The Lake Alice Stewardship Program
Adaptive Management Plan

Phase 2 – Understanding the biota of Lake Alice and Aquatic Plant Management Plan

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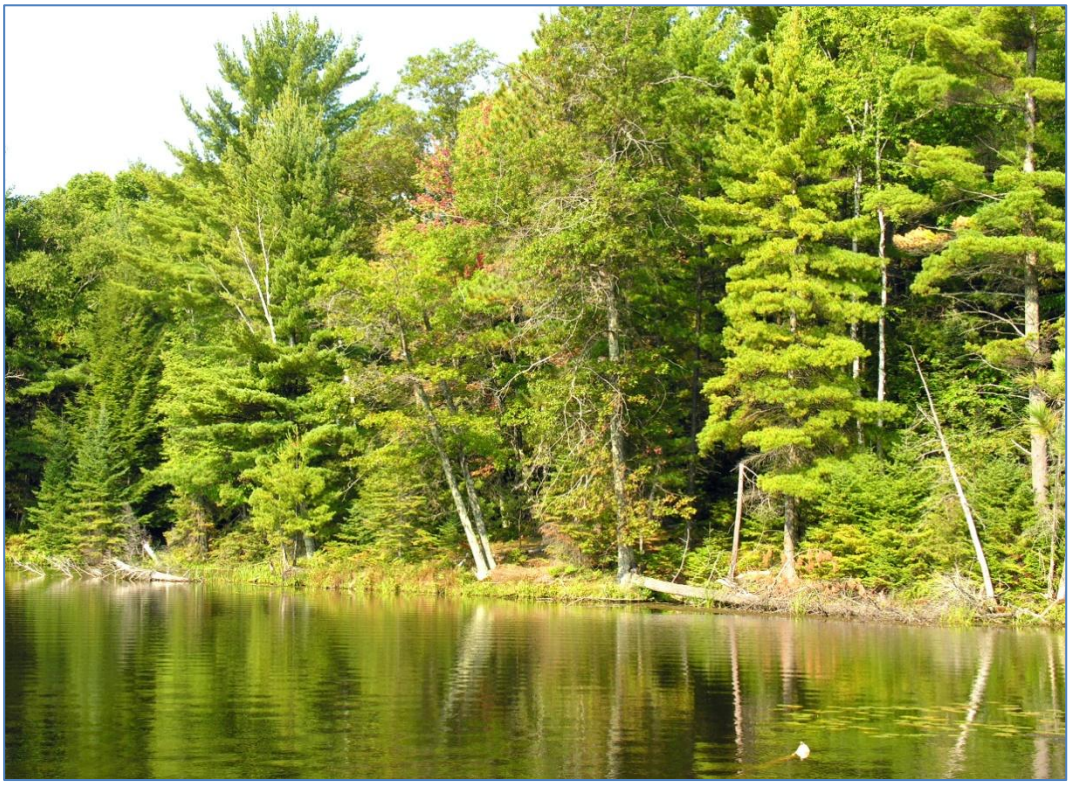

Lake Alice Shoreline 2009 (Dean Premo photo)

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This document is a product of a WDNR Lake Planning Grant awarded to:

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CHAPTER 1

What Is the Lake Alice Stewardship Program?

The Lake Alice Stewardship Program is an ongoing endeavor composed of annual phases that progress toward the overall vision of the Lake Alice Association – a healthy, sustainable Lake Alice. In Phase 1, participants learned about the lake and the landscape. In Phase 2, a principal task involved conducting an aquatic plant survey and creating an aquatic plant management plan. Phase 2 tasks also included frog and toad surveys and a volunteer angler journal. Success of future phases depends on a coalition of participants, each carrying out appropriate tasks and communicating needs and findings to other team members. It is appropriate that the Lake Alice Association (LAA) is the lead organization in this long-range endeavor.

This document represents the Phase 2 product of Lake Alice Stewardship Program with funding from a Wisconsin Department of Natural Resources (WDNR) Lake Planning Grant awarded to LAA. It integrates products of Phase 1 with new products developed in Phase 2. White Water Associates, Inc. (White Water), an independent environmental laboratory and ecological consulting firm, was contracted by LAA to carry out significant aspects of both Phase 1 and Phase 2 projects. Phase 1 focused on an inventory of relevant information on Lake Alice and its surroundings and produced the first iteration of an Adaptive Lake Management Plan. Phase 2 addressed aquatic plants and other biota of Lake Alice and included preparation of an aquatic plant management plan. This document integrates all of these products in the second iteration of the Adaptive Management Plan. The vision of the Lake Alice Stewardship Program is to ensure the perpetuation of a healthy Lake Alice and its surrounding landscape ecosystem far into the future. Participants believe that the tool by which to realize this vision is an adaptive management plan for the Lake Alice and its watershed.

Project participants have embraced the concept of "adaptive management" in their approach to the Lake Alice Stewardship Program. Simply stated, adaptive management uses findings from planned monitoring activities to inform future management actions and periodic refinement of the plan. An adaptive management plan accommodates new findings by integrating this information into successive iterations of the comprehensive plan. The plan

will therefore be a dynamic entity, successively evolving and improving to fit the needs of the Lake Alice watershed. A central premise of adaptive management is that scientific knowledge about natural ecosystems is uncertain. It follows that a practical management plan allows for ongoing adjustments in management designed to "adapt" to changing conditions and new information or understanding. Monitoring the outcomes of plan implementation is essential to the process of adaptive management. It is the goal of the Lake Alice plan that future monitoring will focus on tangible indicators designed to measure progress toward specific program goals.

Besides this introductory chapter, this plan is organized in seven additional chapters. Chapter 2 describes the audience for the Lake Alice Adaptive Management Plan. Chapter 3 addresses why there should be a plan and discusses adaptive management and the underlying assumptions of the approach. Chapter 4 details how the plan was created, including the methodology used. Chapter 5 presents the findings from efforts to gather existing and new information about Lake Alice and its environs by providing summaries of information in ten subsections. Chapter 6 (What Goals Guide the Plan?) presents the desired future condition and goals established by the Lake Alice Association and the plan writers. Chapter 7 (What Objectives and Actions Move Us Toward the Goals?) offers a logical menu of practical management actions ready to be adopted and adapted by those interested in taking an active role in caring for Lake Alice and its surroundings. Three Appendices complete this document. Appendix A contains literature cited. Appendix B contains a historical account of Lake Alice. Appendix C presents the aquatic plant management plan. Appendix D includes the Lake Alice Volunteer Angler's Journal. Finally, Appendix E contains a report on the first year's effort of a Lake Alice frog and toad survey.

CHAPTER 2

Who Is the Audience for the Lake Alice Plan?

The title of Chapter 3 poses the question: "Why have a Lake Alice Adaptive Management Plan?" The short answer is "Because we care!" We believe that people working together in the stewardship of this lake can make a difference. We can protect and restore a healthy ecosystem if we take a long-term, strategic approach. That approach is presented in this adaptive plan. It is an adaptive plan in the sense that it will grow and evolve. Implemented actions will be monitored. The plan will be evaluated. It will be reviewed and refined as years go by – as new generations take up their stewardship responsibility.

People who care about the Lake Alice Watershed are the audience for this plan. They will be the implementers and evaluators. They will be the reviewers and future plan writers. Many of them live in or near the watershed. These are the "grassroots" – the constituency most connected to Lake Alice and its surroundings. People who care are also those who live beyond the watershed boundaries. Some of these people visit Lake Alice for recreation and enjoyment. But the audience also includes foundations and other funding agencies, resource and regulatory agencies concerned with environmental quality, and other citizens that are working on their watersheds.

For those in the "grassroots" camp, this plan is intended to provide you with a practical approach to carrying out protection and restoration of Lake Alice. The plan does not have all the answers (it doesn't even have all the questions). It does not recommend every conceivable rehabilitation or protection action. But the plan does provide plenty with which to get started and it leaves room for ideas and contributions from others. Our recipe mixes a pinch of the theoretical with a cupful of the practical. Those of you who are "hands-on" have plenty to do.

The mixed audience of this plan challenges the authors to present a plan that is scientifically grounded and technically oriented, but at the same time accessible and understandable by the public who will in large part be responsible for its implementation. Although scientists are the primary authors of the plan, the writing is aimed at the public. We define terms where clarity is needed and cite other literature for those interested in the source of a statement, or in learning more about the topic. LAA has interacted with the plan writers

throughout the process and reviewed draft components of the plan. LAA has encouraged our practical approach so that applications of the plan are conspicuous.

We will end this chapter with our strongest management recommendation:

Approach lake and watershed management with humility.

Lake and watershed ecosystems are enormously complex. Our understanding of how they work is not complete. Our ability to predict outcomes from specific actions is uncertain. New discoveries are made every day that have important implications for future watershed management. We may never know all we need, but that fact can't stop us from starting work on Lake Alice today. The fact that ecosystems are inherently resilient is to our great advantage. They are able to rebound from disturbance and repair themselves from injury. In fact, some of today's best watershed managers state that "...successful restoration usually has less to do with skillful manipulation of ecosystems than it does with staying out of nature's way" (Williams et al 1997). This plan is intended to complement nature's own processes.

CHAPTER 3

Why Have a Lake Alice Adaptive Management Plan?

Why have a Lake Alice Adaptive Management Plan? The gut-level answer ("because we care") was offered in Chapter 2, but the question deserves more thoughtful reflection – the focus of this chapter. This requires consideration of environment, economy, history, and culture. This chapter also defines some important terms and presents the process and underlying assumptions.

Part 1 - Why Should We Care?

The health of a watershed and the health of local economies like those that exist in the Lake Alice Watershed are highly integrated. A sustainable economy depends on a healthy environment. In fact all social and economic benefits are based on the biological and physical properties of watersheds (Williams et al. 1997). In fact, our economy should be viewed as being nested inside our environment (Lanoo 1996).

This link between a healthy environment and the economy is true at several scales. For example, most property owners on Lake Alice have invested in an ecosystem. The reasons that they have purchased the property are typically linked to the quality of the environment. The economic value of their investment is linked to the health of lake and surroundings. If ecological health declines, so does the value of the property in dollars.

At a slightly larger scale, this same principal linking the environment and economy applies to municipalities. The Tomahawk community is caretaker of many ecosystems including Lake Alice. The long-term economic health of the municipality is tied to the health of Lake Alice and other lakes and streams in the area. At even larger scales yet, this applies to Lincoln County, to the State of Wisconsin, and so on.

The Lake Alice Association and this plan aspire to cultivate a deep connection to the lake and its surroundings. It is the people of the watershed that will make the management plan work. Lake and watershed stewardship must be a cultural imperative. In some ways, watershed restoration is about cultural restoration – rejuvenating citizens' civic responsibility to care for the environment in which they live. This is what Aldo Leopold referred to as "...the oldest task in human history: to live on a piece of land without spoiling it" (Leopold 1948).

People need to feel vital by working to improve, beautify, or build. Sometimes that need is expressed by gardening, caring for a lawn, or volunteering on civic projects. LAA and this plan endeavor to harness that energy and apply it to restoration and protection actions focused on Lake Alice and its landscape. Education, rehabilitation, and protection become outlets for this creative energy.

Why should you care about creating and implementing a practical watershed plan? Because we realize the economy and the economic options available to citizens in the watershed are tied to a healthy environment. Because we are all connected to the Lake Alice landscape in some way. Because we feel a civic responsibility to care for the lake. Because we can feel vital by doing meaningful work on the watershed. Because future generations depend on us to hand down a healthy Lake Alice ecosystem for them to enjoy and use.

The adaptive management plan will be successful if it allows and organizes meaningful stewardship work for Lake Alice. It needs to make provision for different kinds of approaches and different kinds of people who want to be part of the process. It has to be strategic and integrated so that various actions complement one another, and are consistent with the lake's natural processes. The plan should discourage management actions that work at cross-purposes or whose outcomes are undesirable.

Part 2 - What Is an Adaptive Management Plan?

An adaptive management process (Walters, 1986) is the most appropriate model to use in lake and watershed management. In adaptive management, a plan is made and implemented based on best available information and well-defined goals and objectives. Outcomes of management actions are monitored to ascertain whether they are effective in meeting stated goals and objectives. Based on this evaluation the plan is adapted (modified) in a process of continuous learning and refining.

Adaptive management concedes and confronts a truth that most resource managers are reluctant to acknowledge – uncertainty. Because natural systems are so diverse, so complex, and so variable, almost all management actions will have uncertain outcomes. An adaptive management approach essentially takes a position that says, "We will make our best attempt and get better as we go along. We'll listen to what the natural system tells us." In adaptive management monitoring is crucial. Adaptive management uses information from monitoring to continually evaluate and refine management practices. Monitoring measures the success of restoration or management. Well-designed monitoring should indicate how effectively

management measures are working and give us new insights into ecosystem structure and function. Monitoring should provide needed information to adapt management goals.

The Lake Alice Adaptive Management Plan can be implemented through five kinds of management actions: protection, rehabilitation, enhancement, education, and research. Research actions have a special subset called "monitoring actions" that serve all of the management actions. Each kind of action is summarized in the following bullets.

- Protection actions are used when high quality areas or ecosystem elements are identified and need to be safeguarded. Since numerous aspects of Lake Alice and its surroundings are quite pristine, a significant part of the Lake Alice adaptive management could fall under this kind of action. There are numerous forms that protection actions can take including protecting water quality, conservation easements, buffer zones to prevent runoff into the lake, and so on.
- Rehabilitation actions are those that manipulate site-specific elements of ecosystems in order to repair some past impact. Examples include planting lakeside natural vegetation in areas of erosion, placing fish structure where large woody material has been removed from the lake, or healing an area of active erosion. Individual rehabilitation actions contribute to overall lake and watershed restoration.
- Enhancement actions are intended to improve some function or value of the ecosystem. In some cases, these actions are meant to benefit human users of the lake (for example, enhancing recreation values by planting fish or creating new fish habitat).
- Education actions are those activities that serve to promote lake stewardship and inform landowners and visitors about natural ecosystems. These actions can include this report and management plan as an education piece. These actions also include the installation of interpretive points or incorporation of Lake Alice components in science classes of Tomahawk High School students. Every person that visits Lake Alice is an opportunity for education about healthy ecosystems.
- Research actions are employed to learn about the system being managed. Often we know very little about the plants, animals, habitats, ecosystems, and processes that our management actions are affecting. Research actions began at Lake Alice years ago with basic water quality measures and are ongoing today. Monitoring actions (a subset of research actions) are those that serve to evaluate the outcomes of protection, rehabilitation, enhancement, and education actions. Monitoring actions guide future management.

One word of caution is warranted. Our society typically thinks a long-term planning horizon is twelve months. Unfortunately, this is out of synchrony with the way an ecosystem functions. An ecological clock ticks off time in years, decades, centuries, and even millennia. Lake and watershed management and restoration must be viewed from this perspective. In fact, the final outcomes of some of the good work put in place today might not be apparent until a new generation of lake stewards is on the scene.

Part 3 - What Are the Plan's Underlying Assumptions?

As an adaptive plan, a basic assumption is that the management actions will change over time under the influence of many stakeholders. Through iterative refinement, the plan will more closely reflect the needs of the lake and the people who care about it. This plan has assumed a desired condition of sustainable lake health. The plan attempts to reflect the collective vision of the people and organizations that are concerned with the lake and the surroundings. LAA, Tomahawk High School students and faculty, Lincoln County Land Information and Conservation Department, the Wisconsin Department of Natural Resources, and the community of Tomahawk are among these stakeholders.

The Lincoln County (Wisconsin) Land Information and Conservation Department provides a wide variety of land information and related services including: natural resource and water quality protection information, geographic information, rural addressing, Public Land Survey System and surveying data, property ownership and tax assessment information and mapping products. This office can provide important assistance in during subsequent phases of the Lake Alice Stewardship Program.

At a larger geographic scale the WDNR published the Headwaters Basin Integrated Management Plan (2002) that provides a snapshot of current conditions of resources in the larger drainage basin that includes Lake Alice. The Plan outlines nineteen issues of concern to the basin, including control of exotic species, shoreline development, resource inventory and monitoring, habitat loss, user conflicts, and protection of endangered, special concern, or unique species. The Plan identifies Lake Alice is listed as "outstanding resource waters" and outlines the various offices and their authorities over the resources in the region.

The integrating feature of this lake management plan is Lake Alice and its surroundings. The plan assumes that proper planning in the beginning of the process will save time and money throughout the life of the program and that this can be accomplished by managing the causes rather than (or at least, in addition to) managing the symptoms of any impairments.

CHAPTER 4

How Was the Lake Alice Management Plan Made?

A team of consulting scientists (White Water) working with LAA, prepared this adaptive management plan. It has resulted from the efforts of two project phases. In this chapter, we describe the methods that were employed in each of the two phases.

Part 1 – Phase 1 Methods

In the first project phase, the process began with a meeting between White Water scientists, LAA, and Tomahawk High School biological science teachers to share ideas about the planning process. Information gathering was conducted by each of these parties. Another 2009 meeting was held at the WDNR office in Rhinelander with White Water, LAA, and WDNR to obtain Lake Alice information and discuss specific approaches to information gathering. In Fall of 2009, a field trip was conducted on Lake Alice with members of the LAA, White Water scientist Dean Premo, Tomahawk High School (THS) teachers Todd Fredrickson and Jen Pfanerstill, and over forty THS juniors and seniors.

Existing information was the basis for the Phase 1 planning activity (as will be seen in the next subsection, new information was collected in Phase 2). Existing information is found in many repositories and forms: anecdotal accounts of residents, resource agency reports and memos, municipal planning and zoning documents, scientific reports, old and new photographs, best guesses of knowledgeable people, and government land office records. Not all of the existing information is of equivalent value in the planning process. Some is not verifiable or the methods by which it was collected are unknown.

The methods that we used in Phase 1 followed closely the goals, objectives, and tasks that were described in the grant proposal submitted to the WDNR. The Phase 1 goals were to (1) inventory relevant information on Lake Alice and its watershed, (2) prepare an initial adaptive lake management plan, and (3) deliver educational elements that served to convey information about Lake Alice and the Stewardship Program. Early on in the project, nine objectives and associated tasks were established. In this section, we describe these objectives and tasks and the primary responsibility among project participants for specific tasks.

The first objective was to develop a strategy to perpetuate the quality of Lake Alice and its watershed ecosystem. Four tasks supported this objective: (A) articulate a general strategy in the form of a Lake Planning Grant proposal; (B) meet with project partners at beginning of program to identify and prioritize initial lake management needs and establish long-term goals; (C) meet with project partners at outset of Phase 1 project to develop agreed upon strategy and specific approach to Phase 1; and (D) assign specific tasks to project partners. These tasks were accomplished by a meeting held at the home of LAA Board President Glenn Mott (with representation by White Water, LAA, and THS), a second meeting at the Rhinelander WDNR office, and during numerous phone meetings. The effort was primarily carried out by LAA and White Water.

The second objective of Phase 1 was to gather, consolidate, assess, and manage information about fish and aquatic life and habitats of Lake Alice. Four tasks supported this objective: (A) collect and review historical information regarding the fishery resource in Lake Alice; (B) interview WDNR fisheries biologist regarding the fishery in Lake Alice, (C) collect and review existing information about other aquatic life in the lake; and (D) collect and review existing information about other aquatic and wetland habitats in Lake Alice. These tasks involved contacting various resource agency personnel in the WDNR and knowledgeable local residents. Information from disparate sources represents a large variety of quality and application, and this must be considered when deciding how or if to use a specific data set in management of the Lake. Tasks under the second objective were primarily carried out by White Water.

The third objective was to gather, consolidate, assess, and manage information about Lake Alice water quality and potential risks to water quality. Three tasks were applied to achieving this objective: (A) collect and review existing limnological information about Lake Alice, (B) analyze and summarize existing Lake Alice water quality data, and (C) prepare a water quality sampling regimen for Lake Alice. The relatively small amount of water quality data for Lake Alice came from WDNR lakes database. These data provide insight into lake water quality and are a useful starting point for adaptive lake management. Tasks under the second objective were primarily carried out by White Water.

The fourth objective was to gather, consolidate, assess, and manage information about the Lake Alice Watershed, especially those attributes relevant to lake health. This ambitious objective involved five tasks: (A) delineate the Lake Alice watershed area; (B) map land cover/use and soils of the watershed; (C) depict slopes through topographic maps and digital

elevation models to identify runoff patterns and environmentally "risky" areas in terms of contribution of non-point source (NPS) pollution to Lake Alice; and (D) determine existing institutional programs that affect lake quality. Tasks A, B, and C involved using existing layers of geographic information available from the WDNR and other sources and manipulating these data. Task D required an inventory of the programs within the region that address lake quality. White Water staff carried out tasks A, B, and C under this objective. LAA carried out Task D.

The fifth objective was to prepare a catalog of Lake Alice environmental, cultural, and aesthetic attributes with a qualitative evaluation of the quality and associated potential threats. This objective included four tasks: (A) list the Lake Alice attributes; (B) qualitatively evaluate each of the attributes; (C) identify and describe potential threats to the Lake Alice Attributes; and (D) conduct a site visit to Lake Alice as a reconnaissance of the attributes. Responsibility for these tasks was shared between LAA, THS, and White Water.

The sixth objective was to prepare a history of the Lake Alice area and the human community living there. This objective included three tasks: (A) conduct interviews of lake residents and others; (B) inventory existing written information about the Lake Alice community; and (C) prepare a written history that documents and consolidates findings. LAA had the responsibility for this objective and related tasks.

The seventh objective was to create an initial adaptive lake management plan for Lake Alice that will serve to ensure high quality lake management and will serve as a firm foundation for future iterations of the plan. This rather complex task was guided by two basic tasks: (A) develop adaptive management recommendations for Lake Alice using information gathered in previous objectives; and (B) prepare a practical written plan, grounded in science, that includes sections on implementation, monitoring, and adaptive management. The Phase 1 plan will lay the basis for its expansion in future phases and identify where more information is required. White Water scientists carried out tasks under this objective.

Because other organizations are involved with water resources planning and management in northern Wisconsin, an eighth objective was established to integrate recommendations from existing plans (for example, Headwaters Basin Integrated Management Plan and/or County Land and Water Resources Management Plan) into the Lake Alice Plan. Two tasks supported this effort: (A) review existing basin plan and County Land and Water Resources Management Plan and draw information and recommendations from these (as appropriate) for use in the Lake Alice plan; and (B) prepare a written section of the

Lake Alice Plan that documents this review. Tasks under this objective were carried out by LAA and White Water.

The ninth objective had an education orientation intended to convey information about Lake Alice, LAA, WDNR Lake Program, and resource stewardship. An intended outcome of this objective was to increase support and capacity of LAA through collaboration with THS faculty and students. Another intended outcome was to increase general community awareness of Lake Alice Stewardship and understanding of Lake Alice water quality and factors that affect lake health. Three tasks were outlined to achieve this objective: (A) provide technical assistance to THS faculty and students; (B) provide written education material about the project and about water quality aspects of Lake Alice that can be used for press releases and as handouts at lake association gatherings and other meetings; and (C) contribute information to the LAA website that highlights ongoing aspects of the Lake Alice Stewardship Program and the Phase 1 project. These tasks were shared between LAA, White Water, and THS.

Part 2 – Phase 2 Methods

As in Phase 1, the methods that we used in Phase 2 were associated with specific objectives and tasks that were outlined in the Phase 2 Planning Grant Proposal. The principal objectives in the second phase of the Lake Alice Stewardship Program were to (1) systematically investigate the aquatic plant community, (2) prepare an aquatic plant management plan, (3) prepare and implement a water quality sampling regimen, (4) initiate a volunteer amphibian monitoring program, and (5) develop and initiate a volunteer angler survey. We describe the methods associated with these objectives in this subsection.

The primary question that guided the field investigation of the Lake Alice aquatic plant community was "What is the composition, density, and geographic distribution of the aquatic plant community in the lake?" In the last few years, the WDNR has developed a new and rigorous aquatic plant survey approach. First, they realized that many citizens and lake groups requested permits every year to harvest or chemically treat nuisance plants, with no accounting of how successful they were. Second, the WDNR realized that they could get more information from their own routine plant sampling surveys by taking advantage of new technologies such as the Global Positioning System (GPS). In order to address both issues, the WDNR, with help from the Minnesota DNR, developed a new plant sampling survey system designed to systematically examine all parts of the lake. The protocol calls for using a rake

sampler to determine what species are present, where they occur, at what depths they are found, and in what kind of substrate. The spatially explicit information can be used to create a variety of ecologically based maps such as the location of an invasive plant, where the plants grow most densely, or how a species of special concern is distributed. The survey serves as a baseline for the future, and will be especially important should there be changes in the lake such as a water level or an invasion of an aquatic invasive plant species.

The WDNR launched the new plant survey protocol in 2005. After early experience, they revised the protocol to its current form. A lake group that creates an aquatic plant management plan, requests a permit to do large scale chemical treatment, or requests assistance from the WDNR with aquatic plant issues are asked to perform a plant survey following the new protocol.

This WDNR survey protocol is called a point-intercept sampling scheme because data is collected from all over the lake, instead of sampling along a few straight lines (called transects) laid out perpendicular to the shore (as was done by WDNR plant sampling crews prior to 2005). The first step is to lay an electronic grid (like a sheet of graph paper) over a map of the lake. This step is done by the WDNR's Integrated Science Services, who receives requests and determines the number of sampling points on this grid. This sampling density depends on the acreage of the lake, the depth contours of the lake, and the convolutions of the shoreline. There is a latitude and longitude associated with each point on the grid. The WDNR loaded these coordinates into spreadsheet file and conveyed it to White Water Associates. The White Water team loaded the coordinates into a global positioning (GPS) unit for use in the field.

The White Water field team, used the GPS unit, sampling rakes, and data sheets, to conduct the surveys. The sampling rake is a double-headed metal rake secured to a pole expandable to 15 feet. For deeper points, another double-headed rake weighted and attached to a rope was used. The boat driver used the GPS unit to navigate to each point. The navigator also called out the depth from and electronic depth finder so the sampler knew what sampling rake to use. At each point, the sampler used the rake-on-a-pole or the rake-on-a-rope to scrape the lake bottom and haul up the catch of aquatic plants. The sampler called out the depth and sediment type (muck, sand or rock), identified each plant caught on the rake, and gave each species an abundance rating of 1 (few plants), 2 (moderate amount), or 3 (plants overflowing the rake). The data recorder wrote down all the data and kept track of

what points still need to be sampled. Any non-native species were carefully identified and characterized.

The data allowed calculation of distribution metrics such as number of sites where a plant species is found, relative percent frequency of species occurrence, frequency of occurrence within vegetated areas, frequency of occurrence at all sites, and maximum depth at which plants are found. The data will also allow calculation of metrics such as total number of points sampled, total number of sites with vegetation, total number of sites shallower than maximum depth of plants, frequency of occurrence at sites shallower than maximum depth of plants, Simpson Diversity Index, maximum depth of plants (feet), average number of all species per site, average number of native species per site, and species richness.

An innovative component of the Phase 2 project was the development and initiation of two volunteer-based monitoring programs of vertebrate indicator animals: anurans (frogs and toads) and fish. Monitoring of each of these taxa can provide important information for lake and watershed management.

In the case of frog and toad surveys, a standard protocol was developed in communication with Mike Meyer (WDNR researcher). Several existing volunteer based monitoring programs provided important models and guidance for the program for monitoring amphibians in the Lake Alice watershed using volunteer monitors. More details of the methods used can be seen in the monitoring report in Appendix E.

For the volunteer-based angler survey, models from other regions of the U.S. provided guidance for developing the protocols. This activity will be done in concert with WDNR scientists and managers who provided several reviews of the data form. Volunteer derived fish data can augment fish data collected by WDNR fish studies on Lake Alice. An advantage of such data is it they come from on-going angling activity rather than periodic surveys (usually separated by several year intervals). Noteworthy occurrences (such as the discovery of an aquatic invasive species) or trends in fish sizes or numbers will be reflected in this volunteer data. As an example of the efficacy of this approach, a study reported in the American Fisheries Society Online Journals (Vol. 29, Issue 5) examined use of volunteer angler survey data for assessing length distribution and seasonal catch trends of trophy largemouth bass. Volunteer data were compared with agency collected data as a means to validate volunteer data and length distributions by inch-group. The study found no significant difference between survey methods, validating the fish length reported by volunteers. Additional detail regarding the protocol is provided in Appendix D.

CHAPTER 5

What is the State of Lake Alice and its Watershed?

An understanding of the history, features, and conditions of the Lake Alice and its landscape is the foundation for developing and implementing strategies that seek to protect and restore the biological health of the area. In Phase 1, we focused on existing information relating to the Lake Alice. In Phase 2, we collected new information about plants, animals, and water quality. We have sought out the kind of information useful to devising the adaptive management plan for the lake. Future phases will collect and incorporate additional information about Lake Alice.

This chapter is intended to teach us about Lake Alice. What is the lake like? What is the surrounding landscape? What organisms live here? What is the human community? How healthy is the lake? How have humans contributed (or detracted) from that health? Do threats to watershed health exist? This chapter identifies and organizes information and reports on new findings

If you are new to Lake Alice and its surroundings, this chapter will make you familiar with features and conditions that exist here and provide some insight as to why things are the way they are. If you are a life-long resident of the Lake Alice area, you may be familiar with parts of the discussion in this chapter. You may have things to contribute or correct. This would be a welcome response. Become engaged! Improve the understanding of the watershed by adding your knowledge in future iterations of this plan.

We present Chapter 5 in ten Parts, the first nine fall into descriptive categories: the lake; the history; water quality; fisheries; aquatic plants; rare species; non-native species; frogs and toads; and special attributes. The tenth section summarizes the environmental threats that impinge on Lake Alice and its watershed.

Part 1 – Lake Alice and the Surrounding Area

The Lake Alice Stewardship Program views Lake Alice as part of a larger landscape ecosystem (referred to as the Lake Alice Watershed). The watershed affects the lake and the lake influences the watershed in a tightly connected ecological system. Although Phase 1 of

the program focused primarily on Lake Alice itself, future phases will address other aspects of the watershed (including the nearby riparian ecosystem) as part of an integrated and adaptive management system. To provide context for this report, this section describes Lake Alice and its surroundings.

Lake Alice is a 1,369 impoundment lake on the Wisconsin River. It is located immediately east of the town of Tomahawk in Lincoln County, Wisconsin. Despite its large surface area, Lake Alice is a fairly shallow lake and has a maximum depth of about 32 feet. Lake Alice can be best described as an "impoundment" in the Wisconsin River as its water level is controlled by King's Dam (operated by Tomahawk Power and Pulp and controlled by Wisconsin Valley Improvement Company). Exhibit 1 shows the Lake Alice area and identifies some major landmarks.

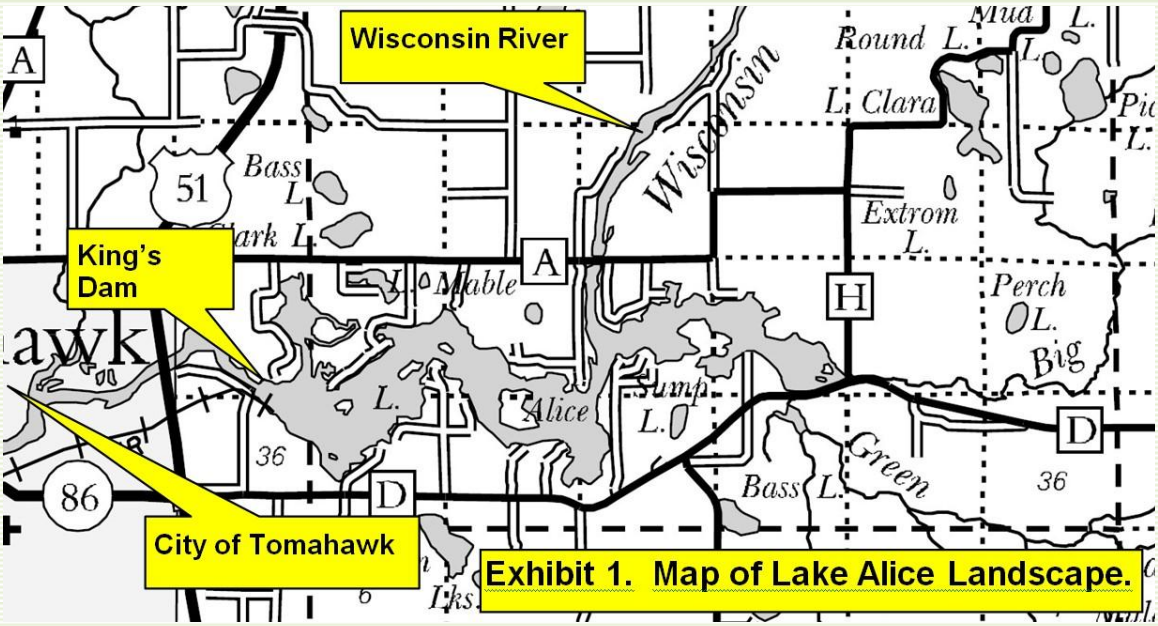


Exhibit 1. Map of Lake Alice Landscape.

Lake Alice is an important resource used by the public for a diversity of recreational pursuits. There are seven public access sites on Lake Alice with a total of forty-one parking spaces. A portage has been installed and maintained around King's Dam to facilitate canoe and kayak enthusiasts in getting around the dam. There are twelve daily rental and one-

hundred yearly rental campsites available around Lake Alice. Public access for fishing from shore is available at the ends of township roads and at several points along Hwy D and Echo Valley Road. Public access for shore fishing is also available on the King's Dam property (except in the immediate vicinity of the dam). Lincoln County owns several small islands on Lake Alice that are used for camping and waterfowl hunting. Up the river from Lake Alice, The State of Wisconsin owns 1,785 acres of land available for public use including hunting and fishing. Some of the land is only accessible by water route from public access sites on Lake Alice. Fishing tournaments are a fairly frequent occurrence on Lake Alice.

At a continental scale, Lake Alice is a part of the Upper Mississippi Water Resource Region (see Exhibit 2.) Waters that flow from Lake Alice eventually enter the Mississippi River and flow into the Gulf of Mexico.

Exhibit 2. United States Water Resource Regions (Source: USGS)

The Upper Mississippi Water Resource Region is further divided into sub-regions (Exhibit 3) and Lake Alice is in the northern part of Sub-region 0707. Exhibit 4 displays the next subdivision (accounting unit) and Lake Alice is in Accounting Unit 070700.

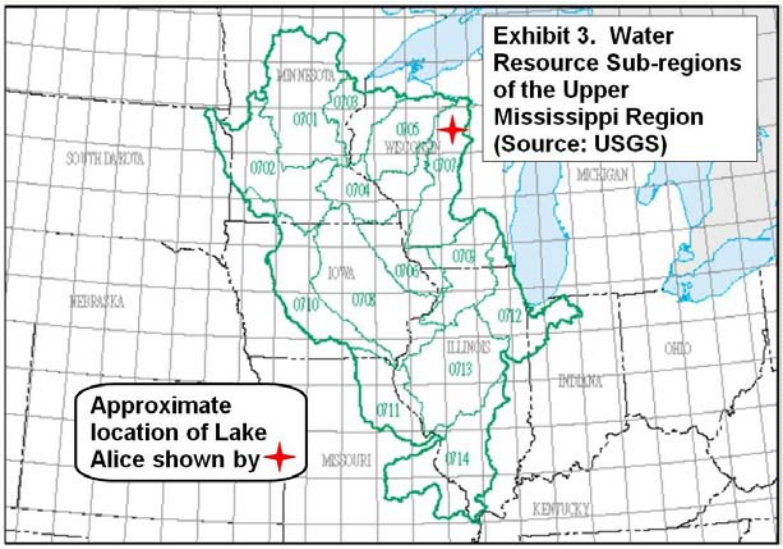


Exhibit 3. Water Resource Sub-regions of the Upper Mississippi Region (Source: USGS)

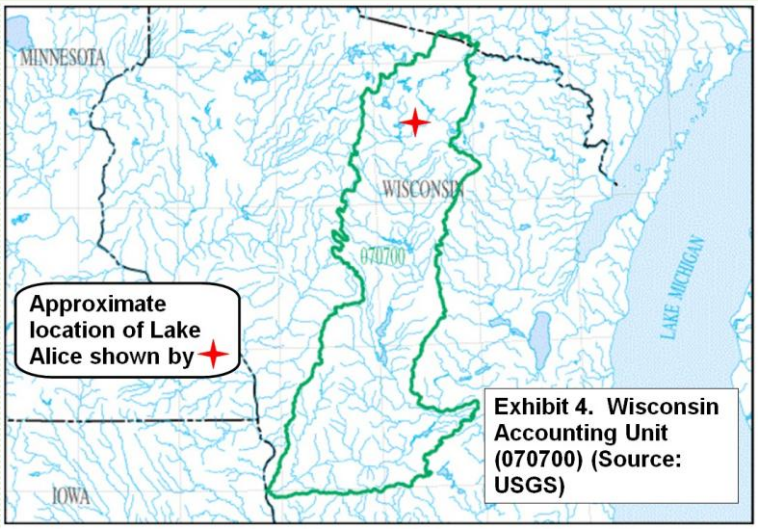
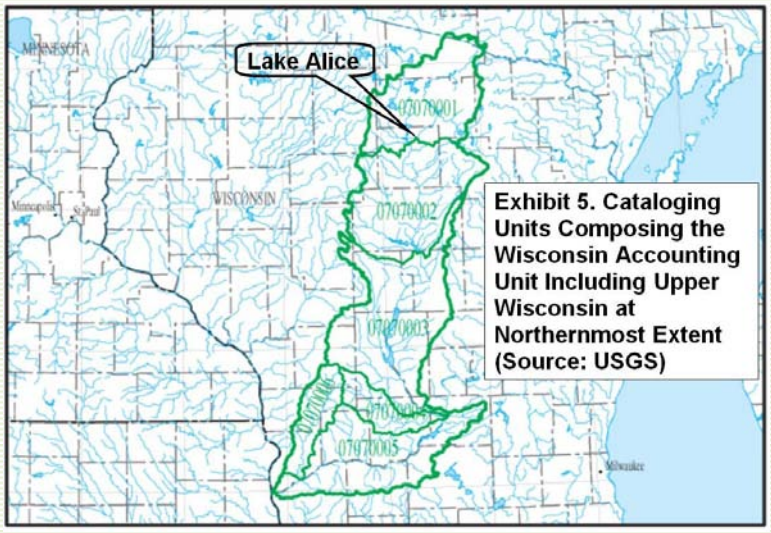
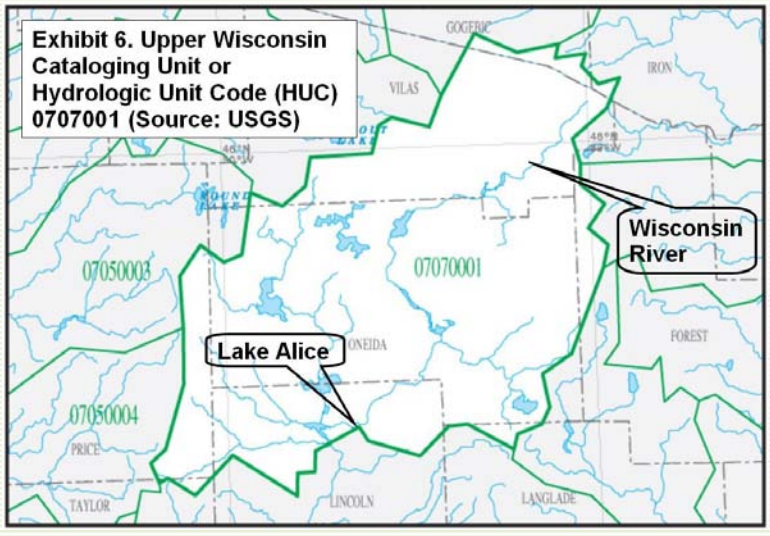


Exhibit 4. Wisconsin Accounting Unit (070700) (Source: USGS)

Exhibits 5 and 6 show further subdivisions and detail of the accounting unit and the location Lake Alice. More can be found at http://water.usgs.gov/wsc/map_index.html.





As part of this Phase 1 work, we delineated the total watershed for Lake Alice as that part of the watershed located upstream of King's Dam (near Tomahawk, Wisconsin). This is illustrated in Exhibit 7. This total watershed for Lake Alice extends up into Michigan's Upper Peninsula and includes over 1,200 square miles of surface area. All water runoff from the land and all of the streams in this region eventually feed into Lake Alice. Likewise, discharges from industry and waste water treatment plants potentially influence Lake Alice.

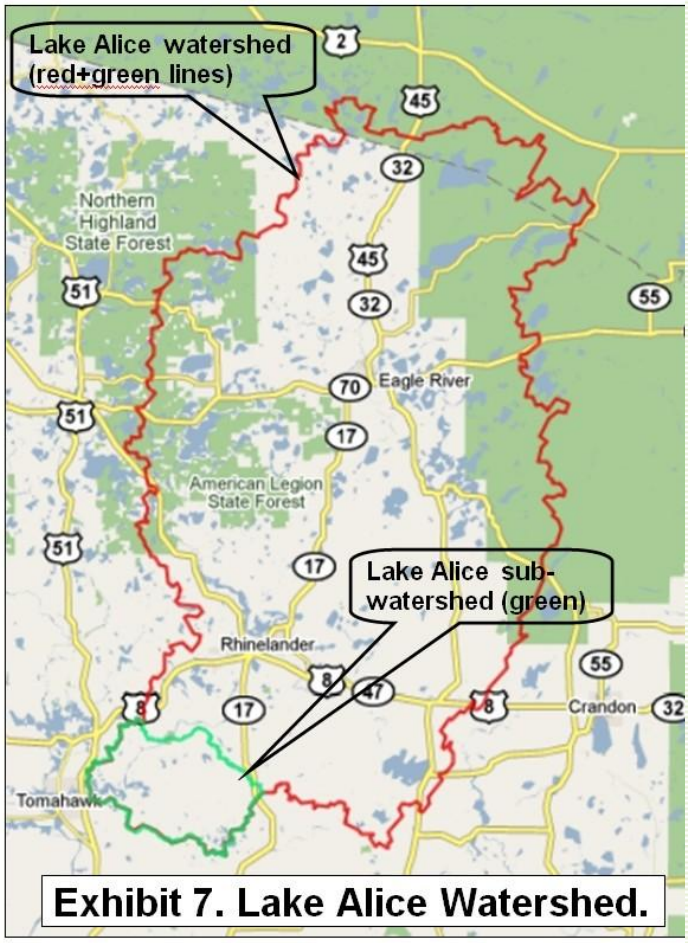


Exhibit 7. Lake Alice Watershed.

