#	Other (please specify)	Date
1	author@bestauthor.com	2/26/2014 6:14 PM

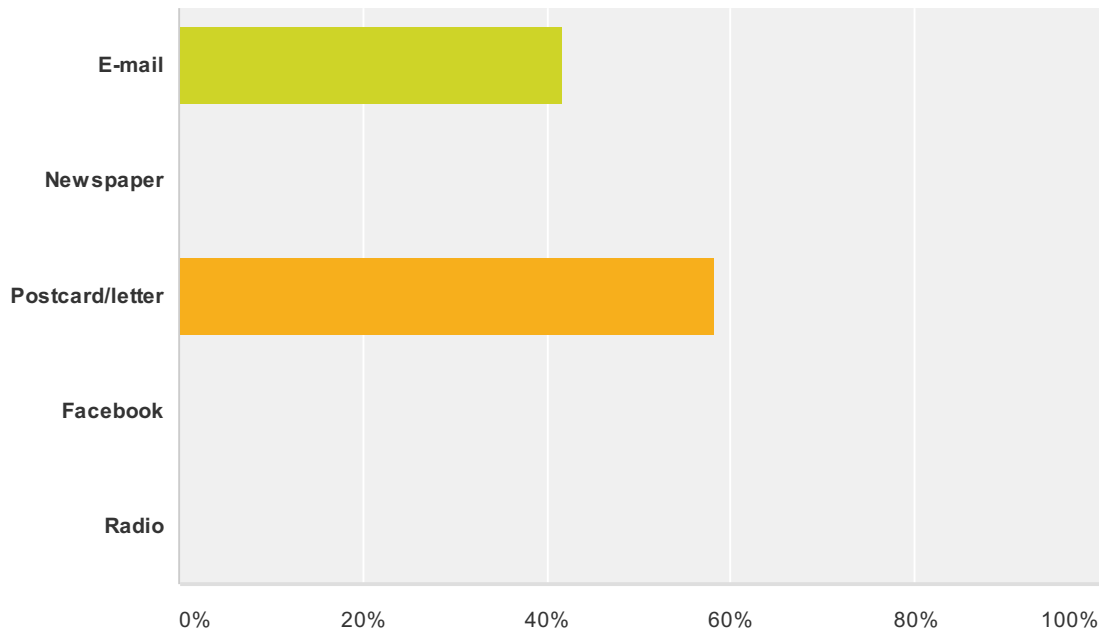
Q1 Enter your Waushara County Lakes Survey ID. If you've forgotten your ID or haven't created one yet, follow the instructions below.

Answered: 13 Skipped: 0

#	Responses	Date
1	██████	3/8/2014 1:10 PM
2	██████	3/6/2014 9:15 AM
3	██████	3/3/2014 6:31 PM
4	██████	2/28/2014 7:49 PM
5	██████	2/28/2014 11:11 AM
6	██████	2/27/2014 9:16 PM
7	██████	2/27/2014 5:07 PM
8	██████	2/27/2014 5:03 PM
9	██████	2/26/2014 6:51 PM
10	██████	2/26/2014 6:15 PM
11	██████	2/26/2014 2:47 PM
12	██████	2/25/2014 1:00 PM
13	██████	2/24/2014 4:29 PM

Q2 How did you hear about this survey?

Answered: 12 Skipped: 1

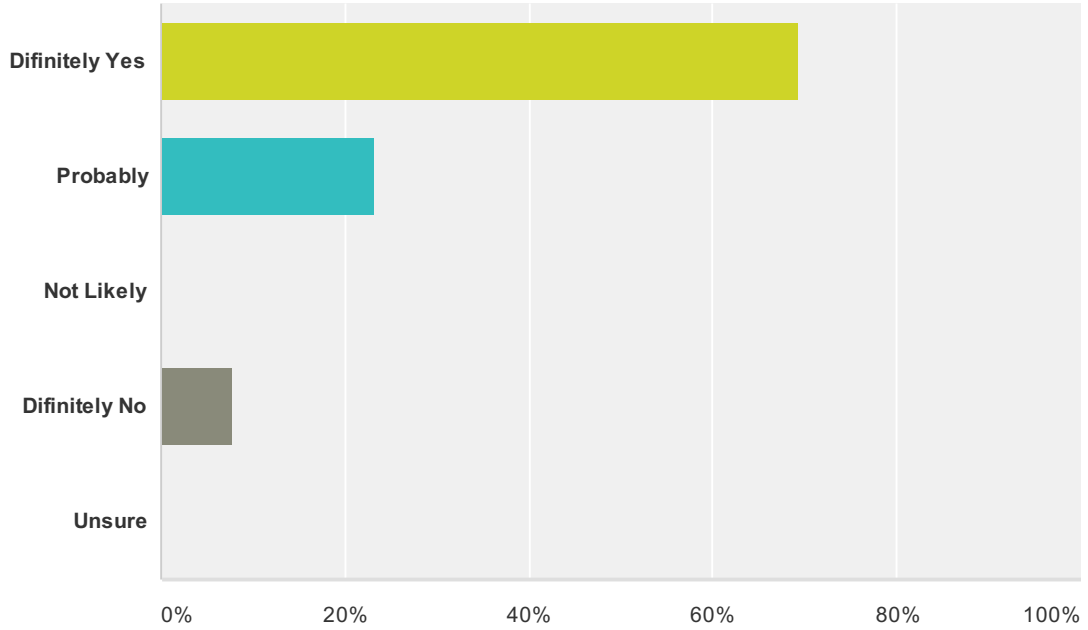


Answer Choices	Responses
E-mail	41.67% 5
Newspaper	0% 0
Postcard/letter	58.33% 7
Facebook	0% 0
Radio	0% 0
Total	12

#	Other (please specify)	Date
1	friend	3/6/2014 9:15 AM

Q3 Does a desire to provide better habitat for fish and wildlife motivate you to support (morally) efforts to improve Spring Lake?

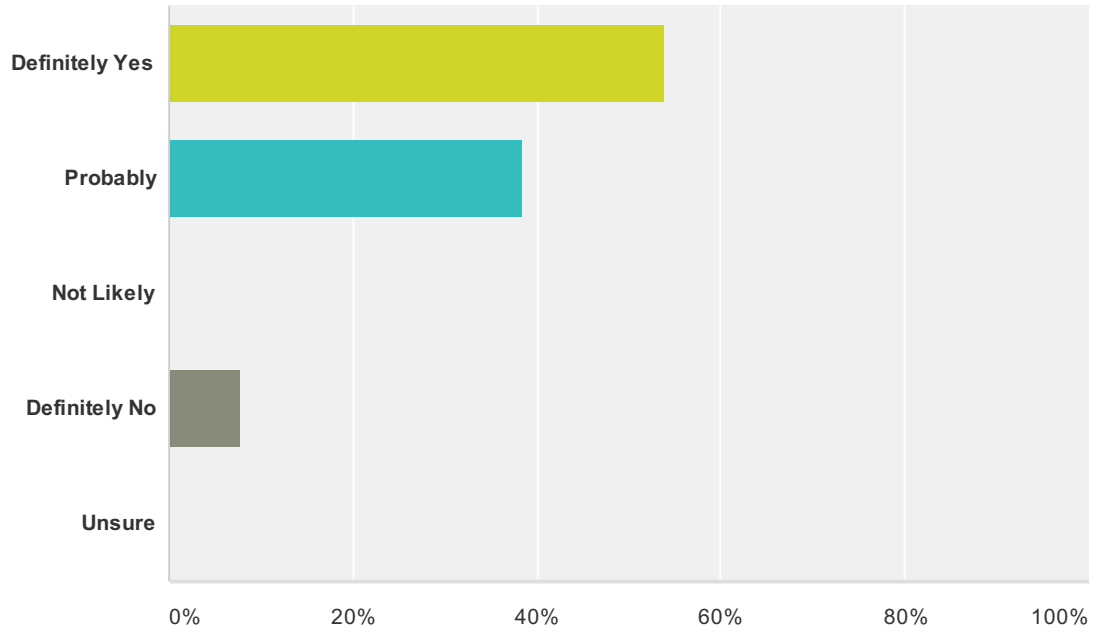
Answered: 13 Skipped: 0



Answer Choices	Responses
Definitely Yes	69.23% 9
Probably	23.08% 3
Not Likely	0% 0
Definitely No	7.69% 1
Unsure	0% 0
Total	13

Q4 Does a desire to provide better habitat for fish and wildlife motivate you to support (by direct action) efforts to improve Spring Lake?

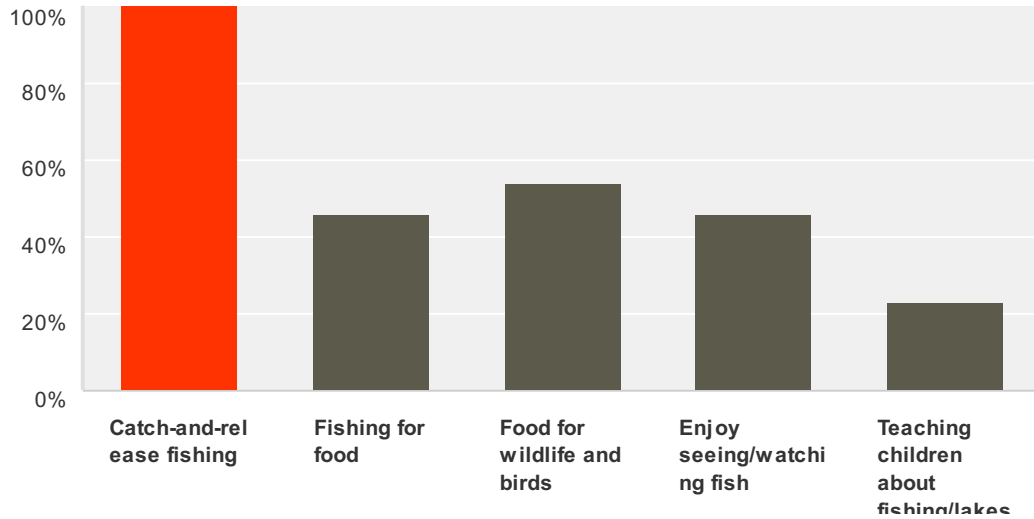
Answered: 13 Skipped: 0



Answer Choices	Responses
Definitely Yes	53.85% 7
Probably	38.46% 5
Not Likely	0% 0
Definitely No	7.69% 1
Unsure	0% 0
Total	13

Q5 For what purposes do you value the fishery in Spring Lake? (Check all that apply.)

Answered: 13 Skipped: 0

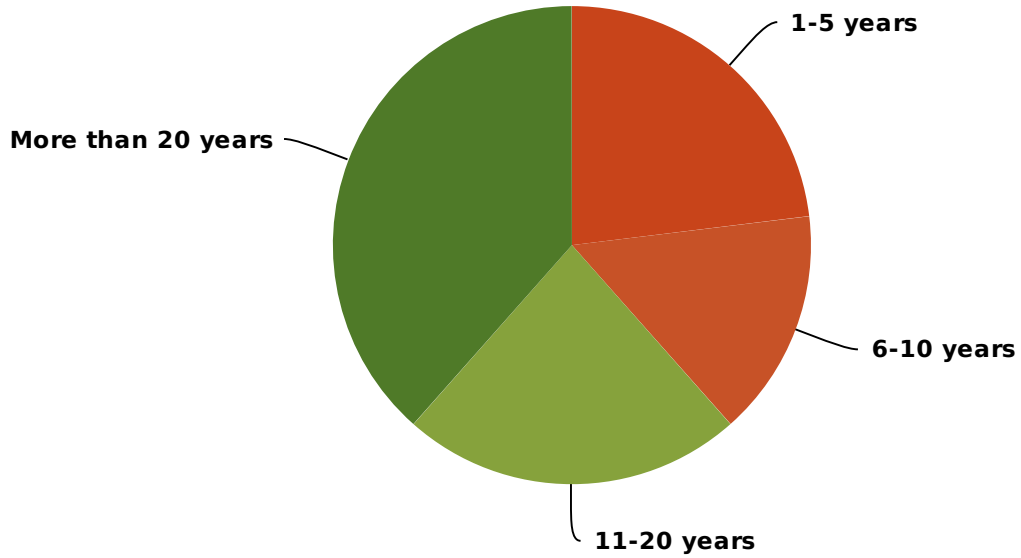


Answer Choices	Responses
Catch-and-release fishing	100% 13
Fishing for food	46.15% 6
Food for wildlife and birds	53.85% 7
Enjoy seeing/watching fish	46.15% 6
Teaching children about fishing/lakes	23.08% 3
Total Respondents: 13	

#	Other (please specify)	Date
	There are no responses.	

Q6 How many years of fishing experience do you have on Spring Lake?

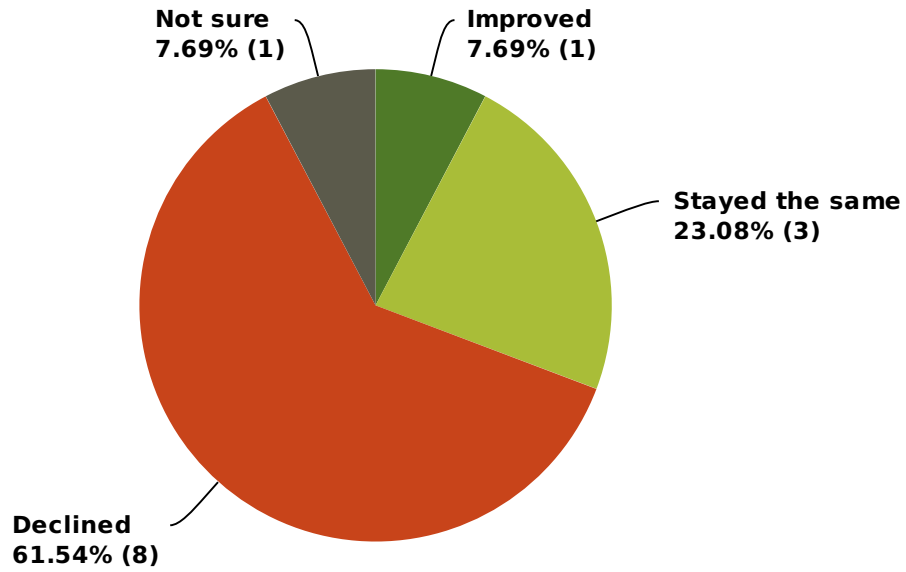
Answered: 13 Skipped: 0



Answer Choices	Responses	
I don't fish PSpring Lake	0%	0
1-5 years	23.08%	3
6-10 years	15.38%	2
11-20 years	23.08%	3
More than 20 years	38.46%	5
Total		13

Q7 In the years you have been fishing Spring Lake, would you say the quality of fishing has...

Answered: 13 Skipped: 0



Answer Choices	Responses
Improved	7.69% 1
Stayed the same	23.08% 3
Declined	61.54% 8
Not sure	7.69% 1
Total	13

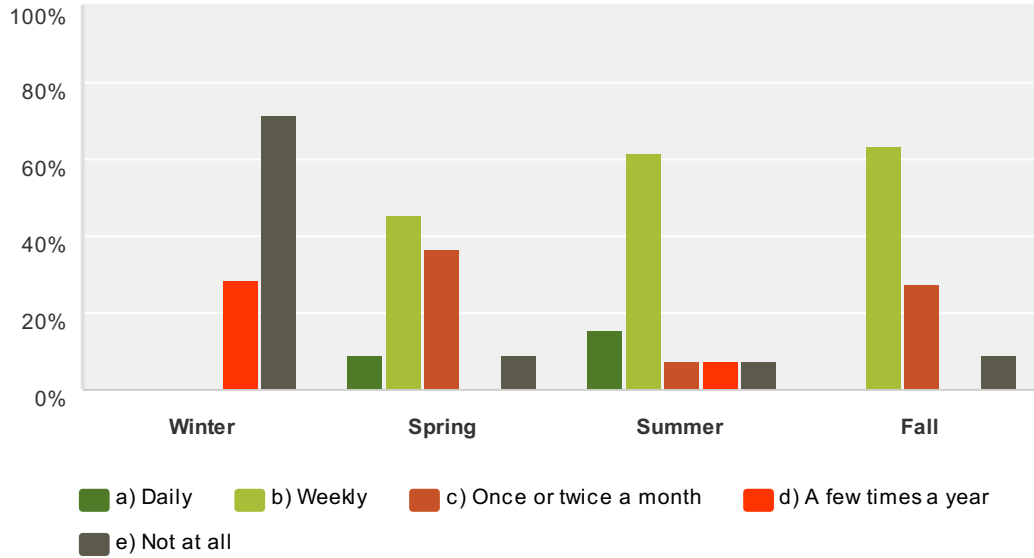
Q8 What factors do you feel have contributed to the change in fishing?

Answered: 3 Skipped: 10

#	Responses	Date
1	less weed coverage	2/27/2014 5:06 PM
2	Too many boat launches	2/26/2014 6:17 PM
3	over fishing during ice fishing season	2/26/2014 2:49 PM

Q9 When and how often do you typically fish Spring Lake? (Please answer a-e)

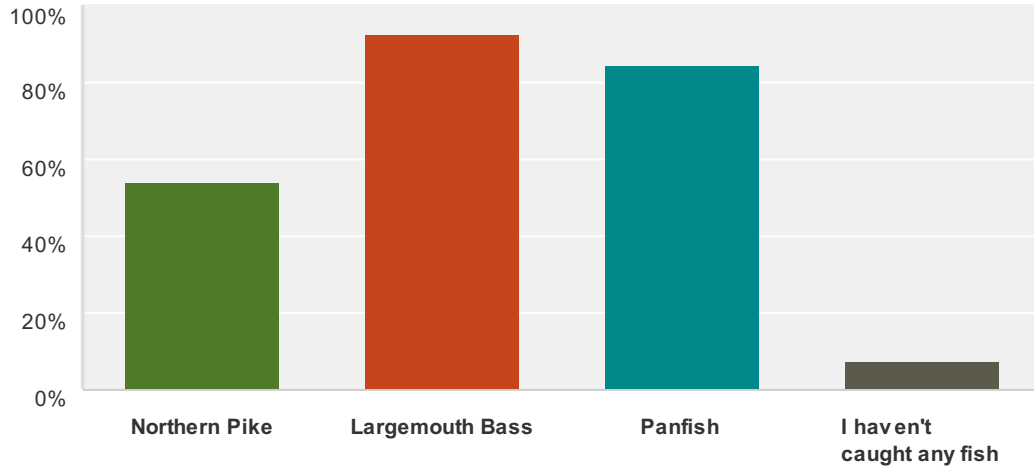
Answered: 13 Skipped: 0



	a) Daily	b) Weekly	c) Once or twice a month	d) A few times a year	e) Not at all	Total Respondents
Winter	0% 0	0% 0	0% 0	28.57% 2	71.43% 5	7
Spring	9.09% 1	45.45% 5	36.36% 4	0% 0	9.09% 1	11
Summer	15.38% 2	61.54% 8	7.69% 1	7.69% 1	7.69% 1	13
Fall	0% 0	63.64% 7	27.27% 3	0% 0	9.09% 1	11

Q10 What fish do you typically catch at Spring Lake? Check all that apply.

Answered: 13 Skipped: 0

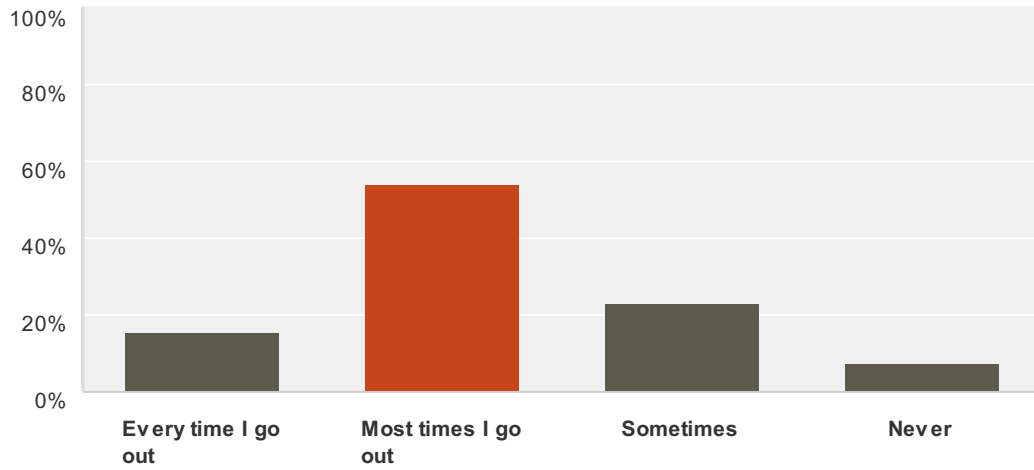


Answer Choices	Responses
Northern Pike	53.85% 7
Largemouth Bass	92.31% 12
Panfish	84.62% 11
I haven't caught any fish	7.69% 1
Total Respondents: 13	

#	Other (please specify)	Date
1	trout	3/8/2014 1:12 PM
2	Brown Trout, Rainbow Trout	2/26/2014 6:53 PM

Q11 In general, how often do you catch fish at Spring Lake?

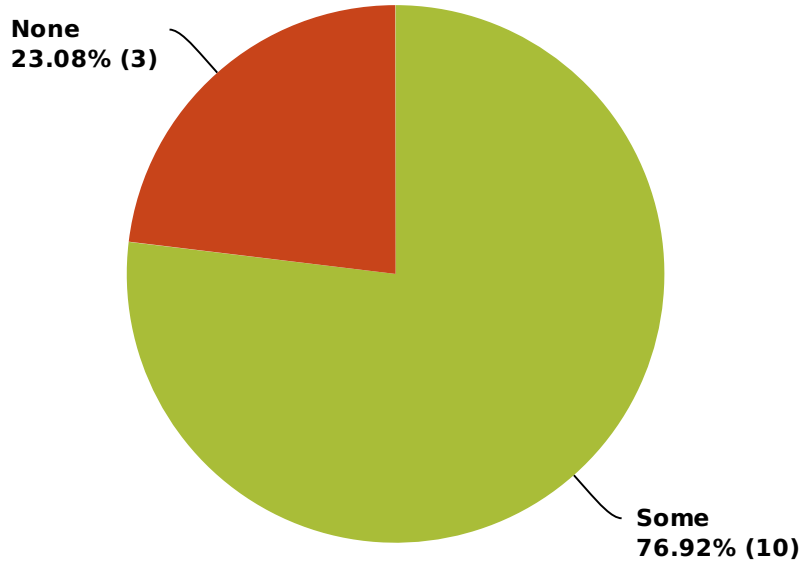
Answered: 13 Skipped: 0



Answer Choices	Responses
Every time I go out	15.38% 2
Most times I go out	53.85% 7
Sometimes	23.08% 3
Never	7.69% 1
Total Respondents: 13	

Q12 In general, how many of the fish are big enough to keep?

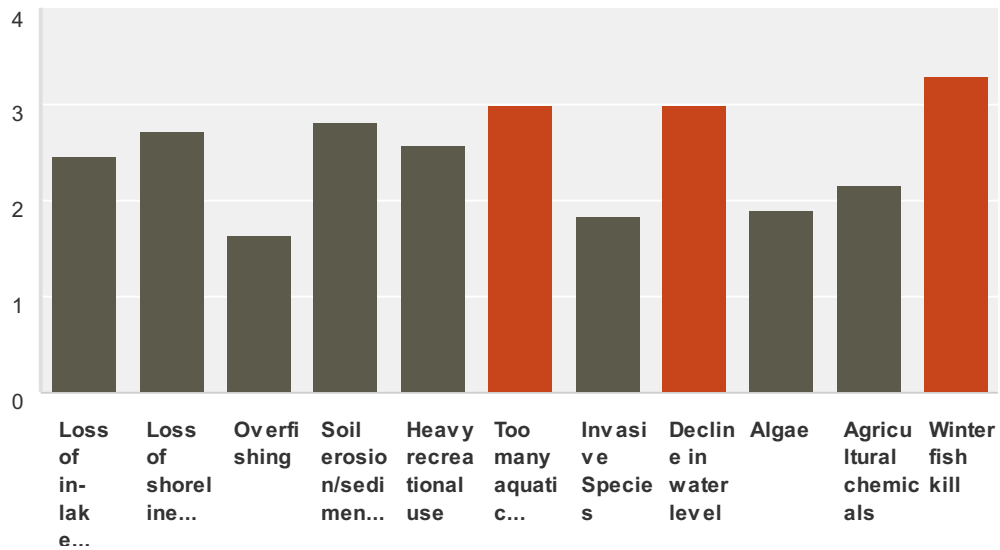
Answered: 13 Skipped: 0



Answer Choices	Responses
All	0% 0
Most	0% 0
Some	76.92% 10
None	23.08% 3
Total	13

Q13 What do you believe is the greatest threat to the fishery in Spring Lake in the next 10 years?

Answered: 13 Skipped: 0



	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Total Respondents
Loss of in-lake habitat	18.18% 2	36.36% 4	36.36% 4	0% 0	9.09% 1	11
Loss of shoreline habitat	9.09% 1	45.45% 5	45.45% 5	9.09% 1	0% 0	11
Overfishing	63.64% 7	27.27% 3	0% 0	0% 0	9.09% 1	11
Soil erosion/sedimentation	0% 0	45.45% 5	36.36% 4	9.09% 1	9.09% 1	11
Heavy recreational use	8.33% 1	33.33% 4	50% 6	8.33% 1	0% 0	12
Too many aquatic plants	8.33% 1	16.67% 2	58.33% 7	0% 0	16.67% 2	12
Invasive Species	23.08% 3	69.23% 9	7.69% 1	0% 0	0% 0	13
Decline in water level	0% 0	9.09% 1	81.82% 9	9.09% 1	0% 0	11
Algae	18.18% 2	72.73% 8	9.09% 1	0% 0	0% 0	11
Agricultural chemicals	16.67% 2	66.67% 8	8.33% 1	0% 0	8.33% 1	12
Winter fish kill	0% 0	30% 3	30% 3	20% 2	20% 2	10

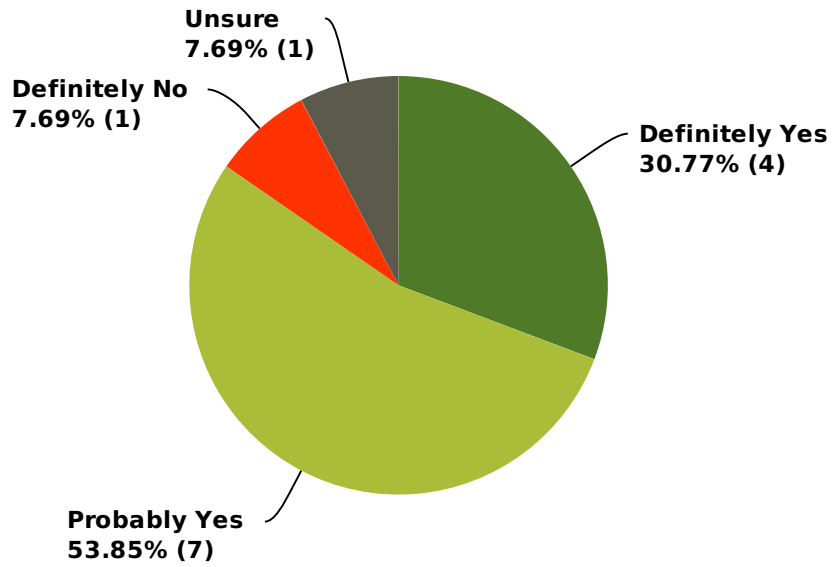
#	Other (please specify)	Date
1	Loss of fish habitat in general	2/28/2014 7:55 PM
2	unregulated large capacity wells	2/27/2014 5:12 PM

Waushara County Lakes Project - Spring Lake Survey #2

3	Ag run off	2/24/2014 4:33 PM
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Q14 Do you believe fish from Spring Lake are safe to eat?

Answered: 13 Skipped: 0



Answer Choices	Responses	
Definitely Yes	30.77%	4
Probably Yes	53.85%	7
Probably No	0%	0
Definitely No	7.69%	1
Unsure	7.69%	1
Total		13

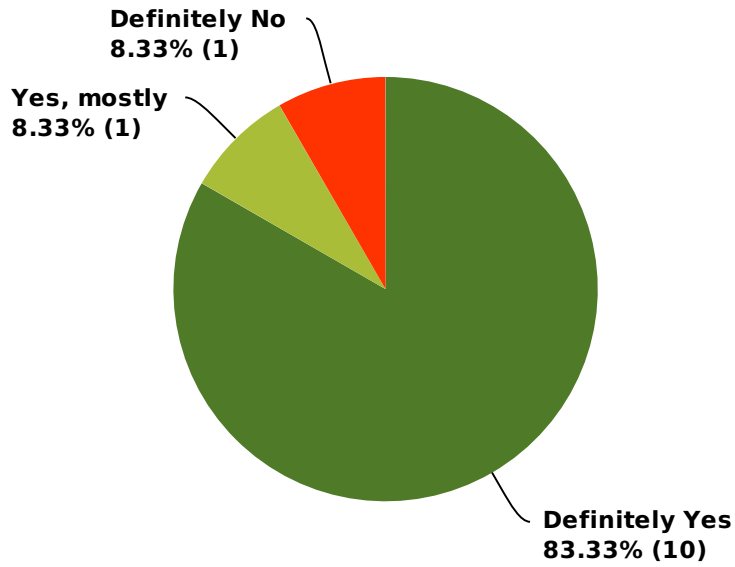
Q15 Do you have any additional comments regarding the fishery in Spring Lake?

Answered: 6 Skipped: 7

#	Responses	Date
1	Over fished in Winter	3/6/2014 9:18 AM
2	Would consider a fish survey (DNR) with a possible stocking/restocking program for proper species	2/28/2014 7:55 PM
3	Since Silver Lake started charging for parking at the public landing there has been a dramatic increase in fishing pressure, especially ice fishing, by people needing a cheap food source. It really has ruined what used to be a great sport fishing lake.	2/26/2014 7:02 PM
4	Fish are infested with parasites	2/26/2014 6:18 PM
5	Appreciate DNR stocking and periodic feedback re: health, size of fish seen during a shocking survey	2/26/2014 2:51 PM
6	So thankful the DNR got involved with the owner of 160 feet of frontage destroying the waterfront. Still have owners who have hardscape at the edge or mow to the edge—need to get them to change.	2/24/2014 4:33 PM

Q16 Spring Lake is a 'No Wake' lake. Do you like this rule?

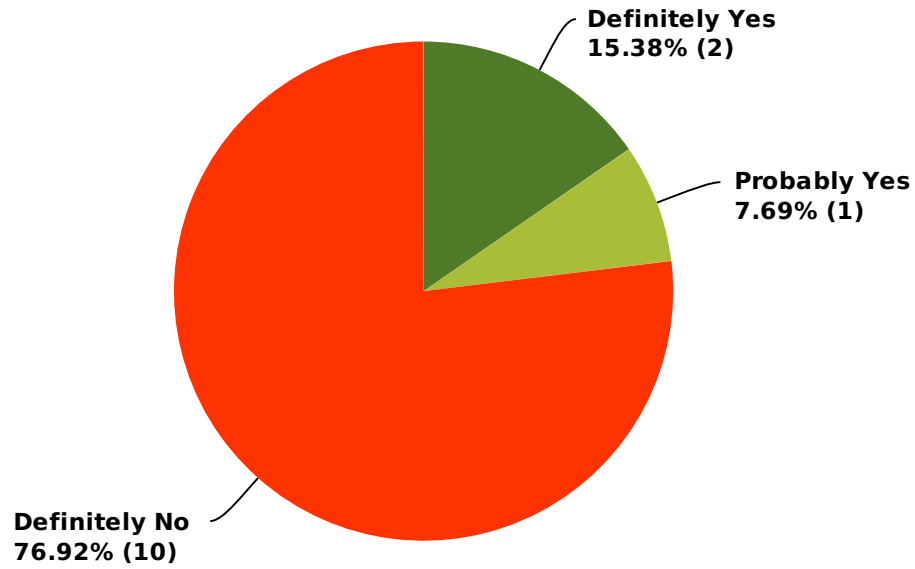
Answered: 12 Skipped: 1



Answer Choices	Responses	
Definitely Yes	83.33%	10
Yes, mostly	8.33%	1
Not most of the time	0%	0
Definitely No	8.33%	1
Unsure	0%	0
Total		12

Q17 Do you think there should be times when a wake is permitted on Spring Lake?

Answered: 13 Skipped: 0



Answer Choices	Responses	
Definitely Yes	15.38%	2
Probably Yes	7.69%	1
Probably No	0%	0
Definitely No	76.92%	10
Unsure	0%	0
Total		13

Waushara County Lakes Project - Spring Lake Survey #2

Q18 What could be done to improve your recreation experience on Spring Lake?

Answered: 12 Skipped: 1

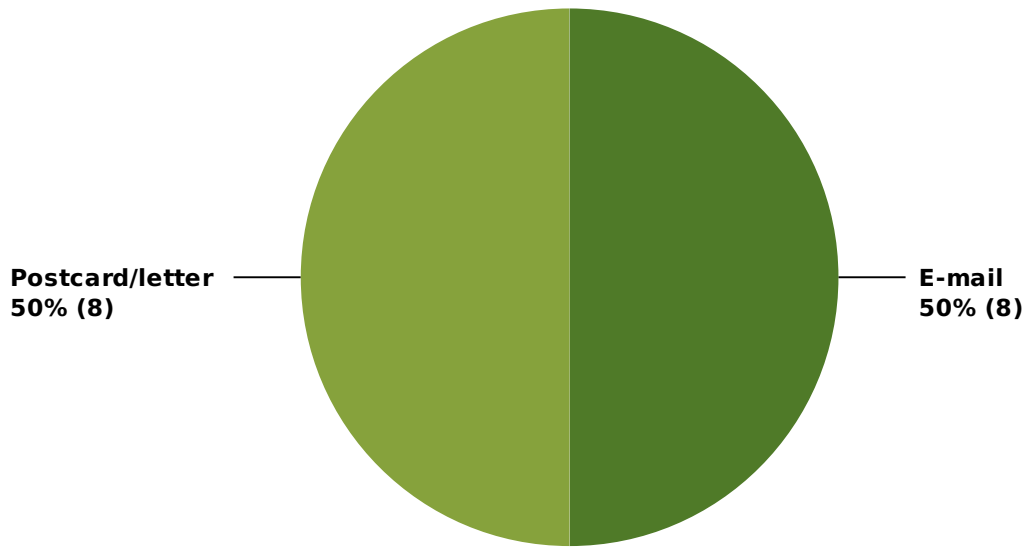
#	Responses	Date
1	having a set time for wake is permitted	3/8/2014 1:14 PM
2	Enforcement of non wake	3/6/2014 9:19 AM
3	I like it pretty much the way it is if we could just get rid of the floating weeds. That is the only reason I think a period allowing wakes would help. I don't support jetski or water skiing but would like to see some occasional wave action to clean the lake. There is never enough action to breakup floating weeds, algae patches or scum. Makes for difficult fishing and general looks. The Northeast end of the lake suffers more from this problem than the more populated south/west end.	2/28/2014 7:58 PM
4	Educate non-owner users about no-wake, sound fishing practices.	2/28/2014 11:15 AM
5	There should be time wake is permitted ex 10 to 1	2/27/2014 9:20 PM
6	Assurance that nothing will change its quality.	2/27/2014 5:14 PM
7	required paid launch fee	2/27/2014 5:09 PM
8	Ban all manner of motorized boats, vehicles, and power augers. Ban all fish locators and underwater cameras	2/26/2014 7:05 PM
9	Close the boat landings	2/26/2014 6:18 PM
10	enforcement of no wake by all - some people ignore rules, not safe then, decrease number of fish caught during ice fishing season so everyone has ability to have good fishing during the whole season.	2/26/2014 2:52 PM
11	People picking up after themselves and people not throwing plastic bags with dead possums in them into the lake.	2/25/2014 1:07 PM
12	STOP all the fireworks! Huge displays, multi days. Then, they don't clean up the remains.	2/24/2014 4:34 PM

Q1 Enter your Waushara County Lakes Survey ID. If you've forgotten your ID or haven't created one yet, follow the instructions below.

Answered: 17 Skipped: 0

Q2 How did you hear about this survey?

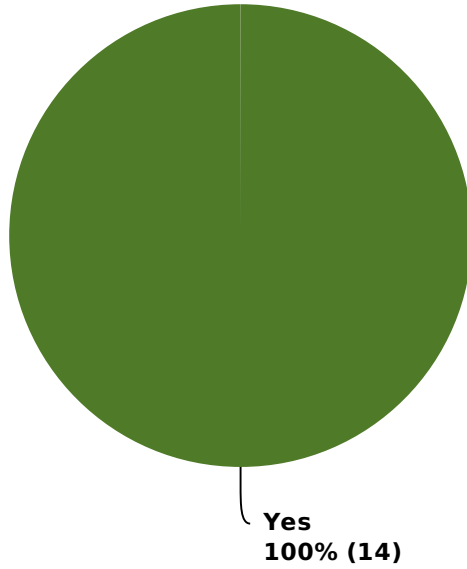
Answered: 16 Skipped: 1



Answer Choices	Responses
E-mail	50% 8
Newspaper	0% 0
Postcard/letter	50% 8
Facebook	0% 0
Radio	0% 0
Total	16

Q3 Were you aware of the importance of aquatic plants?

