Lake Julia Stewardship Project:
Aquatic Plant Management Plan

Lake Julia Lake Association - 2012

Lake Julia Stewardship Project

Aquatic Plant Management Plan

Submitted to: **Wisconsin Department of Natural Resources**
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Contents

Section
1

Introduction to the Lake Julia Aquatic Plant Management Plan

Since 2002, the Lake Julia Stewardship Project has been viewed as an ongoing endeavor composed of annual phases that progress toward the overall vision. Earlier phases have been reported in separate documents. A critical aspect of work was conducted in 2008 - a systematic survey of aquatic plants in Lake Julia using the Wisconsin Department of Natural Resources (WDNR) “point-intercept” method. With that newly collected plant data, along with extensive plant survey and information inventory conducted in earlier project phases, the Lake Julia Lake Association has the necessary components to prepare this ***Aquatic Plant Management Plan***.

Like a certain famous comedian, aquatic plants "get no respect." In common language, 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 term was extrapolated 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.

Contrary to popular opinion, aquatic plants are a vital part of a lake ecosystem, recycling nutrients, providing vertical and horizontal structure, and creating habitat for aquatic animal life. Aquatic invertebrates, including many species of crustaceans and insects, live on or within this “aquatic forest” of plants. Many species of fish find food and shelter within "weed 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. The decaying plants, in turn, can result in low oxygen levels that are deleterious to fish populations. Algal blooms, responding rapidly to nutrient influxes, can create odiferous conditions. 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 boat motors or dumped from home aquariums, may come to dominate a water body excluding a healthy native plant community. Eurasian watermilfoil (*Myriophyllum spicatum*) is one example. Research is currently being conducted on the genetics of this species and the native watermilfoils (particularly *M. sibiricum*) to determine whether hybrids between the alien and native species exhibit "hybrid vigor," resulting in plants that can "take over" the lake through sheer biomass. It is hypothesized that the pure alien strain may be less apt to become a nuisance than the hybrids (Moody 2002). There are locations where Eurasian watermilfoil coexists within a community of aquatic plant species and has not become a problem species (Premo and Premo 2011).

For most northern lakes like Lake Julia, aquatic plants are a positive attribute, greatly enhancing the aesthetics of the lake and providing opportunities for good fishing, good boating, and good snorkeling. Fortunately, Lake Julia does not currently have a nuisance level of aquatic plants. On the contrary, it has a healthy and diverse community of native plants. This is not only a scientifically measured reality, but also the majority favorable perception of the Lake Julia stakeholders that responded to a public questionnaire about Lake Julia (see Section 3, Part H and Appendix B). Members of the Lake Julia Lake Association simply want to maintain this high quality condition. In addition, the Lake Julia Lake Association wants to establish the foundation on which to conduct plant management should the need arise in the future (for example if an aquatic invasive plant species is detected in Lake Julia).

In preparing this plan, we have followed the guidelines prepared by the WDNR called *Aquatic Plant Management in Wisconsin.* This is a fairly new endeavor in Wisconsin (and the United States for that matter). We found, the WDNR Guidance document very useful in preparation of this aquatic plant management plan. We fully expect the plan to be a dynamic document. That is, it will be modified as new information about the Lake Julia 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.

The Lake Julia Lake Association's motivation lies in the first two objectives. Lake Julia 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 seemingly caused relatively minimal degradation to the ecosystem.

During four years under the WDNR Planning Grant Program and through past efforts, the Lake Julia Lake 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 Julia. It resulted from revisions and additions made to the Draft Aquatic Plant Management Plan that was presented to the WDNR for review in 2008 and (and a second WDNR review in 2011). Besides this introductory section, this plan is organized in five additional sections. Section 2 states the purpose and goals for the Lake Julia Aquatic Plant Management Plan. Section 3 references the lake information inventory that has been ongoing in Lake Julia including newly collected data. Section 4 details action objectives for the aquatic plant management plan. Finally, Section 5 outlines a contingency plan for rapid response to alien plant invaders should they appear in Lake Julia. Section 6 provides references used in this work. Two appendices complete this document. Appendix A contains a summary of Lake Julia shoreline and riparian area characteristics and Appendix B contains the results from the Lake Julia Public Questionnaire.

Section
2

Purpose & Goal Statements for the Aquatic Plant Management Plan

The Lake Julia Lake 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 the following **statement of purpose** for the Lake Julia Aquatic Plant Management Plan:

> ***Lake Julia has historically had a healthy and diverse aquatic plant community that has recently been well-documented by two aquatic plant surveys (2003 and 2008). This plant community is essential to, and part of, a high quality northern lake ecosystem that also serves the human community with its recreational and aesthetic features. The Lake Julia Lake Association strives to maintain the Lake Julia aquatic plant community in its present healthy state.***

Supporting this purpose, we offer this **goal statement**:

> ***The Lake Julia Lake Association endeavors to maintain a healthy plant community on Lake Julia by (1) monitoring the aquatic plant community with particular emphasis on changes in the native plant composition and establishment of any aquatic invasive species and (2) monitoring and educating recreational users and riparian owners of Lake Julia with special emphasis on minimizing the opportunities for introductions of non-native species and nutrients that might alter the current plant community dynamics.***

Section
3

An Inventory and Analysis of Information about Lake Julia

Under WDNR Lake Planning Grants, efforts in Phases 1 (2002), 2 (2003), and 3 (2004) of the Lake Julia Stewardship Project have compiled extensive information about conditions of the Lake Julia ecosystem and its surrounding watershed. This information has been organized and presented in reports of each of the phases and submitted to the WDNR as part of the obligation under the grants program. This information includes consideration of the watershed, water quality, fish, wildlife, rare species, exotic species, riparian wetlands, aquatic plants, and aquatic invertebrates. Relevant components of this information (and the plant survey information conducted in 2008) are summarized in this section under respective subheadings: management history, plant community, fisheries and wildlife, water quality, water use, and watershed. A seventh subhead (Lake Julia Analysis) integrates the available information with respect to aquatic plant management for Lake Julia and provides transition to the next section (Actions and Objectives).

Of particular importance to this aquatic plant management plan are two aquatic plant surveys that have been conducted on Lake Julia. The most recent was conducted in summer 2008 and followed the ***WDNR Protocol for Aquatic Plant Survey, Collecting, Mapping, Preserving, and Data Entry***. The results of this comprehensive "point-intercept" survey are presented in this section. In 2003, White Water Associates' scientists conducted a thorough survey of aquatic plants in Lake Julia. This study was reported in a Lake Planning Grant report and is summarized herein.

Lake Julia Plant Management History – Section 3, Part A

As far as we can determine, no systematic or large-scale plant management activity has ever taken place in Lake Julia. Over the years, no particular nuisance issues have demanded control action. The absence of non-native aquatic macrophytes in Lake Julia has meant no targeted plant control actions have occurred. It is the intent of this plan that through several ongoing actions recommended herein, that active plant management remains unnecessary to this beautiful Wisconsin lake.

Lake Julia Plant Community Description – Section 3, Part B

White Water Associates has conducted two intensive plant community studies on Lake Julia. The first was conducted in 2003 and the second in 2008 (the latter study was conducted according to the WDNR point-intercept protocol). Both studies are summarized in this subsection.

In the 2003 study, Lake Julia's dominant submergent, floating, and emergent aquatic plant beds were located and mapped and species identified during three field excursions (August 7, 20, and 27). Specimens were collected using hand or rake samples. Submergent aquatics were sampled using a metal-handled rake with a cord attached. Many samples were taken back to the lab in plastic bags and identified using several different texts and botanical keys (see References, Section 6). In addition, several beds were examined underwater using snorkeling gear. The August sampling date meant that many of the species were in flower or had seeds, facilitating their identification.

Locations of beds sampled were recorded with a GPS unit and given letter/number designations. A relative size of small (S ≤10 foot diameter), medium (M =11-30 foot diameter) or large (L >30 foot diameter) was assigned. Many plants were not in discrete beds but, rather, followed the shoreline broken up by docks and other land owner access. Thirty-eight (38) bed locations were examined and dominant species recorded (Exhibit A, bed locations indicated by LJ-bed#). Location number LJ35 corresponded to the deepest portion of the lake. This was examined with the underwater camera suspended over the side of a pontoon boat. No plants were found in this location.

Aquatic plant beds in Lake Julia vary in the plant species which visually dominate, although they often contain similar species. For example, a bed may appear to be dominated by the floating leaves of watershield, but upon closer inspection the bottom substrate is seen to be covered with water celery, various pondweeds, and the macrophytic algae, *Chara* and *Nitella*. Without labor-intensive and costly quantitative sampling that includes equal effort in all portions of the water column as well as the bottom substrate, a determination of true quantitative dominance is not feasible. During the 2003 survey, we assessed the species richness of the aquatic beds of the lake as a whole, and gained a general impression of relative dominance of species.

If all the aquatic plants in the entire lake were picked, separated, and then weighed the plants that would likely have the greatest weight would be water lilies because of their bulk. However, the species that appeared to be most widely distributed, covering most of the bottom in the shallow portion of the lake is wild celery or *Vallisneria Americana*. This

plant's ribbon-like leaves of two to six feet in length generally is not visible unless one dives to the bottom. The tuberous roots are greatly relished by diving ducks, including the canvasback whose scientific name reflects this connection.

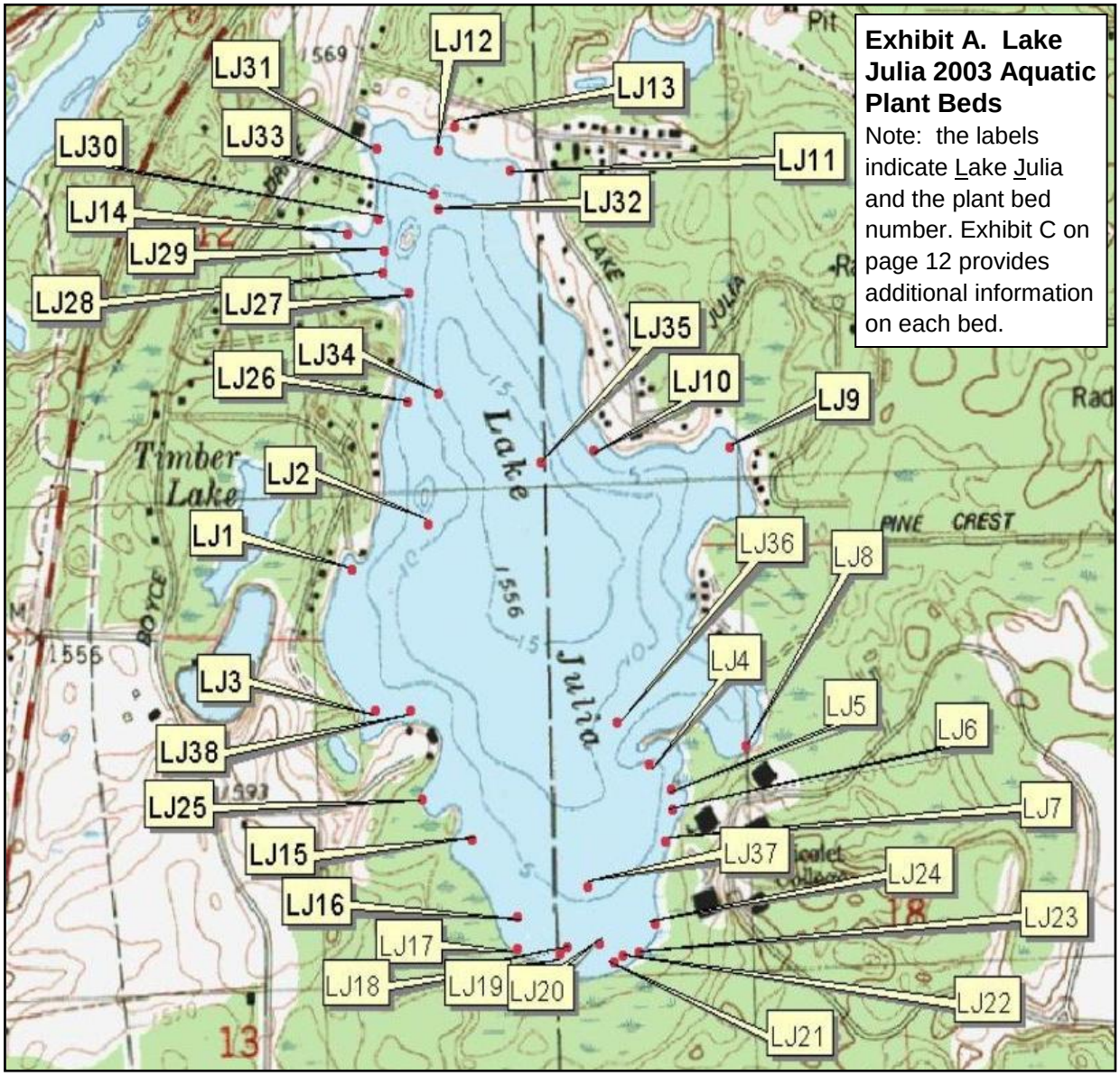


Exhibit A. Lake Julia 2003 Aquatic Plant Beds
Note: the labels indicate Lake Julia and the plant bed number. Exhibit C on page 12 provides additional information on each bed.

During the 2003 aquatic plant survey, we recorded 41 species of vascular plants and 2 species of macrophytic algae (Exhibit B). Lake Julia has an interesting and diverse vegetative community that includes many showy and aesthetically pleasing species.

Floating-leaf Species - The "lily pad" type plants are white water lily (*Nymphaea odorata*), yellow pond lily (*Nuphar variegatum*), and water shield (*Brasenia schreberi*). In certain patches or beds one species may dominate but over the whole lake they appeared to be similar in abundance. The floating leaves of water shield is considerably smaller than the other two species (about 2-4 inches in diameter), with a petiole attached in the middle of a gelatinous-coated, purple underside. The maroon flower that protrudes above the water's surface is quite unobtrusive and often goes unnoticed. This species forms lovely beds in sheltered bays. In many of the bays with extensive weed beds, ribbon-like leaves come to the surface and spread flat with individual leaves as long as 1 to 3 feet. These are burreeds, either American burreed, (*Sparganium americanum*), with leaves about 3/4 inch wide leaves) or narrow-leaved burreed, (*S. angustifolium*), with leaves about 3/8 inch wide. This plant gets its name from its fruit which is a round pod with points on the individual seeds that give the appearance of a bur. These are eaten by a variety of waterfowl. Muskrats may eat the whole plant. The smallest of the floating species is duckweed (*Lemna minor*). These are minuscule vascular, flowering plants with a tiny root system that collects nutrients directly from the water. It is found in sheltered waters along the shore, often dismissed by the casual human observer as "pond scum." In fact, duckweed forms an important part of the diet of many aquatic birds and mammals as well as cover and camouflage for turtles and frogs.

Submersed Species with Floating Leaves - Many of the pondweeds (*Potamogeton spp*.) have both submersed and floating leaves, differing in their shapes. Identification of pondweeds can be tricky, with fruits or flowers often needed for confirmation. Not only do leaf shapes differ between species, they can also differ on a single species depending on the depth of water. We recorded 7 species of pondweed during the 2003 survey of Lake Julia. The largest-leaved species found was large-leaved pondweed (*Potamogeton amplifoilius*), also known sometimes as muskyweed or cabbage. This species produces large lettuce-like leaves on the bottom that provide excellent cover for fish. This species was found throughout the lake, but with no large beds. The other two larger-leaved pondweeds found in the lake are ribbon-leaved pondweed (*P. epihydrus*) and flat-stemmed pondweed (*P. zosteriformis*). Ribbon-leaved pondweed seemed to be the more abundant of these two. All of these species produce seeds that are eaten by waterfowl as well as providing cover and habitat for many fish species. The smaller pondweed species, in addition to producing edible seeds, have tender foliage and roots that are consumed by ducks and muskrats. These are water-thread pondweed (*P. diversifolius*), small pondweed (*P. pusillus*), spiral-fruited pondweed (*P. spirillus*), and Vasey's pondweed (*P. vaseyi*). The very dainty Vasey's pondweed is a Wisconsin species of special concern.

Emergent Species - Emergent species grow rooted to the bottom substrate and protruding above the water's surface, or along the damp shoreline of the lake. These are among the showiest aquatic macrophytes and the most observable. Emergent plants subdue and cushion the waves from boats or heavy winds, protecting the shoreline from erosion. They are the shock absorbers of the shoreline, a function that is often underappreciated until they are removed and erosion sets in. One of the tallest emergent species on Lake Julia is soft-stem bulrush (*Schoenoplectus tabernaemontani*). It is predominant near the public boat landing where it forms a vigorous stand in the extensive shallows extending from the closed resort on the west side of the boat landing to the small island. Fishermen often refer to this plant as "pencil reed." Less dramatic, but still a common component of the Lake Julia shoreline is spikerush (*Eleocharis smallii*). The shoots of this species emerge from rhizomes so the plants appear to be growing in straight lines. Plants consist of stems with a tapered flower spikelet at the tip. Most of the tips of this plant in Lake Julia have been eaten off by August, likely by muskrats. The award for the showiest emergent in Lake Julia may very well go to pickerelweed (*Pontederia cordata*). With its large, heart-shaped, glossy leaves and single, dramatic, purplish-blue flower spike, pickerelweed rivals any garden flower. This species requires clear water to thrive as it begins as submersed basal rosettes that require the penetration of light. The arrowhead's genus name (*Sagittaria*) is named after "the archer" and refers to the arrowhead shape of the leaves of common arrowhead (*Sagittaria latifolia*). The leaves of this species exhibit considerable variation and not all look like arrowheads. Considerably smaller and easily missed is grass-leaved arrowhead (*Sagittaria graminea*) which we found only in several small patches around the lake's edge. Almost everyone is familiar with blue flag or wild iris (*Iris versicolor*). The leaf blades and seed pods of this plant were seen in many places along the shore. Another showy lakeshore species is swamp milkweed (*Asclepias incarnata*). Its stunning magenta blossoms provide nectar sources for monarch butterflies and other insects. Its leaves furnish food for monarch caterpillars. Two sedge species stood out in the littoral zone of Lake Julia. The sedge, *Carex utriculata*, is a dominant species along the western shore, forming a lush stand of plants with stems and leaves extending about two feet above the water's surface. It has a rather bristly or shaggy seed head about 1¼ inches long. Another sedge, *Carex oligosperma*, is found along the shoreline of the rocky point of land by Nicolet College. Yet another sedge (in another genus) found along the lake's edge is three-way sedge (*Dulichium arundinaceum*). This attractive species has a round stem with stiff leaves that spiral up the stem. We found it growing on the west edge of the lake. There were very few cattails (*Typha spp*.) present along Lake Julia. They were scattered here and there around the lake, perhaps most noticeably along the western shore, north of the closed resort. One would not expect extensive stands of cattails along a lakeshore that is relatively low in nutrients. In fact, a pronounced increase in the extent of cattails might indicate problems with leaking septic tanks or excessive fertilizer runoff. Our observations

included the native species, broad-leaved cattail (*Typha latifolia*), as well as the Eurasian species, narrow-leaved cattail (*Typha angustifolia*), and likely the hybrid of the two species (*Typha x glauca*). In general, the non-native species is more likely to become invasive, especially if there is some disturbance or degradation that allows the species to get a start. The quantity of cattails on Lake Julia did not seem excessive or worrisome. Wild calla (*Calla palustris*) we saw in only one place, along the Nicolet College shore, but there are likely other spots. This showy relative of skunk cabbage and jack-in-the-pulpit has dark green, glossy leaves and a flower wrapped in a modified white leaf called a spathe. Rice-cut grass (*Leersia oryzoides*) was found on a vegetated sandbar at the northwest corner of the lake. This sandbar also harbored Kalm's St. Johnswort (*Hypericum kalmianum*), a small plant of 10-12 inches with a yellow flower. Swamp loosestrife (*Decodon verticillatus*), a native, non-invasive loosestrife, was found along the western shore. Canadian rush (*Juncus canadensis*) was collected from on small patch from a bay on the east side of the lake. There are several diminutive emergent species typified by basal rosettes of leaves, growing in the shallows of Lake Julia. One very common species is pipewort (*Eriocaulon aquaticum*). This small plant consists of a flower stalk about 6-10 inches in height topped by a flower head that appears as a single flat whitish cap. The roots of this species show cross segmentations, in contrast to the following two species with basal rosettes. Superficially very similar is water lobelia (*Lobelia dortmanna*) which also has a basal rosette of about the same size with a single stalk emerging from it. The bluish flowers of this species are on the upper third of the stalk. Quillwort (*Isoetes sp*.) is a relative of ferns and horsetails.

Submersed Species - Few lake visitors notice submersed species of aquatic plants that are so crucial to the overall ecosystem. This appreciation is reserved for snorkelers and observant anglers. In addition to the species that also possess floating leaves, several species have almost all their growth beneath the water's surface. As mentioned earlier, water celery (*Vallisneria americana*) is perhaps the most widespread species in the lake. Most of its growth is below the water's surface, but when it blooms, the blossoms ascend on spiral stems until they float on the water's surface, allowing pollination to occur. Common bladderwort (*Utricularia vulgaris*) was found in a substantial patch in a bay in the southwestern end of the lake. In the water, the plants appear as soft tapering tubes two or three feet long. If the finely dissected leaves are looked at with a lens, many "bladders" of perhaps a maximum of 1/8 inch can be seen. Like Venus fly traps or pitcher plants, the insectivorous bladderworts have the ability to catch and use animal matter. As tiny aquatic invertebrates investigate these bladder-like structures they trigger an implosion of the bladder, are sucked in, trapped, and digested for nutrients. The somewhat similarly appearing coontail (*Ceratophyllum demersum*) is another species that can be very abundant. In Lake Julia, however, we found it only at the north end of the

lake in the vicinity of the tavern. Common waterweed (*Elodea canadensis*) is not very common in Lake Julia. It occurs in a wide variety of habitats, being quite common in flowing water as well as still. We found only a few small patches in Lake Julia. Slender naiad (*Najas flexilis*) is usually small and relatively insubstantial. We found only a few floating fragments of plant material. Musk grass (*Chara* sp.) and Stonewort (*Nitella* sp.) are both types of large algae that appear to be vascular plants but are not. *Chara* appears to be far more abundant than the very similarly appearing *Nitella*. The name musk weed refers to the strong odor given off when the plants are bruised. Common water moss or willow moss (*Fontinalis antipyretica*) is a true aquatic moss. The genus grows throughout the northern hemisphere in both flowing and still waters. In Lake Julia, we found it mainly south of Nicolet College, growing in 1-2 feet of water.