In order to have a more practical sized watershed with which to work in the Lake Alice Stewardship Program, we delineated a sub-watershed that extends from King's Dam up to the point where Trout Creek enters the Wisconsin River (approximately four river miles upstream of County Highway A. This sub-watershed is also illustrated in Exhibit 7. The Lake Alice sub-watershed is approximately seventy-four square miles (47,500 acres) and is located entirely within Lincoln County, Wisconsin.

The Lake Alice sub-watershed has relatively low topography, ranging only about 400 feet in elevation from high points in the landscape to the low point on Lake Alice. The southeastern part of the sub-watershed has the highest elevations. A digital elevation model is provided as Exhibit 8 and shows the relative elevations for the sub-watershed.

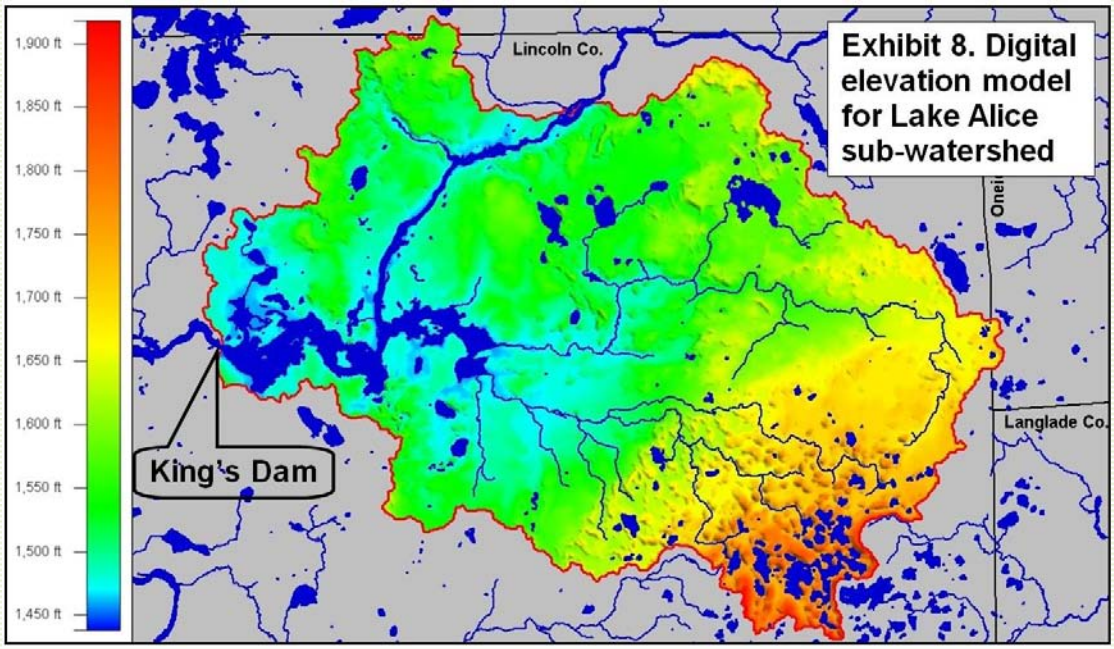


Exhibit 8. Digital elevation model for Lake Alice sub-watershed

Both the total Lake Alice watershed and the Lake Alice sub-watershed are comprised of soils with good infiltration capacity. Soils are classified by the Natural Resource Conservation Service into four Hydrologic Soil Groups based on the soil's runoff potential.[1] The four Hydrologic Soils Groups are A, B, C and D and range from Group A soils with the smallest runoff potential to Group D soils with the greatest. Group A is sand, loamy sand or sandy loam types of soils. It has low runoff potential and high infiltration rates even when thoroughly wetted. Group A soils consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission. Group B is silt loam or loam and has a moderate infiltration rate when thoroughly wetted and consists chiefly of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. Rain water or snow melt water tends to be readily absorbed by Group A and Group B soils making the risk of erosion relatively low. Group C soils are sandy clay loam. They

[1] *Details of this classification can be found in 'Urban Hydrology for Small Watersheds' published by the Engineering Division of the Natural Resource Conservation Service, United States Department of Agriculture, Technical Release–55.*

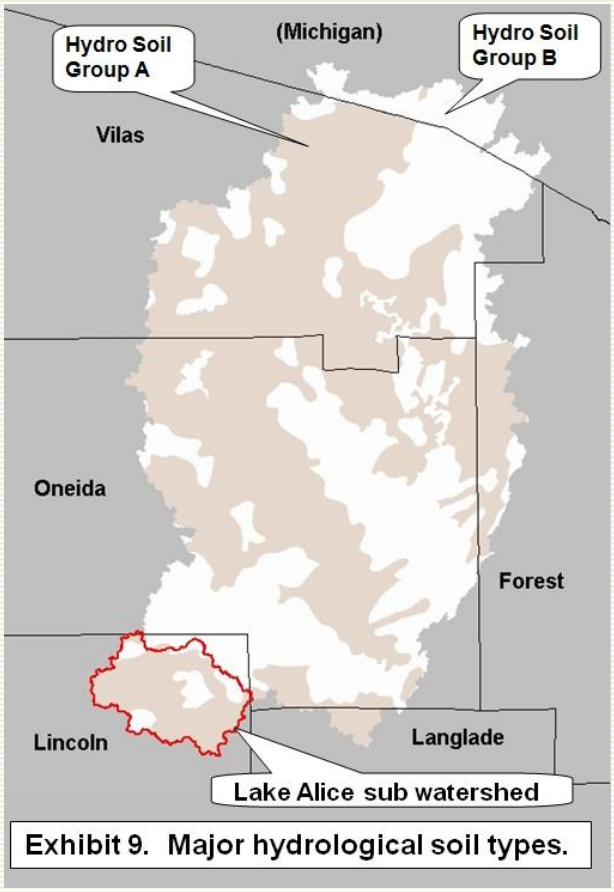


Exhibit 9. Major hydrological soil types.

have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine structure. Group D soils are clay loam, silty clay loam, sandy clay, silty clay or clay. This soil group has the highest runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material. The Lake Alice watershed is comprised only of soils in Groups A and B (Exhibit 9).

The general land cover types in both the Lake Alice sub-watershed and the total Lake Alice watershed are quite similar. Exhibit 10 provides a summary by acres and percent surface area for both. The total watershed (nearly 800,000 acres) has a somewhat larger percentage of open water/wetland (about 40% of the surface area) than the sub-watershed (about 31% of the surface area). Agricultural land represents a fairly small portion of the watershed, but is somewhat higher in the Lake Alice sub-watershed. Forested land is at a greater proportion of the landscape in the Lake Alice sub-watershed than in the total watershed. Residential areas (both high density and low density) represent less than 5% of the landscape surface area in both total and sub-watersheds for Lake Alice. Exhibit 11 presents the land cover types (in fairly low resolution) in the Lake Alice sub-watershed.

Exhibit 10. Lake Alice Watershed General Cover Types				
	Total Watershed		Sub-Watershed	
	Acres	% Acres	Acres	% Acres
Water/Wetland	31,5437	39.86	14,570	30.67
Commercial	988	0.12	3	0.01
Agricultural	18,088	2.29	2,717	5.72
High Density Residential	4307	0.54	106	0.22
Low Density Residential	33,414	4.22	1,886	3.97
Grassland/Pasture	7,552	0.95	978	2.06
Forest	41,1134	51.95	27,240	57.35
Industrial	480	0.06	0	0.00
Total	**791,400**	**100.00**	**47,500**	**100.00**

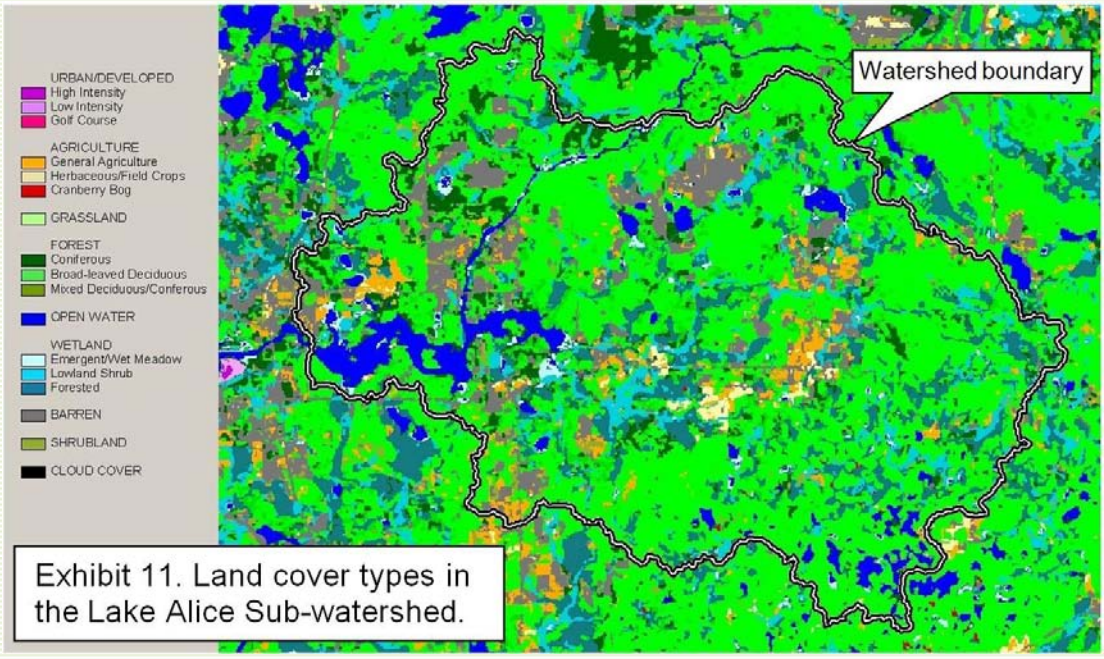


Exhibit 11. Land cover types in the Lake Alice Sub-watershed.

Part 2. Human History

The human history of Lake Alice is one hundred years old in 2010 since Lake Alice was created by impounding the Wisconsin River in 1910. Humans are now and have always been an important influence in the watershed. This management plan recognizes that condition.

In the not too distant past, the Lake Alice landscape was molded and influenced by natural disturbances such as fires, blowdowns, floods, beaver, insect outbreaks, and climate. Today's landscape is the obvious result of the combined interaction of human and natural processes, with humans nowadays serving as the most significant agents of change. The LAA has prepared a history of Lake Alice and this is included in its entirety in Appendix B.

Exhibit 12: A New Generation

The Lake Alice Association believes that the long term health of Lake Alice will be ensured if young people become involved with the process of stewardship. To initiate that process, the LAA organized and hosted a school field trip. In September of 2009, over forty THS biological science students participated with their teachers, LAA members, and Dr. Dean Premo from (White Water Associates) in a field trip on Lake Alice. Key features of the lake were viewed and interpreted. Shoreline assessments were conducted. Water quality sampling was demonstrated. Students documented the outing with notes and digital photography. Back at school, students interpreted notes from the field and organized multi-media presentations of their experiences.

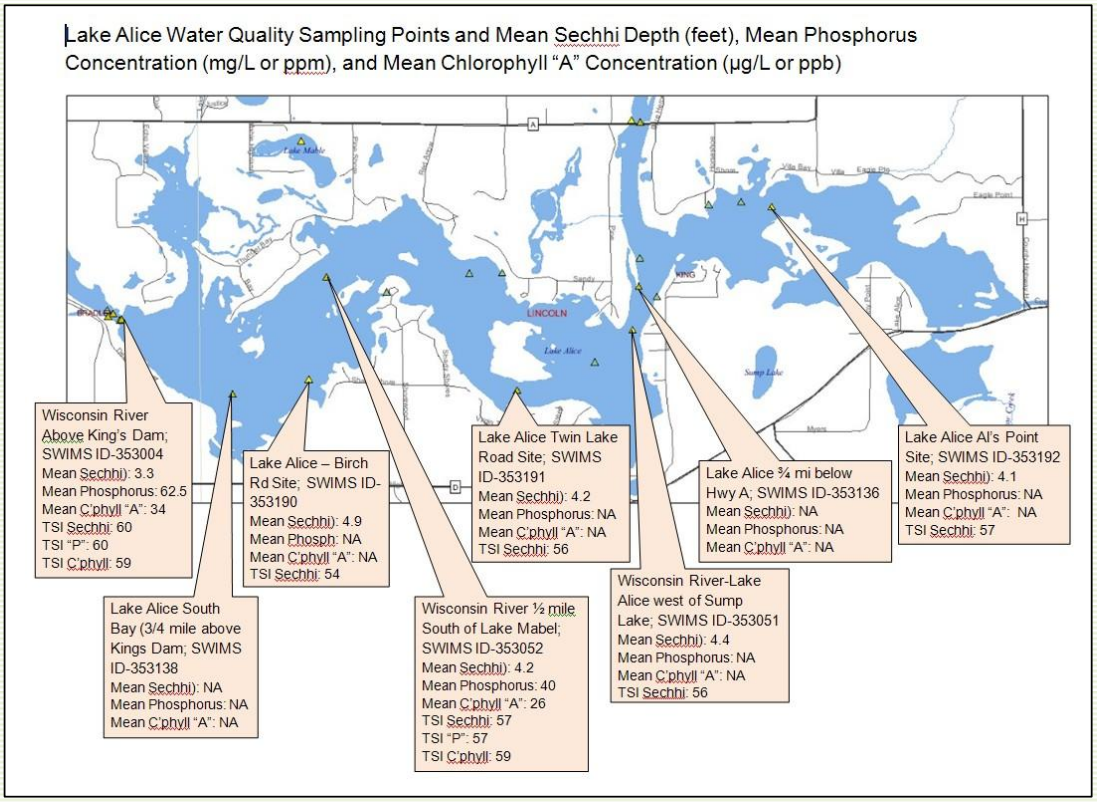
On a pleasant September 2009 day, eight pontoon boats ferried students around Lake Alice (Dean Premo photo)

In recent years, the Lake Alice Association has organized around a common concern for the long-term care of Lake Alice. This has begun a very hopeful chapter in the history of Lake Alice. The LAA has actively become involved with all aspects of Lake Alice resources and with educating those that live near and use the lake. Perhaps most importantly for the future, the LAA has initiated a relationship with Tomahawk High School biological science teachers and students in order to enlist a new generation of lake stewards (see Exhibit 12).

Part 3. Lake Alice Water Quality

A limited set of Lake Alice data (Exhibit 13) is available from the WDNR Self-Help Monitoring Program database.[2] Sechhi transparencies, Chlorophyll "a", and total phosphorus all indicate that Lake Alice should be classified as "eutrophic." The Carlson's Trophic State Index (TSI)[3] also indicates an enriched lake. Eutrophic lakes (Exhibit 14) typically have high nutrients, are highly productive, and support large biomass (all plants and animals in the lake). Eutrophic lakes host high densities of aquatic plants and are prone to algal blooms. Many can experience dissolved oxygen depletion.

Exhibit 13: Lake Alice Water Quality Monitoring.



[2] *Data can be accessed through WDNR at http://www.dnr.state.wi.us/org/water/fhp/lakes/lakesdatabase.asp*

[3] *TSI is determined using a mathematical formula and values for Secchi disk depth, phosphorus concentration, and Chlororphyll "a" concentration. TSI values range from 0 to 100, with lakes that are less fertile having lower TSI values. TSI values that are >50 are considered eutrophic.*

The shoreline development index is a quantitative expression derived from the shape of a lake. It is defined as the ratio of the shoreline length to the length of the circumference of a circle of the same area as the lake. A perfectly round lake would have an index of 1. Increasing irregularity of shoreline development in the form of embayments and projections of the shore is shown by numbers greater than 1. For example, fjord lakes with extremely irregularly shaped shorelines sometimes have SDI's exceeding 5. The Shoreline development index for Lake Alice is 5.2. This high number indicates that the lake has a large area of potentially productive littoral zone habitat (shallow water habitat). This translates as good habitat for fish species and other aquatic animals present in the Lake Alice ecosystem.

Exhibit 14: Trophic Status

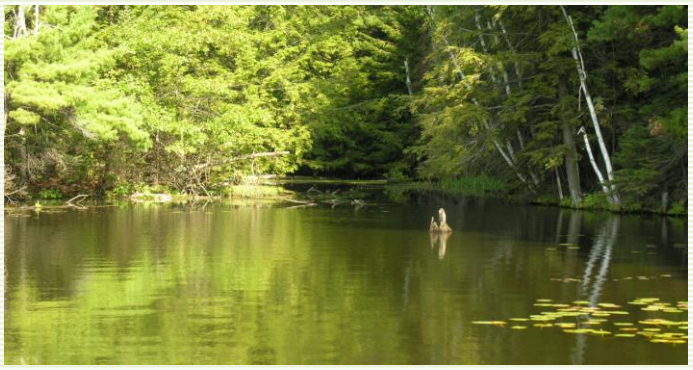
Trophic state *of a lake is an indicator of water quality. Lakes are typically divided into three categories of trophic state: oligotrophic, eutrophic, and mesotrophic.*

Oligotrophic *lakes are clear, deep, and free of weeds or large algal blooms. They are low in nutrients and do not support large fish populations, but they can develop a food web capable of sustaining a desirable fishery.*

Eutrophic *lakes are high in nutrients and support large biomass (plants and animals). They are usually either weedy or subject to large algal blooms or both. Eutrophic lakes can support large fish populations, but are also susceptible to oxygen depletion. Small, shallow, eutrophic lakes are especially vulnerable to winterkill.*

Mesotrophic *lakes are intermediate between the oligotrophic and eutrophic. The deepest levels become devoid of oxygen in late summer and limit coldwater fish. Anoxic conditions at the water-sediment interface causes phosphorus to be released from the sediments.*

Over long periods of time, lakes go through natural aging from oligotrophic through mesotrophic to eutrophic. As part of this process, they begin to fill in. This aging process can be sped up by introductions of sediments and nutrients. (Shaw et al. 2002).



A quiet cove on Lake Alice (D. Premo photo)

Additional water quality analyses from samples collected in 2010 are consistent with the previous water quality findings.

Part 4. Lake Alice Fisheries

In Phase 1 of the program we reviewed existing information about Lake Alice and interviewed WDNR fisheries biologist to glean additional information. In Phase 2, we designed and implemented a volunteer anglers journal as way of gathering information about Lake Alice fisheries that is complimentary to the periodic WDNR fish surveys on the lake. Outcomes from both of these undertakings (Phases 1 and 2) are presented in this section.

On July 16, 2009, Dean Premo (White Water Associates) interviewed Dave Seibel (Fisheries Biologist for Lincoln County, WDNR) regarding the Lake Alice fishery. A list of questions was sent to Seibel several days prior to the phone interview. The following is an account of the conversation prepared by Dean Premo, with supplemental information on stocking and fish survey coming as data provided by Dave Seibel. Dave Seibel reviewed a draft of this account.

Question: Please describe a general overview of the Lake Alice historical fishery.

The Wisconsin River has historically been a good walleye fishery and prior to industrialization was a great fishery. Paper mills, dams, and the associated pollution and environmental effects degraded the river system greatly. This degradation continued until the Clean Water Act (1978) when a turn-around began that continues today. In the decades prior the Clean Water Act, the Wisconsin River (including that part of it in the vicinity of Lake Alice) was heavily polluted. Fisherman reported that the fish flesh gave off a terrible odor when it was cooked. The Wisconsin River provides quite a success story for the Clean Water Act. Once again, the Wisconsin River has healthy water and a great fishery.

Historically, the Wisconsin River, including the Lake Alice area, has been managed primarily for walleye. Other fish were managed in order of their perceived importance to the fishery. These fish species included muskellunge, northern pike, smallmouth bass, largemouth bass, bluegills, crappie, and yellow perch.

Lake Alice has been a good natural fishery since its creation. WDNR stocking records (summarized in Exhibit 15) date back to the late 1930s and show a large variety of fish that were introduced to Lake Alice. Stocking began in 1938 with introduction of 3,000 adult bluegills, 3,000 adult crappies, and 50,000 walleye fingerlings. Interestingly, it would be twenty-five years before walleye were again stocked when in 1963, 22,740 fingerlings were planted. Another ten thousand fingerlings were stocked in 1969 just prior to a fourteen year period (1969-1983) when no fish were introduced to Lake Alice due to high mercury levels in

fish. Starting in 1983 walleye became the major focus of fish introduction into Lake Alice with over 400,000 being planted from 1983 to 2000.

Exhibit 15: Historical record of fish stocking in Lake Alice.

Species	Number	Comments
Walleye	450,000	Stocked in 1938, 1963, 1969, 1983, 1986, 1990, 1992, 1994, 1996, and 1998 as fingerlings. Stocked in 1994, 1999, and 2000 as six to nine inch fish.
Northern pike	375,000	Stocked annually 1940 through 1946 as fry.
Largemouth bass	38,186	Stocked 1941, 1944-1946, 1950, and 1952 as fingerlings.
Muskellunge	29,000	Stocked in 1948, 1951, 1953, 1954, 1955, 1956, 1957, 1959, 1960, 1961, 1962, 1965, and 1989 as fingerlings. Stocked in 1994 and 1997 as eight to fifteen inch fish.
Channel catfish	18,000	Stocked in 1989, 1990, and 1991 as six to eight inch fish.
Smallmouth bass	6,000	Stocked only one time in 1941 as fingerlings.
Bluegill	4,100	Stocked in 1938 and 1939 (adults) and 1939 (fingerlings).
Crappie	3,000	Stocked in 1939 as adults.
Yellow perch	250	Stocked in 1939 as fingerlings.

Channel catfish (not native to this part of the Wisconsin River system) were introduced in 1989, 1990, and 1991. Two catfish in recorded during a 2003 WDNR fish survey. These were likely from the original stocking. Since 2000, no fish stocking (of any species) has occurred in Lake Alice.

Question: How does this historical fishery compare with the current Lake Alice fishery?

The current Lake Alice fishery is similar to the historic fishery although the water quality is currently much higher than it was between time of industrialization and 1978 (Clean Water Act was enacted). The current fishery is very good and self-sustaining. No fish have been stocked for about ten years. Lake Alice is one of the better fisheries in the vicinity. It

displays good populations of all fish species (game and panfish). A healthy distribution of fish sizes (including large fish) exists within each of the species in the community.

This self-sustaining condition is a very desirable condition and a goal of the WDNR for Lake Alice. Based in good quality habitat and high water quality, a self-sustaining fish community offers not only recreation and food to human users, but provides important food and other habitat requirements for many animals.

It is important for the lake stewards and recreationists to understand the value of a healthy self-sustaining fishery. Resource agencies cannot create fish communities as well as nature can if the right habitat and water quality is present. Fishery biologists within the WDNR have become more knowledgeable about the ecosystem effects of stocking fishes in a system of naturally reproducing populations and have become aware of negative consequences. Disease communication, diminishment of gene pool, and introduction of exotic species are all serious considerations. Any future stocking will consider the risks as well as the potential values.

Question: What are the overall management goals for the fish community in Lake Alice?

The WDNR envisions Lake Alice management priorities with respect to fish species to continue with the way it has been in the past. The greatest management attention will directed to walleye. Muskellunge, northern pike, smallmouth bass, largemouth bass, and panfish (listed in order of approximate management importance) will also be part of the overall management scheme. Panfish in the Lake Alice system include bluegill, crappie, bullhead, yellow perch, and pumpkinseed. The WDNR's goals are directed toward a balanced community of native predator and prey species. The agency will seek to achieve this through self-sustaining populations and use of creel limits, size limits, and fishing season dates as well as habitat improvement when appropriate. Redhorse, suckers, and trout perch are also critical members of the fish community and must be present if the system is to be considered healthy.

Question: What are specific goals for individual species within the Lake Alice community?

The WDNR manages to maintain self-sustaining naturally reproducing species and balanced populations in the system. For walleye the WDNR hopes to maintain adult populations above 3 adults per acre (this is the average for northern Wisconsin). For muskellunge, they will try to maintain adult pop above 0.2/acre (again, an average for northern Wisconsin). They are in the process of assessing populations of other fish species in

the system and will set goals accordingly. The WDNR tends to survey Lake Alice fish populations fairly infrequently (it is a large and expensive undertaking). Surveys were conducted in 1977, 1982, and 2003. It will be ten or twelve years before another one is done on Lake Alice (the WDNR's goal is to survey on ten to twelve year intervals). Assessing whether population goals are being met is thus a fairly long term endeavor. Wisconsin River impoundments tend to have high predator densities. This serves to keep the prey densities in check (lower numbers, but high quality bluegills and perch). Three tools are available to the WDNR to achieve their fish management goals: (1) preserve and protect habitat, (2) protecting and improving water quality, and (3) establishing appropriate fishing regulations (fishing seasons, size limits, and bag limits). In 2009, the fishing season for walleye, northern pike, smallmouth bass, and largemouth bass in the Lake Alice system changed from a continuous year-round open season to being closed after the first Sunday in March through the first Friday in May to align with most inland lakes in the state.

Question: How would you rank the quality of fish habitat in Lake Alice?

Great fish habitat exists in Lake Alice. There is a large quantity of standing timber (literally, acres of trees sticking out at the water line). There is a lot of shallow water habitat with diverse and abundant native aquatic plants. There seems to be a good balance of deep water and shallow water habitat, but this attribute is not well studied or understood or even documented on maps. Spawning habitat is present and of good quality for the fish species of management interest in Lake Alice. There are good gravel areas in Lake Alice for smallmouth bass and other fish spawning habitat. Some of the walleye population spawns in the lake while a good many walleyes travel from the lake up the Wisconsin River for spawning.

Question: Are their habitat components or other Lake Alice attributes that require restoration or other management attention?

Perhaps first and foremost is to protect against introduction of aquatic invasive species (AIS). The healthy and diverse native aquatic plant community is the best defense against AIS establishment, but education of boaters and monitoring at boat launches is important in a popular water body like Lake Alice. The entire eastern bay of Lake Alice (often known as the "Pine Creek Flowage," where Pine Creek enters the system) forms a crucial habitat complex. The northerly extending bay off of the King's Dam Reservoir zone of the lake (near the county club) is also an important shallow, well-vegetated habitat.

The large woody material in Lake Alice is a critical part of the fish habitat and should be maintained. Under low water conditions (such as drawdowns for dam repair) there is a temptation to cut down some of the standing timber and remove stumps, but this would be detrimental to fish habitat. Any areas with standing submerged timber should be protected. After assessment of the Lake Alice shoreline habitat and documentation of habitat need, it is possible that dropping trees from the shoreline into the littoral zone would create beneficial habitat.

In so far as possible, the large privately owned islands and other undeveloped islands are important to preserve and maintain as high quality habitat for Lake Alice.

Question: Are non-native fish present in Lake Alice?

No non-native fish are known to be present in Lake Alice (other than the introduced channel catfish that were previously mentioned). Common carp and white bass are not present. None of the Great Lakes AIS fish are present. Rusty crayfish is present, but apparently not creating a big problem with aquatic plants. Smallmouth bass and rock bass are important controllers of this AIS crayfish.

In Phase 2 of the Lake Alice Stewardship Program we established a means by which anglers could collect meaningful fisheries data. Members of the Lake Alice Association and White Water scientist Dean Premo worked closely with the WDNR to develop the Volunteer Angler's Journal. The goal of the journal (and the resulting data) is to augment the discrete periodic WDNR fish surveys (including Fyke nets, electroshocking, and creel surveys) with continuously collected and annually reported fishing data from systematically recorded angler journals. The report in Appendix C describes the protocol thoroughly and presents individual journal entries from 2010.

Part 5. Lake Alice Aquatic Plants

Until 2010, there had been no known formal surveys or studies of aquatic plants in Lake Alice. A few anecdotal records regarding aquatic plants did exist and are summarized in the first few paragraphs of this section. We summarize the results of the formal point-intercept aquatic plant survey conducted in 2010 at the end of this section and present it more fully in Appendix D.

Laura Herman (WDNR, Aquatic Plant Specialist) visited Lake Alice on at least two occasions to investigate specific concerns. She recorded aquatic plant species observed. In 1997, Herman visited the vicinity of Surewood Forest Campground pier area. She recorded burred, fine-leaf pondweed clasping leaf pondweed, coontail, large-leaf pondweed, vallisneria, and sagiteria. In 2001 at a site near Deer Run Road, Herman observed pickerelweed, white water lily, yellow water lily, fern pondweed, floating leaf pondweed, great bladderwort, coontail, and calla.

Wild Rice is an important component of the Lake Alice ecosystem. The eastern component of Lake Alice is the principal population, especially the area referred to as Green Meadow Flowage (where Green Meadow creek enters the system. This provides food and habitat for numerous species – both game and non-game (Exhibit 16).

Exhibit 16: Wild Rice - *The Good Berry*

To the Anishinaabe (the Ojibwe people), wild rice is known as *manoomin*, which translates into "the good berry." According to Ojibwe tradition, centuries ago the Ojibwe were instructed to find the place where "the food grows on the water." This ultimately led them to the shores of Lake Superior and the northern inland lakes of the Michigan, Wisconsin, and Minnesota where flowing fields of manoomin were found in abundance. Seen as a special gift from the Creator, manoomin became a healthy staple in the Ojibwe diet.

Wild rice is important in the ecology of many lakes and streams. Its nutritious seeds have long been recognized as a valuable waterfowl food. Within its core range in Minnesota and northern Wisconsin there may be no food more important to waterfowl. Wild rice also benefits breeding waterfowl, providing roosting and loafing areas to adults and essential cover for the young.

From the muskrat that feeds on a tender spring shoot, to the invertebrate that lives on the fall's dying straw, wild rice benefits a wide range of species because of the food, cover, or physical structure it adds to the environment. The habitat it provides species ranging from aquatic snails to moose adds to the biological diversity of the wetlands where it is found. Rice beds can be important nursery areas for young fish and amphibians, and they attract rails, red-winged blackbirds and other species of birds in the fall. Wild rice also maintains water quality by binding loose soils, tying-up nutrients and slowing winds across shallow wetlands. These factors can increase water clarity and reduce algae blooms. Wild rice is an ecological treasure.

In 1994, the WDNR (Jim Kreitlow, Water Quality Planner) identified algae in a sample taken from Lake Alice. This sample contained green algae (*Dichotomosiphon, Scendesmus quadricauda, Pandorina,* and *Golenkinia*) and diatoms (*Melosira granulate, Fragillaria, Gomphonema, Golenkinia,* and *Caloneis*).

In 2010, White Water scientists conducted a formal point-intercept aquatic plant survey on Lake Alice over the course of three days in mid-summer. We recorded a total of twenty-nine species of aquatic plants on Lake Alice. The aquatic plant community was diverse and had high floristic quality. The previous record of the AIS Curly-leaf Pondweed (AIS) was confirmed and will be investigated further in future phases. An aquatic plant management plan was prepared that fully reports the survey's finding and lays out an approach to aquatic plan management in Lake Alice.

Part 6. Lake Alice Rare Species

Because of it habitat quality and fishery, Lake Alice is home to rare species of vertebrate animals such as bald eagles and common loons. Both species nest at Lake Alice. Standing dead timber (submerged during the original flooding of Lake Alice) makes areas of the lake fairly secluded because it hinders boat traffic from entry and high speed boating. This maintains quiet areas for these relatively shy species. Ospreys are also present.

Small wetland ponds exist in several places in close proximity to Lake Alice and these rather rare habitats provide marvelous areas for amphibians, reptiles, birds, and mammals. These habitats often go unnoticed but they contribute enormously to the biodiversity of the Lake Alice Landscape. These wetlands are some of the first habitats to produce insects in the spring of the year and are therefore important stopover places for birds migrating north for breeding. The abundant forests and wetlands that are part of the Lake Alice riparian ecosystem provide habitat for fisher, otter, mink, black bear, gray fox, red fox, coyotes, muskrats, beaver, and white tailed deer.

In 1992, the WDNR conducted a survey of freshwater mussels in the King's Hydrolectric Project including Lake Alice (Heath 1992). This work was done to evaluate hydroelectric project operations on benthos (aquatic animals living on the bottom of the river/lake) and to determine presence/absence of endangered or threatened species. Thirteen mussel species were recorded in Wisconsin River immediately upstream of Lake Alice (see Exhibit 17) including three state special concern species (*Anodonta imbecillis, Lasmigona,*

compressa, and *Alasmidonta marginata*). None of these species were found in Lake Alice. The WDNR report concluded that the river reach in the vicinity of King's Dam showed much lower species richness (diversity) and presumed this to be due to historic adverse water quality. The report further concluded that the presence of dams on the Wisconsin River has fragmented the riverine habitat and prevented reoccupation by several mussel species now missing into areas with improved water quality. WDNR recommended reintroduction of nine presently absent mussel species in the King's Dam Project.

Exhibit 17: Mussels of the Wisconsin River upstream of Lake Alice

Species Name
Anodonta imbecillis
Anodonta grandis grandis
Anodontoides ferussacianus
Alasmidonta marginata
Lasmigona complanata
Lasmigona compressa
Lasmigona costata
Amblema plicata
Fusconaia flava
Actinonaias ligamentina carinata
Ligumia recta
Lampsilis siliqoidea
Lampsilis ventricosa

Part 7. Lake Alice Non-Native Species

Aquatic invasive plant species have not been noted as a concern in Lake Alice. There is a 1992 report by Gregory Hoffman (WBIS) of curly-leaf pondweed (source of this report: WDNR). Our 2010 aquatic plant survey confirmed this plant species is present and follow up work is ongoing to determine its population size. Eurasian water milfoil has not been reported in the past and was not found during our 2010 survey. Purple loosestrife has been reported from the Lake Alice area (near golf course and along County Road D).

There is a 2002 report to WDNR (reporter unknown) of rusty crayfish in Lake Alice. It is not known to have had detrimental impact. No follow up surveys or studies have occurred for this aquatic invasive species (AIS).

Two other aquatic invaders, spiny waterfleas and zebra mussels, have been surveyed in Lake Alice. Spiny waterfleas were checked for in Lake Alice by WDNR in 2006 and 2008 and were not found. Zebra mussels have been survey by using plate samplers by Tomahawk Pulp & Paper and by WDNR in 2000, 2001, 2006, and 2008. None have been identified.

Channel catfish were introduced to Lake Alice by the WDNR in 1989, 1990, and 1991. Two adult catfish were recorded during a 2003 WDNR fish survey and assumed to be from the original plantings. The fish is not apparently reproducing in Lake Alice. Common carp and white bass have not been found in the Lake Alice system.

Part 8. Lake Alice Frog and Toad Survey

One component of Phase 2 of the Lake Alice Stewardship Program was to establish a volunteer frog and toad survey of habitats in the Lake Alice watershed. The decline of amphibian populations in many areas in North America has prompted monitoring of local frog and toad populations. Many states (including Wisconsin) have developed frog and toad survey protocols for this purpose. We followed the Wisconsin Frog and Toad Survey Manual for site selection and field methodology and surveyed 15 sites in 2010. This was an audio survey, conducted at night, for calling male frogs and toads. Appendix E presents the methodology, locations and descriptions of field sites, and results from the 2010 survey.

Part 9. Lake Alice Special Attributes

Because of its large size, Lake Alice is often divided into five zones for purposes of discussion and navigation. The five zones are illustrated in Exhibit 18.

Members of the Lake Alice Association identified and compiled information about special attributes of Lake Alice. These are outlined in this part along with aerial photos that illustrate the locations of the described features (numbers in the text correspond with location numbers on aerial photos (Exhibits 19-23). Other features are likely to be added in future versions of the Lake Alice plan.

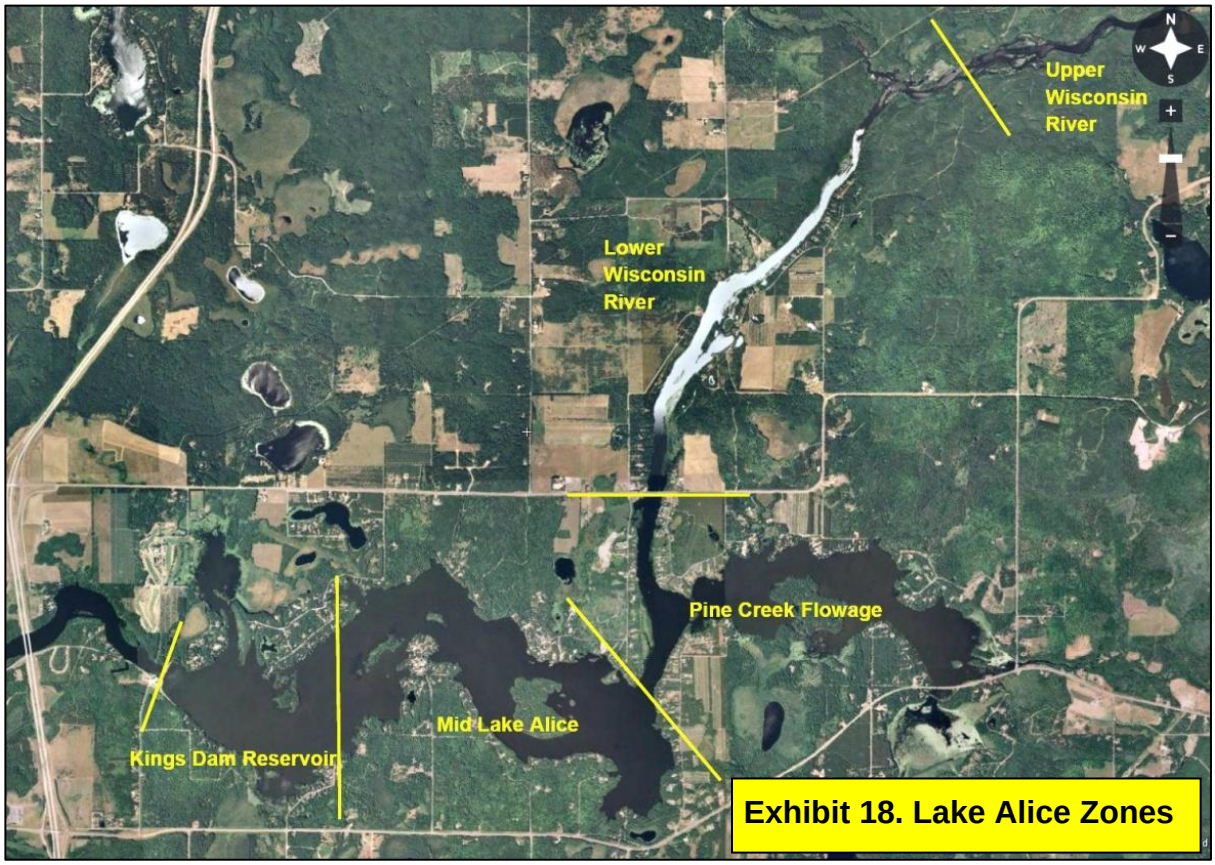


Exhibit 18. Lake Alice Zones

KING'S DAM (1, Exhibit 19) is owned and operated by the Tomahawk Power Company. The dam was built in 1910 creating Lake Alice, a 1,369 acre reservoir. Board members have obtained newspaper accounts and articles about the building of the dam, how Lake Alice got its name, description of the Pulp mill by the dam (Pulp Lake was a suggested name) and of the King family, who lived in this area. This information is contained in Appendix B). The river channel is the deepest from the dam to Generator Island.

GENERATOR ISLAND (2, Exhibit 19) is a privately owned island with high quality natural shoreline. Many of Lake Alice's islands are privately owned and, like Generator Island, are not overly developed. These provide refuge for birds, excellent shorelines and littoral zones for fish habitat, and an aesthetically attractive natural setting away from a comparatively more developed shoreline. This island and others like it are considered very high quality features of Lake Alice.

Exhibit 19. King's Dam Reservoir Attributes

EDGEWATER GOLF COURSE & BAY (3, Exhibit 19) is a large open landscape feature situated in the northern most part of the King's Dam section of Lake Alice. It borders a large shallow bay with excellent native vegetation beds (submergent, floating, and emergent varieties). This area provides great resting and nesting habitat for waterfowl. Fish habitat is also outstanding. The hunting and fishing recreational values of this area are very high. The bay is susceptible to algae blooms (the shallow, clear water and nutrient rich runoff from the surrounding land contribute to this predisposition). A proposed condo development included plans to dredge the shallow bay for a dock/marina. This project was abandoned and critical spawning areas were spared damage. Alice Lake Association President Glen Mott, defined the Lake Association's position as "encouraging responsible development, but discouraging ill conceived projects that threaten fragile areas, as this one."

ACTIVE EAGLE NESTS such as the one indicated in Exhibit 19 (at number 4) occur on several places on Lake Alice. This is a clear indicator of the health environment that Lake Alice represents. Bald eagles are relatively rare animals, but are frequently observed at Lake Alice.

PINE ISLAND (5, Exhibit 19) is a privately owned island with a high quality natural shoreline at the mouth of a bay on the southern shore of the King's Dam section of Lake Alice. The bay has a high density of large woody material in the form of stumps from timber

flooded at the time Lake Alice was created by damming the Wisconsin River. The structure is good for ducks and has high quality bluegill spawning habitat.

OLD RAILROAD TRACKS (6, Exhibit 19) can be seen along the southern shore of the King's Dam section of Lake Alice. This is an historic feature of Lake Alice. Lake Alice Association board member, Neal Pietenpol obtained an historical video describing how Tomahawk's founder, William Bradley, engineered and used this rail as part of his vision of commercial development of logging along with the harnessing and "taming" of the Wisconsin River through impoundments. Lake Alice was one such impoundment that was originally created as part of a commercial enterprise.

THUNDER BAY (7, Exhibit 19) is a secluded narrow bay North of Generator Island. It is provides good cover for waterfowl and spawning habitat for fish.

LONG ISLAND (8, Exhibit 20) and ***GRASS ISLAND*** (9, Exhibit 20) are located in Mid-Lake Alice and provide resting areas for waterfowl and spawning areas for fish that are protected from the heavily used river channel.

PINE SHORE BAY (10, Exhibit 20) is a highly developed area of Mid-Lake Alice.

SPRING POND (11, Exhibit 20) is a high quality spring fed pond that likely existed prior to the creation of Lake Alice. Its water level reflects surrounding water table and often has a different water level than Lake Alice. When Lake Alice water level was lowered for dam maintenance, the pond level remained the same. The drought conditions experience in the past five years has caused a lowering of water in the pond. This pond stays clear even when the lake is experiencing an algal bloom. It has a diverse community of native aquatic plants. This permanent open water wetland forms habitat for numerous species of invertebrate and vertebrate animals. The mosquito population in this pond is low indicating a healthy pond ecosystem with invertebrate and vertebrate predators that keep mosquitoes in check. Many snapping and painted turtles use the pond. Leopard frogs, spring peepers, gray treefrogs, green frogs, and bull frogs use the pond. Migrating waterfowl and songbirds use the pond and the surroundings as stop-over habitat. Other similar ponds exist in the Lake Alice watershed.