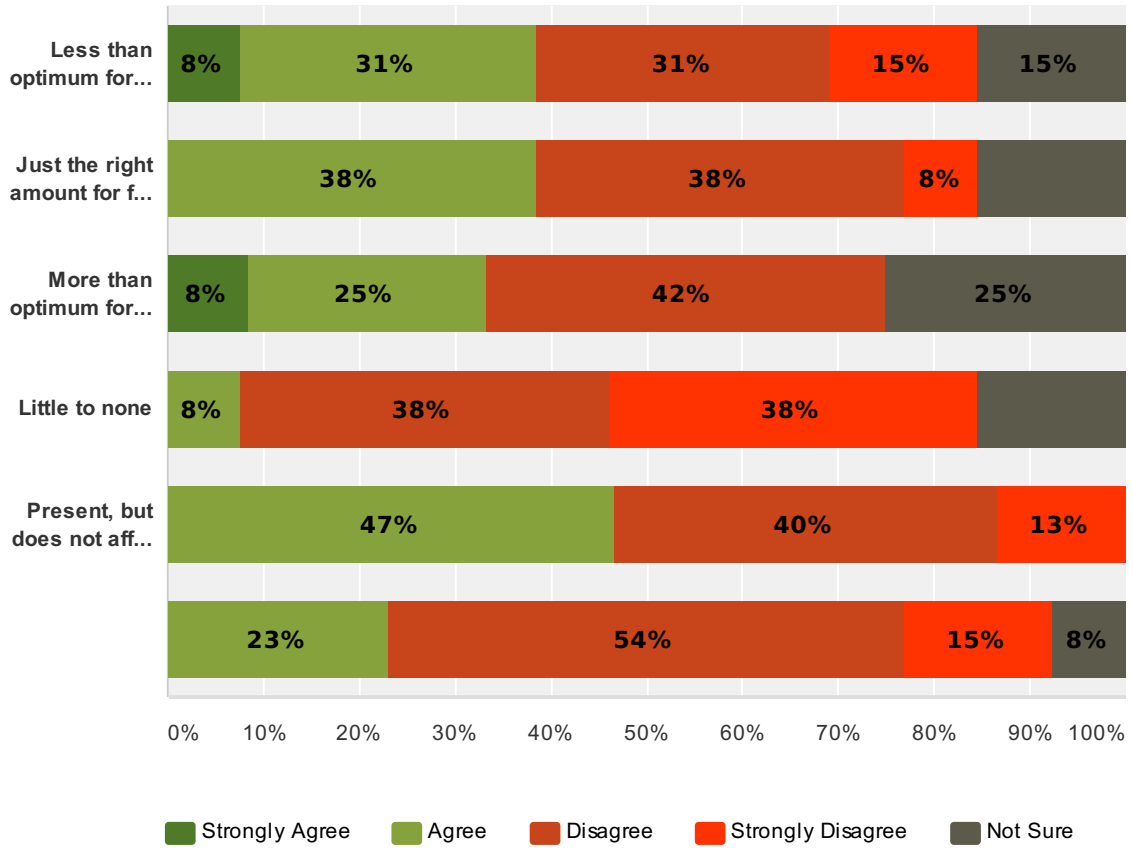
Answered: 14 Skipped: 3



Answer Choices	Responses	
Yes	100%	14
No	0%	0
Unsure	0%	0
Total		14

Q4 In your opinion, which statement best describes the amount of aquatic plant growth in Spring Lake?

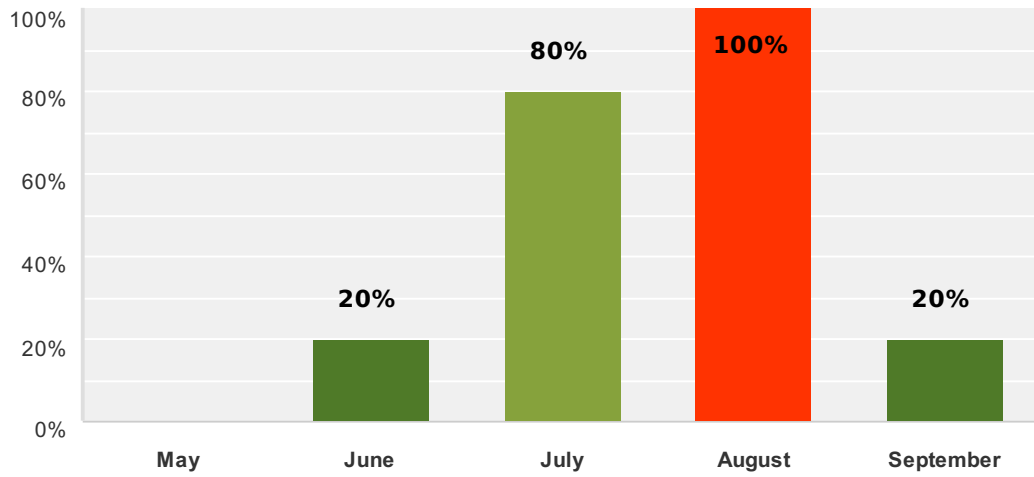
Answered: 15 Skipped: 2



	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Sure	Total
Less than optimum for fish and wildlife	8% 1	31% 4	31% 4	15% 2	15% 2	13
Just the right amount for fish and wildlife	0% 0	38% 5	38% 5	8% 1	15% 2	13
More than optimum for fish and wildlife	8% 1	25% 3	42% 5	0% 0	25% 3	12
Little to none	0% 0	8% 1	38% 5	38% 5	15% 2	13
Present, but does not affect my use of the lake	0% 0	47% 7	40% 6	13% 2	0% 0	15
Dense, affects my use of the lake	0% 0	23% 3	54% 7	15% 2	8% 1	13

Q5 If you selected dense or choked, what month(s) do the problems occur? Check all that apply.

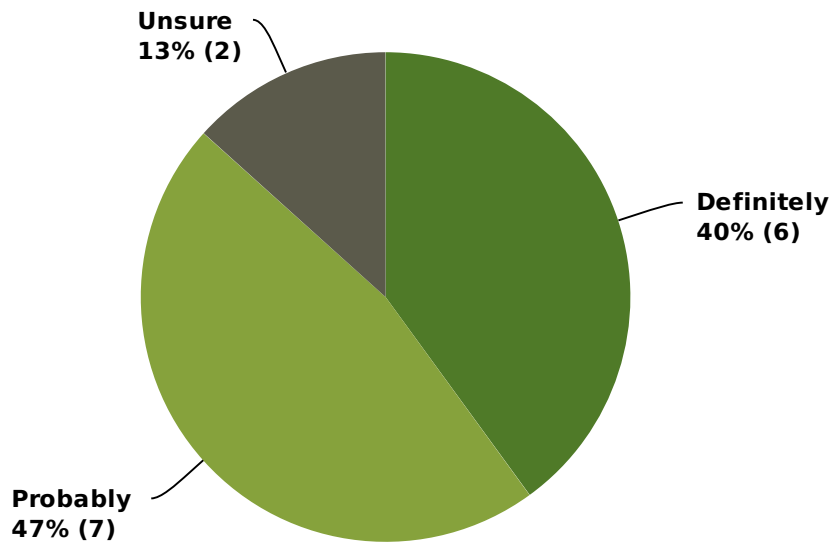
Answered: 5 Skipped: 12



Answer Choices	Responses
May	0% 0
June	20% 1
July	80% 4
August	100% 5
September	20% 1
Total Respondents: 5	

Q6 Do you believe aquatic plant control is needed on Spring Lake?

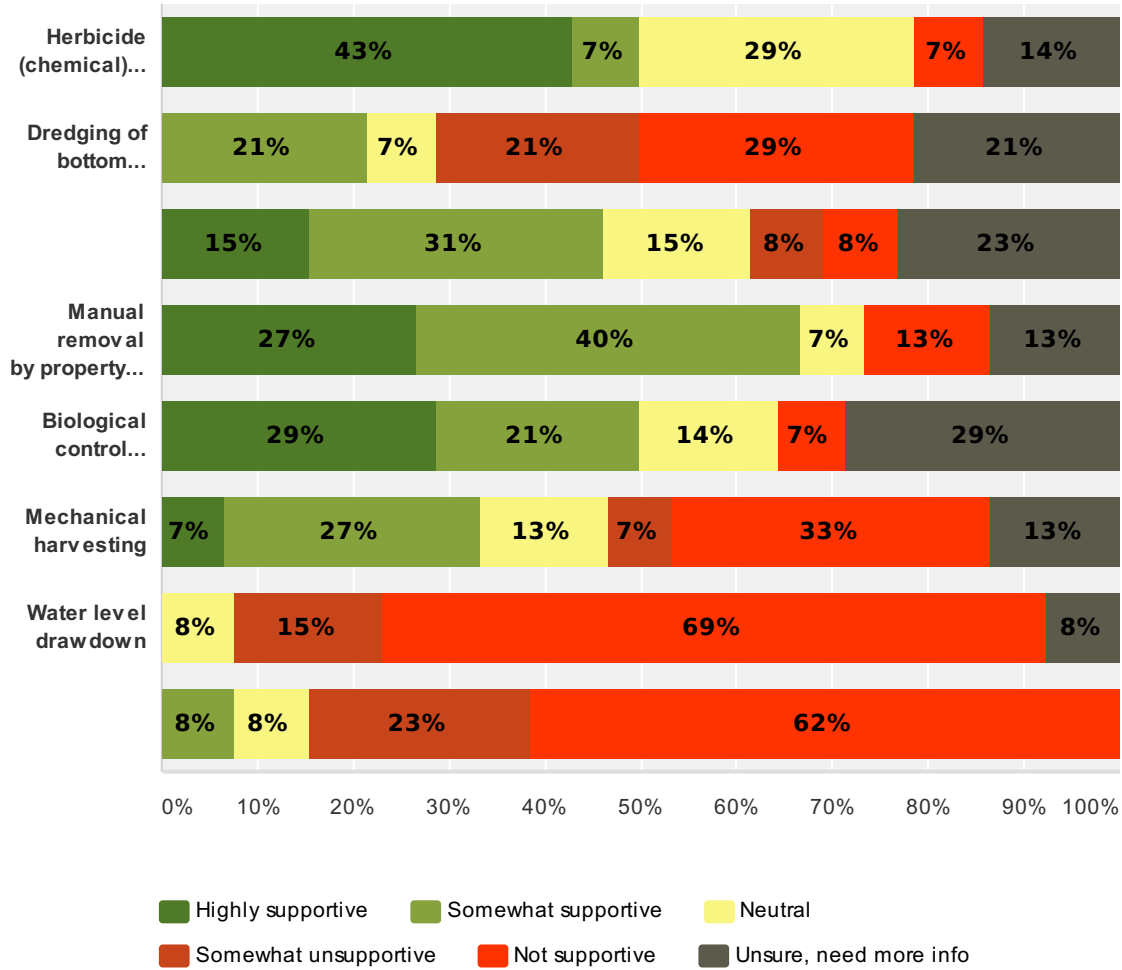
Answered: 15 Skipped: 2



Answer Choices	Responses
Definitely	40% 6
Probably	47% 7
Unsure	13% 2
Probably not	0% 0
Definitely not	0% 0
Total	15

Q7 What is your level of support for the responsible use of the following techniques TO MANAGE AQUATIC PLANTS on Spring Lake?

Answered: 15 Skipped: 2



	Highly supportive	Somewhat supportive	Neutral	Somewhat unsupportive	Not supportive	Unsure, need more info	Total	Average Rating
Herbicide (chemical) control	43% 6	7% 1	29% 4	0% 0	7% 1	14% 2	14	1.79
Dredging of bottom sediments	0% 0	21% 3	7% 1	21% 3	29% 4	21% 3	14	2.93
Hand-removal by divers	15% 2	31% 4	15% 2	8% 1	8% 1	23% 3	13	1.92
Manual removal by property owners	27% 4	40% 6	7% 1	0% 0	13% 2	13% 2	15	1.93
Biological control (milfoil weevil, loosestrife beetle, etc.)	29% 4	21% 3	14% 2	0% 0	7% 1	29% 4	14	1.50

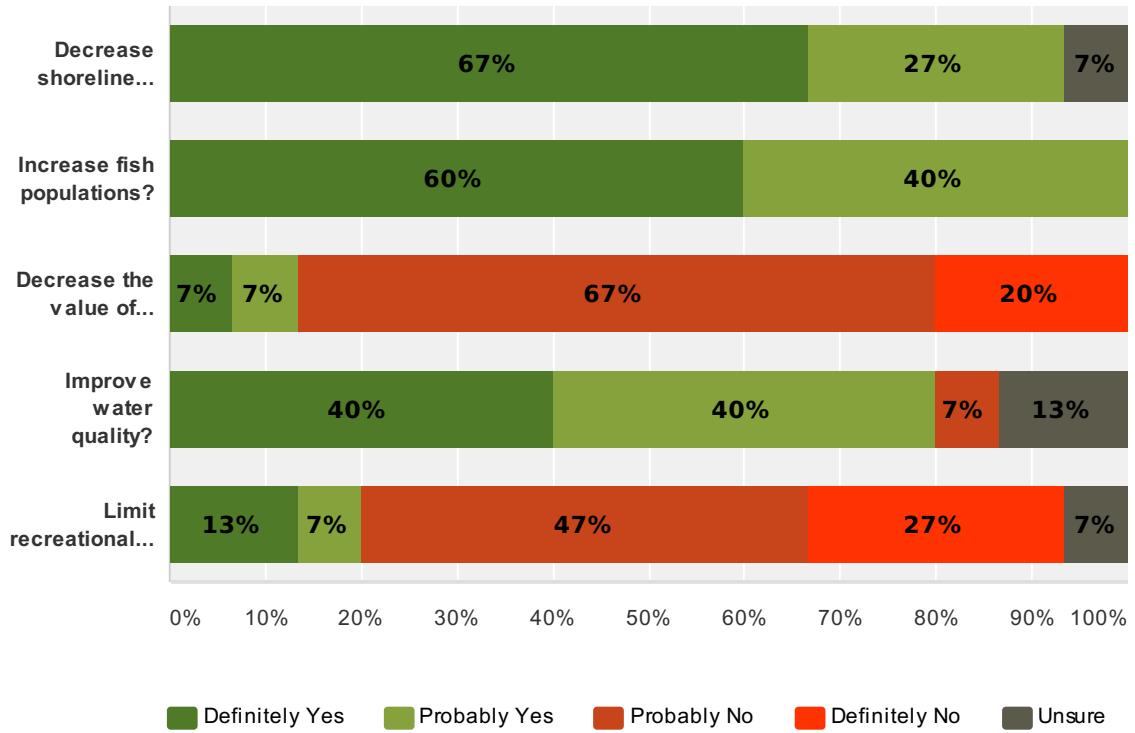
Mechanical harvesting	7%	27%	13%	7%	33%	13%		
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Waushara County Lakes Project - Spring Lake Survey #3

	1%	4%	8%	15%	33%	69%	15%		
mechanical harvesting	1	4	2	1	5	2	15		2.93
Water level drawdown	0% 0	0% 0	8% 1	15% 2	69% 9	8% 1	13		4.31
Do nothing (do not manage plants)	0% 0	8% 1	8% 1	23% 3	62% 8	0% 0	13		4.38

Q8 In your opinion, does establishing or maintaining native vegetation IN THE WATER in the near-shore area...

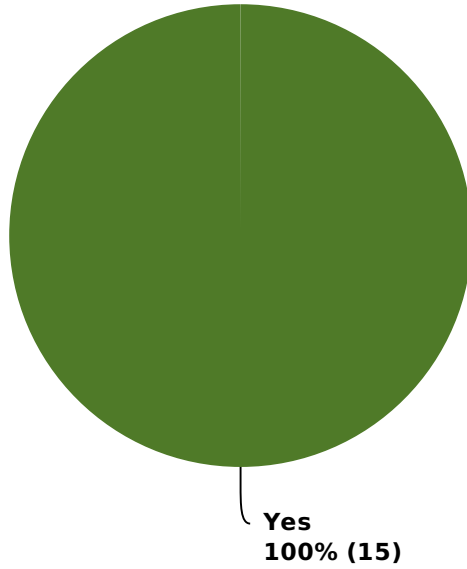
Answered: 15 Skipped: 2



	Definitely Yes	Probably Yes	Probably No	Definitely No	Unsure	Total
Decrease shoreline erosion?	67% 10	27% 4	0% 0	0% 0	7% 1	15
Increase fish populations?	60% 9	40% 6	0% 0	0% 0	0% 0	15
Decrease the value of shoreline property?	7% 1	7% 1	67% 10	20% 3	0% 0	15
Improve water quality?	40% 6	40% 6	7% 1	0% 0	13% 2	15
Limit recreational enjoyment?	13% 2	7% 1	47% 7	27% 4	7% 1	15

Q9 Have you ever heard of aquatic invasive species?

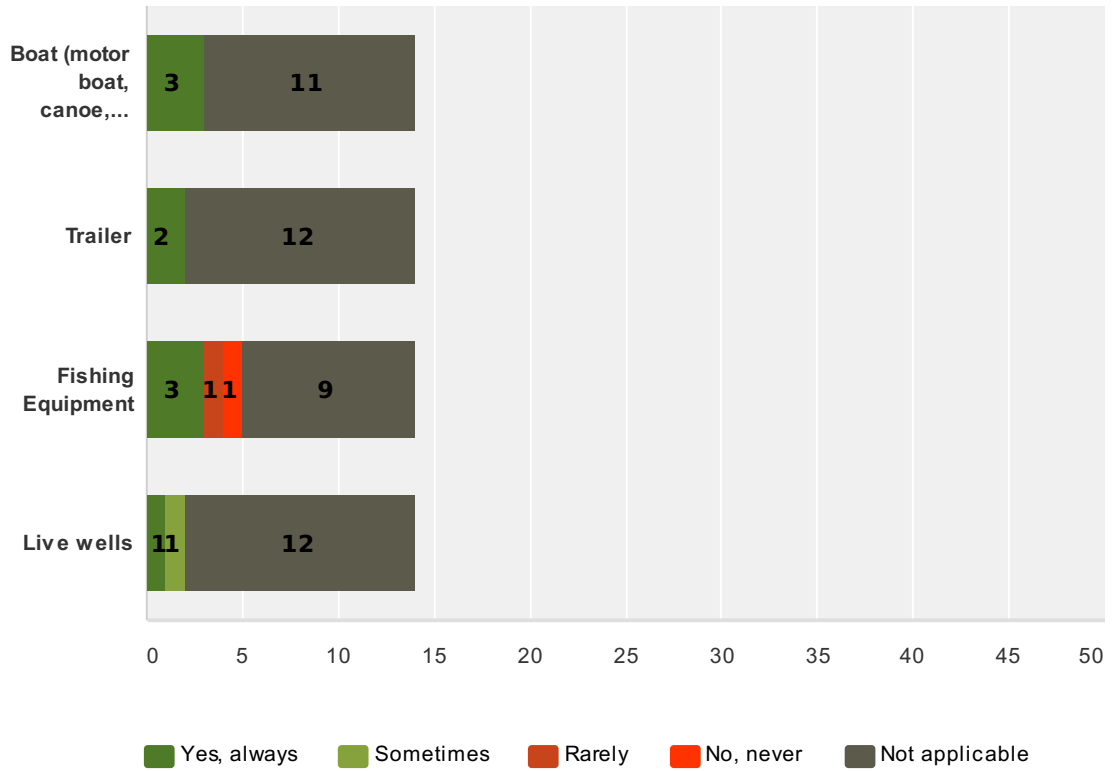
Answered: 15 Skipped: 2



Answer Choices	Responses	
Yes	100%	15
No	0%	0
Total		15

Q10 After you have been to another lake, do you clean your ... before bringing it back to Spring Lake?

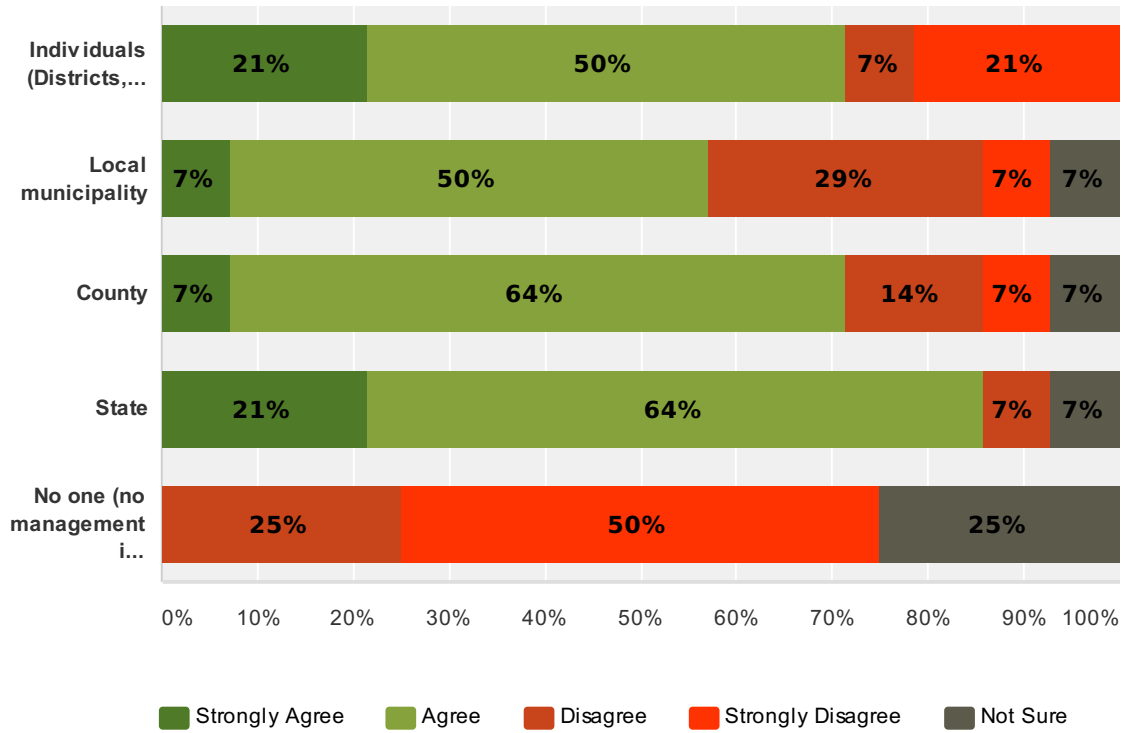
Answered: 14 Skipped: 3



	Yes, always	Sometimes	Rarely	No, never	Not applicable	Total Respondents
Boat (motor boat, canoe, kayak, etc.)	21% 3	0% 0	0% 0	0% 0	79% 11	14
Trailer	14% 2	0% 0	0% 0	0% 0	86% 12	14
Fishing Equipment	21% 3	0% 0	7% 1	7% 1	64% 9	14
Live wells	7% 1	7% 1	0% 0	0% 0	86% 12	14

Q11 Who should pay for the cost of managing invasive aquatic plants? Check all that apply.

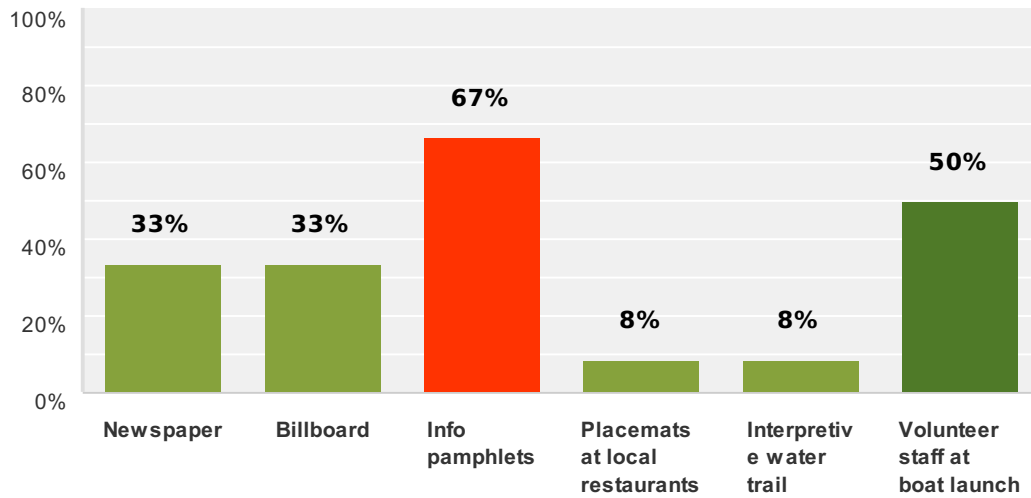
Answered: 14 Skipped: 3



	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Sure	Total
Individuals (Districts, associations, lakefront property owners)	21% 3	50% 7	7% 1	21% 3	0% 0	14
Local municipality	7% 1	50% 7	29% 4	7% 1	7% 1	14
County	7% 1	64% 9	14% 2	7% 1	7% 1	14
State	21% 3	64% 9	7% 1	0% 0	7% 1	14
No one (no management is undertaken)	0% 0	0% 0	25% 3	50% 6	25% 3	12

Q12 What is the most effective way to inform others about aquatic invasive species?

Answered: 12 Skipped: 5

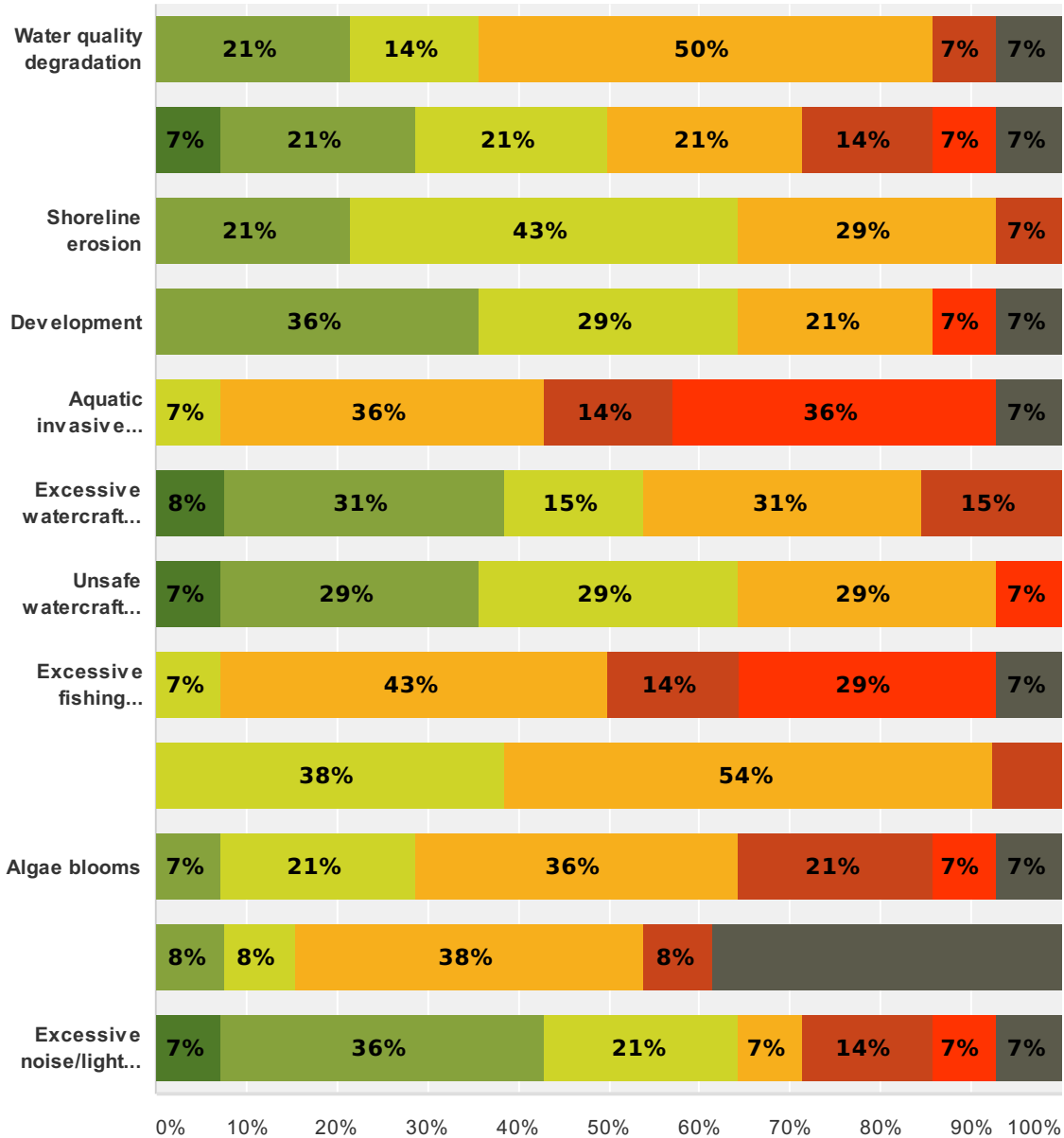


Answer Choices	Responses
Newspaper	33% 4
Billboard	33% 4
Info pamphlets	67% 8
Placemats at local restaurants	8% 1
Interpretive water trail	8% 1
Volunteer staff at boat launch	50% 6
Total Respondents: 12	

Q13 Below is a list of possible negative impacts commonly found in Wisconsin lakes. To what level do you believe each of the following factors may be impacting Spring Lake? (Please rate 0 - 5) * Not Present means that you believe the issue does not exist on Spring Lake. **No Impact means that the issue may exist on Spring Lake but it is not negatively impacting the lake.

Answered: 14 Skipped: 3

Waushara County Lakes Project - Spring Lake Survey #3



■ *Not present 0
 ■ **No Impact 1
 ■ 2
 ■ Moderately negative impact 3
 ■ 4
 ■ Great negative impact 5
 ■ Unsure - need more info

	*Not present 0	**No Impact 1	2	Moderately negative impact 3	4	Great negative impact 5	Unsure - need more info	Total	Average Rating
Water quality degradation	0% 0	21% 3	14% 2	50% 7	7% 1	0% 0	7% 1	14	2.29
Loss of aquatic habitat	7% 1	21% 3	21% 3	21% 3	14% 2	7% 1	7% 1	14	2.21
Shoreline erosion	0% 0	21% 3	43% 6	29% 4	7% 1	0% 0	0% 0	14	2.21
Development	0% 0	36% 5	29% 4	21% 3	0% 0	7% 1	7% 1	14	1.93

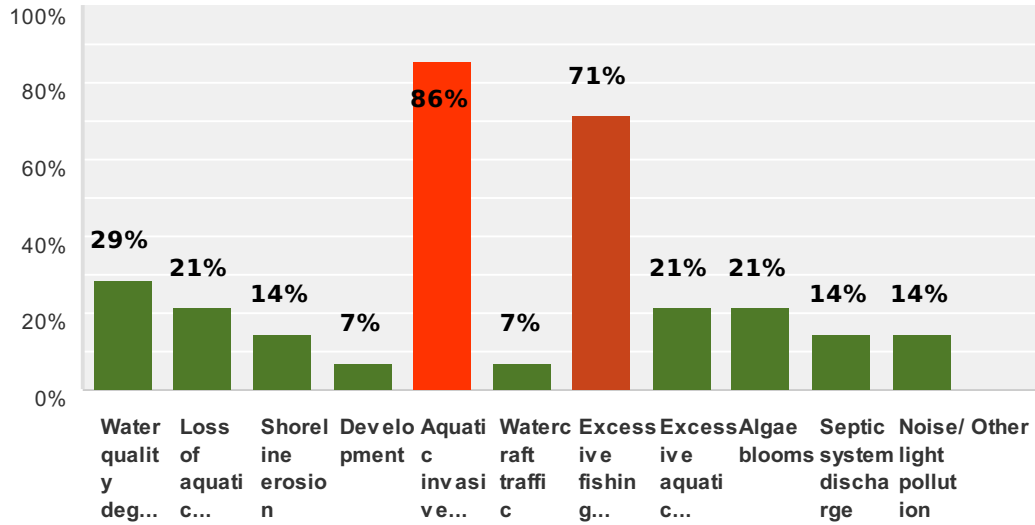
Aquatic invasive species	0%	0%	7%	36%	14%	36%	7%		
--------------------------	----	----	----	-----	-----	-----	----	--	--

Waushara County Lakes Project - Spring Lake Survey #3

Aquatic invasive species introduction	0%	0%	1%	5%	2%	5%	1%	14	3.57
Excessive watercraft traffic	8%	31%	15%	31%	15%	0%	0%	13	2.15
Unsafe watercraft practices	7%	29%	29%	29%	0%	7%	0%	14	2.07
Excessive fishing pressure	0%	0%	7%	43%	14%	29%	7%	14	3.43
Excessive aquatic plant growth (excluding algae)	0%	0%	38%	54%	8%	0%	0%	13	2.69
Algae blooms	0%	7%	21%	36%	21%	7%	7%	14	2.79
Septic system discharge	0%	8%	8%	38%	8%	0%	38%	13	1.69
Excessive noise/light pollution	7%	36%	21%	7%	14%	7%	7%	14	1.93

Q14 From the list below, please mark your top three concerns regarding Spring Lake.

Answered: 14 Skipped: 3



Answer Choices	Responses
Water quality degradation	29% 4
Loss of aquatic habitat	21% 3
Shoreline erosion	14% 2
Development	7% 1
Aquatic invasive species introduction	86% 12
Watercraft traffic	7% 1
Excessive fishing pressure	71% 10
Excessive aquatic plant growth (excluding algae)	21% 3
Algae blooms	21% 3
Septic system discharge	14% 2
Noise/light pollution	14% 2
Other	0% 0
Total Respondents: 14	

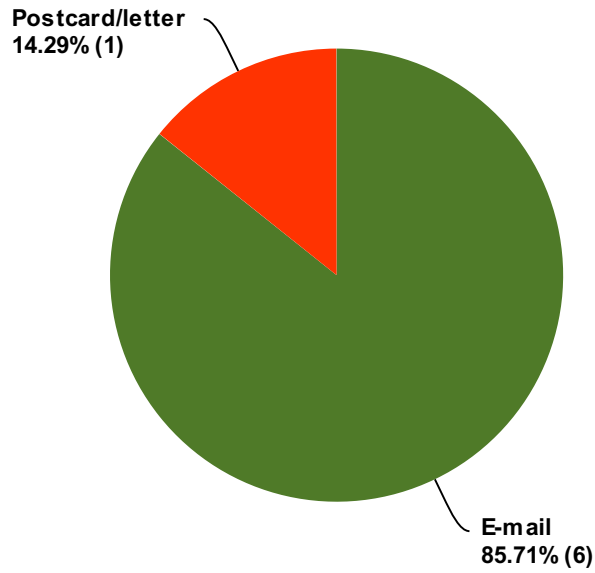
Q1 What is your Waushara County Lakes Study ID?

Answered: 7 Skipped: 0

#	Responses	Date
1	[REDACTED]	5/5/2014 11:17 AM
2	[REDACTED]	5/2/2014 12:41 PM
3	[REDACTED]	5/2/2014 8:01 AM
4	[REDACTED]	5/1/2014 1:07 AM
5	[REDACTED]	4/30/2014 6:59 PM
6	[REDACTED]	4/30/2014 6:17 PM
7	[REDACTED]	4/30/2014 5:01 PM

Q2 How did you hear about this survey?

Answered: 7 Skipped: 0

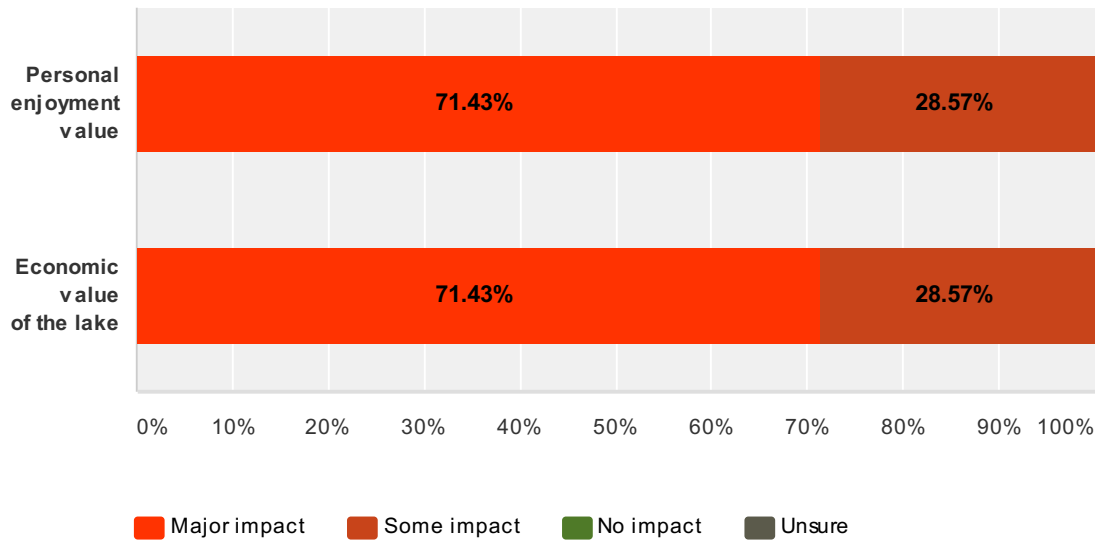


Answer Choices	Responses
E-mail	85.71% 6
Newspaper	0.00% 0
Postcard/letter	14.29% 1
Facebook	0.00% 0
Radio	0.00% 0
Word of mouth	0.00% 0
Total	7

#	Other (please specify)	Date
	There are no responses.	

Q3 How much impact does the water quality of Spring Lake have on the following?

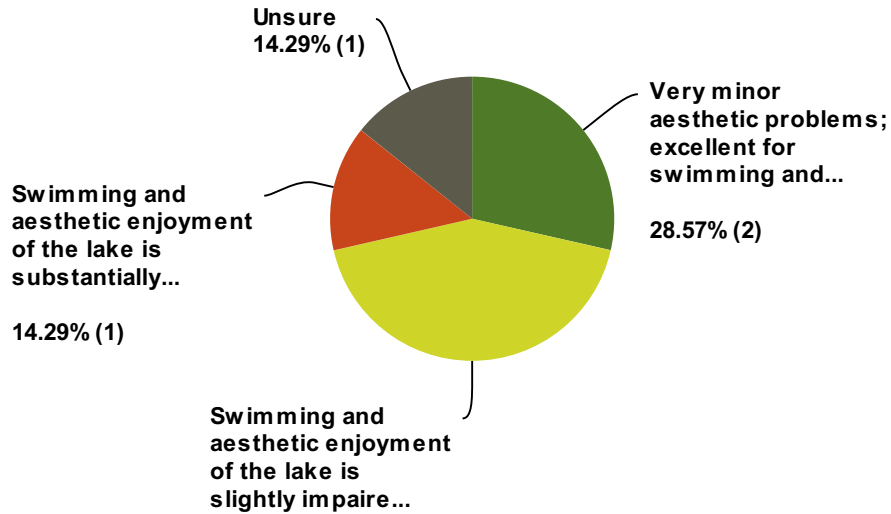
Answered: 7 Skipped: 0



	Major impact	Some impact	No impact	Unsure	Total
Personal enjoyment value	71.43% 5	28.57% 2	0.00% 0	0.00% 0	7
Economic value of the lake	71.43% 5	28.57% 2	0.00% 0	0.00% 0	7

Q4 Which statement best describes water clarity during the times you spend most on the lake?

