Aquatic Plant Management Plan

Lake Nancy

Washburn County, Wisconsin

November 2008

Sponsored By

Lake Nancy Protective Association

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Lake Nancy Protective Association

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Executive Summary

This Aquatic Plant Management Plan for Lake Nancy presents a strategy for managing aquatic plants by protecting native plant populations, controlling the growth of Eurasian water milfoil (EWM), and preventing establishment of additional invasive species through the year 2013. The plan includes data about the plant community, watershed, and water quality of the lakes.

The aquatic plant survey found that Lake Nancy has a very diverse native aquatic plant community. This is especially true in the shallow areas of the lake like Pecos Bay, Shallow Lake, and Lost Lake. Native plants provide fish and wildlife habitat, stabilize bottom sediments, reduce the impact of waves against the shoreline, and prevent the spread of the non-native invasive plant Eurasian water milfoil – all critical functions for the lake. Eurasian water milfoil was first discovered in Lake Nancy in 1991. Its growth is generally limited to the Big Lake and Deep Lake basins of Lake Nancy.

This plan refines a management strategy to keep the growth of Eurasian water milfoil at bay using herbicide treatments early in the growing season to avoid negative impacts on native plants. To ensure effective management, the plan provides for ongoing monitoring of the growth of both native and non-native aquatic plants. It also directs an aggressive management strategy including hand pulling individual plants if they are found in areas beyond the Big and Deep Lake basins.

A second non-native plant, purple loosestrife, was located in the plant survey. This and other invasive aquatic species will be watched and controlled as necessary using methods recommended by the Wisconsin Department of Natural Resources or other experts.

The overall goals of the aquatic plant management plan are as follows:

Goal 1) Prevent the spread of Eurasian water milfoil.

Goal 2) Prevent the spread of purple loosestrife.

Goal 3) Prevent the introduction of other aquatic invasive species.

Goal 4) Preserve the lake's diverse native plant communities.

Goal 5) Minimize runoff of pollutants from the Lake Nancy watershed.

The implementation plan describes the actions that will be taken toward achieving these goals.

A special thank you is extended to the Aquatic Plant Advisory Committee for assistance with plan development.

Introduction

This Aquatic Plant Management Plan for Lake Nancy presents a strategy for managing aquatic plants by protecting native plant populations, controlling the growth of Eurasian water milfoil (EWM), and preventing establishment of additional invasive species. The plan includes data about the plant community, watershed, and water quality of the lakes. Based on this data and public input, goals and strategies for the sound management of aquatic plants in the lakes are presented. This plan will guide the Lake Nancy Protective Association (LNPA), Washburn County, and the Wisconsin Department of Natural Resources in aquatic plant management for Lake Nancy over the next five years (from 2009 through 2013).

Public Input for Plan Development

The Lake Nancy Aquatic Plant Advisory Committee provided input for the development of this aquatic plant management plan. The Aquatic Plant Advisory Committee met twice. At the first meeting October 18, 2008 the committee reviewed aquatic plant management planning requirements, plant survey results, public opinion survey results, and EWM management efforts to date. At a second meeting November 1, 2008 the committee reviewed draft goals and developed objectives and action steps. The APM Committee expressed a variety of concerns that are reflected in the goals and objectives for aquatic plant management in this plan.

Public Opinion Survey

The LNPA distributed a public opinion survey in preparation for this aquatic plant management plan. Attendees at the LNPA annual meeting held August 2, 2008 completed and returned 25 surveys. Follow-up mail surveys were distributed to an additional 100 residents who did not attend the lake association meeting. Results were compiled both separately from meeting and mail responses and also combined together. A total of 63 individuals completed and returned survey questionnaires. Combined responses are reported in Appendix A.

Survey respondents report that “appreciating peace and tranquility” is their top recreational activity at Lake Nancy followed by “enjoying the view.” The top concern regarding owning waterfront property is “excessive invasive aquatic plant growth in the lake.” Invasive species growth is also reported to have the highest negative impact on residents’ use of the lake.

In general, residents support the use of herbicides to control invasive plant species and over half believe that overall plant growth is at an appropriate level. Figures 1 and 2 illustrate these results.

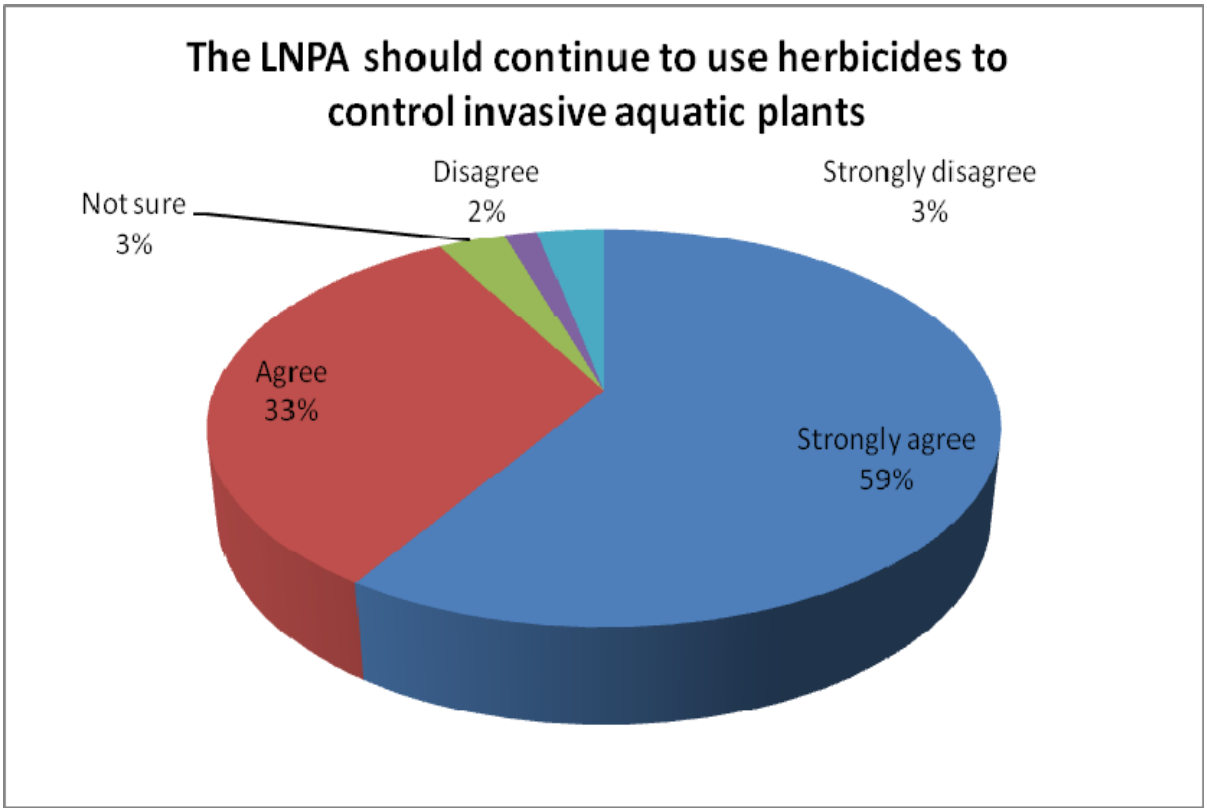

Figure 1. Response to Survey Question Number 7.