KRULL ISLAND (12, Exhibit 20) is a fifty-four acre undeveloped island, flanked to the east by a large submerged stump field. Considered as very high quality habitat, this island provides aesthetic value to the lake and habitat for numerous terrestrial species. The undeveloped shoreline provides good fish habitat. The Lake Alice Association has investigated purchasing this island from the current owner, to preserve its unique ecological and aesthetic values.

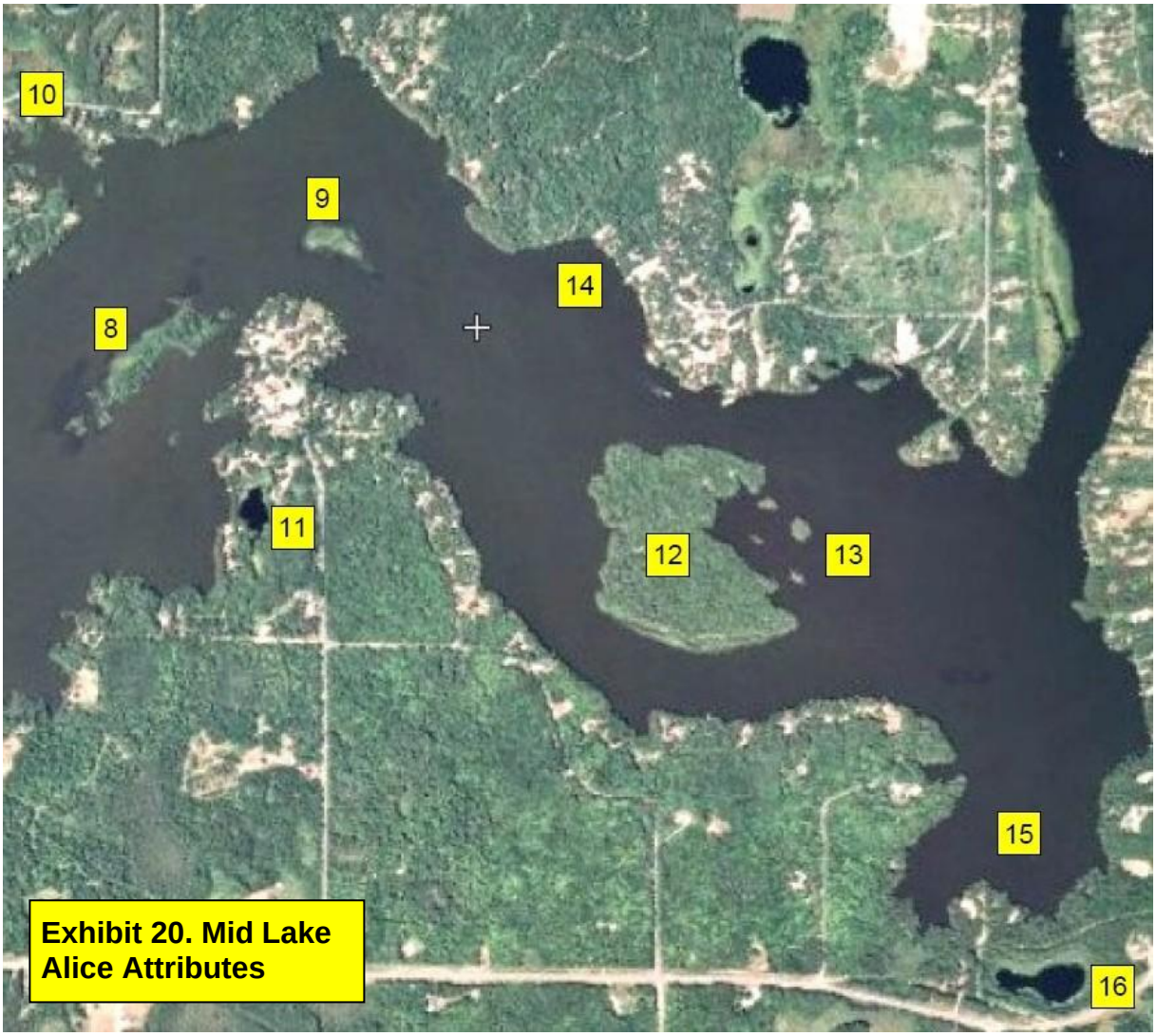


Exhibit 20. Mid Lake Alice Attributes

FIVE ISLANDS (13, Exhibit 20) located on east side of Krull Island provide a wilderness-like setting, that is popular with campers and boaters, as a scenic recreational destination. A wide variety of fish, turtles, and birds use the island. These islands are considered high quality and provide an enchanting and tranquil refuge directly across the river channel from one of the most heavily used portions of Lake Alice.

RESORT ALLEY (14, Exhibit 20) is located on the north shore of Mid-Lake Alice with Old Red Arrow Lodge (currently closed), Surewood Forest Campgrounds and, and Pine Point Resort. This area hosts many vacationers and experiences a high volume of water recreation in the summer months. Tourist sites, seasonal cottages, and resort cabins once lined Lake Alice's shoreline. Many of the resorts are now condominium developments . Seasonal cottages are being replaced by year-round homes. Lake Alice still experiences

heavy recreational use by fishermen, water skiers, sight-seeing pontoons boats, jet skiers, and (more recently) kayak and canoe enthusiasts. This heavy recreational use is a testament to the beauty and quality of Lake Alice, but at the same time poses some risks to the ecosystem.

LOKA BAY (15, Exhibit 20) is a high quality feature located in the southeast part of Mid-Lake Alice. This is a large and generally shallow bay filled with the old stumps from the originally flooded timber and a variety of aquatic plants. It forms a good wood duck breeding area and is a popular year round fishing area. Loka Bay offers spectacular sunset views from the Anglers Avenue side. Stump filled bays, like Loka Bay, provide important habitat for fish and waterfowl. Stump fields are also a refuge for fishermen because the stumps form water hazards that dissuade intrusion of water skiers and high speed watercraft.

POMMERN POND (16, Exhibit 20) is located in between Highway D and the southern tip of Loka Bay on Mid-Lake Alice. It is visible from Highway D. This small pond is probably spring fed and its connection to Lake Alice water levels is unknown. This high quality feature provides great habitat for turtles and amphibians. Beaver and water-related birds (like blue herons and belted kingfishers) use Pommern Pond as important habitat.

A narrow ***FINGER-LIKE BAY*** (17, Exhibit 21) is fronted by a long island (called "Indian Island") on the western portion of the Pine Creek Flowage part of Lake Alice. This area attracts numbers of common loons, common mergansers, hooded mergansers, mallards, and Canada geese in the spring as ice breaks up. The bay has shallow areas with diverse and abundant aquatic plants. Wild rice beds grow on shallow flats that drop off into the deeper channel and holes. The wild rice forms a great habitat resource for waterfowl and fishes. This part of Lake Alice has been called a "wide spot in the river" because it appears to be an extension of Wisconsin River as it flows down from the Highway A bridge. It forms the crossroads of Lake Alice as it provides access from the King's Dam Reservoir and Mid-Lake Alice sections to the five mile run up the Wisconsin River and to the Pine Creek Flowage portion of Lake Alice. Anglers Avenue runs northward along the east bank to a public boat landing in a bay created by Weggie's Point. This bay is shallow and could be a potential site for invasive species coming into the lake from boat trailers. Eagles are often seen on the island off Weggie's Point (located to the east and across the river from the finger-like bay). Once the heavy boat traffic starts many of the early avian arrivals, like common loons, relocate to nest, but blue herons frequent the shallows in summer. Lake Alice has a lot of boat landings relative to its size. This means great access, but also brings up litter issues, especially in spring after ice fishing. Invasive species are commonly introduced by boat trailers and boat

landings in shallow bays can become contaminated. Eurasian water-milfoil has become established in local lakes and poses a threat to Lake Alice.

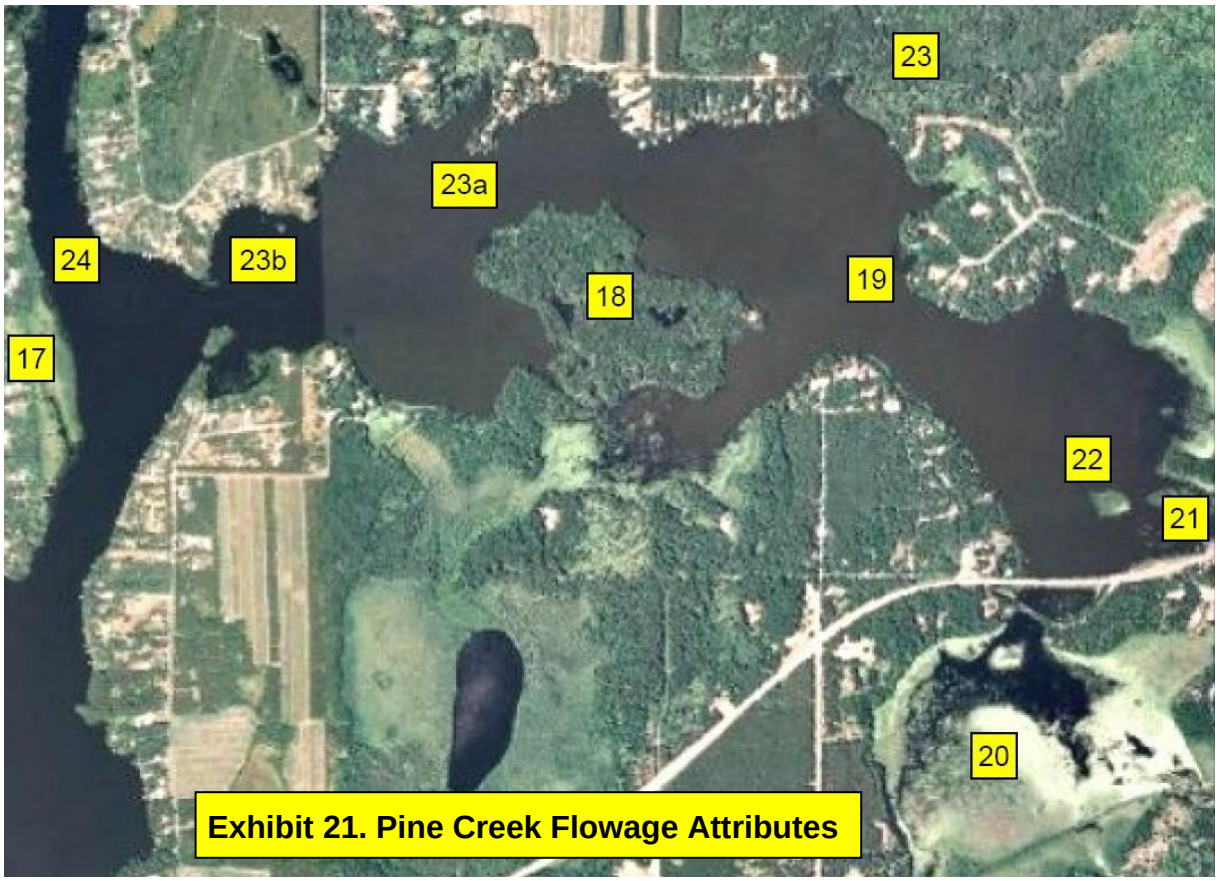


Exhibit 21. Pine Creek Flowage Attributes

BRIDGE ISLAND (18, Exhibit 21) is Lake Alice's largest island and is dominated by natural vegetation. Only one small residence is on the island which is connected to the southern shore of the Pine Creek Flowage section of Lake Alice by a narrow bridge. The entire shoreline of the island is natural providing high quality littoral zone habitat. The island is flanked on the east by a large submerged stump field, a popular fishing area. To the southwest of the island is shallow Turtle Bay, a great spot for turtles, amphibian, spawning fishes (especially bluegills). The bay to the west of the island also contains many submerged stumps and a convoluted shoreline with small bays filled with water lilies. This large island acts a screen from much of the heavier boat traffic of the lake. In the "stump fields," fishermen and nature observers have a refuge, while water skiers and general traffic have "fast lane" the entire length of the lake by following the old river channel (caution must always be given to "floaters" that higher spring waters launch from the shorelines out into the main

lake). The submerged stumps still exist after one hundred years under the waters of Lake Alice. Their longevity may be related to the relative stability of Lake Alice's water level. The constant water level maintains the quality of the lake, but also makes it a magnet for heavy fishing and recreational pressure. The relatively constant water level is a high quality attribute of Lake Alice.

SUNNY POINT (immediately south of 19, Exhibit 21) and EAGLE POINT (immediately east of 19) are prominent features of the Pine Creek Flowage part of Lake Alice. A fair amount of development exists on both points.

GREEN MEADOW LAKE (20, Exhibit 21) is a very high quality and unique feature of Lake Alice. It is approximately a one hundred acre lake with an average depth of about four feet. It is created by three trout stream tributaries, including Green Meadow Creek. Approximately 90% of the shoreline is undeveloped. It is separated from Lake Alice proper by two low bridges. The more southern bridge divides Green Meadow Lake from Lake Alice from a regulatory standpoint where Green Meadow Lake has a different set of non-river flowage regulations.

Green Meadow Lake is a major waterfowl resting area for migrating birds and local nesting species. It provides great spawning habitat for several fish species, including northern pike, yellow perch, largemouth bass, bluegills, and crappie. The south and west shorelines of the lake harbors large fields of wild rice that are attractive to waterfowl and provide good substrate for aquatic insects and hiding areas for small fishes. Muskrats, river otter, mink, fisher, red fox, white tailed deer, beaver, and black bear have been in or around the lake. A diverse fauna of frogs use the lake as well as many painted and snapping turtles. Major hatches of dragonflies and damselflies occur throughout the summer months. Like Lake Alice, the water level in Green Meadow remains relatively constant over the annual cycle.

In recent years, some concerns have been raised regarding Green Meadow Lake. Some observers report increasing density of aquatic vegetation over the past several years with previously well defined creek channels disappearing. In past two years, a new type of alga (large spherical colonies) has appeared in the water. In the past few years, few fish have remained in the lake after early January. It is not known whether this indicates low oxygen concentration. The access to Green Meadow is restricted by the low, privately owned bridge (abandoned by the county years ago). Concern exists of increased access to the lake if the bridge is removed.

PINE CREEK (21, Exhibit 21) is the coldest spring-fed trout stream in Lincoln County. It empties into a shallow bay in the far eastern part of the Pine Creek Flowage. This bay is often full of aquatic vegetation and provides good fish habitat.

Exhibit 22. Lower Wisconsin River Attributes

EAGLE NEST ISLAND (22, Exhibit 21) contains the most easily viewed eagle's nest on the lake.

UNNAMED TRIBUTARY (23, Exhibit 21) to Lake Alice may even be a vestige of the original channel for Pine Creek (prior to when Lake Alice was created).

AL'S POINT (23a, Exhibit 21) is a prominence along the north shore of the Pine Creek Flowage. Water transparency measurements have been obtained using a Secchi disk out in front of Al's Point.

HORSESHOE BOAT LANDING (23b, Exhibit 21) marks the western extent of a section of "old" development along shoreline the north shore of the Pine Creek Flowage. This section extends back to the Unnamed Tributary (23) and is characterized by fairly dense human development.

NO-WAKE ZONE (24, Exhibit 22) extends both north and south of the Highway A Bridge. This area of Lake Alice receives a high density of watercraft traffic. The bridge itself forms nesting habitat for swallows whose mud nests can be observed when boating underneath the bridge. Boat landings exist on both sides of the bridge allowing easy access up and downstream of the bridge. Wild rice beds are present along the river in this area. An unnamed body of water and extensive wetland enters Lake Alice from the west side of the

river just downstream of the Highway A Bridge. This wetland provides high quality habitat, but little is known about the area.

Upstream of the Highway A Bridge, the Wisconsin River, forms a wonderful part of the Lake Alice watershed. Boaters from Lake Alice and navigate for five miles upstream. A few cottages exist along the east bank of the river but disappear about two miles upstream (25, Exhibit 22) of the Highway A Bridge. ***SPRING CREEK*** (26, Exhibit 22) enters the river from the west side in an area of meanders and small islands. Further upstream, ***TROUT CREEK*** (28, Exhibit 23) enters the river at the downstream end of a rapids section of river and opposite the historic ***MENARD'S ISLAND*** (27, Exhibit 23). Menard's Island is a very popular boating destination. Larger watercraft coming upstream from Lake Alice cannot navigate upstream of Menard's Island. This section of river, however, receives a great deal of canoe and kayak traffic that navigates from access points upstream of Menard's Island.

All along the river are important spawning habits for walleye, smallmouth bass and northern pike. Beaver, river otter, mink, muskrat, and many water-associated birds use this section of the river as habitat. Large tracts of shoreline along this section of river are now owned by the State of Wisconsin and under WDNR management. This portion of the Wisconsin River is a very high quality attribute of the Lake Alice watershed ecosystem.

Exhibit 23. Upper Wisconsin River Attributes

The final part of this chapter discusses some of the environmental threats to the attributes of Lake Alice and surroundings.

Part 10. Environmental Threats to Lake Alice

As outlined in the previous part, the Lake Alice watershed ecosystem has numerous attributes of high ecological and aesthetic significance. These attributes are what makes Lake Alice a unique and special place. Nevertheless, these attributes are at risk of degradation from environmental threats. We outline some of these threats in this part of the Lake Alice plan.

Recreational pressure – Lake Alice is a well-known and much-used fishing lake for people from near and far. It is a popular recreation and vacation destination and has received publicity outside of Wisconsin. An expanding base of admirers has resulted in increasing recreational pressures. During the recent draught years in Wisconsin, many bodies of water have experienced greatly reduced water levels (often limiting navigability). Because of the King's Dam hydroelectric facility operating parameters, Lake Alice levels have remained constant even during these draught years. Many boaters and fishermen accustomed to using other water bodies have focused their attention on Lake Alice. For many years, Lake Alice had a year-round open season for many game fishes (see Exhibit 24 for more on this). Boats running up river at excessive speeds resulted in resident complaints about shore erosion, as well as concerns about disturbing loon and other

Exhibit 24: Fishing Season

"Spring run" has always been a Wisconsin River fishing tradition and this was also the case for Lake Alice and the Wisconsin River upstream of the lake. Some feel that heavy fishing pressure (both legal and illegal) on spawning game fish, depleted fish in numbers and size for rest of season. Unregistered bass tournaments have been another relatively unknown source of pressure on the Lake Alice fishery. These threats to the Lake Alice fishery led to direct involvement by the Lake Alice Association and others concerned about Lake Alice. The Association went through a series of meetings with local and regional WDNR, Conservation Congress representatives, and concerned citizens about the resource management of Lake Alice. Under consideration was a slot size for walleyes, future comprehensive fish surveys, and fishing seasons. This effort resulted in a 2009 change in the fishing season for walleye, northern pike, smallmouth bass, and largemouth bass in the Lake Alice system. The season changed from a continuous year-round open season to being closed after the first Sunday in March through the first Friday in May to align with most inland lakes in Wisconsin. A recent Conservation Congress proposal threatens to reverse this change.

nesting birds. The numerous access points to Lake Alice are convenient for the public, but increases fishing and other recreation pressure. These access sites are also points of littering and likely portals for introduction of aquatic invasive species.

Development pressure – Lake Alice has some areas of fairly high residential development as well as development in the form of resorts, road ways (impervious surfaces), and a golf course. In contrast, Lake Alice also has large areas with predominantly natural vegetation and broad and diverse riparian areas. In some areas of the lake, old-style lawns, cropped short and in close proximity to the shore indicate a need for some educational effort to inform residents about more ecologically friendly waterfront vegetation. Likewise, development of artificial beaches diminishes the habitat quality for invertebrates and fish. The riparian wetlands and small ponds are also vulnerable to development and human "grooming" since their great ecological values are often overlooked.

Integrity and Maintenance of King's Dam – Maintaining a hydroelectric facility must be cost-effective in order to continue long term. King's Dam is one-hundred years old and requires frequent and costly upkeep. The periodic relicensing process (overseen by the Federal Energy Regulatory Commission) is also expensive. It is conceivable that at some point a decision would be made to decommission King's Dam resulting in dramatic outcomes for Lake Alice. It is important for the Lake Alice Association and others concerned with a healthy Lake Alice, to remain in communication with King's Dam owner in order to understand the long term plans.

Water quality inputs – The water quality and aquatic ecosystem functioning of Lake Alice is affected by all inputs of water (groundwater, precipitation, streams, and overland runoff). All of these sources have potential to carry pollutants of various kinds to Lake Alice. Fortunately, the water contributions to Lake Alice have become cleaner in years since the Clean Water Act (1978) greatly reduced point-source pollution in the Wisconsin River. Nevertheless, catastrophic spills (from tanker trucks and other carriers) and combined sewer overflows (when wastewater treatment plants are overwhelmed with stormwater runoff) pose a threat to the water quality of Lake Alice. Non-point source pollution (see next paragraph) remains an important threat to Lake Alice water quality.

Non-point source pollution – Surface runoff from the land, roadways, parking lots and other surfaces flows into Lake Alice and to the streams (including the Wisconsin River) that contribute water to Lake Alice. This runoff carries with it sediment, nutrients (for example, from fertilizers) and contaminants (for example, herbicides) that can have detrimental effects on the Lake Alice ecosystem. Known as non-point source pollution (because it does not emanate from a discrete point like an effluent pipe from a paper mill), this kind of runoff can come from lawns, golf courses, agricultural fields, clearcuts, and impervious surfaces (for example, roads and paved parking lots). Sometimes the impact is physical, such as sediment covering gravel spawning areas. Sometimes it is chemical such as excess phosphorus from lawn fertilizers that might invoke an algal bloom. This type of pollution can be best controlled through education and protection of riparian buffers (natural vegetation near the waterways that absorb the pollutants before they reach the water).

Invasive aquatic species – Non native plant and animal species have become a grave concern for aquatic, wetland, and terrestrial ecosystems. Lake Alice has been relatively fortunate so far to avoid serious establishments of these destructive organisms. Nevertheless, the threat remains an important concern especially given the numerous public access sites and the high volume of boat traffic (aquatic invasive species often hitchhike to new bodies of water via boats, trailers, and bait containers). The Wisconsin River upstream of Lake Alice is itself a potential source of invasive aquatic organisms for Lake Alice. When it comes to non-native aquatic plant invaders, the best defense against establishment is a healthy community of native plants. Although no formal plant surveys have been done in Lake Alice, a diverse native plant community presently exists. Effective education and diligent monitoring are important factors in avoiding establishment of aquatic invasive species.

Riparian ecosystem integrity – Healthy riparian areas (the naturally vegetated land near the water) provide numerous important functions and values to Lake Alice. For example, they serve as habitat, filter out non-point source pollution, and protect against erosion. Educating riparian owners around Lake Alice as to the importance of riparian areas is important to the maintenance of these critical areas.

Littoral zone ecosystem quality – Much of the productivity of a lake comes from the shallow water areas known as the littoral zone. This is where plants grow, invertebrates live, fishes

spawn, and aquatic birds and mammals spend much of their time. The presence of good aquatic vegetation, diverse substrate, and dead woody material (logs and branches) is crucial to this littoral zone ecosystem. Sometimes the human temptation is to "clean up" these areas, but in fact this process diminishes the habitat quality greatly. Lake Alice is fortunate to have an abundance of good quality littoral zone habitat, but it can be degraded quickly. It is important to educate landowners and others about how to protect the littoral zone from degradation. Piers and swimming areas impact the littoral zone as well, but can coexist with a quality shallow water habitat if kept to a reasonable level. A rather special feature in Lake Alice is the stump fields (dead standing timber that remains submerged in various areas of the lake). Although these are sometimes located in deeper water the habitat they provide is similar to the woody material found in littoral zones. These areas deserve special consideration in the management of Lake Alice.

Habitat degradation of nearby aquatic and wetland habitats (ponds, streams) – The wetland habitats, streams, small lakes, and ponds in the vicinity of Lake Alice all contribute to the high quality of the lake. These smaller ecosystems can be overlooked in terms of their importance and therefore deserve some special attention. One of the first protective measures to take is to identify where these features are and characterize their size and ecological composition. This informs future protection and restoration efforts.

CHAPTER 6

What Goals Guide the Lake Alice Management Plan?

"Protect the Best and Restore the Rest" has become the credo of successful watershed managers across the country. This simple phrase acknowledges that watershed management is more than identifying the worst areas and trying to rehabilitate them. It recognizes that of equal or greater importance is identifying those areas that are of high or moderate quality in the watershed and establishing mechanisms to maintain that quality. "Protect the Best and Restore the Rest" also implies the importance of identifying imminent threats to watershed health and working to eliminate them. This simple principal is founded on the restoration ecology fact that the most certain way to successfully restore the structure and function of part of a broken watershed ecosystem is to rely on intact areas of the watershed to serve as the donors of healthy "parts" (such as aquatic insect species or good quality water). "Protecting the Best" allows us to "Restore the Rest" more effectively and economically. But, protecting the best is prerequisite.

The primary goal of the Lake Alice Stewardship Program is to perpetuate the quality of Lake Alice and its watershed ecosystem into the future. Sometimes this will mean protecting what is good about the lake and its surroundings and sometimes it may mean restoring some feature that has been degraded. Restoration is reestablishment of the structure and function of an ecosystem including its natural diversity (Cairns 1988; National Research Council 1992). It implies rehabilitating and protecting sufficient components of the ecosystem so that it functions in a more or less natural way, provides habitat for native plants and animals, and supports reasonable human uses.

The Lake Alice Adaptive Management Plan offers several supporting goals. In an adaptive plan, new goals can be adopted as the plan evolves. We conclude this chapter by presenting these goals organized under topical headings.

Restoration – Apply rehabilitation, protection, and education actions under the direction of specific objectives to identified specific areas in the Lake Alice watershed.

Research – Gather information that is useful in planning and monitoring restoration actions and devising education programs.

Monitoring – Establish a monitoring system in the Lake Alice Watershed that will provide data that reveals the quality of the system and establishes methods to evaluate the effectiveness of management efforts.

Cultural Climate – Encourage a cultural and political atmosphere that allows and promotes good watershed stewardship including cooperation between citizens, businesses, public agencies, and municipalities.

Sustainable Economy – Foster an environment that promotes a sustainable economy, provides a diversity of economic options for the residents of the watershed, and does not diminish opportunities for future generations of watershed residents.

Recreation – Promote a sustainable recreation in Lake Alice where all citizens (now and in the future) can enjoy the opportunities of the natural and human-sustained environment while respecting the environment and the rights of fellow citizens.

Program Maintenance – Foster a stewardship culture that engages people to donate time, talent, and money sufficient to support the implementation and periodic update of the Lake Alice plan.

In the final chapter of this Phase 1 plan, we present possible objectives and actions that will serve to move toward these goals. This is not an exhaustive treatment, but a starting point, integrated with monitoring so that adaptive management can take place in subsequent years.

CHAPTER 7

What Objectives and Actions Move Us Toward Those Goals?

The Lake Alice watershed is healthy, diverse, and productive. Our challenge through this adaptive management plan is to perpetuate that condition into the future. The challenge will be met by a capable set of program partners that are prepared to devote themselves to Lake Alice stewardship. These partners include the members of the Lake Alice Association, biological science faculty and students of Tomahawk High School, the ecological scientists of White Water Associates, Inc., and the WDNR.

Abraham Lincoln is attributed with the following wisdom: "If I had an hour to cut down a tree, I'd spend the first 45 minutes sharpening my ax." Planning and preparation are important for any task, but especially when working with a system as complex as a lake or watershed. The vision and goals described in the previous chapter provide the basis for developing objectives and actions to achieve the desired future for the Lake Alice Watershed. In keeping with the spirit of an adaptive management plan, we present several actions and associated objectives that can be undertaken as human and financial resources allow in subsequent phases of the program. Desired outcomes of each action are also stated. The actions, objectives, and outcomes each need to be further developed so that appropriate methodology and accurate estimates of required effort can be described. The plan is flexible and allows the insertion of new actions at any point along the path of lake management.

Action (Research): Conduct temperature and dissolved oxygen profiles over the annual cycle in various parts of Lake Alice.
Objective: To develop a better understanding of available and usable fish habitat.
Outcome: LAA oversees activity and maintains data. Data to be shared with WDNR.
Status: Action included in Phase 1 Adaptive Management Plan. No progress to date.

Action (Education): Work with WDNR to understand and manage the Lake Alice fishery.
Objective: To support scientific and effective restoration of a quality Lake Alice fishery.
Outcome: Document meetings and other contacts made to the WDNR and others.
Status: Action included in Phase 1 Adaptive Management Plan. This is an ongoing activity.

Action (Research): Assess rusty crayfish presence, distribution, and population in Lake Alice.
Objective: To understand the potential impact represented by this aquatic invasive species.
Outcome: A written report should document findings.
Status: Action included in Phase 1 Adaptive Management Plan. No progress to date.

Action (Research): Conduct a survey of amphibians that use Lake Alice and its riparian area wetlands and ponds as habitat.
Objective: To understand the abundance and diversity of this sensitive group of organisms and monitor long-term health of the Lake Alice environment.
Outcome: A report should document the findings. Design monitoring of certain habitats.
Status: Action included in Phase 1 plan. This activity was begun in 2010 and is ongoing.

Action (Education): Establish kiosks or other structure at the public boat launches that provide information on the threats of aquatic invasive species introductions to Lake Alice and outline how such introductions can be minimized.
Objective: Prevent new introductions of aquatic invasive species to Lake Alice.
Outcome: Creates more informed and responsible recreational users of Lake Alice. Lake Alice Association should document that the kiosks are maintained with educational material.
Status: Action included in Phase 1 Adaptive Management Plan. This is an ongoing activity.

Action (Research): Conduct point-intercept survey for aquatic plants in Lake Alice.
Objective: To understand the diversity and abundance of native and non-native aquatic plants in Lake Alice and establish a baseline against which community changes can be monitored.
Outcome: Data archived by Lake Alice Association and submitted to the WDNR.
Status: Action included in Phase 1 Adaptive Management Plan. This action was carried out in 2010 and resulted in an aquatic plant management plan.

Action (Research): Conduct periodic assessments of Lake Alice for aquatic invasive plants.
Objective: To provide an early warning of introductions of aquatic invasive species to allow rehabilitation actions to occur when populations are still small.
Outcome: Document the number and timing of surveys and maintain record of findings.
Status: Action included in Phase 1 Adaptive Management Plan. This is an ongoing activity with more specific guidance provided in the aquatic plant management plan.

Action (Research): In consultation with WDNR, prepare water sampling program (volunteer lake monitoring program including water transparency, nutrients, and chlorophyll "a").
Objective: To understand trophic status and fluxes in Lake Alice.
Outcome: Samples and data delivered to Wisconsin State Lab of Hygiene and WDNR.
Status: Action included in Phase 1 Adaptive Management Plan. Started in 2010 and ongoing.

Action (Protection): Continue to pursue protection mechanisms for Krull Island (including outright purchase, conservation easements, and local land conservancies).
Objective: Ensure long term integrity of this high quality habitat and aesthetic resource.
Outcome: Continue to update LAA members through website and newsletters.
Status: Action included in Phase 1 Adaptive Management Plan. This is an ongoing activity.

Action (Research): Identify, map, and characterize important wetlands (including open water ponds) within the Lake Alice watershed. Assess quality and threats for each wetland.
Objective: Protect and monitor the health of important wetlands that influence Lake Alice.
Outcome: Written report documents findings and recommends follow-up monitoring.
Status: Action included in Phase 1 Adaptive Management Plan. No progress to date.

Action (Research): Document the state of development of the Lake Alice Shoreline using aerial and digital photography (include a count of number of piers along the shoreline).
Objective: Create baseline for shoreline development against which to monitor future change.
Outcome: The findings should be documented in a report.
Status: Action included in Phase 1 Adaptive Management Plan. No progress to date.

Action (Research): Monitor common loon nesting success on Lake Alice.
Objective: To determine presence and reproductive success of common loons.
Outcome: Reports should document annual nesting success and historic trends.
Status: Action included in Phase 1 Adaptive Management Plan. No progress to date.

Action (Research): Monitor bald eagle nesting and success on Lake Alice.
Objective: To determine presence and reproductive success of bald eagles.
Outcome: Reports should document annual nesting success and historic trends.
Status: Action included in Phase 1 Adaptive Management Plan. No progress to date.

Action (Education): Establish an award or recognition of riparian owners that preserve or rehabilitate "natural shoreline" habitat on their property. This could be recognized in LAA newsletter along with an article about the ecological benefits of natural shorelines.

Objective: To encourage good shoreline stewardship by riparian owners and improve the riparian area quality of Lake Alice.

Outcome: Monitor by general awareness of landowners and changes in shoreline maintenance behaviors.

Status: Action included in Phase 1 Adaptive Management Plan. No progress to date.

Action (Education): Conduct periodic field trips for Tomahawk High School biological science students and teachers.

Objective: To foster an interest in Lake Alice in the next generation lake stewards.

Outcome: Student involvement in adaptive management actions on Lake Alice.

Status: Action included in Phase 1 Adaptive Management Plan. First trip conducted in 2009.

Action (Education): Create periodic updates of the adaptive management plan.

Objective: To incorporate most up-to-date information regard Lake Alice and application of best stewardship practices.

Outcome: Up-to-date management plan is available for ongoing implementation and stewardship of Lake Alice.

Status: Action included in Phase 1 Adaptive Management Plan. This document is the second version of the adaptive management plan.

Action (Protection): Adopt and implement the Aquatic Plant Management Plan prepared as result of Phase 2 efforts.

Objective: To protect and maintain a high quality aquatic plant community in Lake Alice, reduce opportunities for introduction of aquatic invasive plant species, and manage the population of Curly-leaf Pondweed that presently occurs in Lake Alice.

Outcome: A healthy, diverse Lake Alice aquatic plant community and a human community that is actively engaged in monitoring and protecting native aquatic plants.

Status: Action included in Phase 2 Adaptive Management Plan. The aquatic plant management plan is intended for adoption in 2010.

Action (Education): Conduct a formal lake users' survey.

Objective: To gather information about Lake Alice users' knowledge base, concerns, and goals for Lake Alice. The formal survey would also serve as an educational vehicle to inform lake users about the Lake Alice Association, the Adaptive Management Plan, and the Aquatic Plant Management Plan.

Outcome: A knowledgeable population of Lake Alice users and a better informed Lake Alice Association that can apply new information and tools to Lake Alice management.

Status: Action included in Phase 2 Adaptive Management Plan. Planned for a future phase.

Action (Research): Continue to implement the volunteer angler's journal and begin to analyze resulting data.

Objective: To create an ongoing database of the Lake Alice fish community as measured by anglers.

Outcome: Provide WDNR and other Lake Alice managers with additional information pertaining to the Lake Alice fishery.

Status: Action included in Phase 2 Adaptive Management Plan. Ongoing.

Future phases of the Lake Alice Stewardship Program will build on the foundation established in Phases 1 and 2. Additional aspects of the Lake Alice watershed ecosystem will be explored. For example, future phases will address watershed wetlands, more thorough aquatic and riparian vegetation assessment and mapping, survey of lake users on conditions of Lake Alice, and education of lake users on topics such as the importance of the riparian zone to lake health. Future phases will include revisions to the lake management plan and actions that support adaptive management.

Lake Alice and its watershed serve its human residents well. But, in order for future generations to enjoy all that the watershed can provide, this adaptive plan should be embraced, developed, and implemented. It may seem slow at first, but considerable momentum already exists because of the hard work that has already occurred. The Lake Alice Watershed has begun this next millennium with a well-prepared and duly concerned human population ready to take up stewardship responsibility.

Appendix A
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Appendix B
Lake Alice History

A LAKE NAMED ALICE [1]

Prepared by Dave Barrows, Lake Alice Association

Dean Premo Ph.D. noted, in the **Lake Alice Stewardship Program: Phase 1**, that you have to view and study Lake Alice as part of a larger landscape, if you are going to effectively understand it and the tightly connected ecological system of which it is a part.[2] The same is true of the history of Lake Alice.

When we purchased our place on Lake Alice, we were excited and curious. My wife asked, "How did Alice get its name?" [3] We did not find out the answer to this question until almost seven years later, but that simple question lead to learning a fascinating story of glaciers, Indians, French *voyageurs* and *coureurs de bois,* lumberjacks, lumber barons and much more.

OF ICE & TIME

In Northern Wisconsin, we live in a landscape that was shaped by ice. In Canada, unmelted snow accumulated and compacted into ice thousands of feet thick. Between 50,000 and 10,000 years ago, this ice pushed southward in finger-like lobes called glaciers. Several of these glaciers advanced across the immense rock dome, the Northern Highland rock shield that extends down from Hudson Bay to cap northern Wisconsin. The part of the glacier that covered all of Oneida and Vilas counties and nearly two thirds of the of the upper part Lincoln County, is known as the Chippewa lobe.[4] For those living around Lake Alice today, it is interesting to try imagine seeing an endless wall of ice a mile high, looming over us, rather than our beautiful lake views.

Our landscape was for the most part not created by the glaciers advancing and gouging out lakes or rivers out of the bedrock of the rock shield. The landscape we enjoy and marvel at today was created when

[1] **Cite as:** Barrows, Dave. 2009. A Lake Named Alice. i.p. of D.B.B.
[2] Premo, Dean and Kent Premo. 2009. Lake Alice Stewardship Program: Phase 1. pg 13-14
[3] **Dave** and Linda **Barrows** purchased their home, WeGotAway in 10/02
[4] Jones, George. 1924. History of Lincoln, Oneida and Vilas Counties. pg.13

the glaciers began to recede and blanketed the land with debris that it had picked up and carried in its descent into northern Wisconsin. When a glacier stopped advancing, the ice along its front edge melted as the ice behind it was pushed forward, depositing its sand, rock and gravel in ridges called moraines. Huge chunks of ice that had broken off and suspended in the debris, melted to form distinctive features, such as potholes and kettles.

Another way the contents of glaciers spread over the land occurred when the water streaming from their melting base carried sand, gravel and stone, depositing material to form an outwash plain. The Northern Highland Pitted Outwash extends from the Winegan Moraine along the upper Michigan border to Harrison Hills in northeast Lincoln County and includes the Northern Highland American Legion State Forest, most of Oneida and Vilas county forests and the northern units of the Lincoln County Forest. [5]

A mile high glacier exerted a pressure over a thousand tons per square yard, and it actually pushed the ground beneath below the water table as it advanced. As the glaciers retreated, some of the compressed ground began to rise. As in the moraines, huge ice chunks deposited in the outwash plain melted to form potholes, hollows and kettles. Water filled these depressions, creating some of the numerous kettle lakes in the Northern Highland Pitted Outwash region. Other lakes were formed by glacial debris damning streams. In this region, Vilas County has the greatest number of lakes. Oneida comes next. While in Lincoln County, lakes are not as numerous and chiefly found in its northern portion in the vicinity of Tomahawk, which may be regarded as the gate way into the lake region.[6]

Many of the Highland glacial lakes are small, irregular in shape and often interconnected by streams, creating an enchanting network of water. The rambunctious Wisconsin and Tomahawk rivers also originate in this outwash. The glaciers left the Highlands a rare and beautiful concentration of lakes, rivers and streams. Only in two other areas on earth, southern Finland and the Minnesota-Ontario boundary waters, contain as many lakes per square mile.

[5] Willow Flowage Scenic Waters Area Master Plan Draft. May, 2000; Wisconsin Department of Natural Resources, pgs. 86
[6] Jones, George O. 1924. History of Lincoln, Oneida and Vilas Counties Wisconsin. pg.15, 19

In the Highland region, the soil types vary greatly over short distances because of the capricious way the glaciers dumped their material. Much of the massive deposits of sandstone that the glaciers carried into Wisconsin was ground down and then broken down by weather into a poor, sandy soil.[7] Lincoln County has more farmland and developed its agriculture much more quickly than Vilas or Oneida because it was only partially covered by the glacier in its northern area.

The glaciers scoured all vegetation in their path, leaving an infertile, barren wake. It was the hardy jack pine, called the cactus of the north because of its ability to grow in sandy soil that took root in the Highlands. The organic matter from the jack pine eventually made it possible for white and red pine to take hold as well. It was the start of the magnificent coniferous forest that would play an important role in the region's history. Spruce, fir, cedar, hemlock and tamarack found niches in which to flourish. Beach and maple also gained a foothold.

THE WILDERNESS

As the glaciers receded, prehistoric Indians followed and hunted caribou and other animals that thrived in the cold, moist ecosystem of the glacial rim. About the time of the birth of Christ, a large community of Indians in southern Wisconsin traded with another Indian culture in northern Wisconsin for copper tools and goods.[8] These and other Indian cultures came and disappeared. In latter part of the seventeenth century, Ojibwa immigrated from the mouth of the St. Lawrence to the east and began fighting for control of the Wisconsin area with the resident Sioux. Eventually, the Ojibwa (also Ojibway or Ojibwe) became the dominant tribe in northern Wisconsin, but flare-ups and fighting with the Sioux continued as late as 1862.[9] The Ojibwa are also commonly referred to as

[7] Premo Dean, and Kent Premo. 2009. Lake Alice Stewardships Program: Phase 1. pgs. 19-20 Describes the type of soil around Lake Alice as being only Type A (sandy types) and Type B (loam).
[8] Mizaga, Vicki. 1988. The First 100 Years. Don Walker. pg.12 The climax of copper manufacturing in northern Wisconsin was from 200 B.C to A.D. 700 B.C. the southern Indian culture had collapsed.
[9] American Guide Series. 1941.Wisconsin. Hastings House. pgs. 26-31. In 1634, there was only one tribe of Algonquian stock residing in Wisconsin, the Menominee, who still reside west of Green Bay. Other branches of the Algonquian people, the Ojibwa, Ottawa and Potawatomie, were forced west into Wisconsin by the fierce Iroquois confederation. By 1654 Fox, Sauk, Miami, Huron and Kickapoo

the Chippewa, a European phonetic corruption of their name.[10] Different communities of Ojibwa were identified with specific names, such Lac du Flambeau and Lac Coutre Oreilles. The Ojibwa are by far the largest tribal group in Wisconsin today.

The French were the first Europeans to set foot in Wisconsin. Jean Nicolet was sent in 1634 to find an easy waterway leading to Pacific Ocean and trade with China and India. Nicolet did not find the fabled passage, but did open up the exploration of a new land and contact with its inhabitants.

In 1660, Father Rene Menard, the first missionary in Wisconsin, was paddling down the upper portion of the Wisconsin River, when he elected to walk around a portage, while his companion took their small craft through the water. Father Menard never emerged from the woods and was never seen again. His cassock and kettle were later found in a Sioux lodge and it is probable that he was murdered.[11] Appropriately, an island accessible from Lake Alice by going under the Highway A Bridge and up the Wisconsin River has been renamed Menard's Island.