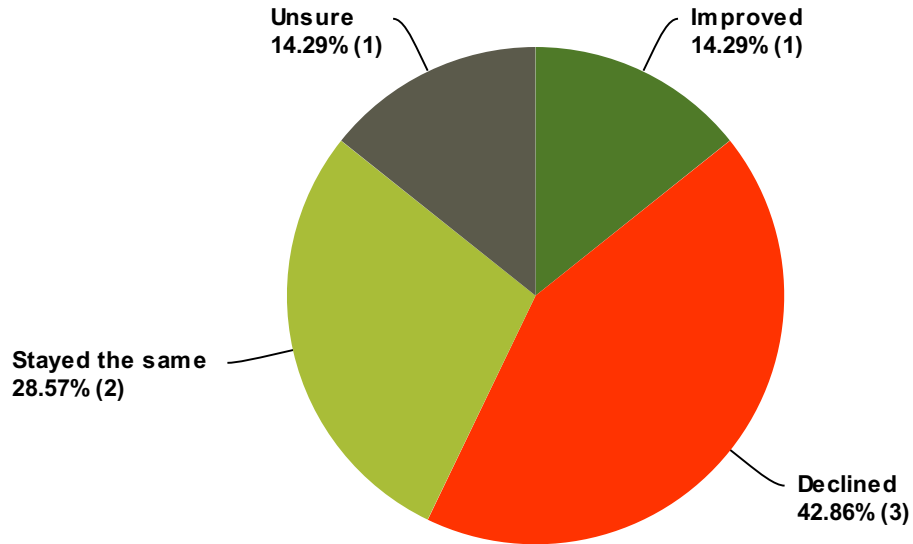
Answered: 7 Skipped: 0



Answer Choices	Responses
Beautiful, could not be any nicer	0.00% 0
Very minor aesthetic problems; excellent for swimming and boating enjoyment	28.57% 2
Swimming and aesthetic enjoyment of the lake is slightly impaired because of algae	42.86% 3
Swimming and aesthetic enjoyment of the lake is moderately reduced because of algae	0.00% 0
Swimming and aesthetic enjoyment of the lake is substantially reduced because of algae	14.29% 1
None of the above	0.00% 0
Unsure	14.29% 1
Total	7

Q5 During the time that you have lived on, visited, or recreated on the lake, how would you say the water quality has changed?

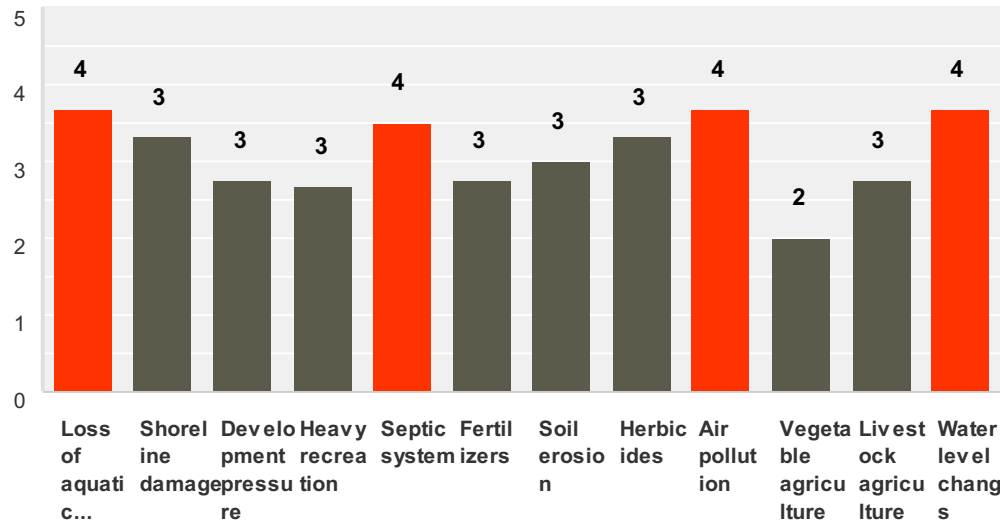
Answered: 7 Skipped: 0



Answer Choices	Responses
Improved	14.29% 1
Declined	42.86% 3
Stayed the same	28.57% 2
Unsure	14.29% 1
Total	7

Q6 If it has declined, in your opinion, what are the primary causes?

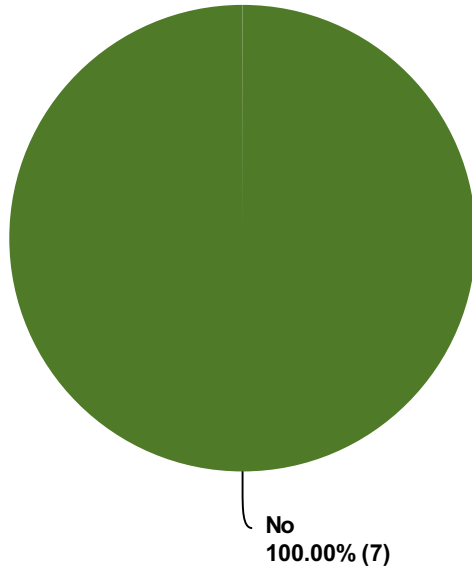
Answered: 5 Skipped: 2



	Strongly Agree	Agree	Disagree	Strongly Disagree	Unsure	Total Respondents
Loss of aquatic plants	0.00% 0	0.00% 0	66.67% 2	0.00% 0	33.33% 1	3
Shoreline damage	0.00% 0	33.33% 1	33.33% 1	0.00% 0	33.33% 1	3
Development pressure	25.00% 1	25.00% 1	25.00% 1	0.00% 0	25.00% 1	4
Heavy recreation	0.00% 0	33.33% 1	66.67% 2	0.00% 0	0.00% 0	3
Septic system	0.00% 0	50.00% 2	0.00% 0	0.00% 0	50.00% 2	4
Fertilizers	0.00% 0	75.00% 3	0.00% 0	0.00% 0	25.00% 1	4
Soil erosion	0.00% 0	66.67% 2	0.00% 0	0.00% 0	33.33% 1	3
Herbicides	0.00% 0	33.33% 1	33.33% 1	0.00% 0	33.33% 1	3
Air pollution	0.00% 0	0.00% 0	66.67% 2	0.00% 0	33.33% 1	3
Vegetable agriculture	33.33% 1	33.33% 1	33.33% 1	0.00% 0	0.00% 0	3
Livestock agriculture	25.00% 1	25.00% 1	25.00% 1	0.00% 0	25.00% 1	4
Water level changes	0.00% 0	0.00% 0	66.67% 2	0.00% 0	33.33% 1	3

Q7 Do you use herbicides or pesticides (i.e. "weed and feed") on your land? If no, please skip to Question 12.

Answered: 7 Skipped: 0



Answer Choices	Responses	
Yes	0.00%	0
No	100.00%	7
Total		7

Q8 Where do you apply herbicides and/or pesticides?

Answered: 0 Skipped: 7

! No matching responses.

Answer Choices	Responses
Agricultural fields	0.00% 0
Garden	0.00% 0
Lawn	0.00% 0
Total	0

#	Other (please specify)	Date
1	na	4/30/2014 5:04 PM

Q9 In a typical year, how often do you apply herbicides and/or pesticides?

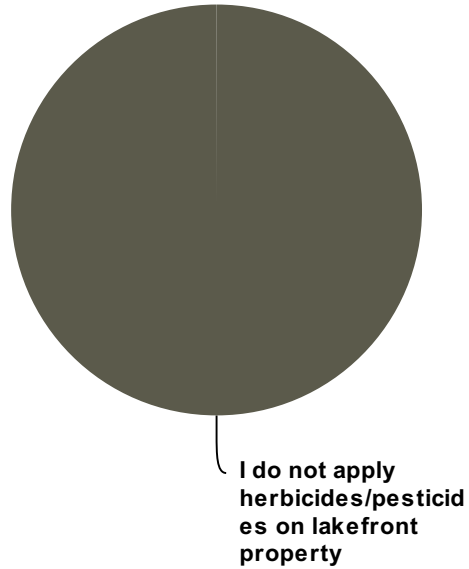
Answered: 0 Skipped: 7

! No matching responses.

	Never	Once	Once a week	Once a month	Varies	Total Respondents
Winter	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Spring	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Summer	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Fall	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0

Q10 If you apply herbicides and/or pesticides on lakefront property, how close to the lake are they applied (select the closest distance to the lake where herbicides/pesticides are applied)?

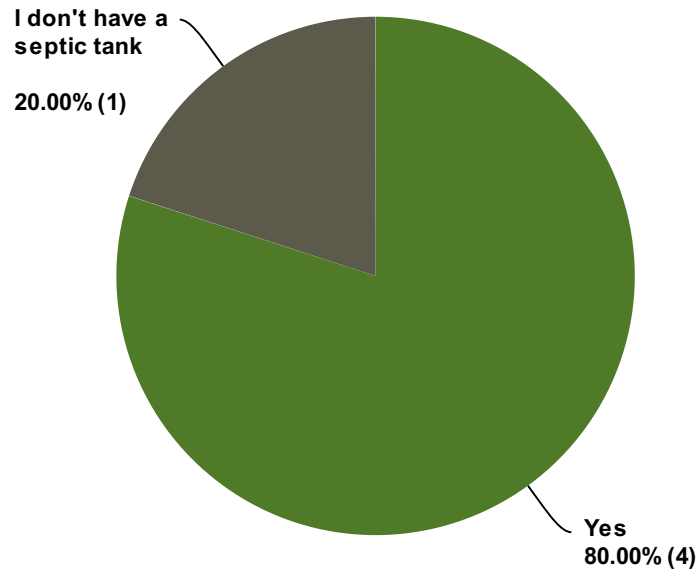
Answered: 1 Skipped: 6



Answer Choices	Responses	
I do not apply herbicides/pesticides on lakefront property	100.00%	1
Up to the lake	0.00%	0
Within 35 feet of the lake	0.00%	0
Farther than 35 feet from the lake.	0.00%	0
Total		1

Q11 Do you have your septic tank pumped at least every 3 years?

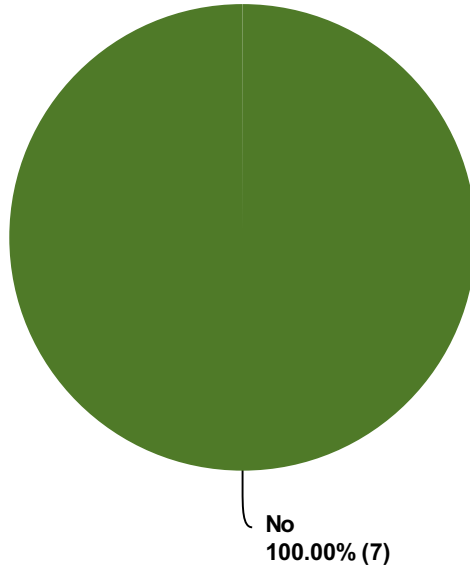
Answered: 5 Skipped: 2



Answer Choices	Responses	
Yes	80.00%	4
No	0.00%	0
I don't have a septic tank	20.00%	1
Total		5

Q12 Do you use fertilizer on your land? If no, please skip to Question 18.

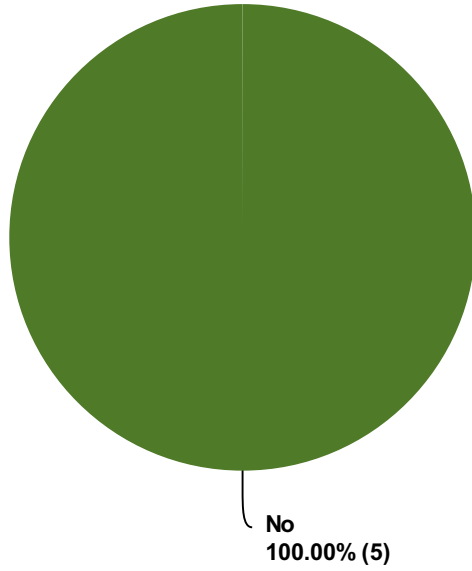
Answered: 7 Skipped: 0



Answer Choices	Responses
Yes	0.00% 0
No	100.00% 7
Total	7

Q13 Do you use fertilizer which contains phosphorus?

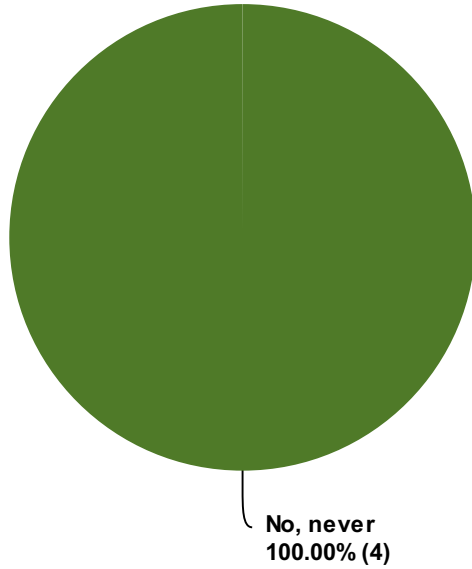
Answered: 5 Skipped: 2



Answer Choices	Responses
Yes	0.00% 0
No	100.00% 5
I don't know	0.00% 0
Total	5

Q14 Do you have your soil tested before applying fertilizer?

Answered: 4 Skipped: 3



Answer Choices	Responses
Yes, all of the time	0.00% 0
Yes, some of the time	0.00% 0
No, never	100.00% 4
Total	4

Q15 Where do you apply fertilizer?

Answered: 0 Skipped: 7

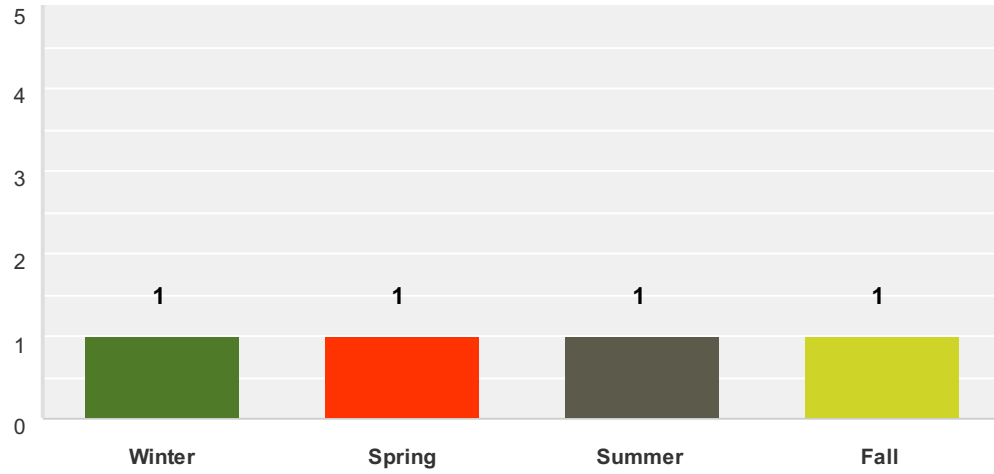
! No matching responses.

Answer Choices	Responses
Agricultural fields	0.00% 0
Garden	0.00% 0
Lawn	0.00% 0
Total	0

#	Other (please specify)	Date
1	n/a	4/30/2014 5:05 PM

Q16 In a typical year, how often do you apply fertilizer?

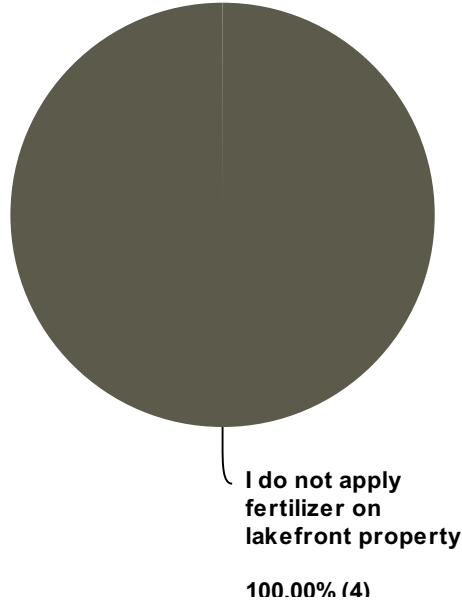
Answered: 4 Skipped: 3



	Never	Once	Once a week	Once a month	Varies	Total Respondents
Winter	100.00% 4	0.00% 0	0.00% 0	0.00% 0	0.00% 0	4
Spring	100.00% 4	0.00% 0	0.00% 0	0.00% 0	0.00% 0	4
Summer	100.00% 4	0.00% 0	0.00% 0	0.00% 0	0.00% 0	4
Fall	100.00% 4	0.00% 0	0.00% 0	0.00% 0	0.00% 0	4

Q17 If you apply fertilizer on lakefront property, how close to the lake is it applied (select the closest distance to the lake where fertilizer is applied)?

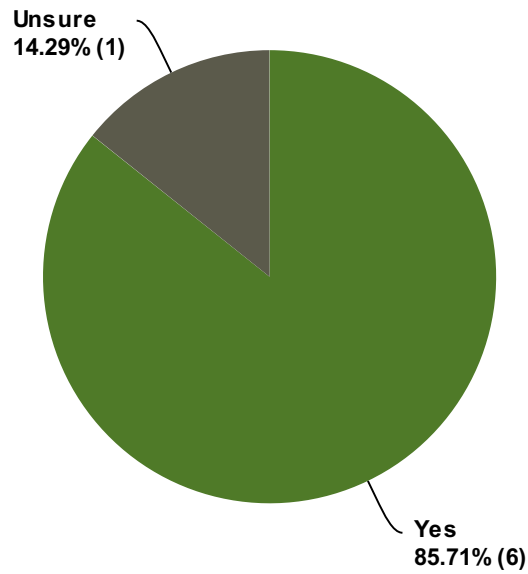
Answered: 4 Skipped: 3



Answer Choices	Responses
I do not apply fertilizer on lakefront property	100.00% 4
Up to the lake	0.00% 0
Within 35 feet of the lake	0.00% 0
Farther than 35 feet from the lake.	0.00% 0
Total	4

Q18 Before reading the previous paragraph, did you know about the effects of phosphorus on lakes?

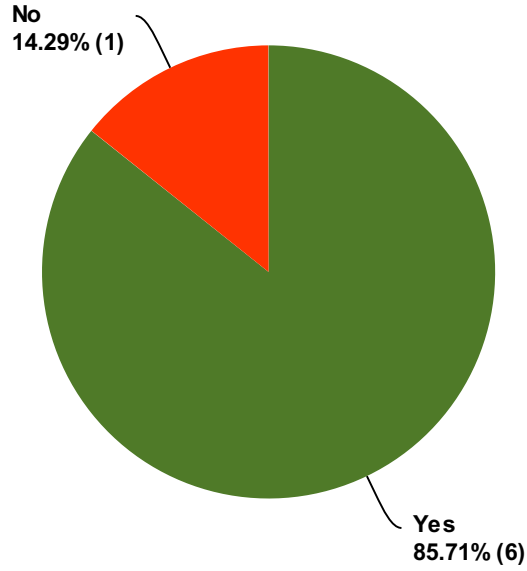
Answered: 7 Skipped: 0



Answer Choices	Responses	
Yes	85.71%	6
No	0.00%	0
Unsure	14.29%	1
Total		7

Q19 Do you own shoreland property? If no, please skip to end of survey.

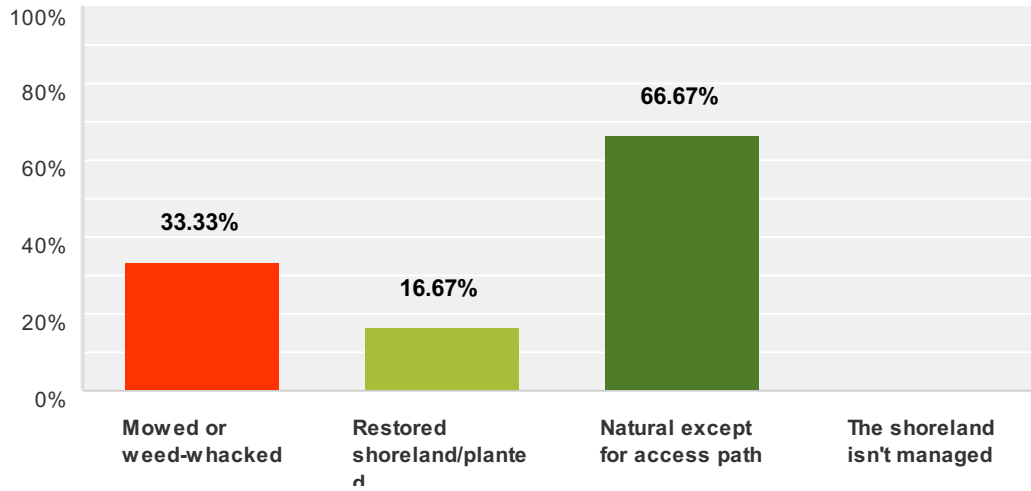
Answered: 7 Skipped: 0



Answer Choices	Responses	
Yes	85.71%	6
No	14.29%	1
Total		7

Q20 How do you currently manage the majority of your property within 35 feet of the lake? Check all that apply.

Answered: 6 Skipped: 1

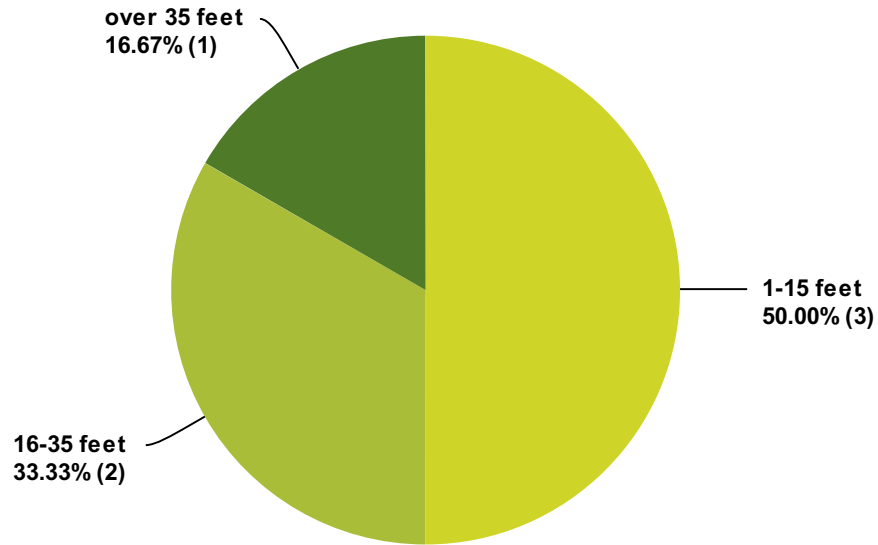


Answer Choices	Responses
Mowed or weed-whacked	33.33% 2
Restored shoreland/planted	16.67% 1
Natural except for access path	66.67% 4
The shoreland isn't managed	0.00% 0
Total Respondents: 6	

#	Other (please specify)	Date
1	35' is ridiculous... I keep a 10' buffer.	5/1/2014 1:11 AM

Q21 If you have unmowed shoreland vegetation, how far inland from the water's edge does it extend?

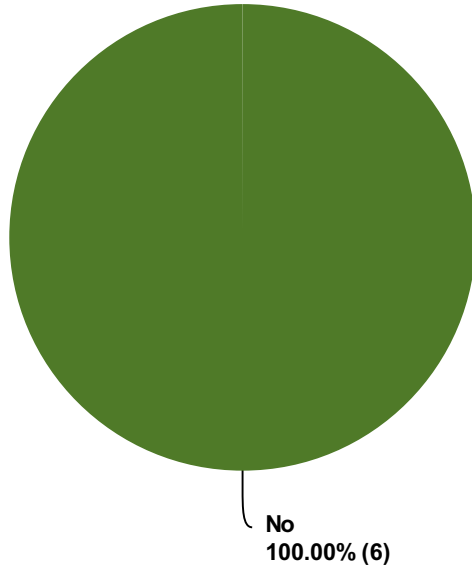
Answered: 6 Skipped: 1



Answer Choices	Responses
I do not have unmowed shoreland vegetation	0.00% 0
1-15 feet	50.00% 3
16-35 feet	33.33% 2
over 35 feet	16.67% 1
Total	6

Q22 Have you observed erosion from your path to the lake?

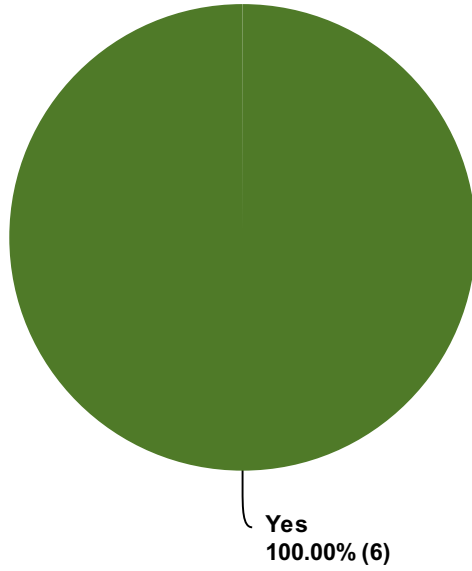
Answered: 6 Skipped: 1



Answer Choices	Responses
I have no path	0.00% 0
Yes	0.00% 0
No	100.00% 6
Unsure	0.00% 0
Total	6

Q23 Did you understand the importance of shoreland vegetation before reading this?

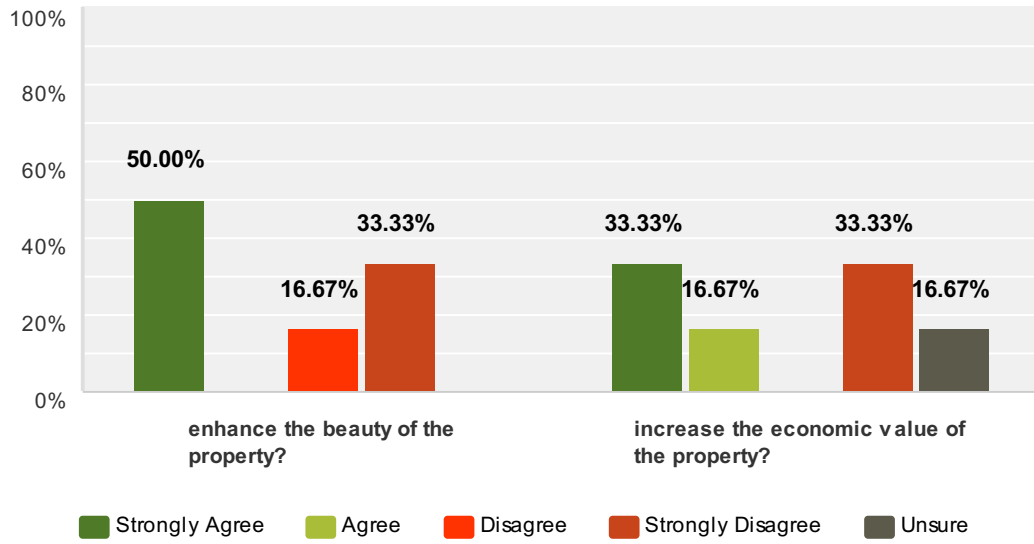
Answered: 6 Skipped: 1



Answer Choices	Responses
Yes	100.00% 6
No	0.00% 0
Unsure	0.00% 0
Total	6

Q24 In your opinion, does shoreland vegetation...

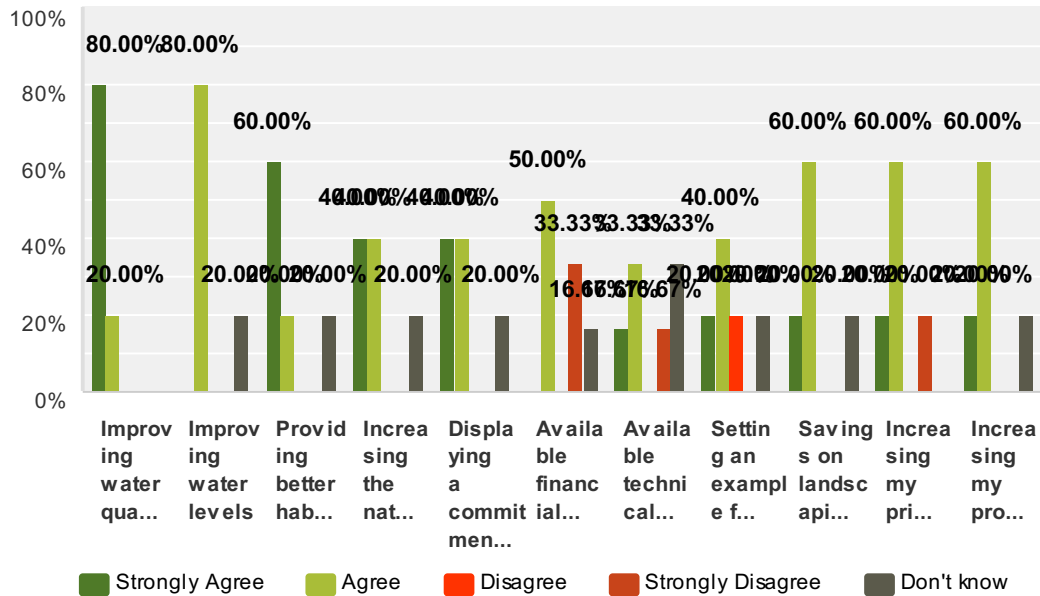
Answered: 6 Skipped: 1



	Strongly Agree	Agree	Disagree	Strongly Disagree	Unsure	Total
enhance the beauty of the property?	50.00% 3	0.00% 0	16.67% 1	33.33% 2	0.00% 0	6
increase the economic value of the property?	33.33% 2	16.67% 1	0.00% 0	33.33% 2	16.67% 1	6

Q25 What might motivate you to change how you manage your land?

Answered: 6 Skipped: 1



	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know	Total
Improving water quality	80.00% 4	20.00% 1	0.00% 0	0.00% 0	0.00% 0	5
Improving water levels	0.00% 0	80.00% 4	0.00% 0	0.00% 0	20.00% 1	5
Providing better habitat for fish and wildlife	60.00% 3	20.00% 1	0.00% 0	0.00% 0	20.00% 1	5
Increasing the natural beauty of my property	40.00% 2	40.00% 2	0.00% 0	0.00% 0	20.00% 1	5
Displaying a commitment to the environment	40.00% 2	40.00% 2	0.00% 0	0.00% 0	20.00% 1	5
Available financial assistance	0.00% 0	50.00% 3	0.00% 0	33.33% 2	16.67% 1	6
Available technical assistance	16.67% 1	33.33% 2	0.00% 0	16.67% 1	33.33% 2	6
Setting an example for community members	20.00% 1	40.00% 2	20.00% 1	0.00% 0	20.00% 1	5
Savings on landscaping/maintenance costs	20.00% 1	60.00% 3	0.00% 0	0.00% 0	20.00% 1	5
Increasing my privacy	20.00% 1	60.00% 3	0.00% 0	0.00% 0	20.00% 1	5
Increasing my property value	20.00% 1	60.00% 3	0.00% 0	0.00% 0	20.00% 1	5

#	Other (please specify)	Date
1	This is really not a survey at all... it is a lecture	5/1/2014 1:13 AM

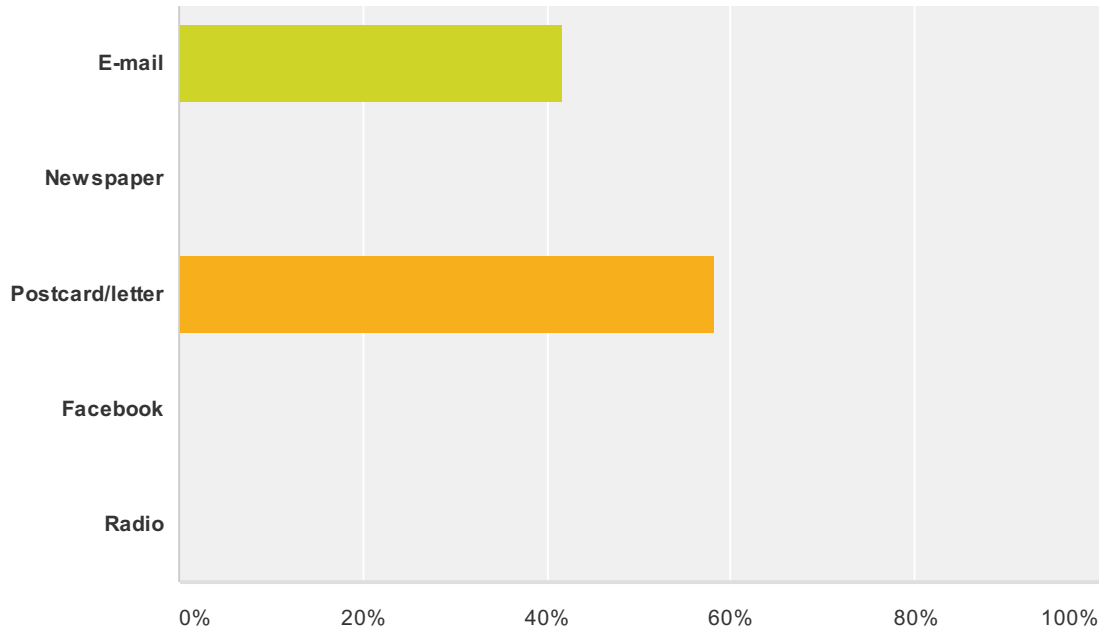
Q1 Enter your Waushara County Lakes Survey ID. If you've forgotten your ID or haven't created one yet, follow the instructions below.

Answered: 13 Skipped: 0

#	Responses	Date
1	██████	3/8/2014 1:10 PM
2	██████	3/6/2014 9:15 AM
3	██████	3/3/2014 6:31 PM
4	██████	2/28/2014 7:49 PM
5	██████	2/28/2014 11:11 AM
6	██████	2/27/2014 9:16 PM
7	██████	2/27/2014 5:07 PM
8	██████	2/27/2014 5:03 PM
9	██████	2/26/2014 6:51 PM
10	██████	2/26/2014 6:15 PM
11	██████	2/26/2014 2:47 PM
12	██████	2/25/2014 1:00 PM
13	██████	2/24/2014 4:29 PM

Q2 How did you hear about this survey?

Answered: 12 Skipped: 1

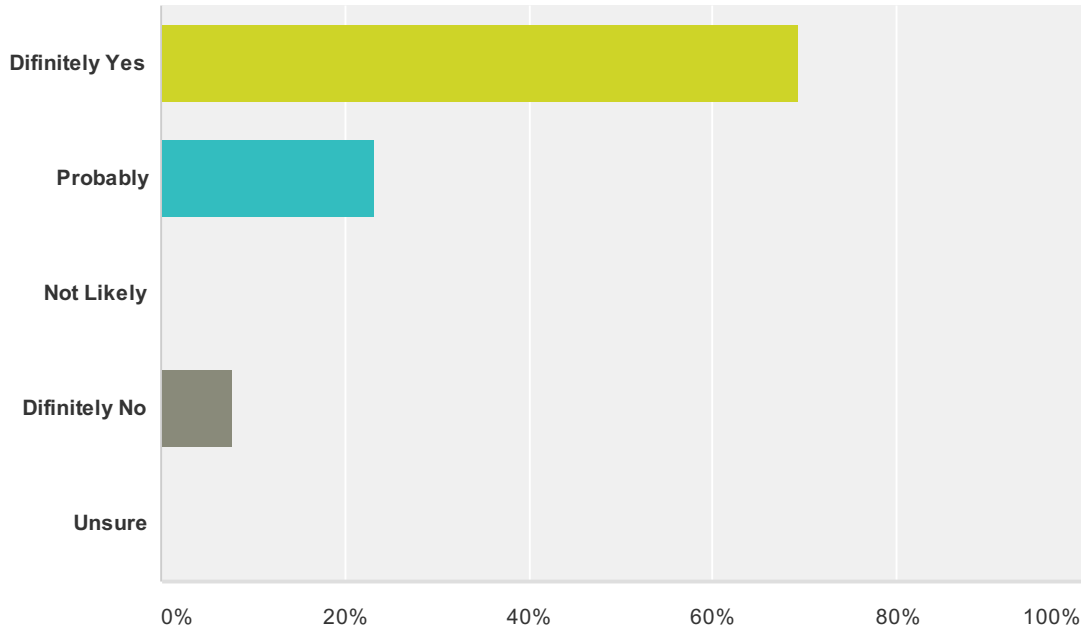


Answer Choices	Responses
E-mail	41.67% 5
Newspaper	0% 0
Postcard/letter	58.33% 7
Facebook	0% 0
Radio	0% 0
Total	12

#	Other (please specify)	Date
1	friend	3/6/2014 9:15 AM

Q3 Does a desire to provide better habitat for fish and wildlife motivate you to support (morally) efforts to improve Spring Lake?