Exhibit B. Plant species observed during the 2003 Lake Julia Plant Survey

Asclepias incarnata (Swamp Milkweed)	*Nuphar variegata*(Yellow Pond-Lily)
Brasenia schreberi (Water Shield)	Nymphaea odorata (Sweet-scented Waterlily)
Calla palustris (Water-Arum; Wild Calla)	*Phalaris arundinacea* (Reed Canary Grass)
Carex oligosperma (Sedge)	*Pontederia cordata* (Pickerel Weed)
Carex utriculata (Sedge)	*Potamogeton amplifolius* (Large-leaved Pondweed)
Ceratophyllum demersum (Coontail, Hornwort)	*Potamogeton diversifolius* (Water-Thread Pondweed)
Chara (Chara; Alga)	*Potamogeton epihydrus* (Ribbon-leaved Pondweed)
Decodon verticillatus (Whorled or Swamp Loosestrife)	*Potamogeton pusillus* (Small Pondweed)
Dulichium arundinaceum (Three-Way Sedge)	*Potamogeton spirillus* (Pondweed)
Eleocharis smallii (Spike-Rush)	*Potamogeton vaseyi* (Vasey's Pondweed)
Elodea Canadensis (Common Waterweed)	*Potamogeton zosteriformis* (Flat-Stemmed Pondweed)
Eriocaulon aquaticum (Pipewort)	*Sagittaria graminea* (Grass-Leaved Arrowhead)
Fontinalis antipyretica (Willow Moss)	*Sagittaria latifolia* (Common Arrowhead)
Hypericum kalmianum (Kalm's St. Johnswort)	*Schoenoplectus tabernaemontani* (Softstem Bulrush)
Iris versicolor (Wild Blue Flag)	*Sparganium americanum* (American Burreed)
Isoetes sp. (Quillwort)	*Sparganium angustifolium* (Narrow-leaved Burreed)
Juncus Canadensis (Canadian Rush)	*Typha angustifolia* (Narrow-leaved Cattail)
Leersia oryzoides (Rice Cut Grass)	*Typha latifolia* (Broad-leaved Cattail)
Lemna minor (Small Duckweed)	*Typha X glauca* (Hybrid Cattail)
Lobelia dortmanna (Water Lobelia)	*Utricularia vulgaris* (Great Bladderwort)
Najas flexilis (Slender Naiad)	*Vallisneria Americana* (Wild Celery)
Nitella sp. (Stonewort; Alga)	

Aquatic plant beds surveyed in 2003 (as depicted in Exhibit A) showed a diversity of plant species. These species are listed by their respective plant beds in Exhibit C). This information forms a potentially valuable baseline against which future monitoring work can be compared.

Exhibit C. Lake Julia Aquatic Plant Species By Sample Bed
Plot Number, Bed Size (Small, Medium Large), Latitude/Longitude, Plant Species Present
LJ1, L, 45.61418/ -89.43559, *Brasenia schreberi, Chara, Eleocharis smallii, Lemna minor, Nuphar variegata, Nymphaea odorata, Pontederia cordata, Potamogeton zosteriformis, Sagittaria latifolia, Schoenoplectus tabernaemontani, Typha X glauca*
LJ2, L, 45.61499/-89.43331, *B. schreberi, Carex utriculata, Chara, Dulichium arundinaceum, E. smallii, Eriocaulon aquaticum, Iris versicolor, Lobelia dortmanna, N. variegata, N. odorata, P. cordata, P. amplifolius, P. epihydrus, P. vaseyi, S. validus, Sparganium Americanum, Vallisneria Americana*
LJ3, L, 45.61161/-89.43489, *B. schreberi, D. arundinaceum, E. smallii, N. odorata, P. cordata, P. epihydrus, P. zosteriformis, S. latifolia, S. validus, V. Americana*
LJ4, L, 45.61057/-89.42675, *B. schreberi, Carex oligosperma, D. arundinaceum, Elodea Canadensis, Isoetes sp., L. dortmanna, N. variegata, P. cordata, P. epihydrus, P. pusillus, P. vaseyi, P. zosteriformis, Sagittaria graminea, S. validus, Sparganium Americanum, Typha X glauca,*
LJ5, S, 45.61011/-89.42612, *E. smallii, Eriocaulon aquaticum, L. dortmanna, Phalaris arundinacea, P. cordata*
LJ6, M, 45.60973/ -89.42609, *Carex utriculata, E. smallii, Fontinalis antipyretica, L. dortmanna, N. variegata, P. cordata, P. epihydrus, P. vaseyi, S. validus, S. Americanum, Typha angustifolia, V. Americana*
LJ7, M, 45.60916/-89.42631, *Calla palustris, P. cordata, S. Americanum*
LJ8, L, 45.61091/-89.42386, *B. schreberi, Calla palustris, Najas flexilis, N. variegata, N. odorata, P. cordata, P. amplifolius, P. epihydrus, P. zosteriformis, S. Americanum, Sparganium angustifolium, Utricularia vulgaris*
LJ9, L, 45.61634/-89.42432, *B. schreberi, Chara, D. arundinaceum, E. smallii, E. Canadensis, Juncus Canadensis, Lemna minor, L. dortmanna, N. variegata, N. odorata, P. cordata, P. pusillus, S. graminea, S. latifolia, S. validus, S. angustifolium, V. Americana*
LJ10, M, 45.61631/-89.42834, *E. smallii, P. cordata, S. validus*
LJ11, M, 45.62145/-89.4308, *B. schreberi, Ceratophyllum demersum, Eriocaulon aquaticum, N. variegata, N. odorata, P. cordata, P. zosteriformis, S. graminea, S. validus, S. Americanum, V. Americana*
LJ12, L, 45.62183/-89.43294, *E. smallii, Eriocaulon aquaticum, N. odorata, P. cordata, S. validus, S. Americanum*
LJ13, L, 45.62224/-89.43246, *B. schreberi, Chara, Decodon verticillatus, Hypericum kalmianum, Leersia oryzoides, Lemna minor, L. dortmanna, N. variegata, N. odorata, P. cordata, P. epihydrus, S. validus, S. Americanum, S. angustifolium, Typha X glauca*
LJ14, L, 45.62029/-89.43567, *B. schreberi, Carex utriculata, Chara, N. variegata, N. odorata, P. cordata, P. epihydrus, P. zosteriformis, S. validus, S. Americanum, Typha X glauca, V. Americana*
LJ15, L, 45.60922/-89.43206, *B. schreberi, Eriocaulon aquaticum, L. dortmanna, Najas flexilis, N. variegata, N. odorata, P. cordata, P. diversifolius, P. epihydrus, P. spirillus, P. zosteriformis, S. graminea, S. Americanum, V. Americana*
LJ16, M, 45.60781/-89.43072, *B. schreberi*
LJ17, M, 45.60722/-89.43074, *B. schreberi, N. variegata, P. zosteriformis, V. Americana*
LJ18, M, 45.60712/-89.42944, *N. variegata, N. odorata*
LJ19, M, 45.60724/-89.42924, *B. schreberi, P. epihydrus*
LJ20, S, 45.6073/-89.42829, *N. odorata*
LJ21, M, 45.60696/-89.42785, *B. schreberi, N. variegata, S. graminea*
LJ22, S, 45.6071/-89.42759, *B. schreberi, N. variegata, S. Americanum*
LJ23, M, 45.60714/-89.42712, *B. schreberi, N. variegata*
LJ24, L, 45.60767-89.42661, *F. antipyretica, N. variegata, S. graminea*
LJ25, L, 45.60995/-89.43351, *B. schreberi, Chara, E. smallii, F. antipyretica, Isoetes sp., N. variegata, N. odorata P. cordata, P. amplifolius, P. epihydrus, P. zosteriformis, S. graminea, S. Americanum, S. angustifolium, Utricularia vulgaris,V. Americana*
LJ26, L, 45.61724/-89.4339, *D. arundinaceum, E. smallii, Isoetes sp., N. odorata, P. cordata, P. amplifolius, P. epihydrus, P. zosteriformis, S. validus, V. Americana*
LJ27, M, 45.61921/-89.43384, *D. arundinaceum, N. odorata, P. cordata, S. Americanum*
LJ28 , S, 45.6196/-89.43462, *N. variegata*
LJ29, L, 45.61998/-89.43456, *B. schreberi, Carex utriculata, D. arundinaceum, N. odorata, P. zosteriformis, S. validus, S. Americanum*
LJ30, L, 45.62058/-89.43475, *B. schreberi, Carex oligosperma, D. arundinaceum, L. dortmanna, N. variegata, P. cordata, P. epihydrus, S. graminea, S. validus, S. Americanum*
LJ31, L, 45.62186/-89.43477, *Asclepias incarnata, B. schreberi, E. smallii, Eriocaulon aquaticum, Leersia oryzoides, L. dortmanna, N. odorata, P. cordata, P. amplifolius, P. diversifolius, P. epihydrus, S. graminea, S. validus, S. Americanum, Typha latifolia*
LJ32, M, 45.62075/-89.43294, *Chara, P. amplifolius, V. Americana*
LJ33, M, 45.62102/-89.43306, *Chara, N. variegata, P. amplifolius, P. epihydrus*
LJ34, M, 45.61736/-89.43298, *Chara, E. Canadensis, Nitella sp., P. amplifolius, P. epihydrus, V. Americana*
LJ35, 45.61611/-89.42995, *Deepest hole in lake. No plants seen with camera.*
LJ36, S, 45.61134/-89.42769, *Chara, P. amplifolius, P. vaseyi, V. Americana*
LJ37, M, 45.60835/-89.4286, *P. amplifolius*
LJ38, S, 45.61159/-89.43388, *N. odorata, P. cordata*

Exhibit D summarizes some of the 2008 plant survey data for Lake Julia. A total of 20 aquatic plant species were recorded in the point-intercept sampling. Another six species were added by the boat survey. This represents an excellent diversity of plants and these species are typical of a moderately fertile lake. We found no invasive plant species. The maximum depth where rooted plants were found was 14 feet. Eighty-one percent of the 423 sampling points was shallower than the maximum depth of rooted plants and 82% of those sites had plants (averaging just over two species per site).

Exhibit D. Summary of Lake Julia Point-Intercept Survey Data (2008 Data)	
Total number of points sampled	423
Total number of sites with vegetation	280
Total number of sites shallower than maximum depth of plants	342
Frequency of occurrence at sites shallower than max. depth of plants	81.9
Simpson Diversity Index	0.86
Maximum depth of plants (ft)	14.0
Number of sites sampled using rake on Rope (R)	175
Number of sites sampled using rake on Pole (P)	16
Average number of all species per site (shallower than max depth)	1.7
Average number of all species per site (veg. sites only)	2.1
Average number of native species per site (shallower than max depth)	1.7
Average number of native species per site (veg. sites only)	2.1
Species Richness	20
Species Richness (including visuals)	20
Species Richness (including boat survey)	26

Exhibit E provides a summary of the distribution of aquatic plants over the survey points in Lake Julia and demonstrates an old ecological truism: “it is common to be rare and rare to be common.” In other words, only a few plants in Lake Julia could be considered “common” when it comes to their distribution among the study points. On the other hand, quite a number of plants could be considered “rare.”

The most common (widely distributed) plant is *Vallisneria American* (wild celery) as it was found on 131 of the 280 sample points that had vegetation (46.8%). It was followed closely by the alga Stonewort (*Nitella sp*.) which occurred at 125 of the vegetated sample points 44.6%). A distant third-most common plant was *Potamogeton pusillus* (Small

Pondweed) which was found at 74 of 280 vegetated sample points (26.4%). Fourth-most common was *Elodea Canadensis* (Common Waterweed) as it was found at 60 of the vegetated sites (21.4%). At the other end of the spectrum, eight species of aquatic plants were found at three or fewer of the 280 vegetated sample points ("it's common to be rare"). More than half of the plant species encountered were found at 12 or fewer sites.

Diversity values are provided in Exhibit D. Both species richness (the number of plants found) and Simpson's Diversity Index (an index that accounts for the number of species and the number of individuals of each species) reflect a diverse community of plants.

Many of the parameters presented in Exhibit D and Exhibit E can be used as measures against which to detect change in the plant community of Lake Julia. Changes in species frequency or distribution, for example may indicated some broader change in the ecosystem. The maximum depth of rooted plants for example might be subject to change if Lake Julia's transparency (as measured by Secchi depth) changes. These data form a valuable baseline of information for Lake Julia.

Scientists have developed a botanical metric called the "Floristic Quality Index" (FQI) to help assess lake quality using the aquatic plants that live in a lake. A group of botanical experts have assigned values called the "coefficient of conservatism" ("C") to 128 of Wisconsin's aquatic plants, indicating how typical a plant is of pristine conditions. A plant found only in clear, low nutrient and undisturbed conditions is given a "C" value of 10. Plants found in more nutrient rich and/or disturbed waters are given lower "C" values. The FQI equals the average C value for all species in a lake multiplied by the square root of the number of species found in the lake (thus explaining why the FQI is a larger number than the C value). The FQI varies from lake to lake in Wisconsin but ranges from 3.0 to 44.6 with a median value of 22.2 for those lakes studied. The FQI is valuable for comparing lakes around the state or looking at a single lake over time. Generally, higher FQI numbers indicate better lake quality. The calculated FQI for Lake Julia is 32 using the 2008 data. This indicates a high quality plant community.

One challenge of the 2008 plant survey is that rare plants are sometimes missed. For example, several plants were found at only one site and could easily have gone unrecorded in this survey. It is possible that a new infestation of an invasive species might also be missed by this kind of survey since the plant would be "rare" (not widely distributed) in the early stages of infestation. Vigilance by property owners and lake users is critical to catching new species or changes in the plant community.

Our 2003 aquatic plant survey tabulated 41 plant species whereas the point-intercept survey accounted for 26 (20 on the designated sampling points). This disparity does not likely indicate a decrease in diversity, but a difference in survey methodology.

Exhibit E. Lake Julia Aquatic Plant Species (2008 Data) Frequency and Distribution

Plant Species and Common Name	Number of Sites Where Found	Relative Frequency (%) (see note below)	Frequency of Occurrence Within Vegetated Areas (%)	Frequency of Occurrence at All Sites <Maximum Depth of Plants (%)
Brasenia schreberi (Water Shield)	12	2.1	4.3	3.5
Chara (Chara; Alga)	37	6.4	13.2	10.8
Eleocharis palustris (Creeping Spike-Rush)	3	0.5	1.1	0.9
Elodea Canadensis (Common Waterweed)	60	10.5	21.4	17.5
Isoetes sp. (Quillwort)	25	4.4	8.9	7.3
Lobelia dortmanna (Water Lobelia)	5	0.9	1.8	1.5
*Fontinalis antipyretica (*Willow Moss)	3	0.5	1.1	0.9
Myriophyllum heterophyllum (Various-leaved water milfoil)	1	0.2	0.4	0.3
Myriophyllum tenellum (Dwarf water milfoil)	27	4.7	9.6	7.9
Najas flexilis (Slender Naiad)	33	5.7	11.8	9.6
Nitella sp. (Stonewort; Alga)	125	21.8	44.6	36.6
Nuphar variegate (Yellow Pond-Lily)	1	0.2	0.4	0.3
Nymphaea odorata (Sweet-scented Waterlily)	3	0.5	1.1	0.9
Potamogeton amplifolius (Large-leaved Pondweed)	25	4.4	8.9	7.3
Potamogeton pusillus (Small Pondweed)	74	12.9	26.4	21.6
Potamogeton vaseyi (Vasey's Pondweed)	1	0.2	0.4	0.3
Potamogeton zosteriformis (Flat-Stemmed Pondweed)	3	0.5	1.1	0.9
Sparganium americanum (American Burreed)	4	0.7	1.4	1.2
Sparganium angustifolium (Narrow-leaved Burreed)	1	0.2	0.4	0.3
Vallisneria Americana (Wild Celery)	131	22.8	46.8	38.3

Note: "Relative Frequency" is calculated by the WDNR APM STATS spreadsheet and is not sensitive to whether all sampled sites, including non-vegetated sites, are included. Including non-vegetated sites will not change the relative frequency.

Lake Julia Fish and Wildlife Habitat – Section 3, Part C

In 2005, White Water Associates and the Lake Julia Lake Association submitted a report to the WDNR entitled *Understanding the Aquatic Food Web in the Lake Julia Ecosystem: a Study of Aquatic Invertebrates and Small Fishes*. Lake Julia has a typical assemblage of invertebrates and small fish species and they seem to be present in healthy population sizes. This is due in part to the good diversity of habitat types found in the Lake Julia ecosystem. It is also due to the fact that despite its urban setting, Lake Julia has a large component of its shoreline in either an undeveloped or a minimally developed state. Thus Lake Julia continues to provide adequate littoral zone habitat of high quality. The only non-native animal species known to inhabit Lake Julia is the Chinese Mystery Snail.

Shoreline development has been one of the largest impacts on Wisconsin lakes. Piers, seawalls, rip-rap, and sandy beaches cannot replace natural gravel, stone, cobble, and large woody material when it comes to aquatic habitat. Mechanical harvesting of "weeds" or chemical treatment may at times be management tools of choice but these techniques also remove habitat from the aquatic ecosystem. Recent work by the WDNR has documented a decline of minnow species in lakes that formerly were more species-rich (Garrison et al 2005, Lyons 1989). The surprise is that the decline has happened in spite of good water quality. At least some of this decline is linked to shoreline development (piers, rip-rap, sandy peaches, etc.). This decline in minnow species may signal larger problems for the ecosystem, but is a concern in-and-of-itself as these fishes are part of the natural heritage in Wisconsin. Fortunately, Lake Julia is only moderately developed and retains a large proportion of natural shoreline and relatively sparse number of piers (see Section 3, Part G for more details).

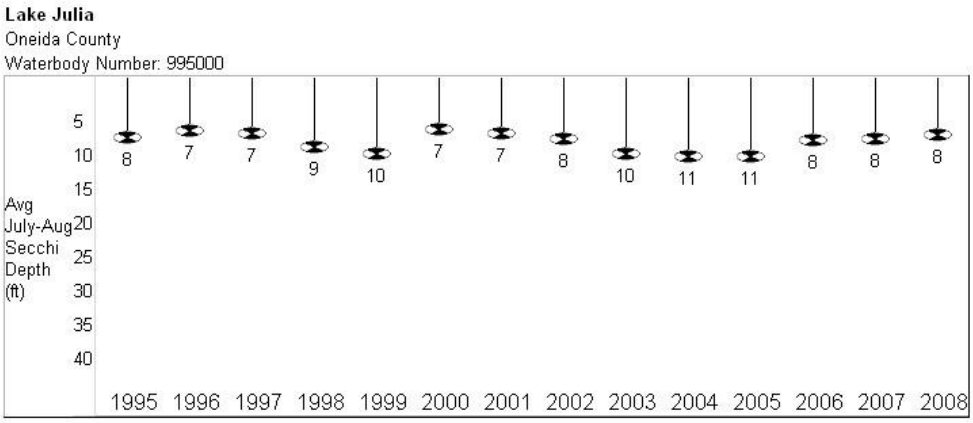
Our work has shown that Lake Julia has a healthy and diverse community of native aquatic plants. The diversity of habitat and small fishes in the littoral zone reflects that diversity. It is a goal of the Lake Julia Lake Association to perpetuate this condition into the future. One of the tools that can be applied to fulfill this goal is education, especially of landowners on Lake Julia regarding the importance of the rich littoral zone community in the lake and the possible impacts of shoreline development on that community.

No *Sensitive Area Designations* (SAD) assessment has been conducted for Lake Julia, yet as has been pointed out, high quality and diverse habitat is present on the lake.

Lake Julia Water Quality – Section 3, Part D

Lake Julia water quality information is available at the WDNR website (*http://ua.dnr.wi.gov/lakes/CLMN/reportsanddata/station.asp?folder=CLMN&stationid=443413*). Of interest to aquatic plant management are parameters related to Lake Julia trophic state and these are described in this sub-section with material taken from the WDNR reports on the website.

Secchi depth (a measure of water transparency) has been monitored annually on Lake Julia since 1995. Over these years, the Secchi depth transparency has averaged 8.6 feet. Exhibit F shows the results of the Secchi depth monitoring.



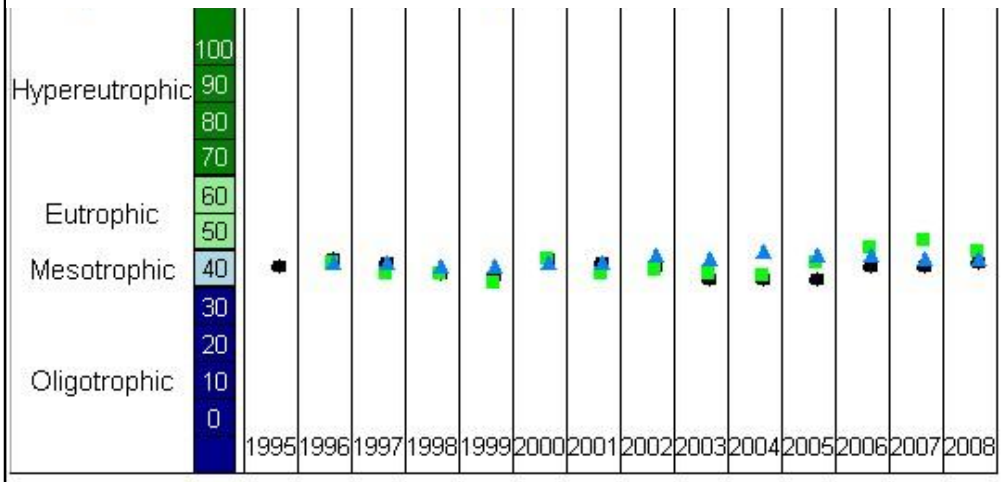
Past secchi averages in feet (July and August only).

Year	Secchi Mean	Secchi Min	Secchi Max	Secchi Count
1995	8	8	8	1
1996	7	6	8.5	5
1997	7.4	6	8.75	2
1998	9.3	9	9.75	3
1999	10.3	9.5	12	5
2000	6.8	6.25	7.5	4
2001	7.4	6.3	8.25	7
2002	8.1	6	12.75	5
2003	10.3	8.5	11.5	3
2004	10.7	10	11.5	5
2005	10.7	10	11.25	4
2006	8.4	7.5	9.5	4
2007	8.1	7	10	4
2008	7.5	7	8	4

Exhibit F. Secchi Transparency Results in Lake Julia 1995-2008

Trophic state index (TSI) is determined using a mathematical formula (WDNR has its own version). The TSI is a score from 0 to 110, with lakes that are less fertile having a low TSI. The WDNR bases the overall TSI on the Chlorophyll TSI when chlorophyll data is available. If lake chemistry data (phosphorus or chlorophyll) is unavailable, TSI Secchi is used. Chlorophyll is the best indicator for trophic state. TSI has also been monitored annually in Lake Julia since 1995. Exhibit G presents this data.

Exhibit G. Trophic Status (TSI values) in Lake Julia 1995-2008



Monitoring Station: Lake Julia - Deep Hole, Oneida County
Past Summer (July-August) Trophic State Index (TSI) averages.