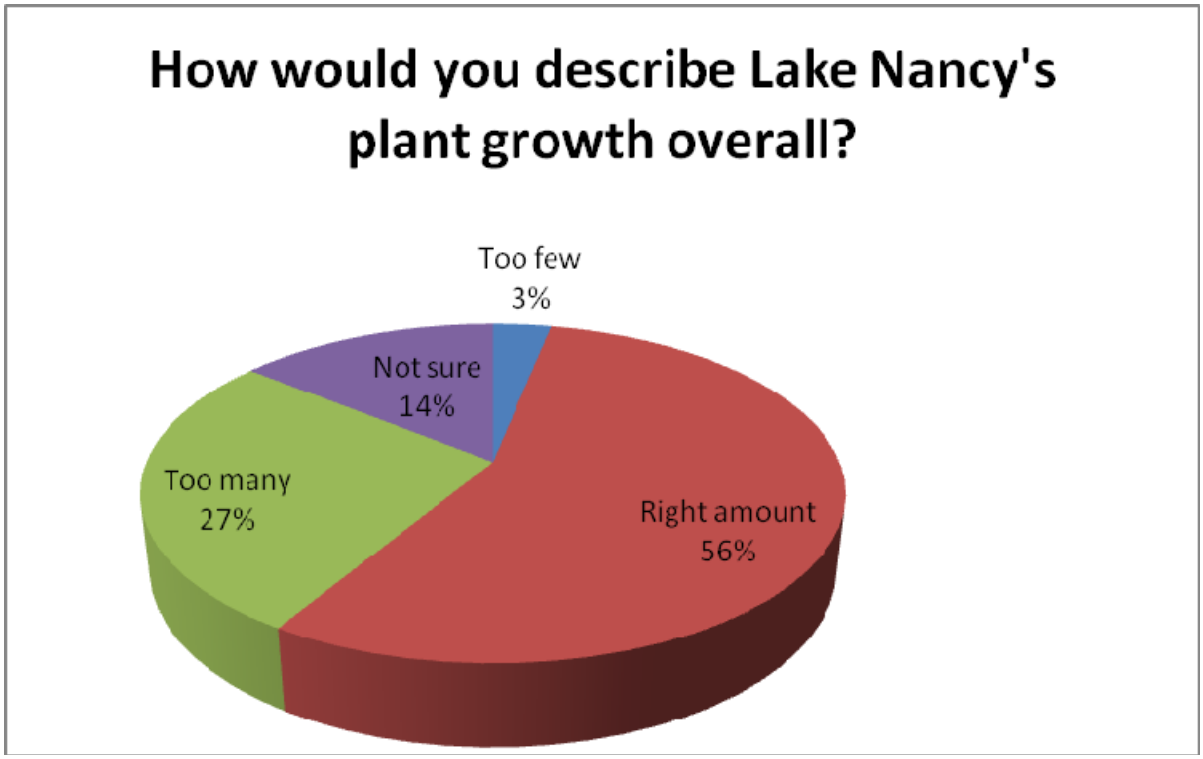

Figure 2. Response to Survey Question Number 5.

The Lake Nancy Association board announced the availability of the draft Aquatic Plant Management plan for review with a special mailing to all lake residents and a public notice in the Spooner Advocate and Northwoods Shopper early in December 2008. Copies of the plan were made available to the public on the Washburn County Land and Water Department web site (http://www.co.washburn.wi.us/departments/landwatercons/) and at the Minong Town Hall. Comments will be accepted through December 15, 2008.

Schedule for Plan Completion

Final draft for DNR and public review	by December 1, 2008
Comments accepted on the plan through	December 15, 2008

Send comments via mail or email to:
Harmony Environmental
516 Keller Avenue S.
Amery, WI, 54001
715-268-9992
harmonyenv@amerytel.net

Board meeting to review comments	early January
Aquatic Invasive Species grant due	February 1, 2009

Lake Information

Lake Nancy is a 772-acre lake with a water body identification code of 269150. Its maximum depth is 39 feet. Lake Nancy is a drainage lake with inflow from a channel that originates from the Kimball Lakes chain. The lake is separated into three main basins: Big Lake, Deep Lake, and Shallow Lake. Information about each basin is reported in Table 1 below. A map of Lake Nancy is shown as Figure 3 below. Lake Nancy is located in Washburn County in the Town of Minong (T42N, R13W).

Table 1. Lake Information

	Big Lake	**Deep Lake**	**Shallow Lake**	**Lake Nancy**
Size (acres)	400	90	282	772
Mean depth (feet)	16	20	4	12
Maximum depth (feet)	28	39	6	39