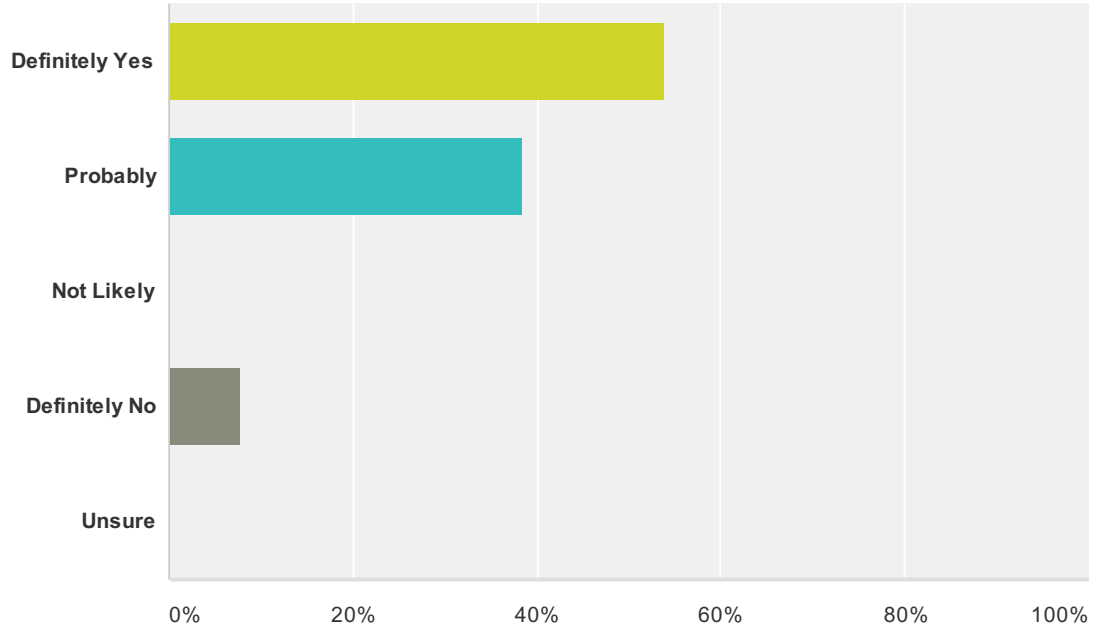
Answered: 13 Skipped: 0



Answer Choices	Responses
Definitely Yes	69.23% 9
Probably	23.08% 3
Not Likely	0% 0
Definitely No	7.69% 1
Unsure	0% 0
Total	13

Q4 Does a desire to provide better habitat for fish and wildlife motivate you to support (by direct action) efforts to improve Spring Lake?

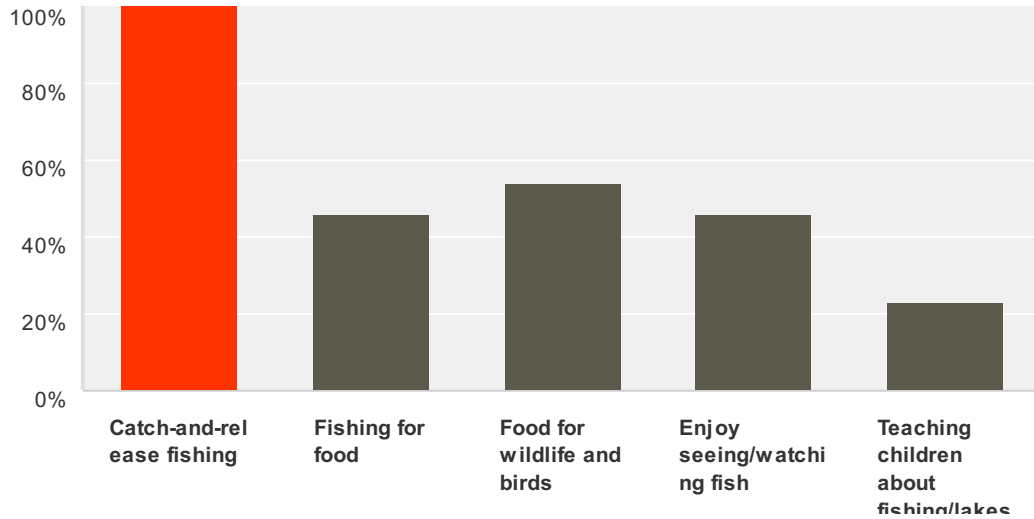
Answered: 13 Skipped: 0



Answer Choices	Responses
Definitely Yes	53.85% 7
Probably	38.46% 5
Not Likely	0% 0
Definitely No	7.69% 1
Unsure	0% 0
Total	13

Q5 For what purposes do you value the fishery in Spring Lake? (Check all that apply.)

Answered: 13 Skipped: 0



Answer Choices	Responses
Catch-and-release fishing	100% 13
Fishing for food	46.15% 6
Food for wildlife and birds	53.85% 7
Enjoy seeing/watching fish	46.15% 6
Teaching children about fishing/lakes	23.08% 3
Total Respondents: 13	

#	Other (please specify)	Date
	There are no responses.	

Q6 How many years of fishing experience do you have on Spring Lake?

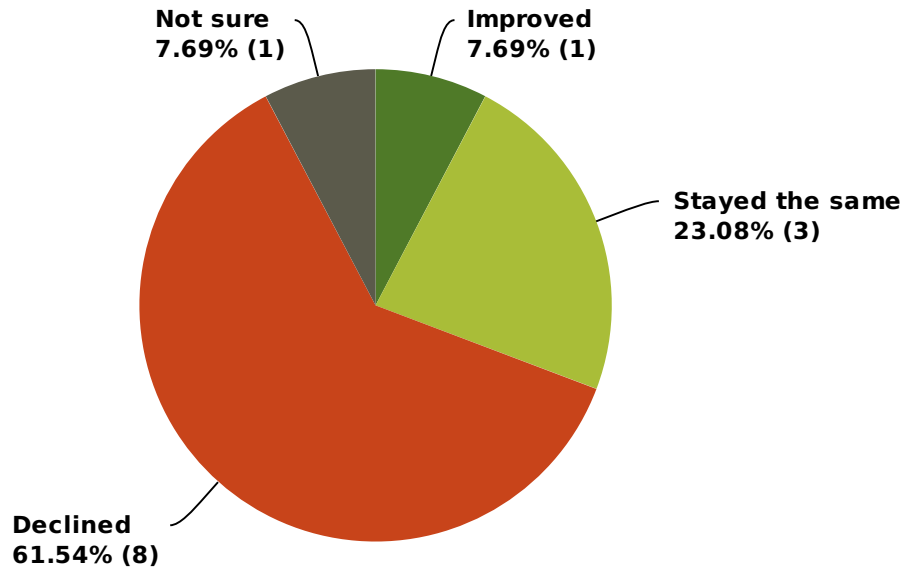
Answered: 13 Skipped: 0



Answer Choices	Responses	
I don't fish PSpring Lake	0%	0
1-5 years	23.08%	3
6-10 years	15.38%	2
11-20 years	23.08%	3
More than 20 years	38.46%	5
Total		13

Q7 In the years you have been fishing Spring Lake, would you say the quality of fishing has...

Answered: 13 Skipped: 0



Answer Choices	Responses
Improved	7.69% 1
Stayed the same	23.08% 3
Declined	61.54% 8
Not sure	7.69% 1
Total	13

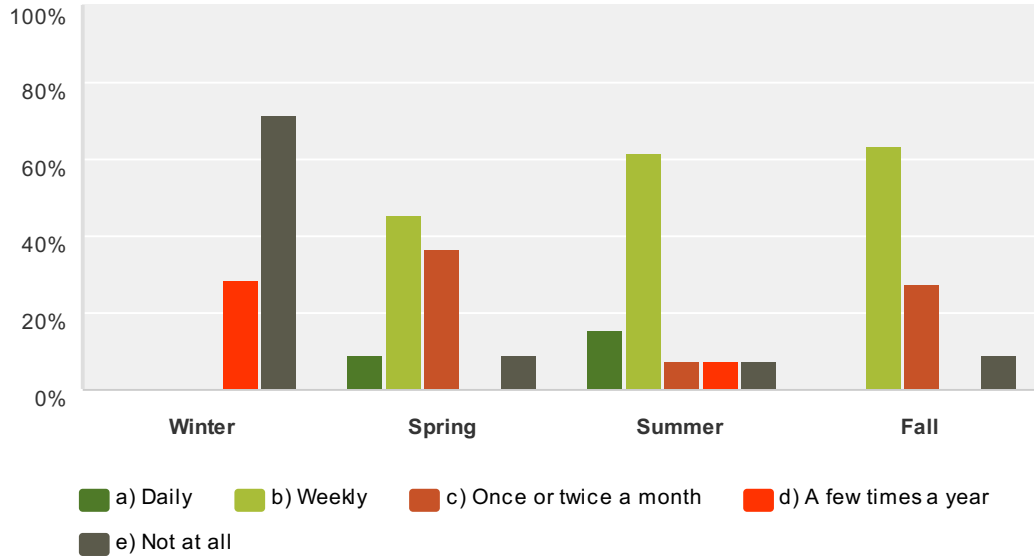
Q8 What factors do you feel have contributed to the change in fishing?

Answered: 3 Skipped: 10

#	Responses	Date
1	less weed coverage	2/27/2014 5:06 PM
2	Too many boat launches	2/26/2014 6:17 PM
3	over fishing during ice fishing season	2/26/2014 2:49 PM

Q9 When and how often do you typically fish Spring Lake? (Please answer a-e)

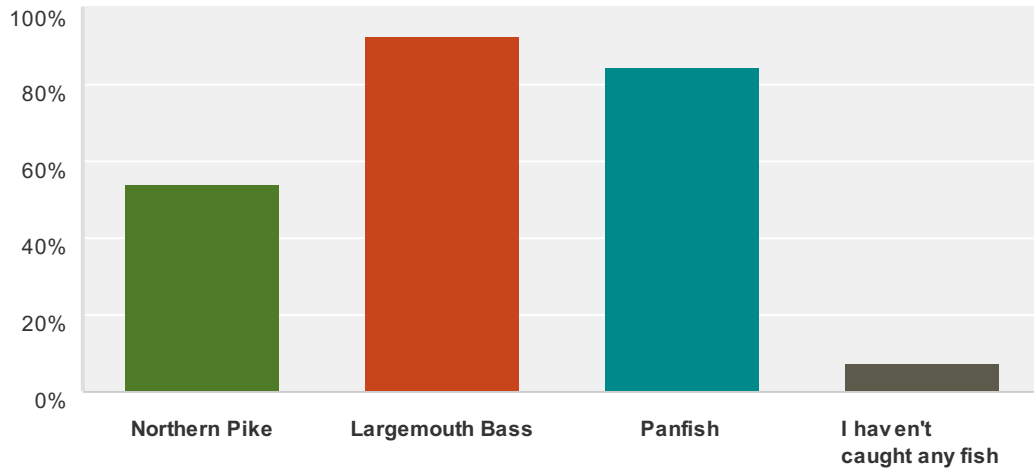
Answered: 13 Skipped: 0



	a) Daily	b) Weekly	c) Once or twice a month	d) A few times a year	e) Not at all	Total Respondents
Winter	0% 0	0% 0	0% 0	28.57% 2	71.43% 5	7
Spring	9.09% 1	45.45% 5	36.36% 4	0% 0	9.09% 1	11
Summer	15.38% 2	61.54% 8	7.69% 1	7.69% 1	7.69% 1	13
Fall	0% 0	63.64% 7	27.27% 3	0% 0	9.09% 1	11

Q10 What fish do you typically catch at Spring Lake? Check all that apply.

Answered: 13 Skipped: 0

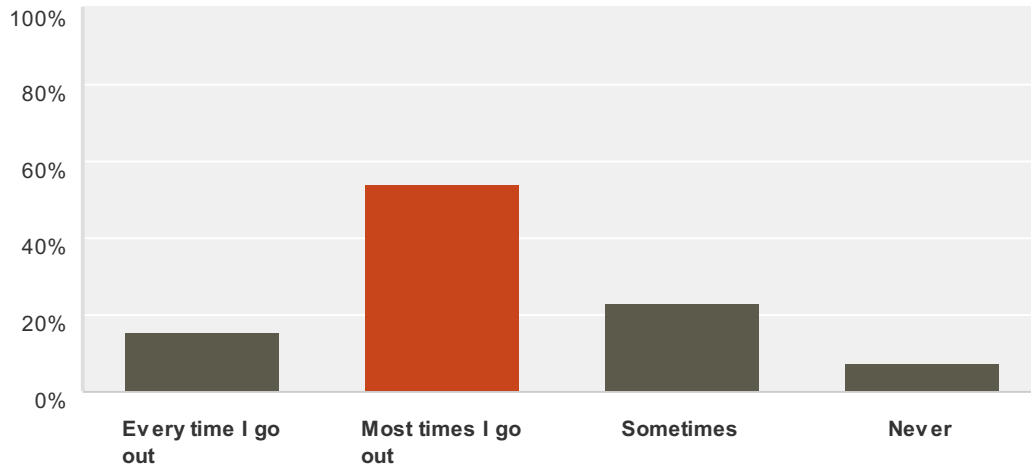


Answer Choices	Responses
Northern Pike	53.85% 7
Largemouth Bass	92.31% 12
Panfish	84.62% 11
I haven't caught any fish	7.69% 1
Total Respondents: 13	

#	Other (please specify)	Date
1	trout	3/8/2014 1:12 PM
2	Brown Trout, Rainbow Trout	2/26/2014 6:53 PM

Q11 In general, how often do you catch fish at Spring Lake?

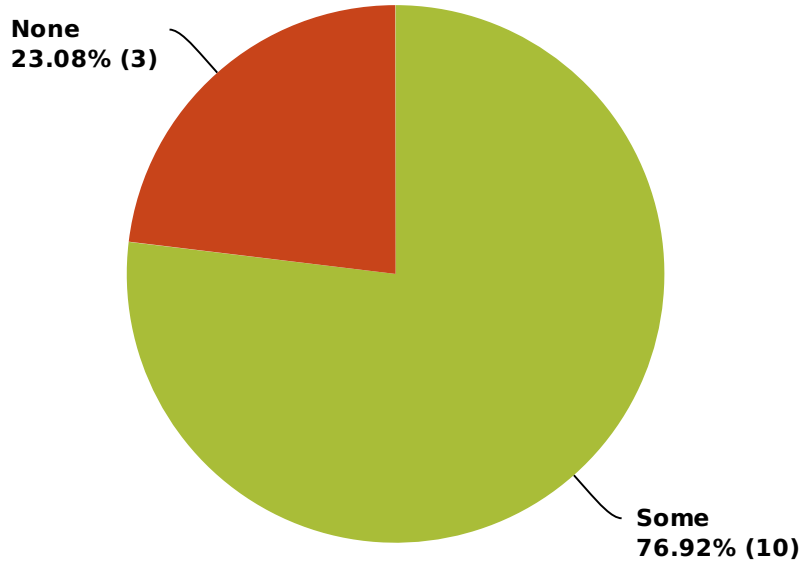
Answered: 13 Skipped: 0



Answer Choices	Responses
Every time I go out	15.38% 2
Most times I go out	53.85% 7
Sometimes	23.08% 3
Never	7.69% 1
Total Respondents: 13	

Q12 In general, how many of the fish are big enough to keep?

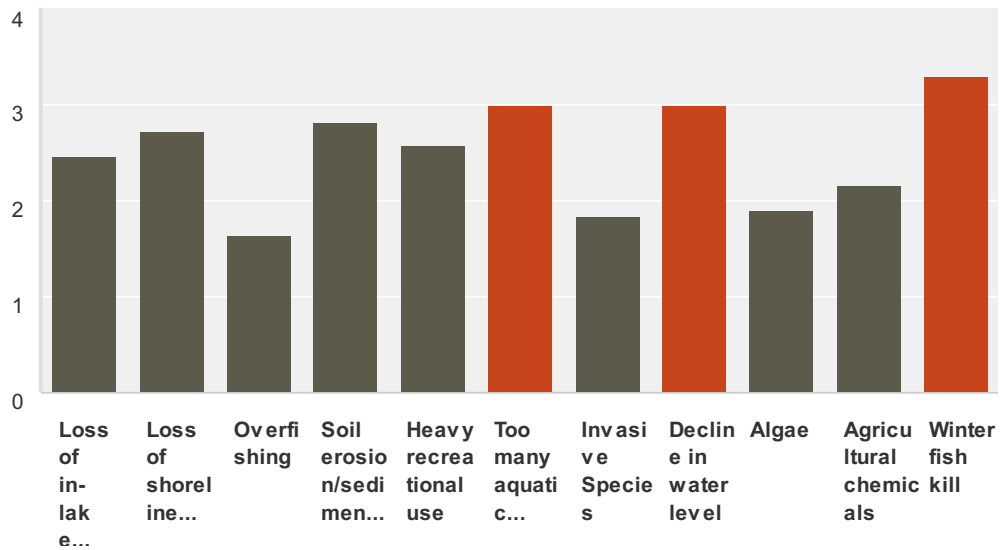
Answered: 13 Skipped: 0



Answer Choices	Responses	
All	0%	0
Most	0%	0
Some	76.92%	10
None	23.08%	3
Total		13

Q13 What do you believe is the greatest threat to the fishery in Spring Lake in the next 10 years?

Answered: 13 Skipped: 0



	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know	Total Respondents
Loss of in-lake habitat	18.18% 2	36.36% 4	36.36% 4	0% 0	9.09% 1	11
Loss of shoreline habitat	9.09% 1	45.45% 5	45.45% 5	9.09% 1	0% 0	11
Overfishing	63.64% 7	27.27% 3	0% 0	0% 0	9.09% 1	11
Soil erosion/sedimentation	0% 0	45.45% 5	36.36% 4	9.09% 1	9.09% 1	11
Heavy recreational use	8.33% 1	33.33% 4	50% 6	8.33% 1	0% 0	12
Too many aquatic plants	8.33% 1	16.67% 2	58.33% 7	0% 0	16.67% 2	12
Invasive Species	23.08% 3	69.23% 9	7.69% 1	0% 0	0% 0	13
Decline in water level	0% 0	9.09% 1	81.82% 9	9.09% 1	0% 0	11
Algae	18.18% 2	72.73% 8	9.09% 1	0% 0	0% 0	11
Agricultural chemicals	16.67% 2	66.67% 8	8.33% 1	0% 0	8.33% 1	12
Winter fish kill	0% 0	30% 3	30% 3	20% 2	20% 2	10

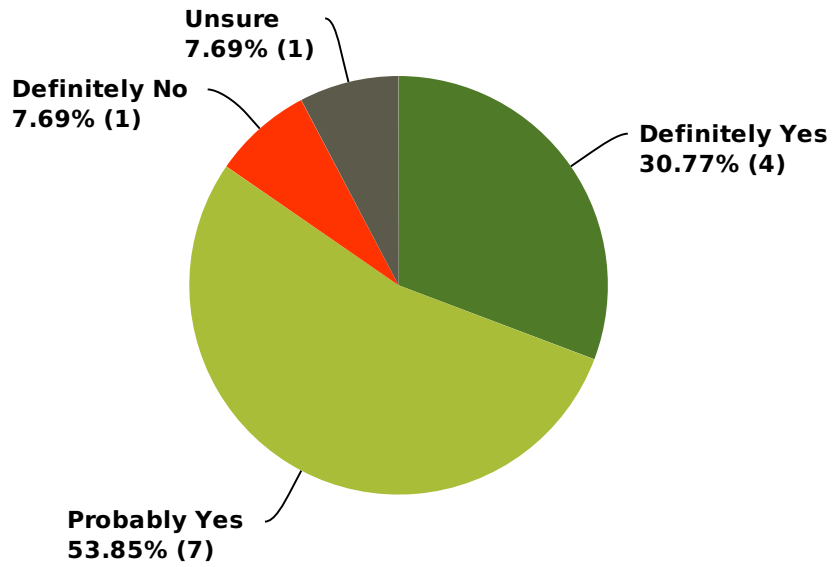
#	Other (please specify)	Date
1	Loss of fish habitat in general	2/28/2014 7:55 PM
2	unregulated large capacity wells	2/27/2014 5:12 PM

Waushara County Lakes Project - Spring Lake Survey #2

3	Ag run off	2/24/2014 4:33 PM
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Q14 Do you believe fish from Spring Lake are safe to eat?

Answered: 13 Skipped: 0



Answer Choices	Responses	
Definitely Yes	30.77%	4
Probably Yes	53.85%	7
Probably No	0%	0
Definitely No	7.69%	1
Unsure	7.69%	1
Total		13

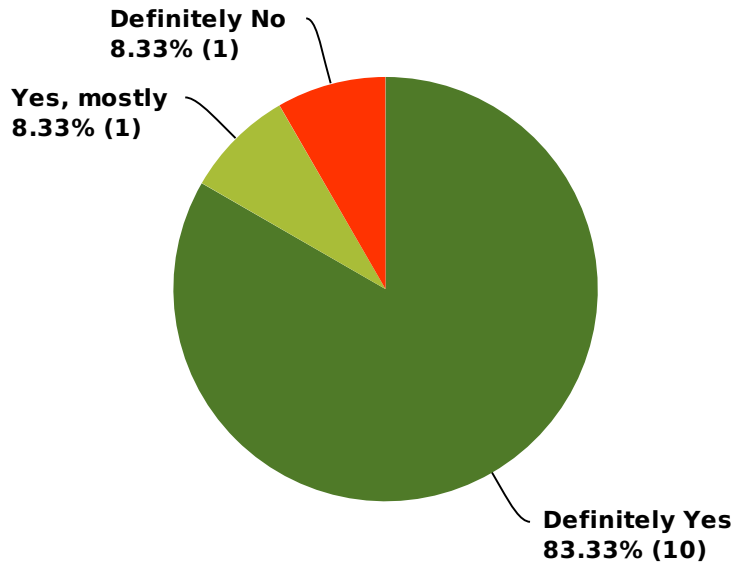
Q15 Do you have any additional comments regarding the fishery in Spring Lake?

Answered: 6 Skipped: 7

#	Responses	Date
1	Over fished in Winter	3/6/2014 9:18 AM
2	Would consider a fish survey (DNR) with a possible stocking/restocking program for proper species	2/28/2014 7:55 PM
3	Since Silver Lake started charging for parking at the public landing there has been a dramatic increase in fishing pressure, especially ice fishing, by people needing a cheap food source. It really has ruined what used to be a great sport fishing lake.	2/26/2014 7:02 PM
4	Fish are infested with parasites	2/26/2014 6:18 PM
5	Appreciate DNR stocking and periodic feedback re: health, size of fish seen during a shocking survey	2/26/2014 2:51 PM
6	So thankful the DNR got involved with the owner of 160 feet of frontage destroying the waterfront. Still have owners who have hardscape at the edge or mow to the edge—need to get them to change.	2/24/2014 4:33 PM

Q16 Spring Lake is a 'No Wake' lake. Do you like this rule?

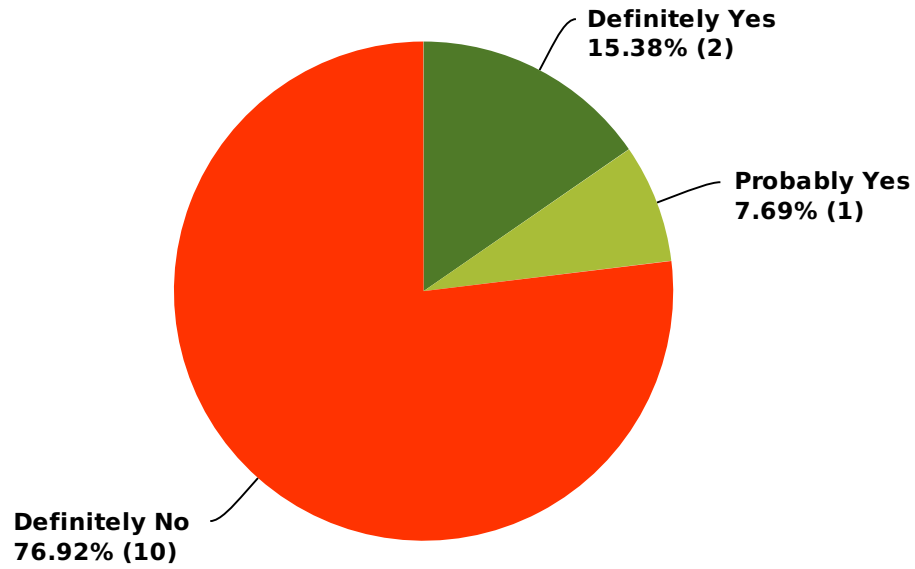
Answered: 12 Skipped: 1



Answer Choices	Responses	
Definitely Yes	83.33%	10
Yes, mostly	8.33%	1
Not most of the time	0%	0
Definitely No	8.33%	1
Unsure	0%	0
Total		12

Q17 Do you think there should be times when a wake is permitted on Spring Lake?

Answered: 13 Skipped: 0



Answer Choices	Responses	
Definitely Yes	15.38%	2
Probably Yes	7.69%	1
Probably No	0%	0
Definitely No	76.92%	10
Unsure	0%	0
Total		13

Waushara County Lakes Project - Spring Lake Survey #2

Q18 What could be done to improve your recreation experience on Spring Lake?

Answered: 12 Skipped: 1

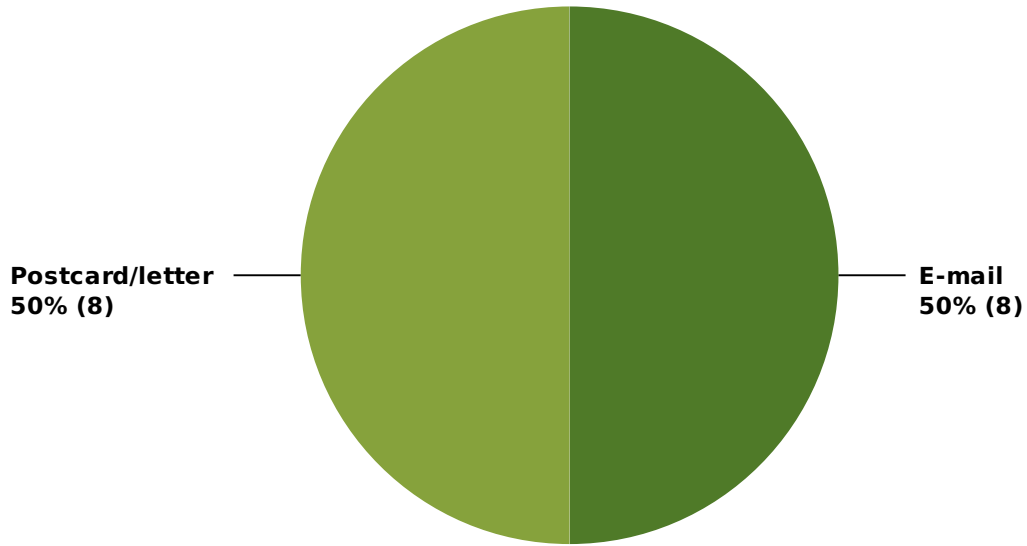
#	Responses	Date
1	having a set time for wake is permitted	3/8/2014 1:14 PM
2	Enforcement of non wake	3/6/2014 9:19 AM
3	I like it pretty much the way it is if we could just get rid of the floating weeds. That is the only reason I think a period allowing wakes would help. I don't support jetski or water skiing but would like to see some occasional wave action to clean the lake. There is never enough action to breakup floating weeds, algae patches or scum. Makes for difficult fishing and general looks. The Northeast end of the lake suffers more from this problem than the more populated south/west end.	2/28/2014 7:58 PM
4	Educate non-owner users about no-wake, sound fishing practices.	2/28/2014 11:15 AM
5	There should be time wake is permitted ex 10 to 1	2/27/2014 9:20 PM
6	Assurance that nothing will change its quality.	2/27/2014 5:14 PM
7	required paid launch fee	2/27/2014 5:09 PM
8	Ban all manner of motorized boats, vehicles, and power augers. Ban all fish locators and underwater cameras	2/26/2014 7:05 PM
9	Close the boat landings	2/26/2014 6:18 PM
10	enforcement of no wake by all - some people ignore rules, not safe then, decrease number of fish caught during ice fishing season so everyone has ability to have good fishing during the whole season.	2/26/2014 2:52 PM
11	People picking up after themselves and people not throwing plastic bags with dead possums in them into the lake.	2/25/2014 1:07 PM
12	STOP all the fireworks! Huge displays, multi days. Then, they don't clean up the remains.	2/24/2014 4:34 PM

Q1 Enter your Waushara County Lakes Survey ID. If you've forgotten your ID or haven't created one yet, follow the instructions below.

Answered: 17 Skipped: 0

Q2 How did you hear about this survey?

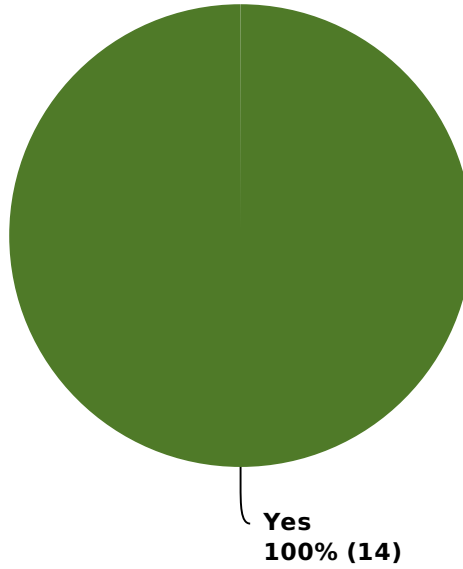
Answered: 16 Skipped: 1



Answer Choices	Responses	
E-mail	50%	8
Newspaper	0%	0
Postcard/letter	50%	8
Facebook	0%	0
Radio	0%	0
Total		16

Q3 Were you aware of the importance of aquatic plants?

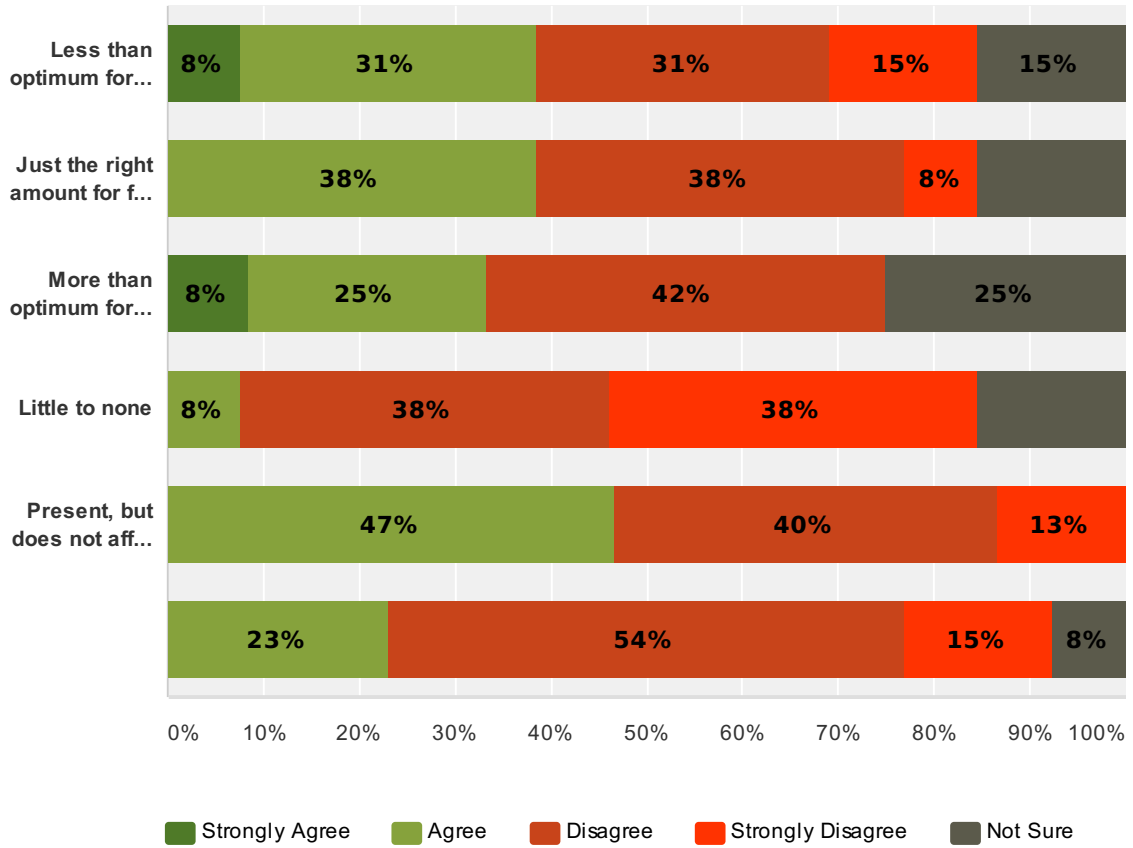
Answered: 14 Skipped: 3



Answer Choices	Responses	
Yes	100%	14
No	0%	0
Unsure	0%	0
Total		14

Q4 In your opinion, which statement best describes the amount of aquatic plant growth in Spring Lake?

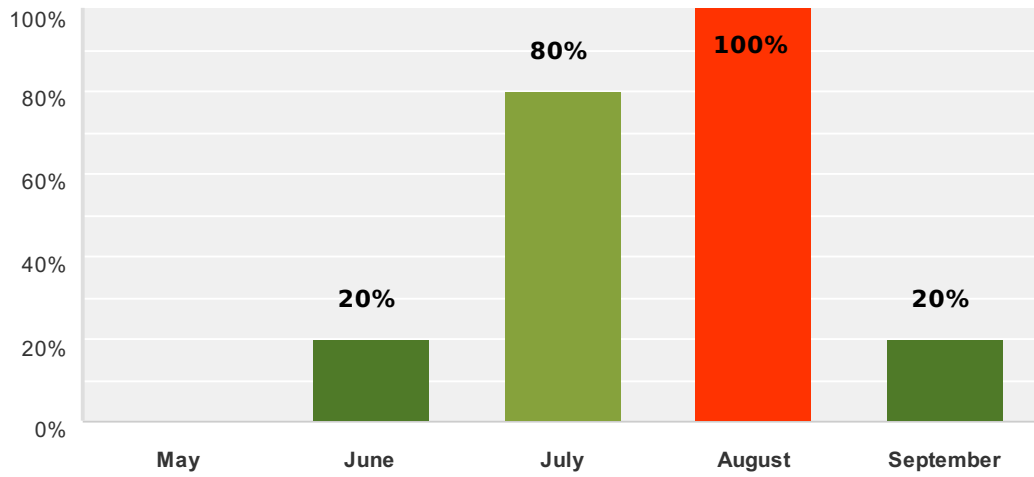
Answered: 15 Skipped: 2



	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Sure	Total
Less than optimum for fish and wildlife	8% 1	31% 4	31% 4	15% 2	15% 2	13
Just the right amount for fish and wildlife	0% 0	38% 5	38% 5	8% 1	15% 2	13
More than optimum for fish and wildlife	8% 1	25% 3	42% 5	0% 0	25% 3	12
Little to none	0% 0	8% 1	38% 5	38% 5	15% 2	13
Present, but does not affect my use of the lake	0% 0	47% 7	40% 6	13% 2	0% 0	15
Dense, affects my use of the lake	0% 0	23% 3	54% 7	15% 2	8% 1	13

Q5 If you selected dense or choked, what month(s) do the problems occur? Check all that apply.

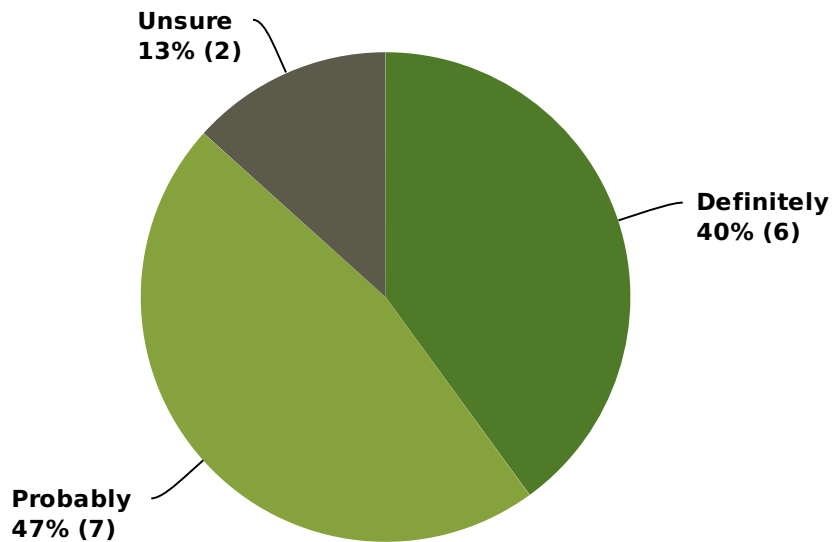
Answered: 5 Skipped: 12



Answer Choices	Responses
May	0% 0
June	20% 1
July	80% 4
August	100% 5
September	20% 1
Total Respondents: 5	

Q6 Do you believe aquatic plant control is needed on Spring Lake?