◆ = Secchi ■ = Chlorophyll ▲ = Total Phosphorus

As part of the lake monitoring program, Lake Julia was sampled on ten days during 2007. Parameters included water clarity, temperature, total phosphorus, and chlorophyll “a”. The mean July-August Secchi disk reading for Lake Julia was 8.1 feet. The 2007 mean for Northeast Georegion lakes was 10.6 feet. The summer 2007 water was reported as “clear” and “brown.” This suggests that the Secchi transparency may have been diminished by tannins (a colored material leached from decaying matter). Tannins can be distinguished from suspended sediment because the water is clear (no suspended particles), but tea-colored. Though tannins are not harmful, they are perceived as detracting from the aesthetic appearance of water. Tannins can also decrease light penetration into the water and algal growth.

The 2007 chemistry data resulted in an average summer chlorophyll concentration at 12.1 µg/l (the Northeast Georegion summer mean was 11.1 µg/l). The summer 2007 total phosphorus concentration averaged 13.5 µg/l. Lakes that have total phosphorus concentrations of more than 20 µg/l may experience noticeable algae blooms.

The 2007 TSI (chlorophyll) for Lake Julia was 54 and indicates a eutrophic status. This TSI usually indicates decreased water clarity, fewer algal species, summer oxygen-depletion in bottom water, plant overgrowth, and water suitable only to warm-water fisheries. The TSI value in 2008 showed a slight decrease from 2007.

Lake Julia is a relatively shallow lake with relatively broad littoral zones. Exhibit H provides a bathymetric map of Lake Julia.

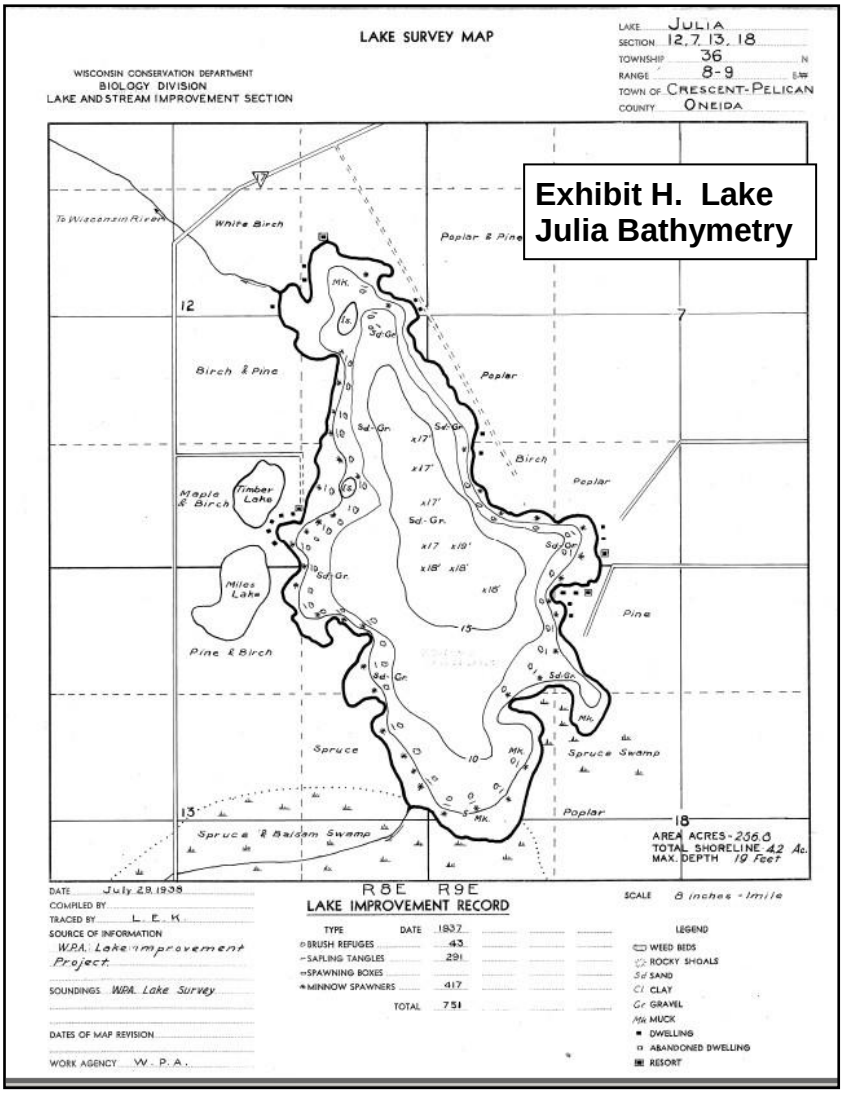


Exhibit H. Lake Julia Bathymetry

Lake Julia Water Use – Section 3, Part E

Despite its proximity to the City of Rhinelander, Lake Julia receives rather modest human use. Fishermen maybe provide the most use although there is some limited water skiing. On the two days of the 2008 plant survey we observed only a couple of fishing boats, one water skier, one kayak, and one pontoon boat. Since no active plant management is planned for Lake Julia, no human use considerations are currently necessary.

Lake Julia Watershed – Section 3, Part F

The Lake Julia watershed is approximately 3,250 acres as estimated from a WISCLAND Land Cover map[1] (see Exhibit I). This is a somewhat atypical watershed in that a large part of the border is the Wisconsin River. The southwestern border of the watershed was estimated on Exhibit I. The actual watershed size may be smaller than the 3,250 acres reported. By far the majority of the land cover in the watershed is forested (broad-leafed deciduous forest predominating, but also including large components of mixed deciduous-coniferous forest, coniferous forest, forested wetland, and lowland shrub wetland). General agriculture forms a smaller part of the watershed, and none of this cover type is closer than about 1,500 feet.

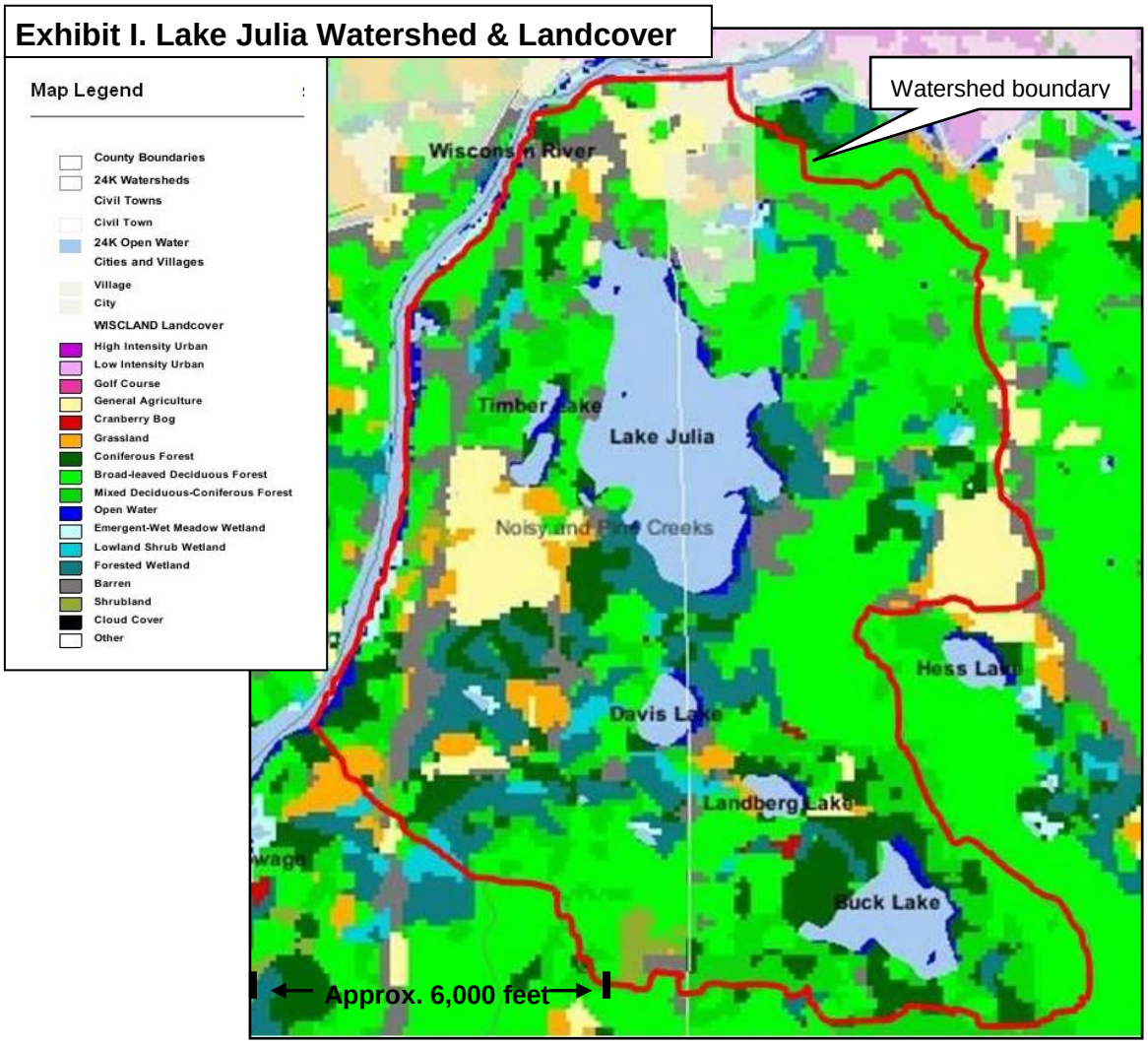
A review of Wisconsin Wetlands Inventory data reveals that there are approximately 50 mapped wetlands within a perimeter of roughly ¾ mile from the Lake Julia shoreline. Within 2000 feet of the shoreline there are approximately 35 mapped wetlands and within 1000 feet of the shore there are 22 mapped wetlands. These mapped wetlands are 2-3 acres in size and larger. This is a significant and important wetland network with many important ecosystem values (such as filtration) that benefit Lake Julia. In 2002, White Water Associates wetland scientists visited each of twenty wetlands nearest Lake Julia and conducted a wetland functional assessment. Complete results of this important baseline study were presented in an earlier Lake Planning Grant report to the WDNR.

Within the Lake Julia watershed, roads and buildings have been built on high ground that lies between major wetlands. This has increased the amount of impervious surfaces that can result in an increase in runoff following precipitation events and a decrease in the rate

[1] *http://dnr.wi.gov/maps/gis/datalandcover.html#data*

of groundwater recharge. In contrast, the wetlands closely surrounding Lake Julia have limited the opportunities for development close to the lake. This lack of development is particularly noticeable on the south end of the lake (although some recent development in this area has occurred). Thus, wetlands protect the water quality of the lake both directly (filtration, groundwater recharge) and indirectly (by limiting development). The wetland functional assessment completed by White Water Associates provides an excellent baseline against which future health and condition of these wetlands can be measured.

Exhibit I. Lake Julia Watershed & Landcover



It was our original intent to apply the WiLMS (Wisconsin Lakes Modeling Suite) to the Lake Julia watershed. In consultation with Kevin Gauthier (WDNR Lakes Management Coordinator) we decided not to apply this model since so much of the watershed is forested and because of the intact riparian area and protective nearby wetlands that buffer Lake Julia from nutrient and sediment inputs via runoff. Our initial focus on the watershed wetlands has provided the Lake Julia Lake Association with a keen awareness of the watershed and the important protective functions of these wetlands.

Lake Julia Riparian Area – Section 3, Part G

Exhibit J (following page) presents a fairly high resolution view of the nearshore riparian area of Lake Julia. The limited human development in this area is noteworthy and serves to buffer Lake Julia from higher than wanted nutrient inputs (e.g., nitrogen and phosphorus). This intact condition is very important to maintain for the long-term health of Lake Julia.

We examined 2005 aerial photography of the shoreline and riparian area around Lake Julia. We established three categories of riparian area condition for this analysis: (1) "natural with broad riparian zone" (at least 500 feet deep), (2) "lightly developed with intact riparian zone," and (3) densely developed with some riparian forest but more buildings and impervious surfaces. Lake Julia has approximately four miles of shoreline (about 21,000 feet). Only 6% of this shoreline was classified as "densely developed" with 78% being "lightly developed" and 16% classified as "natural with broad riparian zone." A count of docks (piers) from this aerial photography resulted in a total of forty-seven (47). It should be noted that in the 2010 direct count of peirs (see later in this section) a total of 64 was recorded. This higher number most likely reflects a more accurate count possible at "ground level" but could also include some new piers installed since 2005. The "shoreline development index" for Lake Julia was calculated as 1.63. The shoreline development index is a quantitative expression derived from the shape of the 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.

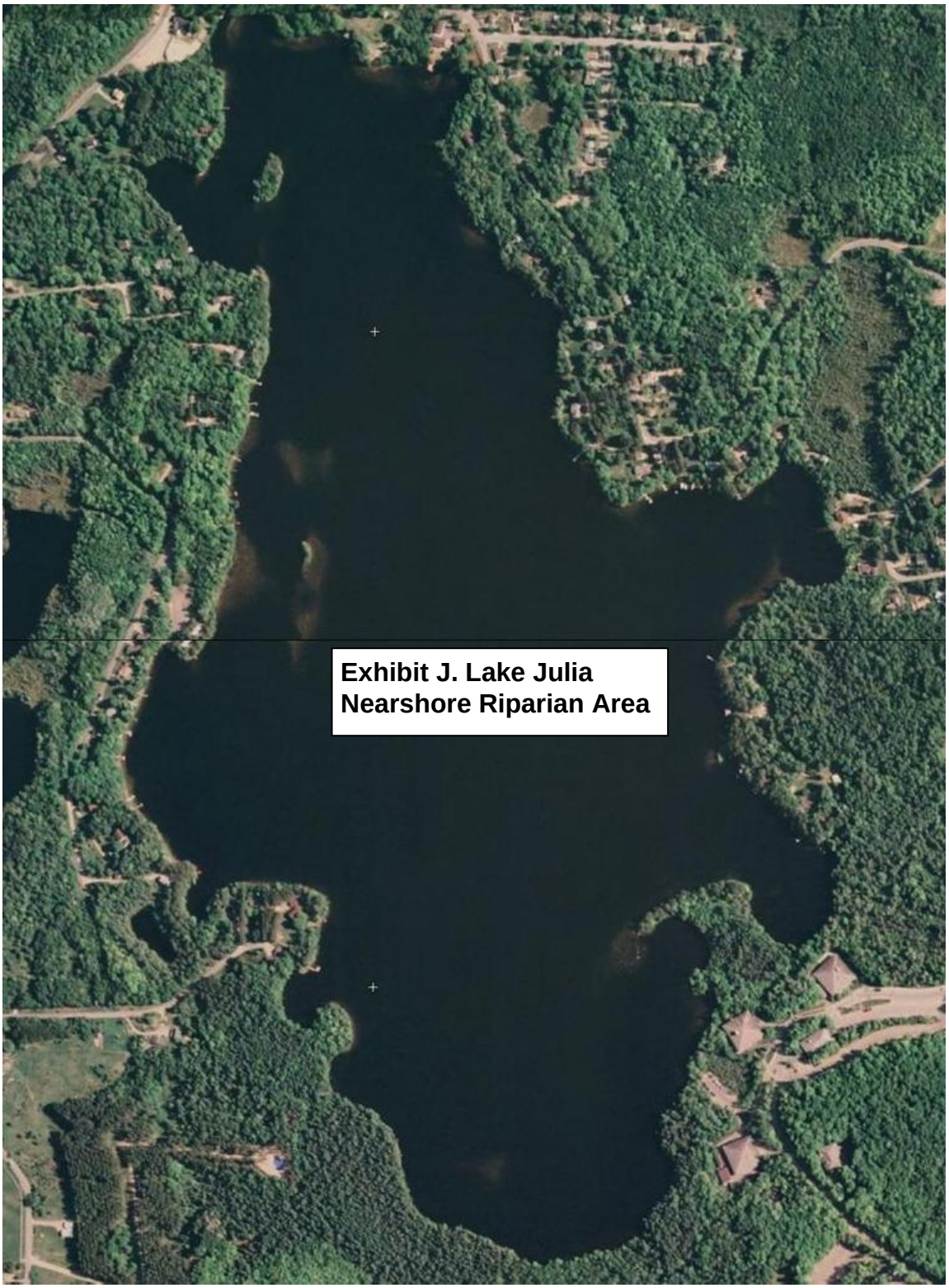


Exhibit J. Lake Julia Nearshore Riparian Area

One objective of our effort was to systematically document the littoral zone and riparian area condition of Lake Julia using digital photography and a qualitative assessment of riparian and lakeshore features. This work was conducted by several Lake Julia Lake Association volunteers. The full effort is provided as a digital deliverable on CD-ROM, but herein we describe and summarize the work.

Digital photography provides an efficient tool for application in documenting the existing conditions along the shoreline of Lake Julia. Adding this to the technology of global positioning systems (GPS) and a straight-forward qualitative assessment of shoreline conditions enabled us to create a practical imaged-based archive of lakefront conditions that can be used to monitor long and short term changes on Lake Julia.

Documenting the existing shoreline condition of inland lakes in Wisconsin is an important idea to pursue. From a regulatory standpoint, knowledge of the shoreline zone helps to determine the extent of future human-caused perturbations and assesses the efficacy of regulatory programs intended to protect the riparian area and lake.

For Lake Julia, we used ground level digital still photography complemented by 2005 aerial photography overlaid by tax parcel lines from a publicly available source (Oneida County GIS Mapping System, data available as of June 2010). Data storage and retrieval are critical to the value of an archive program, so in the electronic deliverable we maintained the original full-resolution photos as links to the more manageably sized photos displayed on the record pages.

Pre-field work involved White Water staff training volunteers and staff at Nicolet Technical College to conduct the digital photography and global positioning system (GPS) fieldwork and to manage digital photography data. Once trained the volunteer team deployed and systematically collected digital photos of the shoreline over the course of a day, May 29, 2010.

The field effort for the Lake Julia 2010 study involved a team aboard a suitable watercraft and armed with digital camera, GPS, map, and data forms for recording qualitative data collected on specific stretches of waterfront. The watercraft was positioned at a fairly uniform distance from shore (about 200 feet). Every photograph has an associated GPS position and direction noted by the observers; a photograph was taken perpendicular to the shore at a standardized focal length resulting in shoreline views encompassing at least 160-240 feet on average with overlap.

These digital photos were conveyed to White Water along with the datasheets and associated GPS coordinates. Here they were integrated into an interactive electronic

archive that includes geographic information and qualitative assessment of littoral zone and riparian area and necessary navigational controls.

A total of one hundred and one (101) shoreline segments were qualitatively assessed for a variety of shoreline parameters. This entire data set is provided in the electronic deliverable, but is summarized in tabular form in Appendix A. A few highlights of that data set are presented in the bulleted list:

- For 47 of 101 segments no house was noted.
- For 44 of 101 segments no structure was noted. In some segments, more than one dock was detected so the actual count of docks (piers) was 64 in the 2010 assessment.
- For 38 of 101 segments no access was noted.
- "No beach" or "Natural beach" is by far the most observed condition on the Lake Julia shoreline (94 of 101 segments).
- In 61 of the 101 segments buffer was checked as "above 10 feet." In 21 of 101 cases "no buffer was recorded."
- Erosion was rarely observed along the Lake Julia shoreline (90 of 101 segments were marked as "no erosion").

Over the course of our various field work on Lake Julia (beginning in 2002), we have kept field notes on the riparian fringe plants that we have observed. Although this does not represent a thorough inventory of plants present in the riparian area (near shore and visible from the lake) it does reflect the high diversity of the plant community of the Lake Julia area. Exhibit I provides the list of seventy plant species that we have incidentally recorded.

Exhibit I. Lake Julia riparian area plants.		
Abies balsamea (Balsam Fir)	*Eriocaulon septangulare* (Pipewort)	*Pinus resinosa* (Red Pine)
Acer rubrum (Red Maple)	*Eupatoreum maculatum* (Joe-Pye Weed)	*Pinus strobus* (White Pine)
Acer saccharum (Sugar Maple)	*Euthamia graminifolia* (Grass-Leaved Goldenrod	*Pontederia cordata* (Pickerel Weed)
Alnus rugosa (Tag Alder)	*Fraxinus nigra* (Black Ash)	*Populus tremuloides* (Quaking Aspen)
Amelanchier sp. (Juneberry)	*Glyceria Canadensis* (Rattlesnake Grass)	*Prunus serotina* (Wild Black Cherry)
Asclepias incarnata (Swamp milkweed)	*Glyceria striata* (Fowl Manna Grass)	*Rubus strigosus* (Wild Red Raspberry)
Betula alleghaniensis (Yellow Birch)	*Hypericum ascyron* (Giant St. Johnswort)	*Rhamnus grangula* (Glossy Buckthorn)
Betula papyrifera (Paper Birch)	*Ilex verticillata* (Winterberry)	*Salix discolor* (Pussy Willow)
Bidens cermuus (Beggarticks)	*Impatiens capensis* (Jewelweed)	*Salix eriocephala* (Willow)
Calamagrostis Canadensis (Blue-joint Grass)	*Iris versicolor* (Wild Blue Flag)	*Scirpus cyperinus* (Woolgrass)
Carex gynandra (Sedge)	*Juncus effuses* (Soft-stemmed Rush)	*Schoenoplectus tabernaemontani* (Softstem Bulrush)
Carex lasiocarpa (Sedge)	Larix laricina (Tamarack)	*Scutellaria galericulata* (Common Skullcap)
Carex lacustris (Sedge)	*Ledum groenlandicum* (Labrador Tea)	*Sphagnum sp.* (Sphagnum Moss)
Carex stipata (Sedge)	*Lobelia dortmanna* (Water Lobelia)	*Spiraea alba* (Meadowsweet)
Carex tenera (Sedge)	*Lycopus Americanus* (American Bugleweed)	*Spiraea tomentosa* (Steeplebush)
Carex trisperma (Sedge)	*Maianthemum Canadense* (Canada Mayflower)	*Stachy tenuifolia* (Smooth Hedge Nettle)
Chamaedaphne calyculata (Leatherleaf)	*Matteuccia struthiopteris* (Ostrich Fern)	*Thalictrum dasycarpum* (Tall Meadow-Rue)
Chelone glabra (Turtlehead)	*Menyanthes trifoliate* (Buckbean)	*Thuja occidentalis* (White Cedar)
Cicuta bubifera (Water Hemlock)	*Nemopanthus cucronata* (Mountain Holly)	*Trientalis borealis* (Starflower)
Clintonia borealis (Bluebead Lily)	*Onoclea sensibilis* (Sensitive Fern)	*Typha latifolia* (Broad Leaved Cattail)
Cornus canadensis (Bunchberry)	*Osmunda cinnamomea* (Cinnamon Fern)	*Ulmus Americana* (American Elm)
Dryopteris cristata (Crested Shield Fern)	*Parthenocissus quinquefolia* (Virginia Creeper)	*Vaccinium myrtilloides* (Canada Blueberry)
Dulichium arundinaceum (Three-way Sedge)	*Phalaris arundiacea* (Reed Canary Grass)	
Equisetum pretense (Meadow Horsetail)	*Picea mariana* (Black Spruce)	

Keeping Lake Julia healthy is not just a matter of taking care of the lake itself. The riparian edge functions to protect and "feed" the littoral zone habitat of the lake. To keep Lake Julia's high quality attributes, lakeside development should strive to keep an intact riparian edge, vegetated with native vegetation. Even a strip of wet meadow plants (sedges, milkweed, rushes, etc.) only a few feet wide does much to protect the lake from fertilizer runoff and preserves habitat connectivity for species such as frogs and turtles. Trees that die and fall over into the water should not be viewed as debris to be cleaned up, but as structural habitat that is crucial to the animals in the lake.