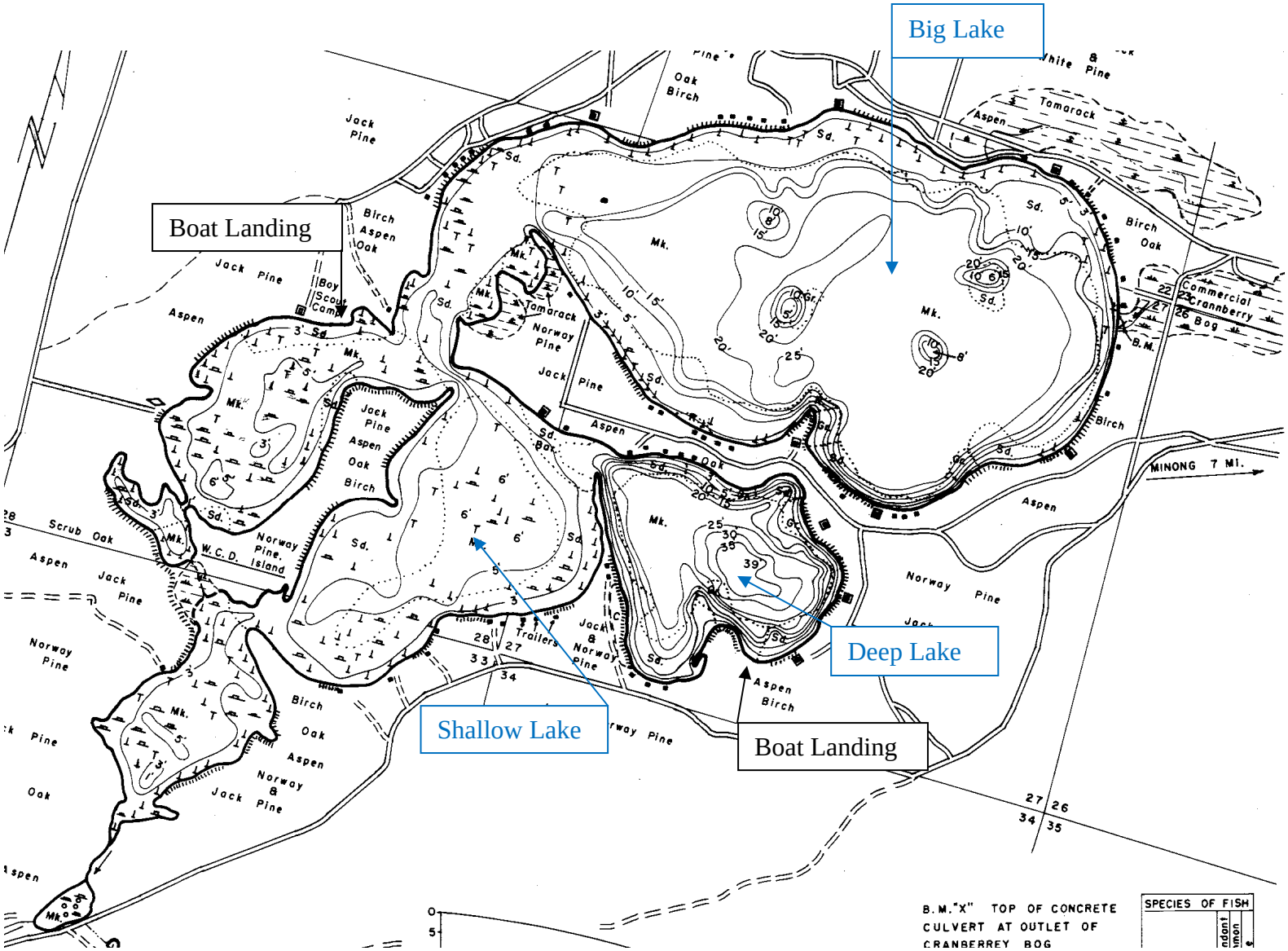

Figure 3. Lake Nancy Map

Water Quality

Water quality is frequently reported by the trophic status or nutrient level of the lake. Nutrient rich lakes are classified as eutrophic. These lakes tend to have abundant aquatic plant growth and low water clarity due to algae blooms. Mesotrophic lakes have intermediate nutrient levels and only occasional algae blooms. Oligotrophic lakes are nutrient poor with little growth of plants and algae.

Secchi depth readings are one way to assess the trophic status of a lake. The Secchi depth reported is the depth at which the black and white Secchi disk is no longer visible when it is lowered into the water. Greater Secchi depths occur with greater water clarity. It is important to note that factors other than nutrient status such as tannins in the water may reduce water clarity and influence Secchi depth results.

Secchi depth readings, phosphorus concentrations, and chlorophyll measurements can each be used to calculate a Trophic Status Index (TSI) for lakes.[1] TSI values range from 0 – 110. TSI values from 40 to 50 characterize mesotrophic lakes. Lakes with TSI values greater than 50 are considered eutrophic, and lakes with TSI values below 40 are considered oligotrophic. Lake Nancy is a mesotrophic lake based upon available lake data.

Volunteers have collected lake data on a regular basis since 2001 from the Deep Lake and Big Lake basins of Lake Nancy. Figure 4 illustrates Secchi depth averages from 2002 through 2008 for the Deep Lake basin. Figure 5 graphs trophic status based upon secchi, chlorophyll, and total phosphorus results. Figure 6 illustrates Secchi depth averages for the Big Lake basin, and Figure 7 graphs trophic status results for Big Lake.

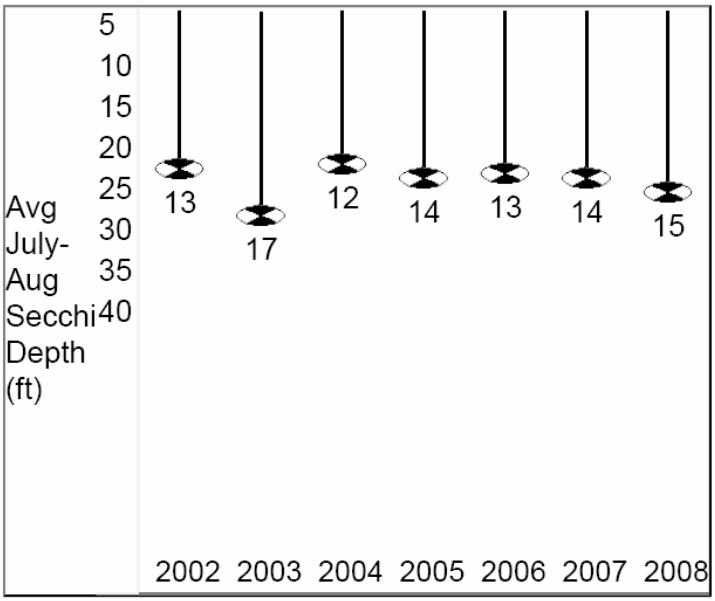

Figure 4. Deep Lake July/August Secchi Depth Averages

[1] TSI = 60 – 14.41 (ln * Sechhi depth in meters) and TSI = (9.81) (ln Chl a + 30.6).