The French interest in Wisconsin may have started with hope of a northwest passage to the orient or a desire to do missionary among the Indians, but it soon focused on a more profitable venture, the fur trade. Although pelts from animals, such as the black bear and martins, commanded the best price, it was the numerous beaver and their pelts used to make fur hats was the bulk and back-bone of the fur trade. The fur trade brought European goods into the north woods. It also resulted in unions between the French traders and Indians. French surnames are not unusual among the Ojibwa.[12]

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fled into Wisconsin too. There was immediate enmity between them and the resident Siouan tribes: Dakota, Iowa and Winnebago.

[10] Mizaga, Vicki. 1998. The First 100 Years…pg. 4 The Ojibwa originally called themselves the *Anishinaabe*, meaning "Human Beings" or "The People." Ojibwa means "puckered" and refers to how the tops of their moccasins were stitched.

[11] American Guide Series. 1941. Wisconsin. Pg. 2, 31

[12] Jones, George O. .History of Lincoln, Oneida and Vilas Counties Wisconsin. 1924. H.C. Cooper, JR. & CO. pgs.6-8.French were not accepted by every Indian tribe. The fierce Fox, and their confederates, the Sauk, Mascouten and Kickapoo, waged war against the French for thirty years in Wisconsin until 1740, and their hostility blocked the French from exploiting the Fox-Wisconsin waterway. In close proximity, the Fox River accessed the Great Lakes, while the Wisconsin flowed into the Mississippi River so this area was of great strategic importance. The French and Indian war, began in1754 and ended in 1763, gave England control of Canada and the Northwest territory. French *voyageur*s and *coureurs de bois* were employed by the British and traded with the superior British

By the mid 1800's, the beaver population in northern Wisconsin was pretty well decimated and beaver hats went out of fashion in Europe.[13] A few independent traders and posts remained, but northern Wisconsin was basically deserted until after the Civil War and the start of the lumber industry in late 1800's. The Ojibwa, who had become dependent of trade goods had to fend for themselves. There were a series of treaties with the American government, that promised provisions and annual payments, but these commitments were often not kept.[14]

The Treaty of 1854 established Ojibwa reservations in Wisconsin. But into the 1880's, scattered Indian settlements were found off reservation. There are accounts from this time of large bands of a hundred or more Indians riding into Tomahawk on horses to set up camp. Chee-kee-gwa, or Indian Pete, was well known personality and Ojibwa leader. Until his death 1905 at his cabin seven miles north of the city, Indian Pete led large processions of Indians into Tomahawk on the 4th of July. The town residents enjoyed watching the Indians staging pow-wows with drums and dancing along the river.[15] The current 4th of July celebration in Tomahawk is called Pow-Wow Days, recalling a time when Indian drums reverberated through the town and across the water.

Over a hundred years after the signing, the terms of the Wisconsin Indian treaties were still under contention. In 1983, the courts determined how Indian treaty rights to hunt, fish and gather off reservation on the lands ceded by the tribes in the original treaties were to be implemented. Although created well after the original treaties,

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goods. French remained the European language of the Wisconsin woods. In 1763, Pontiac, an Ottawa chief, united the tribes between the Allegheny Mountains and the Mississippi in a revolt lasting three years. For the most part, Wisconsin tribes refused to participate in the uprising.

[13] Jones, George. History of Lincoln…pg. 7. The yearly harvest of Wisconsin fur amounted to 500 to 600 packs, valued at a quarter of million dollars, but the dishonesty of payment and poor quality goods from the French caused trouble with tribes like the Fox and their allies.

[14] American Guide Series. 1941. Wisconsin .pg. 32-34 The British ceded the northwest to America in 1783, but the British maintained their control over the tribes in Wisconsin and American influence was nominal. In the War of 1812, Scotch/British fur traders, voyageurs and Indians captured American out posts Mackinac and Prairie du Chien. By 1816, American authority was established and the British trade monopoly was broken. American settlement moved in aggressively. Grievances between Indians and white settlers climaxed in the tragic Black Hawk War of 1832 which ended Indian resistance of white expansion into Wisconsin. Thereafter the tribes ceded to the United States much of their land. Between 1825 and 1837, many Indian tribes were relocated west of the Mississippi. By 1856, Indian title to Wisconsin lands covered only a few reservations.

[15] The Tomahawk Area Historical Society. Remembering Yesterday. pgs. 9-10, 20, 54, 56.

Lake Alice is in the ceded territory and subject to all the ramifications of Lac Courtre Orelilles vs. Keist.

ENTERPRIZE IN THE PINES

The Forks, at the confluence of the Tomahawk, Somo and Wisconsin Rivers, was an attractive site at which Indians visited and camped. In 1858, Germaine Bouchard operated a ferry and tavern where the Tomahawk and Somo Rivers ran into the Wisconsin. Fur traders and Indians frequented Bouchard's outpost, which was called Tomahawk because the shape of a near-by lake resembled an axe blade.[16] This was the extent of the habitation, until the arrival of the Tomahawk Land and Boom Company that was organized by William H. Bradley in 1881. In the spring of 1886, the city of Tomahawk was surveyed and laid out with its lots up for sale in Milwaukee in 1887. The **Lincoln County Advocate** noted in its July 16, 1887 edition:

> *It is a clearing in the woods, an opening in the heart of the great pinery, 25 miles due north of Merrill. The great jumping off place; it is on the Wisconsin River, away up where the logs come from – where the raging Tomahawk River comes cutting and scalping its way through the rough hard pan, eagerly scampering to join the waters of the "old Wisconsin" previous to their break neck plunge down the confined falls of the Grandfather Bull…northern Wisconsin is "pointing with pride" to the remarkable career of Tomahawk.*

Tomahawk became a bustling town, a startling and remarkable over-night achievement, due to the vision and drive of W. H. Bradley. This lumber baron saw the Somo, Spirit, Tomahawk and Wisconsin Rivers as highways for massive flotillas of logs to be carried down to hungry sawmills. At conflux of these rivers, he could build not just a town, but an empire.

William H. Bradley was born in Bangor, Maine, in 1838, and was a teenager when he came west with his father to find their fortunes in the vast stands of lumber in Michigan and Wisconsin. When he arrived in Tomahawk 1887, "Colonel" William Bradley was already very

[16] American Guide Series. 1941 Wisconsin. Pg. 379

successful businessman. A large, imposing man, he was called "Big Bill" by his mill workers. He had a long gray beard that gave him a patriarchal look. Impeccably groomed, he usually wore gray suits and always had a black cane topped with a gold handle in hand.

The Bradley Bank was started by William H. and, his brother, James W. Bradley in a small wooden building when Tomahawk was little more than a clearing in the woods. The first officers were: J.W. Bradley, president; Robert B Tweedy, vice president; and John W. Frohlich, cashier.[17]

Robert B. Tweedy was the son-in-law of the third Bradley brother, Edward Bradley.[18] As the Bradley enterprises grew rapidly to include mills, a large box factory, tannery, electric generating dams, farms, grist mill, mercantile stores, the elegant Mitchell Hotel and other concerns, R.B Tweedy took on increasing responsibilities in the management of the Bradley interests, which would lead him to having a major role in the creation of Lake Alice.

UP RIVER AT A PLACE CALLED KING'S

While "Big Bill" was conducting business or entertaining guests in the posh, luxurious amenities of the Mitchell Hotel in Tomahawk, Lisum King and his wife operated a rustic station, three miles east on the Wisconsin River where an old military road, running north to Eagle River, crossed the river by a ford.[19] Their clientele consisted lumberjacks, log drivers and "river rats," who stopped here to sort out the logs that they had floated down the river, and travelers, arriving with wet feet after wading across the river. Both enjoyed Mrs. King's warm food and lodging, if they needed it.

[17] Jones, George O. History of Lincoln, Oneida and Vilas Counties Wisconsin…..pg
[18] Of the three Bradley brothers, William was the only one to spend any significant time in Tomahawk.
[19]While W.H. Bradley was the quintessential Yankee entrepreneur, the Kings were of French Canadian and Indian descent. This racial combination is some times referred to as Métis, meaning mixed in French. Originally used in Manitoba, Canada referring to a people of French and Cree Indian extraction, who rebelled in 1869-70, when they were systematically pushed off their land, and forced into to Saskatewan, where they again revolted in the Northwest Rebellion of 1885. Today many people of partial Indian ancestry in Canada and the northern parts of bordering American states, such as Wisconsin and Minnesota, refer to themselves as Métis.

Lisum and his brother, Charlie King, worked as log drivers and were known for their ability to break up log jams.[20] It is hard to imagine how dangerous the work was in the mills, logging camps and, certainly, on the rivers at this time. While guiding huge log flotillas down river, men became suddenly trapped and were crushed, when the crossed, jammed logs unexpectedly shifted. Some were never found, others appeared floating down stream and a few stayed hidden to emerge when the ice broke up following spring. A popular a ballad of the time, lamenting the loss of a young log driver, poignantly asks if anyone knows where their loved one was laid to rest for when a body was found, sometimes it was just buried unmarked "on the spot" and the river drive continued.

Charlie King, some what of a recluse, lived in small, sparsely furnished log shanty that was a couple miles east of Lisum's inn. A typical lumberjack, he would work in the woods or on the river, get paid and then hike into town, where most of his hard earned wages was spent in the taverns. Both King brothers avoided the hazards of their work and lived long lives. Lisum died in 1929 at the age of seventy. Charlie was a well recognized figure around town for many years who died at ninety years (or more) in 1954. [21]

When a dam was built over the ford by Lisum's inn, unlike the lake it created, there was no doubt what to name it. That particular place had been so identified with the family for so long, it was called King's Dam. The road, between the dam and town, undoubtedly the same trail Charlie trekked into Tomahawk for so many years on, was appropriately called King's Road. Along King's Road is Squaw Point where Chee-kee-gwa's, Indian Joe's, wife is believed to be buried.

Today, the water is too swift and dangerous to ford below the dam. A portage has been installed around King's Dam to allow canoe and kayak enthusiasts to continue on down the river. As they carry their crafts around the dam to head down river into Tomahawk, it is a reminder of a time when this particular stretch of the river was active with log drives, settlers and travelers passing back and forth and stopping over at a place called King's.[22]

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[20]The Tomahawk Area Historical Society. Remembering Yesterday…..pg.73

[21] Remembering Yesterday…pg.73

[22] **LINCOLN COUNTYY OUTDOOR RECREATIONAL PLAN** notes that while the number of residents that canoe or kayak is much less than those power boating, canoeing and kayaking

DAMMING CREATES OPPORTUNITY AND A LAKE

In its heyday, the annual cut of Tomahawk was between sixty to seventy-five million board feet of lumber and some 25 million shingles. The stands of old white pine were harvested until today there are very few virgin stands of pine in northern Wisconsin.[23] Pulp and paper production was seen at that time as a way to diversify. Upon W.H. Bradley's death in 1902, Robert B. Tweedy took over management of the Bradley holdings.[24] Just as Bradley, Tweedy built, sold and bought a number of businesses and was a dynamic force in the area's economy. In 1909, the Bradley Company under Tweedy's guidance began construction the King's Dam. [25]

Newspaper articles from **The Tomahawk** communicate the excitement and anticipation of the dam and new mill.[26]

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participants are the fastest growing having increased by 413.7%. From on line, **Wisconsin River Centennial Trail: Rhinelander to King's Dam** notes for kayakers:: Miles 080 – 082 (eighty miles from the headwater of the Wisconsin River) Rhinelander to USH 8; miles 082-087 USH 8 to Hat Rapids (attractive); miles 087-091 Hat Rapids to Whirlpool Rapids(natural, scenic riffles, Class II rapids, then minor rapids); miles 091-099 Whirlpool Rapids to County A Bridge (fast water ends at Menards Island); miles 099-104 County A Bridge to Kings Dam (heavy boating & challenging west winds. The County A Bridge is where Lake Alice is considered to begin.

[23] White pine has a lifespan much longer than most trees. The white pine would grow to towering heights over 100 feet and their crowns would shade out competition, as well cause their sun starved side braches to fall off, producing tall straight trunks. Storms, drought, ice, fire, insects and diseases punched out holes in the pinery, allowing for a more diverse forest. Some of the white pine taken cut by loggers in the 1800's was over 400 years old. Pine floats very well and vast amounts were moved over the area's rivers. Most of the larger pine tree today date form the 1800's and are 90 to 100 years old.

The harvesting of the pinery allowed for a more diverse & colorful forest, as well as causing the white tailed deer population to grow immensely, according to Robert Willging, author of **On the Hunt: the History of Hunting in Wisconsin**, during a reception on Sept. 28, 2009 at the Tomahawk Library.

[24] On his death, W.H. Bradley had been a generous benefactor giving the schools, parks, churches, newspaper and hospital of Tomahawk a splendid start.

[25] Jones, George, 1924. History of Lincoln…pg. 79 Notes that the dam was build by the Bradley Company in 1909 or 1910, while the newspaper article says the dam is nearing completion in 1911. What was to be Lake Alice had been created in 1910, as the dam construction proceeded and the river was blocked and backed up.

[26] Jones, George. 1924. History of Lincoln… pgs. 71-72. Tomahawk has had a number of newspapers, including the **Tomahawk Blade, The Tomahawk** (1887) and the **Tomahawk Leader,** which published its first issue July 4, 1896. The present **Tomahawk Leader** carries on the tradition of its predecessors and is an excellent weekly newspaper.

The Tomahawk, Nov. 12, 1910:

THE TOMAHAWK is authoritatively informed that the power of the King dam, built by the Bradley Company, will be utilized to drive electric generators which will furnish electrical power…for a pulp mill and a paper mill The new dam will furnish 3,200 horsepower. The mills will be substantially built and the new manufacturing plants will be factors in the furthering the advancement of Tomahawk and development of this part of the country. The dam was built by the Bradley Company, another institution, which is and has been a potent factor in the developing the resources of northern Wisconsin.

The Tomahawk, Feb. 18, 1911 :

MUCH ACTIVITY AT NEW DAM

Pulp Mill Will Be The Most Modern On The River

Dam Will Also Supply Power For Pulp Mill

A trip to the new King Dam two miles east of the city will convince one that something is doing… which means a a whole lot in furthering the advancement and development of the city of Tomahawk and Lincoln County.[27]

The dam which is conceded to be one of the best and most substantial on the river is about completed, and the and the construction of the new pulp mill is well under way.

These articles show that there was legitimate concern that the boom and growth that Tomahawk enjoyed would evaporate when the timber was exhausted.

The Tomahawk, April 8,1911:

TOMAHAWK'S PULP AND PAPER MANUFACTURING INDUTRIES BUSY

While Tomahawk is known as a lumbering town and there is still an abundance of raw material. Tomahawk is at present a paper manufacturing town… In the early days many were of the opinion that the lumber would soon be

[27] Jones, George. 1924. History of Lincoln… pg. 2. Lincoln County was erected from Marathon County under chapter 128 of the Laws of 1874.
Lincoln County Outdoor Recreational Plan notes: Lincoln County is 584,960 acres, with 15,000 acres in water. 16 townships; 2 cities, Tomahawk in the north and Merrill in the south…

gone and the town… would decrease in population… the Tomahawk Pulp & Paper Company's[28] are at the present Tomahawk's most substantial business enterprise…. the new Pulp mill at King dam will be put into operation in about two weeks… the grinder room… is provided with four water wheels, one is 500 horse power and three of 950 horse power. There are six grinders of the latest type… There is at present About 1500 cords of barked spruce bolts ready for the grinders… The importance of the paper industry in Tomahawk should not be under estimated.[29]

A LAKE NAMED ALICE

The building of King's Dam and the expansion of the pulp industry was so greatly valued that the lake created by the King's Dam was almost given the appropriate name, if not too attractive name, of Pulp Lake. The first trip from the King's Dam up the impounded Wisconsin River was noted in **The Tomahawk,** July 29, 1911:

The first motor boat trip made up the Wisconsin was enjoyed last Wednesday, by Messrs. A.G. Schutte, H.J. Taylor and and Frank Theiler. They went as far as Nigger Island[30]… the water is clear as a mirror, and there is no difficulty in following difficulty in following the channel... It has been has been suggested to name this picturesque body of water Pulp Lake. ***THE TOMAHAWK*** *would be pleased to receive other suggestions.*

The newspaper received many suggestions, but was captivated by one charming account. Robert B. Tweedy, the director of the Bradley

[28] Tomahawk Pulp and Paper Co was built by Anson M. Pride. After 1916, run by Charles B. Pride.
[29] Besides the dam & mill, a spur railroad was built to service the facility. Remnants of the old line can be seen in aerial photographs as a line cutting across the bay behind Pine Island southeast of the dam.
[30] Jones, George O. 1924, History of Lincoln… pg. 80. This offensive name was later referred to and mapped as Negro Island. The name is attributed to black rocks on the island. Folklore has this being an under ground railroad stop, but that is unlikely . Today, it has been renamed **Menards Island.** It is a local landmark, denoting how far motorized craft ascend up the Wisconsin River from Lake Alice. For kayakers, **Menards Isand** is where the fast water ends It is an appropriate setting to recall how Father Menard was lost, while descending the Wisconsin in the 1600's.

business interests, that built the King's Dam, married Edna Bradley, the niece of W.H. Bradley, in Milwaukee in 1891. Their three daughters visited and fished as the new dam was being completed in 1910. They made a tremendous impression on the men working there.

The Tomahawk, August 12,1911:

LAKE ALICE

Many names have been suggested for the name of Tomahawk's new lake above the King Dam, but the name which meets with the approval of a great majority of those interested in naming this beautiful sheet of water is ***Lake Alice****. This name was suggested by a number of men who worked on the construction of the new dam and this is the reason for making their suggestion:*

One day last summer the Misses Alice, Dorothy and Laura Tweedy after watching the men at work for a time decided to try their luck fishing. Miss Alice had a place above the dam as her fishing place, while the other young ladies fished below the dam. Miss Alice was favored with the best luck and when the other two young ladies discovered this one of them said: "Let's go fish Alice's Lake." The workmen heard this and from then on, many of the men referred to the water above the dam as Lake Alice.

So here's all kinds of good luck to Alice while fishing at Lake Alice in the future and may the lake always remain as As beautiful as it is at the present time.[31]

Lake Alice has retained its beauty. Public access for fishing from shore on the King's Dam property allows current anglers to enjoy a day of fishing, just as Alice and her sisters did a hundred years ago.

Less then a month after the first boat trip up Lake Alice and the Wisconsin River, there were numerous sightseers and fisherman boating

[31] This article, as well as the others cited here from **The Tomahawk**, were found by our fellow Lake Alice Association board members**, Andrea and Hank Michaud**, who located them after viewing page
after page of old newspapers at the Tomahawk Public Library. Thanks to their patience, we know not just how Lake Alice got its name, but the excitement of the building of the dam and how early travelers on the lake were impressed by its beauty.

on Lake Alice. The fisherman were interested reaching previous hard to get to the trout streams, as such Spring Creek and Trout Creek, that run into the Wisconsin and Pine Creek, that merges with the stream fed Green Meadow Lake to form the Pine Creek Flowage part of Lake Alice.

The Tomahawk, Aug. 26, 1911:

> *Lake Alice above the King dam is attracting much attention among sportsmen and pleasure seekers. There is no channel in this new lake. It is all channel. But just now the numerous motor boat owners are interested in finding the outlet of the various streams that empty into Lake Alice. Although a motor boat ride up the Somo river is delightful and the scenery picturesque, it is the opinion of many that Lake Alice surpasses the Somo river in this respect.*

THE ALLURE OF ALICE

Although a man-made phenomena, Lake Alice has all the charm and allure expected of a north woods lake. An early description of the northern Wisconsin lake region could just was well describe early Lake Alice, when it says: "…it is not its geographical or geological importance that has made it famous, but its irresistible appeal to the tourist, sportsman, health seeker, and the lover of the beautiful in nature.[32] It is beyond all things a paradise of the fisherman…The fishing season is long, beginning early in the spring and lasting well into the fall. Trout abound…unexcelled bass fishing, with plenty of pickerel and perch. The muskellunge , or "muskie," is plentiful… there is plenty of tackle to be had, with bait for every sort of fish, together with canoes, boats and camping outfits… Also there are experienced guides and congenial to be had for trips… Yet the tourist who loves to get close to nature has no

[32] D.N.R. 2000. Willow Flowage Scenic Watters Area Master Plan Draft **.** pgs. 86**.** Notes that: the region was a pinery and contained a rich mixture of white, red and jack pine prior to European settlement. Much of the region still contains abundant pine, however, aspen and paper birch increased substantially early in this century following the harvesting of the pine…The northern third of Wisconsin is part of a large eco-region called the Laurentian Mixed Forest.. The regions forest is about 25% aspen and white birch, 30% northern hardwood, 25% forested wetland and 20% pine… The region has 350 species of terrestrial vertebrates,30 species of major trees and 1,200 plant species.

need to "rough it"…the hospitable log cabin or more awaits him at the end of his daily trips."[33]

Lake Alice became a much visited lake with active seasonal cottages, resort cabins and tourist sites lining its shoreline. It was a special place where many came to have their "up north" experience. Because of this heavy and democratic use, Lake Alice was referred in town as the "poor-man's Nokomis." Some of these resorts, such as the Red Arrow and Weegies are no longer in existence and many of the seasonal cottages have become condos or converted into year-round homes and north woods getaways. [See Sidebar at end of this document, p33 for a personal account.]

As a popular tourist destination, Lake Alice was an important resource and attraction, that helped support the local economy through tough times. In the 1940's, **WISCONSIN A Guide to the Badger State** described Tomahawk and the area around it as "Paper and pulp , furs and farming keep the city alive through the winter; in the summer it earns what it can from selling fishing tackle and bait, groceries, gasoline and bathing suits to the… tourists hurrying northward… By 1890…the mill hands, trades people, industrialists, and railroad were all making money. But the boom collapsed as suddenly as it began. With timber exhausted, the sawmills closed, then the paper and pulp mills: only one continues to operate, working sporadically." [34]

Presently, Tomahawk is fortunate to have large employers, such as Harley Davidson (400 employees), Packaging Corporation of America Mill (450 employees), Daigle Brothers, and a host of other businesses, that are great corporate citizens, sponsoring many community events, enriching our town's quality of life. There is an excellent blend between industry and tourism that gives the local economy balance and diversification.

Lake Alice still has its charms and mystique for today's visitor, as well as accommodations at Pine Pointe Resort, Zipp Inn, Lueth Landing and the Surewood Forest Campgrounds. Out door columnist, Jeff Lampe, in an article about fishing Lake Alice for his Illinois audience, noted that

[33] Jones, George O. 1924. History of Lincoln…pg 15
[34] American Guide Series. 1941. WISCONSIN A Guide To the Badger State. pg. 379

the appeal of northern Wisconsin is more than catching fish, that there is something transformational and therapeutic of being on a lake enclosed by pines and birch, with eagles over head and returning each night to the camaraderie around a bonfire and recalling the day's adventures.[35] He also lamented the fact that this "up north" experience is becoming harder to come by as the resorts that once lined Lake Alice are disappearing, as more of them are converted into year around homes or condos.[36]

There is a real concern about the impact of increased development on the lake's shoreline and if it will threaten vulnerable, fragile ecosystems, such as shallow bay areas. A proposed condo development in the Edgewater Golf Course Bay included plans to dredge a shallow bay for a marina. This project was abandoned and critical spawning areas were spared damage. Lake Alice Association President Glen Mott,[37] defined the Lake Association's position as "encouraging responsible development, but discouraging ill conceived projects that threaten fragile areas." Also, there is a strong desire to preserve the large islands and island clusters on Lake Alice as they are with minimal development. The Lake Association investigated purchasing the fifty-four acre Krull Island to preserve its unique ecological and aesthetic values.

A FISHERY TO SAFEGUARD

Because of its large shallow, stump-filled bays, Lake Alice has been a good fishery since its creation. Its natural reproduction was enhanced by stocking in 1938, when some 3,000 adult bluegills, 3,000 adult crappie and 50,000 walleye fingerlings were introduced. Stocking abruptly stopped in 1969, because fish had high levels of mercury. Lake Alice

[35] NCRPC 2006. LINCOLN COUNTY RECREATIONAL PLAN 2007-2011. pgs 85 The area's weather is described as: climate continental type - summers warm, but not excessively hot with cool and comfortable nights – Winter long, cold, snowy – Mean annual precipitation 32 inches - Snow cover on ground & ice on lake December – April, -growing season frost free 124 days May 22 – Sept 23 – Prevailing winds NW in fall through Spring from South remainder of the year – Wind spend 4-15j mph –Winter conductive to snowmobling & cross country skiing due to long duration of snow – Summer camping, fishing

[36] Lampe, Jeff.. September 24, 2006**. Journal Star.** pg. D12.

[37]**Glen Mott, LLA President**, is the LAA's main spokesman. His drive, energy and persistence pushed needed reforms to protect Lake Alice through the system. More than an orator, Glen has made numerous wood duck nesting boxes for the lake and his welding skills have helped lake residents with many problems, like a broken log crib(Thanks!). **Glen is the LLA's best contact on any question concerning the LAA and its position on any issue Lake Alice (715-453-7378).**

waters were polluted and degraded by the effects of paper mill and industrial pollution coming down river from Rhinelander.

Fishermen on Lake Alice even commented on fish they caught in the Pine Creek section of the lake, that was fed by trout streams, as tasting fine, but those caught from the Wisconsin River to the dam, as having a terrible odor and taste when cooked. The Clean Water Act of 1978 instituted the regulations and enforcement, that were needed to clean up the system. Today, Alice has healthy water and is a great fishery.

In 1983, walleye stocking started again and continued until 2000. Over 400,000 walleyes were introduced in this period. After 2000, the Wisconsin Department of Natural Resources (WDNR) became reluctant to stock Lake Alice because it might introduce disease, exotic species or lead to the gene pool becoming tainted and weakened. [38]

The WDNR wants Lake Alice managed as a self-sustaining system. This recognizes the current fishery as being very good and capable of maintaining its current healthy populations levels of fish if managed properly. The goal would be a balanced community of predator and prey species so that muskellunge, northern pike, bass and pan fish would all flourish. The management would utilize creel limits, size limits and fishing season dates to achieve this goal.[39]

If there is not to be any stocking and supplementing the natural fish populations in the future, the importance of having the correct regulations for the lake is essential. The wrong regulations would slowly, but progressively degrade the system, causing long-term harm to the fishery.

Recognizing the seriousness of this challenge, the Lake Alice Association[40] entered into a series of open meeting with local and regional Wisconsin Department of Natural Resources, Conservation Congress representatives and concerned citizens about the resource

[38] Dean, Premo,and Kent Premo…pg 27
[39] Premo, Dean, and Kent Premo. 2009…pg. 28
[40] The Lake Alice Association was organized in 1999 and incorporated under Chapter 181 Wisconsin Statues in 2000. The Association exists for the benefit of the general public. The purpose of the Association is to protect, preserve and improve the integrity of Lake Alice and its ecosystems through education of and communication between concerned citizens.

management of Lake Alice. In a series of open meetings, information was shared. With "everything on the table," issues, such as slot sizes for walleyes, comprehensive fish surveys and fishing seasons, were all discussed in depth.

In the January, 2008 issue of the **Lake Alice Association Newsletter**[41], Neal Pietenpol[42] summarized the conclusions of these meetings and the actions that all the participants agreed were necessary to maintain lake Alice as "one of the better fisheries:"[43]

> *DNR Rule Change and Proposal for Lake Alice at the April of 2008 Spring Hearing. As you remember, we were working on a rule change for a slot size on Walleye as well a proposal for the regular season (not year round) for game fish on the Wisconsin River from Rhinelander down through Lake Alice. both were forwarded to the DNR statewide review team for consideration.*
>
> *The proposal for a regular Wisconsin inland season, 1st Saturday In May to the first Saturday in March for game fish and 0 bag, catch and release for Bass until the 3rd Saturday in June from Rhinelander Dam to Kings Dam passed and will be voted on at the Spring Hearings.*
>
> *The slot size proposal was 14" to 18" on Walleye with a 3 fish limit. You could have 2 fish under 14" and 1 over 18" or 3 fish 14" or under. This will be coming up now as a Conservation Congress resolution. Our committee will try to get it bumped up to a DNR rule change for 2009.*
>
> *We feel the change to a regular season, like the rest of the state will help our fishery the most. This will eliminate the tremendous amount of fishing pressure on a small section of the Wisconsin*

[41] **Lake Alice Association Newsletter** is edited by **Michael** and **Kris Toelle**, whose efforts have made it a quality publication, that has done a great job in communicating LAA concerns, its positions on issues and has enhanced the image of the LAA in the community it serves..

[42] **Neal Pietenpol** is a LAA board member, committee head, past Conservation Congress representative, who has had a life time interest in the improvement and enhancement of the of quality fishing and hunting experience in Wisconsin. Always willing to share his opinion and wisdom (as well his waders), he is an excellent contact on conservation issues (715-612-6302).

[43] Dave Seibel, fish biologist quoted in Premo, Dean. and Kent Premo. 2009….pg.26

when the Walleye, Northern and Smallmouth Bass are spawning.

With the invasion of Invasive Aquatic Species, VHS, Shore land Development, and change in water quality, we should at least try to preserve our fishery so that the next generation can enjoy the wonderful recreation opportunities on Lake Alice and the Wisconsin River…

We are getting excellent cooperation and guidance from the DNR Fishery specialist Steven Avelallemant of Rhinelander, John Kubisak, who is the DNR biologist from Rhinelander, and Dave Seibel who is the fish biologist out of Antigo….

This documents the high degree of involvement of both the LAA, Conservation Congress members, and WDNR in crafting the final proposal for the vote at the Spring Hearings. In a later conference, LAA was informed that after review by the WDNR at state level, the slot limit proposal needed further study and "more biology." This additional information would be acquired in Lake Alice's next lake survey. But as fish biologist Dave Seibel commented: "The WDNR tends to survey Lake Alice fish populations fairly infrequently (it is a large and expensive undertaking). Surveys were conducted in 1977, 1982 and 2003. It will be ten or twelve years before another one is done on Lake Alice." [44]

Always a well-known and a much-used fishing lake, the recent years of drought has made Lake Alice the focus of even greater fishing and recreational pressure. Many surrounding lakes and flowages experienced significant drops in water levels, while Lake Alice levels remained constant because of the King's Dam being a hydroelectric generating facility and the water levels it requires.[45] Lake Alice's constant water levels attracted boaters and fishermen that usually used other bodies of waters. Business shut downs and lay offs in Merrill and Rhinelander put more fishermen on the ice and Alice was covered with increasing

[44] Premo, Dean, and Kent Premo. 2009…pg. 28 Side note: WDNR did find the time and money to perform a fish survey from April 15- 30, 2009 on Lake Mohawksin.. The results of this Mohawksin survey and a future one for Lake Alice are part of the criteria cited to the LAA by the WDNR for determining regulation changes, such as slot limits.

[45] Premo, Dean, and Kent Premo. 2009...pg 14

numbers of shanties, that continued the heavy fishing pressure on the lake's fishery.

Lake Alice and the Wisconsin River upstream of the lake had for years a continuous fishing season. While other lakes were closed in the spring, Lake Alice was a magnet and focus of heavy pressure of the "spring run" that focused on harvesting spawning game fish. WDNR fish biologist, Dave Seibel, noted, that while "Some of the walleye population spawns in the lake…A good many walleyes travel from the lake up the Wisconsin River for spawning."[46]

The river above Lake Alice is relatively narrow and confined. The management practices used on larger systems should not be considered applicable to this situation. Even the limit of walleyes allowed is significantly higher for the river above the HWY A Bridge than for the much larger lake. The continuous season made the lake's adult walleyes especially vulnerable to both legal and illegal exploitation, as they migrated up into the river.[47]

Not surprisingly, a very few in a very short time were able remove a lot of fish. Ironically, there were those who vehemently objected to the decision of Lac Courtre Oreilles vs. Keist, because of a visceral aversion to the image of a large egg ladened fish being rendered helpless by a blinding light and then removed at the end of a spear before they even had a chance to procreate. What is the difference if a fish is speared off its spawning area or taken by hook & line?

The supporters of the easy up river "shooting fish in a barrel" harvest are at odds with sportsmen who believe that nature should be allowed to take its course, letting the fish population replenish each year without interruption and then allow these fish to return back to the lake so they can to be sought after to the benefit of many more anglers, including the elderly and disabled, who can not brave the spring weather, as well as the vast majority of tourists, that contribute so much to the local economy.

[46] Premo, Dean, and Kent Premo .2009…pg. 28

[47] Local wardens Rich Peters and Ron Nerva both supported the proposed change and its ability to stop illegal, over-harvest of fish on the Wisconsin River between Rhinelander and King's Dam during this time.

There is danger of becoming "walleye blind," when considering the correct way to manage a fishery, and ignore other populations of fish, such as bass. The continuous season of Lake Alice created a loop-hole that allowed bass to be fished off their spawning beds. While bass in surrounding bodies of water were regulated and protected, unregistered bass tournaments descended on Lake Alice to take advantage of the aggressive instincts of the bass protecting their nests. When a male bass is removed from its spawning bed, the nest and its eggs are devastated within minutes by crayfish and panfish and the reproduction of that species can be severely affected.

Bass are fun to catch, easy to let go and give a lot of fight and excitement through out the fishing season. Beyond their recreational value, bass are an very important component in control of the rusty crayfish. An Invasive Species, an unchecked population of rusty crayfish, which are in Lake Alice, will decimate natural, native aquatic plants to the detriment of native fish, amphibian and bird populations. As fish biologist, Dave Seible noted: "Smallnouth bass and rock bass are important controllers of this AIS crayfish."[48]

There are some that rightly value bass as a great game fish, while others dismiss it as a "green carp," in order to make their case for management practices favoring other species. Bass, as well as carp, have their own role in a healthy fishery. As fish biologist, Dave Seibel said: "Redhorse, suckers, and trout perch are also critical members of the fish community and must be present if the system is to be considered healthy."[49]

We can no longer afford the opinions of the ecologically ignorant and biased or allow their preferences for easy targets of spawning fish, like bass, to jeopardize our system by reducing a species that is an important biological control and allowing an AIS to run rampant. Protection of the bass population was an important consideration by the LAA in its efforts to make the regulations on Lake Alice and its portions of the Wisconsin River to be consistent with all the other inland waters in this part of the state, as well as the same as the entire Wisconsin River above.

[48] Premo, Dean, and Kent Premo. 2009…pg. 29
[49] Premo, Dean, and Kent Premo. 2009….pg 27

Sponsored by the LAA, the DNR rule change read:

Question: **Open Season on Lake Alice, Hat Rapids Flowage and connecting portion of the Wisconsin River**
Make open seasons on the portion of the Wisconsin River system from Rhinelander Paper Mill (St. Regis) Dam downstream to **Kings Dam**, including Hat Rapids Flowage and **Lake Alice** consistent with other inland waters in northern Wisconsin. This change would protect gamefish from harvest during spawning in March and April. This encompasses about 22 miles of the Wisconsin River system.

The angling season on this stretch of the Wisconsin River has been open continuously for largemouth bass, northern pike, and walleye since 1970 while all surrounding water are subject to the general inland open seasons for these species. At that time, the river was highly polluted, and closed seasons were not needed to protect fish that people either did not want to eat or couldn't safely eat. The Wisconsin River has undergone a dramatic restoration in response to cleanup mostly due to the passage of the Clean Water Act in 1972. It now supports improved populations of fish that are safe for human consumption. However, many anglers believe that high exploitation during spawning seasons when all surrounding waters are closed for gamefish is impacting abundance and size structure, especially of bass and walleye. The public voted in favor of a resolution to follow the same seasons as other inland waters in this part of the state by 78% and 71% margins at the 2007 Lincoln and Oneida spring hearings, respectively.

Question: Do you favor making the open season on the Wisconsin River system from Kings Dam (Lake Alice) upstream to the St. Regis Dam (Rhinelander Paper Mill) consistent with the general inland open season in northern Wisconsin? For largemouth bass, smallmouth bass, northern pike, and walleye, this would change the open season from continuous to the first Saturday in May through the first Sunday in March. In addition, the daily bag limit for largemouth and smallmouth bass would be 0 (catch and release only) from the first Saturday in May through the Friday before the third Saturday in June.

In Lincoln County, the Congress was held in the Tomahawk High School gym on April 14, 2008. There were speakers to both sides of the

issues. Glen Mott and Neal Pietenpol gave the most persuasive, concise arguments for the measure. After his father Phil Zipp spoke in favor of the Question, Greg Zipp, a well-known fish guide, stood to support the passage of the Question and said, " You may not like it, but we all know what the RIGHT THING to do is."

That night the right thing was done and vote in Lincoln County was 116 to 81 in favor of the Question. Of the 72 counties in Wisconsin, 68 voted in favor, 8 voted no (4 of these were decided by 3 or fewer votes) and one voted a tie. Of the counties, 88% voted in favor of passing the question. The state wide vote was even more dramatic: 2279 yes-1251 no. Later that year, the representatives of each county of the Conservation Congress voted and gave it even greater support, with some representatives, such Oneida County, voting in favor of the Question when their county vote had been no. At the Governor's Board, the measure was presented for approval by the DNR and spoken for by Glen Mott, representing the LAA. It then moved on to the legislature and was approved.

February 20,2009, the DNR issued a news release, **New Regulation changes game fishing on the Wisconsin River between Rhinelander and Kings Dam**. From the headwaters of the Wisconsin River down to King's Dam were properly governed by the same consistent regulations. After the King's Dam, the river has a hodge-podge of different statutes. Finally, the spawning fish of Lake Alice and the vulnerable river flowing into it were protected just like all the other gamefish in surrounding waters and were no longer easy targets.

This material, the collective reasoning behind the needed reform, and an account of the whole process has been presented in some depth because there has been misinformation circulated in a persistent attempt to reverse this rule change. When listening to discussions about this topic, one can now determine what is being distorted and more importantly , which view best serves the long term interests of Lake Alice, its wildlife, fish and the many who use it recreationally. Persuasive arguments and distortions can be used to cloak rather selfish desires and a wanton so-long-as-I-get-mine-to hell-with-everyone-else mentality.

A PLAN FOR LAKE ALICE

Steve Avelallemant, the Northern Region Fishing Specialist, was an effective coordinator throughout the whole rule change process. He let a lot of different opinions be expressed and yet kept a diverse group on track. This created a dynamic in which all participants felt comfortable. Kevin Gauthier, WDNR Water Resource Management Specialist, was also a key participant and the LAA felt very comfortable in getting his guidance on the need for and reasons why Lake Alice should develop comprehensive a lake plan.

The LAA board scheduled a meeting with Kevin Gauthier at the WNDR Rhinelander office. He concisely outlined the reasons why an association should pursue creating a lake plan and all the elements that the WDNR felt necessary in a successful lake plan. He emphasized that having such a plan in place would be of great value in getting assistance of the state and WNDR to address any issues or help fund any challenges the lake may have in the future.

Lake Mohawksin, just on the other side of King's Dam, as well as other area lakes, had become infested with the AIS, Eurasian Water-Milfoil. This invasive formed dense mats that had chocked out native plants, reducing the habitat need by fish, wildlife and even made some areas unnavigable. Eventually, Mohawksin received grants totaling $200,000 to address their infestation.[50] Usually introduced to a body of water by a boat trailers, an invasive, such Eurasian Water-Milfoil, could get a foothold in the shallow bays associated with the highly used boat launches on Lake Alice. If such an infestation was to occur, a lake plan would be of great value in applying for aid from the state in the form of grants to combat problems.

A lake plan is much more than a potential revenue stream. In its best form, a lake plan would **assess**: the fishery, aquatic habit, watershed and water quality; **describe**: land uses, habitat conditions and ecological relationships; and **identify**: water quality problems, sources of pollution, endangered areas, potential threats to habitat, fish and wildlife. This information would be tracked, evaluated, updated, revised and analyzed

[50] Buelow, Jed. Sept.15, 2009. "Mohawksin Friends look to double milfoil treatment". **Tomahawk Leader**. pg 7

to ultimately produce a strategy that will help **protect** and **enhance** the entire lake system. It would incorporate immediate yearly goals within the context of an adaptive management plan that would be implemented for decades.

The LAA board came out that meeting believing that Lake Alice needed and would benefit greatly from a comprehensive lake plan. The information and insights, that Kevin Gauthier had provided, made it very clear that LAA would need professional guidance to be successful. The application process to initiate the plan was complex and criteria based. If you submitted a plan that was incomplete, it would be passed over in a competitive process, as better conceived plans were accepted. Requirements in the plan, such as a point-intercept survey, which is an extensive rake survey and identification of aquatic plants at numerous GPS points across the lake, required expertise far beyond the abilities of the Association and its members.

LAA started interviewing firms that specialized in creating lake plans and already had experience in Wisconsin and the WDNR process. Surprisingly, one was little more than a chemical company that wanted a contract for expensive yearly treatments, basically offering strategic poisoning rather than strategic planning. Another firm, that was well used in the area, offered a substantive plan, but intended to execute it with in a year. Quick results, but it meant that the grant applied for through the state would be for a very large sum, of which LAA be responsible for a co-pay of 25%. These proposals might have had more appeal if Lake Alice had an AIS threat for which immediate treatment was already decided upon as the course of action. The LAA board did not see in them the vision and long term commitment, that Kevin Gauthier had described.

The search for a firm to provide the professional guidance , that the LAA needed, led to a road trip to Amasa, a small town in Michigan's Upper Peninsula, to meet with Dean Premo, Ph.D., President of White Water Associates, Inc. The company was established in 1985, as an independent environmental laboratory and ecological consulting firm. Although lake planning was not its primary focus, there was no doubt that White Water Associates, Inc., and the family that guided it, was highly qualified and had needed the technical expertise.

Dr. Dean Premo, a Certified Senior Ecologist, is a nationally recognized expert in biodiversity and ecosystems, whose scientific leadership and consul had been sought by institutions, such as the U.S. Environmental Protection Agency, National Wildlife Federation, Natural Research Council, college of Natural Science at Michigan State, Great Lake Indian Tribes and the Michigan Technological School of Forestry.

Kent Premo, M.S., a systems support scientist, is an outstanding technical editor and writer, whose skills at creating scientific and educational publications, would be a great benefit to any project like ours.

Dr. Bette Premo, the White Water Chief Executive Officer, was the principal scientist for water quality and aquatic ecosystem assessment related to FERC relicensing projects for major hydroelectric companies. She has extensive experience in writing and procuring grants for municipalities, schools, universities and corporations. In addition to her CEO duties, she manages the laboratory staff and consults on data quality control issues.

Recently, Kent Premo and Dr. Bette Premo helped our neighbor, Oneida County, develop a geographical information system (GIS) for its 1,200 lakes and then assisted Oneida in the classification and designation of these numerous 1,200 lakes for purposes of shoreland ecosystem management and zoning regulations.