A Survey of Lake Julia Stakeholders – Section 3, Part H

In summer of 2009, fifty-two (52) questionnaires were sent out to Lake Julia stakeholders. Recipients were given about four months to respond. Twenty-eight (28) people replied with completed questionnaires. The entire questionnaire is presented in Appendix B along with a summary of the responses for each question. In this section, we highlight the findings.

The respondents reflect a good cross section of lake dwellers (both seasonal and year-round) and a wide range and even distribution of number of years of experience with Lake Julia. The activities respondents undertake on Lake Julia are diverse and fairly evenly distributed, although fishing was represented in the highest proportion of responses (17%). Respondents are very satisfied with the quality of their recreational experiences on Lake Julia (54% and 46% of the respondents designated their more recent experience on Lake Julia as "very enjoyable" or "enjoyable," respectively with "not too enjoyable" and "not at all enjoyable" receiving zero responses. Fishing, swimming, pontoon boating, pleasure boating, canoeing and kayaking, nature viewing, and scenery all receive high ranking for recreational opportunities on Lake Julia. The respondents to the questionnaire demonstrated fairly frequent use of the recreational opportunities on Lake Julia (38% indicating they use the lake 10 or more times in the summer and 46% indicating they use the lake three to nine times).

From a long list of concerns, respondents ranked water quality, quality of fish habitat, aquatic plant growth, aquatic invasive species introduction, and shoreline vegetation removal of fairly high concern, but they evaluated the overall lake quality has "excellent" (19%) or "good" (70%) with only 11% ranking lake quality as "fair" and no responses of "poor." Thirty-two percent (32%) indicated they observed "no dramatic changes" on Lake Julia in the past ten years. Interestingly, about equal numbers of respondents indicated they observe "more aquatic plants than in the past" (19%) and "fewer aquatic plants than in the past" (16%). In contrast, 13% of respondents

observe more algal blooms in the past and only 3% indicated “fewer algal blooms than in the past.” The majority of respondents indicated that aquatic plant growth “rarely” (48%) or “never” (26%) negatively affects their use of Lake Julia.

Forty-four percent (44%) responded that some kind of aquatic plant management is needed on Lake Julia and several indicated on a map of Lake Julia some specific concerns. The questionnaire queried stakeholders regarding their level of support of various aquatic plant management approaches. Hand pulling/raking received the strongest support. Fairly strong support was expressed for monitoring plant populations in Lake Julia. Prevention of aquatic invasive species received very high ranking reflecting both a strong concern among stakeholders and the effectiveness of the WDNR awareness campaign for AIS. A large number of respondents (61%) indicated willingness to volunteer for Lake Julia stewardship activities.

Lake Julia Analysis – Section 3, Part I

Although on the days of our plant survey in 2008 Lake Julia was relatively free of boaters, it is close to a small city, and at times can experience quite intensive use. There are a substantial number of permanent riparian dwellings around the lake. In spite of this human presence, Lake Julia is in exceptionally good shape.

No invasive alien plant species were found during the plant surveys. Some of the developed shoreline areas undoubtedly have impacts on the lake in terms of increased surface run-off, but these impacts appear to be minor. On the whole, the shoreline has not been denuded of woody vegetation or converted to incompatible uses. Most homes have retained trees and shrubs along the shoreline which assists protecting water quality as well as the aesthetics of the lake and shoreline.

To keep these high quality attributes, lakeside development should strive to keep an intact riparian area with native vegetation. Even a strip of wet meadow plants (sedges, rushes) only a few feet wide does much to protect the lake from fertilizer runoff and preserves habitat connectivity for species such as frogs and turtles.

In short, Lake Julia currently supports a diverse and beautiful aquatic plant community that is truly a treasure. The Lake Julia Lake Association is pleased to be involved in perpetuating the ecological health of this lake and its associated shorelands and wetlands for future generations. In the next section, we put forth actions and associated objectives and monitoring effort to ensure the continued health of Lake Julia.

Section
4

Actions & Objectives for Aquatic Plant Management in Lake Julia

The purpose and goals stated in Section 2 provide the platform for developing actions and objectives to achieve the desired future for Lake Julia aquatic plant community. In this section, we present several actions and associated objectives that the Lake Julia Lake Association plans to implement in future phases of the stewardship program. Recommended monitoring is also described and action status is indicated. In some cases, the actions, objectives, and monitoring each need to be further developed so that appropriate methodology can be employed. The Lake Julia Lake Association will seek advice from the WDNR Aquatic Plant Manager and other experts. The plan is flexible and allows the insertion of new ideas and actions at many points along the path of aquatic plant management in Lake Julia. Once again, we have followed the advice provided in the WDNR guidance document entitled "Aquatic Plant Management in Wisconsin."

Action (Research): Conduct formal survey of Lake Julia stakeholders.

Objective: To ascertain perspectives and priorities of Lake Julia stakeholders. The survey will inform preparation of the final aquatic plant management plan and identify gaps in understanding about aquatic plants to help guide education efforts.

Monitoring: The Lake Julia Lake Association oversees activity and maintains data.

Status: Occurred in 2009 and completed in 2010.

Action (Research): Review and analyze existing Lake Julia water quality information.

Objective: Provide current water quality analysis for Final Aquatic Plant Mgt Plan.

Monitoring: The Lake Julia Lake Association oversees activity and maintains data.

Status: Completed in 2009.

Action (Research): Conduct a near-shore habitat inventory of Lake Julia.

Objective: To characterize, assess, & photograph the near-shore habitat (including plants, level of disturbance, amount of natural shoreline, and impacted areas).

Monitoring: The Lake Julia Lake Association oversees activity and maintains data.

Status: Conducted and completed in 2010.

Action (Education): Create and adopt the Final Aquatic Plant Management Plan.

Objective: To provide foundation for long-term native plant community conservation and to be prepared for response to non-native invasive species introductions.

Monitoring: The Lake Julia Lake Association oversees activity and maintains plan.

Status: Completed in 2010.

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

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

Monitoring: Lake Julia Lake Assoc. oversees and maintains data; copies to WDNR.

Status: Anticipated in 2014

Action (Research): Request that the WNDR conduct a "Sensitive Area Designation Assessment" on Lake Julia.

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

Monitoring: Lake Julia Lake Assoc. oversees and develops further actions if necessary.

Status: Anticipated to make request to WDNR in 2010.

Action (Research): Continue water clarity monitoring and advanced water quality monitoring (phosphorous and chlorophyll a).

Objective: To understand and follow the trophic status of Lake Julia

Monitoring: Lake Julia Lake Assoc. conducts sampling.

Status: Commence in 2012.

Action (Education): Develop a Citizen Lake Monitoring Network to monitor for invasive species on Lake Julia 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 & to educate recreational users regarding aquatic invasives & special features of L. Julia

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

Status: Anticipated to begin in 2011

Action (Education): Re-implement the "Clean Boats, Clean Waters" program in a form that will engage and enlist volunteers. This program actively informs lakefront property owners and public boat landing users of the need to prevent the spread of aquatic invasive species.

Objective: To monitor recreational traffic out of the lake checking for possible introduction of invasive aquatic plants on boats, engines, and trailers and to educate recreational users regarding aquatic invasives and special features of Lake Julia.

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

Status: This program was initiated in 2005, but volunteer participation has waned. We hope to re-implement in 2011

Action (Education): Create an education plan for the Lake Julia Lake Association members and other Lake Julia stakeholders that will address issues of healthy aquatic and riparian plant communities.

Objective: To educate Lake Julia 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 Julia 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 Julia Lake Association oversees activity and assesses effectiveness.

Status: Anticipated to begin in 2011

Action (Research): Identify, photograph, and describe areas of Lake Julia riparian area and shoreline that might be candidates for rehabilitation or restoration.

Objective: To inventory and describe areas of Lake Julia riparian area and shoreline and plan possible rehabilitation or restoration actions.

Monitoring: The Lake Julia Lake Association oversees activity and maintains data.

Status: Anticipated to begin in 2011

Action (Education): Manage and increase Lake Julia Stakeholders Mailing List.

Objective: To increase ability to communicate with Lake Julia riparian owners and other stakeholders. To be used in delivering education materials and fostering lake stewardship and volunteerism.

Monitoring: The Lake Julia Lake Association oversees activity and maintains data.

Status: This database has already commenced and has a list of 150 stakeholder contacts. Anticipated to continue in subsequent years.

Section

5

Contingency Plan for Rapid Response to Aquatic Plant Invaders

Although Lake Julia currently is home to a well-balanced native community of aquatic plants, it is important to be prepared for the discovery of an introduced invasive plant species. Unfortunately, sources of aquatic invasive plants are numerous in Wisconsin. Several of the actions and objectives in the previous section address minimizing the likelihood of introduction, but this section outlines a contingency plan for newly-found populations of an aquatic invasive species in Lake Julia. It is what the Lake Julia Lake Association can do by way of ***rapid response*** to remove or contain a plant invader.

Aquatic plants designated as aquatic invasive species include curly-leaf pondweed, Eurasian water milfoil, and purple loosestrife. If one of these aquatic invasive species is discovered in Lake Julia, the Lake Association will follow the protocol outlined below.

If curly-leaf pondweed, Eurasian water milfoil, or purple loosestrife are detected in Lake Julia:

1. Have an aquatic plant expert confirm the identification of the plant.

2. Determine the extent of the aquatic invasive species' colonization in the lake (location, approximate number of plants, description of the colony). Use a global positioning system (GPS) unit to assist in locating the position and boundaries of the colony.

3. Contact the local WDNR aquatic plant manager to help ascertain whether manual removal of plants is a feasible approach to management.

4. Determine from the WDNR aquatic plant manager whether a plant community evaluation is warranted (via point-intercept survey). If so, request the WDNR to conduct this evaluation.

5. If manual removal is appropriate, undertake the removal by recommended means and dispose of removed plants appropriately (follow advice of WDNR aquatic plant manager). Invasive plants can be removed from public waters (after confirmation of identification) without a permit under the following conditions by manual removal as indicated in NR109.07 when performed in a manner that does not harm the native aquatic plant community. Depending on the extent of the invasion, a professional may be engaged for the manual removal. Note that non-chemical treatment costs are eligible for reimbursement under a WDNR grant.

6. Frequently monitor whether the manual removal of the invasive species was complete and report results to WDNR aquatic plant manager.

If Lake Julia Lake Association (in consultation with the WDNR aquatic plant manager) determines the extent or type of the invasive species' colonization is beyond feasibility of manual control, evaluate other control options including chemical and proceed by the following steps:

1. Make a determination (in consultation with the WDNR aquatic plant manager) if the chemical treatment of a pioneer infestation of an invasive aquatic plant warrants a rapid response permit and grant (requested in consultation with the WDNR aquatic plant manager).

2. If chemical treatment is warranted determine from the WDNR aquatic plant manager whether a plant community evaluation (via point-intercept survey) needs to be conducted prior to treatment. If yes, request that the WDNR conduct this evaluation.

3. Determine the appropriate timing of treatment (based on season and other factors).

4. Authorize a Lake Julia Lake Association member to act on behalf of the organization to apply for the required permit and prepare the permit application.

5. Raise necessary funds for up-front payment of chemical treatment (expect to pay all the cost for control up-front because grants operate on a reimbursement basis).

6. Conduct the treatment using qualified, certified, and experienced applicator.

7. Conduct frequent follow-up monitoring to determine efficacy of treatment and need for additional treatment as well as assessing any residual effects.

Section
6

References

Bormann, S., R. Korth, J. Temte.1997. *Through the Looking Glass. A Field Guide to Aquatic Plants*. University of Wisconsin-Extension. Stevens Point, WI.

Brown, L. 1979. *Grasses: An Identification Guide*. Houghton Mifflin Company, Boston

Cobb, B. 1963. *A Field Guide to the Ferns.* Peterson Field Guide Series. Houghton Mifflin Company, Boston.

Cody, W.J. and D. M. Britton. 1989. *Ferns and Fern Allies of Canada*. Research Branch Agriculture Canada. Publication 1829/E. Canadian Government Publishing Centre, Ottawa, Canada.

Dresen, M.D. and R.M. Korth. 1995. *Life On The Edge…Owning Waterfront Property*. University of Wisconsin Extension (UWEX)-Lakes Partnership. University of Wisconsin, Stevens Point.

Edsall, M. S. 1985. *Roadside Plants and Flowers. A Traveler's Guide to the Midwest and Great Lakes Area*. University of Wisconsin Press, Madison, WI.

Eggers, S. and D. Reed. 1997. *Wetland Plants and Plant Communities of Minnesota and Wisconsin*. U.S. Army Corps of Engineers, St. Paul District, Minnesota

Garrison, P. J., D.W. Marshal, Laura Stemick-Thompson, P.L. Cicero, and P.D. Dearlove. 2005. *Effects of pier shading on littoral zone habitat and communities in Lakes Ripley and Rock, Jefferson County, Wisconsin.* PUB-SS-1006-2005.

Henderson, C.L., C.J. Dindorf, and F. J. Rozumalski. 1998. *Landscaping for Wildlife and Water Quality*. Minnesota Department of Natural Resources, St. Paul, MN.

Hitchcock, A.S. *Manual of the Grasses of the United States*. Second edition revised by Agnes Chase. Volumes 1 and 2. Dover Publications, Inc., New York.

Lellinger, D.B. 1985. *A Field Manual of the Ferns & Fern Allies of the United States and Canada*. Smithsonian Institution Press, Washington, D.C.

Lyons, John. 1989. *Changes in the abundance of small littoral-zone fishes in Lake Mendota, Wisconsin.* Canadian Journal of Zoology, 1989, 67:(12) 2910-2916, 10.1139/z89-412

Moody, M. L.; Les, D. H. 2002. *Proceedings of the National Academy of Sciences*, USA 99: 14867–14871.

Newcomb, L. 1977. *Newcomb's Wildflower Guide*. Little, Brown and Co., Boston.

NRC (National Research Council). 2002. *Riparian Areas: Functions and Strategies for Management*. National Academy Press, Washington, D.C.

Peterson, R. T. and M. McKenny. 1968. *Wildflowers: Northeastern/Northcentral North America*. Peterson Field Guide Series, Houghton Mifflin Company, Boston.

Pohl, R.W. 1978. *How To Know The Grasses*. Wm. C. Brown Company Publishers, The Pictured Key Nature Series. Dubuque, IA.Newmaster, S.G., A .G .Harris, and L. J. Kershaw.1997. *Wetland Plants of Ontario*. Lone Pine Publishing, Edmonton, Alberta.

Premo, Dean and Kent Premo. 2011. *Monitoring the Little Quinnesec Falls Hydroelectric Project for Eurasian Watermilfoil and Purple Loosestrife (FERC Hydro Project No. 2536, Little Quinnesec Falls)*. Report to Northbrook Energy, LLC by White Water Associates, Inc.

Redington, C.B. 1994. *Plants in Wetlands*. Kendall/Hunt Publishing Company, Dubuque, Iowa.

Smith, H.V. 1966. *Michigan Wildflowers*. Cranbrook Institute of Science, Bulletin 42, Bloomfield Hills, MI.

Soper, J.H. and M.L. Heimburger. 1982. *Shrubs of Ontario*. Royal Ontario Museum, Toronto, Ontario, Canada.

United States Army Corps of Engineers. 1987. *Corps of Engineers Wetlands Delineation Manual.* Technical Report Y-87-1. Waterways Experiment Station, Vicksburg, MI

United States Department of Agriculture. 1993. *Soil Survey of Oneida County, WI*. USDA Soil Conservation Service.

United States Department of Interior, Fish and Wildlife Service. 1988. National List of Plant Species That Occur in Wetlands: Michigan. Washington, D.C.

Voss, Edward G. 1972. *Michigan Flora. Part I. Gymnosperms and Monocots.* Bull. 55. Cranbrook Inst. Sci. and University of Michigan Herbarium. 488 pp.

Voss, Edward G. 1985. *Michigan Flora. Part II. Dicots (Saururaceae to Cornaceae)*. Bull. 59. Cranbrook Inst. Sci. and University of Michigan Herbarium. 724 pp.

Voss, Edward G. 1996. *Michigan Flora Part III. Dicots (Pyrolaceae--Compositae)*. Bull 61. Cranbrook Inst. Sci. and University Michigan Herbarium. 622 pp

Appendix A

Lake Julia Shoreline and Riparian Area Summary

Lake Julia Shoreline and Riparian Area Summary

A Summary of Shoreline and Riparian Area Parameters Recorded by a Team of Lake Julia Volunteers in Spring 2010 - Prepared by White Water Associates, Inc.

One hundred and one (101) shoreline segments (each approximately 200 feet long) were assessed for a variety of shoreline parameters by members of the Lake Julia Lake Association in spring 2010. The data and photographs for each of the segments are contained in the electronic deliverable associated with Phase 5 of the Lake Julia Stewardship Project. This information is analyzed and summarized below. These data will be a useful tool in identifying and planning restoration projects in the Lake Julia riparian area, targeting educational efforts, and for monitoring long-term change. Please note that for each segment no elements or more than one element might have been recorded thus the "% records" for a give category do not necessarily total 100%. Also note that observations were made from a boat approximately 200 feet from shore. It is possible that some elements were hidden from view and not recorded.

Lake Julia Shoreline – Development		
Type	Number of records	% records
house	54	53%
shed	4	4%
garage	1	1%
gravel drive	2	2%
paved drive	0	0%
lawn	3	3%
other	5	5%

For 47 of 101 segments no house was noted.

Lake Julia Shoreline – Structures		
Type	Number of records	% records
dock	57	56%
breakwater	0	0%
stormwall	0	0%
boathouse	1	1%
rip-rap	5	5%
other	5	5%

For 44 of 101 segments no structure was noted. In some segments, more than one dock was detected so the actual count of docks (piers) was 64 in the 2010 assessment.

Lake Julia Shoreline – Access		
Type	Number of records	% records
none	38	38%
unimproved path	45	45%
gravel path	0	0%
chip path	0	0%
paved path	5	5%
boardwalk	1	1%
stairs	15	15%
other	0	0%

For 38 of 101 segments no access was noted.

Lake Julia Shoreline – Beach		
Type	Number of records	% records
None	73	72%
natural	21	21%
artificial	6	6%
stable	1	1%
eroding	5	5%
other	3	3%

"No beach" or "Natural beach" is by far the most observed condition on the Lake Julia shoreline (94 of 101 segments).

Lake Julia Shoreline – Vegetation		
Type	Number of records	% records
upland	59	58%
wetland	28	28%
forested	86	85%
shrub	2	2%
natural openings	0	0%
stream	0	0%
other	12	12%

Lake Julia Shoreline – Buffer		
Type	Number of records	% records
buffer_none	21	21%
1-3 ft	8	8%
4-10 ft	18	18%
above 10 ft	61	60%
type: herbaceous	0	0%
type: shrubs	6	6%
type: trees	12	12%
type: other	4	4%

In 61 of the 101 segments buffer was checked as "above 10 feet." In 21 of 101 cases "no buffer was recorded."

Lake Julia Shoreline – Erosion		
Type	Number of records	% records
none	90	89%
undercut banks/slumping	1	1%
furrows/gullies	0	0%
bare earth	14	14%
other	2	2%

Erosion was rarely observed along the Lake Julia shoreline (90 of 101 segments were marked as "no erosion").

Lake Julia Shoreline – Bank Height		
Type	Number of records	% records
none	25	25%
slight (< 2 ft)	25	25%
abrupt (2 ft or greater)	53	52%

Appendix B

Lake Julia Public Questionnaire Results

Lake Julia Aquatic Plant Management Plan - Public Questionnaire

Prepared by Lake Julia Lake Association
Technical assistance by White Water Associates, Inc.

June 2009

Note: This public questionnaire was sent out as a four-page document with the first page being explanatory material (see text below). Here the original questionnaire is expanded to provide the analysis (primarily in bar graph form) of responses from 28 respondents.

We are writing to inform you about an important Lake Julia planning process that could have important outcomes for Lake Julia and how you use and enjoy the lake. Please assist us in the process by completing this questionnaire and conveying your ideas about Lake Julia. Return the survey by November 14, 2009.

Since 2002, the Lake Julia Lake Association has devoted considerable effort to understanding the Lake Julia ecosystem. Over the course of that work, two aquatic plant surveys have provided substantial information on aquatic plant presence and distribution in the lake. Lake Julia currently has a healthy and diverse community of native aquatic plants and does not harbor any aquatic invasive plant species.

An aquatic plant bed is often termed a "weed bed." In fact, many aquatic species have "weed" as part of their names. Duckweed, pondweed, musky weed, and waterweed are just a few examples. This usage is not meant to be derogatory, but unfortunately "weed" also connotes an unwanted plant, often one that exhibits rampant growth. Such is not the case for the vast majority of native plants in aquatic ecosystems.