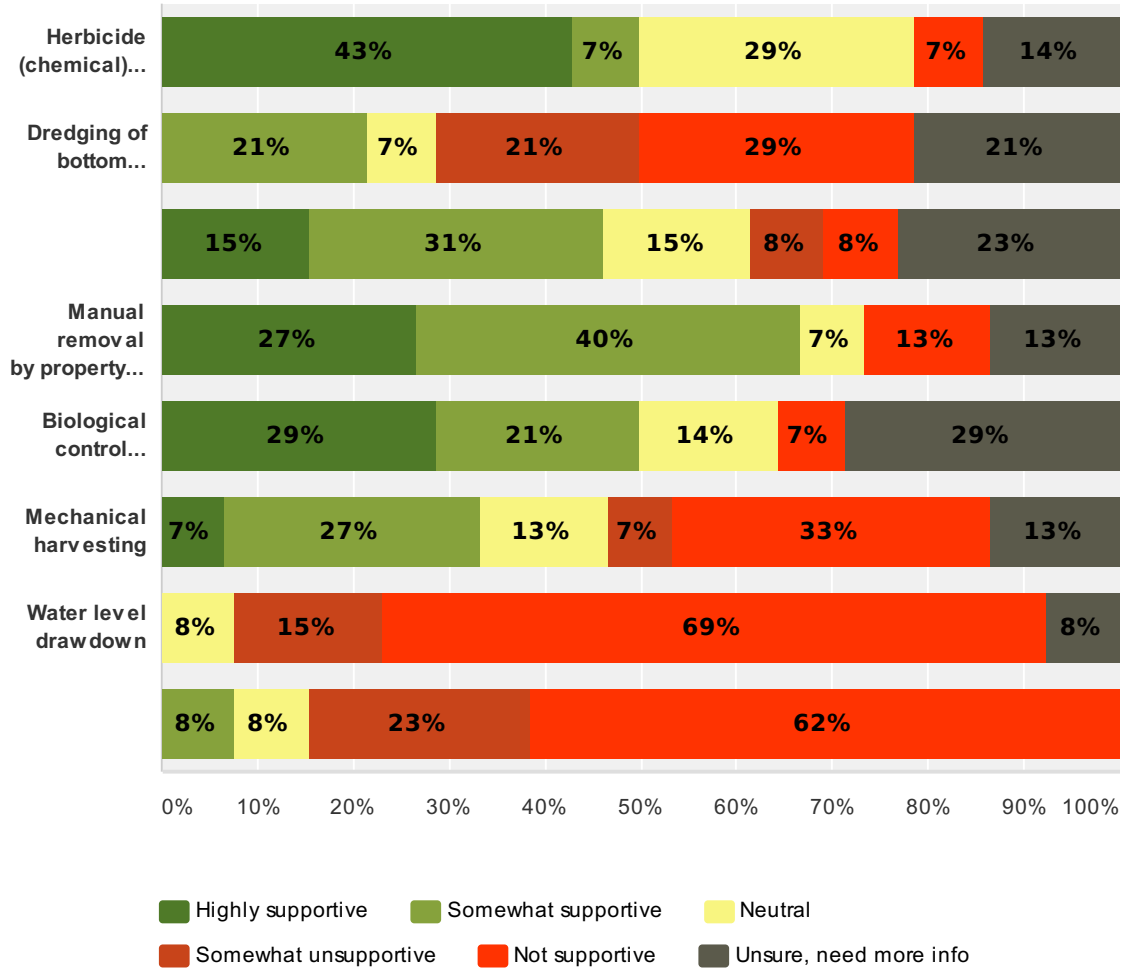
Answered: 15 Skipped: 2



Answer Choices	Responses
Definitely	40% 6
Probably	47% 7
Unsure	13% 2
Probably not	0% 0
Definitely not	0% 0
Total	15

Q7 What is your level of support for the responsible use of the following techniques TO MANAGE AQUATIC PLANTS on Spring Lake?

Answered: 15 Skipped: 2



	Highly supportive	Somewhat supportive	Neutral	Somewhat unsupportive	Not supportive	Unsure, need more info	Total	Average Rating
Herbicide (chemical) control	43% 6	7% 1	29% 4	0% 0	7% 1	14% 2	14	1.79
Dredging of bottom sediments	0% 0	21% 3	7% 1	21% 3	29% 4	21% 3	14	2.93
Hand-removal by divers	15% 2	31% 4	15% 2	8% 1	8% 1	23% 3	13	1.92
Manual removal by property owners	27% 4	40% 6	7% 1	0% 0	13% 2	13% 2	15	1.93
Biological control (milfoil weevil, loosestrife beetle, etc.)	29% 4	21% 3	14% 2	0% 0	7% 1	29% 4	14	1.50

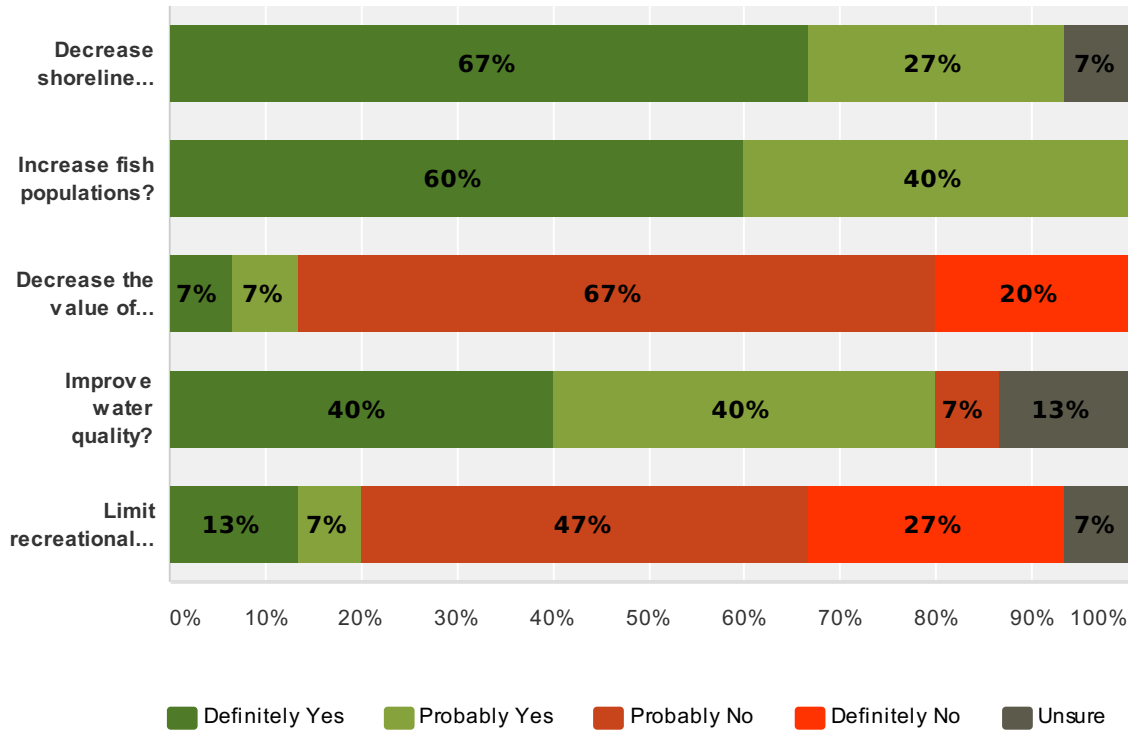
Mechanical harvesting	7%	27%	13%	7%	33%	13%		
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Waushara County Lakes Project - Spring Lake Survey #3

	1%	4%	8%	15%	33%	69%	15%		
mechanical harvesting	1	4	2	1	5	2	15		2.93
Water level drawdown	0% 0	0% 0	8% 1	15% 2	69% 9	8% 1	13		4.31
Do nothing (do not manage plants)	0% 0	8% 1	8% 1	23% 3	62% 8	0% 0	13		4.38

Q8 In your opinion, does establishing or maintaining native vegetation IN THE WATER in the near-shore area...

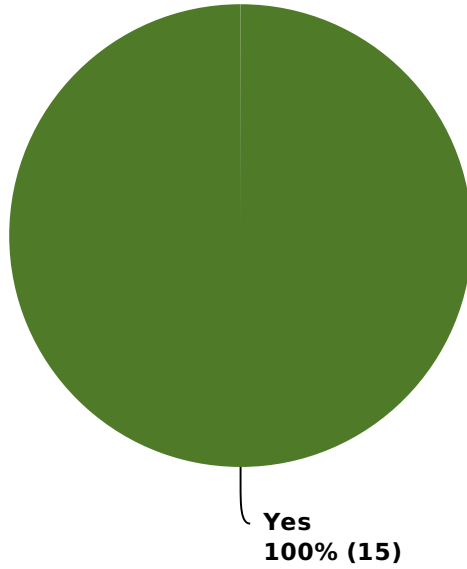
Answered: 15 Skipped: 2



	Definitely Yes	Probably Yes	Probably No	Definitely No	Unsure	Total
Decrease shoreline erosion?	67% 10	27% 4	0% 0	0% 0	7% 1	15
Increase fish populations?	60% 9	40% 6	0% 0	0% 0	0% 0	15
Decrease the value of shoreline property?	7% 1	7% 1	67% 10	20% 3	0% 0	15
Improve water quality?	40% 6	40% 6	7% 1	0% 0	13% 2	15
Limit recreational enjoyment?	13% 2	7% 1	47% 7	27% 4	7% 1	15

Q9 Have you ever heard of aquatic invasive species?

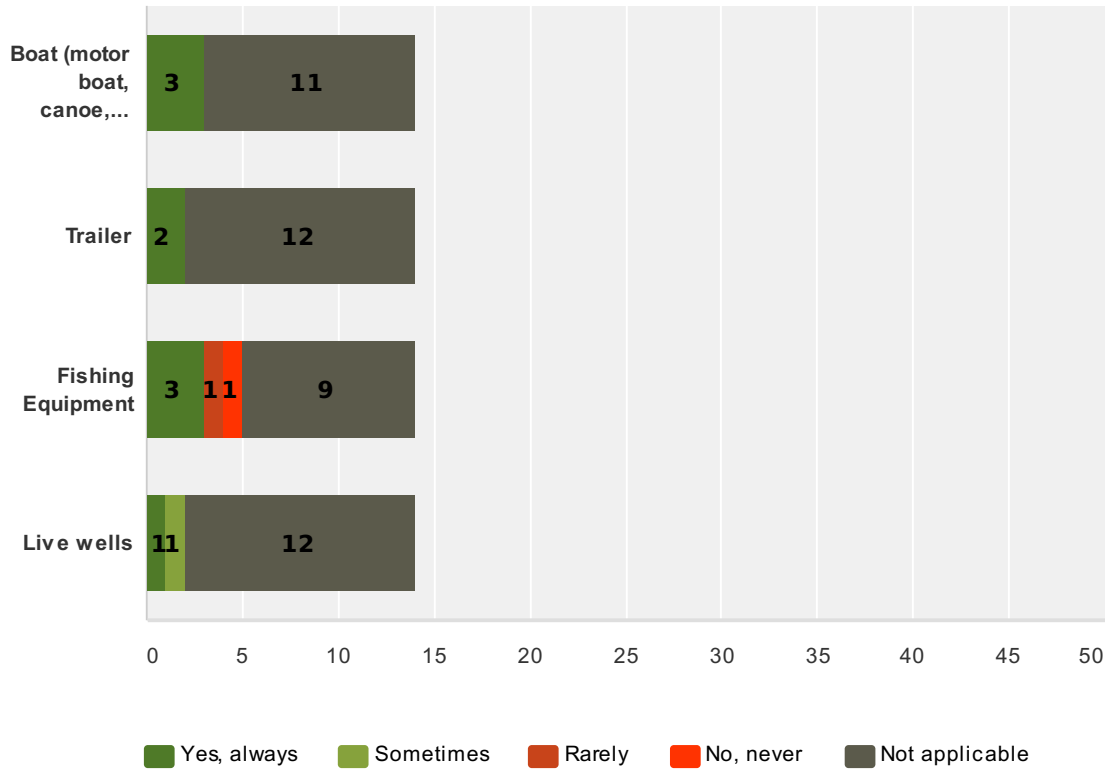
Answered: 15 Skipped: 2



Answer Choices	Responses	
Yes	100%	15
No	0%	0
Total		15

Q10 After you have been to another lake, do you clean your ... before bringing it back to Spring Lake?

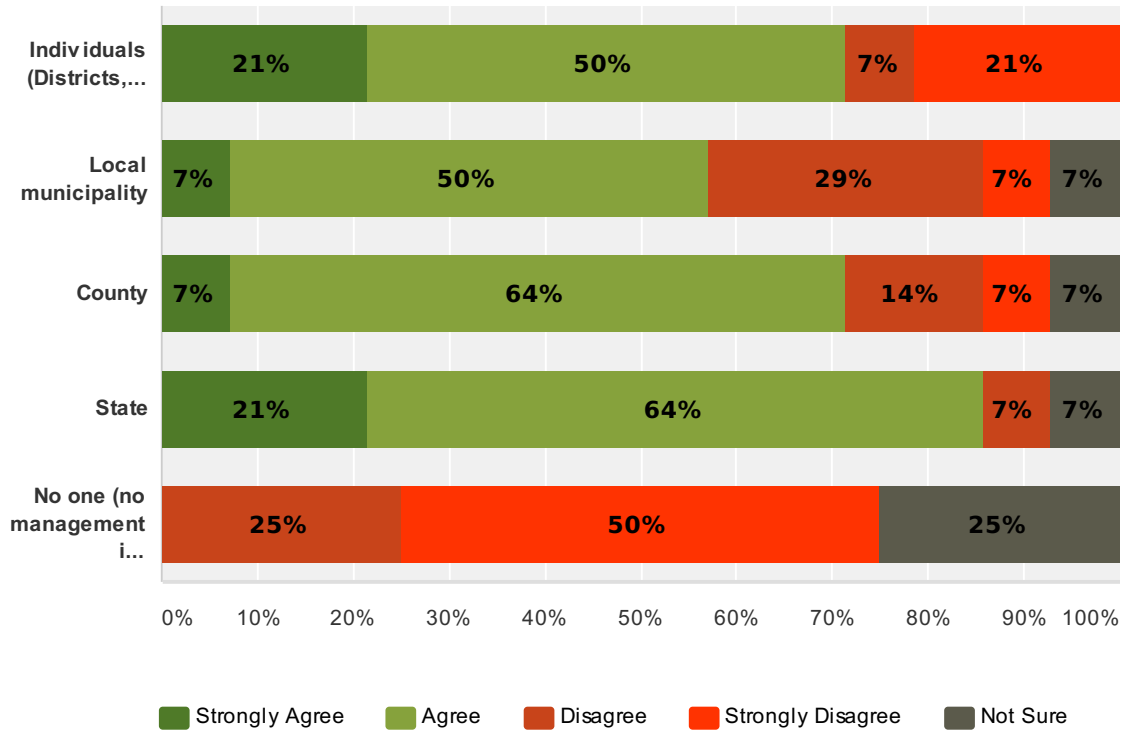
Answered: 14 Skipped: 3



	Yes, always	Sometimes	Rarely	No, never	Not applicable	Total Respondents
Boat (motor boat, canoe, kayak, etc.)	21% 3	0% 0	0% 0	0% 0	79% 11	14
Trailer	14% 2	0% 0	0% 0	0% 0	86% 12	14
Fishing Equipment	21% 3	0% 0	7% 1	7% 1	64% 9	14
Live wells	7% 1	7% 1	0% 0	0% 0	86% 12	14

Q11 Who should pay for the cost of managing invasive aquatic plants? Check all that apply.

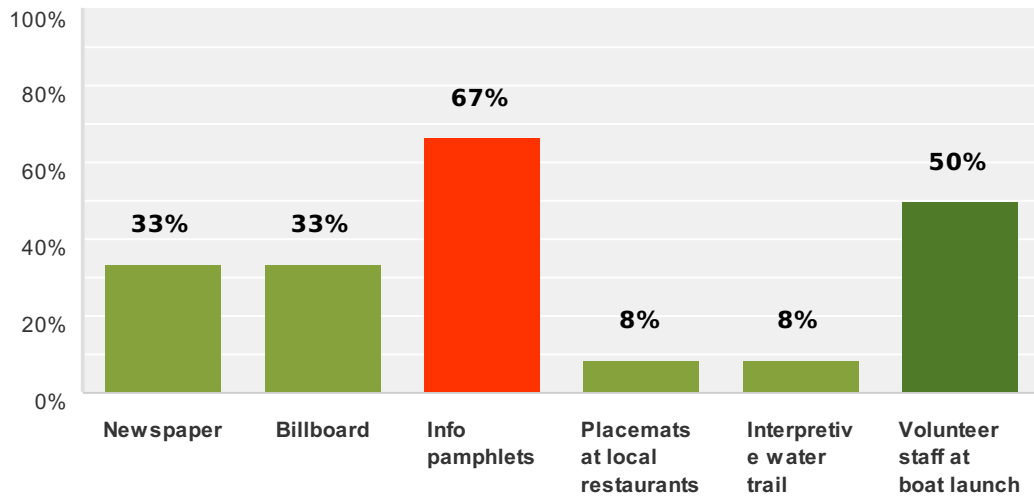
Answered: 14 Skipped: 3



	Strongly Agree	Agree	Disagree	Strongly Disagree	Not Sure	Total
Individuals (Districts, associations, lakefront property owners)	21% 3	50% 7	7% 1	21% 3	0% 0	14
Local municipality	7% 1	50% 7	29% 4	7% 1	7% 1	14
County	7% 1	64% 9	14% 2	7% 1	7% 1	14
State	21% 3	64% 9	7% 1	0% 0	7% 1	14
No one (no management is undertaken)	0% 0	0% 0	25% 3	50% 6	25% 3	12

Q12 What is the most effective way to inform others about aquatic invasive species?

Answered: 12 Skipped: 5

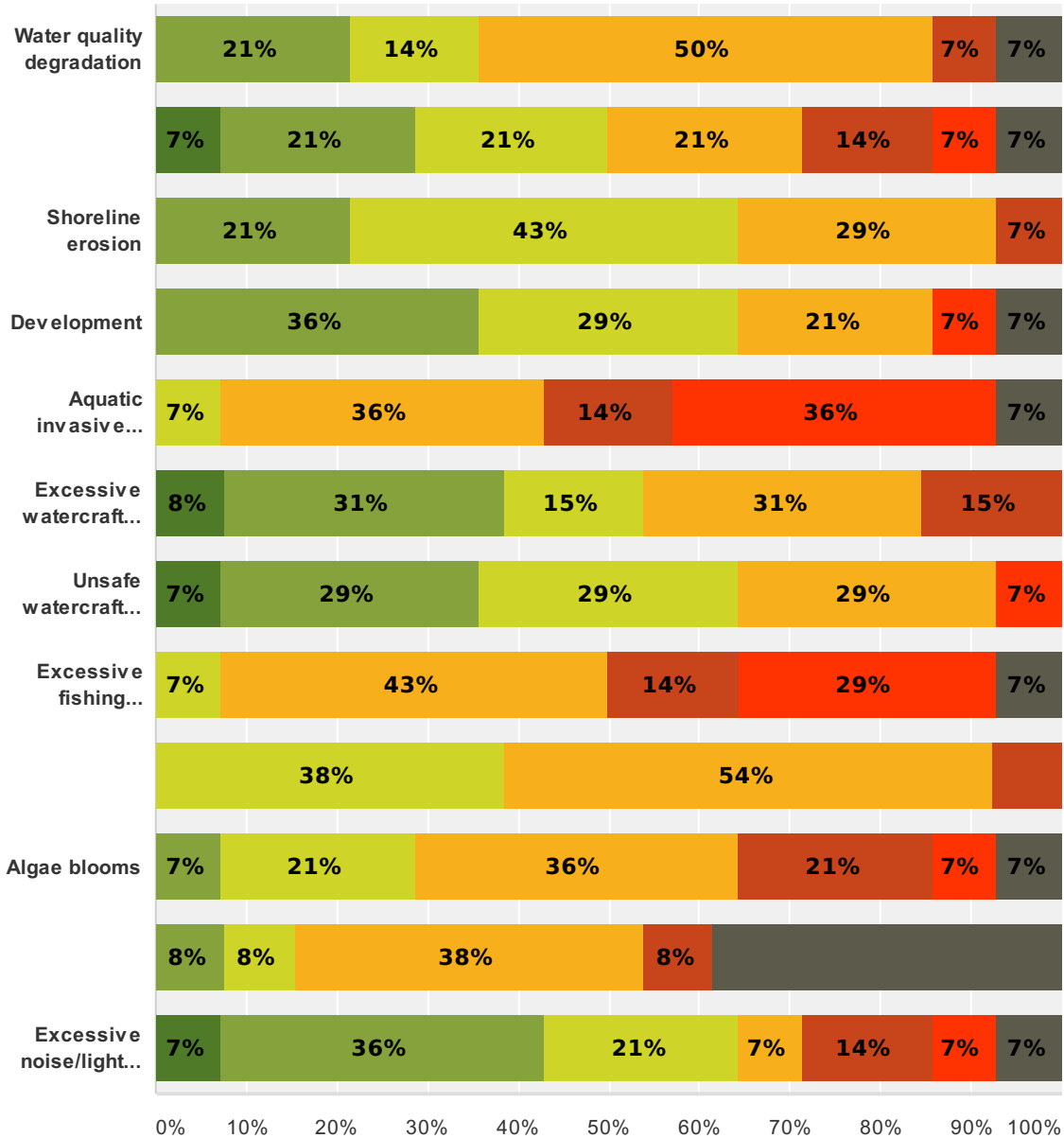


Answer Choices	Responses
Newspaper	33% 4
Billboard	33% 4
Info pamphlets	67% 8
Placemats at local restaurants	8% 1
Interpretive water trail	8% 1
Volunteer staff at boat launch	50% 6
Total Respondents: 12	

Q13 Below is a list of possible negative impacts commonly found in Wisconsin lakes. To what level do you believe each of the following factors may be impacting Spring Lake? (Please rate 0 - 5) * Not Present means that you believe the issue does not exist on Spring Lake. **No Impact means that the issue may exist on Spring Lake but it is not negatively impacting the lake.

Answered: 14 Skipped: 3

Waushara County Lakes Project - Spring Lake Survey #3



■ *Not present 0
 ■ **No Impact 1
 ■ 2
 ■ Moderately negative impact 3
 ■ 4
 ■ Great negative impact 5
 ■ Unsure - need more info

	*Not present 0	**No Impact 1	2	Moderately negative impact 3	4	Great negative impact 5	Unsure - need more info	Total	Average Rating
Water quality degradation	0%	21%	14%	50%	7%	0%	7%	14	2.29
Loss of aquatic habitat	7%	21%	21%	21%	14%	7%	7%	14	2.21
Shoreline erosion	0%	21%	43%	29%	7%	0%	0%	14	2.21
Development	0%	36%	29%	21%	0%	7%	7%	14	1.93

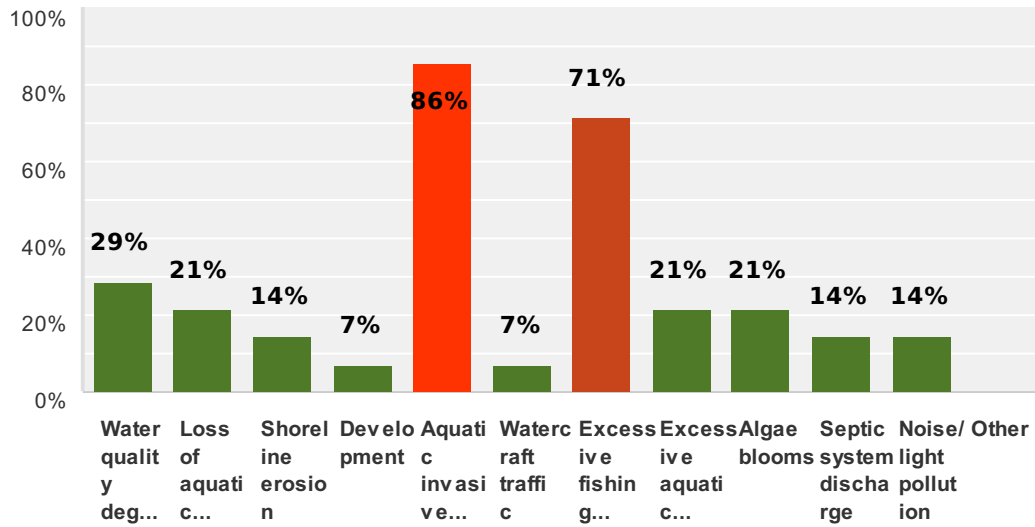
Aquatic invasive species	0%	0%	7%	36%	14%	36%	7%		
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Waushara County Lakes Project - Spring Lake Survey #3

Aquatic invasive species introduction	0%	0%	1%	5%	2%	5%	1%	14	3.57
Excessive watercraft traffic	8%	31%	15%	31%	15%	0%	0%	13	2.15
Unsafe watercraft practices	7%	29%	29%	29%	0%	7%	0%	14	2.07
Excessive fishing pressure	0%	0%	7%	43%	14%	29%	7%	14	3.43
Excessive aquatic plant growth (excluding algae)	0%	0%	38%	54%	8%	0%	0%	13	2.69
Algae blooms	0%	7%	21%	36%	21%	7%	7%	14	2.79
Septic system discharge	0%	8%	8%	38%	8%	0%	38%	13	1.69
Excessive noise/light pollution	7%	36%	21%	7%	14%	7%	7%	14	1.93

Q14 From the list below, please mark your top three concerns regarding Spring Lake.

Answered: 14 Skipped: 3



Answer Choices	Responses
Water quality degradation	29% 4
Loss of aquatic habitat	21% 3
Shoreline erosion	14% 2
Development	7% 1
Aquatic invasive species introduction	86% 12
Watercraft traffic	7% 1
Excessive fishing pressure	71% 10
Excessive aquatic plant growth (excluding algae)	21% 3
Algae blooms	21% 3
Septic system discharge	14% 2
Noise/light pollution	14% 2
Other	0% 0
Total Respondents: 14	

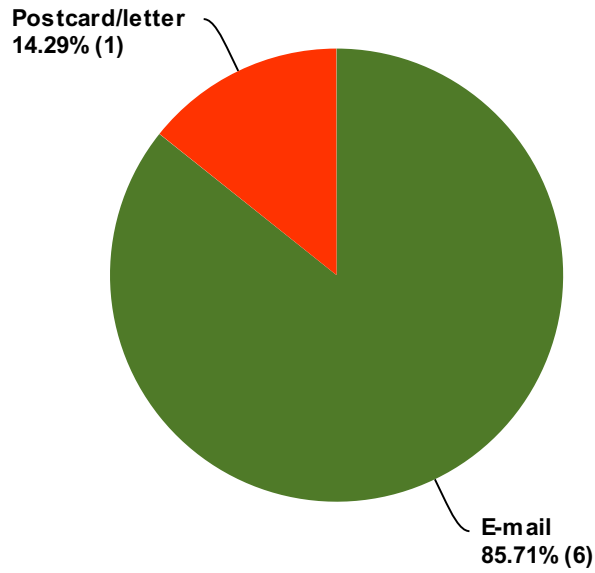
Q1 What is your Waushara County Lakes Study ID?

Answered: 7 Skipped: 0

#	Responses	Date
1	[REDACTED]	5/5/2014 11:17 AM
2	[REDACTED]	5/2/2014 12:41 PM
3	[REDACTED]	5/2/2014 8:01 AM
4	[REDACTED]	5/1/2014 1:07 AM
5	[REDACTED]	4/30/2014 6:59 PM
6	[REDACTED]	4/30/2014 6:17 PM
7	[REDACTED]	4/30/2014 5:01 PM

Q2 How did you hear about this survey?

Answered: 7 Skipped: 0

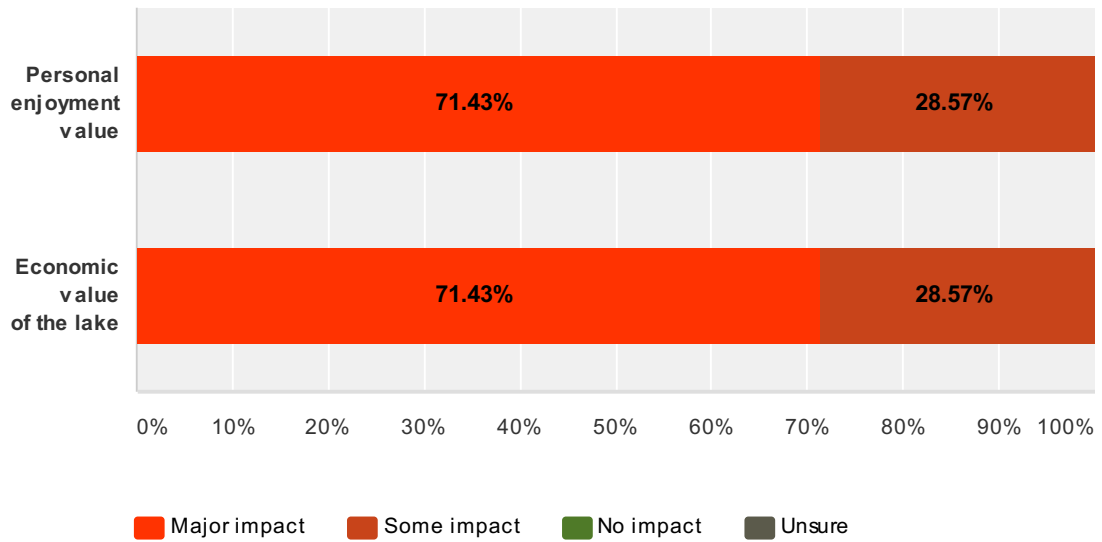


Answer Choices	Responses
E-mail	85.71% 6
Newspaper	0.00% 0
Postcard/letter	14.29% 1
Facebook	0.00% 0
Radio	0.00% 0
Word of mouth	0.00% 0
Total	7

#	Other (please specify)	Date
	There are no responses.	

Q3 How much impact does the water quality of Spring Lake have on the following?

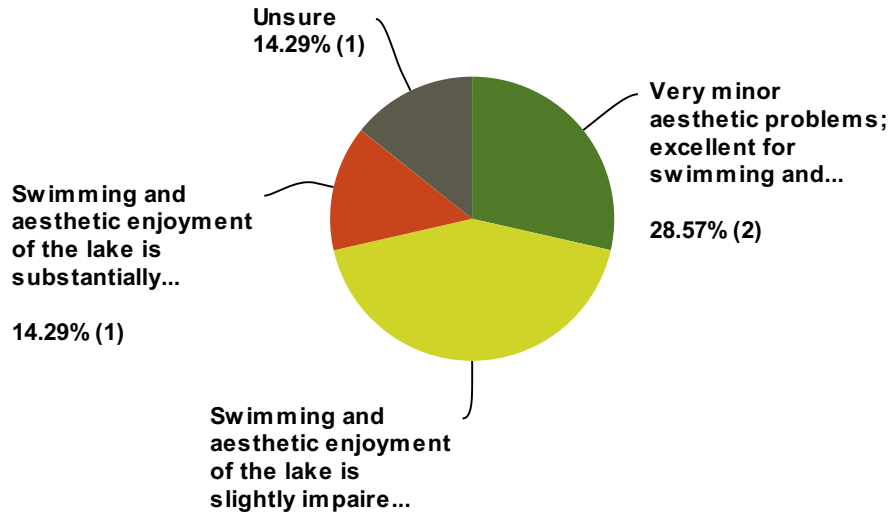
Answered: 7 Skipped: 0



	Major impact	Some impact	No impact	Unsure	Total
Personal enjoyment value	71.43% 5	28.57% 2	0.00% 0	0.00% 0	7
Economic value of the lake	71.43% 5	28.57% 2	0.00% 0	0.00% 0	7

Q4 Which statement best describes water clarity during the times you spend most on the lake?

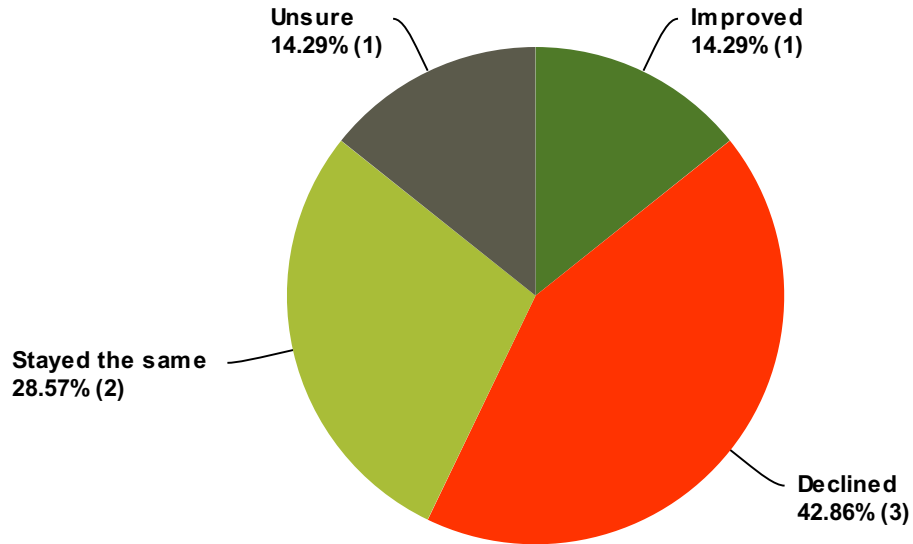
Answered: 7 Skipped: 0



Answer Choices	Responses
Beautiful, could not be any nicer	0.00% 0
Very minor aesthetic problems; excellent for swimming and boating enjoyment	28.57% 2
Swimming and aesthetic enjoyment of the lake is slightly impaired because of algae	42.86% 3
Swimming and aesthetic enjoyment of the lake is moderately reduced because of algae	0.00% 0
Swimming and aesthetic enjoyment of the lake is substantially reduced because of algae	14.29% 1
None of the above	0.00% 0
Unsure	14.29% 1
Total	7

Q5 During the time that you have lived on, visited, or recreated on the lake, how would you say the water quality has changed?

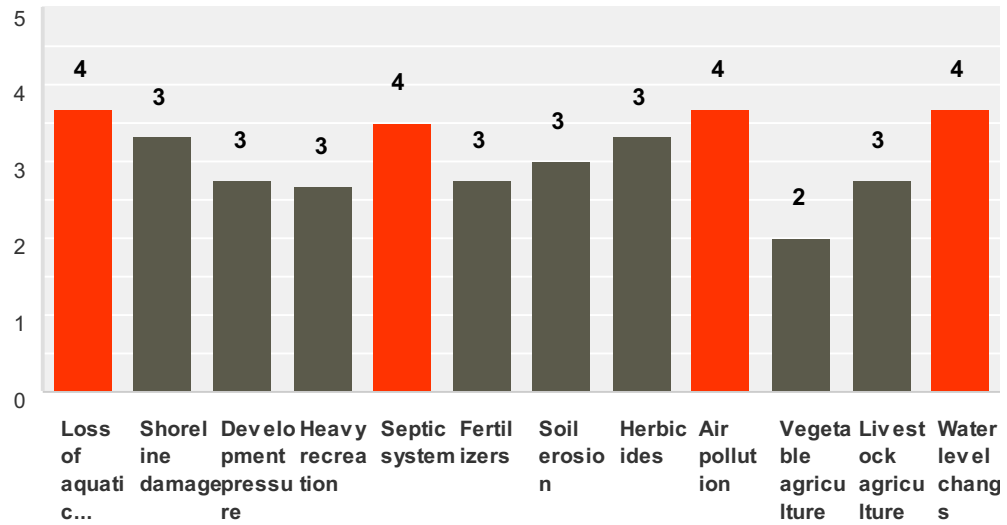
Answered: 7 Skipped: 0



Answer Choices	Responses
Improved	14.29% 1
Declined	42.86% 3
Stayed the same	28.57% 2
Unsure	14.29% 1
Total	7

Q6 If it has declined, in your opinion, what are the primary causes?

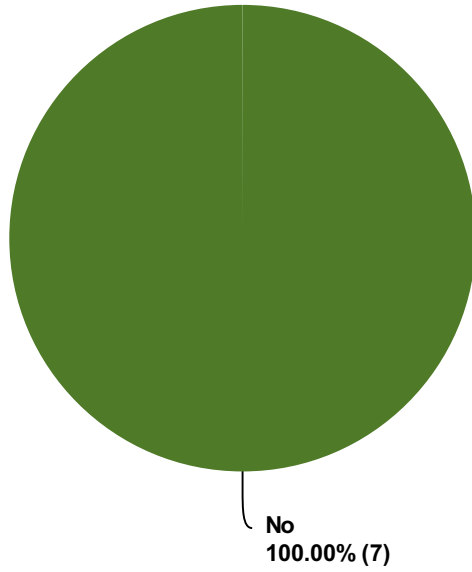
Answered: 5 Skipped: 2



	Strongly Agree	Agree	Disagree	Strongly Disagree	Unsure	Total Respondents
Loss of aquatic plants	0.00% 0	0.00% 0	66.67% 2	0.00% 0	33.33% 1	3
Shoreline damage	0.00% 0	33.33% 1	33.33% 1	0.00% 0	33.33% 1	3
Development pressure	25.00% 1	25.00% 1	25.00% 1	0.00% 0	25.00% 1	4
Heavy recreation	0.00% 0	33.33% 1	66.67% 2	0.00% 0	0.00% 0	3
Septic system	0.00% 0	50.00% 2	0.00% 0	0.00% 0	50.00% 2	4
Fertilizers	0.00% 0	75.00% 3	0.00% 0	0.00% 0	25.00% 1	4
Soil erosion	0.00% 0	66.67% 2	0.00% 0	0.00% 0	33.33% 1	3
Herbicides	0.00% 0	33.33% 1	33.33% 1	0.00% 0	33.33% 1	3
Air pollution	0.00% 0	0.00% 0	66.67% 2	0.00% 0	33.33% 1	3
Vegetable agriculture	33.33% 1	33.33% 1	33.33% 1	0.00% 0	0.00% 0	3
Livestock agriculture	25.00% 1	25.00% 1	25.00% 1	0.00% 0	25.00% 1	4
Water level changes	0.00% 0	0.00% 0	66.67% 2	0.00% 0	33.33% 1	3

Q7 Do you use herbicides or pesticides (i.e. "weed and feed") on your land? If no, please skip to Question 12.

Answered: 7 Skipped: 0



Answer Choices	Responses	
Yes	0.00%	0
No	100.00%	7
Total		7

Q8 Where do you apply herbicides and/or pesticides?

Answered: 0 Skipped: 7

! No matching responses.

Answer Choices	Responses
Agricultural fields	0.00% 0
Garden	0.00% 0
Lawn	0.00% 0
Total	0

#	Other (please specify)	Date
1	na	4/30/2014 5:04 PM

Q9 In a typical year, how often do you apply herbicides and/or pesticides?

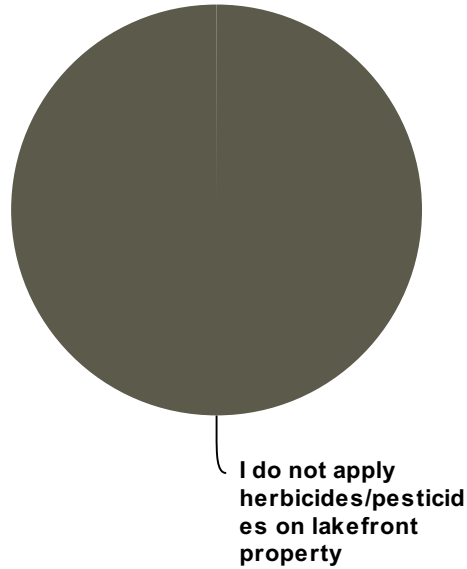
Answered: 0 Skipped: 7

! No matching responses.