Dr. Dean Premo discussed with members of the LAA the purpose of the lake plan, the application process and showed examples of publications and lake plans that White Water had done. The material was impressive in its contents, layout and design. More importantly, it contained the strategic focus and long-term perspective, that the LAA board was looking for in a lake plan. Dean quipped that Bette had to approve a taking on such a project and that she normally would only allow White Water to be involved in only one lake plan a year.

White Water, Inc. was contracted by the LAA and applied to the Wisconsin Department of Natural Resources (WDNR) for a large-scale lake management planning grant on January 1, 2009. The application was successful and the WDNR gave LAA a grant of $10,000 to fund the plan's first year, from March of 2009 to March of 2010. This, along with

a generous grant of $500 from the Tomahawk STAR Foundation, as well as $2,500 from the Association's fund raising efforts, provided the start up capital needed to underwrite the project's first year was in place.

Initially, the focus would be on gathering and reviewing information, establishing a coalition of participants and producing the first iteration of an Adaptive Lake Management Plan. Dr. Premo said: "The plan will not be a cookbook telling you what to do next. Instead, it will change as findings are made and news issued arise." From the start, it was conceived as a dynamic entity, evolving and improving to fit the needs of the Lake Alice watershed with the long term goal establishing a stewardship, that would perpetuate a healthy Lake Alice and its surrounding ecosystem far into the future.[51]

White Water and Dr Dean Premo provided a vision to the Lake Alice Stewardship Program, that was broad, substantive and inclusive. They effectively utilized the resources of the Wisconsin Department of Natural Resources, the application of the WDNR Headwater Basin Integrated Management Plan (2202) to Lake Alice and have made the WDNR an valued shareholder in the process. They have identified organizations, such as the Lincoln County Land Information and Conservation Department, that will be important participants in the future. They were also instrumental in getting the Tomahawk High School as a partner.

Two science teachers of the Tomahawk High School (THS), Todd Fredrickson (an Environmental Science & Biology teacher) and Jen Pfannerstill (teacher of Advanced Placement Biology) were interested in a project that would engage themselves and their students in a real-world environmental project. In a meeting, White Water scientist Dr. Dean Premo, LAA board members and THS faculty discussed the prospects of a collaborative effort on the lake study and management planning for the Lake Alice watershed.

[51] Premo, Dean, and Kent Premo. 2009..pg 18 **" In order to have a more practical sized watershed with which to work in the Lake Alice Stewardship program, we delineated a sub-watershed that extends from Kings Dam up to the point where Trout Creek enter the Wisconsin River**…**The Lake Alice sub-watershed is approximately seventy-four square miles (47,000 acres) and located entirely within Lincoln County, Wisconsin."** This recognizes the interrelationship of Lake Alice and the navigable portion of the Wisconsin River above it.

LAA was already highly committed and eager to contribute to the plan. The project-based learning that THS students would participate in, would of great help and value. White Water would provide the expertise of their scientists and their immense experience of successfully implementing and coordinating such projects. The Lake Alice Stewardship Program became a collaborative effort, having a much greater impact, study and scale, than other lake plans that are little more than a documentation of good & bad plants and water clarity. It is a partnership, that has good synergy and the promise of great results.

In the fall of 2009, a field trip was organized on Lake Alice with members of the LAA providing pontoons to carry over forty THS students, their two teachers and Dr.Premo for a complete tour around the lake. The outing was much more than a sight seeing excursion, Dr. Premo assigned tasks for each boat, that would be combined to create a written and digital photographic record of the lake, delineating its shoreline and attributes. Specific activities, such as testing for water clarity, were documented as well.

The field trip was a great experience, especially for the LAA members. The participation of THS students and teachers infused the project with a new energy. It was great to be see a new generation getting involved in the issues of resource management, that many LAA members had devoted so much time and energy to. During the lunch at Pine Pointe after the outing, Bruce Oradei commented: "We want them to be aware that this will all be theirs some day. That our concerns now will be theirs in the future."[52]

IMMEDIATE AND FUTURE CHALLENGES

In the November, 2009 LAA monthly board meeting, the success of the THS outing was recapped. The agenda also included preparation of a detailed checklist for the upcoming *Alice in Winterland* fishery. This popular winter event, occurring in the second week of February, is the

[52] **Bruce Oradei** is a LAA board member, past Town of King Supervisor, the Vice President of the Lincoln County Lakes and Rivers Association and a good rope man to have when a felling a tree. LAA was a participant in the forming of Lincoln County Lakes and Rivers Association and LAA board member, **Hank Michaud,** was its first V.P. Bruce's comments were also used by Jed Below in the **Tomahawk Leader** in an article about the event.

LAA's primary fund raiser. The revenue that it generates is used to fund the lake plan, scholarships for THS students, the Association's news letters and all the other LAA activities. The status of our web site was also discussed.

Our old web site had crashed and never really recovered. Board member Mike Sigl had just coordinated the creation of a new site, **www.lakealice.info**, with a new web site manager. It was exciting to be back on line and be able to post current information and pictures of our events. The site could now evolve and become a major repository for the information collected through the lake plan process that anyone interested in Lake Alice could review. Hopefully, users will one day be able to access interesting related links, such as current community and fishing information, as well.

We also hope that this new web site will become a place where stories and reminisces about the Lake Alice experience can be posted. That it will document the community life of Lake Alice, in much the same way as the Tomahawk Area Historical Society's excellent publication, **Remembering Yesterday Memories of Tomahawk**, contains recollections from many contributors, whose individual stories create a very interesting a first hand, historic tableau.[53]

There were two guest presentations, as well. Chris Hamerla, Lumberjack Aquatic Invasive Coordinator Lincoln, Langlade & Forest Co., brought a book that he had compiled with photographs of native aquatic plants and invasives, such as the Eurasian Water-Milfoil. He offered to let this be posted on our web sight.

Ben Niffenegger, Shoreland Protection Specialist for Lincoln County Planning & Zoning, also brought information that could be posted for the benefit of Association members, interested in rehabilitating and renewing their shorelines and properties with native, non-invasive plants.

[53] **Mike Sigl,** a board member , whose patient efforts have really brought the LAA into the electronic age, is the coordinator and filter through which all web site entries pass. We encourage any one who wants to contribute their Lake Alice experiences to submit them to Mike at **gbfdcapt4b@yahoo.com.** All submissions may subject to editing and LAA retains the privilege to reject any submission.

Both offered to give presentations at the Association's spring meeting, that occurs in June each year. Both also volunteered to tour the lake and offer their expertise and suggestions during the summer.

The information and expertise that Chris and Ben offered will help LAA begin fulfilling one of the 15 Actions (&Objectives & Outcomes) that White Water had developed for LAA to focus on.[54] In this case, increase the awareness of landowners and encourage good shoreline stewardship, that preserves or restores natural shorelines.

The Lake Alice Stewardship Program Phase 1 as sent Dr. Dean Premo was reviewed. **Part 8. Lake Alice Special Attributes,** that the LAA had contributed, was in this iteration and the **Lake Alice History** was the last segment needed from the LAA.[55]

There was discussion concerning remarks made at a Lincoln County Lakes and Rivers Association meeting about removing water from Lake Alice. Lake Alice is a fairly shallow lake best described as an "impoundment." Its water level is controlled by the King's Dam (operated by Tomahawk Power and Pulp and controlled by the Wisconsin Valley Improvement Company (WVIC).[56]

The WVIC manages some 20 reservoirs in the Wisconsin River system through a license from the Federal Energy Regulation Commission (FERC), that was reissued in 1996. Since the King's Dam has continued to generate electricity, the FERC license agreement stipulates that the water level of Lake Alice be kept within certain parameters. This gives Lake Alice a constant water level, while surrounding reservoirs experience fluctuations.

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[54] Premo, Dean, and Kent Premo. 2009…pgs. 48-51. Series of 15 Actions: 1) conduct temperature and dissolved oxygen profiles, 2) work closely with the WDNR to understand and manage the resource, 3) assess rusty cray fish presence, 4) amphibians survey, 5) have and maintain informational kiosks at landings, 5) point-intercept survey for aquatic plants, 6) periodic assessments of AIS, 7) implement WDNR water quality sampling, 8) pursue protection of Krull Island, 9) wetlands identification and mapping, 10) Aerial and digital photography documentation of shoreline, 11) monitor loon nesting success, 12) monitor bald eagle nesting and success, 13) educate and reward good shoreline stewardship, 14) field trips with THS and 15) update adaptive management plan, that will be implemented and the goals of the Lake Alice Stewardship Program..

[55] **Dave Barrows** started to compile and write the history in November of 2009.

[56] Premo, Dean, and Kent Premo. 2009…pg. 14

The drought-like conditions of the last three years is similar to those in 1910, when north woods had less than 19 inches of rain (normal precip is above 30). The impact of water level drops on tourism and WVIC management of the system was reviewed by the State Board of Forestry and WVIC was found to be acting in good faith. In 1913, water level limits were established. From this time, Lake Alice and the entire system have been managed accordingly.[57]

Glen Mott, LAA President, said that the LAA will categorically oppose any proposition that proposes the modification of current regulations of the water levels of Lake Alice. It would violate licensing agreements that were supposed to be in effect for decades and management practices that WVIC had used for almost a century.

It is even doubtful that if any additional water was drained from Lake Alice that less water would be taken from other parts of the system. There is no doubt, that such fluctuations in Alice's water level would have a serve impact on several ecologically sensitive areas.

The valuable spawning and nesting habitats found in hundreds of acres in the, as noted by the WDNS fish biologist assigned to our lake, " the entire eastern bay (often known as the "Pine Creek Flowage," where Pine Creek enters the system) forms a crucial habitat complex. The northerly extending bay off King's Dam Reservoir zone of the lake (the Golf Course Bay) is also an important shallow, well-vegetated habitat."[58] If water levels are reduced, these vital areas, essential to the lake's health, maintenance and reproduction of fish, birds, invertebrates and mammals, will be devastated, even destroyed. The Wisconsin River portion of the system is even more vulnerable.

The Wisconsin River portion of the Lake Alice sub-ecosystem includes 12,094 acres of the Menard Island Area Recourse, which is managed by the WDNR. This is a relatively narrow and shallow river corridor of immense ecological and recreational value, that could be left high and dry if the water level of Lake Alice were lowered. It would be tragic if recently protected spawning fish, migrating up from the lake to this

[57] Miazga, Vicki. 1988. The First 100 Years…pg. 31
[58] Premo, Dean,and Kent Premo. 2009…pg. 28

portion of the river, as well as nesting loons, would now have their habitat destroyed by draining. It would be a devastating blow to tourism and the lake's economy, as well.

As long as the FERC license remains in effect and King's Dam continues to produce electricity, it is highly unlikely that there will be any change in the management of Lake Alice's water level. But the facility is a 100 years old and the up-keep and licensing process is very expensive. The LAA has to remain vigilant and react to any suggestion of excessive draining and be able vocalize the extensive, detrimental impact it would have.

The board members present also discussed and voted unanimously to send a delegation to the Warm Water Committee of the Conservation Congress, in December, to voice the Association's disapproval of an question before the committee, that asks the Congress to consider reversing its recent over whelming approval of protecting spawning fish Lake Alice and its portion of the Wisconsin River.

These are not all the items discussed that November night, but provide a good overview of the both the immediate and future focus of the LAA and its ongoing mission to protect, preserve and improve the integrity of Lake Alice through prudent management, education and communication. Years from now, the history of Lake Alice will hopefully be an account of how the LAA was successful in these endeavors. So that the sentiment expressed in **The Tomahawk** a hundred years ago will still ring true:

> *So here's all kinds of good luck to Alice while fishing at Lake Alice in the future and may the lake always remain as beautiful as it is at the present time.*

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Sidebar: Memories of Lake Alice

A personal account by Jim Wunsch, Lake Alice Property Owner (2/25/2008)

I am originally a Marshfield man. Born in nearby Rozellville in 1938, my family moved to town when I was four. We started taking a vacation shortly after, and I will always remember loading up the 1930 Chevrolet and taking the 3.5 hour trip to Tomahawk and Pine Creek Resort on Lake Alice. This resort was on the eastern most end of the lake on what was then, old highway "D". My dad and uncles seined minnows from a small creek near Marshfield, and we transported them in an old milk can, which was mounted on the front bumper of the car. Sometimes when we went through Tomahawk, we would stop by the old Tourist Information Hut on main street and look at pictures of fish and get an ice cream cone.

Arriving at Pine Creek Resort was always exciting. The old cabins were indeed rustic with an icebox rather than a refrigerator. Ice harvested from Lake Alice in the winter was stored deep under sawdust in the icehouse, and it was from there that we retrieved the blocks as needed. We also stored the fish we caught in the icehouse, wrapping them in waxed paper and burying them deep in the sawdust and marking the spot with a stick.

And did we catch fish? The fishing was always great. The first year we were there a guy caught a northern that was so big they took a picture of it next to me, and it was longer than I was. We generally fished fairly close to the resort because outboard motors were pretty rare. The stumps across the lake were eight feet high back in those days and loaded with crappies and blue gills. There was no such thing as a spinning rod back then. You caught the majority of your fish on worms and minnows. The minnows we transported from Marshfield kept nicely all week in a screened live box in the lake, and the worms and night crawlers were kept in an apple crate covered with ferns and parked under the cabin where the icebox vent dripped cool water. Fishing was still always best in the morning or evening. Of course, when the kids were bedded down after dark, mom and dad could walk over to the bar and socialize with other adults.

Twenty years passed. I am then married with four young daughters and living in Sheboygan Falls, Wisconsin. We know the people who ran Al's Point Resort on Lake Alice. They are from Marshfield as well. We decide to vacation at one of their cabins in 1966. My parents and other siblings in my family joined us in the years that followed. And in 1968 my father Elmer found out Hal DeRoche was selling lake frontage from his Pine Creek Resort property. He was quick to buy the first lot from Hal (110 feet, $2,500), and in 1969 my brothers and I helped him build a cabin on that property, which I own today. The cabin has undergone quite a transformation during the last 40 years: a garage, a boat shed, a pontoon shed, an adjoining back lot to burn brush and park vehicles, and some internal improvements as well. In late September of 1983 when the lake was drawn down 5.5 feet to repair Kings Dam, we built a fish crib just out from our pier. That crib is still there today and still a popular fishing spot on the lake.

The lake has changed too. In the mid 1990's, the 485 acre property directly across from our cabin, which was a tree farm owned by Ed Stiegerwald, was finally developed and 20 or more properties were sold with cabins quickly following. Virgin shoreline gone forever. Surely the fishing is not what it was. While it was very common to go out and catch 50 crappies or bluegills in the 1970's and 80's, it is a struggle now to catch a half dozen. Bass fishing with a surface bait was something I always enjoyed, but I don't even try anymore. It was hard to find an ice shanty on our end of the lake in those early years. Now it's like a city out there in some places. I surely wonder how the lake can be expected to produce enough fish for that kind of pressure. On the bright side, the northern fishing is still good, and there certainly are more walleye in the lake than there were years ago.

There was such a concern over the years with the development of larger boats and PWC's, but it seems to me to be offset by the pontoon boats. People are finding that a great way to enjoy the lake is from the comfortable seat of a quiet, slow-moving pontoon. There is no better way to enjoy a summer day in northern Wisconsin than to cruise around on a pontoon boat. And if you find yourself doing just that, and you happen to see my pontoon ("Rosebud") go by, wave and say hi. I'm the guy in the tan hat.

Building a fish crib during the draw down on Lake Alice -- September 1983.

Appendix C
Aquatic Plant Management Plan

The Lake Alice Stewardship Program

Aquatic Plant Management Plan

Prepared for:

Lake Alice Association
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Prepared by:

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Aquatic vegetation on Lake Alice (Dean Premo photo)

Date: May 17, 2011

The Lake Alice Stewardship Program

Aquatic Plant Management Plan

This document is a product of a WDNR Lake Planning Grant awarded to:

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CHAPTER 1 Introduction

The Lake Alice Stewardship Program is viewed as an ongoing endeavor composed of annual phases that progress toward the overall vision. A critical aspect of work was conducted in summer 2010 - a systematic survey of aquatic plants in Lake Alice using the Wisconsin Department of Natural Resources (WDNR) "point-intercept" method. With that newly collected plant data the Lake Alice Association has the necessary components to prepare this Aquatic Plant Management Plan.

Aquatic plants rarely get the respect they deserve, although this is slowly changing. Still, in common parlance, an aquatic plant bed is a "weed bed." Many aquatic species incorporate "weed" in their names. Consider duckweed, pondweed, musky weed, and waterweed, to name a few. Likely this appellation was borrowed from "seaweed" and not meant to be derogatory, but in today's language, "weed" connotes an unwanted plant, often exhibiting rampant growth. Such is not the case for the vast majority of plants in aquatic ecosystems.

Aquatic plants are a vital part of a lake ecosystem, recycling nutrients, providing vertical and horizontal structure, and creating habitat for a plethora of animal life. Aquatic invertebrates, including many species of crustaceans and insects, live on or within this veritable "aquatic forest" of plants. Many species of fish find food and shelter within aquatic plant beds. Some species of waterfowl eat parts of plants directly as well as feed on the abundant invertebrate life associated with the plants. Muskrats eat a variety of aquatic plants with a particular affinity for cattails and bulrushes. Otter and mink hunt invertebrates and small vertebrates within the shelter of submergent and emergent beds. Great blue and green herons find small fishes among the plants in this same shallow water.

In lakes that receive an overabundance of nutrients (particularly from fertilizers or leaking septic tanks), plant growth can become too lush, or dominated by only a few species that respond more rapidly to extra nutrients. As these abundant plants die, their decomposition can result in low oxygen levels that are injurious to fish populations. Algal blooms, responding rapidly to nutrient influxes, can create foul odors. In short, this process of accelerated lake eutrophication can give aquatic plants a bad name.

On another negative front, non-native plant species, transported on boats and trailers or dumped from home aquariums, may come to dominate a water body to the exclusion of a healthy diversity of native species. Eurasian watermilfoil (*Myriophyllum spicatum*) is one of the better known examples of these so-called ***aquatic invasive species*** (***AIS***).

For most lakes like Lake Alice, aquatic plants are a positive attribute, greatly enhancing the aesthetics of the lake and providing opportunities for good fishing, good hunting, good boating, and good snorkeling. Fortunately, Lake Alice does not currently have a nuisance level of aquatic plants. On the contrary, it has a healthy and fairly diverse community of native plants. Members of the Lake Alice Association want to maintain this high quality condition. In addition, the Lake Alice Association wants to establish the foundation on which to conduct plant management should the need arise in the future.

In preparing this plan, we have followed the guidelines prepared by the WDNR called Aquatic Plant Management in Wisconsin. We found, the WDNR Guidance document very useful in preparation of this aquatic plant management plan. We fully expect the plan to be a adaptive plan (Walters 1986). That is, it will be modified as new information about the Lake Alice aquatic plant community and its management becomes available.

The WDNR Guidance document outlines three objectives that may lead to preparation of an aquatic plant management plan:

- ***Protection*** - preventing the introduction of nuisance or invasive species into waters where these plants are not currently present;
- ***Maintenance*** - continuing the patterns of recreational use that have developed historically on and around a lake; and
- ***Rehabilitation*** - controlling an imbalance in the aquatic plant community leading to the dominance of a few plant species, frequently associated with the introduction of invasive non-native species.

Currently, the Lake Alice Association's motivation lies in the first two objectives. Lake Alice is a tremendous resource with good water quality and a diverse and interesting community of aquatic plants. It also has a strong recreational history and current human use that has caused only moderate degradation to the ecosystem.

During two years under the WDNR Planning Grant Program and through past efforts, the Lake Alice Association has followed the first five steps in the seven-step plan outlined in the Guidance Document for developing an aquatic plant management plan:

1. Goal setting – Getting the effort organized, identifying problems to be addressed, and agreeing on the goals;
2. Inventory – Collecting baseline information to define the past and existing conditions;
3. Analysis – Synthesizing the information, quantifying and comparing the current conditions to desired conditions, researching opportunities and constraints, and setting directions to achieving the goals;
4. Alternatives – Listing possible management alternatives and evaluating their strengths, weaknesses and general feasibility;
5. Recommendations – Prioritizing and selecting preferred management options, setting objectives, drafting the plan;
6. Implementation – Formally adopting the plan, lining up funding, and scheduling activities for taking action to achieve the goals;
7. Monitor & Modify – Developing a mechanism for tracking activities and adjusting the plan as it evolves.

This document presents the Aquatic Plant Management Plan for Lake Alice. It resulted from a draft plan prepared by White Water Associates and submitted to the Lake Alice Association for critical review and comment. Besides this introductory chapter, this plan is organized in five additional Chapters. Chapter 2 describes the study area. Chapter 3 states the purpose and goals for the Lake Alice Aquatic Plant Management Plan. Chapter 4 references the lake information inventory that has been ongoing in Lake Alice including newly collected data (particularly, results of the aquatic plant survey conducted in 2010). Chapter 5 provides recommendations for objections and actions that support the overall goals and establish the stewardship component of aquatic plant management plan. Finally, Chapter 6 outlines a contingency plan for rapid response to aquatic invasive plant species should they appear in Lake Alice. Two appendices complete this document. Appendix A contains literature cited in this document and Appendix B contains tables and figures.

CHAPTER 2

Study Area

Lake Alice is a 1,369 impoundment lake on the Wisconsin River. It is located immediately east of the town of Tomahawk in Lincoln County, Wisconsin. Despite its large surface area, Lake Alice is a fairly shallow lake and has a maximum depth of about 32 feet. Lake Alice can be best described as an "impoundment" in the Wisconsin River as its water level is controlled by King's Dam (operated by Tomahawk Power and Pulp and controlled by Wisconsin Valley Improvement Company). Exhibit 1 shows the Lake Alice area and identifies some major landmarks. The Lake Alice Adaptive Management Plan describes the landscape surrounding Lake Alice more thoroughly.

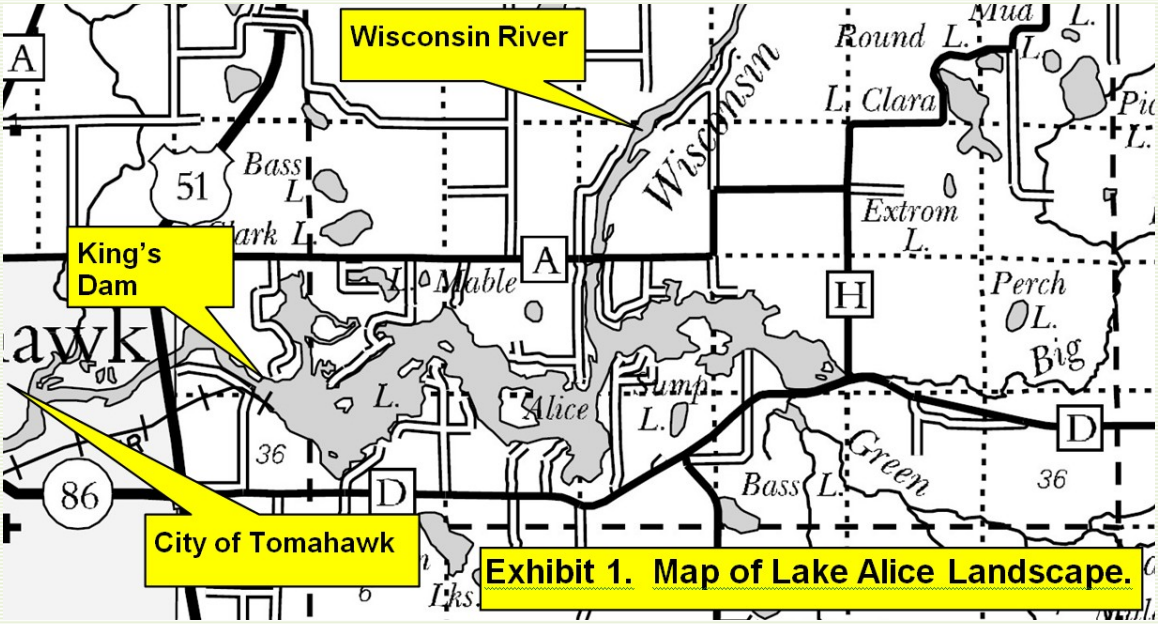


Exhibit 1. Map of Lake Alice Landscape.

CHAPTER 3

Purpose and Goal Statements

The Lake Alice Association approaches aquatic plant management with a healthy dose of humility. We do not always understand the causes of environmental phenomena or the effects of our actions to manage the environment. With that thought in mind, we have crafted a statement of purpose and for the Lake Alice Aquatic Plant Management Plan:

> ***Lake Alice has a healthy and diverse aquatic plant community that was well-documented by a point-intercept survey in 2010. This plant community is essential to, and part of, a high quality lake ecosystem that serves the human community with its recreational and aesthetic features. The Lake Alice Association aspires to maintain the Lake Alice aquatic plant community in its present high quality state.***

Supporting this purpose, we offer this goal statement:

> ***It is the goal of the Lake Alice Association to maintain a healthy Lake Alice ecosystem by (1) monitoring the native plant community, (2) guarding against establishment of aquatic invasive species (AIS), and (3) monitoring and educating Lake Alice recreationists and riparian owners with special emphasis on minimizing introduction of AIS, reducing input of nutrients that might alter the plant community, and miminizing physical removal of near-shore riparian plants and littoral zone aquatic plants.***

The purpose and goals are the foundation for the aquatic plant management plan presented in this document. They drive the objectives and actions outlined in Chapter 5 and are the principal motivation of Lake Alice stewards.

CHAPTER 4 Information and Analysis

Our efforts in Phases 1 and 2 of the Lake Alice Stewardship Program have compiled extensive information about historical and current conditions of the Lake Alice ecosystem and its surrounding watershed. This information has been organized and presented in the Lake Alice Adaptive Management Plan (to which this Aquatic Plant Management Plan is appended) and submitted to the WDNR as part of our obligation under the Lake Planning Grants. Of particular importance to this aquatic plant management plan is the aquatic plant survey that was conducted in summer 2010 using the ***WDNR Protocol for Aquatic Plant Survey, Collecting, Mapping, Preserving, and Data Entry***. The results of this comprehensive "point-intercept" survey along with relevant components of other Lake Alice information are presented in this chapter under nine respective subheadings: watershed, aquatic plant management history, aquatic plant community description, fish community, water quality and trophic status, water use, riparian area, wildlife, and stakeholders.

Part 1 – Watershed

The Lake Alice Stewardship Program views Lake Alice as part of a larger landscape ecosystem (referred to as the Lake Alice Watershed). At a continental scale, Lake Alice is a part of the Upper Mississippi Water Resource Region. Waters that flow from Lake Alice eventually enter the Mississippi River and flow into the Gulf of Mexico.

As part of the Phase I work of the Lake Alice Stewardship Program, we delineated the total watershed for Lake Alice as that part of the watershed located upstream of King's Dam (near Tomahawk, Wisconsin). This is illustrated in Exhibit 2. This total watershed for Lake Alice extends up into Michigan's Upper Peninsula and includes over 1,200 square miles of surface area. All water runoff from the land and all of the streams in this region eventually feed into Lake Alice. Likewise, discharges from industry and waste water treatment plants potentially influence Lake Alice.

In order to have a more practical sized watershed with which to work, we delineated a sub-watershed that extends from King's Dam up to the point where Trout Creek enters the Wisconsin River (approximately four river miles upstream of County Highway A). This sub-

watershed is also illustrated in Exhibit 2. The Lake Alice sub-watershed is approximately seventy-four square miles (47,500 acres) and is located entirely within Lincoln County, Wisconsin.

Exhibit 2. Lake Alice Watershed

The Lake Alice sub-watershed has relatively low topography, ranging only about 400 feet in elevation from high points in the landscape to the low point on Lake Alice. The southeastern part of the sub-watershed has the highest elevations. A digital elevation model is provided as Exhibit 3 and shows the relative elevations for the sub-watershed.

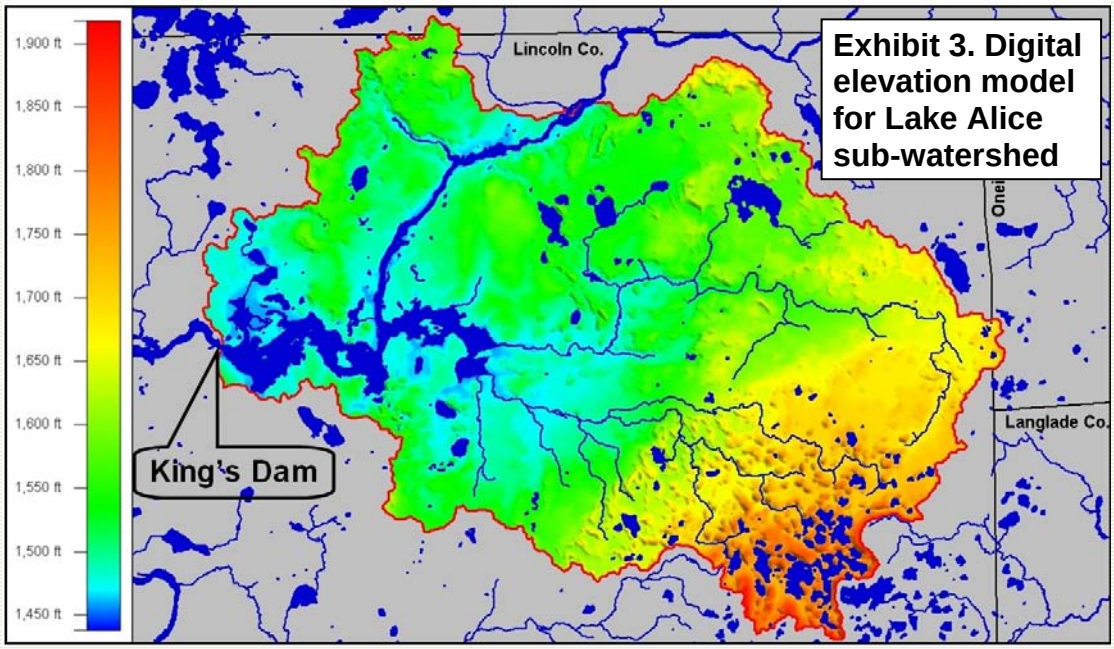


Exhibit 3. Digital elevation model for Lake Alice sub-watershed

Both the total Lake Alice watershed and the Lake Alice sub-watershed are comprised of soils with good infiltration capacity. The general land cover types in both the Lake Alice sub-watershed and the total Lake Alice watershed are quite similar. The land cover types in the sub-watershed include forest (57% of surface area), water and wetland (31%), agriculture (6%), low density residential (4%), and grassland-pasture (2%).

Part 2. Aquatic Plant Management History

As far as we can determine, no systematic or large-scale plant management activity has ever taken place in Lake Alice. Over the years, no particular nuisance issues have demanded control action. Although there was a record of Curly-leaf Pondweed for Lake Alice (a record confirmed by the 2010 plant survey) its small numbers and the absence of other AIS plants in Lake Alice has meant no targeted plant control actions have occurred. It is the hope of the Lake Alice Association and the intent of actions recommended in this plan that active plant management remains unnecessary for this beautiful Wisconsin water body.

Part 3. Aquatic Plant Community Description

Why do lakes need aquatic plants? In many ways, they are underwater forests. Aquatic plants provide vertical and horizontal structure in the lake just like the many forms and variety of trees do in a forest. Imagine how diminished a forest's biodiversity becomes in the advent of a clearcut. Similarly, a lake's biodiversity in part depends on a diversity of plants.

Aquatic plants are beneficial in many ways. Areas with plants produce more food for fish (insect larvae, snails, and other invertebrates). Aquatic vegetation offers fish shelter and spawning habitat. Many submerged plants provide food for waterfowl and habitat for insects on which some waterfowl feed. Aquatic plants further benefit lakes by producing oxygen and absorbing nutrients (phosphorus and nitrogen) from runoff. Aquatic plants also protect shorelines and lake bottoms by dampening wave action and stabilizing sediments.

The distribution of plants within a lake is generally limited by light availability, which is, in turn, controlled by water clarity. Based on Lake Alice clarity, we would estimate that rooted aquatic plants can exist in up to about eight feet depth (in fact, the maximum depth of rooted vegetation determined in our survey was seven feet). In addition to available light, the type of substrate influences the distribution of rooted aquatic plants. Plants are more likely to be found in muddy or soft sediments containing organic matter, and less likely to occur where the substrate is sand or gravel. Finally, water chemistry influences which plants are found in a body of water. Some species prefer alkaline lakes and some prefer more acidic lakes.

As mentioned earlier, AIS can reach high densities and wide distribution within a lake. This diminishes the native plant community and the related habitat. At times, even native plants can reach nuisance levels with respect to certain kinds of human recreation. In these instances, some kind of plant management may be warranted.

Prior to the formal point-intercept aquatic plant survey conducted in 2010, we are aware of no formal surveys or studies of aquatic plants on Lake Alice. A few records regarding aquatic plants in Lake Alice do exist. These are described Adaptive Management Plan and summarized here. Laura Herman (WDNR, Aquatic Plant Specialist) visited Lake Alice on two occasions. In 1997, Herman visited the vicinity of Surewood Forest Campground pier area. She recorded burreed, fine-leaf pondweed, clasping leaf pondweed, coontail, large-leaf pondweed, *Vallisneria*, and *Sagiteria*. In 2001 at a site near Deer Run Road, Herman observed pickerelweed, white water lily, yellow water lily, fern pondweed, floating leaf pondweed, great bladderwort, coontail, and *Calla*. In 1994, the WDNR (Jim Kreitlow, Water Quality Planner) identified algae in a sample taken from Lake Alice. This sample contained

green algae (*Dichotomosiphon, Scendesmus quadricauda, Pandorina*, and *Golenkinia*) and diatoms (*Melosira granulate, Fragillaria, Gomphonema, Golenkinia,* and *Caloneis*).

Wild Rice is an important component of the Lake Alice ecosystem. The principal rice population is contained in the eastern component of Lake Alice contains, especially the area referred to as Green Meadow Flowage (where Green Meadow creek enters Lake Alice).

We conducted a WDNR point-intercept aquatic plant survey on Lake Alice during July 2010. This formal survey assessed the plant species composition on a grid of 878 points distributed evenly over Lake Alice. Using latitude-longitude coordinates and a handheld GPS unit, we navigated to the points and used a rake mounted on a pole or rope to sample plants. These were identified and recorded and input into a dedicated spreadsheet for storage and data analysis. This systematic survey provides baseline data about the lake. Future monitoring can identify and track changes in the plant community. Changes in a lake environment might manifest as loss of species, change in species abundance or distribution, difference in the relative composition of various plant life forms (emergent, floating leaf, or submergent plants), and/or appearance of an AIS or change in its population size. Monitoring can track changes and provide valuable insight on which to base management decisions. In the remainder of this section (Part 5) we report the findings of the 2010 point-intercept survey. The supporting tables and figures are provided in Appendix B.

We recorded a total of twenty-nine species of aquatic plants on Lake Alice. Twenty-three of these were collected at sampling sites and an additional six were observed from the boat. Table 1 displays summary statistics for the survey. Table 2 provides a list of the species encountered, including common and scientific name along with some summarizing statistics. The number of species is referred to as "richness," thus the species richness for Lake Alice is 29. The number of species encountered at any given sample point ranged from 0 to 10, but only 66 sample points were found to have aquatic vegetation present. The average number of species encountered at these vegetated sites was 2.68. The actual number of species encountered at each of the vegetated sites is graphically displayed on Figure 1. Plant density is estimated by a "rake fullness" metric (3 being the highest possible density). These densities (considering all species) are displayed for each sampling site on Figure 2.

We determined the maximum depth of plant colonization was 7 feet (see Figure 3 and Table 1). Rooted vegetation was found at 66 of the 211 sample sites with depth ≤7 feet (31.3% of the sites). These sites are displayed on Figure 4. This indicates that although availability of appropriate depth may limit the distribution of plants, it is not the only habitat

factor involved. Substrate is another feature that influences plant distribution. A comparison of Figures 4 and 5 reveals that many of the sites with suitable depth but no plants had sandy substrate that likely did not provide suitable anchoring substrate and/or nutrients for plants.

Table 2 provides information about the frequency of occurrence of the plant species encountered in Lake Alice. Several metrics are provided, including total number of sites in which each species was found and frequency of occurrence at sites ≤ the maximum depth of rooted vegetation. This frequency metric is standardized as a "relative frequency" (also shown in Table 2) by dividing the frequency of occurrence for a given species by the sum of frequency of occurrence for all plants and multiplying by 100 to form a percentage. The resulting relative frequencies for all species total 100%. The relative frequencies for the 23 plant species collected with a rake are graphically displayed in descending order on Figure 6. This display shows that slender waterweed had the highest relative frequency followed by coontail. The lowest relative frequencies are at the far right of the graph. As examples of individual species distributions, we show the occurrences of the four most frequently encountered plants and the three least frequently encountered plants in Figures 7-13.

Species richness (total number of plants recorded at the lake) is a measure of species diversity, but it doesn't tell the whole story. As an example, consider the plant communities of two hypothetical ponds each with 1,000 individual plants representing ten plant species (richness is 10). In the first pond each of the ten species populations in comprised of 100 individuals. In the second pond, Species #1 has a population of 901 individuals and each of the other nine species is represented by one individual plant. Intuitively, we would say that first pond is more diverse because there is more "even" distribution of individual species. The "Simpson Diversity Index" takes into account both richness and eveness in estimating diversity. The Simpson Diversity Index for Lake Alice plants is 0.91 (Table 1) which indicates a diverse aquatic plant community.

Another measure of floristic diversity and quality is the *Floristic Quality Index* (FQI). Floristic quality is an assessment metric designed to evaluate the closeness that the flora of an area is to that of undisturbed conditions (Nichols 1999). Among other applications, it forms a standardized metric that can be used to compare the quality of different lakes (or different locations within a single lake) and monitor long-term changes in a lake's plant community (an indicator of lake health). The FQI for a lake is determined by using the average *coefficient of conservatism* times the square root of the number of native plant species present in the lake. Knowledgeable botanists have assigned to each native aquatic plant a *coefficient of*

conservatism representing the probability that a plant is likely to occur in pristine environment (relatively unaltered from presettlement conditions). The coefficients range from 0 to 10, with 10 being assigned to those species most sensitive to disturbance. As more environmental disturbance occurs, the less conservative species become more prevalent.

Nichols (1999) analyzed aquatic plant community data from 554 Wisconsin Lakes to ascertain geographic (ecoregional) characteristics of the FQI metric. This is useful for considering how the Lake Alice FQI (30.1) compares to other lakes and regions. The statewide medians for number of species, average conservatism value, and FQI are 13, 6, and 22.2, respectively. On a statewide basis, Lake Alice compares favorably to these values (Lake Alice's native species count is 28 and it mean conservatism is 5.7). Nichols (1999) determined that there are four ecoregional-lake types groups in Wisconsin: (1) Northern Lakes and Forests lakes, (2) Northern Lakes and Forests flowages, (3) North Central Hardwoods and Southeastern Till Plain lakes and flowages, and (4) Driftless Area and Mississippi River Backwater lakes. Lake Alice is located in the Northern Lakes and Forests flowages group. Nichols (1999) found species numbers for the Northern Lakes and Forests flowages group were the highest of any of the four groups with a median value of 24. Lake Alice data is consistent with that find. The Lake Alice mean average conservatism (5.7) is also similar to Nichols (1999) findings for the median value for the Northern Lakes and Forests flowages group (6.2). Finally, the Lake Alice FQI (30.1) is somewhat higher than the median value for the Northern Lakes and Forests flowages group (28.3). These findings support the contention that the Lake Alice plant community is healthy and diverse.

We observed no aquatic macrophytes in Lake Alice that would be considered a nuisance-level population density/distribution. Our survey, however, did verify the earlier find of the aquatic invasive plant species Curly-leaf Pondweed (*Potamogeton crispus*). We found a single turion (burr-like winter buds) in the same location as the earlier find.

Part 4. Fish Community

The Lake Alice Adaptive Management Plan summarizes the Lake Alice fish community. Lake Alice is one of the better fisheries in the area and includes walleye, largemouth bass, smallmouth bass, northern pike, muskellunge, bluegill, black crappie, and yellow perch. The WDNR indicates it displays good populations of all fish present. A healthy distribution of fish sizes also exists. No non-native fish species are known to be present, except for Channel Catfish which were introduced by the WDNR (see Part 8).

Part 5. Water Quality and Trophic Status

According to the WDNR, the hydrologic lake type for Lake Alice is a "drainage lake" and its waterbody type is "flowage." A limited set of Lake Alice data is available from the WDNR Self-Help Monitoring Program database. Sechhi transparencies, Chlorophyll "a", and total phosphorus all indicate that Lake Alice should be classified as "eutrophic" (Shaw *et al.* 2002). The Carlson's Trophic State Index also indicates an enriched lake. Eutrophic lakes typically have high nutrients, high productivity, and support large biomass of plants and animals. Eutrophic lakes host high densities of aquatic plants and are prone to algal blooms. Many experience dissolved oxygen depletion. Secchi depth for Lake Alice averages around four feet. During the summer of 2010, White Water scientists collected Lake Alice water for analysis. The resulting data support the conclusion that Lake Alice is a eutrophic lake.

The shoreline development index (the ratio of the shoreline length to the length of the circumference of a circle of the same area as the lake) for Lake Alice is 5.2. This high number indicates that the lake has a large area of potentially productive littoral zone habitat (shallow water habitat). This translates as potentially good habitat for aquatic plants, fish species, and other aquatic animals present in the Lake Alice ecosystem.

Part 6. Water Use

Lake Alice is an important resource used by the public for recreation. There are seven public access sites with a total of forty-one parking spaces. A portage has been installed and maintained around King's Dam to facilitate canoe and kayak enthusiasts in getting around the dam. There are twelve daily rental and one-hundred yearly rental campsites available around Lake Alice. Public access for fishing from shore is available at the ends of township roads and at several points along Hwy D and Echo Valley Road. Public access for shore fishing is also available on the King's Dam property (except in the immediate vicinity of the dam). Lincoln County owns several small islands on Lake Alice that are used for camping and waterfowl hunting. Up the river from Lake Alice, The State of Wisconsin owns 1,785 acres of land available for public use including hunting and fishing. Some of the land is only accessible by water route from public access sites on Lake Alice. Fishing tournaments are a fairly frequent occurrence on Lake Alice. In recent years, the Lake Alice Association (LAA) has organized around a common concern for the long-term care of Lake Alice. This has begun a very hopeful chapter in the history of Lake Alice. The LAA has actively become involved with all aspects of Lake Alice resources and with educating those that live near and use the lake.