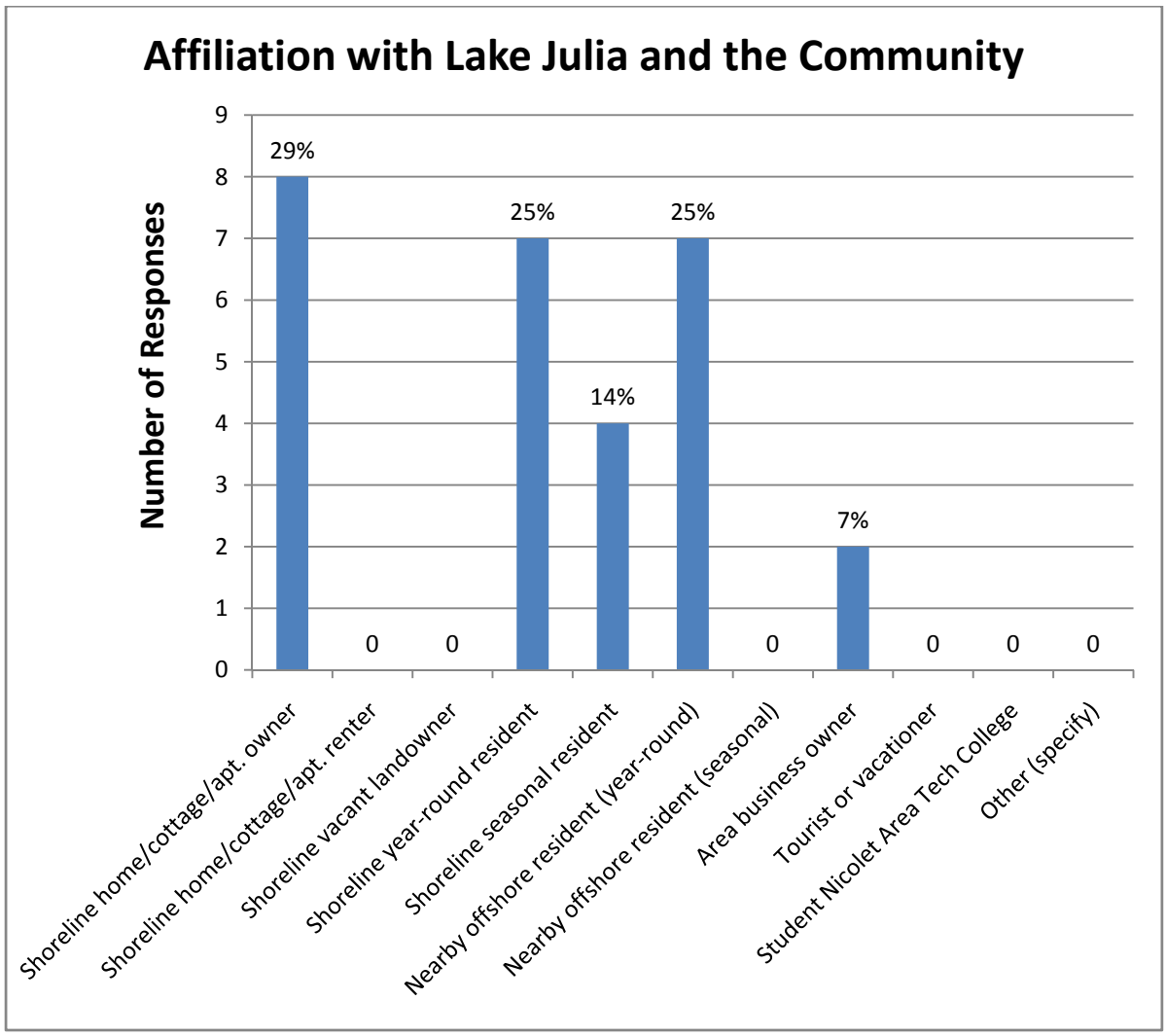
Aquatic plants are a vital part of a lake ecosystem. They provide habitat for fish and other animals, filter runoff from the uplands, stabilize the shoreline against erosion, offer spawning areas for fish, produce oxygen, absorb nutrients (making them less available for nuisance algae), provide food for many animals, and make it difficult for aquatic invasive plant species to become established.

In lakes that receive an overabundance of nutrients (particularly from excessive fertilizers or leaking septic tanks), plant growth can become too lush, or dominated by only a few species. This process of accelerated lake plant growth (often caused by human influences) can give aquatic plants a bad name. Non-native plant species (aquatic invasive species) can be transported on boat motors or dumped from home aquariums and establish in a lake. Sometimes, they may come to dominate a lake and exclude other native species.

The Lake Julia Lake Association wants to maintain the high quality condition present in Lake Julia. It wants to establish the foundation to conduct plant management should the need arise in the future (for example if an aquatic invasive plant species is detected in Lake Julia). An Aquatic Plant Management Plan is required by the WDNR prior to any plant management and the Lake Julia Lake Association is in the process of creating such a plan.

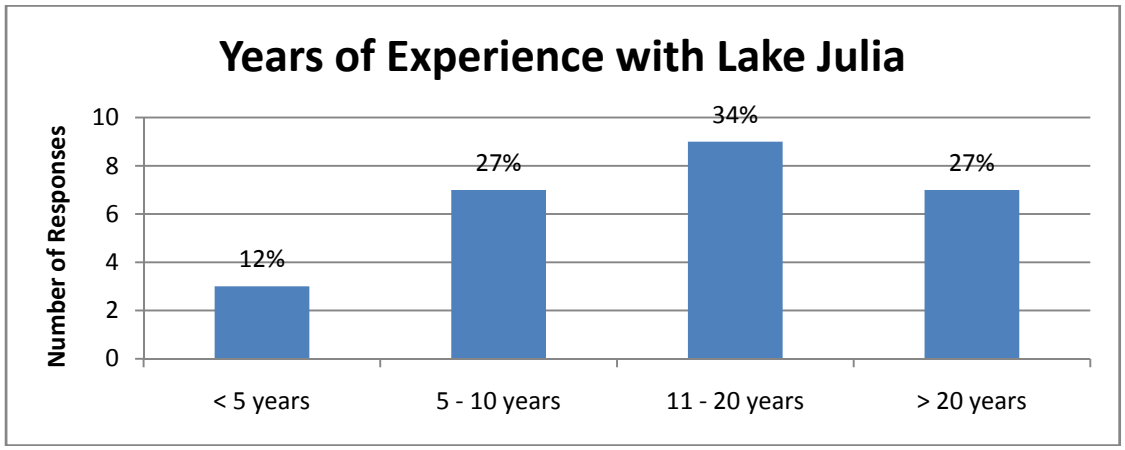
1. Please circle the response(s) that describes your affiliation with Lake Julia and the community.

A. Shoreline home/cottage/apartment owner
B. Shoreline home/cottage/apartment renter
C. Shoreline vacant landowner
D. Shoreline year-round resident
E. Shoreline seasonal resident
F. Nearby offshore resident (year-round)
G. Nearby offshore resident (seasonal)
H. Area business owner
I. Tourist or vacationer
J. Student Nicolet Area Tech College
K. Other (specify)_____



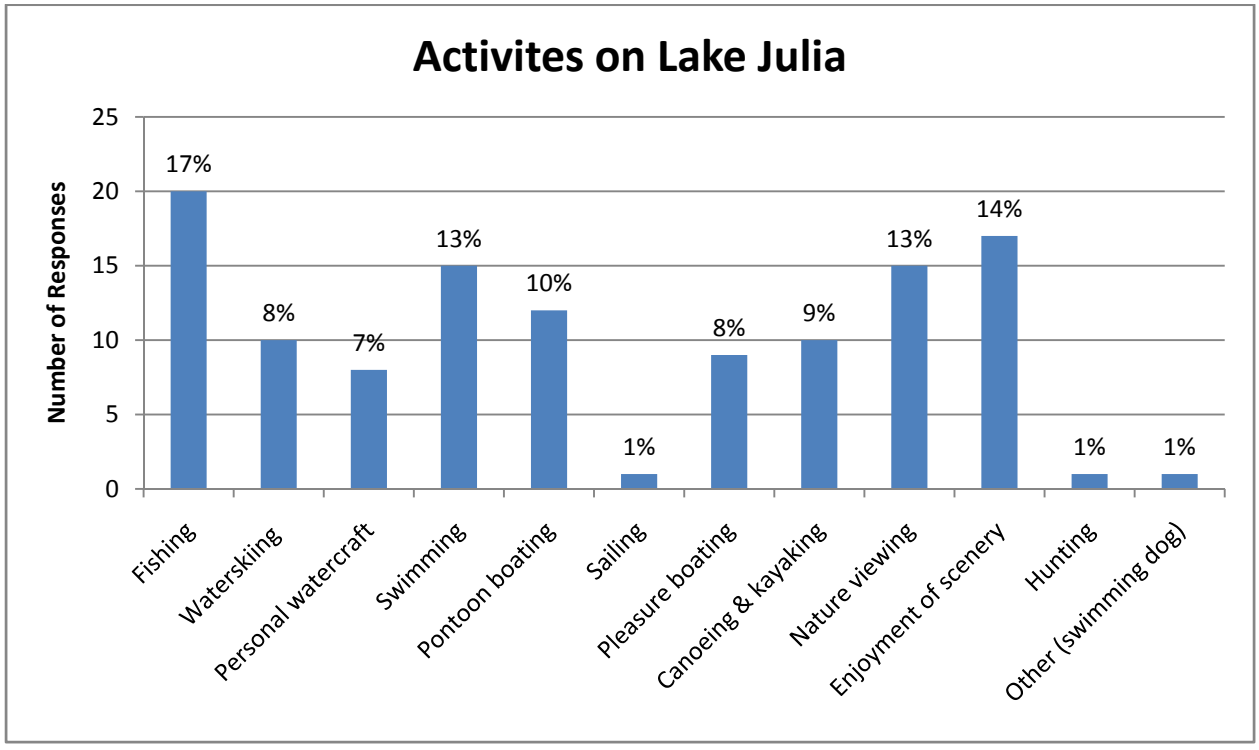
2. How many years of experience do you have with Lake Julia?

A. Less than 5 B. 5-10 C. 11-20 D. Greater than 20



3. Please circle the activities that you do on Lake Julia. (Circle all that apply)

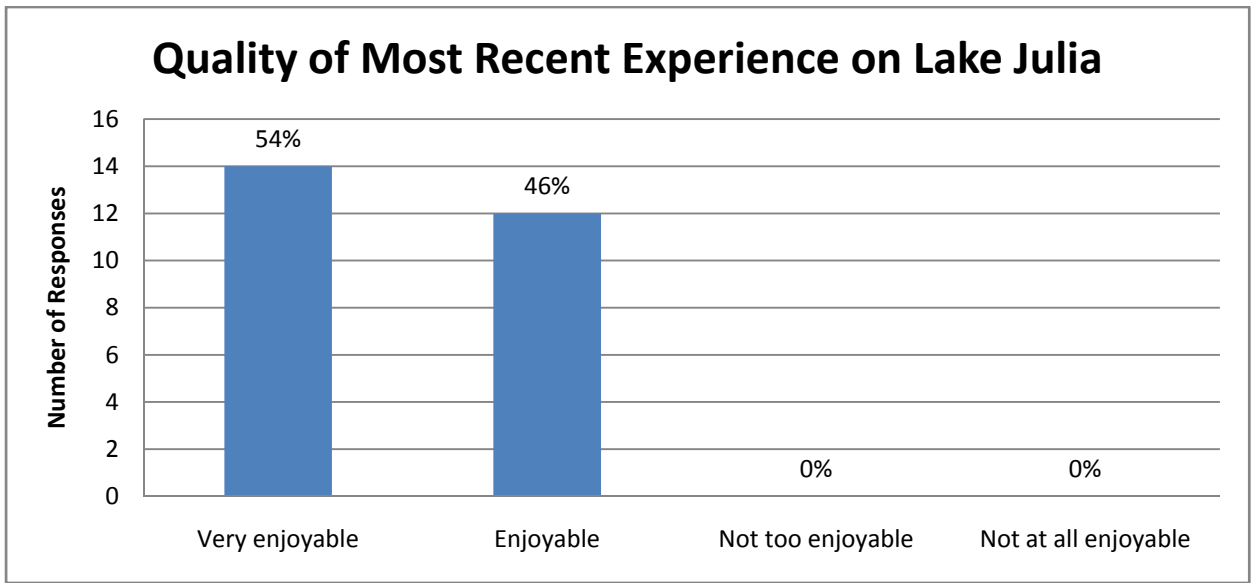
A. Fishing
B. Waterskiing
C. Personal watercraft
D. Swimming
E. Pontoon boating
F. Sailing
G. Pleasure boating
H. Canoeing & kayaking
I. Nature viewing
J. Enjoyment of scenery
K. Hunting
L. Other_____



4. From the question 3 list, write the letter of your most recent recreational activity on Lake Julia? ____

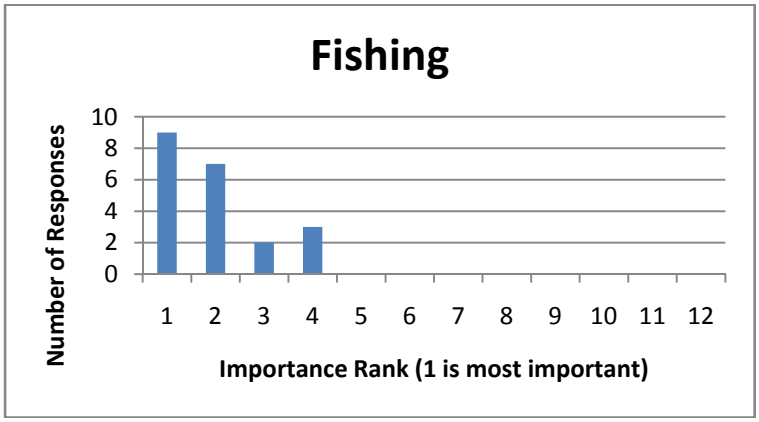
Overall, how would you rate that experience? (Please select only one)

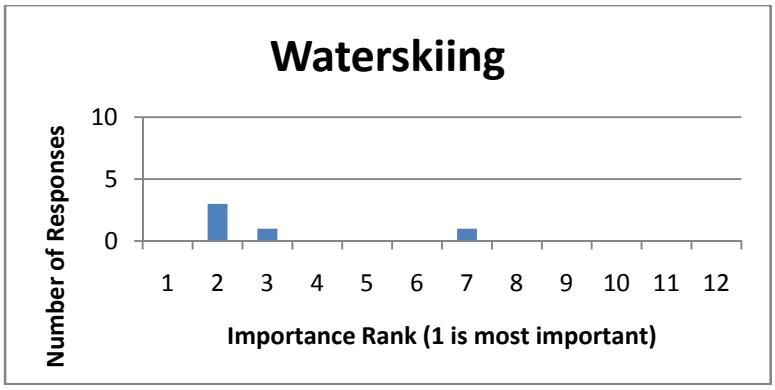
A. Very enjoyable B. Enjoyable C. Not too enjoyable D. Not at all enjoyable

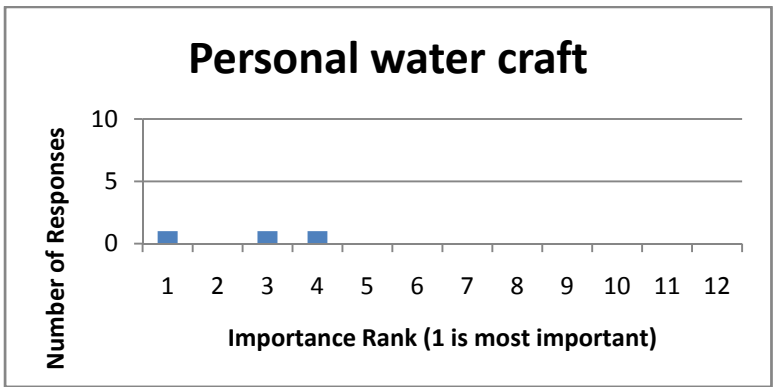


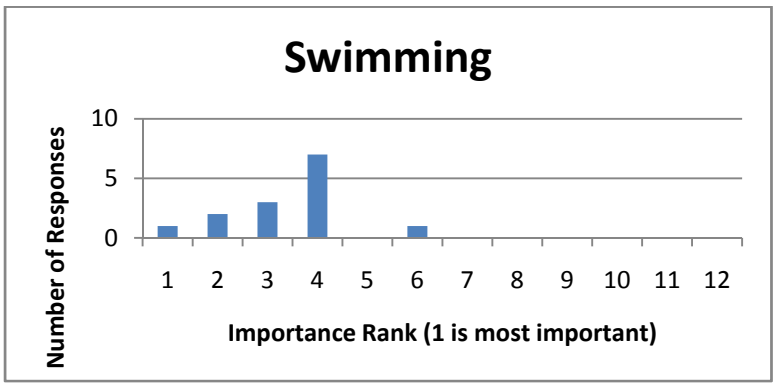
5. Please rank the four activities that are most important to you on Lake Julia. (Use "1" for the most important, "2" for your next choice and so on.)

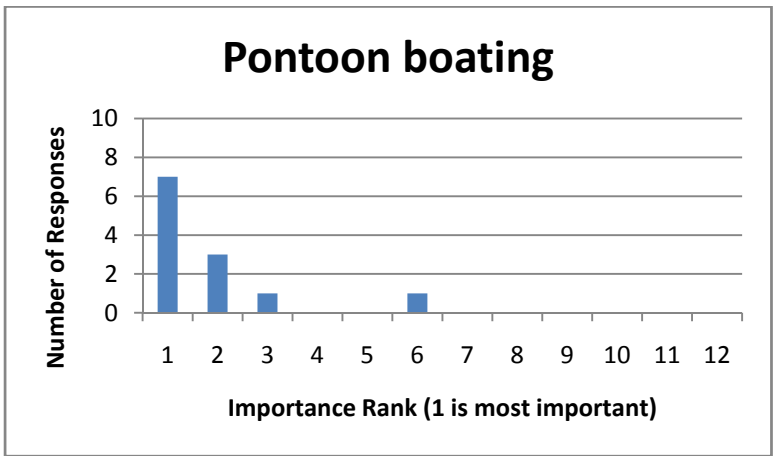
___Fishing
___Waterskiing
___Personal water craft
___Swimming
___Pontoon boating
___Sailing
___Pleasure boating
___Canoeing & kayaking
___Nature viewing
___Scenery
___Hunting
___Other (specify)_____

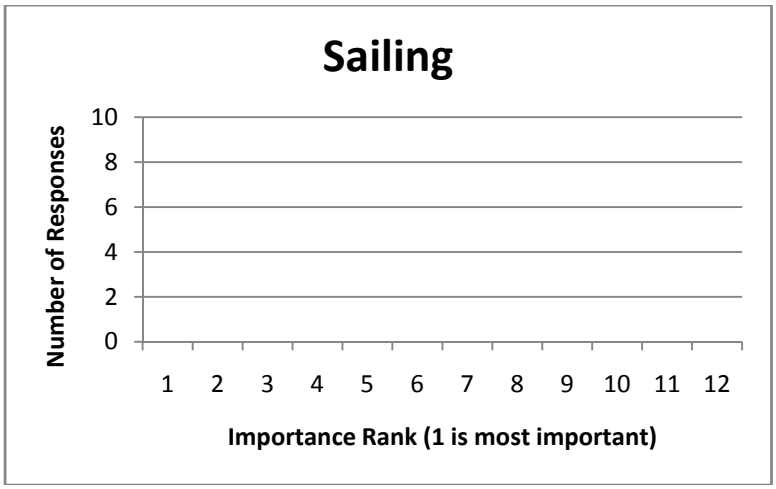


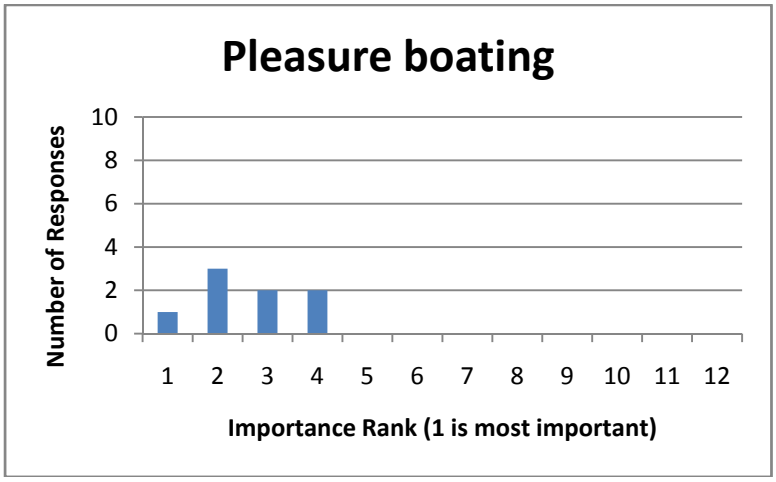

Waterskiing
Number of Responses
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)

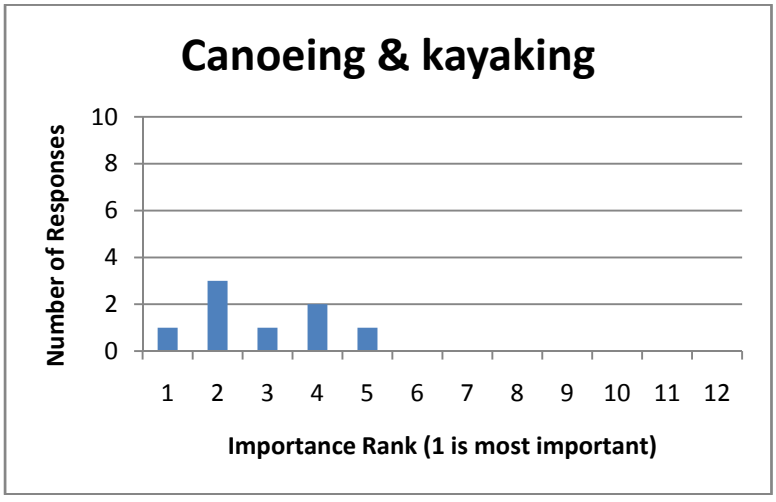

Personal water craft
Number of Responses
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)

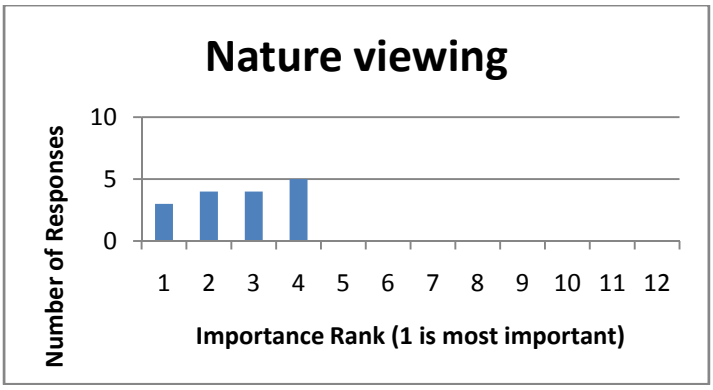

Swimming
Number of Responses
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)

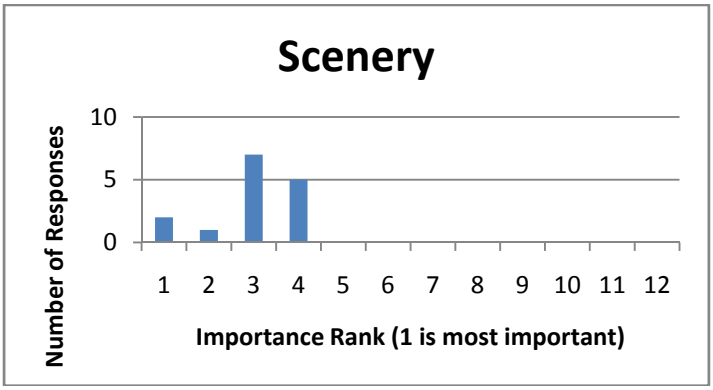

Pontoon boating
Number of Responses
10
8
6
4
2
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)

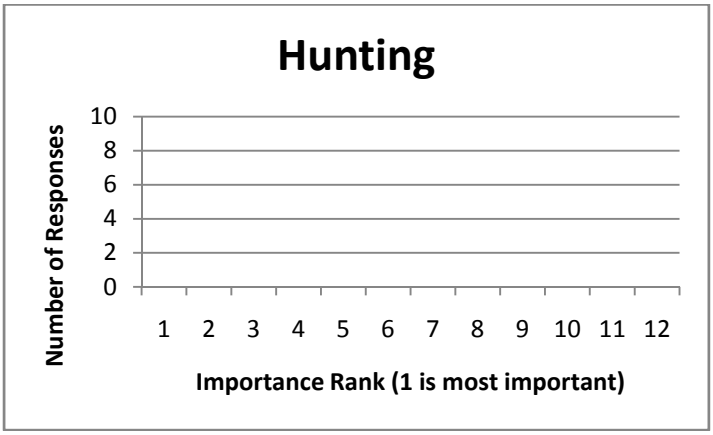

Sailing
Number of Responses
10
8
6
4
2
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)