	Never	Once	Once a week	Once a month	Varies	Total Respondents
Winter	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Spring	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Summer	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0
Fall	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0

Q10 If you apply herbicides and/or pesticides on lakefront property, how close to the lake are they applied (select the closest distance to the lake where herbicides/pesticides are applied)?

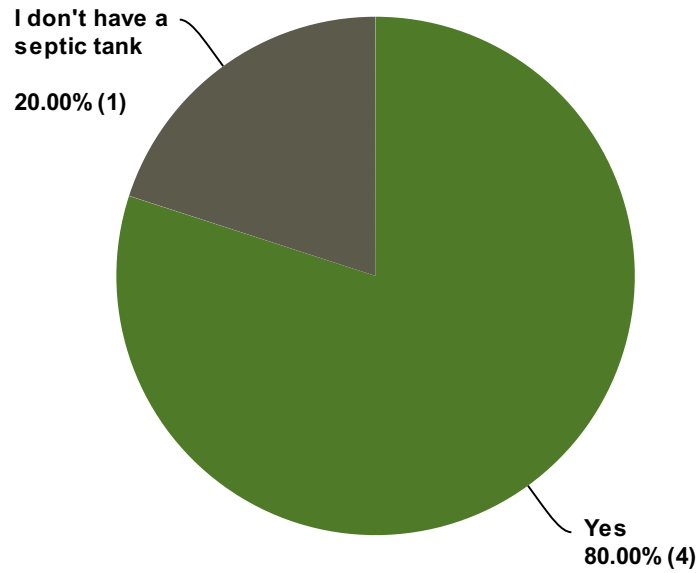
Answered: 1 Skipped: 6



Answer Choices	Responses	
I do not apply herbicides/pesticides on lakefront property	100.00%	1
Up to the lake	0.00%	0
Within 35 feet of the lake	0.00%	0
Farther than 35 feet from the lake.	0.00%	0
Total		1

Q11 Do you have your septic tank pumped at least every 3 years?

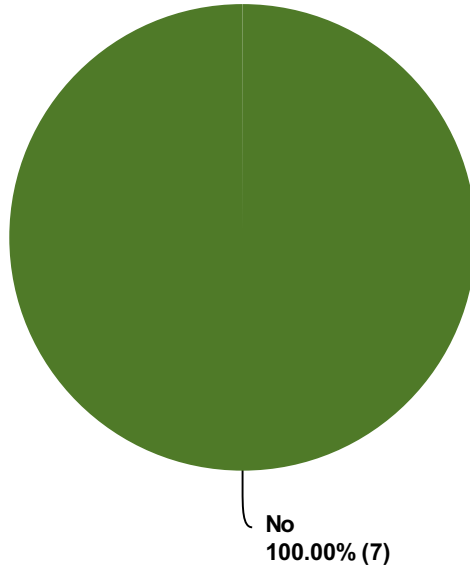
Answered: 5 Skipped: 2



Answer Choices	Responses	
Yes	80.00%	4
No	0.00%	0
I don't have a septic tank	20.00%	1
Total		5

Q12 Do you use fertilizer on your land? If no, please skip to Question 18.

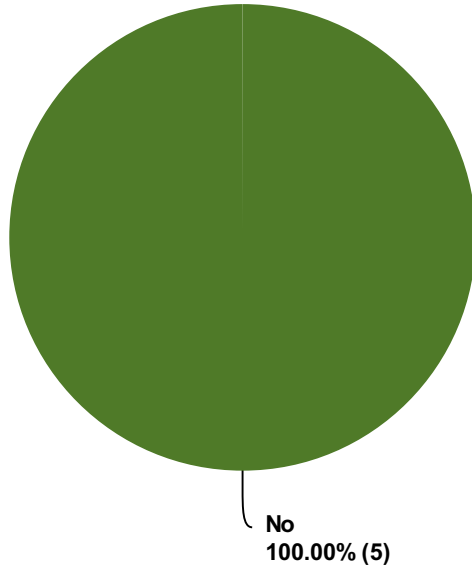
Answered: 7 Skipped: 0



Answer Choices	Responses
Yes	0.00% 0
No	100.00% 7
Total	7

Q13 Do you use fertilizer which contains phosphorus?

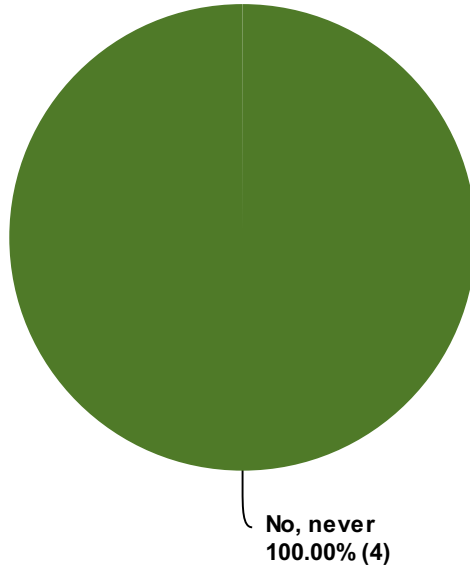
Answered: 5 Skipped: 2



Answer Choices	Responses
Yes	0.00% 0
No	100.00% 5
I don't know	0.00% 0
Total	5

Q14 Do you have your soil tested before applying fertilizer?

Answered: 4 Skipped: 3



Answer Choices	Responses
Yes, all of the time	0.00% 0
Yes, some of the time	0.00% 0
No, never	100.00% 4
Total	4

Q15 Where do you apply fertilizer?

Answered: 0 Skipped: 7

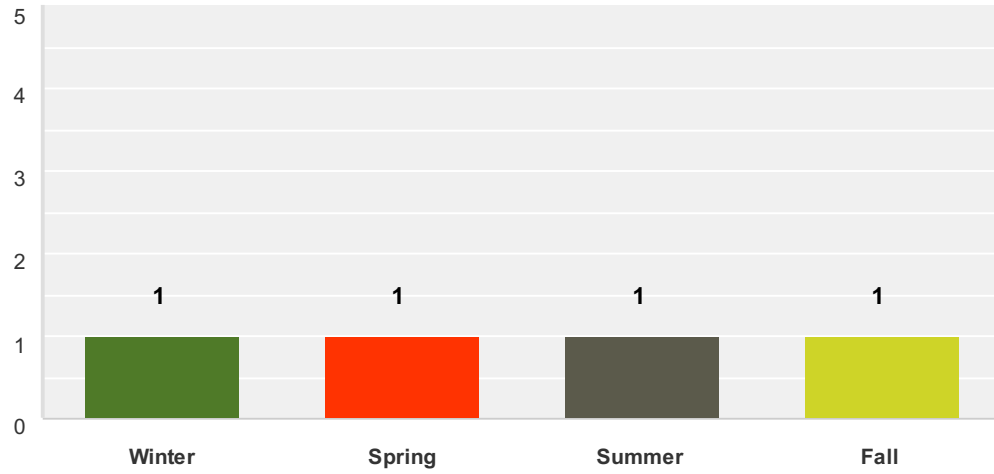
! No matching responses.

Answer Choices	Responses
Agricultural fields	0.00% 0
Garden	0.00% 0
Lawn	0.00% 0
Total	0

#	Other (please specify)	Date
1	n/a	4/30/2014 5:05 PM

Q16 In a typical year, how often do you apply fertilizer?

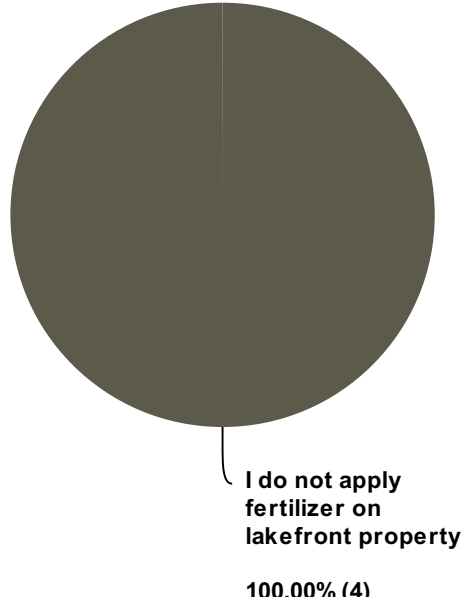
Answered: 4 Skipped: 3



	Never	Once	Once a week	Once a month	Varies	Total Respondents
Winter	100.00% 4	0.00% 0	0.00% 0	0.00% 0	0.00% 0	4
Spring	100.00% 4	0.00% 0	0.00% 0	0.00% 0	0.00% 0	4
Summer	100.00% 4	0.00% 0	0.00% 0	0.00% 0	0.00% 0	4
Fall	100.00% 4	0.00% 0	0.00% 0	0.00% 0	0.00% 0	4

Q17 If you apply fertilizer on lakefront property, how close to the lake is it applied (select the closest distance to the lake where fertilizer is applied)?

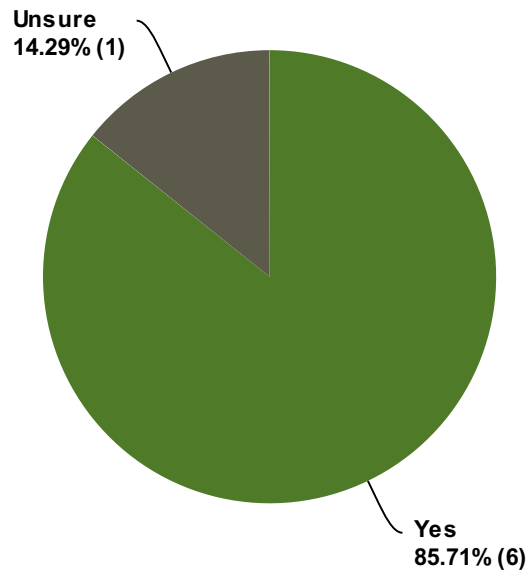
Answered: 4 Skipped: 3



Answer Choices	Responses
I do not apply fertilizer on lakefront property	100.00% 4
Up to the lake	0.00% 0
Within 35 feet of the lake	0.00% 0
Farther than 35 feet from the lake.	0.00% 0
Total	4

Q18 Before reading the previous paragraph, did you know about the effects of phosphorus on lakes?

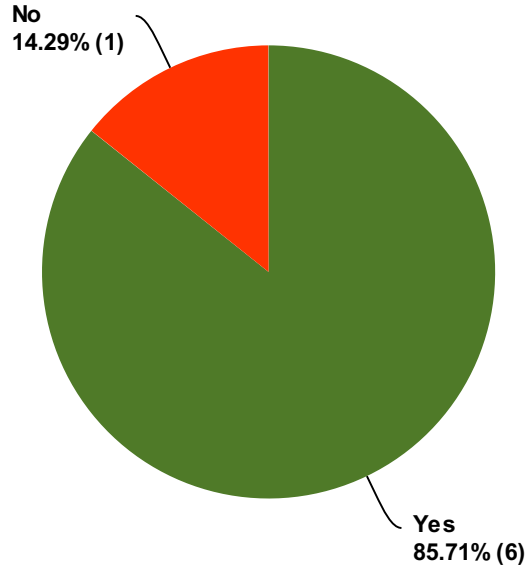
Answered: 7 Skipped: 0



Answer Choices	Responses	
Yes	85.71%	6
No	0.00%	0
Unsure	14.29%	1
Total		7

Q19 Do you own shoreland property? If no, please skip to end of survey.

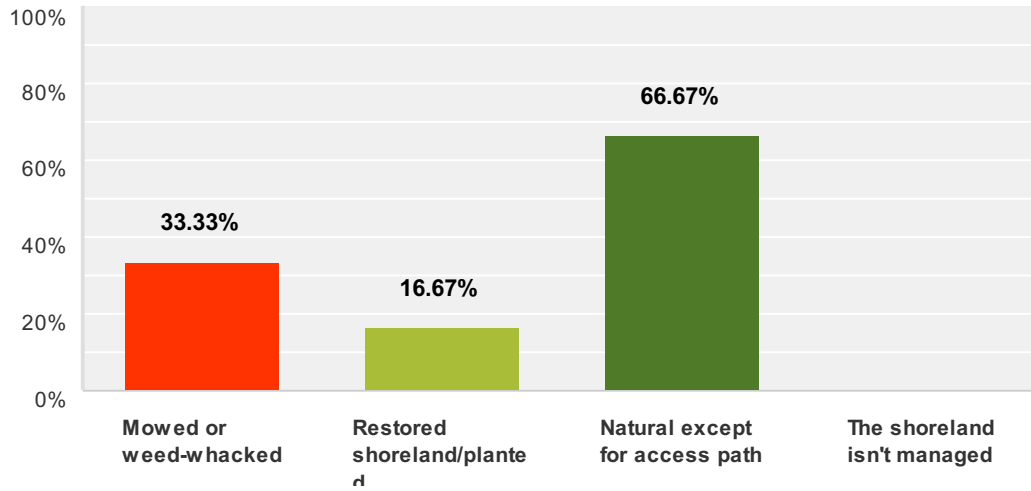
Answered: 7 Skipped: 0



Answer Choices	Responses	
Yes	85.71%	6
No	14.29%	1
Total		7

Q20 How do you currently manage the majority of your property within 35 feet of the lake? Check all that apply.

Answered: 6 Skipped: 1

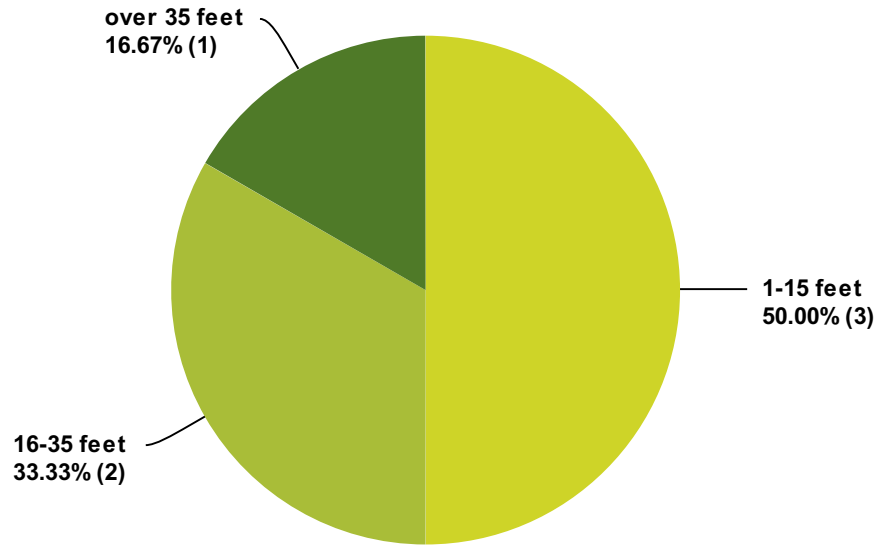


Answer Choices	Responses
Mowed or weed-whacked	33.33% 2
Restored shoreland/planted	16.67% 1
Natural except for access path	66.67% 4
The shoreland isn't managed	0.00% 0
Total Respondents: 6	

#	Other (please specify)	Date
1	35' is ridiculous... I keep a 10' buffer.	5/1/2014 1:11 AM

Q21 If you have unmowed shoreland vegetation, how far inland from the water's edge does it extend?

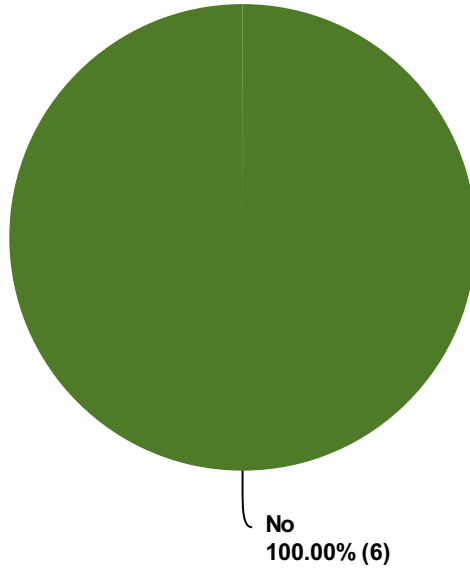
Answered: 6 Skipped: 1



Answer Choices	Responses
I do not have unmowed shoreland vegetation	0.00% 0
1-15 feet	50.00% 3
16-35 feet	33.33% 2
over 35 feet	16.67% 1
Total	6

Q22 Have you observed erosion from your path to the lake?

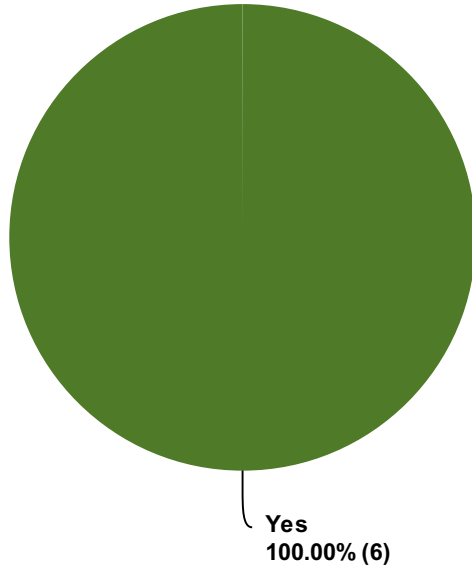
Answered: 6 Skipped: 1



Answer Choices	Responses
I have no path	0.00% 0
Yes	0.00% 0
No	100.00% 6
Unsure	0.00% 0
Total	6

Q23 Did you understand the importance of shoreland vegetation before reading this?

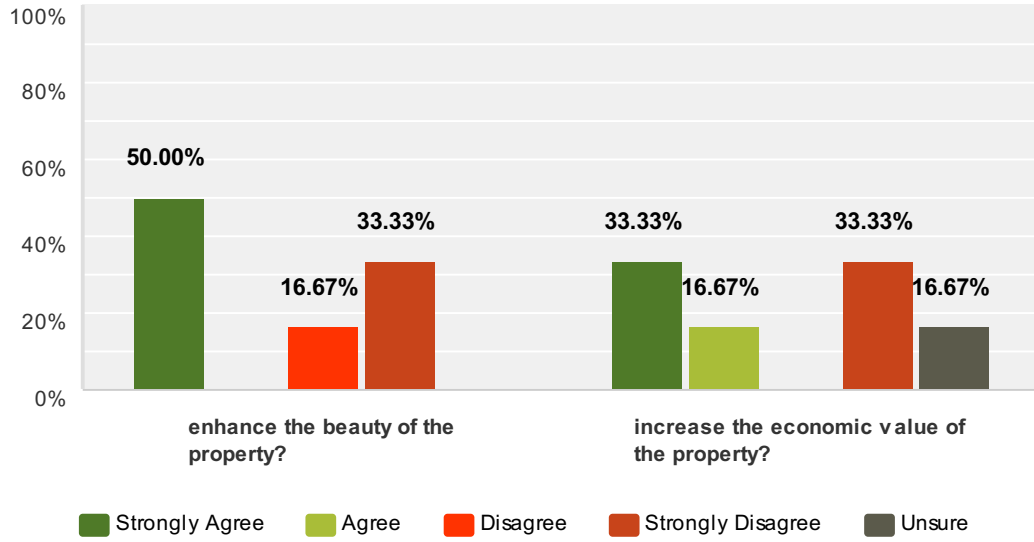
Answered: 6 Skipped: 1



Answer Choices	Responses
Yes	100.00% 6
No	0.00% 0
Unsure	0.00% 0
Total	6

Q24 In your opinion, does shoreland vegetation...

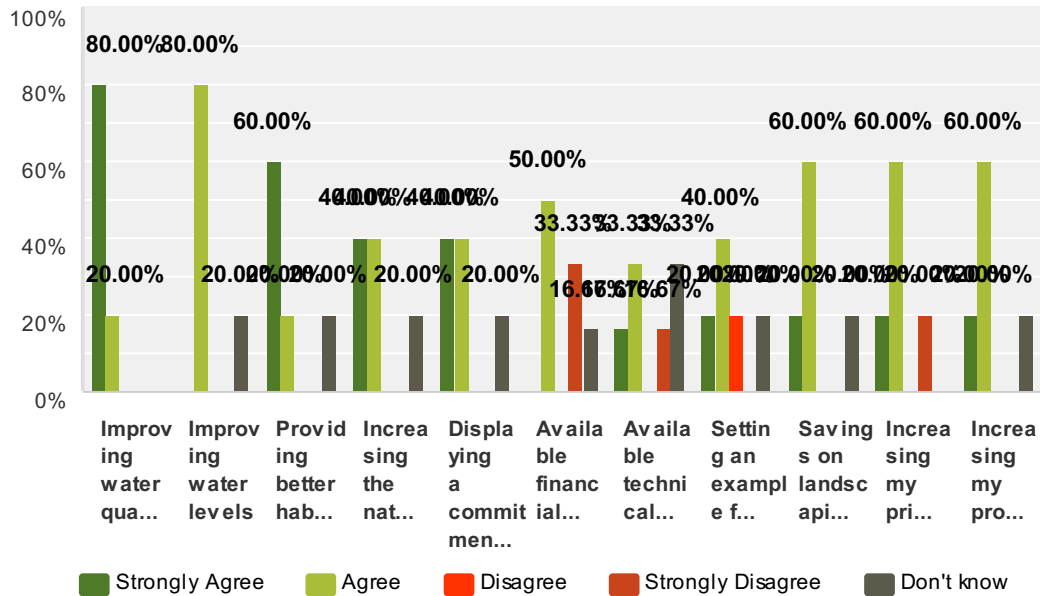
Answered: 6 Skipped: 1



	Strongly Agree	Agree	Disagree	Strongly Disagree	Unsure	Total
enhance the beauty of the property?	50.00% 3	0.00% 0	16.67% 1	33.33% 2	0.00% 0	6
increase the economic value of the property?	33.33% 2	16.67% 1	0.00% 0	33.33% 2	16.67% 1	6

Q25 What might motivate you to change how you manage your land?

Answered: 6 Skipped: 1



	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know	Total
Improving water quality	80.00% 4	20.00% 1	0.00% 0	0.00% 0	0.00% 0	5
Improving water levels	0.00% 0	80.00% 4	0.00% 0	0.00% 0	20.00% 1	5
Providing better habitat for fish and wildlife	60.00% 3	20.00% 1	0.00% 0	0.00% 0	20.00% 1	5
Increasing the natural beauty of my property	40.00% 2	40.00% 2	0.00% 0	0.00% 0	20.00% 1	5
Displaying a commitment to the environment	40.00% 2	40.00% 2	0.00% 0	0.00% 0	20.00% 1	5
Available financial assistance	0.00% 0	50.00% 3	0.00% 0	33.33% 2	16.67% 1	6
Available technical assistance	16.67% 1	33.33% 2	0.00% 0	16.67% 1	33.33% 2	6
Setting an example for community members	20.00% 1	40.00% 2	20.00% 1	0.00% 0	20.00% 1	5
Savings on landscaping/maintenance costs	20.00% 1	60.00% 3	0.00% 0	0.00% 0	20.00% 1	5
Increasing my privacy	20.00% 1	60.00% 3	0.00% 0	0.00% 0	20.00% 1	5
Increasing my property value	20.00% 1	60.00% 3	0.00% 0	0.00% 0	20.00% 1	5

#	Other (please specify)	Date
1	This is really not a survey at all... it is a lecture	5/1/2014 1:13 AM

Waushara County Lakes Study

Spring Lake

Spring 2014

University of Wisconsin-Stevens Point



University of Wisconsin
Stevens Point

PRIMARY AUTHORS

Authors listed are from the UW-Stevens Point unless otherwise noted.

Aquatic Plants

Golden Sands Resource Conservation & Development, Inc.

Sediment Core

Samantha Kaplan

Paul Garrison (Wisconsin Department of Natural Resources)

Shoreland Assessments

Ed Hernandez and Waushara County Land Conservation Department Staff

Dan McFarlane

Water Quality and Watersheds

Nancy Turyk, Paul McGinley, Danielle Rupp and Ryan Haney

Ed Hernandez and Waushara County Land Conservation Department Staff

UW-Stevens Point Students

Melis Arik, Nicki Feiten, Sarah Hull, Chase Kasmerchak, Justin Nachtigal, Matt Pamperin, Scott Pero, Megan Radske, Anthony Recht, Cory Stoughtenger, Hayley Templar, Garret Thiltgen

Editor: Jeri McGinley

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SPRING LAKE STUDY RESULTS

WAUSHARA COUNTY LAKES STUDY BACKGROUND

Lakes and rivers contribute to the way of life in Waushara County. Local residents and visitors alike enjoy fishing, swimming, boating, wildlife viewing, and the peaceful nature of the lakes. Healthy lakes add value to our communities. They provide places to relax and recreate, and they can stimulate tourism. Like other infrastructure in our communities, lakes require attention and good management practices to remain healthy in our developing watersheds.

Thirty-three lakes in Waushara County were selected for this study. The study focused on learning about the lakes' water quality, aquatic plant communities, shoreland habitats, watersheds, and histories in order to help people make informed lake management decisions. This report summarizes data collected for Spring Lake between fall 2010 and fall 2012.

ABOUT SPRING LAKE

To understand a lake and its potential for water quality, fish and wildlife, and recreational opportunities, we need to understand its physical characteristics and setting within the surrounding landscape. Spring Lake is located in the township of Marion, south of the town of Spring Lake, and south of highway 21, with two public boat launches located on its southern and eastern sides. Spring Lake is a 50 acre drainage lake with surface runoff and groundwater contributing most of its water. The maximum depth in Spring Lake is 37 feet; the lakebed has slopes ranging from gradual to steep, with an average lake depth of 22 feet (Figure 1). Spring Lake has a water residence time of 17 months. The residence time helps determine the potential effects of nutrients entering the lake and the length of time pollutants may stay in the lake. Its bottom sediments are mostly muck with a small amount of sand found in the southwestern corner of the lake.

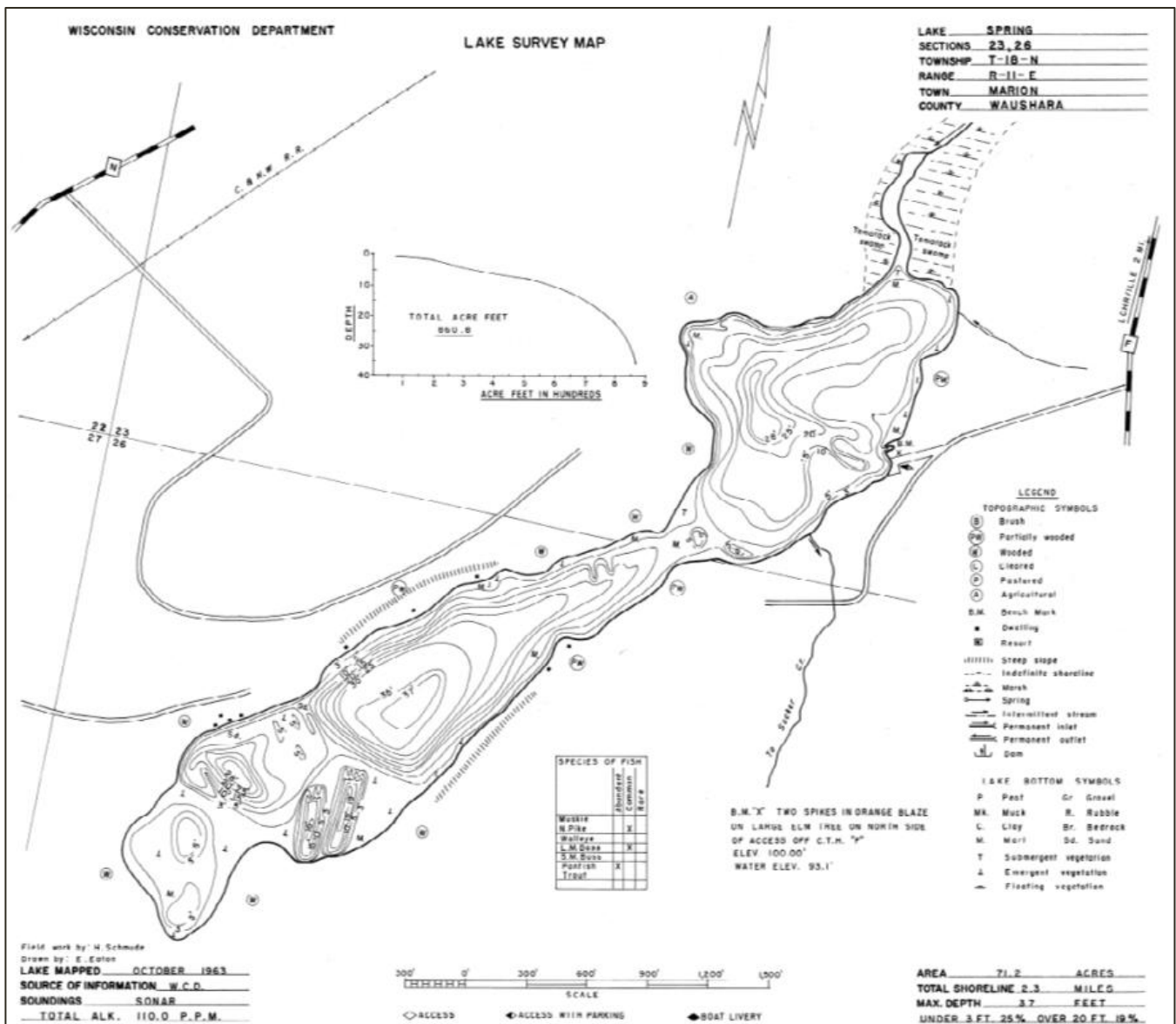


FIGURE 1. CONTOUR MAP OF THE SPRING LAKE LAKEBED.

The water quality in Spring Lake is a reflection of the land that drains to it. The water quality, the amount of algae, aquatic plants, the fishery and other animals in the lake are all affected by natural and manmade characteristics. Natural characteristics that affect a lake include the amount of land that drains to the lake, the hilliness of the landscape, types of soil, extent of wetlands, and the type of lake. Within the lake's watershed, alterations to the landscape, the types of land use, and the land management practices are examples of how people may affect the lake.

It is important to understand where Spring Lake's water originates in order to understand the lake's health. During snowmelt or a rainstorm, 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 Spring Lake is called a surface watershed. Groundwater also feeds Spring Lake; its land area may be slightly different than the surface watershed. The surface watershed is shown in Figure 2.

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 a greater capacity to hold water during rain events and snowmelt help to slow the delivery of the water to the lake. Minimizing excess 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.

Land use and land management practices within a lake's watershed can affect both its water quantity and quality. While forests and grasslands allow a fair amount of precipitation to soak into the ground, resulting in more groundwater and better water quality, other types of land uses may result in increased runoff and less groundwater recharge, and may 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 often results in changes to natural drainage patterns, 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 can encourage the growth of algae and aquatic plants in our lakes.

A variety of land management practices can be put into place to help reduce impacts to our lakes. Some practices are designed to reduce runoff. These include protecting/restoring wetlands, installing rain gardens, swales and 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 native vegetation in the shoreland, and using erosion control practices. Waushara County staff and other professionals can work with landowners to determine which practices are best suited to a particular property.

SPRING LAKE SURFACE WATERSHED

The surface watershed for Spring Lake is approximately 1,988 acres (Figure 2). The dominant types of land use in the watershed are agriculture (50%) and forests (27%). The land closest to the lake often has the greatest impact on water quality and habitat; Spring Lake's shoreland is surrounded primarily by development, wetlands and forests.

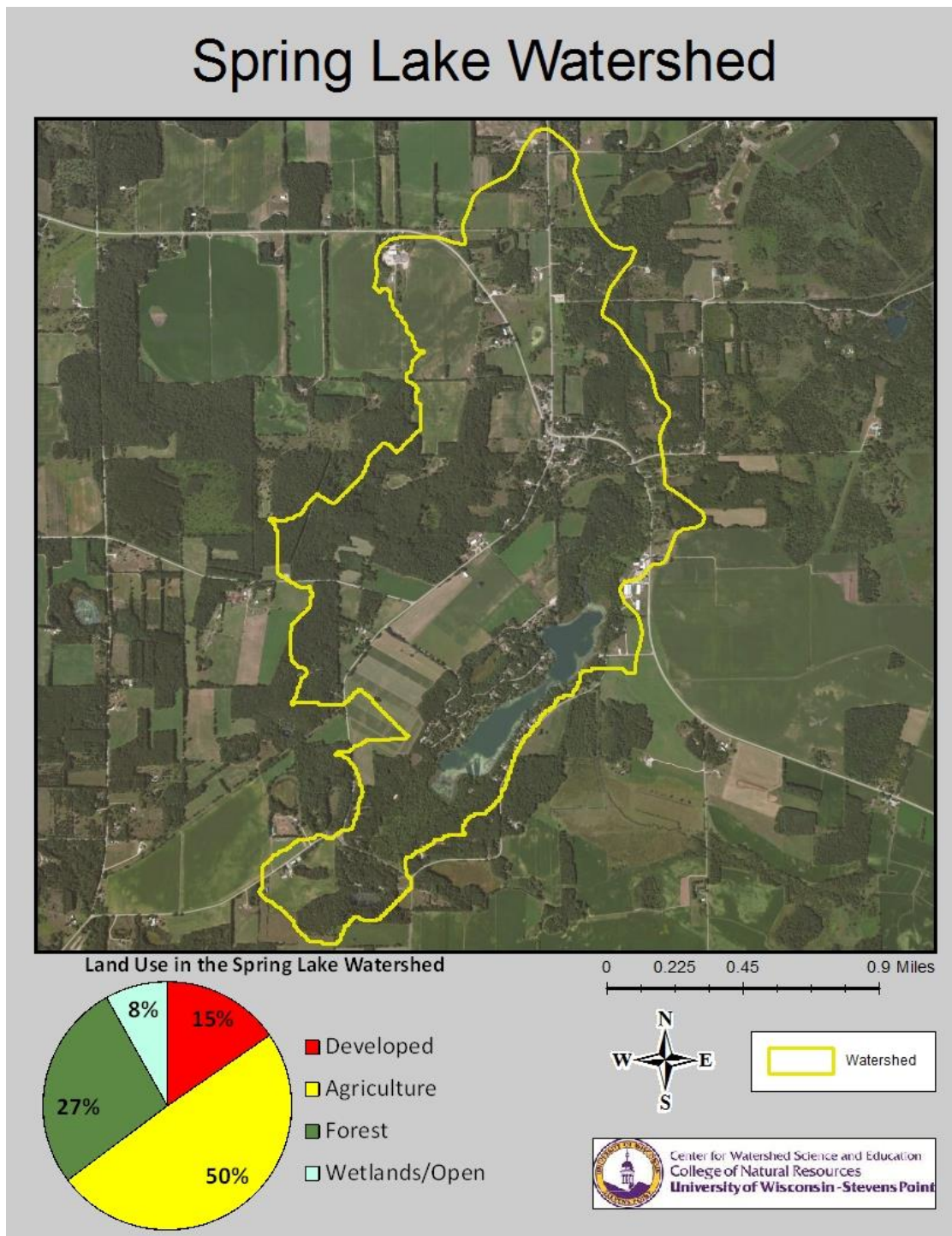


FIGURE 2. LAND USE IN THE SPRING LAKE WATERSHED.

SPRING LAKE GROUNDWATER WATERSHED

The more the lake's water interacts with groundwater, the more influence the geology has on the lake. The length of time water remains below ground affects the temperature and chemistry of the groundwater. Groundwater temperature is near constant year round; during the summer, groundwater feeding Spring Lake will help keep the lake water cooler.

Groundwater flows below ground from higher to lower elevations, discharging into wetlands, streams, and lakes. The groundwater feeding the lakes in Waushara County originates nearby. The black arrows in Figure 3 indicate the general direction of groundwater flow. Much of the groundwater enters Spring Lake on its western side.