Part 7. Riparian Area

The Lake Alice Adaptive Management Plan describes the extensive and diverse riparian area that encompasses the lake. Lake Alice has about 27 miles of shoreline and associated riparian area (about 5.4 miles of this shoreline results from islands). Healthy riparian areas provide numerous important functions and values to Lake Alice. Educating riparian owners around Lake Alice as to the value of riparian areas is important to the maintenance of these critical areas.

Part 8. Wildlife

The Lake Alice Adaptive Management Plan characterizes the wildlife in the vicinity of Lake Alice. In 2010, the Lake Alice Association conducted a frog/toad survey on wetlands in the vicinity of Lake Alice and the results are reported in the Adaptive Management Plan.

There is a 2002 report to WDNR (reporter unknown) of rusty crayfish in Lake Alice. It is not known to have had detrimental impact. No follow up surveys or studies have occurred for this AIS.

Two other aquatic invaders, spiny waterfleas and zebra mussels, have been surveyed in Lake Alice. The WDNR checked for spiny waterfleas in Lake Alice in 2006 and 2008, but detected no evidence. Zebra mussels have been surveyed by using plate samplers by Tomahawk Pulp & Paper and by WDNR in 2000, 2001, 2006, and 2008. None have been identified in Lake Alice.

Channel catfish were introduced to Lake Alice by the WDNR in 1989, 1990, and 1991. Two adult catfish were recorded during a 2003 WDNR fish survey and assumed to be from the original plantings. The fish is not apparently reproducing in Lake Alice. Common carp and white bass have not been found in the Lake Alice system.

Part 9. Stakeholders

At this juncture in the ongoing aquatic plant management planning process, the Lake Alice Association has represented the population of Lake Alice stakeholders. In the future, additional stakeholders and interested citizens will be invited to participate as the plan is refined in order to broaden input and to help build consensus. No controversial direct plant management actions (for example, harvesting or use of herbicides) are a component of the current plan.

CHAPTER 5

Recommendations

In this chapter we provide recommendations for specific objectives and associated actions to support the goal stated in Chapter 3 and re-stated here for convenient reference:

> ***It is the goal of the Lake Alice Association to maintain a healthy Lake Alice ecosystem by (1) monitoring the native plant community, (2) guarding against establishment of aquatic invasive species (AIS), and (3) monitoring and educating Lake Alice recreationists and riparian owners with special emphasis on minimizing introduction of AIS, reducing input of nutrients that might alter the plant community, and miminizing physical removal of near-shore riparian plants and littoral zone aquatic plants.***

Since Lake Alice is a healthy and diverse ecosystem, we could simply recommend an alternative of "no action." In other words, let Lake Alice continue without any effort or intervention on part of lake stewards. We consider the "no action" alternative a risk. Many forces threaten the quality of the lake and the Lake Alice Association feels a great responsibility to minimize the threats. We therefore outline in this section a set of actions and related management objectives that will actively engage Lake Alice stewards in the process of lake management.

The actions are presented in tabular form. Each "action" consists of a set of four statements: (1) a declarative "action" statement the specifies the action (2) a statement of the "objective" that the action serves, (3) a "monitoring" statement that specifies the party responsible for carrying out the action and maintaining data, and (4) a "status" statement that suggests a timeline/calendar and indicates status (not yet started, ongoing, or completed).

At this time, we recommend no direct manipulation of plant populations. No native plants in Lake Alice exhibit nuisance population size or distribution. The Curly-leaf Pondweed find requires additional research to determine the extent and density of this AIS population in Lake Alice.

Recommended Actions for the Lake Alice Aquatic Plant Management Plan
Action: Conduct a formal survey of Lake Alice stakeholders. ***Objective:*** To ascertain perspectives and priorities of Lake Alice stakeholders especially with regard to aquatic plants. The survey will inform ongoing refinements of the aquatic plant management plan and identify gaps in understanding about aquatic plants to help guide education efforts. ***Monitoring:*** The Lake Alice Association oversees activity and maintains data. ***Status:*** Planned to occur in 2012.
Action: Monitor Lake Alice water quality. ***Objective***: Continue with collection and analysis of Lake Alice water quality parameters to detect trends in parameters such as nutrients, chlorophyll "a", and water clarity. ***Monitoring:*** The Lake Alice Association oversees activity and maintains data. ***Status:*** Ongoing.
Action: Conduct a qualitative near-shore habitat inventory of Lake Alice. ***Objective:*** To characterize, assess, & photograph the near-shore habitat (including plants, level of disturbance, amount of natural shoreline, and impacted areas). ***Monitoring:*** The Lake Alice Association oversees activity and maintains data. ***Status:*** Planned for 2012.
Action: Adopt the Aquatic Plant Management Plan. ***Objective:*** To provide foundation for long-term native plant community conservation and stewardship and to be prepared for response to AIS introductions. ***Monitoring:*** The Lake Alice Association oversees activity and maintains plan. ***Status:*** Planned for 2011.
Action: Form an Aquatic Invasive Species Rapid Response Team (see Chapter 7) ***Objective:*** To be prepared for AIS discovery and efficient response. ***Monitoring:*** The Lake Alice Association coordinates activity. ***Status:*** Planned for 2011.

Recommended Actions for the Lake Alice Aquatic Plant Management Plan

Action: Conduct quantitative plant survey every five years using WDNR Point-Intercept Methodology.

Objective: To watch for changes in native species diversity, floristic quality, plant abundance, and plant distribution and to check for the occurrence of non-native, invasive plant species.

Monitoring: Lake Alice Association oversees and maintains data; copies to WDNR.

Status: Anticipated in 2015.

Action: Request that the WNDR conduct a "Sensitive Area Designation Assessment" on Lake Alice.

Objective: Identify and protect sensitive and special habitat areas and conservancy areas in the Lake Alice ecosystem.

Monitoring: Lake Alice Association oversees and develops further actions if necessary.

Status: Anticipated to make request to WDNR in 2012.

Action: Develop a Citizen Lake Monitoring Network to monitor for invasive species on Lake Alice and develop strategies including education and monitoring activities (see http://www.uwsp.edu/cnr/uwexlakes/clmn for additional ideas).

Objective: To create a trained volunteer corps to monitor aquatic invasive species and to educate recreational users regarding AIS and special features of Lake Alice

Monitoring: The Lake Alice Association oversees activity and records instances of possible or actual introductions of aquatic invasives.

Status: Anticipated to begin in 2011

Action: Continue the "Clean Boats, Clean Waters" program in a form that will engage and enlist volunteers.

Objective: To monitor recreational watercraft traffic as it comes in and out of the lake checking for possible introduction of AIS on boats, engines, and trailers and to educate recreational users regarding AIS and special features of Lake Alice.

Monitoring: The Lake Alice Association oversees activity and records instances of possible or actual introductions of aquatic invasives.

Status: Ongoing

Recommended Actions for the Lake Alice Aquatic Plant Management Plan
Action: Create an education plan for the Lake Alice Association members and other Lake Alice stakeholders that will address issues of healthy aquatic and riparian plant communities. ***Objective:*** To educate Lake Alice stakeholders about issues and topics that affect the lake's aquatic and riparian plant communities, including topics such as: (1) the importance of the aquatic plant community; (2) no or minimal mechanical removal of plants along the shoreline is desirable and that any plant removal should conform to Wisconsin regulations; (3) the value of a natural shoreline in protecting the aquatic plant community; (4) nutrient sources to Lake Alice and the role excess nutrients play in degradation of the aquatic plant community; (5) the importance of reducing or eliminating use of fertilizers on lake front property; ***Monitoring:*** Lake Alice Association oversees activity and assesses effectiveness. ***Status:*** Anticipated to begin in 2012
Action: Identify, photograph, and describe areas of Lake Alice riparian area and shoreline that might be candidates for rehabilitation or restoration. ***Objective:*** To inventory and describe areas of Lake Alice riparian area and shoreline and plan possible rehabilitation or restoration actions. ***Monitoring:*** The Lake Alice Association oversees activity and maintains data. ***Status:*** Anticipated to begin in 2012
Action: Manage and increase Lake Alice Stakeholders Mailing List. ***Objective:*** To increase ability to communicate with Lake Alice riparian owners and other stakeholders. To be used in delivering education materials and fostering lake stewardship and volunteerism. ***Monitoring:*** The Lake Alice Association oversees activity and maintains data. ***Status:*** Ongoing

Recommended Actions for the Lake Alice Aquatic Plant Management Plan
Action: Investigate the extent of the Curly-leaf Pondweed population in Lake Alice. ***Objective:*** To understand the size and distribution of the population and determine appropriate management response(s) to this AIS species in Lake Alice. ***Monitoring:*** The Lake Alice Association oversees activity and maintains data. ***Status:*** Anticipated in 2011.
Action: Participate in the Mable Lake Association lake stewardship program. ***Objective:*** To provide guidance to Mable Lake Association as it addresses lake management issues, including a newly discovered AIS population (Eurasian watermilfoil) in Mable Lake (located just ¼ mile north of Lake Alice). ***Monitoring:*** The Lake Alice Association oversees activity. ***Status:*** Anticipated in 2011.
Action: Work with Edgewater Golf Course to create a better buffer zone between the golf course and Lake Alice. ***Objective:*** Provide protection against runoff of nutrients into this Lake Alice bay and to convey information to the public about the importance of buffer zones along lakes. ***Monitoring:*** The Lake Alice Association oversees activity. ***Status:*** Anticipated in 2012.
Action: Map stands of wild rice in Lake Alice. ***Objective:*** Provide a baseline understanding of the distribution of this species in the lake in order to characterize the resource and monitor possible plant community change in the future. ***Monitoring:*** The Lake Alice Association oversees activity. ***Status:*** Anticipated in 2012.
Action: Monitor the Lake Alice watershed for purple loosestrife. ***Objective:*** Identify purple loosestrife populations before they reach large size. ***Monitoring:*** The Lake Alice Association oversees activity. ***Status:*** Anticipated in 2012.

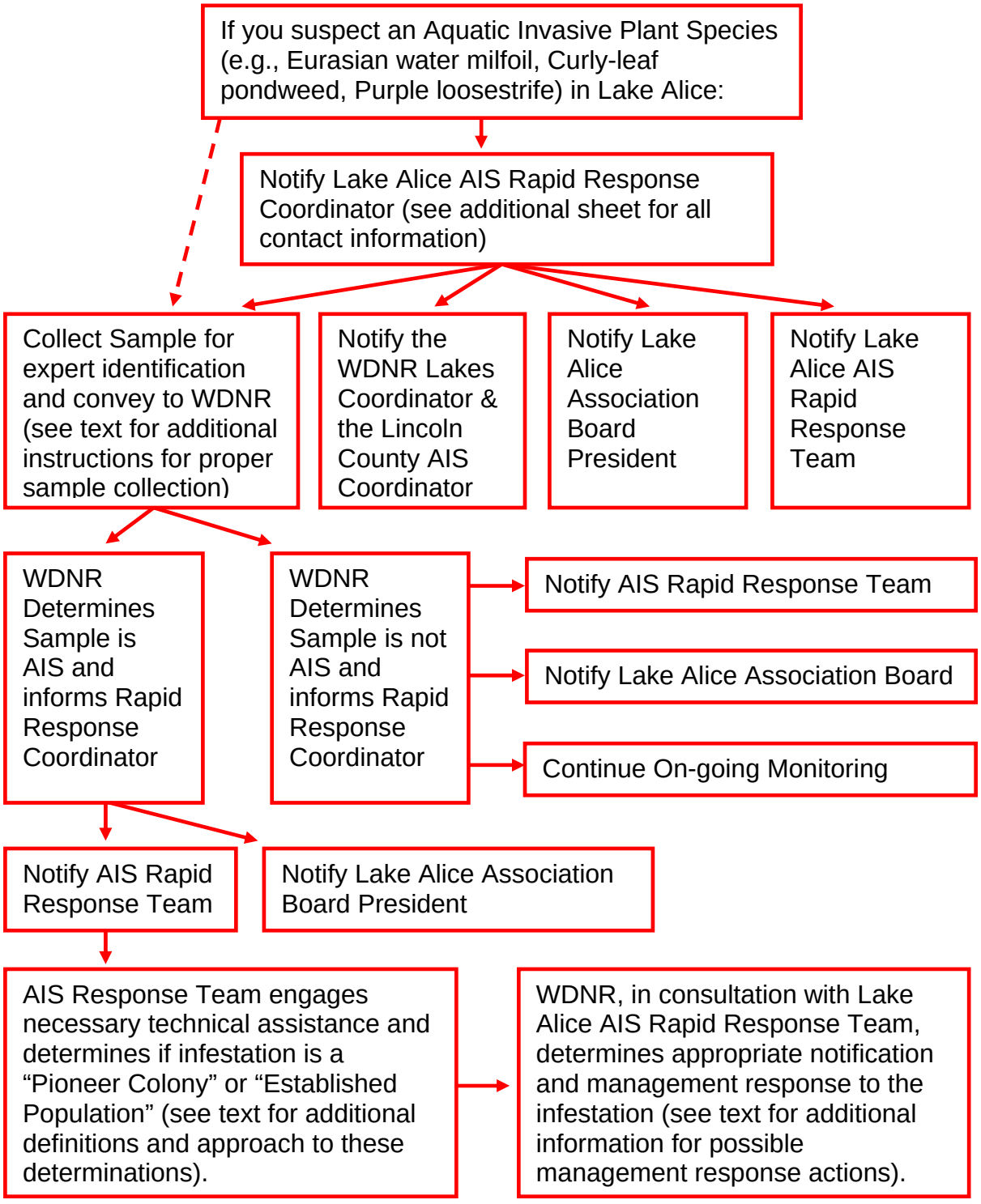
CHAPTER 6 Contingency Plan for AIS

Unfortunately, sources of aquatic invasive plants and other AIS are numerous in Wisconsin. There is an increasing likelihood of accidental introduction of AIS to Lake Alice through conveyance of life stages by boats, trailers, and other vectors. It is important for the Lake Alice Association to be prepared for the contingency of an aquatic invasive plant species population in the lake. The most likely aquatic invasive plant species to colonize Lake Alice at this time are Purple Loosestrife, Eurasian Watermilfoil, and Curly-leaf Pondweed. In fact, the 2010 verified presence of Curly-leaf pondweed in Lake Alice will provide a case study for the contingency plan for rapid response to AIS that we outline in this final chapter of the aquatic plant management plan.

For riparian owners and users of a lake ecosystem, the discovery of AIS is a tragedy that elicits an immediate desire to fix the problem. Although strong emotions may be evoked by such a discovery, a deliberate and systematic approach is required to appropriately and effectively address the situation. An aquatic plant management plan (one including a contingency plan for AIS) is the best tool by which the process can be navigated. One of the actions outlined in the previous chapter was to establish an Aquatic Invasive Species Rapid Response Team. This team and its coordinator are integral to the management process. It is important for this team to be multi-dimensional (or at least have quick access to the expertise that may be required). AIS invade not just a single lake, but an entire region since the new infestation is an outpost from which the AIS can more easily colonize other nearby water bodies. For this reason it is strategic for the Rapid Response Team to include representation from regional stakeholders.

Exhibit 4 (next page) provides a flowchart for an appropriate rapid response to the suspected discovery of an aquatic invasive plant species. The response will be most efficient if an AIS Rapid Response Team has already been established and is familiar with the contingency plan. In the remainder of this chapter we further describe the approach.

Exhibit 4. Lake Alice Aquatic Invasive Plant Species Rapid Response



When a suspect aquatic invasive plant species is found, either the original observer or a member of the Rapid Response Team should collect an entire plant specimen including roots and stems. The sample should be placed in a sealable bag with a small amount of water to keep it moist. Place a label in the bag written in pencil with date, time, collector's name, lake name, location, town, and county. Attach a lake map to the bag that has the location of the suspect AIS marked and GPS coordinates recorded. The sample should be placed on ice in a cooler or in a refrigerator. Deliver the sample to the WDNR Lakes Management Coordinator (Kevin Gauthier in Rhinelander) as soon as possible (at least within three days). The WDNR or their botanical expert(s) will determine the species and confirm whether or not it is an AIS.

If the suspect specimen is determined to be an invasive plant species, the next step is to determine the extent and density of the population since the management response will vary accordingly. The Rapid Response Team should conduct (or have its consultant conduct) a survey to define the colony's perimeter and estimate density. If less than five acres (or <5% of the lake surface area), it is designated a "Pioneer Colony." If greater than five acres (or >5% of the lake surface area) then it is designated an "Established Population." Once the infestation is characterized, "at risk" areas should also be determined and marked on a map. For example, nearby boat landing sites and areas of high boat traffic should be indicated.

When "pioneer" or "established" status has been determined, it is time to consult with the WDNR Lakes Coordinator to determine appropriate notifications and management responses to the infestation. Determining whether hand-pulling or chemical treatment will be used is an important and early decision. Necessary notifications of landowners, governmental officials, and recreationists (at boat landings) will be determined. Whether the population's perimeter needs to be marked with buoys will be decided by the WDNR. Funding sources will be identified and consultants and contractors will be contacted where necessary. The WDNR will determine if further baseline plant survey is required (depending on type of treatment). A post treatment monitoring plan will be discussed and established to determine the efficacy of the selected treatment.

Once the Rapid Response Team is organized, one of its first tasks is to develop a list of contacts and associated contact information (phone numbers and email addresses). At a minimum, this contact list should include: the Rapid Response Coordinator, members of the Rapid Response Team, County AIS Coordinator, WDNR Lakes Management Coordinator, Lake Alice Association President, local WDNR warden, local government official(s), other experts, chemical treatment contractors, and consultant(s).

Appendix A
Literature Cited

LITERATURE CITED

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Appendix B
Tables and Figures

Table 1. Summary statistics for the 2010 point-intercept aquatic plant survey for Lake Alice.

Lake: Lake Alice
County: Lincoln
WBIC: 1555900
Survey Date: August 3-6, 2010

Summary Statistic	Value	Notes
Total number of sites on grid	878	Total number of sites on the original grid (not necesarily visited)
Total number of sites visited	679	Total number of sites where the boat stopped, even if much too deep to have plants.
Total number of sites with vegetation	66	Total number of sites where at least one plant was found
Total number of sites shallower than maximum depth of plants	211	Number of sites where the depth was less than or equal to the maximum depth where plants were found. This value is used for Frequency of occurrence at sites shallower than maximum depth of plants.
Frequency of occurrence at sites shallower than maximum depth of plants	31.3	Number of times a species was seen divided by the total number of sites shallower than maximum depth of plants.
Simpson Diversity Index	0.91	This is a nonparametric estimator of community heterogeneity. It is based on Relative Frequency and thus is not sensitive to whether all sampled sites (including non-vegetated sites) are included. The closer the Simpson Diversity Index is to 1, the more diverse the community.
Maximum depth of plants (ft)**	7.00	The depth of the deepest site sampled at which vegetation was present.
Number of sites sampled using rake on Rope (R)	46	
Number of sites sampled using rake on Pole (P)	254	
Average number of all species per site (shallower than max depth)	0.84	
Average number of all species per site (vegetated sites only)	2.68	
Average number of native species per site (shallower than max depth)	0.83	
Average number of native species per site (vegetated sites only)	2.67	
Species Richness	23	Total number of species collected. Does not include visual sightings.
Species Richness (including visuals)	29	Total number of species collected including visual sightings.
Floristic Quality Index (FQI)	30.1	

Table 2. Plant species recorded and distribution statistics for the 2010 Lake Alice aquatic plant survey.

Common name	Scientific name	Frequency of occurrence at sites less than or equal to 7' (maximum depth of plants)	Frequency of occurrence within vegetated areas (%)	Relative Frequency (%)	Number of sites where species found	Number of sites where species found (including visuals)	Average Rake Fullness
Slender waterweed	*Elodea nuttallii*	14.69	46.97	17.51	31	32	1.06
Coontail	*Ceratophyllum demersum*	12.32	39.39	14.69	26	33	1.38
Fern pondweed	*Potamogeton robbinsii*	8.53	27.27	10.17	18	19	1.22
Flat-stem pondweed	*Potamogeton zosteriformis*	8.53	27.27	10.17	18	30	1.00
Wild celery	*Vallisneria americana*	7.11	22.73	8.47	15	22	1.07
Whorled water-milfoil	*Myriophyllum verticillatum*	4.74	15.15	5.65	10	23	1.00
Slender naiad	*Najas flexilis*	3.32	10.61	3.95	7	7	1.00
Clasping-leaf pondweed	*Potamogeton richardsonii*	3.32	10.61	3.95	7	9	1.00
Small duckweed	*Lemna minor*	2.84	9.09	3.39	6	11	1.00
Forked duckweed	*Lemna trisulca*	1.90	6.06	2.26	4	4	1.00
Nitella	*Nitella* sp.	1.90	6.06	2.26	4	4	1.00
Spatterdock	*Nuphar variegata*	1.90	6.06	2.26	4	17	1.00
White water lily	*Nymphaea odorata*	1.90	6.06	2.26	4	25	1.00
Large-leaf pondweed	*Potamogeton amplifolius*	1.90	6.06	2.26	4	10	1.00
Small pondweed	*Potamogeton pusillus*	1.90	6.06	2.26	4	4	1.00
Water marigold	*Bidens beckii* (formerly *Megalodonta*)	1.42	4.55	1.69	3	5	1.00
Water star-grass	*Heteranthera dubia*	1.42	4.55	1.69	3	7	1.00
Watershield	*Brasenia schreberi*	0.95	3.03	1.13	2	5	1.00
White-stem pondweed	*Potamogeton praelongus*	0.95	3.03	1.13	2	4	1.00
Spiral-fruited pondweed	*Potamogeton spirillus*	0.95	3.03	1.13	2	2	1.00
Curly-leaf pondweed	*Potamogeton crispus*	0.47	1.52	0.56	1	1	1.00
Floating-leaf pondweed	*Potamogeton natans*	0.47	1.52	0.56	1	3	1.00
Short-stemmed bur-reed	*Sparganium emersum*	0.47	1.52	0.56	1	7	1.00
Pickerelweed	*Pontederia cordata*				Visual	5	
Cattail	*Typha* sp.				Visual	3	
Common bladderwort	*Utricularia vulgaris*				Visual	3	
Southern wild rice	*Zizania aquatica*				Visual	3	
Creeping spikerush	*Eleocharis palustris*				Visual	1	
Hardstem bulrush	*Schoenoplectus acutus*				Visual	1	

Frequency of occurrence within vegetated areas (%): Number of times a species was seen in a vegetated area divided by the total number of vegetated sites.

Figure 1. Number of plant species recorded at Lake Alice sample sites (2010).

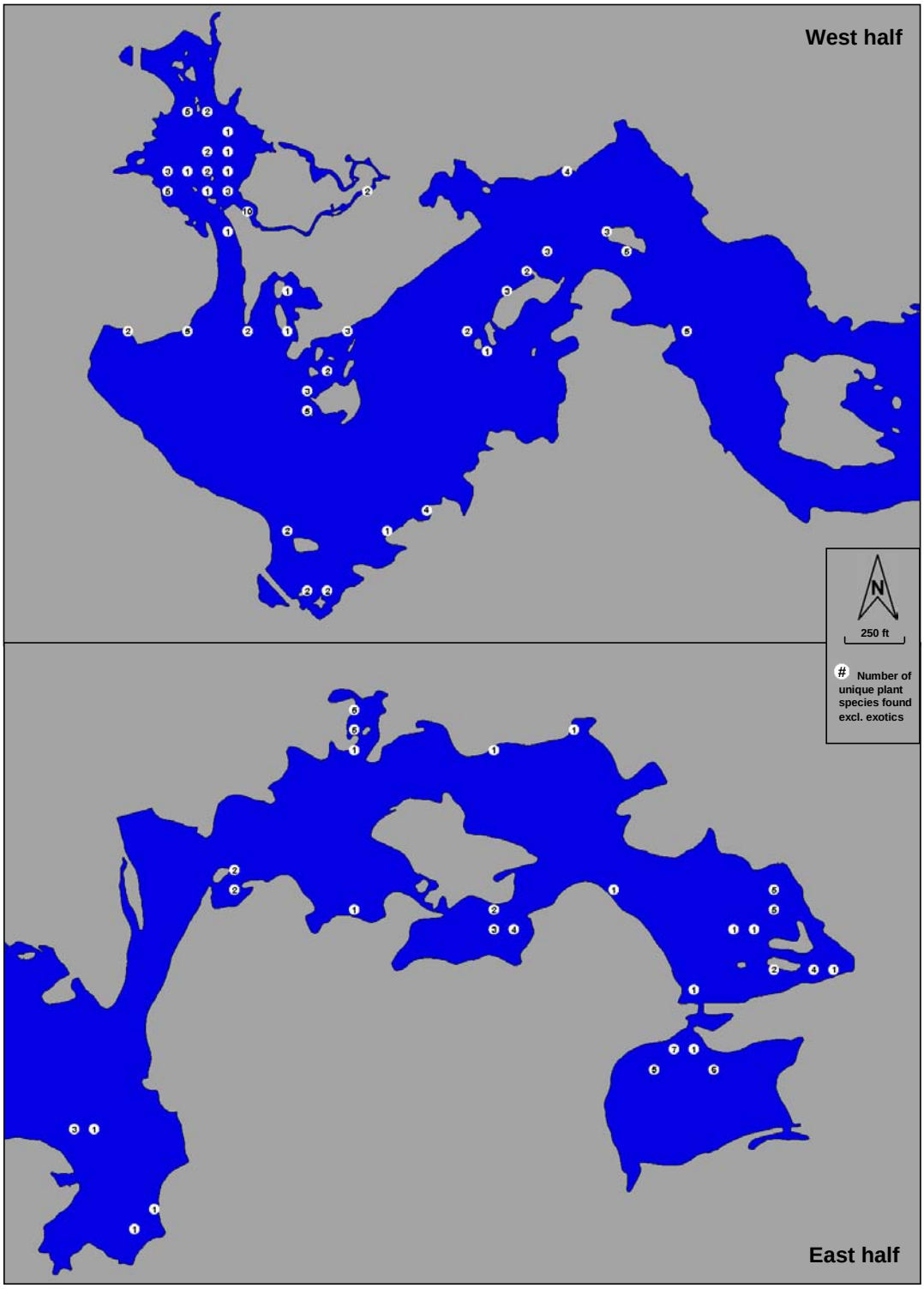


Figure 2. Rake fullness ratings for Lake Alice sample sites (2010).

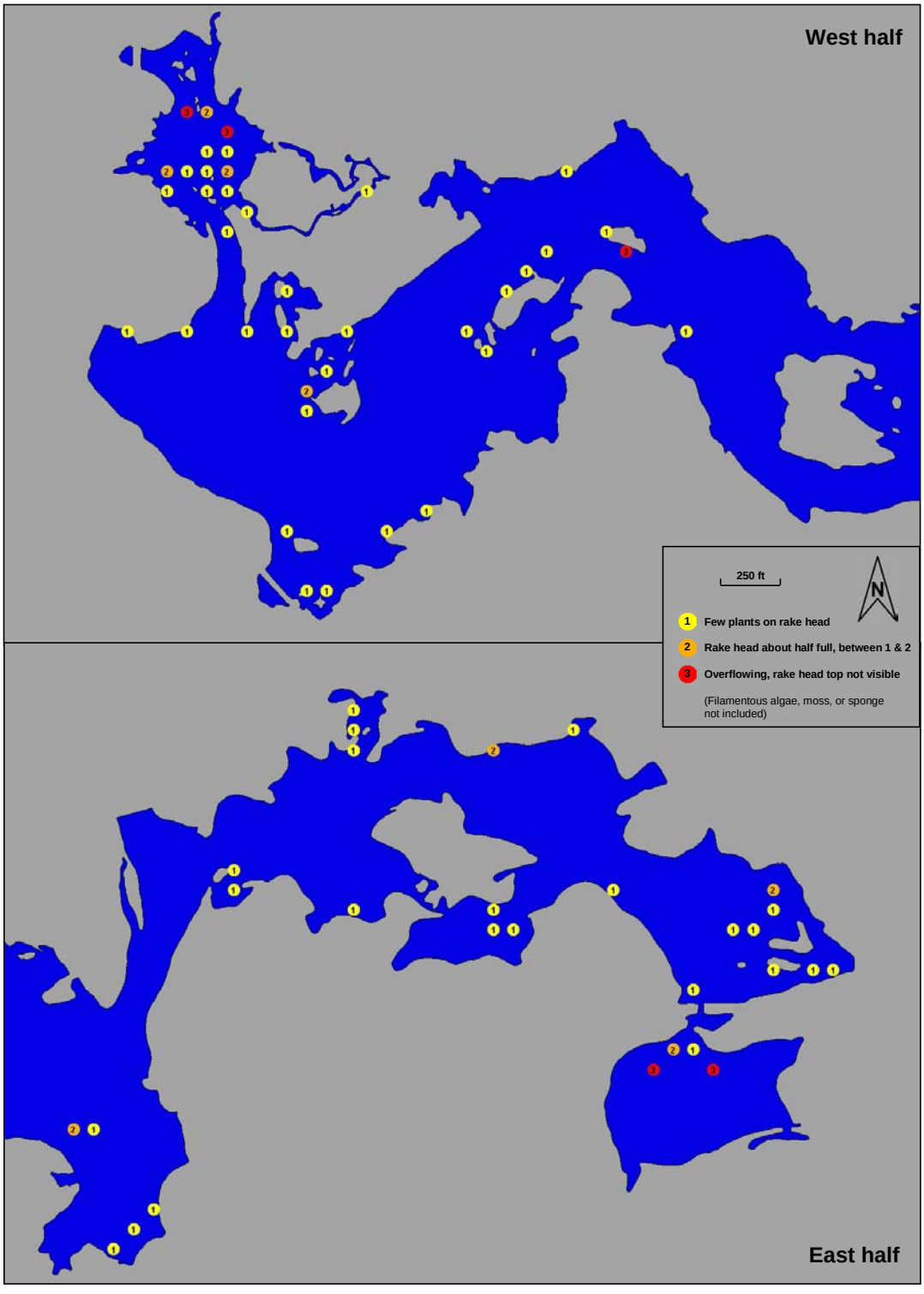


Figure 3. Maximum depth of plant colonization in Lake Alice (2010).

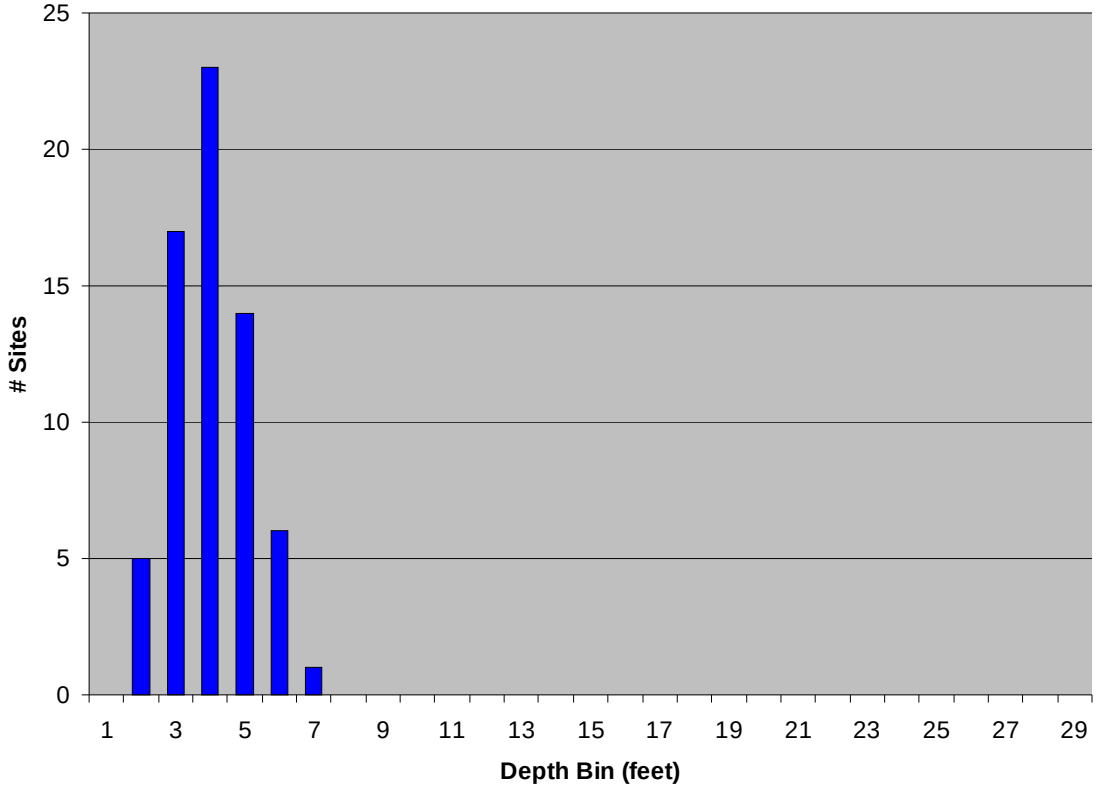


Figure 4. Lake Alice sampling sites less than or equal to maximum depth of rooted vegetation.

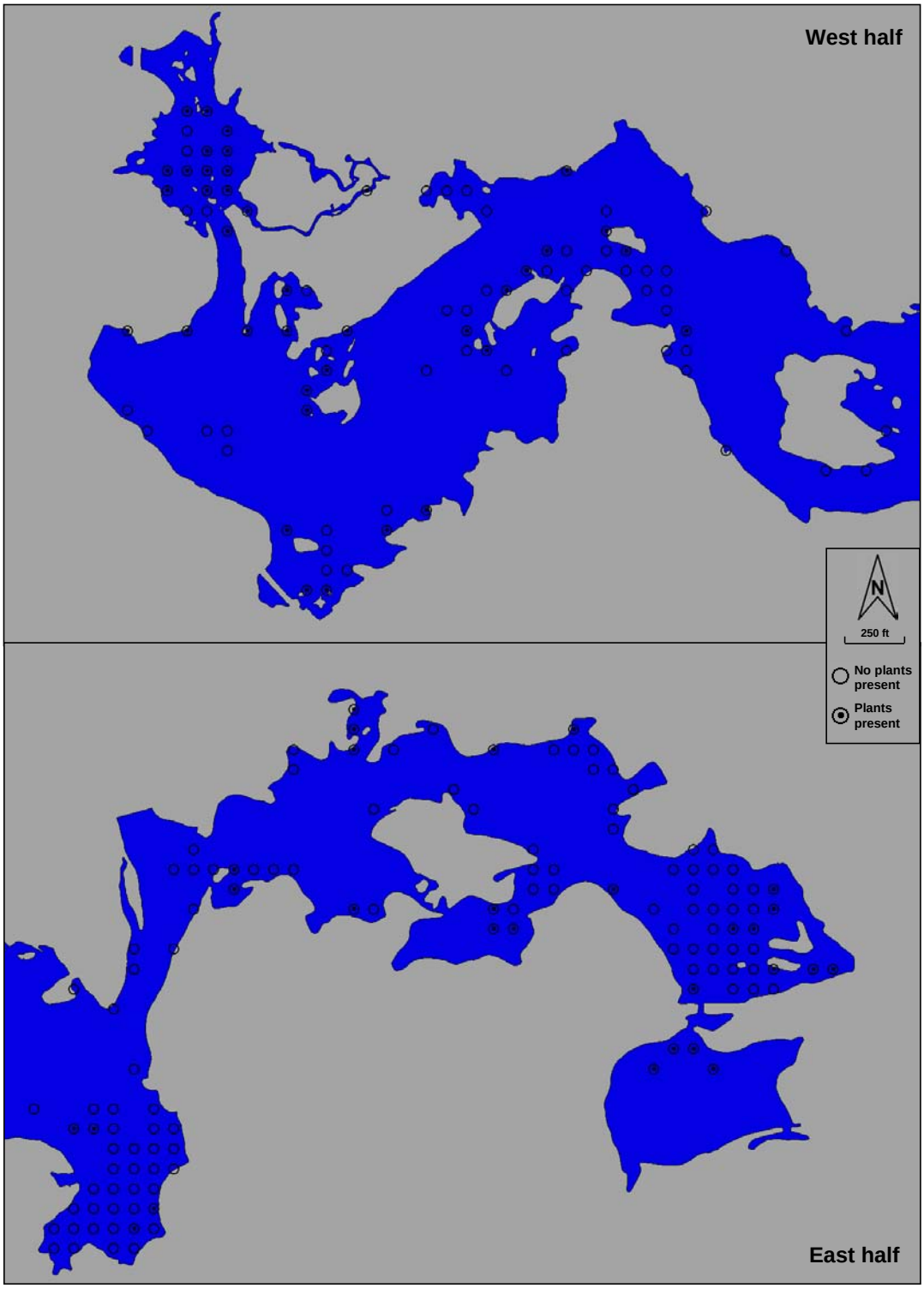


Figure 5. Lake Alice substrate encountered at point-intercept plant sampling sites in 2010.

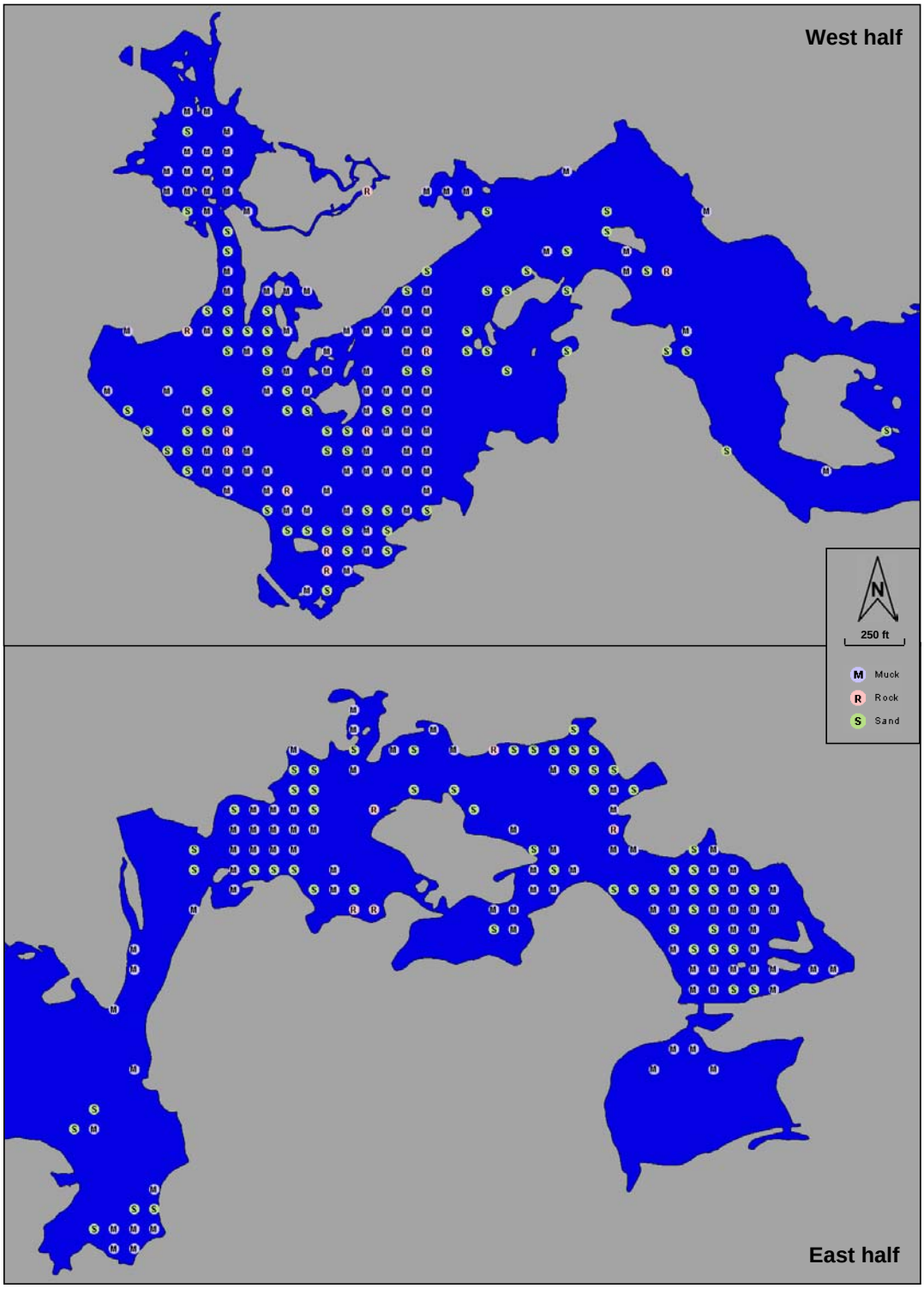


Figure 6. Relative frequency of Lake Alice aquatic plants (2010).
(Aquatic invasive species, Curly-leaf pondweed, indicated in red.)

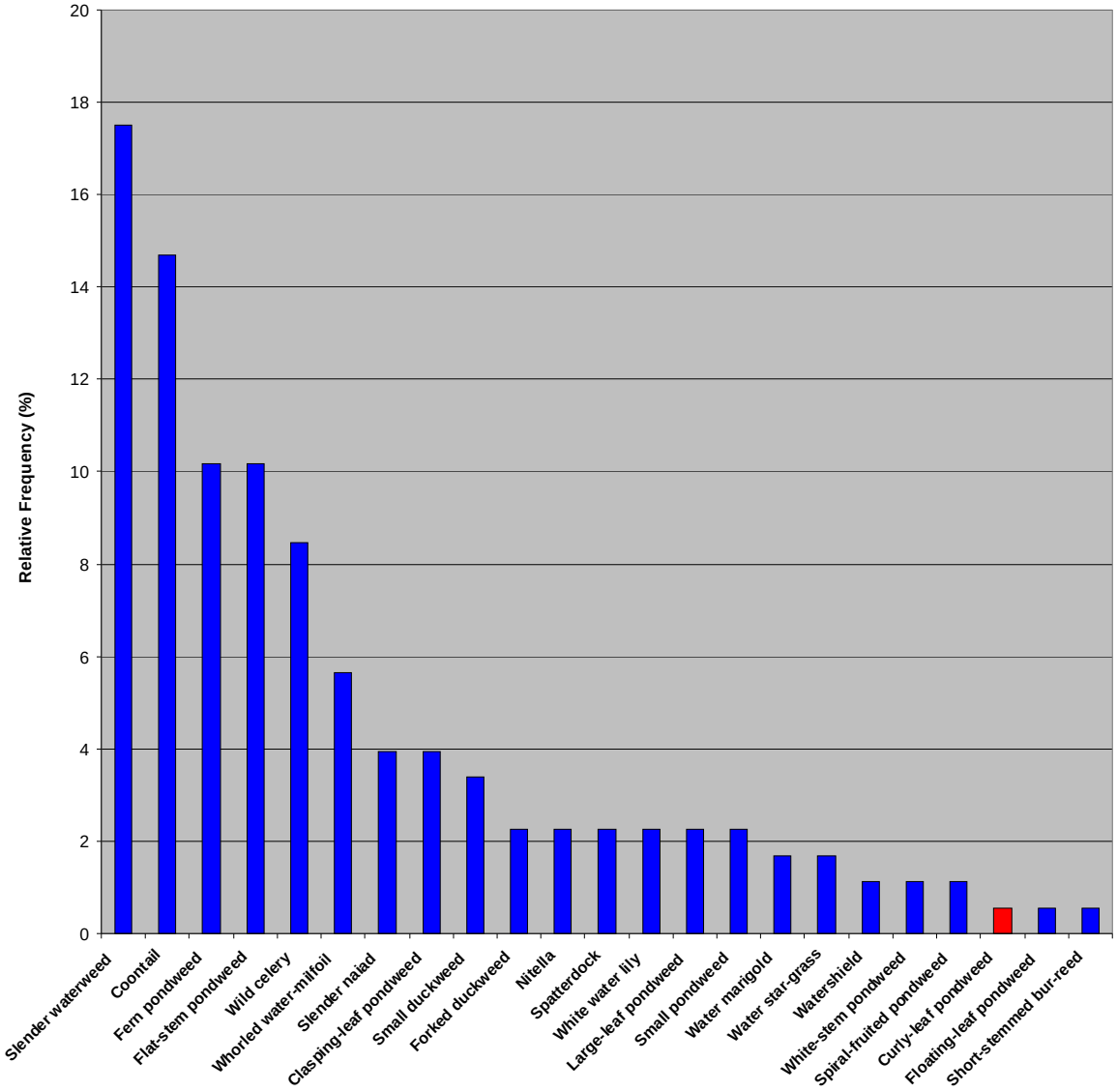


Figure 7. Distribution of *Elodea nuttallii* (Slender waterweed) in Lake Alice (2010).