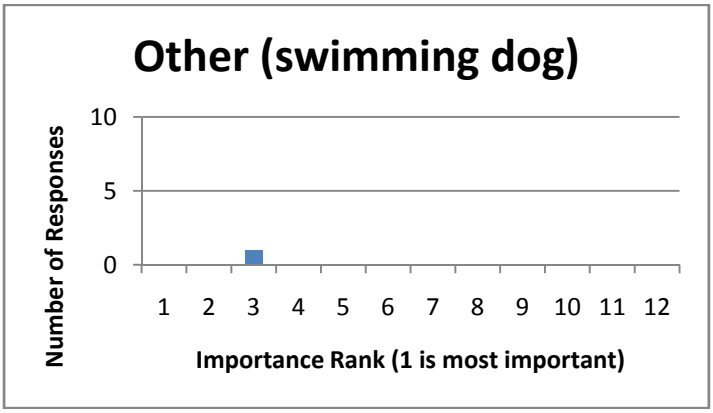

Pleasure boating
Number of Responses
10
8
6
4
2
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)


Canoeing & kayaking
Number of Responses
10
8
6
4
2
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)


Nature viewing
Number of Responses
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)

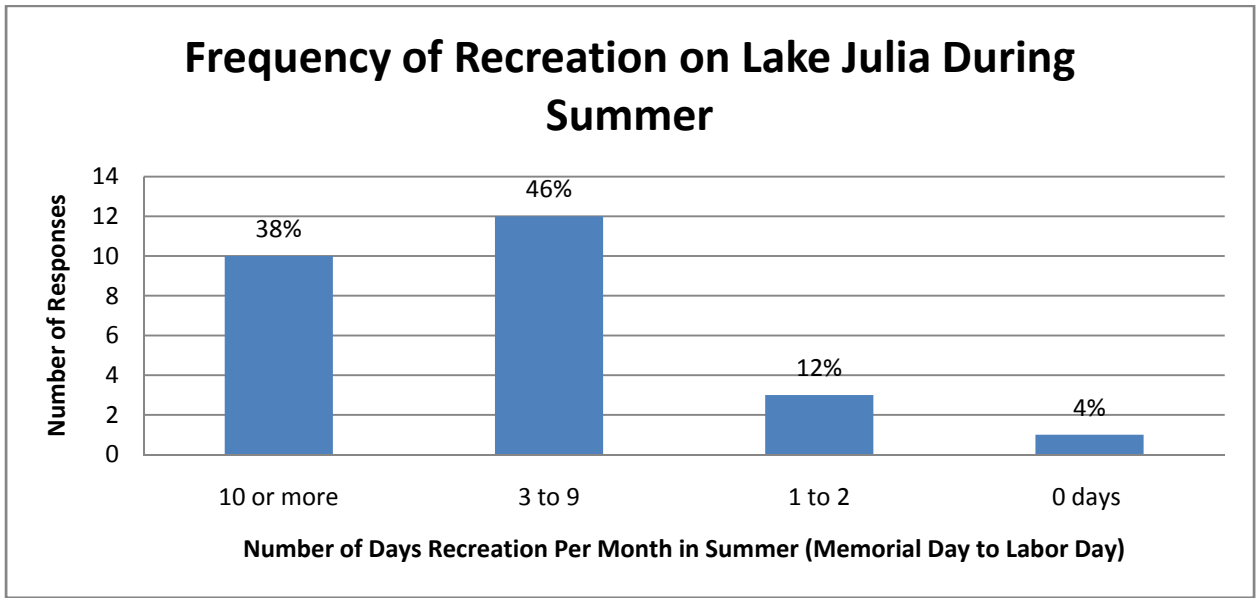

Scenery
Number of Responses
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)


Hunting
Number of Responses
10
8
6
4
2
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)


Other (swimming dog)
Number of Responses
10
5
0
1 2 3 4 5 6 7 8 9 10 11 12
Importance Rank (1 is most important)

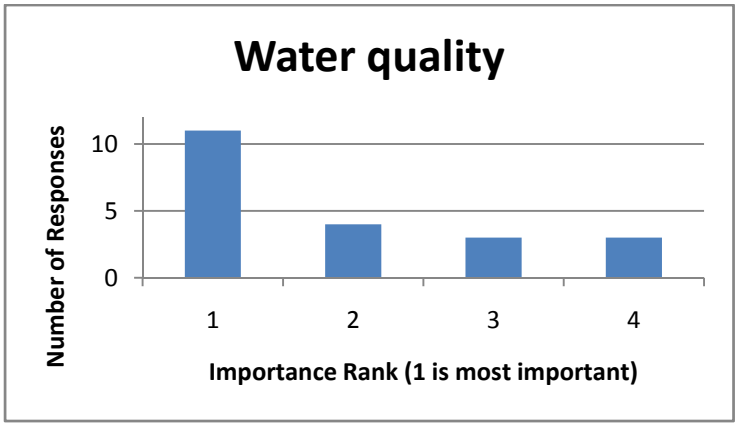
6. Please circle the statement that best describes how often you recreate on Lake Julia during the summer (between Memorial Day and Labor Day).

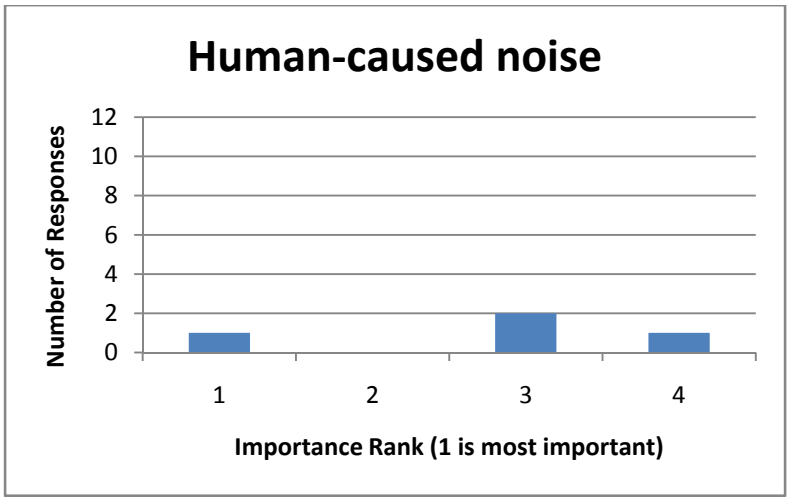
A. 10 or more days per month B. 3-9 days per month C. 1-2 days per month D. Never

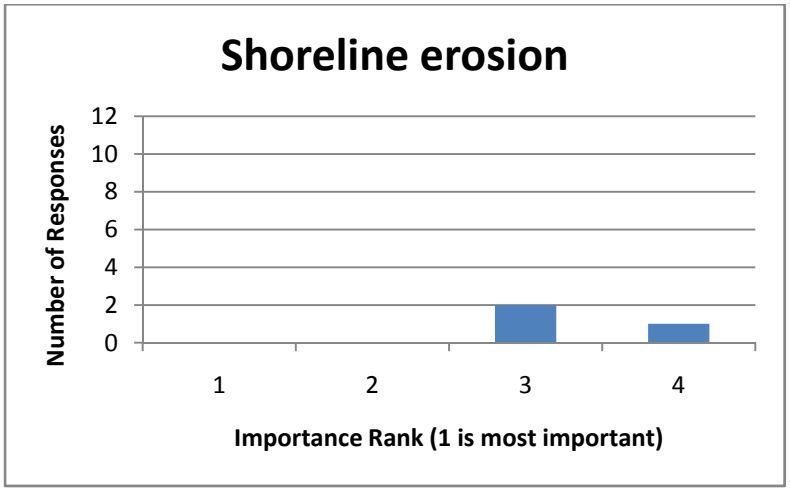


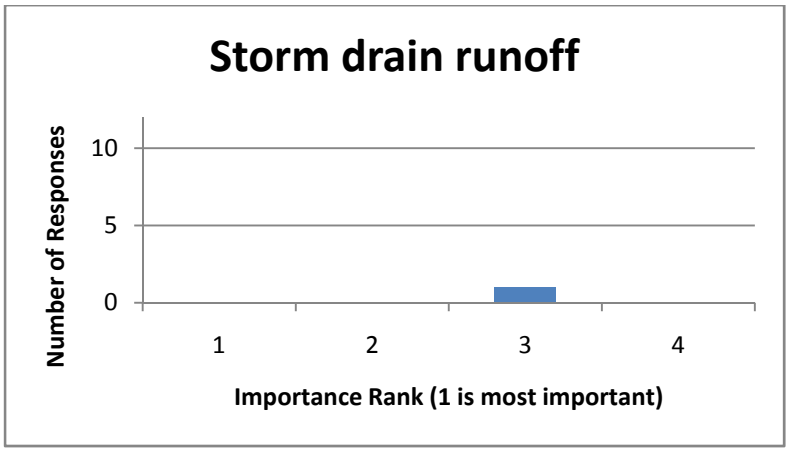
7. From the list below, please rank your top four (1, 2, 3, and 4) concerns for Lake Julia. Write a 1 for your primary (most important) concern.

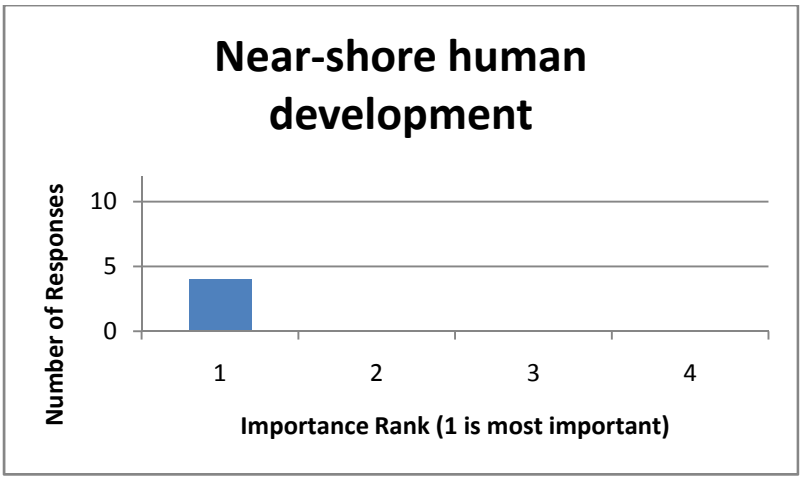
___ Water quality
___ Human-caused noise
___ Shoreline erosion
___ Storm drain runoff
___ Near-shore human development
___Boat traffic
___Boating safety
___Quality of fish habitat
___ Aquatic plant growth
___ Algae growth
___Aquatic Invasive Species (AIS) introduction
___ Human development on the greater watershed
___ Shoreline vegetation removal
___Other (explain_____)

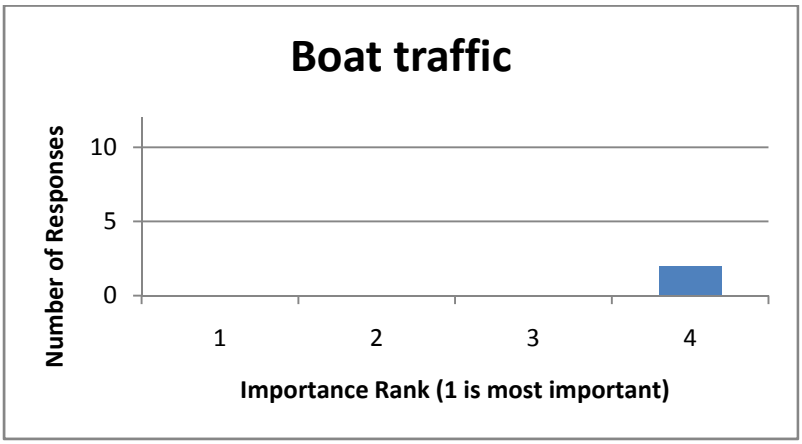


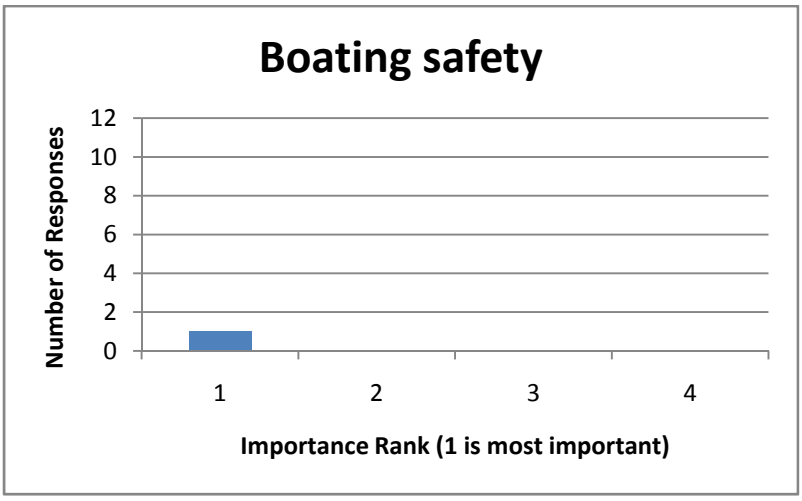

Human-caused noise
Number of Responses
12
10
8
6
4
2
0
1
2
3
4
Importance Rank (1 is most important)

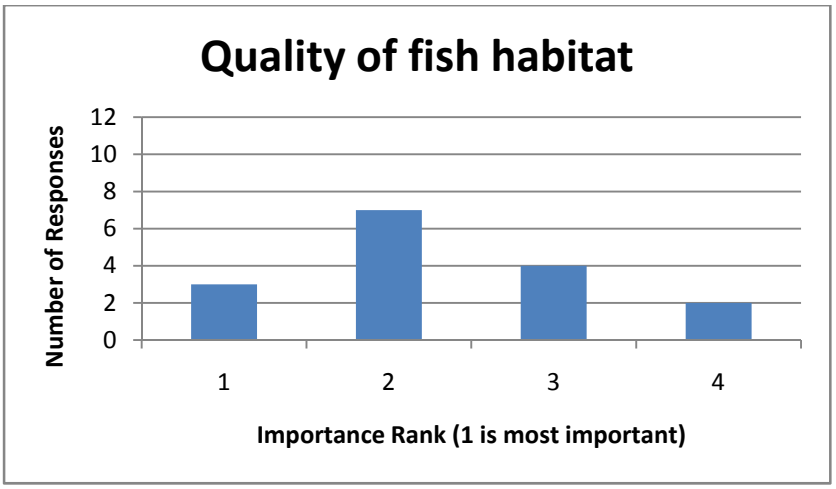

Shoreline erosion
Number of Responses
12
10
8
6
4
2
0
1
2
3
4
Importance Rank (1 is most important)

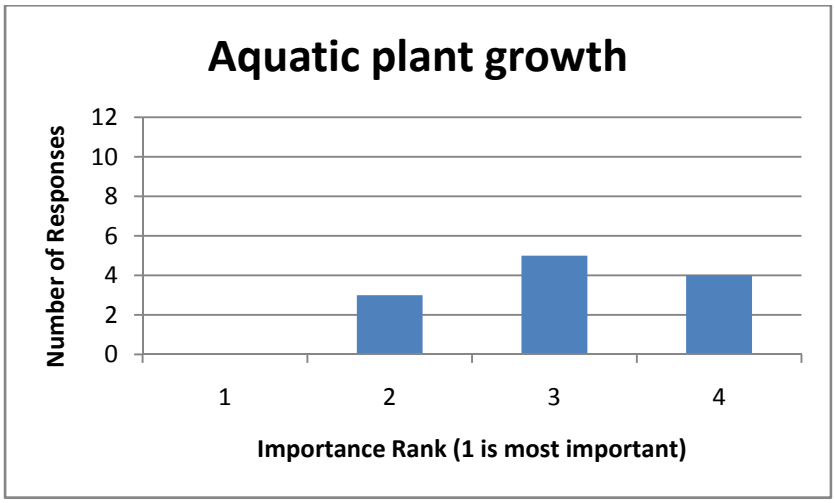

Storm drain runoff
Number of Responses
10
5
0
1
2
3
4
Importance Rank (1 is most important)

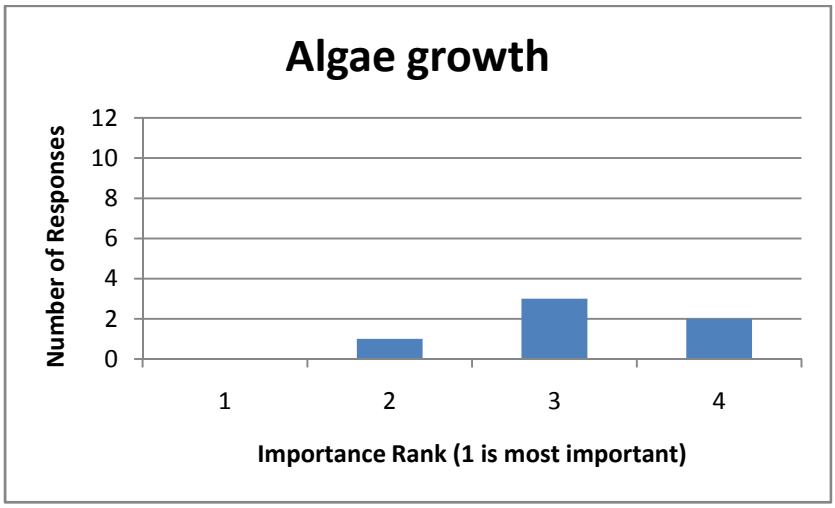

Near-shore human development
Number of Responses
10
5
0
1
2
3
4
Importance Rank (1 is most important)

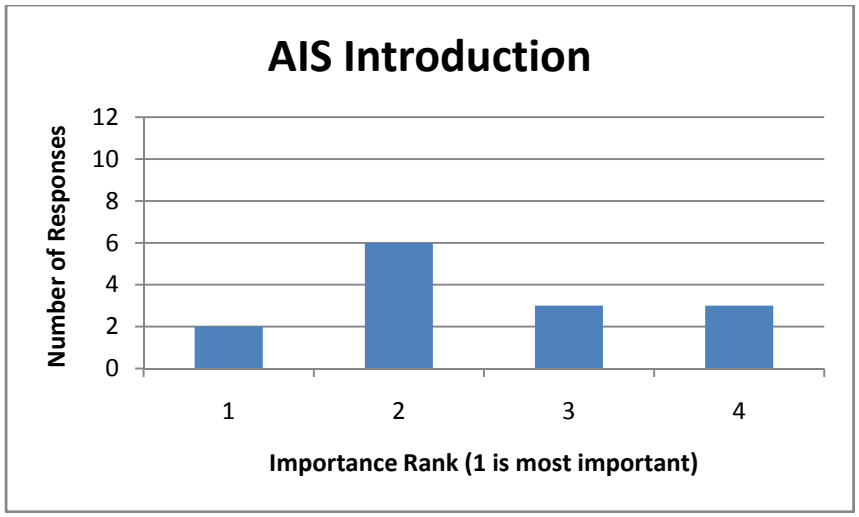

Boat traffic
Number of Responses
10
5
0
1
2
3
4
Importance Rank (1 is most important)

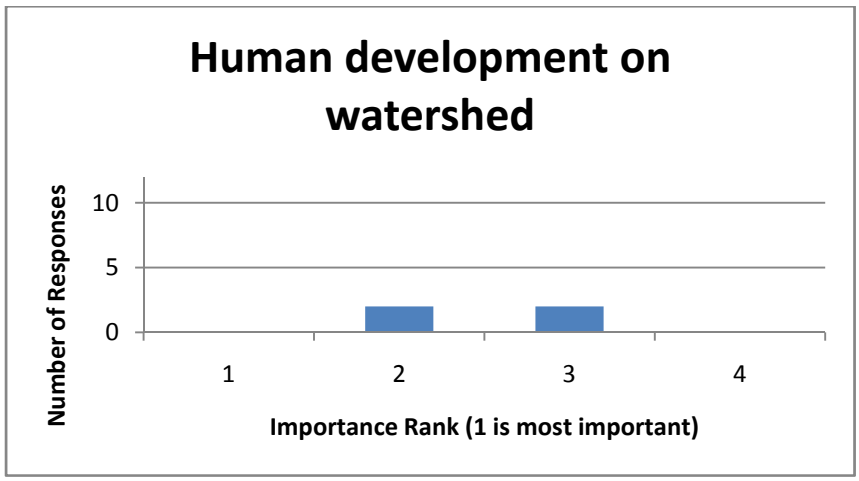

Boating safety
Number of Responses
12
10
8
6
4
2
0
1
2
3
4
Importance Rank (1 is most important)

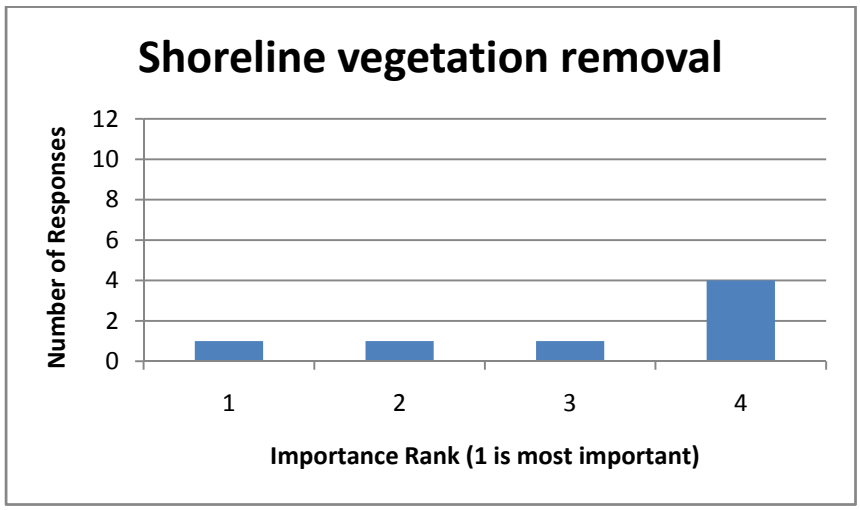

Quality of fish habitat
Number of Responses
12
10
8
6
4
2
0
1
2
3
4
Importance Rank (1 is most important)