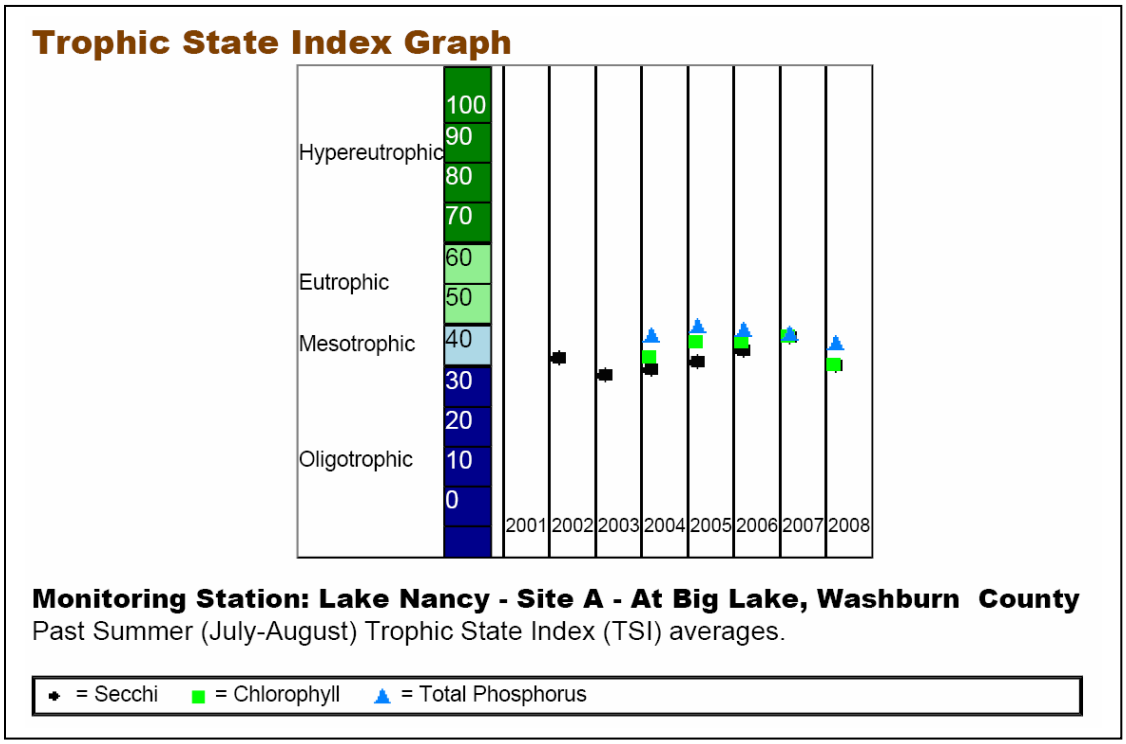

Figure 5. Deep Lake Trophic Status Index Graph

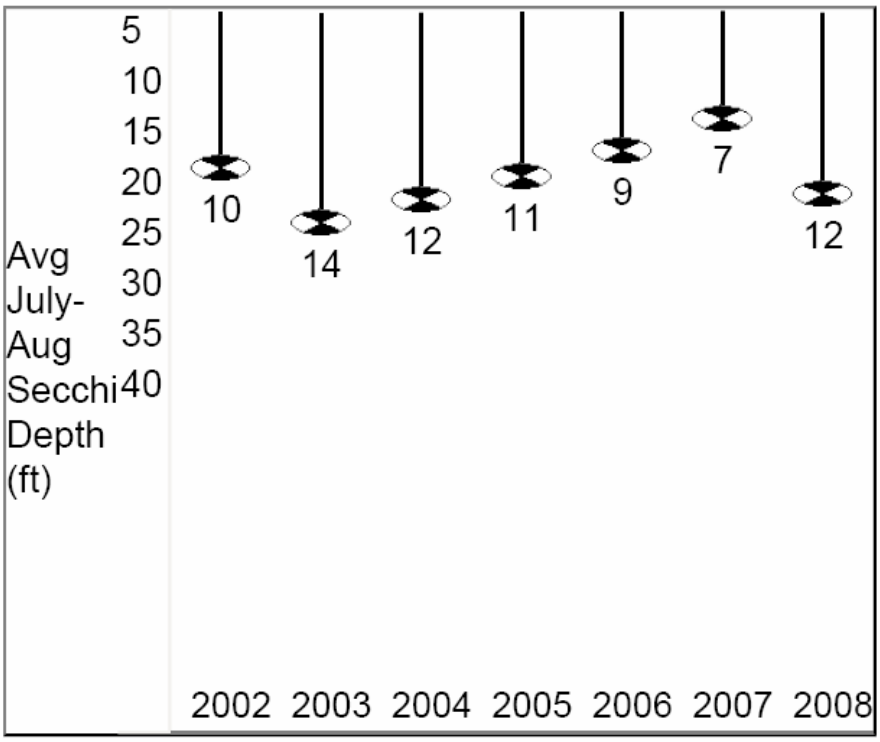

Figure 6. Big Lake July/August Secchi Depth Averages

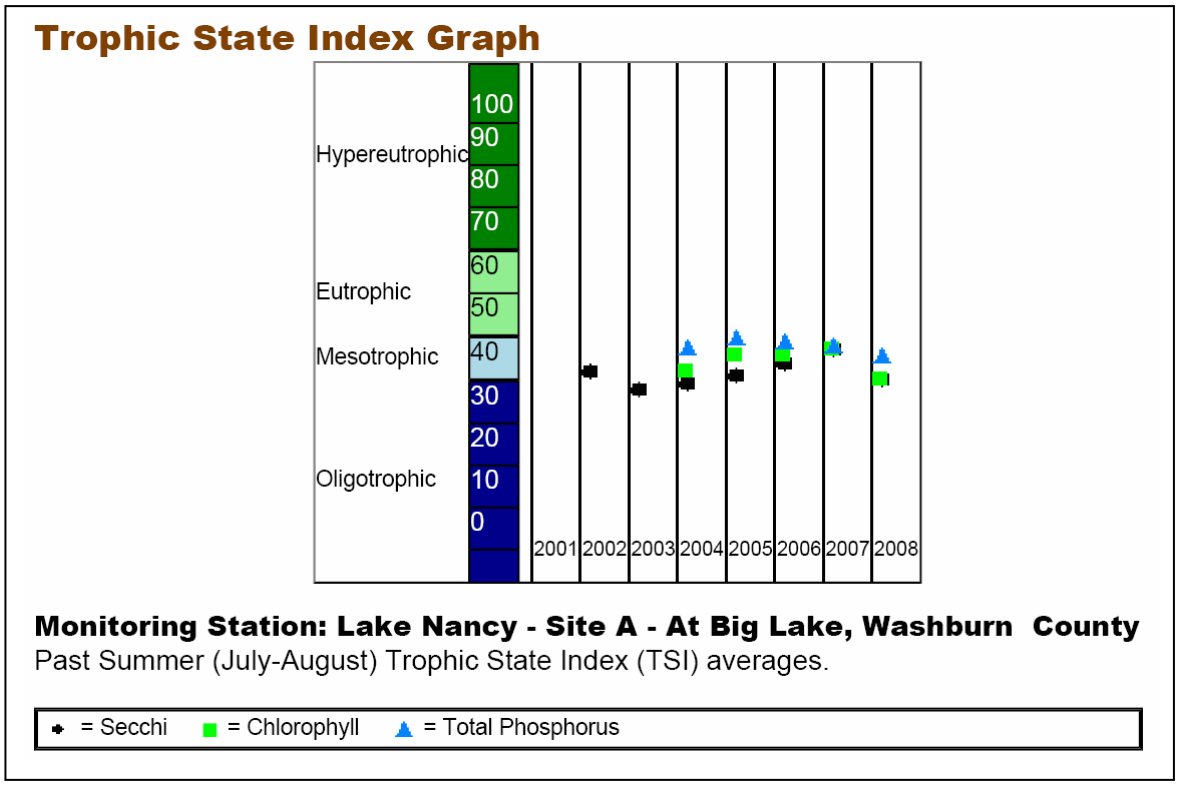

Figure 7. Big Lake Trophic Status Index Graph

The Shallow Lake basin does not have recorded regular monitoring. However, this area was monitored as part of a 2000 Lake Management Plan study. This basin consistently had secchi depth readings of 5 feet, with the lake bottom visible. Total phosphorus readings were very similar to the Deep Lake and Big Lake basins.