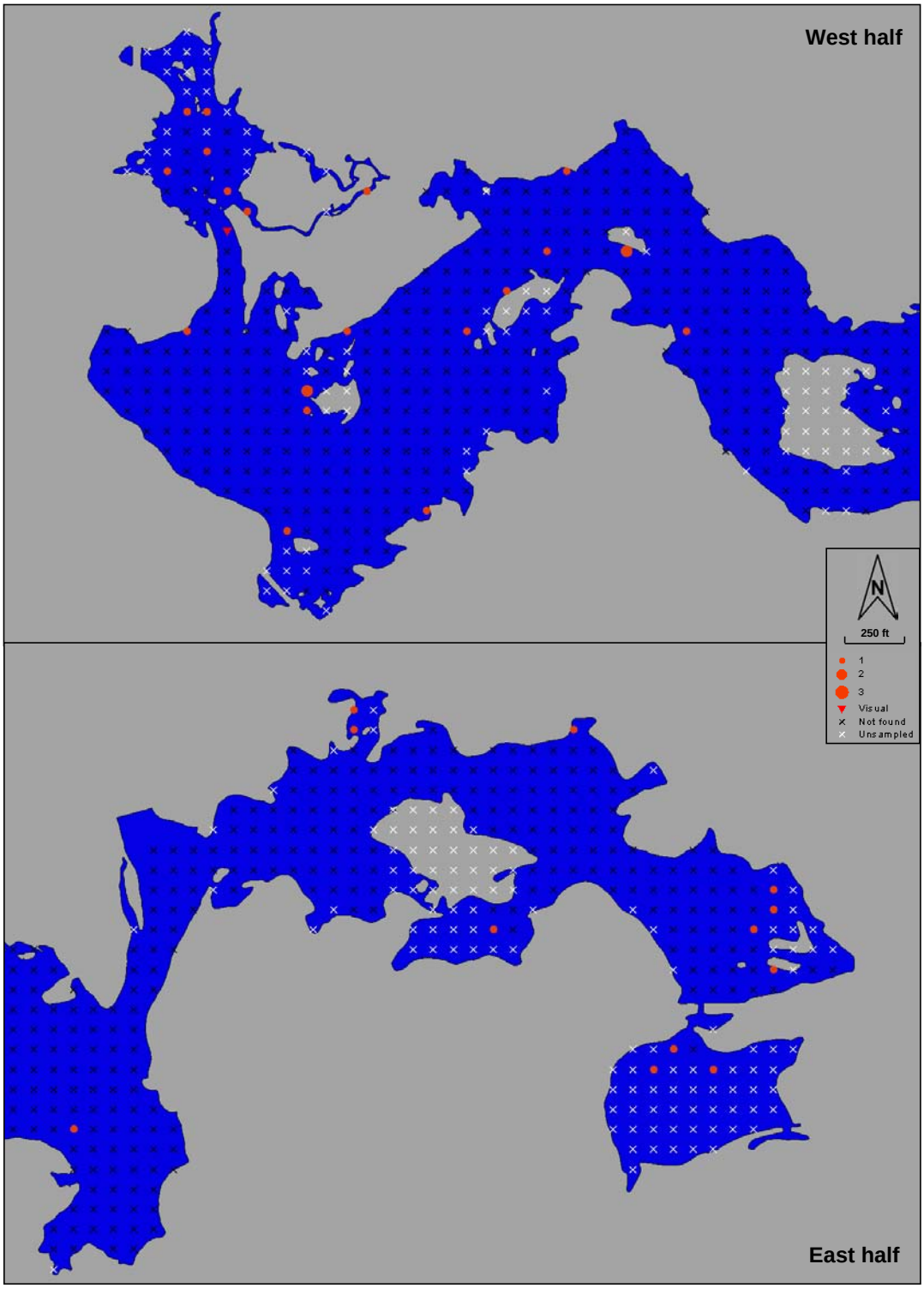


Figure 8. Distribution of *Ceratophyllum demersum* (Coontail) in Lake Alice (2010).

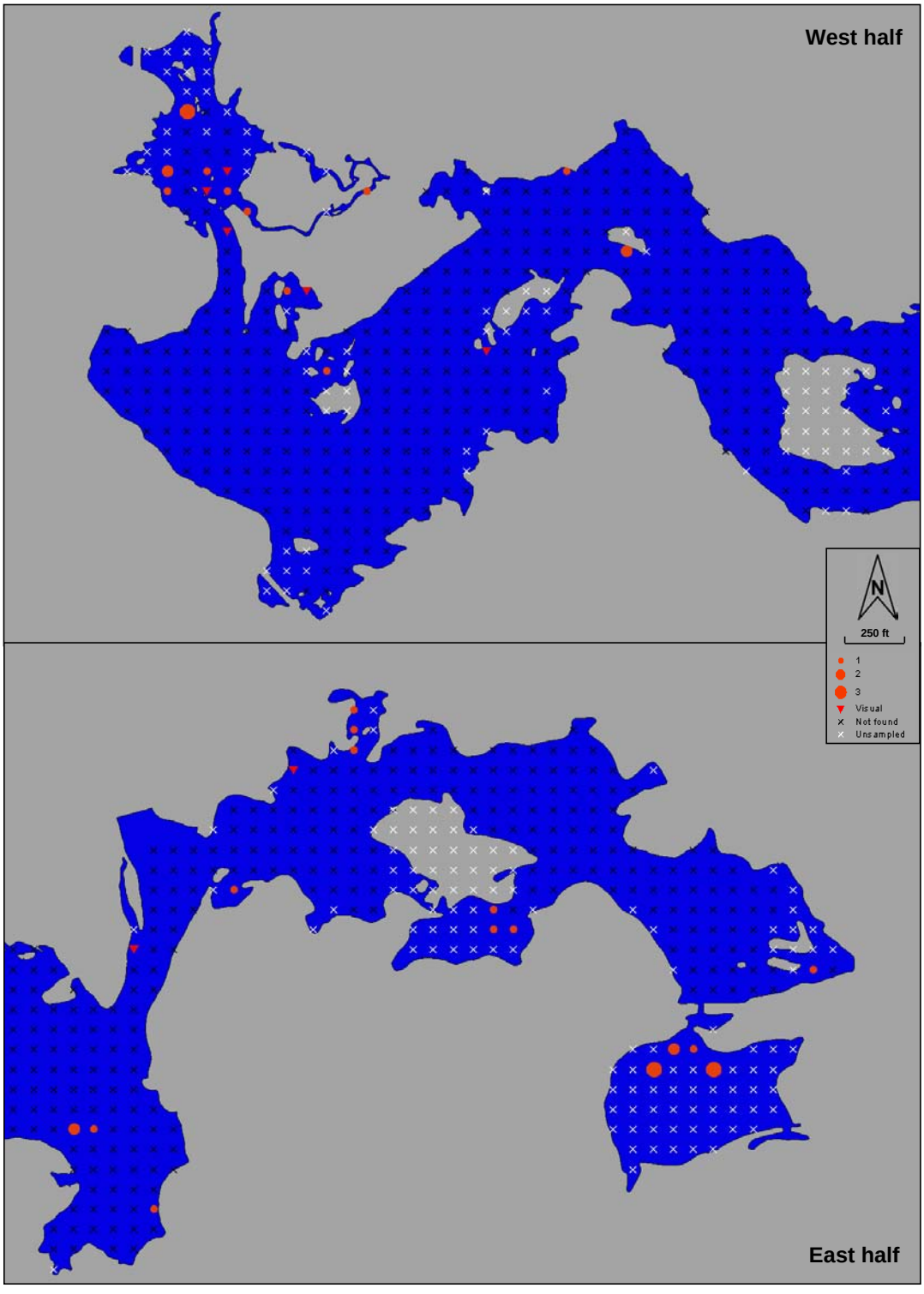


Figure 9. Distribution of *Potamogeton robbinsii* (Fern pondweed) in Lake Alice (2010).

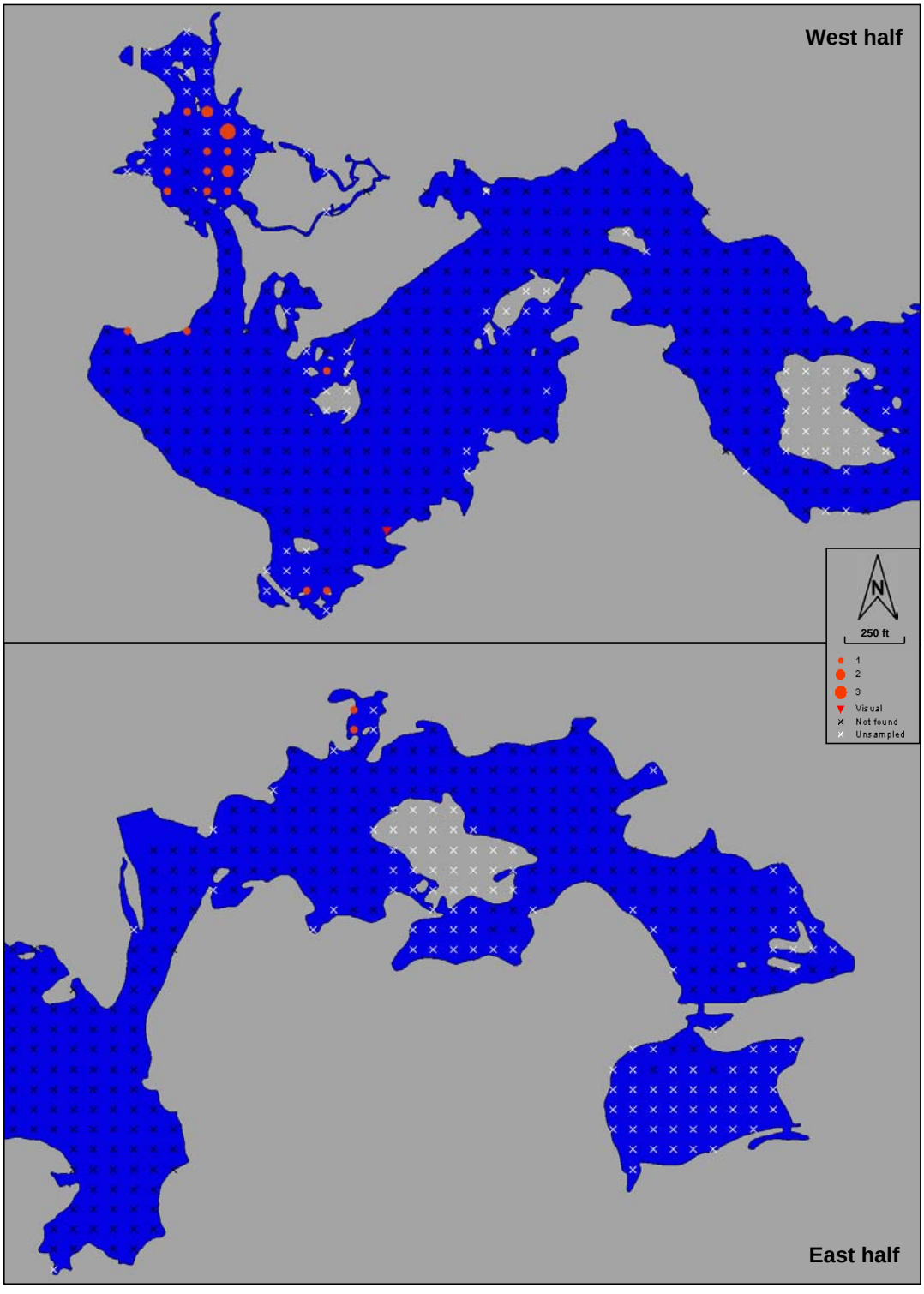


Figure 10. Distribution of *Potamogeton zosteriformis* (Flat-stem pondweed) in Lake Alice (2010).

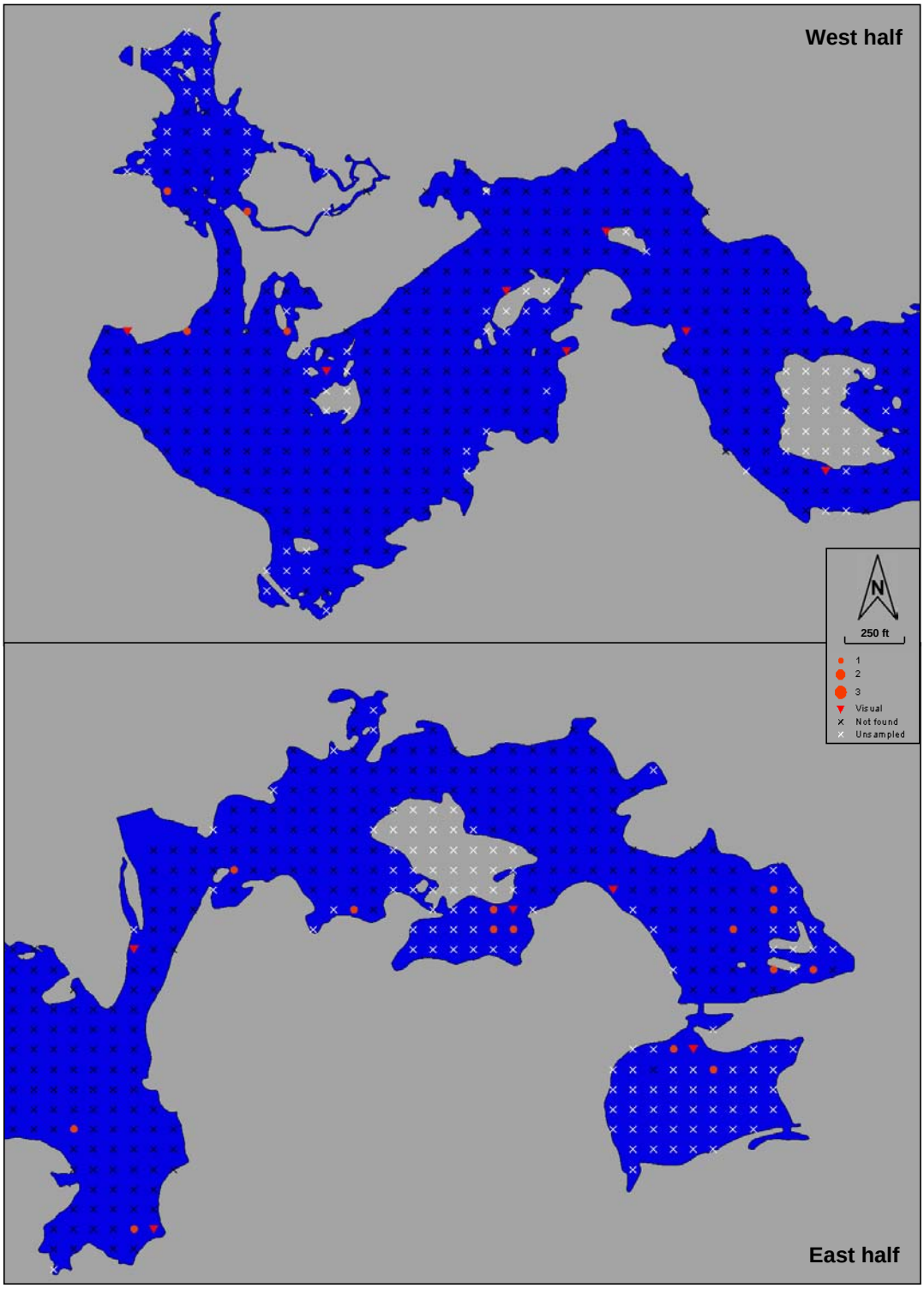


Figure 11. Distribution of *Potamogeton crispus* (Curly-leaf pondweed) in Lake Alice (2010).

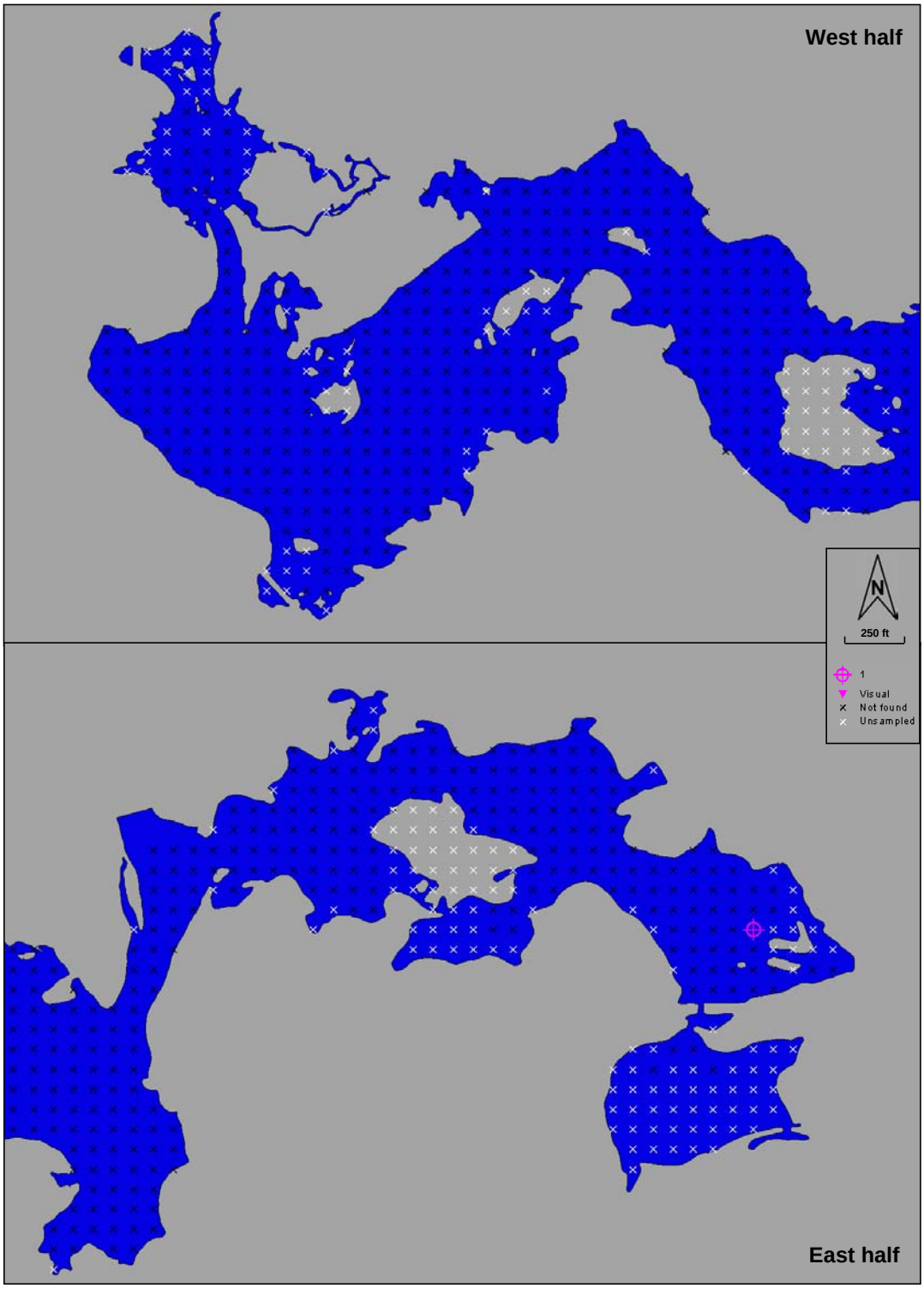


Figure 12. Distribution of *Potamogeton natans* (Floating-leaf pondweed) in Lake Alice (2010).

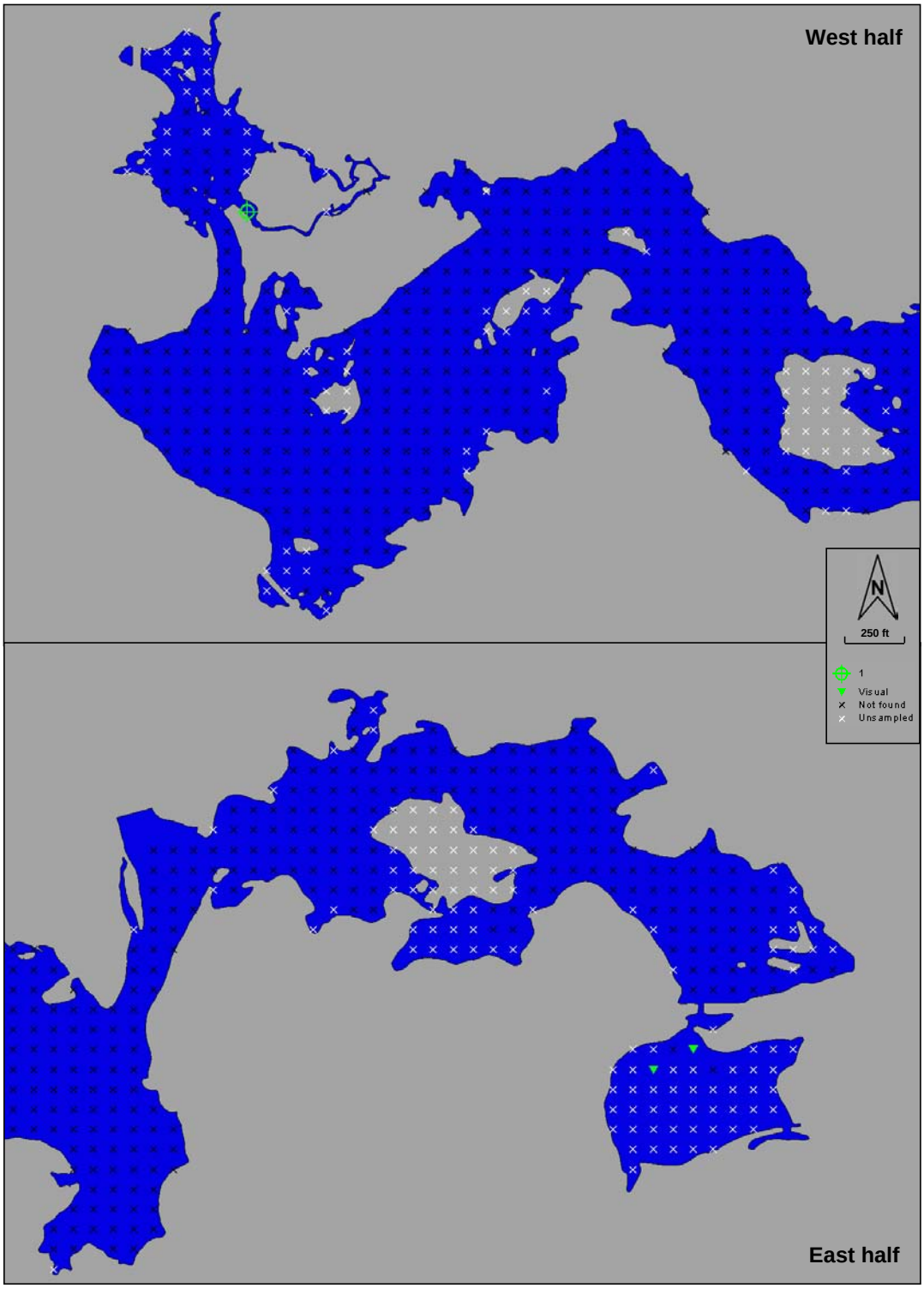
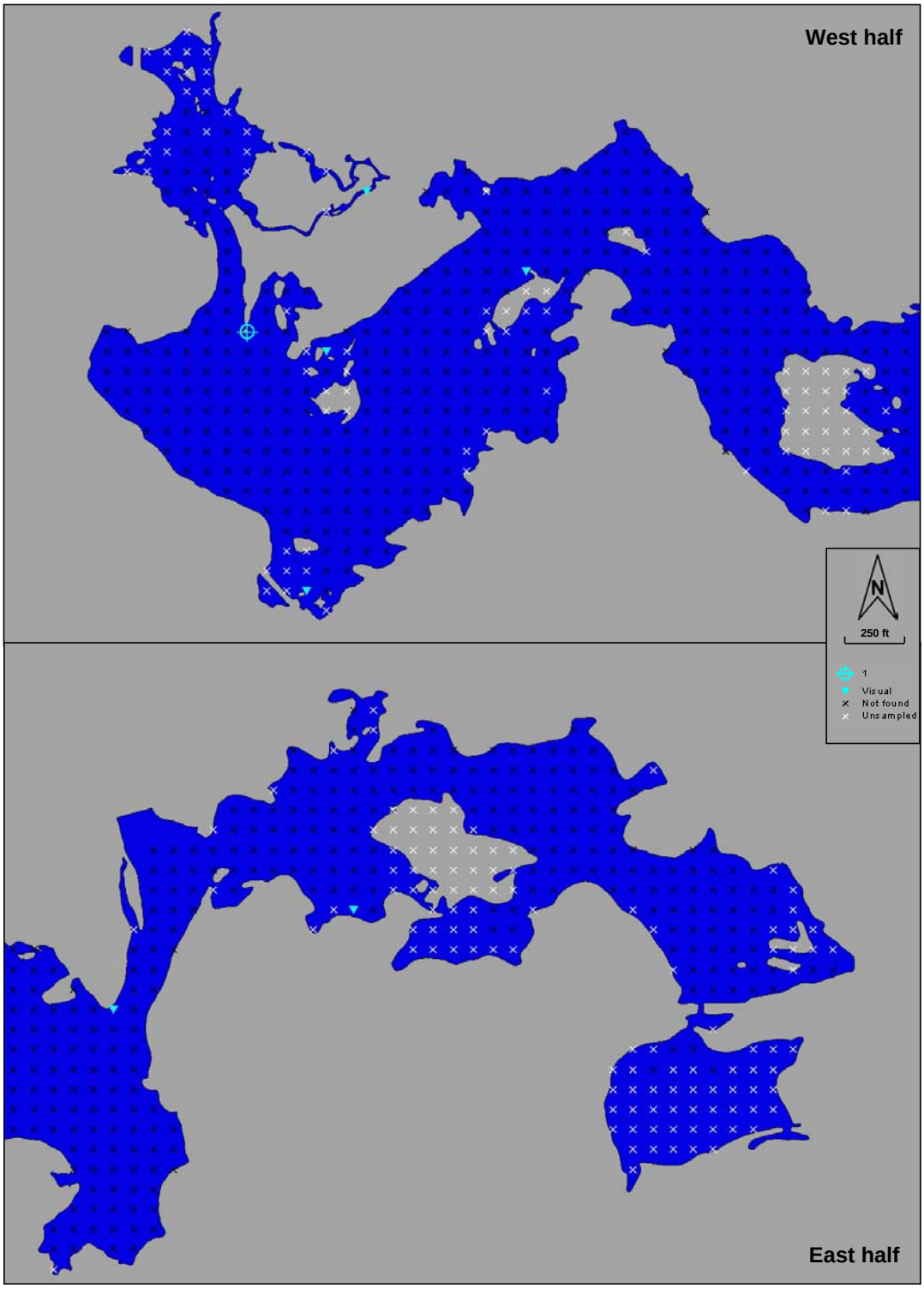


Figure 13. Distribution of *Sparganium emersum* (Short-stemmed bur-reed) in Lake Alice (2010).



Appendix D
Lake Alice Volunteer Angler Journal

Lake Alice Stewardship Program
Volunteer Angler's Journal Annual Report

Ice fishing is a popular activity on Lake Alice (photo by Dean Premo)

This document is a product of a WDNR Lake Planning Grant awarded to:

Lake Alice Association
Contact: Glenn Mott, Board President
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Submitted to:

Wisconsin Department of Natural Resources
Attention: Kevin Gauthier, Sr., Lakes Management Coordinator
107 Sutliff Ave, Rhinelander, WI 54501
Phone: (715) 365-8937; Email: Kevin.GauthierSr@wisconsin.gov

Prepared by:

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Date: May 2011

Introduction

One component of Phase 2 of the Lake Alice Stewardship Program was to establish a means by which anglers could collect meaningful fisheries data. Members of the Lake Alice Association and their consultant (White Water Associates) worked closely with the Wisconsin Department of Natural Resources (WDNR) to develop the Volunteer Angler's Journal. The goal of the journal (and the resulting data) is to augment the discrete periodic WDNR fish surveys (including Fyke nets, electroshocking, and creel surveys) with continuously collected and annually reported fishing data from systematically recorded angler journals. This report documents the methods and findings for the first year of volunteer fish monitoring in Lake Alice.

Methods

This volunteer angler journal program was designed so that volunteer anglers can systematically record their fishing experiences. The program was conceived and designed by White Water Associates although components of the program (and field form) were drawn from the literature (similar programs have been established in other states). Careful review by WDNR fisheries staff (Dennis Scholl and David Seibel) and WDNR Lakes Management Program Coordinator (Kevin Gauthier) resulted in several meaningful modifications.

We hope that participating anglers will be engaged in the journaling process for at least a year (and hopefully more). Nevertheless, the system can also accommodate anglers who participate for one fishing trip only. It is hoped that this activity will engage anglers in collecting fish data and understanding the dynamics of fish populations. The objectives for the angler journal program include providing information on:

- species of fish caught while angling on Lake Alice;
- size distribution of fishes caught on Lake Alice;
- fishing emphases of Lake Alice anglers (i.e., time spent on panfish, walleyes, bass, etc.);
- fishing techniques used on Lake Alice (ie., trolling, bait fishing, spin fishing, etc.);
- relative amount of catch and release fishing; and
- catch-per-effort for various Lake Alice fish species.

Volunteer anglers participating in the journal program were provided with field data forms (see Exhibit 1 on next page) and specific instructions on how to fill in the forms with fishing information. The forms were designed to be easy to understand and fill out.

Exhibit 1. Volunteer Anglers Journal field data form.

VOLUNTEER ANGLERS JOURNAL FIELD DATA FORM

Important Instructions (*see Angler Journal Description for details*)
Fill sheet out only for yourself (a partner fills out a separate sheet). Use new sheet for each fishing trip. Record unsuccessful trips too. Measure and record all gamefish caught and indicate if kept/released. For panfish, measure the length of the first ten of each species and indicate if kept or released. For additional panfish, count number kept and number released and record. Complete a journal form every time you fish.

Angler and Fishing Trip Data

Angler Name:	Phone:	Date:
Time start (actual fishing time):	Time end (actual fishing time):	Total time fishing (excluding lunch break, etc.):

List fish species sought and % time spent for each. If you are seeking all species listed during your entire outing, list "100%" by each.

Watercraft (circle one): Ice Pontoon Fishing boat Canoe Kayak Other (specify):

Fishing Style (circle 1 or more): Tip-up Jigging Trolling Casting Bait Fly Other (specify):

Weather Conditions: Sunny _____ Partly Cloudy _____ Overcast _____ Air temp (°F) _____ Water temp (°F) _____ Rainy _____ Calm winds _____ Moderate winds _____ Strong winds _____ Wind Direction _____ Other weather notes:

Level of satisfaction (circle one): Low Medium High Explain:

Record Fish Caught on Trip

Catch #	Fish Species Common Name	Length (nearest ¼ inch)	Check one: Kept	Check one: Released	Catch #	Fish Species Common Name	Length (nearest ¼ inch)	Check one: Kept	Check one: Released	Counts of unmeasured panfish
1					11					Bluegill
2					12					
3					13					Pumpkinseed
4					14					
5					15					Crappie
6					16					
7					17					Yellow Perch
8					18					
9					19					Other (specify)
10					20					

Data continued on second page? (circle one): YES NO Note: If you need more space, indicate by circling "YES" and then record data on back of this sheet or on a 2nd data form.

Important instructions to the volunteers were summarized on the data form and emphasized on a separate handout. These instructions included the following specifics:

- Fill out the data form only for yourself (if they wish, a fishing partner should fill out his/her own);
- Use a new sheet for each fishing outing;
- Record all trips including unsuccessful trips too (even if you have caught no or few fish);

- Record actual time spent fishing (boating to and from your fishing areas and time spent doing reconnaissance with sonar are considered fishing activities and you should include the time spent on these activities even though you may not have a line in the water). Don't include non-fishing activity such as a lunch break or time spent swimming);
- Measure all fish caught (even tiny ones) in inches from tip of the snout to tip of the tail. Measure to the nearest one-quarter (1/4) inch. We want to understand the population size structure;
- Indicate if the fish was kept or released;
- Be consistent; fill out a journal field data sheet every time you fish;
- List the fish species you are seeking during a fishing trip and estimate a percentage of time devoted to each. If you are seeking all species listed during your entire outing, record "100%" by each species;
- Measure and record all gamefish species caught. For panfish species, measure the length of the first ten of each species and indicate if kept or released. For additional panfish (beyond 10), simply count (don't measure) the number kept and number released. Record these numbers;
- If you need additional space for recording fish, indicated "continued on another page" and then record on back of the Field Data Form or on a second Field Data Form.

As with any biological sampling (whether done by professionals or volunteers), appropriate scientific and resource management use of data must recognize possible limitations of the data. In the case of the Lake Alice Volunteer Angler's Journal, data will be most valid and useful if volunteers: (1) carefully follow directions regarding data recording, (2) accurately identify fish and measure fish length, (3) honestly record all data (big fish, little fish, many fish, and few fish), (4) consistently use the journal on all fishing outings, and (5) participate for multiple years.

Results

The volunteer angler's journal endeavor began with a small number of participants, but we anticipate that this number will grow. The scientific value of the information collected will increase with a greater number of participants and participation of several years. Individual 2010 records are included at the end of this report.

LAKE ALICE ANGLERS JOURNAL – FIELD DATA FORM

Angler and Fishing Trip Data		
Angler Name: Neil Reetenpeel	Phone: 715-612-0096	Date: 4-27-2010
Fishing Partner(s):	Time start: 3:00 PM	Time end: 5:00 PM
Fish species sought: Bluegills		
Lake Zone (circle 1 or more; optional): (King's Dam Reservoir) Mid Lake Alice Pine Cr. Flowage Lower Wisc. River Upper Wisc. River		
Watercraft (circle one): Ice Pontoon Bass boat Canoe Kayak Other (specify): Shore line Pier		
Fishing Style (circle 1 or more): Tip-up (Jigging) Trolling Casting (Bait) Fly Other (specify):		
Weather Conditions: Sunny X Partly Cloudy ____ Overcast ____	Air temp (°F) 60+ Water temp (°F) ____ Rainy ____	Calm winds X Moderate winds ____ Strong winds ____ Wind Direction S Other weather notes:
Level of satisfaction (circle one): Low Medium (High)	Explain: Earliest ever to find fish shallows	

Record for First Ten Fish Caught on Trip						
Catch Number	Time (AM/PM)	Fish Species Common Name	Length (inches)	Weight (optional)	Lure/Bait Used	Released (Y/N)
1						
2						
35	PM	Bluegills	6"-7"		Jig + worm	20 yes
4						
5						
6						
7						
8						
9						
10						

Fish had lots of black spots in fillets

over

LAKE ALICE ANGLERS JOURNAL – FIELD DATA FORM

Angler and Fishing Trip Data		
Angler Name: Paul Fenner	Phone: 715-966-2707	Date: 5/4/2010
Fishing Partner(s):	Time start: 5:00 PM	Time end: 8:60 PM
Fish species sought: Walleye Ect.		
Lake Zone (circle 1 or more; optional): (King's Dam Reservoir) Mid Lake Alice Pine Cr. Flowage Lower Wisc. River Upper Wisc. River		
Watercraft (circle one): Ice Pontoon Bass boat Canoe Kayak Other (specify): Pier fishing		
Fishing Style (circle 1 or more): Tip-up (Jigging) Trolling (Casting) (Bait) Fly Other (specify):		
Weather Conditions: Sunny ____ Partly Cloudy ____ Overcast X	Air temp (°F) 46 t Water temp (°F) ____ Rainy ____	Calm winds ____ Moderate winds X Strong winds ____ Wind Direction West Other weather notes:
Level of satisfaction (circle one): Low Medium (High) Explain:		

Record for First Ten Fish Caught on Trip

Catch Number	Time (AM/PM)	Fish Species Common Name	Length (inches)	Weight (optional)	Lure/Bait Used	Released (Y/N)
1	PM	17½" Walleye	17½		Lure	No
2 1	PM	14" Walleye	14		Lure	yes
3 1	PM	8" Walleye	8		Bait	yes
4 1	PM	9" Perch	9		Bait	yes
5 1	PM	7" Sill	7		Bait	yes
6						
7						
8						
9						
10						

Please return form when finished or Call Neil Pietenpol 715-612-6302 will Pickup
When extra copies are needed please make more or call will provide more
But with comments on back of form

Contact Number

VOLUNTEER ANGLERS JOURNAL FIELD DATA FORM

Important Instructions (see *Angler Journal Description for details*)
Fill sheet out only for yourself (a partner fills out a separate sheet). Use new sheet for each fishing trip. Record unsuccessful trips too. Measure and record all gamefish caught and indicate if kept/released. For panfish, measure the length of the first ten of each species and indicate if kept or released. For additional panfish, count number kept and number released and record. Complete a journal form every time you fish.

Angler and Fishing Trip Data

Angler Name: Zuhse	Phone:	Date: 2010
Time start (actual fishing time):	Time end (actual fishing time):	Total time fishing (excluding lunch break, etc.):

List fish species sought and % time spent for each. If you are seeking all species listed during your entire outing, list "100%" by each.

Watercraft (circle one): Ice Pontoon (Fishing boat) Canoe Kayak Other (specify):

Fishing Style (circle 1 or more): (Tip-up) Jigging Trolling (Casting) (Bait) (Fly) Other (specify):

Weather Conditions: Sunny _____ Partly Cloudy _____ Overcast _____ Air temp (°F) _____ Water temp (°F) _____ Rainy _____ Calm winds _____ Moderate winds _____ Strong winds _____ Wind Direction _____ Other weather notes:

Level of satisfaction (circle one): Low Medium (High) Explain:

Record Fish Caught on Trip

Catch #	Fish Species Common Name	Length (nearest ¼ inch)	Check one: Kept	Released	Catch #	Fish Species Common Name	Length (nearest ¼ inch)	Check one: Kept	Released	Counts of unmeasured panfish
4/30	Panfish		10	8	6/25	Northern	16-22	0	3	Bluegill
4/31	"		6	10	6/26	Panfish		8	12	
5/1	Walleye	15"	1	3	7/7	Northern	18-26	0	2	Pumpkinseed
5/2	Northern	18-26	0	1	7/10	"	16-28	0	2	
5/3	"	16-24	2	2	8/6	Panfish		0	12	Crappie
5/14	Panfish		8	20	8/7	"		0	16	
5/27	Northern	20-24	0	3	9/16	"		8	10	Yellow Perch
5/28	Dogfish	22-26	3	0	11/26	Northern	14-26	5	4	
5/30	Panfish		25	20	11/27	"	"	0	2	Other (specify)
5/31	Northern	18-28	4	6	20					

Data continued on second page? (circle one): YES NO Note: If you need more space, indicate by circling "YES" and then record data on back of this sheet or on a 2nd data form.