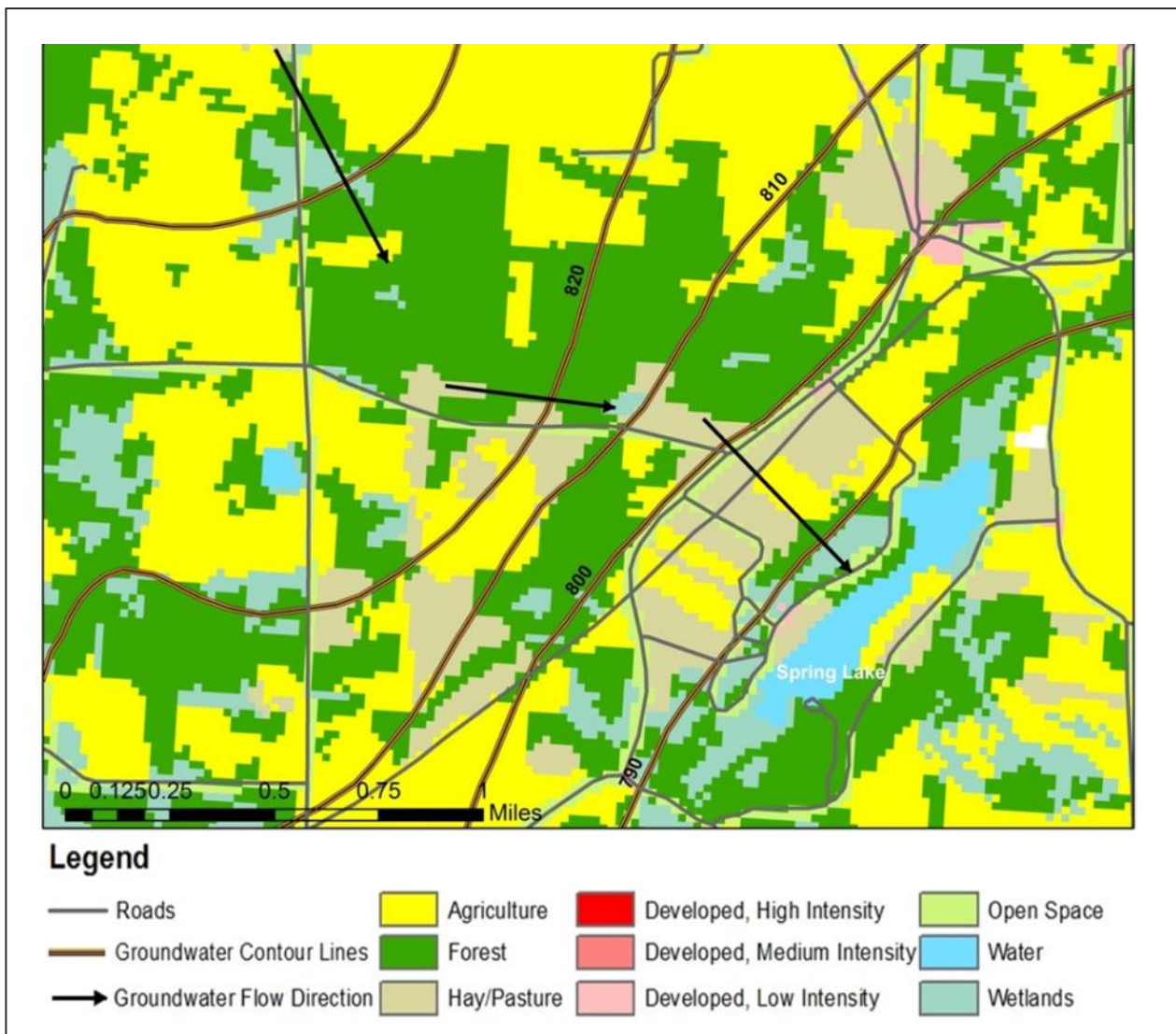
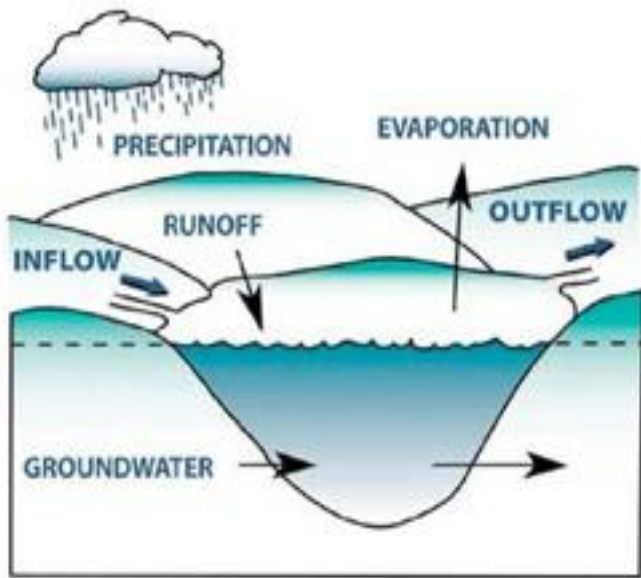


FIGURE 3. GROUNDWATER FLOW DIRECTION NEAR SPRING LAKE.

WATER QUALITY

Lake water quality is a result of many factors including the underlying geology, the climate, and land management practices. Assessing lake water quality allows us to evaluate current lake health and changes from the past. We can then identify what is needed to achieve a more desirable state or preserve an existing state for aesthetics, recreation, wildlife and the fishery. During this study, water quality in Spring Lake was assessed by measuring different characteristics including temperature, dissolved oxygen, water clarity, water chemistry, and algae.

The source of a lake’s water supply is important in determining its water quality and choosing management practices to preserve or influence that quality. Spring Lake is a groundwater drainage lake, which receives its water primarily via groundwater, with lesser inputs from surface runoff and direct precipitation (Figure 4). Water exits Spring Lake via a small outlet stream. Groundwater drainage lakes often have higher concentrations of minerals such as calcium and magnesium, which travel with groundwater moving through soil and rock. Groundwater drainage lakes can be vulnerable to contamination moving towards the lake in the groundwater.



The geologic composition that lies beneath a lake has the ability to influence its temperature, pH, minerals, and other properties (Shaw et al., 2000). As groundwater travels, some substances are filtered out, but other materials in the soil dissolve into the groundwater. Minerals such as calcium and magnesium in the soil around Spring Lake are dissolved in the water, making the water hard. The average hardness for Spring Lake during the 2010-2012 sampling period was 229 mg/L, which is considered hard (Table 1). Hard water provides the calcium necessary for building bones and shells for animals in the lake. The average alkalinity was 211 mg/L; higher alkalinity in inland lakes can support higher species productivity. Hardness and alkalinity also play a role in the type of aquatic plants that are found in a lake (Wetzel, 2001).

FIGURE 4. CARTOON SHOWING INFLOW AND OUTFLOW OF WATER IN A GROUNDWATER DRAINAGE LAKE.

TABLE 1. MINERALS AND PHYSICAL MEASUREMENTS IN SPRING LAKE, 2010-2012.

Spring Lake	Alkalinity (mg/L)	Calcium (mg/L)	Magnesium (mg/L)	Hardness (mg/L as CaCO ₃)	Color (SU)	Turbidity (NTU)
Average Value	211	41.8	24.1	229	18.6	2.03

Chloride concentrations, and to lesser degrees sodium and potassium concentrations, are commonly used as indicators of how strongly a lake is being impacted by human activity. The presence of these compounds where they do not naturally occur indicates the movement of pollutants from the landscape to the lake.

Spring Lake had elevated potassium, chloride, and sodium concentrations on average during the monitoring period (Table 2), indicating that human activities were impacting the lake water. Chloride and sodium sources can include animal waste, septic systems, fertilizers, and road-salt. Sources of potassium include fertilizers, animal waste, and septic systems. Atrazine (DACT), an herbicide commonly used in corn production, averaged 0.12 ug/L in the samples that were analyzed from Spring Lake. The presence of this chemical suggested that agricultural activities in the surrounding area were impacting water quality. Some toxicity studies have indicated that reproductive system abnormalities can occur in frogs at these levels (Hayes et al., 2003).

TABLE 2. SPRING LAKE AVERAGE WATER CHEMISTRY, 2010-2012.

Spring Lake	Average Value			Reference Value		
	Low	Medium	High	Low	Medium	High
Potassium (mg/L)			1.63	<.75	0.75-1.5	>1.5
Chloride (mg/L)			12.5	<3	3.0-10.0	>10
Sodium (mg/L)			4.7	<2	2.0-4.0	>4

Dissolved oxygen is an important measure in aquatic ecosystems because a majority of organisms in the water depend on oxygen to survive. Oxygen is dissolved into the water from contact with the 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.

In a lake, the water temperature changes throughout the year and may vary with depth. During winter and summer when lakes stratify (layer), the amount of dissolved oxygen is often lower towards the bottom of the lake. Dissolved oxygen concentrations below 5 mg/L can stress some species of cold water fish and over time can reduce the amount of available habitat for sensitive cold water species of fish and other aquatic organisms.

Water temperature and dissolved oxygen were measured in Spring Lake from top to bottom at the time of each sample collection. Throughout much of the year, temperatures in Spring Lake were warmer near the top and cooler near the bottom. This is typical for Wisconsin lakes, but layering results in the inability of oxygen and nutrients to mix throughout the lake. Profiles taken during the fall turnover showed uniform temperatures from top to bottom (Figure 5).

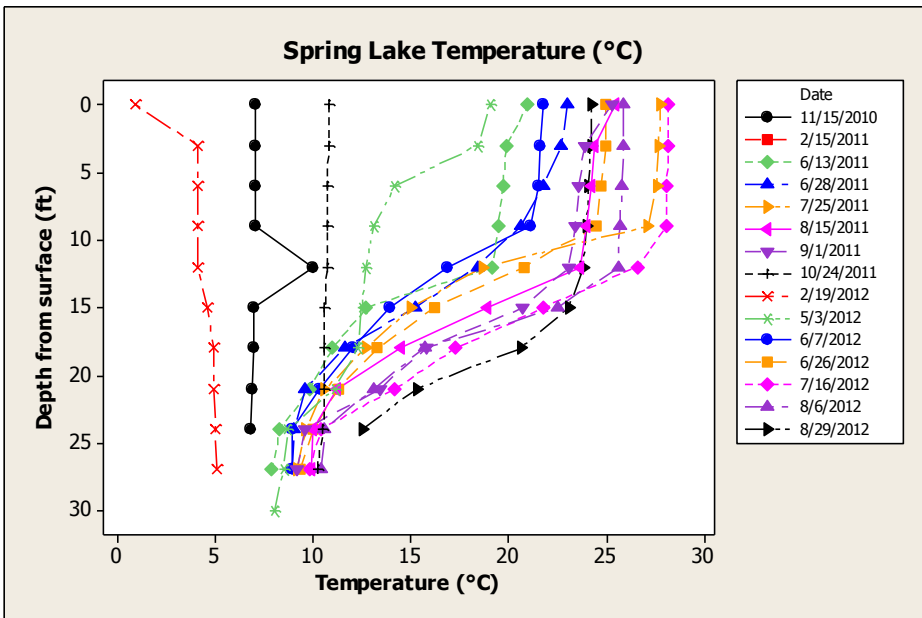


FIGURE 5. TEMPERATURE PROFILES IN SPRING LAKE, 2010-2012.

Measurements of dissolved oxygen in Spring Lake followed a similar pattern to temperature. There were similar concentrations of dissolved oxygen from top to bottom during the fall and spring (Figure 6). Similar to temperature, dissolved oxygen concentrations were higher at the surface and lower towards the bottom during other times of the year. During the winter when ice prevents water contact with the atmosphere, dissolved oxygen concentrations declined with depth. The winter samples demonstrated that dissolved oxygen concentrations can become very low in Spring Lake.

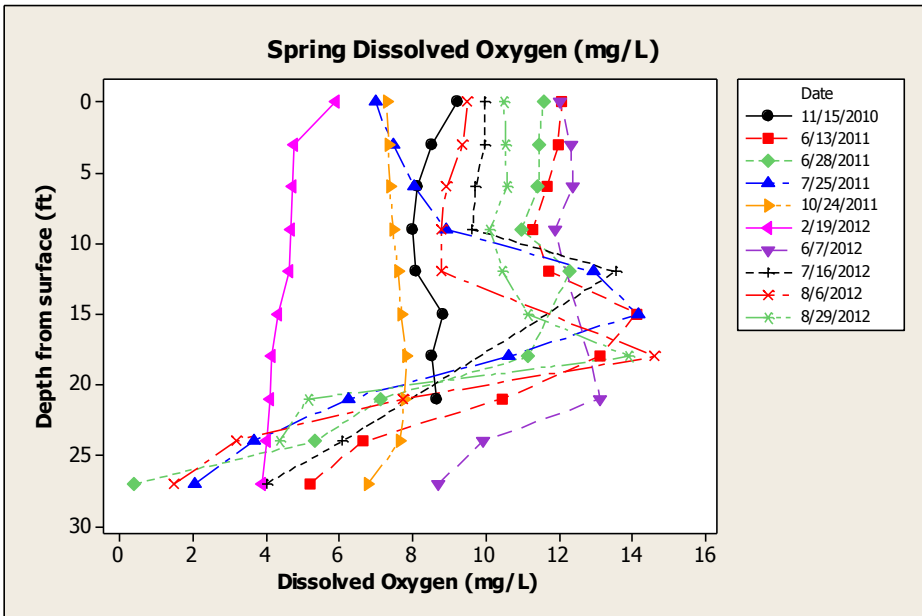


FIGURE 6. DISSOLVED OXYGEN PROFILES IN SPRING LAKE, 2010-2012.

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 Spring Lake, color and turbidity were relatively low (Table 1), indicating that the variability in transparency throughout the year is primarily due to fluctuating algae concentrations and re-suspended sediment following storms and/or heavy boating activity.

In Spring Lake, water clarity ranged from 6.5 feet to 15.5 feet (Figure 7). It is typical to have variability in a lake, often based on seasonal conditions. When compared with historic data, the average water clarity measured during the study was slightly better in May, June, July, August, and October, and worse in September. Water clarity in Spring Lake is typically poorer in August and September. This corresponds with the period when algae growth is greatest.

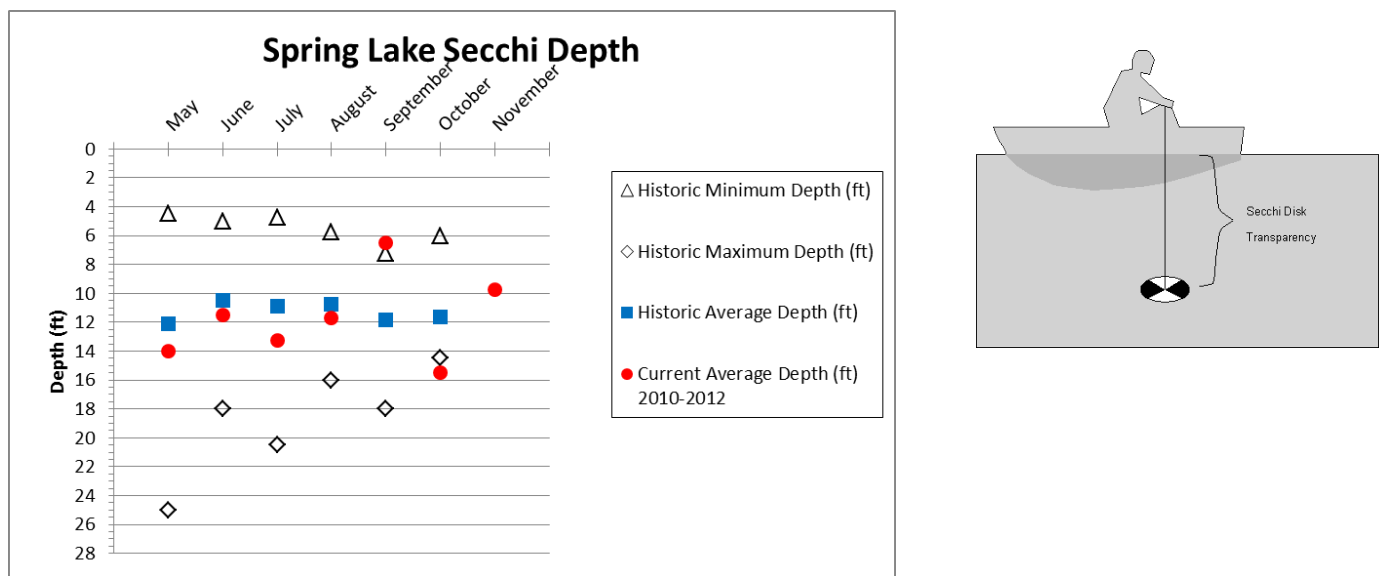


FIGURE 7. WATER CLARITY IN SPRING LAKE, 2010-2012 AND HISTORIC.

Nutrients (phosphorus and nitrogen) are used by algae and aquatic plants for growth. Phosphorus is present naturally throughout the watershed in soil, plants, animals and wetlands. Additional sources from human activities include soil erosion, animal waste, fertilizers and septic systems.

It is most common for phosphorus to move from the land to the water through surface runoff, but it can also travel to the lake in groundwater. Once in a lake, a portion of the phosphorus becomes part of the aquatic system in the forms of plant tissue, animal tissue, and sediment. The phosphorus continues to cycle within the lake for many years.

Total phosphorus concentrations in samples collected from Spring Lake ranged from a high of 22 ug/L in February and November 2011 to a low of 3 ug/L in July 2011 (Table 3). The summer median total phosphorus was 14 ug/L and 10.5 ug/L in 2011 and 2012, respectively. This is below Wisconsin’s phosphorus standard of 30 ug/L for deep drainage lakes. During the study, inorganic nitrogen concentrations were high enough in the spring to enhance algal blooms throughout the summer (Shaw et al., 2000).

Chlorophyll *a* is a measurement of algae in the water. Chlorophyll *a* concentrations in Spring Lake varied little throughout the monitoring season, ranging from a high of 3 ug/L to a low of 0.5 ug/L. The average during the monitoring period was 1.7 ug/L.

TABLE 3. SEASONAL SUMMARY OF NUTRIENT CONCENTRATIONS IN SPRING LAKE, 2010-2012.

Spring Lake	Inorganic Nitrogen (mg/L)			Organic Nitrogen (mg/L)			Total Nitrogen (mg/L)			Soluble Reactive Phosphorus (ug/L)			Total Phosphorus (ug/L)		
	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max
Fall	1.40	2.75	4.10	0.47	0.58	0.68	2.48	3.56	4.64	4	6	8	14	18	22
Spring	1.80	1.97	2.13	0.50	0.50	0.50	2.72	2.72	2.72	1	3	5	11	13	14
Summer													3	12	19
Winter	2.06	2.38	2.69	0.39	0.41	0.42	2.69	3.03	3.36	1	11	20	13	18	22

Estimates of phosphorus from the landscape can help to understand the phosphorus sources to Spring Lake. Land use in the surface watershed was evaluated and used to populate the Wisconsin Lakes Modeling Suite (WILMS) model. In general, each type of land use contributes different amounts of phosphorus in runoff and through groundwater. The types of land management practices that are used and the distance from the lake or inflowing stream also affect the contributions to the lake from a parcel of land. Based on modeling results, agriculture had the greatest percentages of phosphorus contributions from the watershed to Spring Lake (Figure 8). The phosphorus contributions by land use category, called phosphorus export coefficients, are shown in Table 4. The phosphorus export coefficients have been obtained from studies throughout Wisconsin (Panuska and Lillie, 1995).

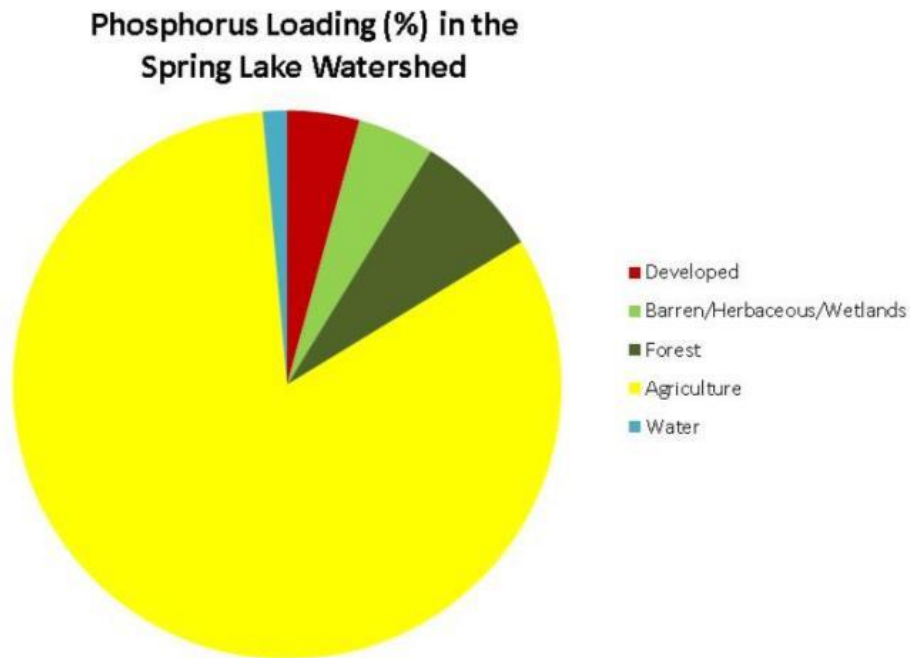


FIGURE 8. ESTIMATED PHOSPHORUS LOADS FROM LAND USES IN THE SPRING LAKE WATERSHED.

TABLE 4. MODELING DATA USED TO ESTIMATE PHOSPHORUS INPUTS FROM LAND USES IN THE SPRING LAKE WATERSHED (LOW AND MOST LIKELY COEFFICIENTS USED TO CALCULATE RANGE IN POUNDS).

Spring Lake Watershed Land Use	Phosphorus Export Coefficient (lbs/acre-yr)	Land Use Area Within the Watershed		Estimated Phosphorus Load	
		Acres	Percent	Pounds	Percent
Water	0.1	52	3	4-13	1
Developed	0.04	298	15	13-26	4
Barren/Herbaceous/Wetland	0.09	158	8	14-42	5
Forest	0.04	524	26	23-42	8
Cultivated Agriculture	0.45	957	48	256-683	82

Although a fair amount of phosphorus comes off of the landscape, the hard water in Spring Lake has helped to buffer nutrient impacts from the watershed as evidenced by lower measures of algae. The hard water has limited buffering capacity, so measures should be taken to reduce near shore and watershed-scale impacts to the lake. Atrazine and inorganic nitrogen are traveling in the groundwater that flows into the lake. The likely source is agriculture. Septic systems and lawn/garden fertilizer may also be contributing some of the inorganic nitrogen.

AQUATIC PLANTS

(Based on contributions from Golden Sands Resource Conservation & Development Council, Inc., 2014)

Aquatic plants play important roles in a lake's ecosystem. They provide habitat for the fishery and other aquatic organisms, stabilize the sediment, reduce erosion, buffer temperature changes and waves, and infuse oxygen into the water. The rapid and dominant growth of aquatic invasive plants, such as Eurasian watermilfoil (EWM), can reduce the recreational value of a lake. Aquatic invasive plants may also outcompete and cause a decline in native vegetation, which degrades habitat diversity and can alter the aquatic ecosystem.

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

An aquatic plant survey was conducted by Golden Sands RC&D on Spring Lake in August 2013. Eighty-nine percent (115 of 129) of the sites visited had vegetative growth. The greatest depth at which aquatic plant growth was found was 19 feet. Twenty-five species of aquatic plants were found in Spring Lake (Table 5). This number of species was above-average compared with other lakes in Waushara County. Figure 9 shows the number of species that were identified at each sampling site.

The dominant plant species found in Spring Lake was muskgrass (*Chara* spp.), followed by coontail (*Ceratophyllum demersum*). Muskgrass and coontail are favorite waterfowl foods and also offer cover for fish. A number of invertebrate and fish species use the bushy stems and stiff whorls of the leaves of the coontail as habitat, especially in the winter when other aquatic plants have died back (Borman et al., 2001).

The Floristic Quality Index (FQI) evaluates how close a plant community is to undisturbed conditions. Each plant is assigned a coefficient of conservatism value (C-value) that reflects its sensitivity to disturbance, and these numbers are used to calculate the FQI. C-values range from 0 to 10. The lower the number, the more tolerant the plant is of disturbance. Having more plants with low C-values than high C-values is an indicator of disturbance, as the lower C-value plants better tolerate stresses caused by disturbance. A C-value of 0 is assigned to exotic species. C-values for each species of aquatic plant found in Spring Lake are displayed in Table 5. The FQI for Spring Lake was 27.8, which is slightly above-average for all lakes in the Waushara County Lakes Study.

In Spring Lake, C-values ranged from 0 to 9. Five of the twenty-five species found in Spring Lake had a C-value of 8, indicating good health in the aquatic plant community. The species with the highest frequency of occurrence within vegetated areas was *Chara* spp., with a C-value of 7. Three invasive plant species were observed: EWM, curly-leaf pondweed (CLP), and narrow-leaf cattail. All have C-values of 0.

TABLE 5. LIST OF AQUATIC PLANT SPECIES IDENTIFIED IN SPRING LAKE, 2013.

Common name	Scientific name	Sampled	Visuals	C-value
coontail	<i>Ceratophyllum demersum</i>	x	x	3
muskgrass	<i>Chara</i> spp.	x	x	7
common waterweed	<i>Elodea canadensis</i>	x	x	3
water stargrass	<i>Heteranthera dubia</i>	x	x	6
northern watermilfoil	<i>Myriophyllum sibiricum</i>		x	6
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>		x	0
whorled watermilfoil	<i>Myriophyllum verticillatum</i>	x	x	8
slender naiad	<i>Najas flexilis</i>	x		6
southern naiad	<i>Najas guadalupensis</i>	x	x	8
stoneworts	<i>Nitella</i> spp.	x		7
bullhead pond lily	<i>Nuphar variegata</i>	x	x	6
white water lily	<i>Nymphaea odorata</i>	x	x	6
curly-leaf pondweed	<i>Potamogeton crispus</i>	x		0
Fries' pondweed	<i>Potamogeton friesii</i>	x	x	8
variable pondweed	<i>Potamogeton gramineus</i>	x	x	7
Illinois pondweed	<i>Potamogeton illinoensis</i>	x	x	6
floating-leaf pondweed	<i>Potamogeton natans</i>		x	5
flat stem pondweed	<i>Potamogeton zosteriformis</i>	x	x	6
hard-stem bulrush	<i>Schoenoplectus acutus</i>	x	x	6
sago pondweed	<i>Stuckenia pectinata</i>	x	x	3
narrow-leaf cattail	<i>Typha angustifolia</i>		x	0
creeping bladderwort	<i>Utricularia gibba</i>	x		9
common bladderwort	<i>Utricularia macrorhiza</i>	x	x	7
small purple bladderwort	<i>Utricularia resupinata</i>	x		9
filamentous algae		x		-

Invasive plant species are present in Spring Lake. EWM can create dense beds that can damage boat motors, make areas non-navigable, stunt or alter the fishery, create problems with dissolved oxygen in the winter, and limit activities such as fishing and swimming. This plant can produce a viable seed; however, its primary mode of reproduction and spread is fragmentation. A one-inch fragment is enough to start a new plant, making EWM very successful at reproducing. CLP has a unique life cycle. It typically dies off in June, releasing phosphorus into the water from its decaying tissue. This can become problematic by enhancing algal blooms. It also starts growing under the ice before other plants, giving it a competitive advantage over native aquatic species. Narrow-leaf cattail also harms shoreline and wetland habitat by displacing native plants.

The Simpson Diversity Index (SDI) quantifies biodiversity based on a formula that uses the number of species surveyed and the number of individuals per site (Figure 9). The SDI uses a decimal scale from 0 to 1. Values closer to one represent higher amounts of biodiversity. The SDI of Spring Lake for the 2013 survey was 0.82. This represents an average biodiversity when compared to other lakes in the Waushara County Lakes Study.

Aquatic plants play another critical role in the lake’s ecosystem by using nutrients that would otherwise be available to algae. Any management activities should be planned to minimize the disturbance of native species in the water and on shore in order to maintain the balance between aquatic plants and algae. In addition, care should be taken to minimize raking the lake bed and pulling plants, since disturbing these valuable open spaces may allow invasive plants such as EWM to establish.

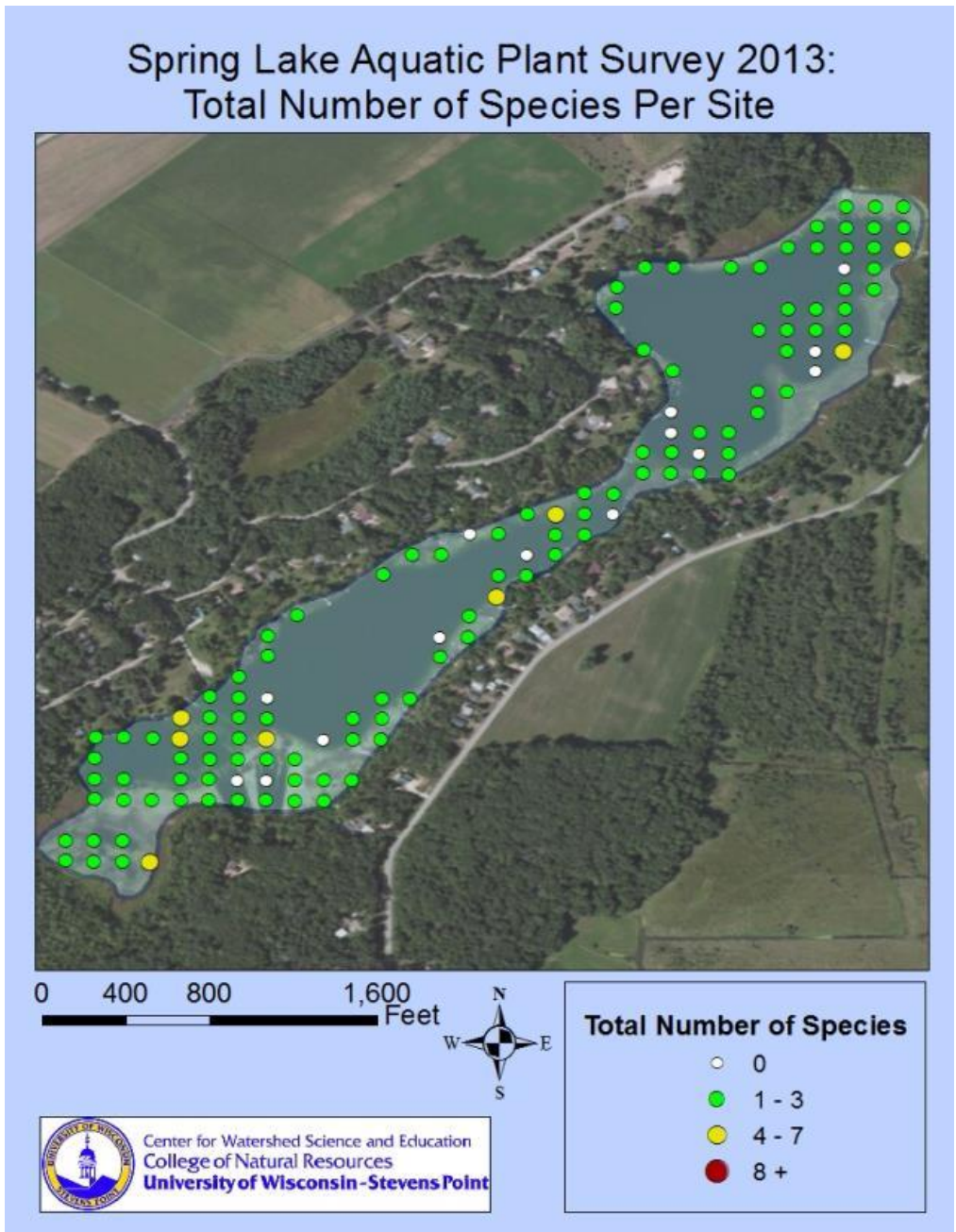


FIGURE 9. NUMBER OF AQUATIC PLANTS SPECIES OBSERVED AT EACH SAMPLE SITE IN SPRING LAKE, 2013.

SHORELANDS

Shoreland vegetation is critical to a healthy lake's ecosystem. It provides habitat for many aquatic and terrestrial animals including birds, frogs, turtles, and many small and large mammals. It also helps to improve the quality of the runoff that is flowing across the landscape towards the lake. Healthy shoreland vegetation includes a mix of tall grasses/flowers, shrubs and trees which extend at least 35 feet landward from the water's edge.

To better understand the health of the Waushara County lakes, shorelands were evaluated by the Center for Land Use Education and Waushara County as a part of the Waushara County Lakes Study. 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 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. Larger 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 Spring Lake is displayed in Figure 10. 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 human disturbances. Red shorelands indicate locations where changes in management or mitigation may be warranted. Large stretches of Spring Lake's shorelands are in good shape, but some portions have challenges that should be addressed. There were no stretches of Spring Lake shoreland that 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 *SPRING LAKE*

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



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 warranted. 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



Map created by Dan McFarlane
Center for Land Use Education

FIGURE 10. OVERALL SHORELAND HEALTH AROUND SPRING LAKE, 2011.

CONCLUSIONS & RECOMMENDATIONS

In general, each type of land use contributes different amounts of phosphorus, nitrogen, and pollutants in runoff and through groundwater. The types of land management practices that are used and their distances from the lake affect the contributions to the lake from a parcel of land.

- Water quality measurements of potassium, chloride, sodium, inorganic nitrogen, and atrazine indicate that land use management practices in the watershed are influencing the water quality in Spring Lake.
- Of the lakes in the Waushara County Lake Study, Spring Lake had the highest nitrate ($\text{NO}_2 + \text{NO}_3\text{-N}$) concentrations. Sources of nitrate include fertilizers, septic systems, animal waste. The nitrate is likely moving to the lake in groundwater.
 - Water users around and upgradient of Spring Lake should have the water from their private wells tested to identify if they exceed the state and federal drinking water standard.
 - In a lake, nitrate can be readily used by plants and therefore can increase the growth of aquatic plants and some types of algae.
- Atrazine (DACT), an herbicide commonly used on corn, was detected in the samples that were analyzed from Spring Lake. Some toxicity studies have indicated that reproductive system abnormalities can occur in frogs at these levels. The presence of this chemical indicates that agricultural activities are influencing the water quality in Spring Lake.
- While phosphorus sources exist in the Spring Lake watershed, the hard water (from calcium in the groundwater) in Spring Lake has helped to minimize phosphorus impacts in the lake. The hard water has limited capacity to buffer phosphorus, so measures should be taken to reduce near shore and watershed-scale impacts to the lake.
- Over-application of chemicals and nutrients should be avoided. Landowners in the watershed should be made aware of their connection to the lake and should work to reduce their impacts through the implementation of water quality-based best management practices.
- Shoreland health is critical to a healthy lake's ecosystem. Spring Lake's shoreland was assessed for the extent of vegetation and disturbances. Shoreland vegetation provides habitat for many aquatic and terrestrial animals, including birds, frogs, turtles, and many small and large mammals. Vegetation also helps to improve the quality of the runoff that is flowing across the landscape towards the lake. Healthy shoreland vegetation includes a mix of tall grasses/flowers, shrubs and trees extending at least 35 feet inland from the water's edge. Alone, each manmade disturbance may not pose a problem for a lake, but on developed lakes, the collective impact of these disturbances can be a problem for lake habitat and water quality.
 - Large stretches of shorelands around Spring Lake are considered healthy. Intermittent parts of the shoreland could be improved, but none of the shorelands were ranked as poor.
 - Strategies should be developed to ensure that healthy shorelands remain intact and efforts should be made to improve shorelands that have disturbance. Depending upon the source of disturbance, erosion should be controlled, vegetation should be restored, and/or excess runoff should be minimized.
 - Dissemination of relevant information to property owners is the first step towards maintaining healthy shorelands.
- The Waushara County Land Conservation Department and Natural Resources Conservation Service (NRCS) have professional staff available to assist landowners interested in learning how they can improve water quality through changes in land management practices.

Spring Lake is home to a good diversity of aquatic plants and has five species that indicate an overall healthy aquatic plant community. During the summer 2013 survey, most areas of the lake had medium densities of plants, which provided habitat for fish and other aquatic organisms and food for animals such as waterfowl, turtles, and fish. These densities should be low enough to accommodate recreational activities.

Three aquatic invasive plant species (AIS) exist in Spring Lake: Eurasian water milfoil (EWM), curly-leaf pondweed (CLP), and narrow-leaf cattail. Although these invasive species currently have low populations, all three species have the potential to overwhelm portions of the native plant community. Boats and trailers that have visited other lakes can be a primary vector for the transport of AIS. The lack of intensive high-speed recreational boating helps to preserve the integrity of Spring Lake by reducing disturbances to the lakebed that often encourage the colonization of AIS.

- CLP should be monitored annually in early June, and if the beds continue to expand, management should be considered.
- Since populations of EWM are present, an aquatic plant management (APM) plan should be developed. The plan should identify recommended measures to manage EWM in Spring Lake.
- Any plant management activities should be designed to minimize disturbance of the native species in the water and on shore, and to maintain the balance between aquatic plants and algae.
- Care should be taken to minimize the amount of disturbed lakebed from raking or pulling of plants, since these open spaces are “open real estate” for aquatic invasive plants to become established.
- Volunteer boat inspectors at the boat landing, trained through the Clean Boats, Clean Waters (CBCW) program, can help prevent new AIS introductions.
- Monitoring for AIS should be conducted routinely throughout the lake by either trained citizen volunteers or paid personnel.

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GLOSSARY OF TERMS

Algae: One-celled (phytoplankton) or multicellular plants either suspended in water (plankton) or attached to rocks and other substrates (periphyton). Their abundance, as measured by the amount of chlorophyll a (green pigment) in an open water sample, is commonly used to classify the trophic status of a lake. Numerous species occur. Algae are an essential part of the lake ecosystem and provide the food base for most lake organisms, including fish. Phytoplankton populations vary widely from day to day, as life cycles are short.

Atrazine: A commonly used herbicide. Transports to lakes and rivers by groundwater or runoff. Has been shown to have toxic effects on amphibians.

Blue-Green Algae: Algae that are often associated with problem blooms in lakes. Some produce chemicals toxic to other organisms, including humans. They often form floating scum as they die. Many can fix nitrogen (N₂) from the air to provide their own nutrient.

Calcium (Ca⁺⁺): The most abundant cation found in Wisconsin lakes. Its abundance is related to the presence of calcium-bearing minerals in the lake watershed. Reported as milligrams per liter (mg/l) as calcium carbonate (CaCO₃), or milligrams per liter as calcium ion (Ca⁺⁺).

Chloride (Cl⁻): The chloride ion (Cl⁻) in lake water is commonly considered an indicator of human activity. Agricultural chemicals, human and animal wastes, and road salt are the major sources of chloride in lake water.

Chlorophyll a: Green pigment present in all plant life and necessary for photosynthesis. The amount present in lake water depends on the amount of algae, and is therefore used as a common indicator of algae and water quality.

Clarity: See “Secchi disk.”

Color: Color affects light penetration and therefore the depth at which plants can grow. A yellow-brown natural color is associated with lakes or rivers receiving wetland drainage. Measured in color units that relate to a standard. The average color value for Wisconsin lakes is 39 units, with the color of state lakes ranging from zero to 320 units.

Concentration units: Express the amount of a chemical dissolved in water. The most common ways chemical data is expressed is in milligrams per liter (mg/l) and micrograms per liter (ug/l). One milligram per liter is equal to one part per million (ppm). To convert micrograms per liter (ug/l) to milligrams per liter (mg/l), divide by 1000 (e.g. 30 ug/l = 0.03 mg/l). To convert milligrams per liter (mg/l) to micrograms per liter (ug/l), multiply by 1000 (e.g. 0.5 mg/l = 500 ug/l).

Cyanobacteria: See “Blue-Green Algae.”