Watershed

The lakes' watershed is part of the Lower Namekagon River watershed (Watershed Identification Key SC19) in the St. Croix River Basin. Lake Nancy has an outflow creek which empties into the Totogatic River and subsequently joins the Namekagon. Watershed data was developed as part of the Lake Nancy Lake Management Plan.[2] The lakes watershed area illustrated in Figure 8 is from this plan.

The Lake Nancy watershed consists of forested (60%), wetland (34%), and residential shoreland (6%) cover. Plan maps in Appendix B include color aerial photos which illustrate this cover. The watershed (or drainage area) of Nancy Lake is 3,125 acres not including the lakes' surface. Watershed area is broken down in Table 2 below.

Table 2. Lake Nancy Watershed Area

Watershed Component	Acres
Big Lake Basin	663
Wetland/Kimball Lake Channel	1609
Deep Lake Basin	242
Shallow Lake Basin	611
Lake Nancy Watershed	3,125

Phosphorus from Watershed Runoff

Phosphorus is the pollutant that most influences the clarity of Lake Nancy because it is the limited ingredient for algae growth.[3] For Lake Nancy, almost half of the phosphorus loading comes from rain falling on the lake. Table 3 summarizes phosphorus loading calculated for the lake management plan.

Phosphorus is also carried in runoff from the watershed both dissolved in the water and carried in soil particles that erode from bare soil. Phosphorus runoff from the watershed is determined by how land is used in the lake's watershed along with watershed soils and topography.

When a watershed is maintained in natural vegetation, there is less runoff of pollutants that impact the lake. Agricultural and residential land tends to contribute greater amounts of phosphorus in runoff. Soil erosion is reduced when there is good vegetative cover. Water flow is slowed by tall vegetation, and forest groundcovers and fallen leaves allow runoff water to soak into the ground. In summary, anything that reduces soil erosion and/or the amount of nutrient-rich runoff water flowing from a portion of the watershed reduces pollution to the lake.

Shoreland areas are important contributing areas of lake watersheds, and as described above, those in a natural state generally result in less runoff and phosphorus loading to lakes. Volunteers completed a shoreland inventory as part of the lake management study in 2000. The inventory focused on the shoreline areas back to about 15 feet from the water's edge. Volunteers looked at

[2] McComas, Steve, Blue Water Science. Lake Nancy, Washburn County, Wisconsin Lake Management Plan. May 2001.
[3] Based on nitrogen to phosphorus ratios from sample results for both lakes from 2000.

217 parcels on the lake, and found 41 or 19 percent of parcels undeveloped. They also found that 80% had at least 50% of the first 15 feet of shoreline buffer in natural vegetation. Fewer residents (72 %) had at least 75% of the first 15 feet of shoreline buffer in natural vegetation. The lake management plan reported that this compared favorably with other Wisconsin and Minnesota lakes. However, this does not necessarily mean that Nancy Lake parcels meet local standards for shoreland buffer zones. Washburn County standards generally require natural vegetation back at least 35 feet for 70 - 90% of the shoreline.

Table 3. Lake Nancy Phosphorus Inputs (2000)

Phosphorus (P) Source	**Area or Quantity**	**Pounds/Year**	**Percent of P Load**
Rainfall on the lake	772 acres	205	48
Forests	915 acres	73	17
Wetlands	516 acres	47	11
Residential shorelands	85 acres	9	2
Septic systems	100 systems[4]	21	5
Kimball chain	1609 acres	73	17
TOTAL P INPUT		428	100

[4] Although the LNPA board reports that there are about 175 septic systems in 2008, this is the number of systems used in the calculation for the year 2000 phosphorus loading. There is no explanation of why this number was used in the McComas plan.

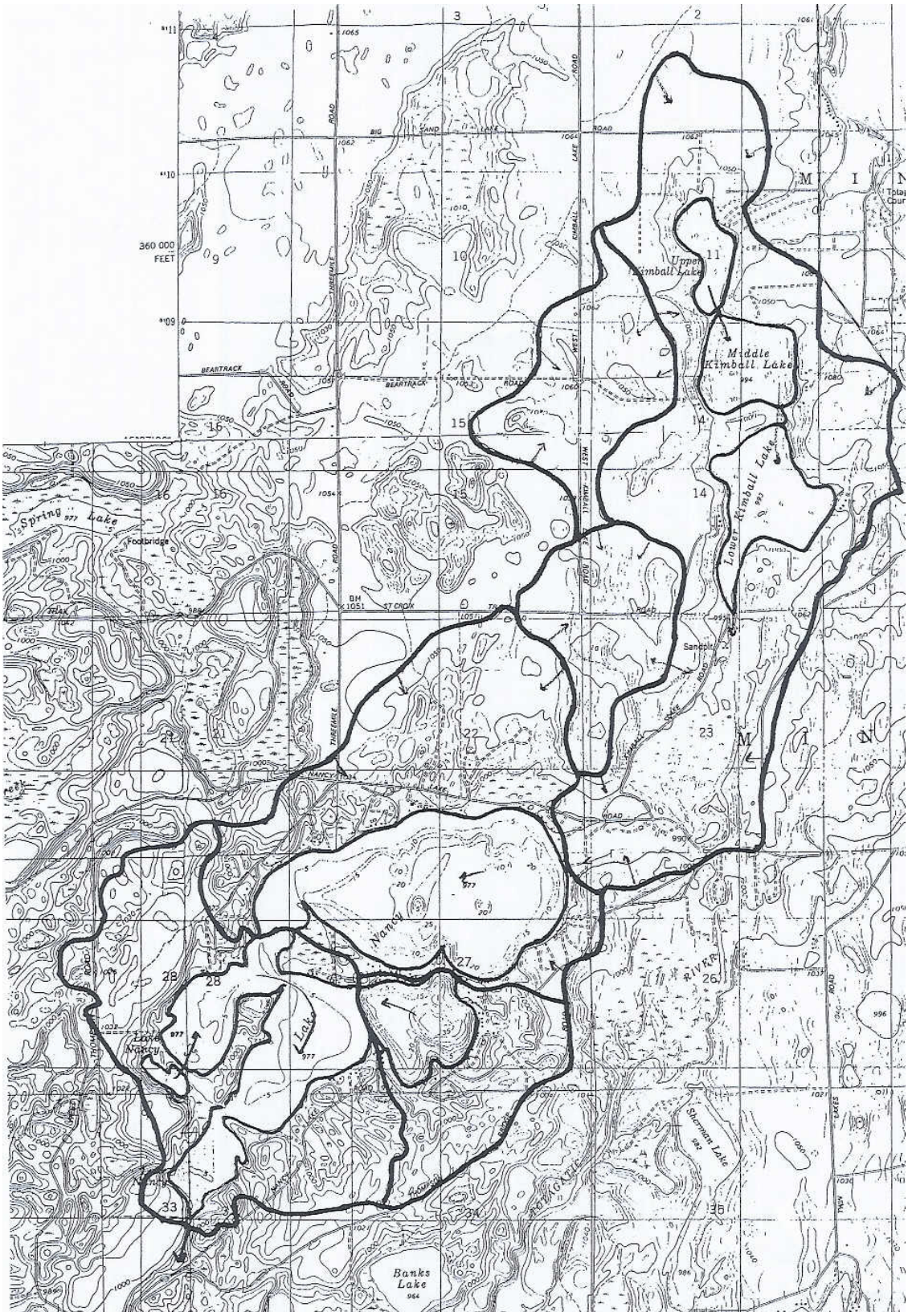

Figure 8. Lake Nancy Watershed (from McComas 2001)