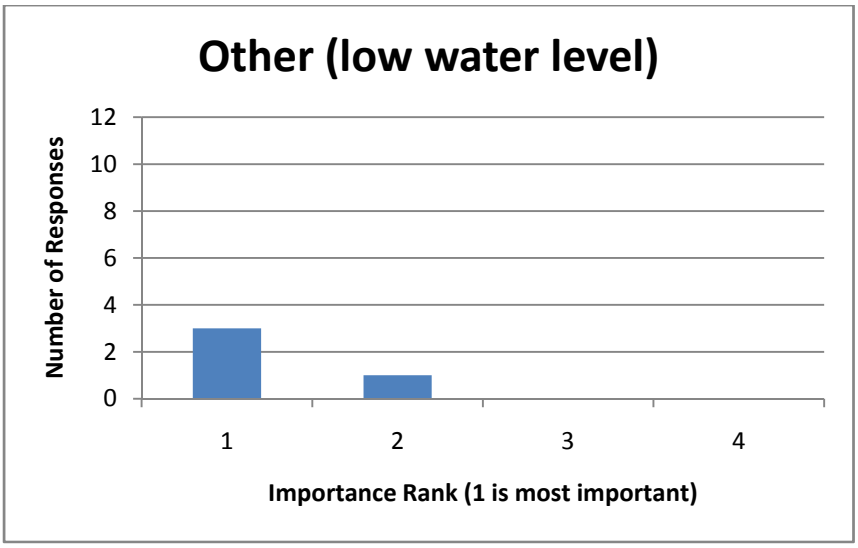

Aquatic plant growth
Number of Responses
12
10
8
6
4
2
0
1
2
3
4
Importance Rank (1 is most important)


Algae growth
Number of Responses
12
10
8
6
4
2
0
1
2
3
4
Importance Rank (1 is most important)


AIS Introduction
Number of Responses
12
10
8
6
4
2
0
1
2
3
4
Importance Rank (1 is most important)

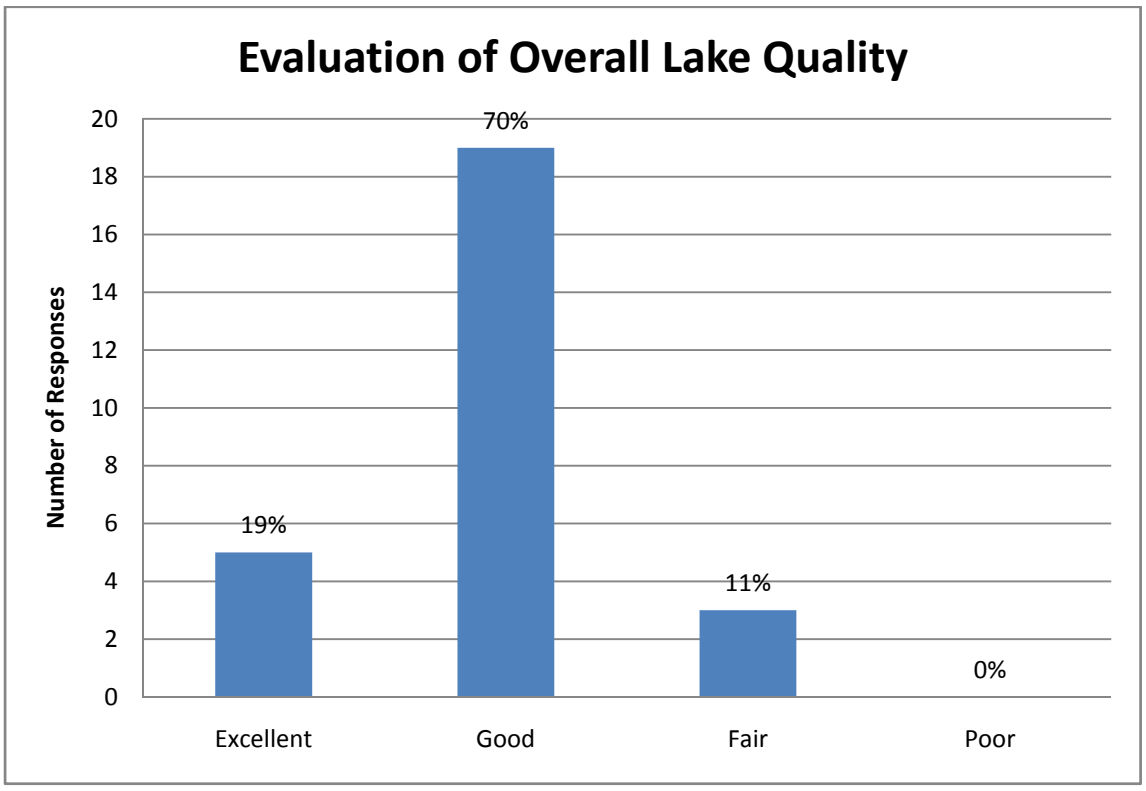

Human development on watershed
Number of Responses
10
5
0
1
2
3
4
Importance Rank (1 is most important)


Shoreline vegetation removal
Number of Responses
12
10
8
6
4
2
0
1
2
3
4
Importance Rank (1 is most important)



8. Considering the lake issues in question 7, please evaluate the overall lake quality. (Circle one)

A. Excellent B. Good C. Fair D. Poor



9. In the last 10 years, what changes have you seen in L. Julia's aquatic plants? (circle all that apply)

A. No dramatic changes – about the same as always.

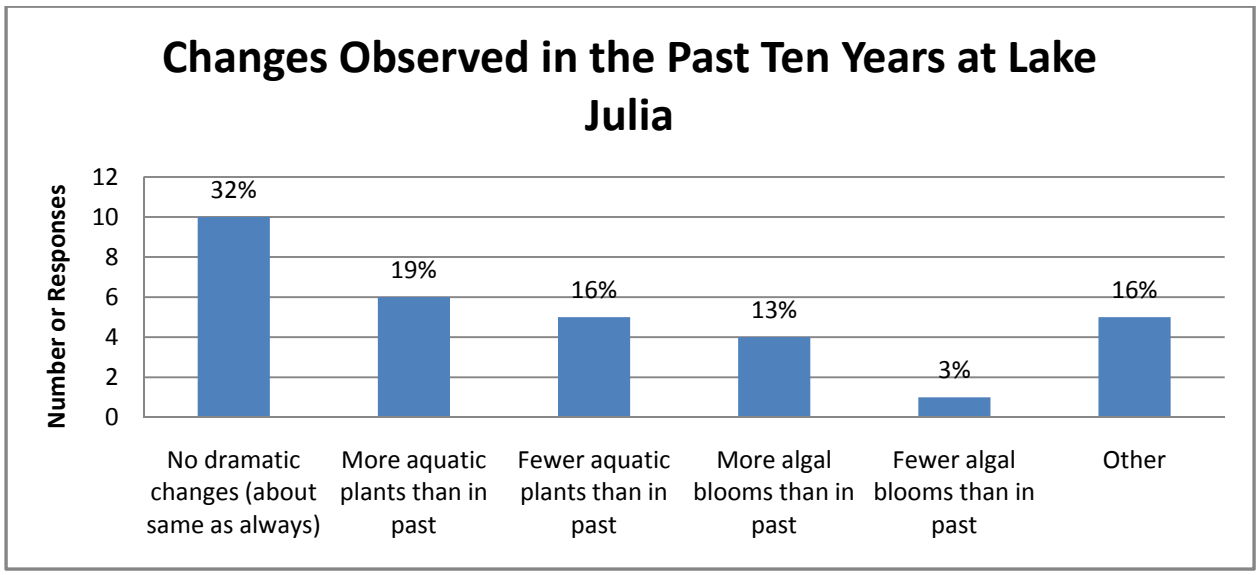
B. More aquatic plants than in the past.

C. Fewer aquatic plants than in the past.

D. More algal blooms than in the past.

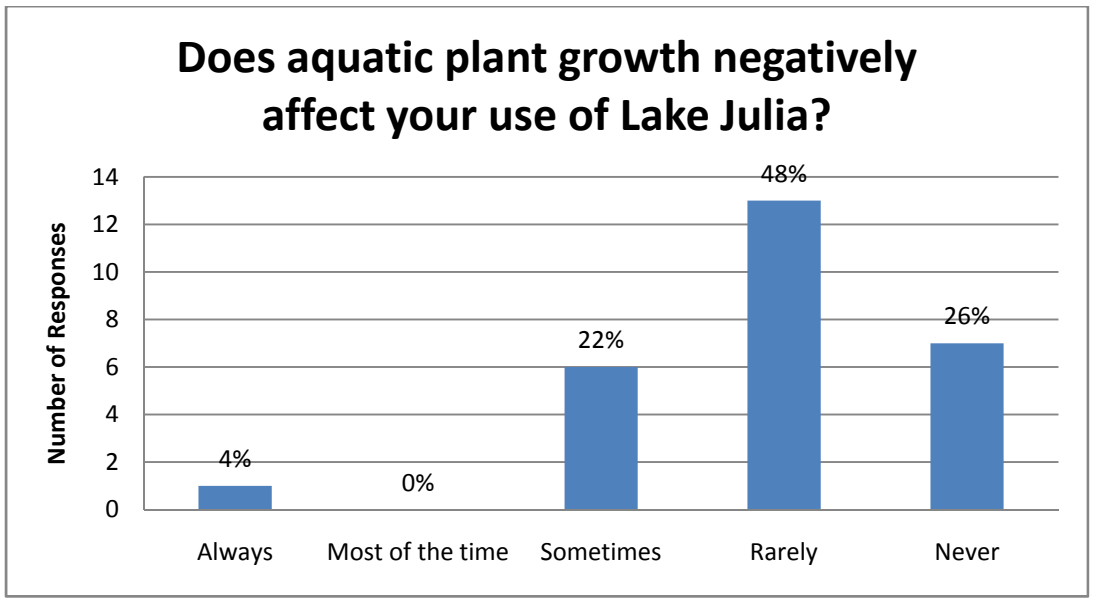
E. Fewer algal blooms than in the past.

F. Other (describe: _____)



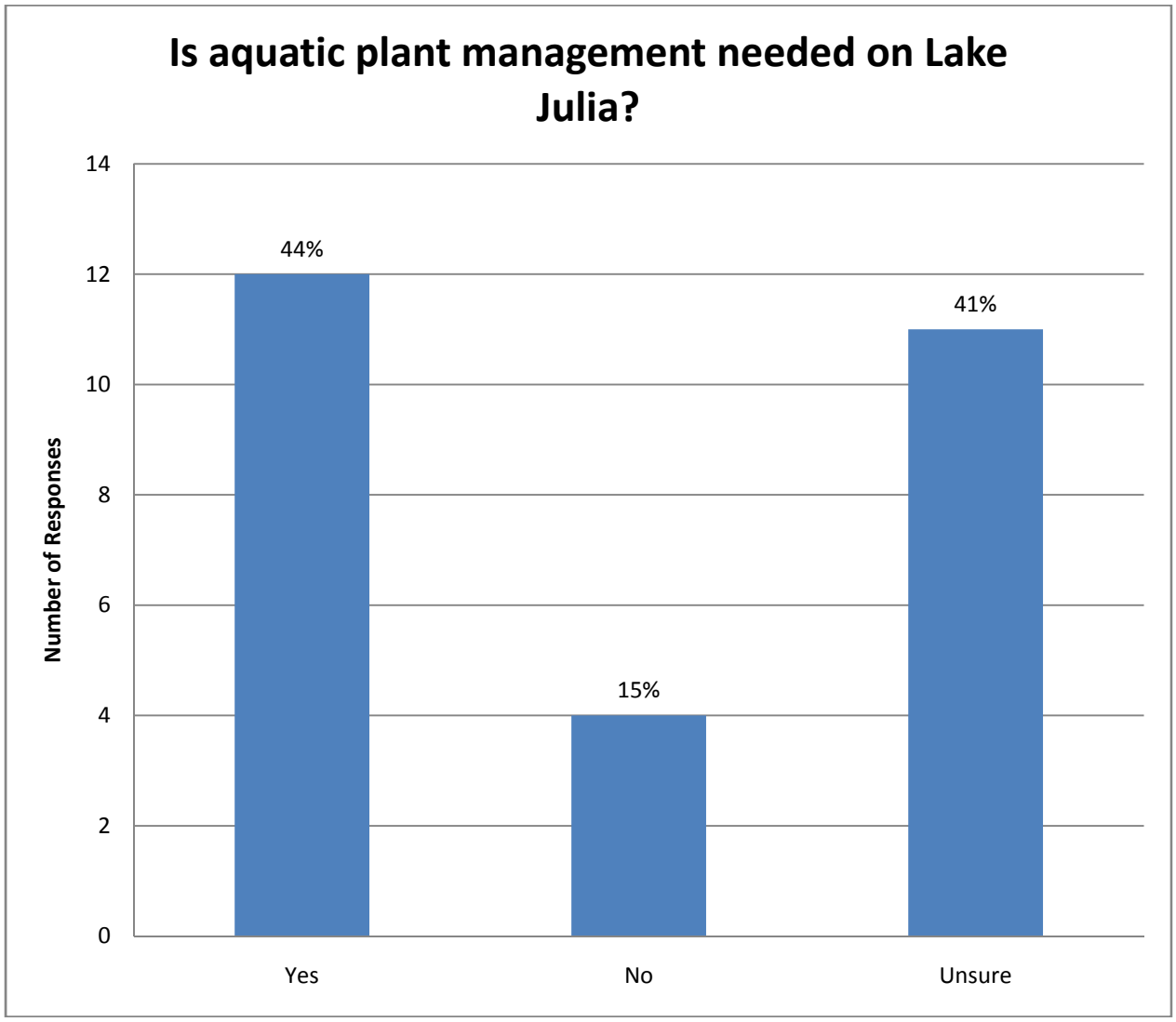
10. How often, if ever, does aquatic plant growth negatively affect your use of Lake Julia? (Circle one)

A. Always B. Most of the time C. Sometimes D. Rarely E. Never



11. Do you believe that aquatic plant management is needed on Lake Julia? (Please circle only one)

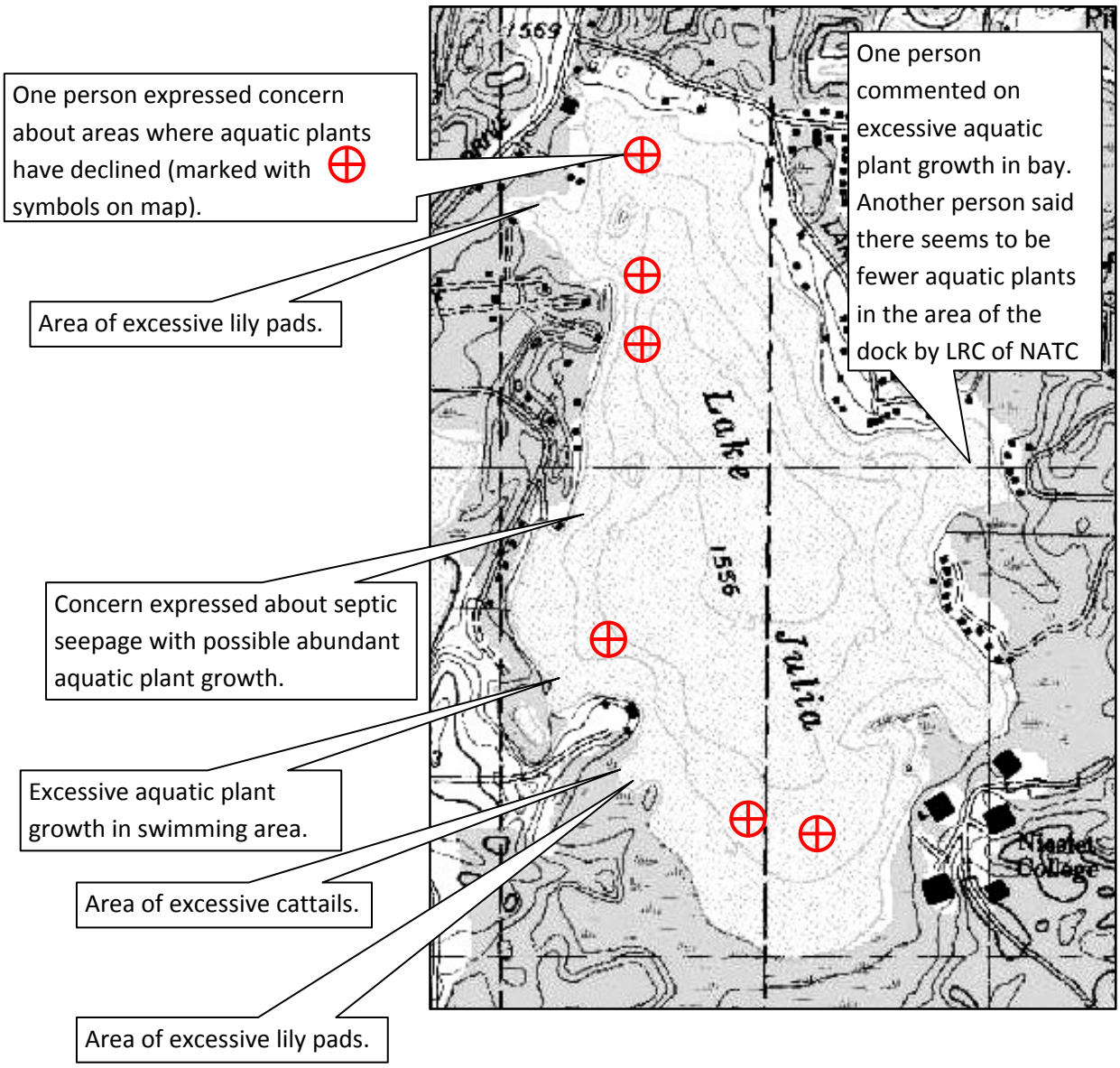
A. Yes B. No C. Unsure



12. If you answered "Yes" to question 11, please describe the problem on Lake Julia that you believe requires aquatic plant management. Label on the map (if appropriate) where you have observed plant problems.

(See map and annotations on following page)

Below is a map that summarizes comments from several survey respondents to Question 12.



13. Below are several methods used to manage Aquatic Invasive Species. Using the following scale, please indicate your level of support or opposition for each control method.

A. Definitely support B. Probably support C. Unsure D. Probably oppose E. Definitely oppose

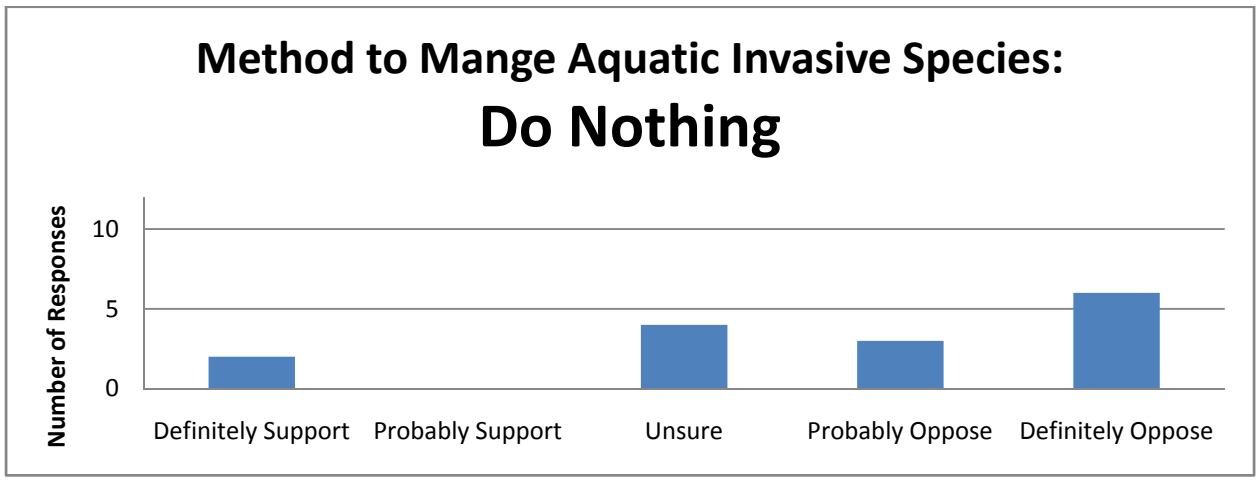
___Do nothing

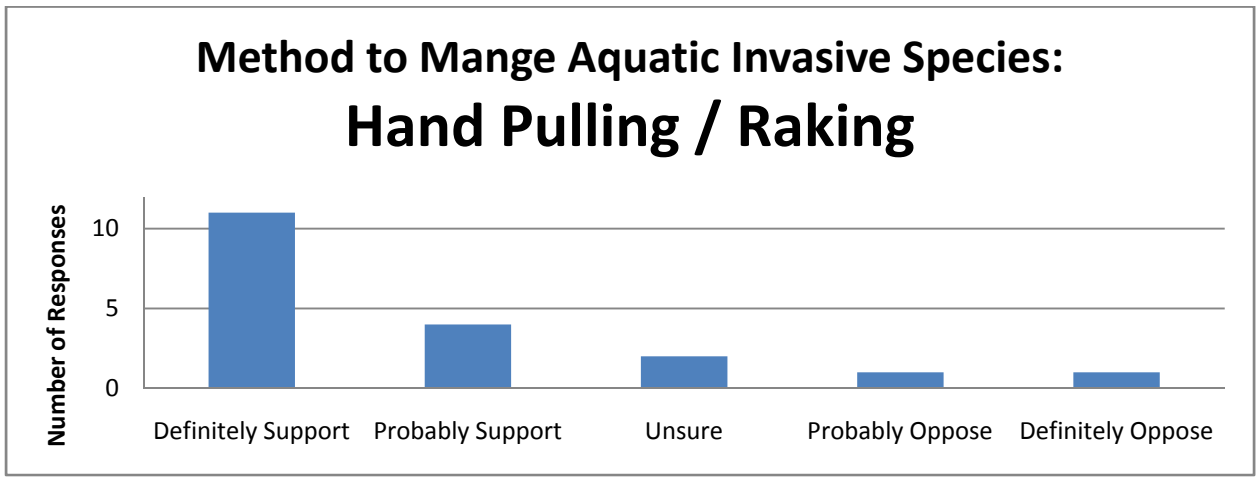
___Hand pulling and raking

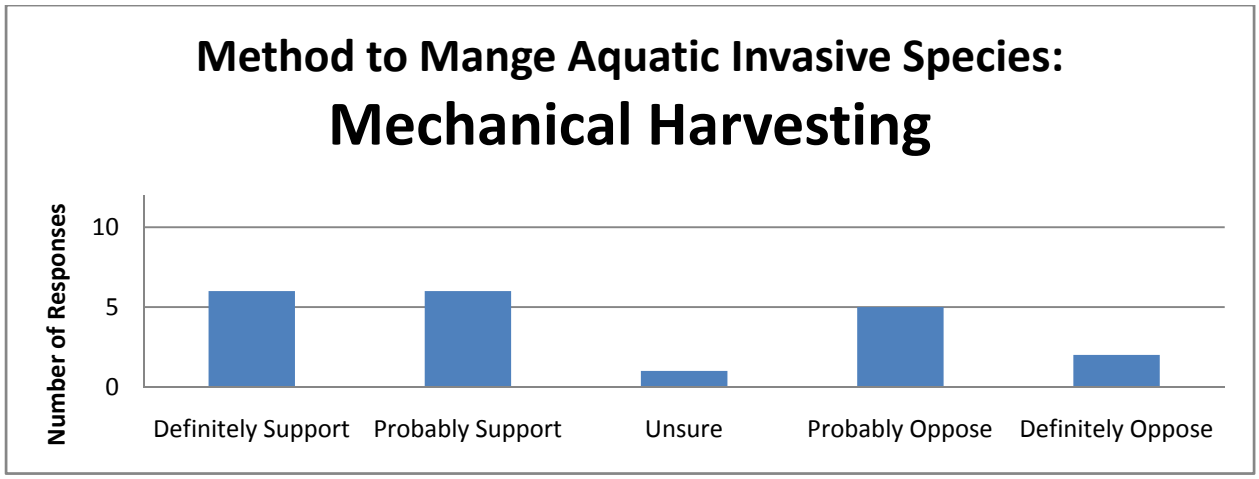
___Mechanical harvesting

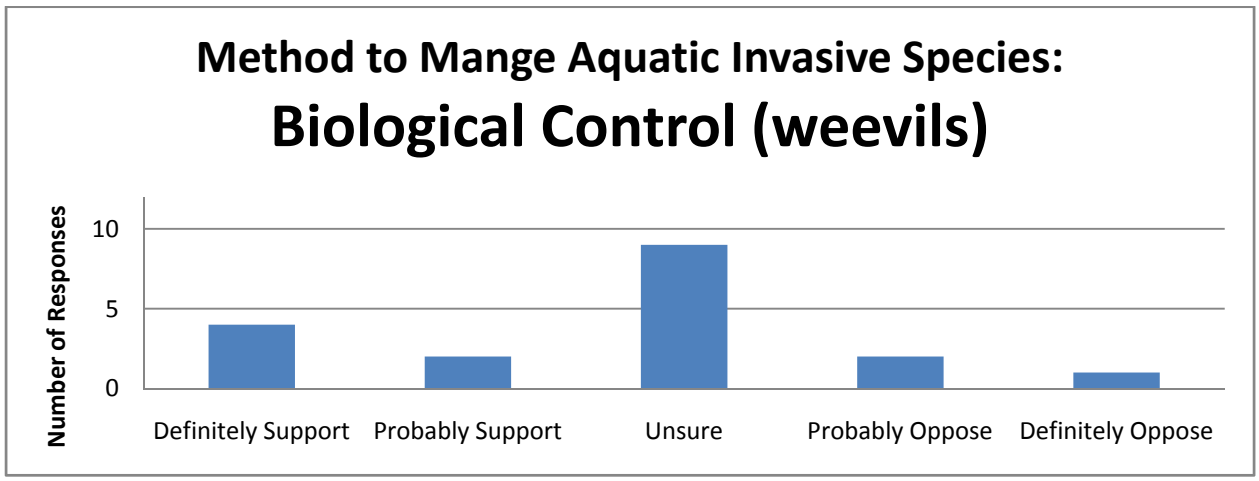
___Biological controls (weevils)