LAKE ALICE ANGLERS JOURNAL – FIELD DATA FORM

Angler and Fishing Trip Data		
Angler Name: JAMES A WUNSCH	Phone: 920-467-6126	Date: 6-8-10
Fishing Partner(s): 5 OTHER GUYS	Time start:	Time end:
Fish species sought: USUALLY NORTHERN PIKE		
Lake Zone (circle 1 or more; optional): King's Dam Reservoir Mid Lake Alice (Pine Cr. Flowage) Lower Wisc. River Upper Wisc. River		
Watercraft (circle one): Ice Pontoon Bass boat Canoe Kayak Other (specify): 14' BOATS (2)		
Fishing Style (circle 1 or more): Tip-up Jigging Trolling (Casting) Bait Fly Other (specify):		
Weather Conditions: Sunny ____ Partly Cloudy ____ Overcast ____ Air temp (°F) ____ Water temp (°F) ____ Rainy ____ Calm winds ____ Moderate winds ____ Strong winds ____ Wind Direction ____ Other weather notes:		
Level of satisfaction (circle one): Low Medium High Explain:		

Record for First Ten Fish Caught on Trip

Catch Number	Time (AM/PM)	Fish Species Common Name	Length (inches)	Weight (optional)	Lure/Bait Used	Released (Y/N)
1		FOR DETAILS – SEE ATTACHMENT				
2						
3						
4						
5						
6						
7						
8						
9						
10						

Please return form when finished or call Neil Rietenpal 715-612-6302 will pick up
When extra copies are needed please make more or call, will provide more
Post other comments on back of form

Warden in

LAKE ALICE ANGLERS JOURNAL – FIELD DATA FORM

Angler and Fishing Trip Data		
Angler Name: Neil Pretenpeel	Phone: 715-612-0096	Date: 4-27-2010
Fishing Partner(s):	Time start: 3:00 PM	Time end: 5:00 PM
Fish species sought: Bluegills		
Lake Zone (circle 1 or more; optional): (King's Dam Reservoir) Mid Lake Alice Pine Cr. Flowage Lower Wisc. River Upper Wisc. River		
Watercraft (circle one): Ice Pontoon Bass boat Canoe Kayak Other (specify): Shore line River		
Fishing Style (circle 1 or more): Tip-up (Jigging) Trolling Casting (Bait) Fly Other (specify):		
Weather Conditions: Sunny X; Partly Cloudy ____; Overcast ____ / Air temp (°F) 60+; Water temp (°F) ____; Rainy ____ / Calm winds X; Moderate winds ____; Strong winds ____ / Wind Direction S; Other weather notes:		
Level of satisfaction (circle one): Low Medium (High) Explain: Earliest ever to find Gills shallows		

Record for First Ten Fish Caught on Trip

Catch Number	Time (AM/PM)	Fish Species Common Name	Length (inches)	Weight (optional)	Lure/Bait Used	Released (Y/N)
1						
2						
35	PM	Bluegills	6"-7"		Jig - worm	20 yes
4						
5						
6						
7						
8						
9						
10						

Gills had lots of black spots in fillets

over

Weather Sent in

LAKE ALICE ANGLERS JOURNAL – FIELD DATA FORM

Angler and Fishing Trip Data		
Angler Name: Paul Fenner	Phone: 715-966-2707	Date: 5/4/2010
Fishing Partner(s):	Time start: 5:00 PM	Time end: 8:00 PM
Fish species sought: Walleye Ect.		
Lake Zone (circle 1 or more; optional): (King's Dam Reservoir) Mid Lake Alice Pine Cr. Flowage Lower Wisc. River Upper Wisc. River		
Watercraft (circle one): Ice Pontoon Bass boat Canoe Kayak Other (specify): Pier fishing		
Fishing Style (circle 1 or more): Tip-up (Jigging) Trolling (Casting) (Bait) Fly Other (specify):		
Weather Conditions: Sunny ____ Partly Cloudy ____ Overcast X	Air temp (°F) 46+ Water temp (°F) ____ Rainy ____	Calm winds ____ Moderate winds X Strong winds ____ Wind Direction West Other weather notes:
Level of satisfaction (circle one): Low Medium (High) Explain:		

Record for First Ten Fish Caught on Trip

Catch Number	Time (AM/PM)	Fish Species Common Name	Length (inches)	Weight (optional)	Lure/Bait Used	Released (Y/N)
1	PM	17½" Walleye	17½		Lure	No
2	PM	14" Walleye	14		Lure	yes
3	PM	8" Walleye	8		Bait	yes
4	PM	9" Perch	9		Bait	yes
5	PM	7" Bill	7		Bait	yes
6						
7						
8						
9						
10						

Please return form when finished or Call Neil Pietenpol 715-612-6302 will Pick up
When extra copies are needed please make more or call will provide more.
Put weather comments on back of form

LAKE ALICE ANGLERS JOURNAL – FIELD DATA FORM

Angler and Fishing Trip Data		
Angler Name: Neil Pietenpol	Phone: 715-612-6302	Date: May 21 2010
Fishing Partner(s): Bob Hannemann 5 Yo Morgan 3 1/2 Lauren	Time start: 11:00	Time end: 2:00
Fish species sought: Bluegills		
Lake Zone (circle 1 or more; optional): (King's Dam Reservoir) Mid Lake Alice Pine Cr. Flowage Lower Wisc. River Upper Wisc. River		
Watercraft (circle one): Ice Pontoon Bass boat Canoe Kayak Other (specify): Beer + Wadeberry Skeeter		
Fishing Style (circle 1 or more): Tip-up Jigging Trolling Casting (Bait) Fly Other (specify):		
Weather Conditions: Sunny ____ Partly Cloudy ____ Overcast X	Air temp (°F) ____ Water temp (°F) ____ Rainy X	Calm winds X Moderate winds ____ Strong winds ____ Wind Direction ____ Other weather notes:
Level of satisfaction (circle one): Low Medium (High)	Explain: Caught on Long Crappie rod, 6# test line Seemed Very heavy for its length, almost instant release, Have picture	

Record for First Ten Fish Caught on Trip

Catch Number	Time (AM/PM)	Fish Species Common Name	Length (inches)	Weight (optional)	Lure/Bait Used	Released (Y/N)
1		14 Gills Kept	7"		Bait	10 Released
2						
3		20 Gills Kept	6 3/4-7"		Bait	15 Released
4						
5		Muskey 40+" fish	40+		Hit Gill	Released
6						
7						
8						
9						
10						

Bob + family

Neil

Neil

Please return form when finished or call Neil Pietenpol 715-612-6302 Will pick up
When extra copies are needed please make more or call, will provide more
Put other comments on back of form

History of Fishing Trips to Lake Alice Date 6-8-2010

I have been taking a spring (opening weekend) fishing trip to Lake Alice with 5 other guys for the last 15 years or more. We usually stay for four days. We fish the Pine Creek Flowage part of the lake. That early in the year our target fish is Northern Pike because the pan fish are usually not active yet. We all fish with casting baits and spend about 5 hours a day on the water, weather permitting.

We typically catch about 70 or 80 Northern Pike and usually have a couple over 30 inches. We keep (and eat) about five or six in the 22 to 26 range because we can fillet them and get the "Y" bones out. The rest are released. Also we catch a handful of large mouth bass, some up to 4 pounds and here and there a walleye but they are released as well. This past year we spent some time fishing for pan fish because of the unusually warm spring and caught a few dozen crappies and blue gills on small casting baits in areas with stumps.

I personally have been fishing Lake Alice for over fifty years. I have had a cottage there since 1969. Through the seventies and 80's we would catch crappies and blue gills by the pail full but the pan fishing it nowhere near that good today. The Northern Pike fishing has remained excellent all through those years and more recently we are catching more walleye and we are not actually fish for them. We catch them when we use our jigs for pan fish.

I hope this information can be useful in your analysis of the Lake Alice Fishery and help to maintain it for future generations. I would be happy to provide an interview on my years of experience on this lake. I can be reached at 920-467-6126.

Regards, Jim Wunsch, Sheboygan Falls WI

VOLUNTEER ANGLERS JOURNAL FIELD DATA FORM

Important Instructions (see *Angler Journal Description for details*)
Fill sheet out only for yourself (a partner fills out a separate sheet). Use new sheet for each fishing trip. Record unsuccessful trips too. Measure and record all gamefish caught and indicate if kept/released. For panfish, measure the length of the first ten of each species and indicate if kept or released. For additional panfish, count number kept and number released and record. Complete a journal form every time you fish.

Angler and Fishing Trip Data

Angler Name: Mike Sigl	Phone: 715-966-2351	Date: 12-20-10
Time start (actual fishing time): 4 pm	Time end (actual fishing time): 5:30 PM	Total time fishing (excluding lunch break, etc.): 1.5

List fish species sought and % time spent for each. If you are seeking all species listed during your entire outing, list "100%" by each.
Walleye 100 %

Watercraft (circle one): (Ice) Pontoon Fishing boat Canoe Kayak Other (specify):

Fishing Style (circle 1 or more): (Tip-up) Jigging Trolling Casting Bait Fly Other (specify):

Weather Conditions:				
Sunny ____	Air temp (°F) 21	Calm winds X	Wind Direction ____
Partly Cloudy ____	Water temp (°F) ____	Moderate winds ____	Other weather notes:
Overcast X	Rainy ____	Strong winds ____	

Level of satisfaction (circle one): Low (Medium) High Explain: 1 Fish in 1.5 hrs, not bad - 2 Flags

Record Fish Caught on Trip

Catch #	Fish Species Common Name	Length (nearest ¼ inch)	Check one: Kept	Check one: Released	Catch #	Fish Species Common Name	Length (nearest ¼ inch)	Check one: Kept	Check one: Released	Counts of unmeasured panfish
1	Walleye	14		X	11					Bluegill
2					12					
3					13					Pumpkinseed
4					14					
5					15					Crappie
6					16					
7					17					Yellow Perch
8					18					
9					19					Other (specify)
10					20					

Data continued on second page? (circle one): YES NO Note: If you need more space, indicate by circling "YES" and then record data on back of this sheet or on a 2nd data form.

VOLUNTEER ANGLERS JOURNAL FIELD DATA FORM

Important Instructions (see *Angler Journal Description for details*)
Fill sheet out only for yourself (a partner fills out a separate sheet). Use new sheet for each fishing trip. Record unsuccessful trips too. Measure and record all gamefish caught and indicate if kept/released. For panfish, measure the length of the first ten of each species and indicate if kept or released. For additional panfish, count number kept and number released and record. Complete a journal form every time you fish.

Angler and Fishing Trip Data

Angler Name: Jon Sigl | Phone: 715-966-2400 | Date: 12-18-2010

Time start (actual fishing time): 3:00 PM | Time end (actual fishing time): 5:30 P.M | Total time fishing (excluding lunch break, etc.): 2.5

List fish species sought and % time spent for each. If you are seeking all species listed during your entire outing, list "100%" by each.

Walleye 100 %

Watercraft (circle one): (Ice) Pontoon Fishing boat Canoe Kayak Other (specify):

Fishing Style (circle 1 or more): (Tip-up) Jigging Trolling Casting Bait Fly Other (specify):

Weather Conditions: Sunny ____ Partly Cloudy X Overcast ____ | Air temp (°F) 12 | Water temp (°F) ____ | Rainy ____ | Calm winds X | Moderate winds ____ | Strong winds ____ | Wind Direction ____ | Other weather notes:

Level of satisfaction (circle one): Low Medium (High) Explain: 2 Fish, 2 Fish

Record Fish Caught on Trip

Catch #	Fish Species Common Name	Length (nearest ¼ inch)	Check one: Kept	Check one: Released	Catch #	Fish Species Common Name	Length (nearest ¼ inch)	Check one: Kept	Check one: Released	Counts of unmeasured panfish
1	Walleye	12		X	11					Bluegill
2	Walleye	23		X	12					
3					13					Pumpkinseed
4					14					
5					15					Crappie
6					16					
7					17					Yellow Perch
8					18					
9					19					Other (specify)
10					20					

Data continued on second page? (circle one): YES NO Note: If you need more space, indicate by circling "YES" and then record data on back of this sheet or on a 2nd data form.

Appendix E
Lake Alice Frog and Toad Survey

Lake Alice Stewardship Program Frog & Toad Survey

Bullfrog (*Rana catesbeiana*) from a Lake Alice wetland (photo by Neil Pietenpol)

This document is a product of a WDNR Lake Planning Grant awarded to:

Lake Alice Association
Contact: Glenn Mott, Board President
W 4945 Echo Point, Tomahawk, WI 54487
Phone: (715) 453-7378 E-mail: glen.mott@yahoo.com

Submitted to:

Wisconsin Department of Natural Resources
Attention: Kevin Gauthier, Sr., Lakes Management Coordinator
107 Sutliff Ave, Rhinelander, WI 54501
Phone: (715) 365-8937 Fax: (715) 365-8932
Email: Kevin.GauthierSr@wisconsin.gov

Prepared by:

White Water Associates, Inc.
Dean Premo, Ph.D.
429 River Lane, P.O. Box 27
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Phone: (906) 822-7889; Fax: (906) 822-7977
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Date: January 2011

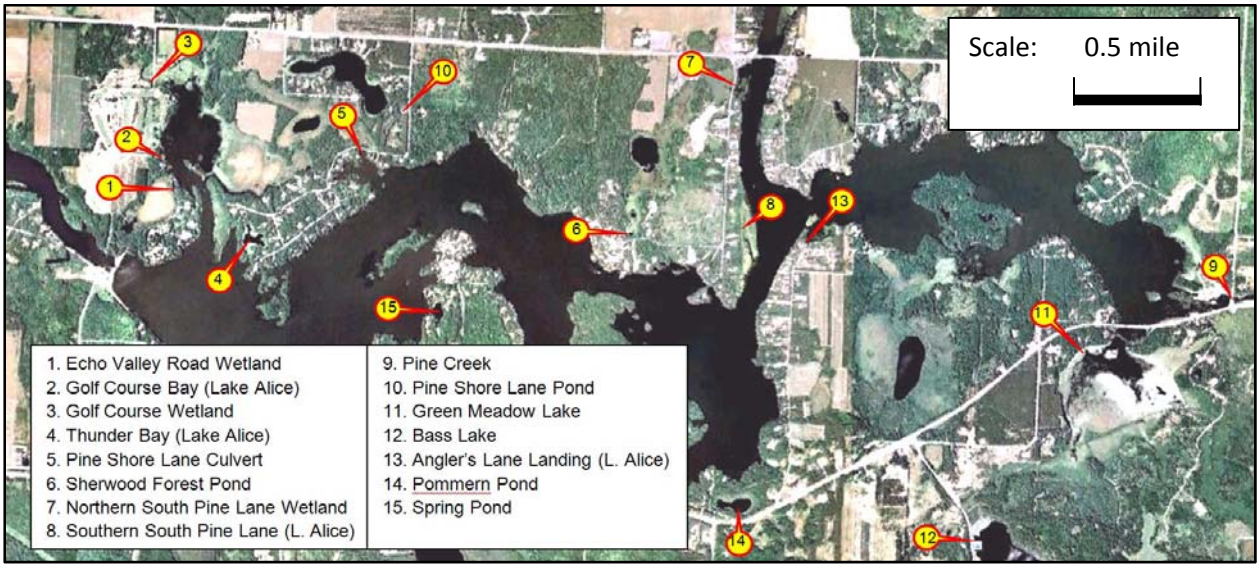
Introduction

One component of Phase 2 of the Lake Alice Stewardship Program was to establish a volunteer frog and toad survey of habitats in the Lake Alice watershed. The decline of amphibian populations in many areas in North America has prompted monitoring of local frog and toad populations. Many states (including Wisconsin) have developed frog and toad survey protocols for this purpose. This report documents the methods and findings for the first year of monitoring around Lake Alice.

Methods

We followed the Wisconsin Frog and Toad Survey Manual[1] for site selection and field methodology. Working in consultation with Lake Alice Association members with local knowledge of area wetlands, Dr. Dean Premo (a trained herpetologist) selected fifteen sites in the Lake Alice watershed as prospective frog and toad survey wetlands for the 2010 field season. These sites are shown in Exhibit 1. In general, these sites are at least one-half mile apart (exceptions include Sites 8 and 13, Sites 2 and 3, and Sites 10 and 11).

Exhibit 1. Fifteen frog and toad survey wetlands.



[1] Paloski, R.A. T.L.E. Bergeson, M. Mossman, and R. Hay (eds). 2006. Wisconsin Frog and Toad Survey Manual PUB-ER-649. Bureau of Endangered Resources, Wisconsin Department of Natural Resources, Madison, WI. 25 pp.

Several hearty volunteers, active members in the Lake Alice Association, offered their efforts for the "swing-shift" activity of surveying for frogs and toads (frog and toad monitoring starts after dark and may go late into the night). This group was given instruction from Dean Premo and provided recordings of frog calls from which to study. The team was split into two groups (each group taking about half the wetlands to survey. All fifteen wetlands were surveyed on the same three dates ("first run" on April 22, "second run" on May 20, and "third run" on June 8, 2010) under weather conditions conducive to frog/toad activity and to hearing the breeding males vocalize.

According to range maps in the scientific literature and the Frog and Toad Survey Manual, eight anuran (frogs and toads) species have been documented in Lincoln County. Two additional species have been documented in adjacent counties. Exhibit 2 provides this list. These species are the most likely anurans to be heard in the Lake Alice watershed. The volunteers became familiar with their vocalizations.

Exhibit 2. Lincoln County Frogs and Toads (Anurans)

Anurans for which Lincoln County Records Exist

1. Eastern American Toad (*Bufo americanus*)
2. Striped Chorus Frog (*Pseudacris triseriata*)
3. Northern Spring Peeper (*Pseudacris crucifer*)
4. Gray Tree Frog (*Hyla versicolor*)
5. Bullfrog (*Rana catesbeiana*)
6. Green Frog (*Rana clamitans*)
7. Wood Frog (*Rana sylvatica*)
8. Northern Leopard Frog (*Rana pipiens*)

Not documented in Lincoln, but from adjacent county(s)

9. Pickerel Frog (*Rana palustris*)
10. Mink Frog (*Rana septentrionalis*)

Note: *Hyla chrysoscelis* has not been documented in Lincoln or adjacent counties (but from two counties away)

Results

All field data collected is presented in the site data summary sheets at the end of this report. These summary sheets also show the location of the wetland on an aerial photograph and describe the habitat. If available, site photos are included for the subject wetlands.

A total of seven anuran species were detected during the auditory surveys in 2010. These species are listed in Exhibit 3. This represents all but one of the species for which Lincoln County records exist. The Striped Chorus Frog was not detected in the 2010 survey.

Exhibit 3. Anuran species detected in the Lake Alice Watershed (2010)

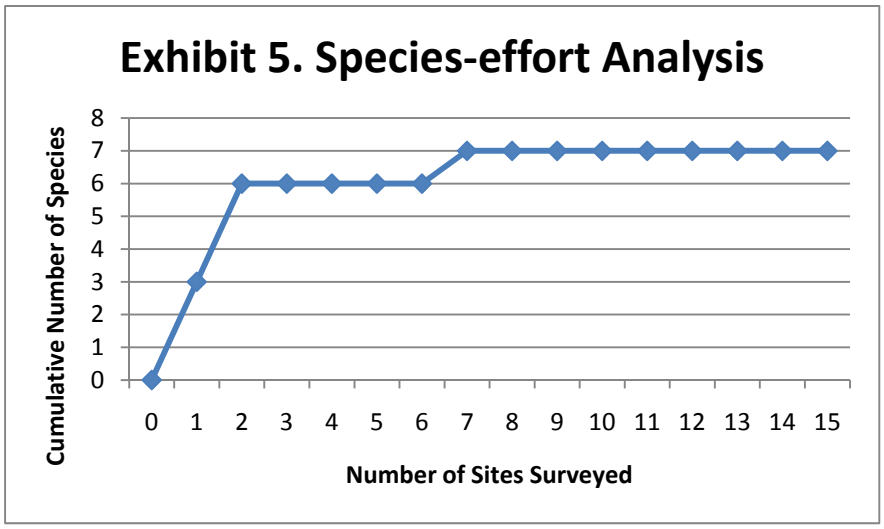
Anuran Species	Number of Sites Detected
Eastern American Toad (*Bufo americanus*)	9
Northern Spring Peeper (*Pseudacris crucifer*)	13
Gray Tree Frog (*Hyla versicolor*)	2
Bullfrog (*Rana catesbeiana*)	12
Green Frog (*Rana clamitans*)	15
Wood Frog (*Rana sylvatica*)	3
Northern Leopard Frog (*Rana pipiens*)	2

The Green Frog was the most widely distributed species in the survey, occurring at all fifteen sites. Northern Spring Peeper and Bullfrog were also widespread (at 13 and 12 sites respectively). The Gray Tree Frog (two sites) and Northern Leopard Frog (two sites) were the most restricted in distribution. Since the sites visited were permanent water sites Wood Frogs may be under represented in the survey. The Striped Chorus Frog also prefers seasonal ponds.

Exhibit 4 displays the species detected at each of the fifteen study sites. Site 9 had the highest number of species (six). Two sites (12 and 13) had only two species. The median number of species per site was 4 and the average number per site was 3.7.

Exhibit 4. Anuran species distribution across Lake Alice watershed study sites.								
Site	**Total Species**	**American Toad**	**Spring Peeper**	**Gray Treefrog**	**Bullfrog**	**Green Frog**	**Wood Frog**	**Leopard Frog**
1	4		X	X		X		X
2	3	X	X			X		
3	4		X	X	X	X		
4	3	X			X	X		
5	4	X	X		X	X		
6	3		X		X	X		
7	3		X		X	X		
8	4	X	X		X	X		
9	6	X	X		X	X	X	X
10	4	X	X		X	X		
11	5	X	X		X	X	X	
12	2		X			X		
13	2				X	X		
14	4	X	X		X	X		
15	5	X	X		X	X	X	

Finally, as a measure of survey thoroughness, we present an analysis of species detected and effort expended. In this case our measure of effort is the number of sites included in our survey (15). Exhibit 5 shows a graph of cumulative number of species plotted against number of sites visited. The actual site numbers were randomly arranged for this analysis (2, 9, 10, 6, 8, 13, 1, 7, 5, 15, 3, 11, 14, 12, 4). The curve has leveled off after 8 or 9 sites indicating our effort with regard to number of sites surveyed was more than adequate.



Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 1 Site Name: Echo Valley Road Wetland

Site Location: Echo Valley Rd, south of golf course (Edgewater Country Club)

Habitat Description: Partially flooded bog and marsh.

Site Photo: None available

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Glenn Mott, Mike Sigl	Glenn Mott, Mike Sigl, Hank and Andrea Michaud	Glenn Mott, Mike Sigl, Hank and Andrea Michaud
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	0	0
Sky	0	0	0
Begin Air Tmp	47°F	70°F	68°F
End Air Temp	40°F	62°F	65°F
Observations (species, call index)	Spring peeper (1) Northern leopard frog (1)	Spring peeper (2) Eastern gray treefrog (1) Green frog (1)	Green frog (1)
Notes			

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 2 Site Name: Golf Course Bay

Site Location: Echo Valley Rd, south of golf course (Edgewater Country Club)

Habitat Description: Wooded riparian area and shrub shoreline of Lake Alice.

Site Photo: None available

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Glenn Mott, Mike Sigl	Glenn Mott, Mike Sigl, Hank and Andrea Michaud	Glenn Mott, Mike Sigl, Hank and Andrea Michaud
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	0	0
Sky	0	0	0
Begin Air Tmp	47°F	70°F	68°F
End Air Temp	40°F	62°F	65°F
Observations (species, call index)	Spring peeper (1) American toad (1)	Spring peeper (2) American toad (3)	Green frog (1)
Notes	Noisy golf course sprinkler		

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers.

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 3 Site Name: Golf Course Wetland

Site Location: Echo Valley Rd, south of golf course (Edgewater Country Club)

Habitat Description: Weedy, shallow marsh with stumps.

Site Photo: None available

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Glenn Mott, Mike Sigl	Glenn Mott, Mike Sigl, Hank and Andrea Michaud	Glenn Mott, Mike Sigl, Hank and Andrea Michaud
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	0	0
Sky	0	0	0
Begin Air Tmp	47°F	70°F	68°F
End Air Temp	40°F	62°F	65°F
Observations (species, call index)	Spring peeper (1)	Spring peeper (3) Eastern gray treefrog (3) Green frog (1) Bullfrog (1)	Green frog (1) Bullfrog (1)
Notes			

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 4 Site Name: Thunder Bay (Lake Alice)

Site Location: Private residence off South Bay Road

Habitat Description: Shallow bay; lots of emergent macrophytes, wooded riparian area.

Site Photo: None available

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Glenn Mott, Mike Sigl	Glenn Mott, Mike Sigl, Hank and Andrea Michaud	Glenn Mott, Mike Sigl, Hank and Andrea Michaud
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	0	0
Sky	0	0	0
Begin Air Tmp	47°F	70°F	68°F
End Air Temp	40°F	62°F	65°F
Observations (species, call index)	American toad (1)	American toad (3)	Green frog (2) Bullfrog (1)
Notes			

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 5 Site Name: Pine Shore Lane Culver (L. Alice & wetland)

Site Location: Pine Shore Lane

Habitat Description: Shallow bay with emergent macrophytes on Lake Alice side and permanent water marsh on north side of culvert, wooded riparian area.

Site Photo: None available

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Glenn Mott, Mike Sigl	Glenn Mott, Mike Sigl, Hank and Andrea Michaud	Glenn Mott, Mike Sigl, Hank and Andrea Michaud
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	0	0
Sky	0	0	0
Begin Air Tmp	47°F	70°F	68°F
End Air Temp	40°F	62°F	65°F
Observations (species, call index)	Spring peeper (2)	Spring peeper (3) American toad (2)	Green frog (2) Bullfrog (1)
Notes			

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 6 Site Name: Sherwood Forest Pond

Site Location: Near end of Sandy Lane

Habitat Description: Marshy permanent pond, but some areas become dry, wooded riparian area.

Site Photo: None available

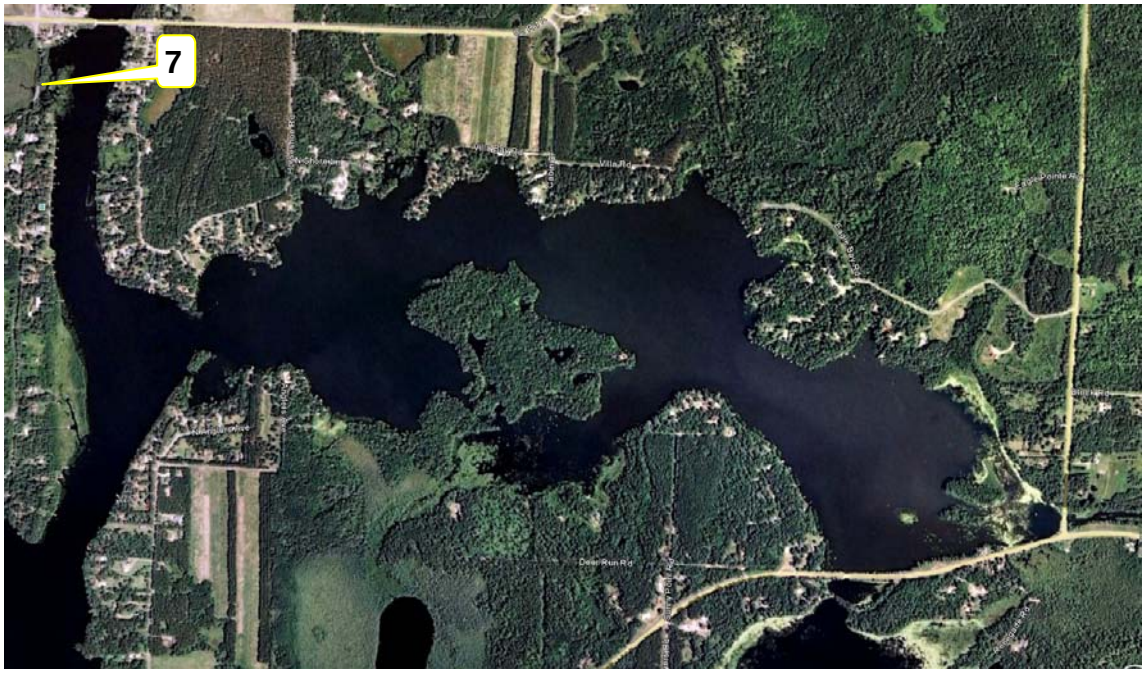
Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Glenn Mott, Mike Sigl	Glenn Mott, Mike Sigl, Hank and Andrea Michaud	Glenn Mott, Mike Sigl, Hank and Andrea Michaud
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	0	0
Sky	0	0	0
Begin Air Tmp	47°F	70°F	68°F
End Air Temp	40°F	62°F	65°F
Observations (species, call index)	Spring peeper (3)	Green frog (3) Bullfrog (3)	Green frog (2) Bullfrog (1)
Notes	Likely erroneous determination of Cricket frog at this site (will check in Spring 2011)		

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 7 Site Name: Northern South Pine Lane Wetland

Site Location: North part of South Pine Lane (a bit more than 0.1 mile south of CR-A)



Habitat Description: Marshy permanent pond west of road and Lake Alice emergent wetland on east of road. Surrounded by woods and shrubs.

Site Photo: None available

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Glenn Mott, Mike Sigl	Glenn Mott, Mike Sigl, Hank and Andrea Michaud	Glenn Mott, Mike Sigl, Hank and Andrea Michaud
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	0	0
Sky	0	0	0
Begin Air Tmp	47°F	70°F	68°F
End Air Temp	40°F	62°F	65°F
Observations (species/index)	Spring peeper (3)	Spring peeper (3) Green frog (2)	Green frog (1) Bullfrog (1)
Notes	Likely erroneous determination of Cricket frog at this site (will check in Spring 2011)		

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 8 Site Name: Southern South Pine Lane (L. Alice wetland)

Site Location: South part of South Pine Lane (approx. 0.7 mile south of CR-A)

Habitat Description: Lake Alice emergent wetland (lots of pickerelweed)

Site Photo: See inset

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Neil and Carol Pietenpol, Dave and Linda Barrow	Neil and Carol Pietenpol, Bruce Orader	Neil and Carol Pietenpol, Dave and Linda Barrows, Bruce Orader, Dale and Joan Zutz
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	1	0
Sky	0	1	0
Begin Air Tmp	47°F	70°F	70°F
End Air Temp	38°F	62°F	64°F
Observations (species, call index)	Spring peeper (1)	Spring peeper (1) American toad (3)	Green frog (3) Bullfrog (3)
Notes			

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 9 Site Name: Pine Creek (L. Alice wetland at mouth of creek)

Site Location: CR-H crossing of Pine Creek (approx. 90 yards north of CR-D)

Habitat Description: Lake Alice floating and emergent plant wetland at mouth of creek.

Site Photo: See inset

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Neil and Carol Pietenpol, Dave and Linda Barrow	Neil and Carol Pietenpol, Bruce Orader	Neil and Carol Pietenpol, Dave and Linda Barrows, Bruce Orader, Dale and Joan Zutz
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	1	0
Sky	0	1	0
Begin Air Tmp	47°F	70°F	70°F
End Air Temp	38°F	62°F	64°F
Observations (species, call index)	Wood frog (1) Spring peeper (1) Northern leopard frog (1)	Spring peeper (2) American toad (3)	Green frog (2) Bullfrog (1)
Notes			

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 10 Site Name: Pine Shore Lane Pond

Site Location: Pine Shore Lane (one quarter mile south of CR-A)

Habitat Description: Permanent pond with emergent plants and surrounding forest.

Site Photo: None available

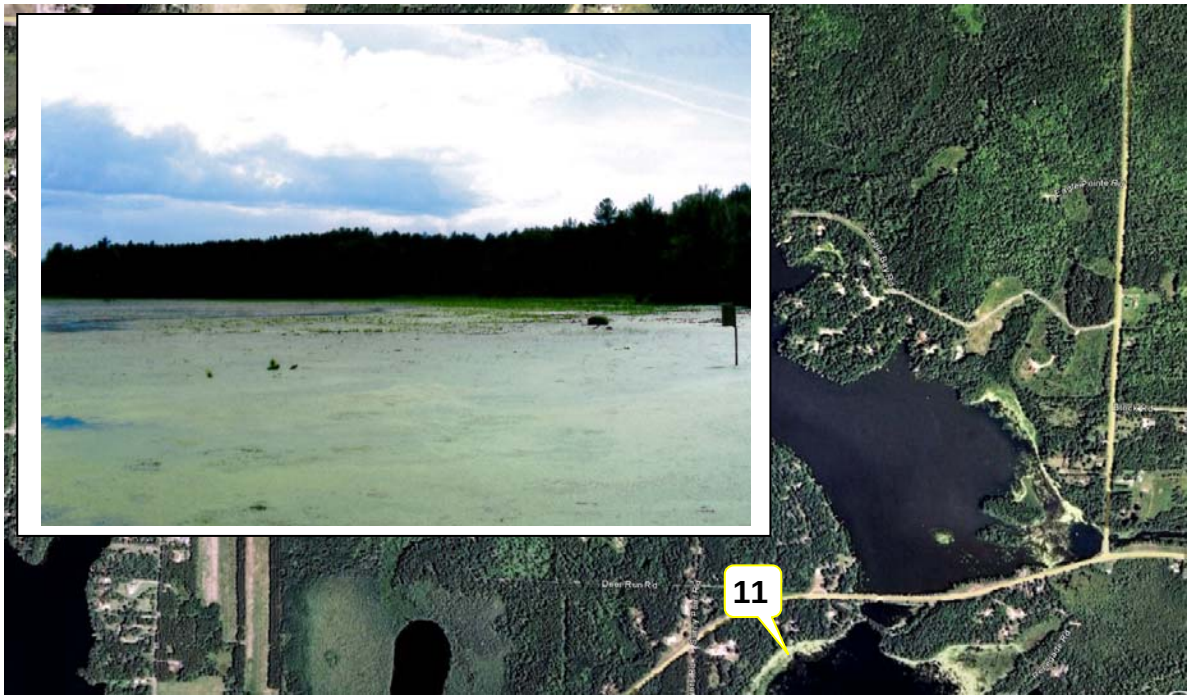
Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Glenn Mott, Mike Sigl	Glenn Mott, Mike Sigl, Hank and Andrea Michaud	Glenn Mott, Mike Sigl, Hank and Andrea Michaud
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	0	0
Sky	0	0	0
Begin Air Tmp	47°F	70°F	68°F
End Air Temp	40°F	62°F	65°F
Observations (species, call index)	Spring peeper (1) American toad (1)	American toad (3) Green frog (3)	Green frog (1) Bullfrog (1)
Notes		Toads & green frogs so loud as to obscure other sounds	

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 11 Site Name: Green Meadow Lake

Site Location: Approx. 0.1 mile south of CR-H



Habitat Description: Shallow, marshy lake, lots of floating and emergent vegetation.

Site Photo: See inset

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Neil and Carol Pietenpol, Dave and Linda Barrow	Neil and Carol Pietenpol, Bruce Orader	Neil and Carol Pietenpol, Dave and Linda Barrows, Bruce Orader, Dale and Joan Zutz
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	1	0
Sky	0	1	0
Begin Air Tmp	47°F	70°F	70°F
End Air Temp	38°F	62°F	64°F
Observations (species, call index)	Spring peeper (2) American toad (2)	Wood frog (1) Spring peeper (2) American toad (3)	Green frog (1) Bullfrog (1)
Notes	May 22 seems late for wood frog (could be misidentified)		

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 12 Site Name: Bass Lake and adjacent wetland

Site Location: CR-H about, 0.5 miles south of intersection of CR-H and CR-D

Habitat Description: Shallow, marshy lake, lots of floating and emergent vegetation.

Site Photo: See inset

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Neil and Carol Pietenpol, Dave and Linda Barrow	Neil and Carol Pietenpol, Bruce Orader	Neil and Carol Pietenpol, Dave and Linda Barrows, Bruce Orader, Dale and Joan Zutz
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	1	0
Sky	0	1	0
Begin Air Tmp	47°F	70°F	70°F
End Air Temp	38°F	62°F	64°F
Observations (species/index)	Spring peeper (2)	Spring peeper (2)	Green frog (2)
Notes	May 22 seems late for wood frog (could be misidentified)		

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 13 Site Name: Angler's Lane Landing (L. Alice wetland)

Site Location: Angler's Lane Boat Landing on Lake Alice

Habitat Description: Lake Alice emergent wetland and wooded riparian area

Site Photo: See inset

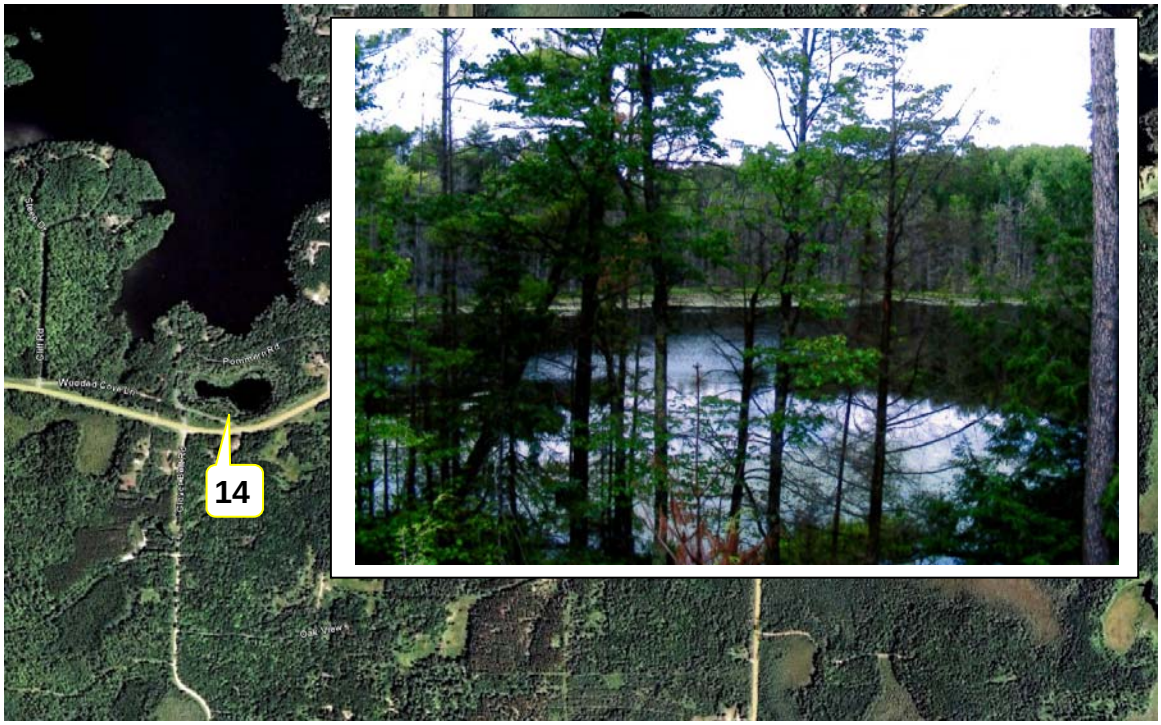
Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Neil and Carol Pietenpol, Dave and Linda Barrow	Neil and Carol Pietenpol, Bruce Orader	Neil and Carol Pietenpol, Dave and Linda Barrows, Bruce Orader, Dale and Joan Zutz
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	1	0
Sky	0	1	0
Begin Air Tmp	47°F	70°F	70°F
End Air Temp	38°F	62°F	64°F
Observations (species/index)	No calling	No calling	Green frog (2 Bullfrog (2)
Notes			

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 14 Site Name: Pommern Pond

Site Location: Immediately north of CR-D (30 yards) and south of Pommern Road



Habitat Description: Secluded pond, floating & emergent plants, wooded riparian area

Site Photo: See inset

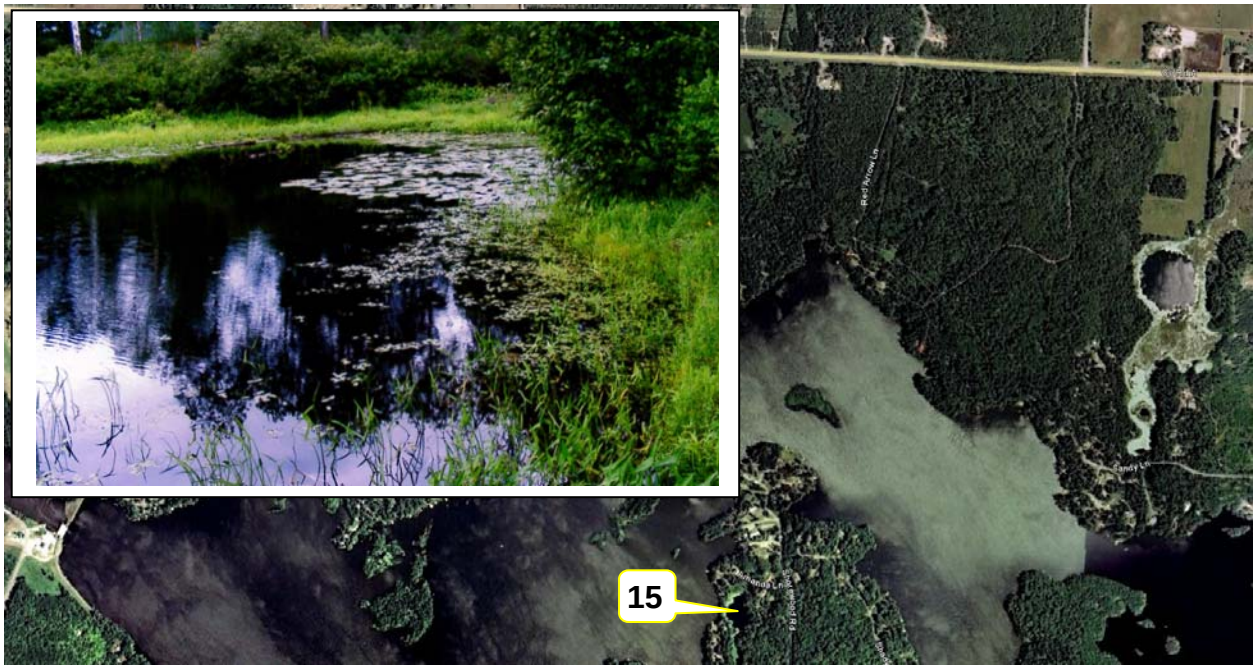
Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Neil and Carol Pietenpol, Dave and Linda Barrow	Neil and Carol Pietenpol, Bruce Orader	Neil and Carol Pietenpol, Dave and Linda Barrows, Bruce Orader, Dale and Joan Zutz
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	1	0
Sky	0	1	0
Begin Air Tmp	47°F	70°F	70°F
End Air Temp	38°F	62°F	64°F
Observations (species/index)	Spring peeper (3)	Spring peeper (2) American toad (3)	Green frog (2) Bullfrog (1)
Notes			

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers

Lake Alice Watershed Frog & Toad Survey - Site Data Summary

Site Number: 15 Site Name: Spring Pond

Site Location: Immediately south of Amanda Lane



Habitat Description: Permanent small pond, floating & emergent plants, wooded margin

Site Photo: See inset

Field Results for 2010 Lake Alice Stewardship Program Frog/Toad Survey			
	First Run	Second Run	Third Run
Date	April 22, 2010	May 20, 2010	June 8, 2010
Observers	Neil and Carol Pietenpol, Dave and Linda Barrow	Neil and Carol Pietenpol, Bruce Orader	Neil and Carol Pietenpol, Dave and Linda Barrows, Bruce Orader, Dale and Joan Zutz
Begin Time	8:30 PM-CT	9:00 PM-CT	9:30 PM-CT
End Time	10:00 PM-CT	10:30 PM-CT	10:50 PM-CT
Water Temp	58°F	68°F	77°F
Wind	0	1	0
Sky	0	1	0
Begin Air Tmp	47°F	70°F	70°F
End Air Temp	38°F	62°F	64°F
Observations (species, call index)	Spring peeper (1)	Wood frog (1), Spring peeper (2), American toad (3), Green frog (1), Bullfrog (1)	Green frog (2) Bullfrog (1)
Notes		Seems late for wood frog (could be misidentified)	

Call index: 1=individuals can be counted, there is space between calls (no overlapping of calls); 2=calls of individuals can be distinguished but there is overlapping of calls; 3=full chorus, calls are constant, continuous, and overlapping, individual calls cannot be distinguished. **Wind Codes**: 0=less than 1mph, 1=1 to 3mph, 2=4 to 7mph, 3=8 to 12mph, 4=13 to 18mph. **Sky Codes**: 0=clear or a few clouds, 1=partly cloudy or variable, 2=cloudy (broken) or overcast, 4=fog, 5=drizzle, 6=showers