Aquatic Habitats

Primary Human Use Areas

Lakeshore property owners and the general public utilize the lake for a wide variety of activities including fishing, boating, skiing, swimming, kayaking, and viewing wildlife. Public access points (boat landings) are located on the map in Figure 3.

Over the decades the usage of Lake Nancy has changed. In the 1950-60's there were ten small fishing resorts on the lake. As of 2008, there is just one. Most of the resort properties have been converted into single family homes--some in their original condition, but many have been modified or torn down and replaced with large homes. There has been subsequent change in the boating on the lake. There used to be many small fishing boats with small motors. Now, most boat traffic is made up of larger boats with larger motors, pontoon boats with larger motors and a number of personal watercraft. Many owners water ski or go tubing on the lake.[5]

A couple of factors stand out in the survey results tallied from the responses of Nancy owners. First, the responses in question three indicate that there is not a great deal of concern related to fishing (compared to the other negative impacts listed as choices to the question). This low level of concern about fishing mirrors the perceived drop in the number of owners who participate in fishing. Another interesting, and perhaps surprising answer, is contained in question 16. It appears that most people who answered the questionnaire do not believe that water runoff from their property "adds more phosphorous to the lake than before my property was developed." This lack of knowledge shows that considerable education of owners can still be done.

EWM Status

There are several waterbodes in Washburn County and nearby Burnett County with EWM present (see Table 4 below).

Table 4. Nearby Waterbodies with EWM Present[6]

Waterbody Name	County	Year Identified
Minong Flowage	Washburn	2002
Nancy Lake	Washburn	1991
Radisson Flowage	Sawyer	2003
Totagatic River	Washburn	2003
Shallow Lake	Washburn/Burnett/Barron	2003
Ham Lake	Burnett	2003
Round Lake	Burnett	2003

[5] Personal communication. Sam Lewis. LNPA Board. October 2008.

[6] According to the DNR *Listing of Wisconsin Waters with Eurasian Water-Milfoil infestations (current as of 01/02/07).*

Functions and Values of Native Aquatic Plants

Naturally occurring native plants provide a diversity of habitat, help maintain water quality, sustain the fishing quality for which Lake Nancy is known, and support common lakeshore wildlife from loons to frogs.

Water Quality

Aquatic plants can improve water quality by absorbing phosphorus, nitrogen, and other nutrients from the water that could otherwise fuel nuisance algal growth. Some plants can even filter and break down pollutants. Plant roots and underground stems help to prevent resuspension of sediments from the lake bottom. Stands of emergent plants (with stems that protrude above the water surface) and floating plants help to blunt wave action and prevent erosion at the shoreline.

Fishing

Habitat created by aquatic plants provides food and shelter for both young and adult fish. Invertebrates living on or beneath plants are a primary food source for fish. Other fish such as bluegills graze directly on the plants themselves. Plant beds provide important spawning habitat for many fish species.

Waterfowl

Plants offer food, shelter, and nesting material. Birds eat both the invertebrates that live on plants and the plants themselves.[7]

Protection Against Invasive Species

Non-native invasive species threaten native plants in Northern Wisconsin. The most common are Eurasian Water Milfoil (EWM) and Curly Leaf Pondweed (CLP). These species are described as opportunistic invaders. This means that these "invaders" benefit where an opening occurs from removal of plants. Without competition from other plants, invasive species may successfully become established in a lake. Removal of native vegetation not only diminishes the natural qualities of a lake, it may increase the risk that an invasive species can successfully invade into an area where native plants have been removed. This concept is easily observed on land where bare soil is quickly taken over by weeds. While not providing a guarantee against invasive plants, protecting and allowing the native plants to remain may reduce the success of establishment of an invasive species. Invasive species can change many of the natural features of a lake and often lead to expensive annual control plans. Native vegetation may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.[8]

Sensitive Areas

The Wisconsin Department of Natural Resources has completed sensitive area surveys to designate areas within aquatic plant communities that provide important game fish, forage fish, macroinvertebrate, and wildlife habitat as well as important shoreline stabilization functional values. The Department of Natural Resources is transitioning to designations of *critical habitat areas* that include both *sensitive areas* and *public rights features*. The c*ritical habitat area*

[7] Above paragraphs summarized from Through the Looking Glass. Borman etal. 1997.
[8] Taken from Aquatic Plant Management Strategy. DNR Northern Region. Summer 2007.

designation will provide a holistic approach to ecosystem assessment and protection of those areas within a lake that are most important for preserving the very character and qualities of the lake. These sites are those sensitive and fragile areas that support wildlife and fish habitat, provide the mechanisms that protect the water quality in the lake, harbor quality plant communities, and preserve the places of serenity and aesthetic beauty for the enjoyment of lake residents and visitors.

Critical habitat areas include *sensitive areas* that offer critical or unique fish and wildlife habitat (including seasonal or lifestage requirements) or offer water quality or erosion control benefits to the area (Administrative code 107.05(3)(1)(1)). The Wisconsin Department of Natural Resources is given the authority for the identification and protection of sensitive areas of the lakes. *Public rights features* are areas that fulfill the right of the public for navigation, quality and quantity of water, fishing, swimming, or natural scenic beauty. Protecting these *critical habitat areas* requires the protection of shoreline and in-lake habitat. The *critical habitat area* designation will provide a framework for management decisions that impact the ecosystem of the lake.

The Department of Natural Resources completed a critical habitat survey for Nancy Lake in the summer of 2008. While results will not likely be available until after this aquatic plant management plan is complete, data and recommendations will be considered in plan implementation.

Rare and Endangered Species Habitat

Nancy Lake is located in T42N, R13W. The Wisconsin Natural Heritage Inventory lists the following species for this area. The listing does not provide enough detail to know if these species are found on the lake itself. In fact, lake residents report seeing Blandings turtle, bald eagles, and osprey on the lake. In addition, twin-stemmed bladderwort, (*Utricularia geminiscapa)*, listed as species of concern, was found in Lake Nancy during the plant survey for this project.