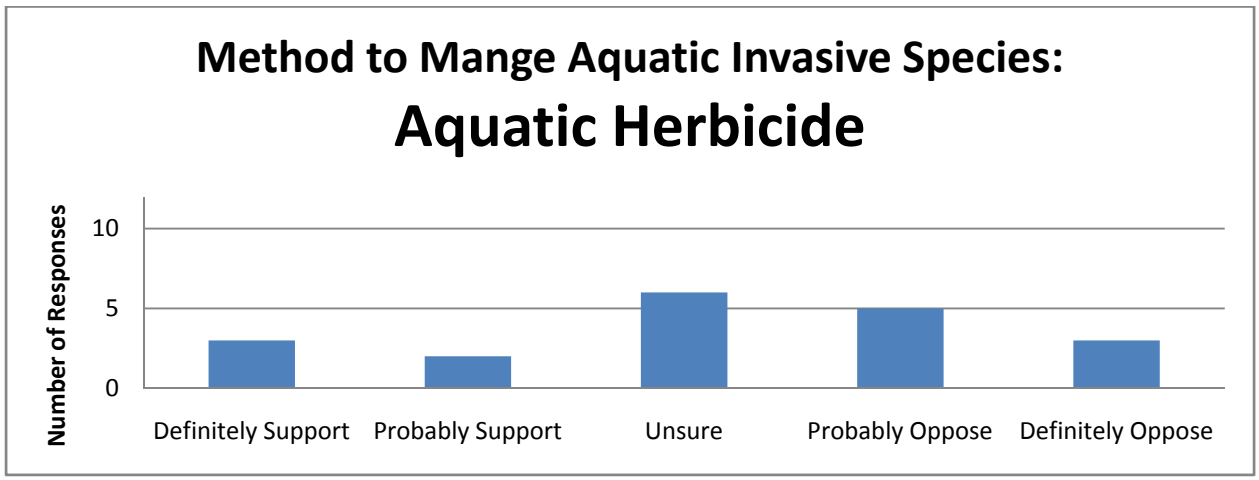
___Aquatic herbicides






Method to Mange Aquatic Invasive Species:
Mechanical Harvesting
Number of Responses
10
5
0
Definitely Support
Probably Support
Unsure
Probably Oppose
Definitely Oppose


Method to Mange Aquatic Invasive Species:
Biological Control (weevils)
Number of Responses
10
5
0
Definitely Support
Probably Support
Unsure
Probably Oppose
Definitely Oppose


Method to Mange Aquatic Invasive Species:
Aquatic Herbicide
Number of Responses
10
5
0
Definitely Support
Probably Support
Unsure
Probably Oppose
Definitely Oppose

14. The Aquatic Plant Management (APM) Plan can have several goals. We would like to know where you think the Plan should place its emphasis. Rank the following list of APM Plan goals ("1" being the most important and "6" being the least important).

___Monitor Lake Julia for changes in native plant composition and distribution.

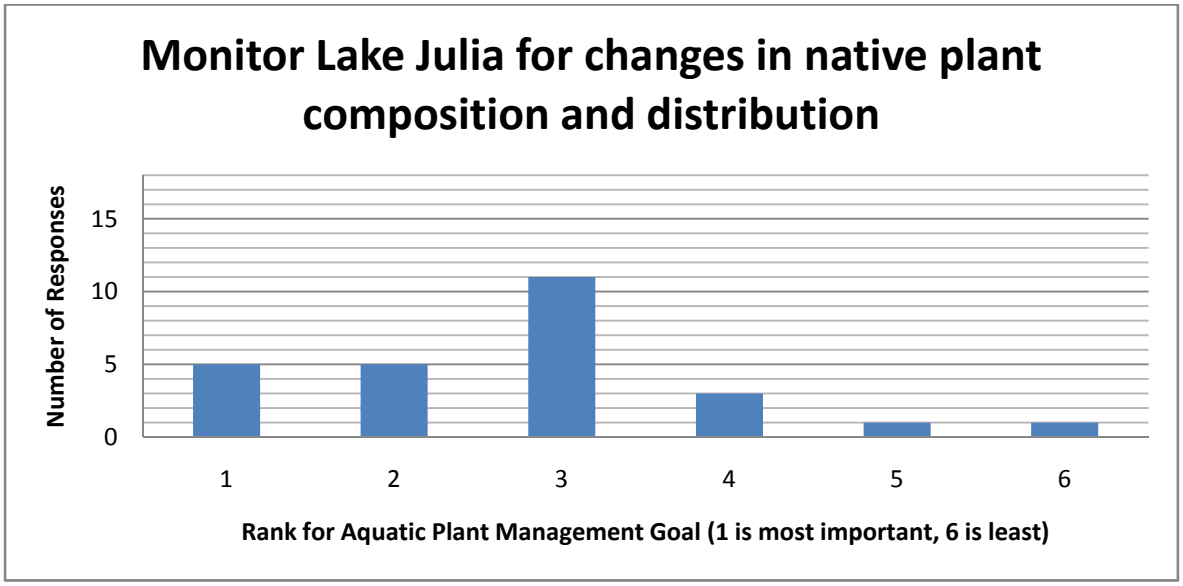
___Protect native plant species.

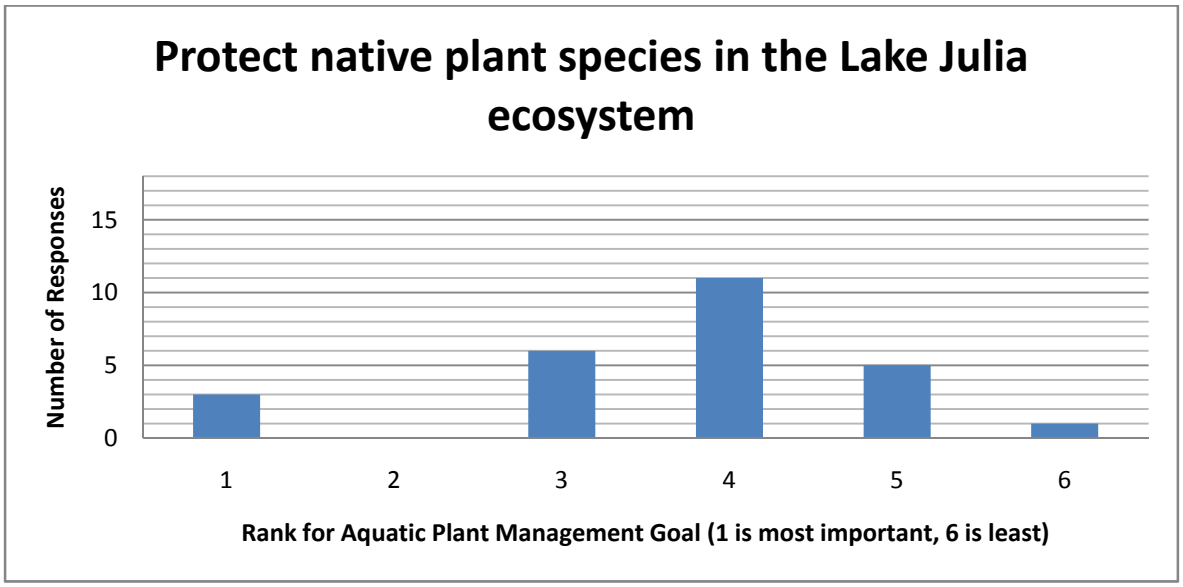
___Prevent the introduction of Aquatic Invasive Species.

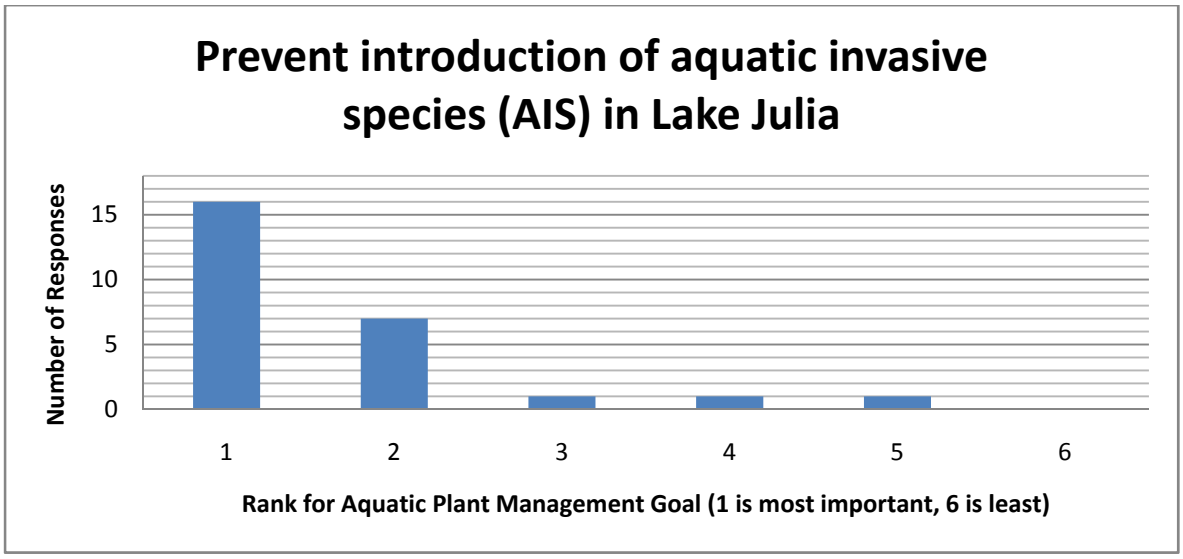
___Provide education to Lake Julia stakeholders regarding the plant community.

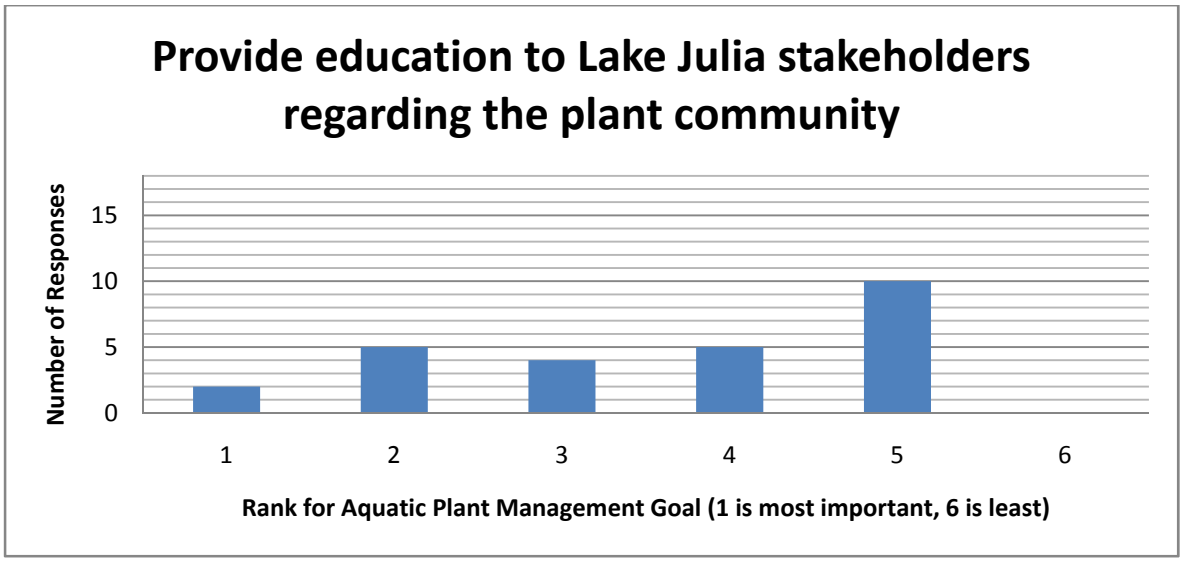
___Monitor recreational users to minimize introduction of Aquatic Invasive Species.

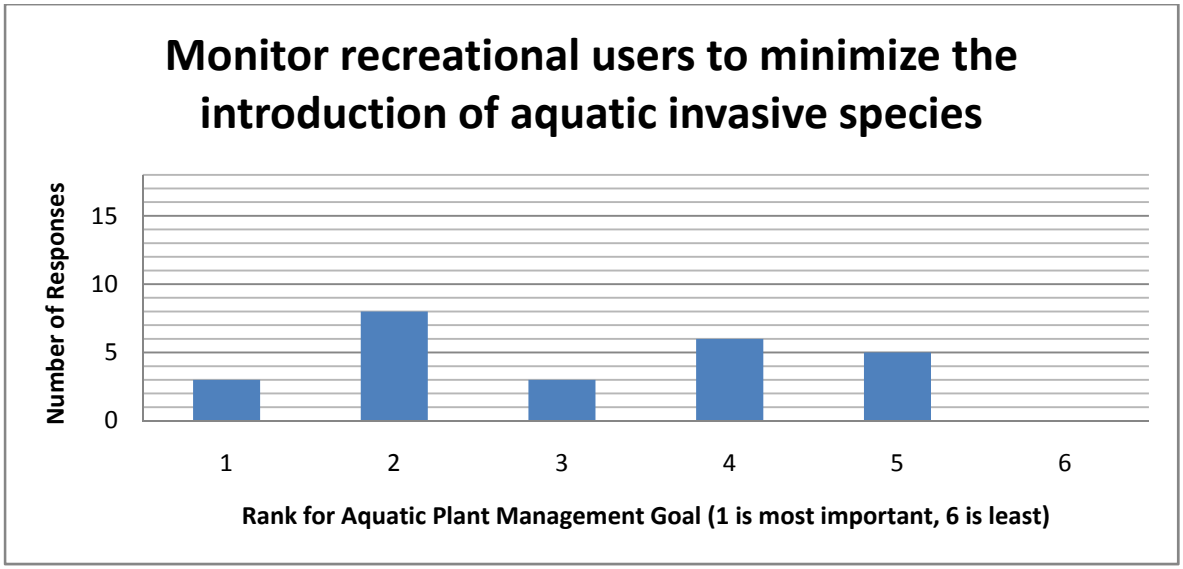
___Other_____

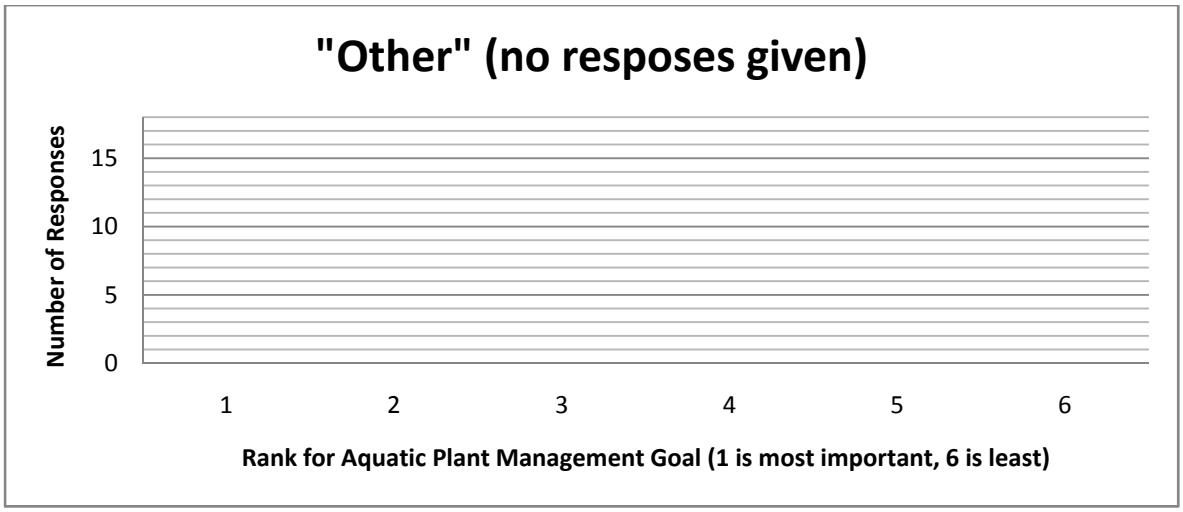





Prevent introduction of aquatic invasive species (AIS) in Lake Julia
Number of Responses
15
10
5
0
1
2
3
4
5
6
Rank for Aquatic Plant Management Goal (1 is most important, 6 is least)

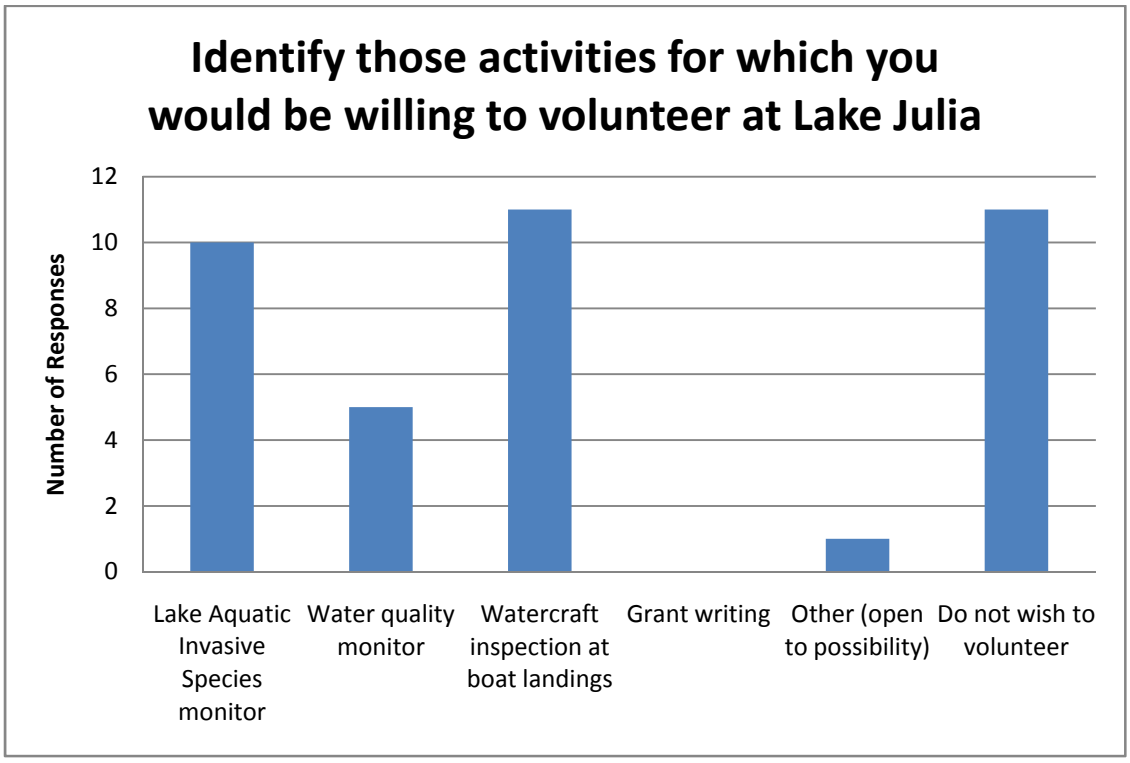

Provide education to Lake Julia stakeholders regarding the plant community
Number of Responses
15
10
5
0
1
2
3
4
5
6
Rank for Aquatic Plant Management Goal (1 is most important, 6 is least)


Monitor recreational users to minimize the introduction of aquatic invasive species
Number of Responses
15
10
5
0
1
2
3
4
5
6
Rank for Aquatic Plant Management Goal (1 is most important, 6 is least)



15. There are several opportunities for citizens to become actively involved in important roles during Aquatic Plant Management Plan implementation. From the list below, please identify which activities, if any, you would be interested in helping with. (Select all that apply)

A. Lake Aquatic Invasive Species monitor
B. Water quality monitor
C. Watercraft inspection at boat landings
D. Grant writing
E. Other (specify:_____)
F. Do not wish to volunteer



NOTE: If you checked any of the volunteer opportunities, please provide your contact information.

Name_____

Address_____

City _____ State_____ Zip Code_____

Phone_____ Email_____

14 of 28 respondents provided contact information

16. On a separate sheet, please include any additional comments and suggestions that you would like to see incorporated into the AQM Plan. Thank you for taking time to complete this questionnaire.

No additional comments were provided via separate sheet.

Return completed questionnaires to:

Must be received by November 14, 2009

Terry Rutlin
Nicolet Area Technical College
Box 518
Rhinelander, WI 54501