Dissolved oxygen: The amount of oxygen dissolved or carried in the water. Essential for a healthy aquatic ecosystem in Wisconsin lakes.

Drainage basin: The total land area that drains runoff towards a lake.

Drainage lakes: Lakes fed primarily by streams and with outlets into streams or rivers. They are more subject to surface runoff problems, but generally have shorter residence times than seepage lakes.

Emergent: A plant rooted in shallow water and having most of its vegetative growth above water.

Eutrophication: The process by which lakes and streams are enriched by nutrients, and the resulting increase in plant and algae. The extent to which this process has occurred is reflected in a lake's trophic classification: oligotrophic (nutrient poor), mesotrophic (moderately productive), and eutrophic (very productive and fertile).

Groundwater drainage lake: Often referred to as a spring-fed lake, it has large amounts of groundwater as its source and a surface outlet. Areas of high groundwater inflow may be visible as springs or sand boils. Groundwater drainage lakes often have intermediate retention times with water quality dependent on groundwater quality.

Hardness: The quantity of multivalent cations (cations with more than one +), primarily calcium (Ca⁺⁺) and magnesium (Mg⁺⁺) in the water expressed as milligrams per liter of CaCO₃. Amount of hardness relates to the presence of soluble minerals, especially limestone or dolomite, in the lake watershed.

Intermittent: Coming and going at intervals, not continuous.

Macrophytes: See “Rooted aquatic plants.”

Marl: White to gray accumulation on lake bottoms caused by precipitation of calcium carbonate (CaCO₃) in hard water lakes. Marl may contain many snail and clam shells. While it gradually fills in lakes, marl also precipitates phosphorus, resulting in low algae populations and good water clarity. In the past, marl was recovered and used to lime agricultural fields.

Mesotrophic: A lake with an intermediate level of productivity. Commonly clear water lakes and ponds with beds of submerged aquatic plants and mediums levels of nutrients. See also “eutrophication”.

Nitrate (NO₃-): An inorganic form of nitrogen important for plant growth. Nitrate often contaminates groundwater when water originates from manure, fertilized fields, lawns or septic systems. In drinking water, high levels (over 10 mg/L) are dangerous to infants and expectant mothers. A concentration of nitrate-nitrogen (NO₃-N) plus ammonium-nitrogen (NH₄-N) of 0.3 mg/L in spring will support summer algae blooms if enough phosphorus is present.

Oligotrophic: Lakes with low productivity, the result of low nutrients. Often these lakes have very clear waters with lots of oxygen and little vegetative growth. See also “eutrophication”.

Overturn: Fall cooling and spring warming of surface water increases density, and gradually makes lake temperatures and density uniform from top to bottom. This allows wind and wave action to mix the entire lake. Mixing allows bottom waters to contact the atmosphere, raising the water's oxygen content. Common in many lakes in Wisconsin.

Phosphorus: Key nutrient influencing plant growth in more than 80% of Wisconsin lakes. Soluble reactive phosphorus is the amount of phosphorus in solution that is available to plants. Total phosphorus includes the amount of phosphorus in solution (reactive) and in particulate form.

Rooted aquatic plants (macrophytes): Refers to higher (multi-celled) plants growing in or near water. Macrophytes are beneficial to lakes because they produce oxygen and provide substrate for fish habitat and aquatic insects and provide food for many aquatic and terrestrial animals. Overabundance of such plants, especially problem species, is related to shallow water depth and high nutrient levels.

Secchi disk: An 8-inch diameter plate with alternating quadrants painted black and white that is used to measure water clarity (light penetration).

Sedimentation: Materials that are deposited after settling out of the water.

Stratification: The layering of water due to differences in density. As water warms during the summer, it remains near the surface while colder water remains near the bottom. Wind mixing determines the thickness of the warm surface water layer (epilimnion), which usually extends to a depth of about 20 feet. The narrow transition zone between the epilimnion and cold bottom water (hypolimnion) is called the metalimnion. Common in many deeper lakes in Wisconsin.

Watershed: See “Drainage basin.”

**Aquatic Macrophyte Survey
of
Spring Lake
Town of Marion
Waushara County, Wisconsin**



Small purple bladderwort (*Utricularia resupinata*), a rare species found in Spring Lake
Photo: Paul Skawinski

January 2014

*Prepared by
Golden Sands Resource Conservation & Development Council, Inc.
www.goldensandsrcd.org*



Golden Sands
Resource Conservation
& Development Council, Inc.

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INTRODUCTION

A point-intercept survey of aquatic plants was conducted on Spring Lake during August 18-21, 2013. The information in the survey was obtained to evaluate the aquatic plant community and can be used as baseline information for the development of an aquatic plant management plan. Spring Lake is a 50-acre hard-water lake. The maximum depth of the lake is 37 feet.

Aquatic plants play an important role in a lake's ecosystem. They provide habitat for the fishery and other aquatic organisms, stabilize the sediment, reduce shoreline erosion, buffer temperature changes and waves, and infuse oxygen into the water. Rapid and dominant growth of aquatic invasive plants, such as Eurasian watermilfoil (EWM), can outcompete and cause a decline in native vegetation, which degrades habitat diversity and recreational value. In Wisconsin, aquatic invasive species (AIS) have spread quickly via transport on boats, trailers, and equipment. Two AIS were found in our survey: EWM and curly-leaf pondweed (CLP).

METHODS

The aquatic plant survey in Spring Lake was conducted by Golden Sands RC&D Council, Inc. on August 18-21, 2013. The survey was accomplished using the Wisconsin Department of Natural Resources (WDNR) point-intercept sampling protocol. The GPS coordinates for the grid, which consisted of 222 sample sites, was provided by WDNR (Figure 1). The grid was laid out with equal spacing between all points to ensure future replicability and thorough coverage of the lake. The shape of the lake and the size of the littoral zone are the two factors used to determine the number of points and their spacing. The GPS points were first overlaid onto an aerial photograph that was used in the field. A handheld GPS unit was also used to navigate to sampling sites while in the field.

For aquatic plant sampling, a pole-mounted rake was used to sample aquatic plants at each accessible site by dropping the rake straight down, turning it 360°, then pulling it straight back up. The rake had a double rake head with fourteen teeth on each side with a width of 13.8 inches. The pole rake method was usable up to a depth of 13.5 feet. At depths greater than this, a rake on a rope was used by towing the rake 0.75 meters along the lake bottom before pulling it straight back up. The rope was marked in 1-foot increments. After the rake was retrieved, each species present was assigned a rake fullness rating to quantify relative abundance. Ratings ranged from 0 (plants not present) to 3 (plants overflowing the rake tines). If an aquatic plant was seen at a site but not pulled up on the rake, it was noted with a "V" on the data sheets and included in the plant list on Table 1 of this report.

At each site, depth and dominant sediment type were also recorded. Depth was measured by 1-foot increments on the rake pole or rope. Sediment was measured by visual observation or by tapping the rake on the bottom to determine the substrate type.

A one-man kayak with one person was used during this survey. This person navigated, recorded data, and sampled and identified aquatic plants.

There were a number of points that were inaccessible by boat; if the points were inaccessible, they were deemed “non-navigable”.

RESULTS & DISCUSSION

The survey was based on 222 sample sites that were assigned using the WDNR’s point-intercept protocol; 129 of these points were accessible to sample during this survey. Some points were inaccessible due to dense, matted vegetation or because points were placed on shore. In addition, some points were too deep and were unlikely to have vascular plants or were too shallow. 115 (89%) of the 129 sampled sites had vegetation present.

The greatest depth at which aquatic plant growth was found was 19 feet. 97% of the sites sampled had vegetation growing shallower than the maximum plant depth. This is reflected in the total rake fullness (Figure 2). The lake had a species richness of 20 (25 including visuals). Filamentous algae were noted as well. Figure 3 displays the total number of species at individual sampling points. This indicates how diverse each site is.

Frequency of Occurrence

The frequency of occurrence (FO) value is a measure of the frequency at which a species occurs in the lake. The FO for total vegetation occurring at shallower than the maximum plant depth for Spring Lake was 92%. The most frequently occurring aquatic species found in Spring Lake was muskgrasses (*Chara* spp.), which occurred at 74% of areas that contained vegetation (Figure 4). The second most frequently occurring aquatic plant species was coontail (*Ceratophyllum demersum*) which occurred at 17% of vegetated areas (Figure 5).

Although northern watermilfoil (NWM) and whorled watermilfoil did not occur as frequently as coontail and muskgrasses, they are still important species to know. NWM and whorled watermilfoil can look very similar to their invasive counterpart, EWM; however, they tend to be less abundant. There were three points in the lake which had NWM present, and nine points that had whorled watermilfoil. These native milfoils can easily be misidentified as EWM, which may prompt unnecessary action.

Simpson Diversity Index

The Simpson Diversity Index (SDI) quantifies biodiversity based on a formula that uses the number of species surveyed and the number of individuals per site. The SDI uses a decimal scale; values closer to one represent higher amounts of biodiversity. The SDI of Spring Lake for the 2013 survey was 0.82. This is a moderate SDI compared to other Waushara County lakes surveyed in August 2013.

Floristic Quality Index

The Floristic Quality Index (FQI) evaluates the similarity of a plant community to undisturbed conditions. Each plant is assigned a coefficient of conservatism value (“C-value”) that reflects its sensitivity to disturbance and these numbers are used to calculate the FQI. C-values range from 0 to 10—the higher the number, the more intolerant of disturbance the plant is. A C-value of 0 is assigned to non-native species, which benefit from disturbance. The FQI for Spring Lake was 27.8. The FQI for Spring Lake is above the statewide average for lakes. Figure 8 displays the maximum C-value of each sample site.

In Spring Lake, the C-value ranged from 0 to 9 (Table 2). Two invasive species were sampled, CLP and EWM, both of which have a C-value of 0. 5 of the 26 species found in Spring Lake (southern naiad, small purple bladderwort, whorled watermilfoil, creeping bladderwort, Fries’ pondweed) had a C-value of 8 or greater, indicating good health in the aquatic plant community. Within vegetated areas, southern naiad occurred at 12% of the sample sites, small purple bladderwort at 9%, whorled watermilfoil at 5%, and creeping bladderwort and Fries’ pondweed both occurred at 4%.

AIS

Three invasive plants species currently exist in Spring Lake: EWM, CLP and narrow-leaf cattail. EWM is currently found at one point in the southwestern part of the lake, and was first identified in the lake in 1994. CLP is currently found at two points in the lake. One point is at the southeastern part of the northern lobe, and the other is at the southwestern part of the southern lobe. This could be due to an accumulation of soft sediments or flowing water, which are ideal for CLP. CLP was first reported in the lake in 2004. Our August survey showed populations of both EWM and CLP (Figures 6,7).

Because our survey took place in August, results for CLP may not be representative of the population, due to the unique life cycle of the plant. CLP typically dies off in late June, releasing phosphorus from its plant tissues into the water. The timing of the die off can be problematic by fueling filamentous algae blooms. The CLP turions, or winter buds, establish themselves in a suitable substrate shortly after the plants die back. When conditions are right in autumn, the turions will sprout and exist in a dormant state under the ice. The plants then resume growth shortly after ice out; this unique life cycle gives it a head start and a competitive advantage over other aquatic plants. CLP was sampled during our August survey, as depicted in Figure 7.

Narrow-leaf cattail can harm shoreline and wetland habitat. It competes and hybridizes with its native counterpart, broad-leaf cattail.

CONCLUSIONS

Spring Lake has a highly diverse aquatic plant community. The lake is designated “slow-no wake”, which allows for more stable conditions for aquatic plants, and in some cases may increase the possibility for the presence of rare species that may be less tolerant of disturbance.

CLP was found at two points in Spring Lake in August. This plant can become invasive and may contribute to nuisance algae blooms throughout the summer. CLP should be monitored annually in early June, and if the beds continue to expand, management should be considered.

EWM was found at one point in Spring Lake. EWM can create dense beds which can damage boat motors, make areas non-navigable, and prevent activities like swimming and fishing. This plant can produce viable seed; however, its primary mode of spread is fragmentation. Just a small fragment of the stem is enough to start a new plant.

Boats and trailers that have visited other lakes can be a primary vector for the transport of AIS. Volunteer boat inspectors at the boat landing, trained through the Clean Boats, Clean Waters (CBCW) program, can help prevent new AIS introductions. The lack of intensive high-speed recreational boating helps to preserve the integrity of Spring Lake by reducing disturbance to the lakebed. Disturbed conditions often encourage the colonization of AIS. Monitoring for AIS should be conducted routinely throughout the lake by either trained citizen volunteers or paid personnel. Free training for volunteers for CBCW and AIS monitoring is available through the Regional AIS Program at Golden Sands RC&D Council, Inc. Contact Golden Sands RC&D at 715-343-6215 or www.goldensandsrcd.org.

Aquatic plants play a critical role in the aquatic ecosystem by providing quality habitat and food for fish, invertebrates, birds, and mammals. The plants tie up nutrients which would otherwise be available to algae. Any management activities should be planned to minimize disturbance of the native species in the water and on shore, and maintain the balance between aquatic plants and algae. In addition, care should be taken to minimize the amount of disturbed lake bed from raking or pulling of plants, since these open spaces are simply “open real estate” for aquatic invasive plants to establish.

Sedimentation and excessive nutrient inputs accelerate algae and aquatic plant growth in the lake. Some erosion and sedimentation occurs naturally in the watershed, but it is commonly increased by shoreline disturbance and fertilizer applications. Protecting lakefront and riverfront habitat throughout the watershed will help to reduce the amounts of sediment and nutrients delivered to the lake. A minimum 35-foot vegetative buffer is recommended to provide sufficient filtering of runoff. Healthy, vegetated shoreline buffers are comprised of native, unmown grasses, forbs, shrubs, and trees. Riparian property owners looking to add native plants to their shorelines can find several local sources, including:

- Prairie Nursery of Westfield, WI
- J&J Aquatic Nursery of Wild Rose, WI
- Marshland Transplant of Berlin, WI

Spring Lake Aquatic Plant Survey 2013: Location of Sampling Points



0 395 790 1,580
Feet



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Legend

● Sampling Point

Figure 1. Sampling points for an aquatic macrophyte survey of Spring Lake using the Wisconsin DNR point-intercept method.

Spring Lake Aquatic Plant Survey 2013: Total Rake Fullness



0 400 800 1,600
Feet



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Total Rake Fullness

- 0
- 1
- 2
- 3

Figure 2. Total rake fullness of aquatic macrophytes in Spring Lake, August 18-21, 2013.

Spring Lake Aquatic Plant Survey 2013: Total Number of Species Per Site



0 400 800 1,600
Feet



Total Number of Species

- 0
- 1 - 3
- 4 - 7
- 8 +



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Figure 3. Total number of species at each sample site in Spring Lake, August 18-21, 2013.

Spring Lake Aquatic Plant Survey 2013: Presence of Muskgrasses (*Chara* spp.)

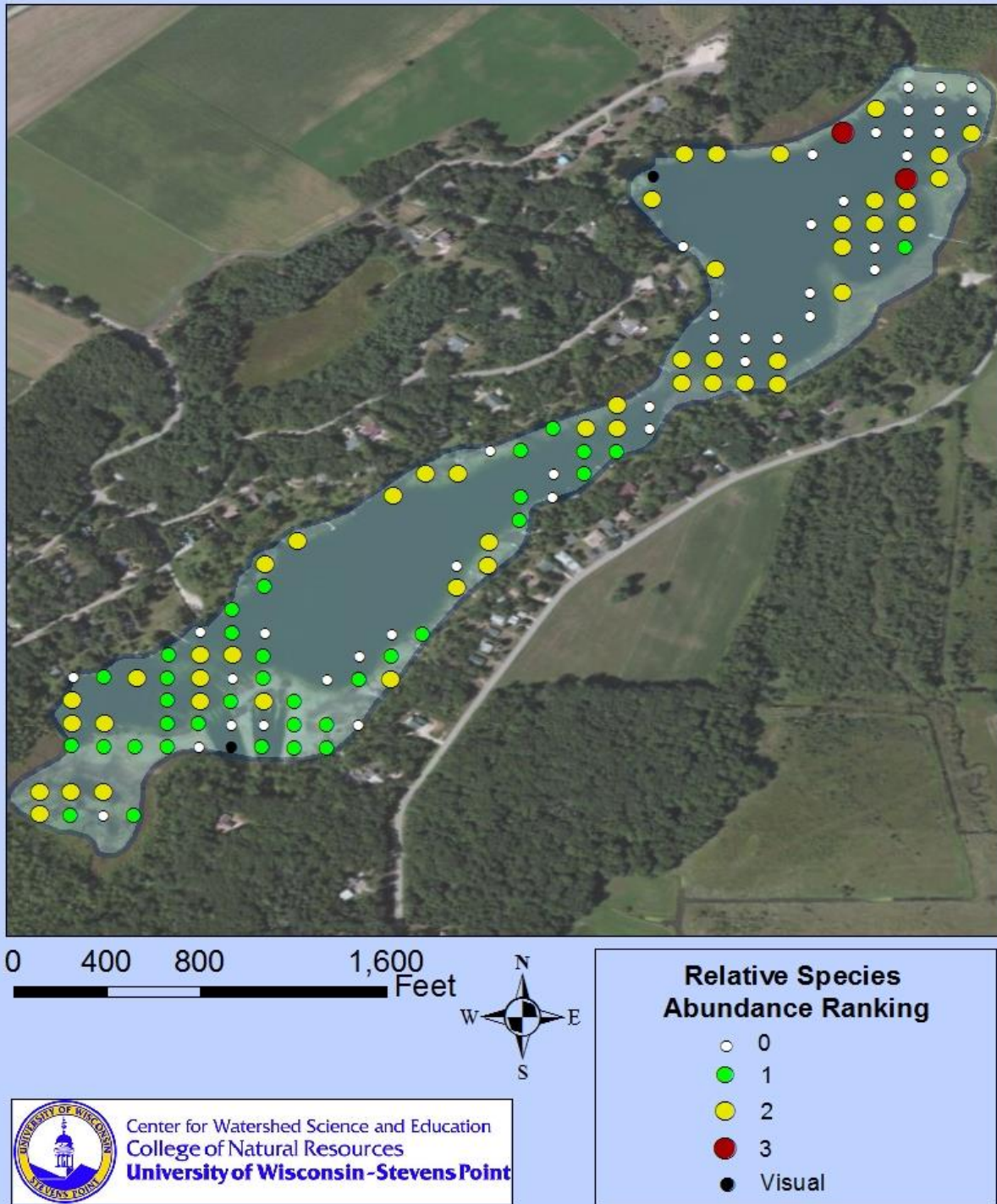


Figure 4. Location and relative abundance of muskgrasses in Spring Lake, August 18-21, 2013.

Spring Lake Aquatic Plant Survey 2013: Presence of Coontail (*Ceratophyllum demersum*)

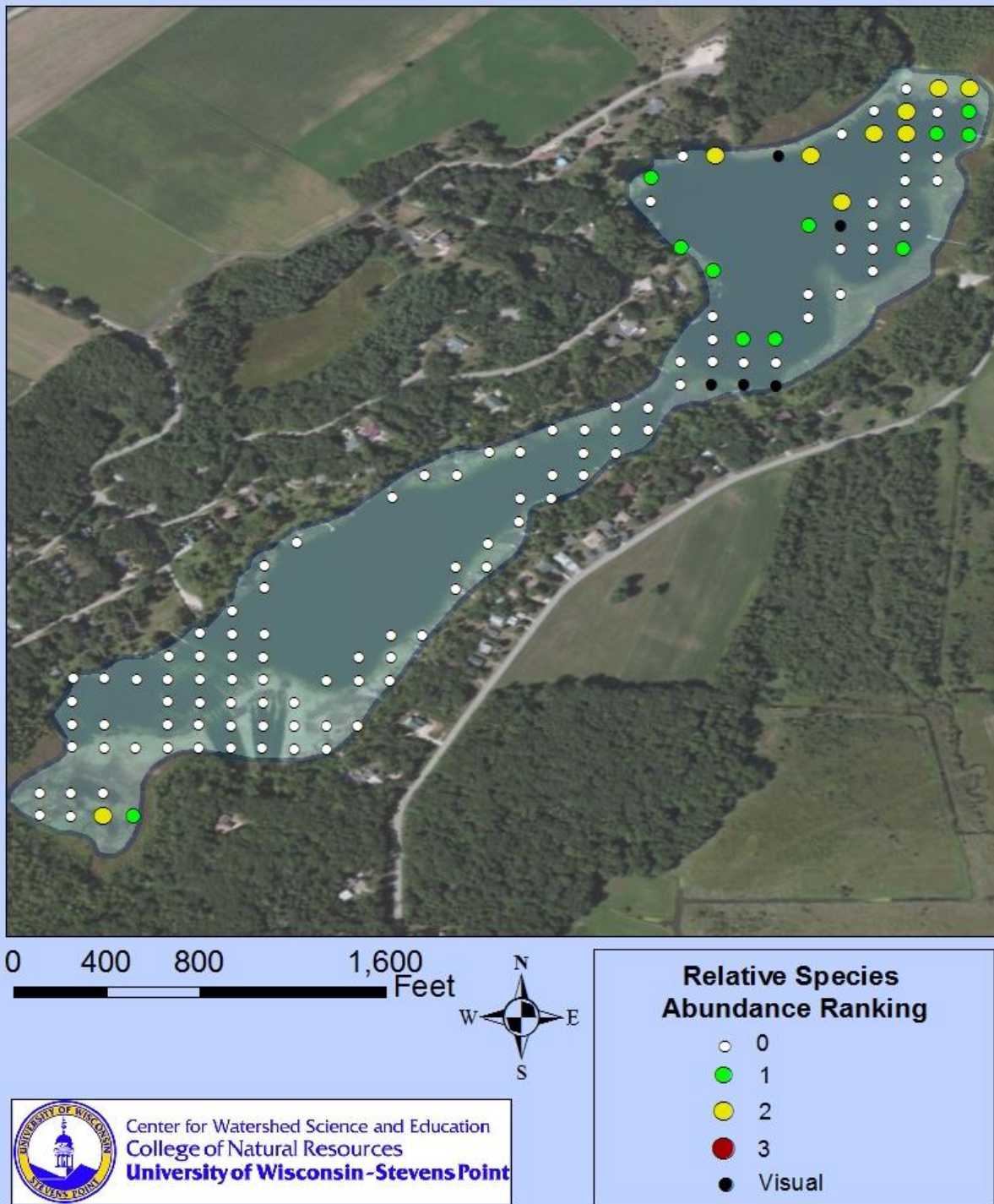


Figure 5. Location and relative abundance of coontail in Spring Lake, August 18-21, 2013.

Spring Lake Aquatic Plant Survey 2013: Presence of Eurasian Water-Milfoil (*Myriophyllum spicatum*)

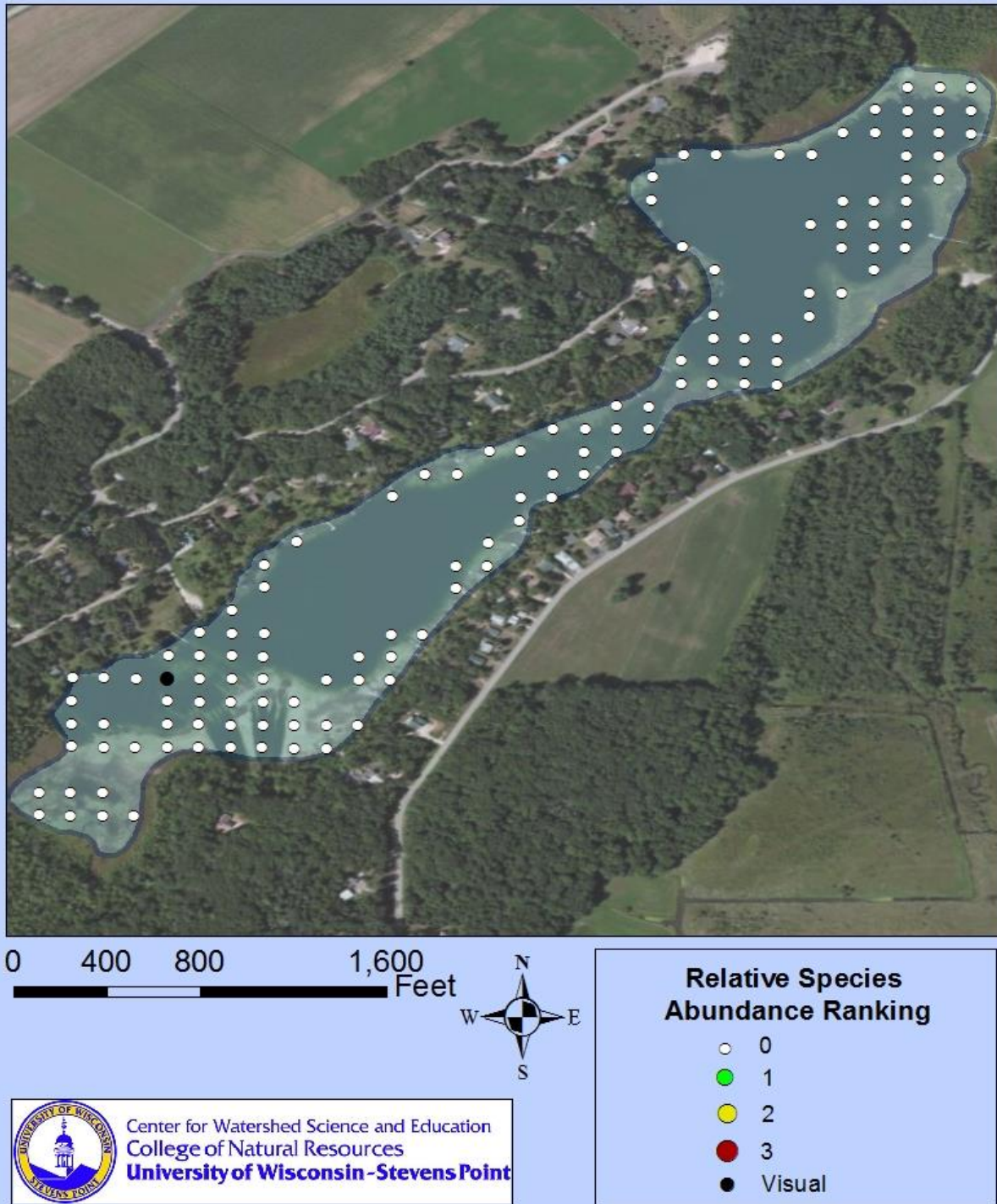


Figure 6. Location and relative abundance of Eurasian watermilfoil in Spring Lake, August 18-21, 2013.

Spring Lake Aquatic Plant Survey 2013: Presence of Curly-leaf Pondweed (*Potamogeton crispus*)

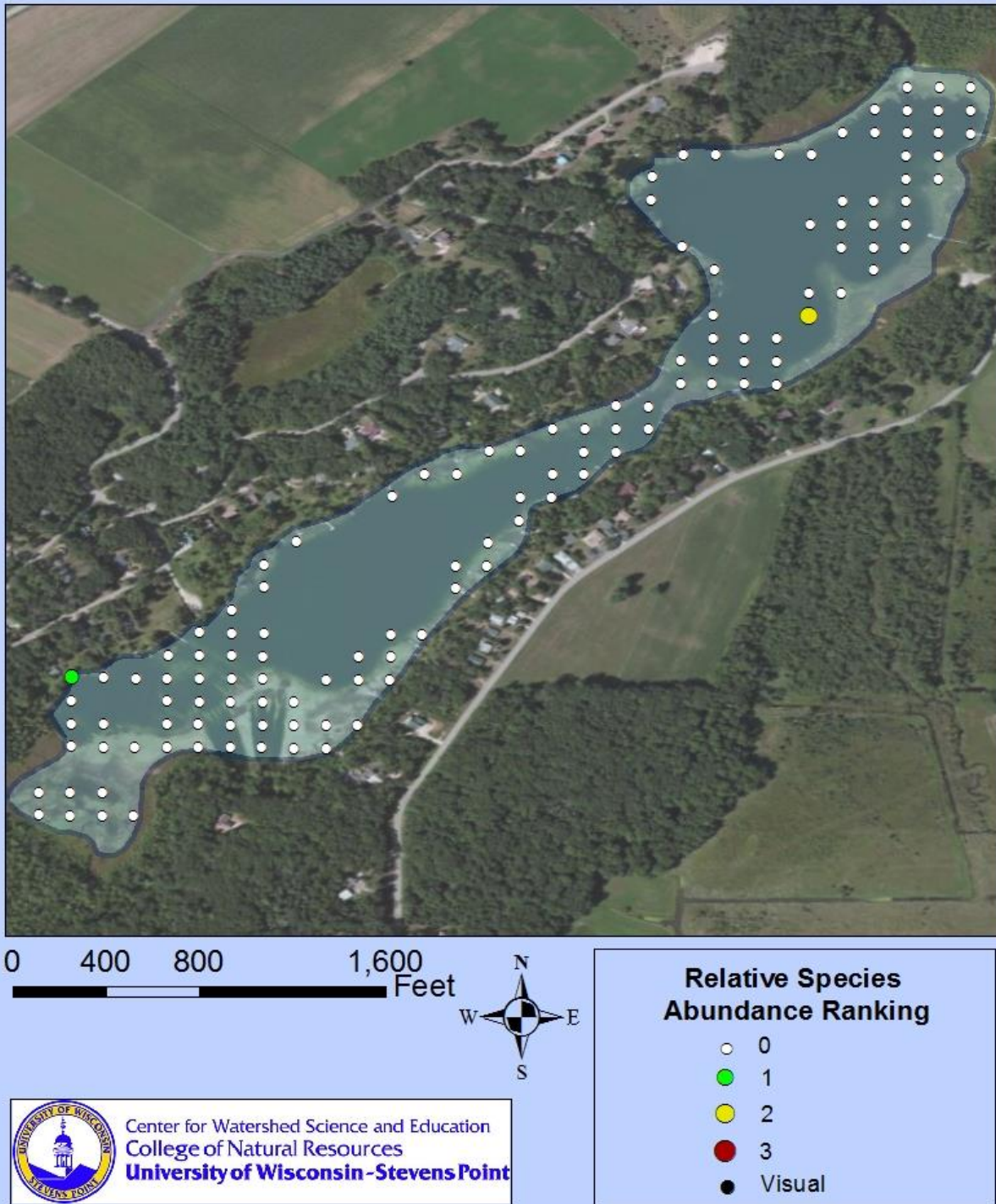
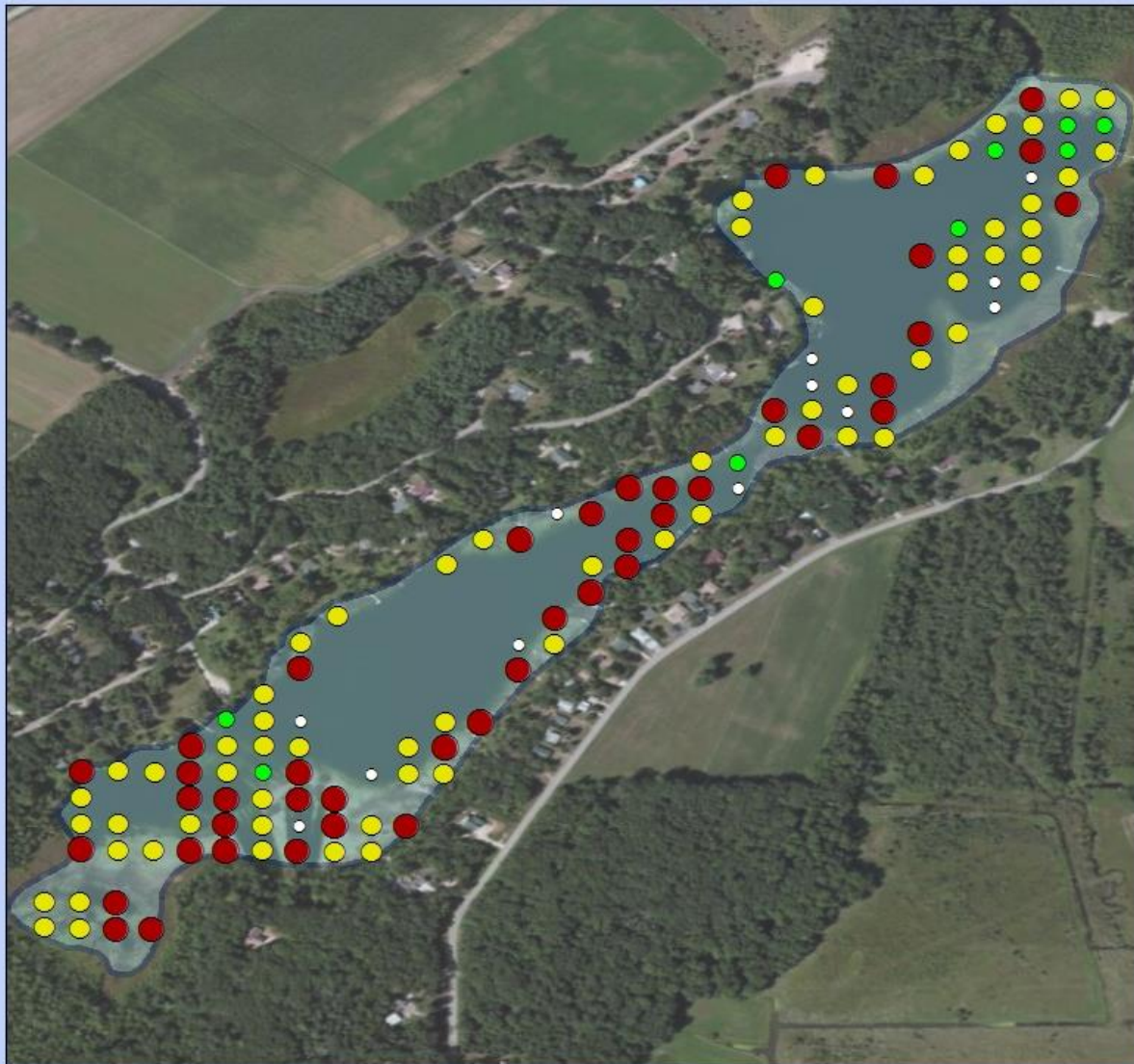


Figure 7. Location and relative abundance of curly-leaf pondweed in Spring Lake, August 18-21, 2013.

Spring Lake Aquatic Plant Survey 2013: Max C Value



0 400 800 1,600
Feet



Max C Value

- 0
- 1 - 3
- 4 - 7
- 8 - 10



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Figure 8. Maximum Coefficient of Conservatism value found at each sample site in Spring Lake, August 18-21, 2013.

Table 1. Aquatic plant species identified in survey of Spring Lake, August 18-21, 2013.

Scientific name	Common name	Sampled	Visuals
<i>Ceratophyllum demersum</i>	Coontail	x	x
<i>Chara</i> spp.	Muskgrasses	x	x
<i>Elodea canadensis</i>	Common waterweed	x	x
<i>Heteranthera dubia</i>	Water stargrass	x	x
<i>Myriophyllum sibiricum</i>	Northern watermilfoil		x
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil		x
<i>Myriophyllum verticillatum</i>	Whorled watermilfoil	x	x
<i>Najas flexilis</i>	Slender naiad	x	
<i>Najas guadalupensis</i>	Southern naiad	x	x
<i>Nitella</i> spp.	Stoneworts	x	
<i>Nuphar variegata</i>	Bullhead pond lily	x	x
<i>Nymphaea odorata</i>	White water lily	x	x
<i>Potamogeton crispus</i>	Curly-leaf pondweed	x	
<i>Potamogeton friesii</i>	Fries' pondweed	x	x
<i>Potamogeton gramineus</i>	Variable pondweed	x	x
<i>Potamogeton illinoensis</i>	Illinois pondweed	x	x
<i>Potamogeton natans</i>	Floating-leaf pondweed		x
<i>Potamogeton zosteriformis</i>	Flat stem pondweed	x	x
<i>Schoenoplectus acutus</i>	Hard-stem bulrush	x	x
<i>Stuckenia pectinata</i>	Sago pondweed	x	x
<i>Typha angustifolia</i>	Narrow-leaf cattail		x
<i>Utricularia gibba</i>	Creeping bladderwort	x	
<i>Utricularia macrorhiza</i>	Common bladderwort	x	x
<i>Utricularia resupinata</i>	Small purple bladderwort	x	
	Filamentous algae	x	

Table 2. Coefficient of Conservatism values for species present during the survey of Spring Lake, August 18-21, 2013.

Scientific name	Common name	C-value
<i>Ceratophyllum demersum</i>	Coontail	3
<i>Chara</i> spp.	Muskgrasses	7
<i>Elodea canadensis</i>	Common waterweed	3
<i>Heteranthera dubia</i>	Water stargrass	6
<i>Myriophyllum sibiricum</i>	Northern watermilfoil	6
<i>Myriophyllum spicatum</i>	Eurasian watermilfoil	0
<i>Myriophyllum verticillatum</i>	Whorled watermilfoil	8
<i>Najas flexilis</i>	Slender naiad	6
<i>Najas guadalupensis</i>	Southern naiad	8
<i>Nitella</i> spp.	Stoneworts	7
<i>Nuphar variegata</i>	Bullhead pond lily	6
<i>Nymphaea odorata</i>	White water lily	6
<i>Potamogeton crispus</i>	Curly-leaf pondweed	0
<i>Potamogeton friesii</i>	Fries' pondweed	8
<i>Potamogeton gramineus</i>	Variable pondweed	7
<i>Potamogeton illinoensis</i>	Illinois pondweed	6
<i>Potamogeton natans</i>	Floating-leaf pondweed	5
<i>Potamogeton zosteriformis</i>	Flat-stem pondweed	6
<i>Schoenoplectus acutus</i>	Hard-stem bulrush	6
<i>Stuckenia pectinata</i>	Sago pondweed	3
<i>Typha angustifolia</i>	Narrow-leaf cattail	0
<i>Utricularia gibba</i>	Creeping bladderwort	9
<i>Utricularia macrorhiza</i>	Common bladderwort	7
<i>Utricularia resupinata</i>	Small purple bladderwort	9
	Filamentous algae	-