Table 5. Area Rare and Endangered Species

Scientific Name	**Common Name**	**State Status**[9]
Clemmys insculpta	Wood Turtle	THR
Dendroica kirtlandii	Kirtland's Warbler	SC/FL
Emydoidea blandingii	Blanding's Turtle	THR
Etheostoma microperca	Least Darter	SC/N
Haliaeetus leucocephalus	Bald Eagle	SC/P
Pandion haliaetus	Osprey	THR
Spermophilus franklinii	Franklin's Ground Squirrel	SC/N

[9] THR = Threatened, END = endangered, SC/FL = Special Concern (federally protected as endangered or threatened), SC/N = Special Concern (no laws regulating use, possessions, or harvesting), and SC/H = Special Concern (take regulated by establishment of open closed seasons).

Nancy Lake Fishery

The Wisconsin Lakes Book lists the following species and frequency of occurrence.

Common Name	Frequency of Occurrence
Muskie	Present
Northern Pike	Common
Walleye	Common[10]
Largemouth Bass	Common
Smallmouth Bass	Present
Panfish	Abundant

The Department of Natural Resources Nancy Lake Management Plan (1994) reported that while the walleye population had excellent natural reproduction in the 1970s, it was very limited in the 1980s. The plan suggested walleye stocking, protection of four natural walleye spawning areas (in the Big Lake and Deep Lake basins), and consideration of an artificial spawning reef. The management goal for muskie was to maintain a low density based on natural reproduction. A subsequent DNR report (2005) reported that walleye numbers had increased to target numbers of two adults per acre in 1998.

The 1994 fisheries management plan goal related to Eurasian water milfoil was to slow its spread through careful protocol during and after DNR fish surveys. The plan also discourages waterfront property owners from activities including dredging and chemical and mechanical weed control that might encourage the spread of EWM.

[10] Although lake residents report that walleye are no longer common on Lake Nancy.

Plant Community

Aquatic Plant Survey Results

An aquatic plant inventory according to the DNR-specified point intercept method was completed for Lake Nancy in June and August of 2008. The results discussed below are from that survey. Survey methods are found in Appendix C.

The Wisconsin Department of Natural Resources (Wisconsin DNR) generated the sampling point grid of 701 points for Lake Nancy. Only points shallower than 25 feet were initially sampled until the maximum depth of plants could be established.

In June 2008 an early season survey for curly leaf pondweed (CLP) (*Potamogeton crispus*) was conducted. This survey is done in June so the CLP can be surveyed while it is robust. Since CLP dies in early July, the survey must be done before that time. No CLP was sampled or observed during this survey.

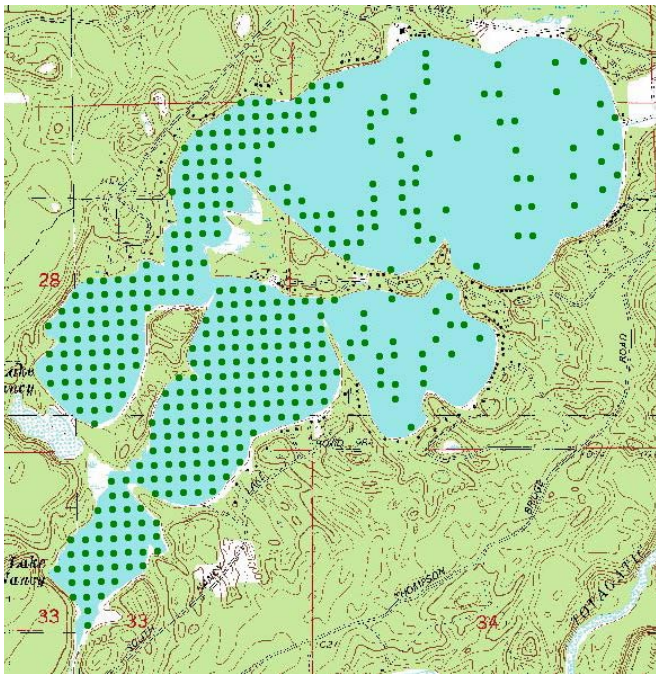

Figure 9. Early Season Sample Locations (June 2008)

In August 2008, the full survey was conducted. Figure 10 is a map of the sample grid. Figure 11 is a map showing where plants were actually found on Lake Nancy.

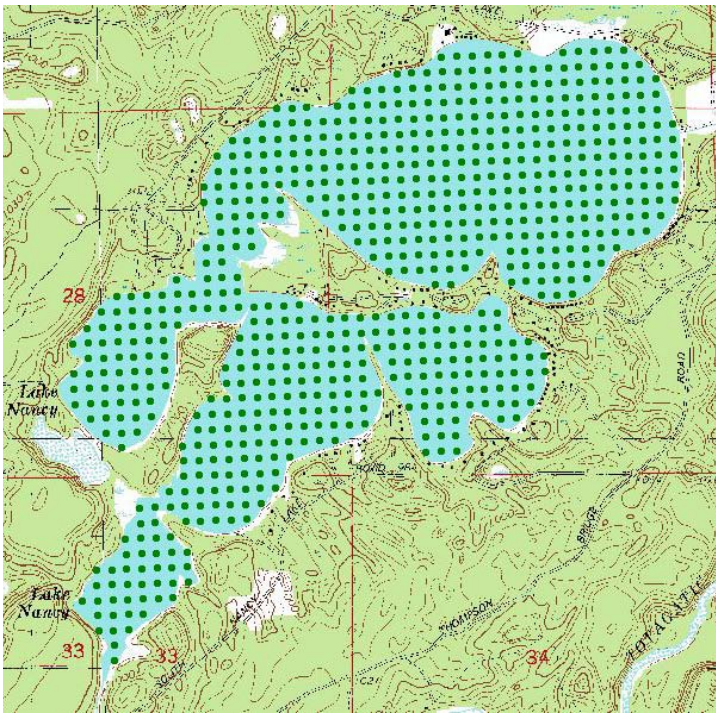

Figure 10. Map of Sample Points Grid

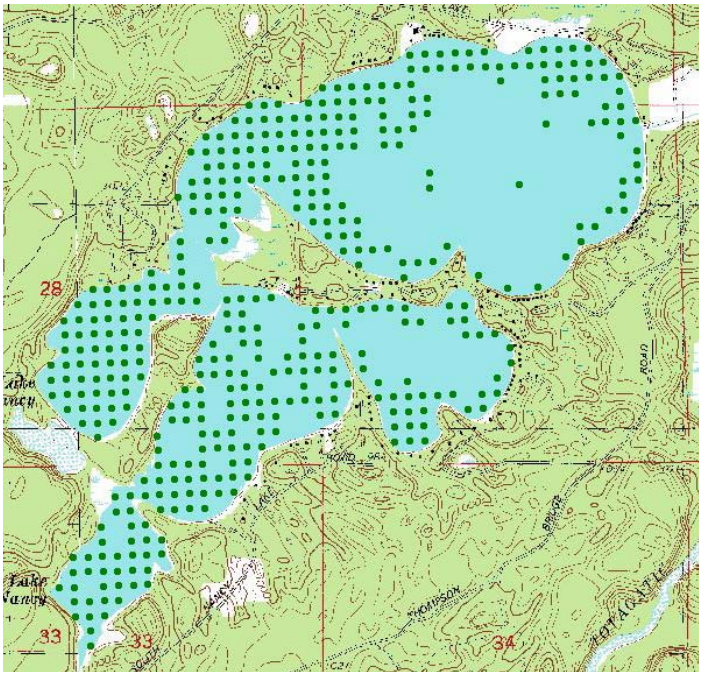

Figure 11. Map of Points With Vegetation Present

The survey data shows a very extensive, diverse plant community. Table 6 summarizes data from the completed survey. The number of species in Lake Nancy is high at 47 sampled and 54 when including viewed species. The Simpson's diversity is also high at 0.94. It is quite rare to have this high of a Simpson's diversity index. The number of species per point averages 2.88 as illustrated in Figure 12. The coverage of plants is high with 79.3% of the littoral zone having plants growing and 60.6 % of the entire sample grid having plants present. All of these statistics indicate high diversity in the Lake Nancy plant community.

Table 6. Lake Nancy Macrophyte Survey Statistics

Survey Statistics	
Total number of points sampled	**550**
Total number of sites with vegetation	**425**
Total number of sites shallower than maximum depth of plants	**536**
Frequency of occurrence at all sites on entire lake	**60.6**
Frequency of occurrence at sites shallower than maximum depth of plants	**79.3**
Simpson Diversity Index	**0.94**
Maximum depth of plants (ft)	**24.10**
Average number of all species per site (veg. sites only)	**2.89**
Average number of native species per site (veg. sites only)	**2.79**
Species Richness	**47**
Species Richness (including visuals)	**54**

The diversity in the lake is quite widespread. The southern bays held the most diversity. However, the entire lake is quite diverse as a whole. In addition, one species, twin-stemmed bladderwort (*Utricularia geminiscapa)*, is listed as species of concern. The Wisconsin DNR defines species of special concern as, *"special concern species are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of this category is to focus attention on certain species before they become threatened or endangered."*

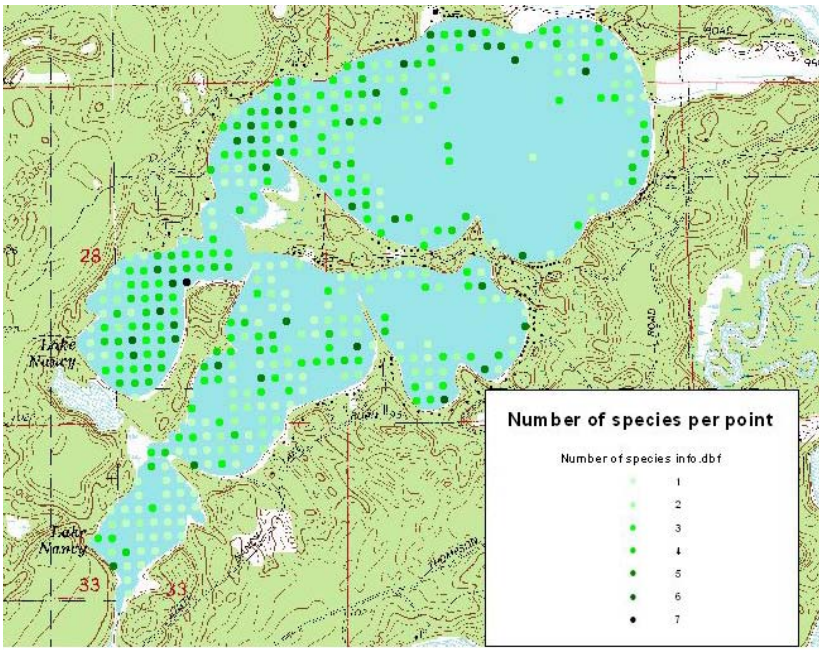

Figure 12. Number of Species per Point

Table 7. Lake Nancy Aquatic Plant Species List

Species	Frequency of Occurrence Vegetated	Frequency of Occurrence Littoral	Relative Frequency (%)	Number of sites sampled	Average Rake Fullness
*Potamogeton robbinsii,*Robbins pondweed	37.91	27.80	13.12	149	1.26
Elodea canadensis,Common waterweed	30.28	22.20	10.48	119	1.18
Potamogeton amplifolius,Large-leaf pondweed	22.90	16.79	7.92	90	1.01
Najas flexilis,Bushy pondweed	21.88	16.04	7.57	86	1.01
Nymphaea odorata,White water lily	20.61	15.11	7.13	81	1.00
Brasenia schreberi,Watershield	15.27	11.19	5.28	60	1.00
Potamogeton pusillus,Small pondweed	14.25	10.45	4.93	56	1.13
Schoenoplectus subterminalis,Water bulrush	12.21	8.96	4.23	48	1.00
Myriophyllum spicatum,Eurasian water milfoil	9.67	7.09	3.35	38	1.53
Nuphar variegata,Spatterdock	9.16	6.72	3.17	36	1.00
Ceratophyllum demersum,Coontail	8.40	6.16	2.90	33	1.06
Potamogeton illinoensis,Illinois pondweed	7.63	5.60	2.64	30	1.00
Filamentous algae	5.34	3.92	1.85	21	1.00
Chara sp., Muskgrasses	5.34	3.92	1.85	21	1.00
Sagittaria sp. Arrowhead rosette	5.34	3.92	1.85	21	1.00
Vallisneria americana,Wild celery	5.34	3.92	1.85	21	1.00
*Myriophyllum tenellum,*Dwarf water milfoil	5.09	3.73	1.76	20	1.05
Nitella sp.,Nitella	5.09	3.73	1.76	20	1.10
Megalodonta beckii,Water marigold	4.83	3.54	1.67	19	1.00
Potamogeton gramineus,Variable pondweed	4.58	3.36	1.58	18	1.00

Species	Frequency of Occurrence Vegetated	Frequency of Occurrence Littoral	Relative Frequency (%)	Number of sites sampled	Average Rake Fullness
Potamogeton praelongis, White-stem pondweed	4.33	3.17	1.50	17	1.06
Potamogeton zosteriformis, Flat-stem pondweed	4.33	3.17	1.50	17	1.00
Utricularia vulgaris, Common bladderwort	4.07	2.99	1.41	16	1.00
Eleocharis acicularis, Needle spikerush	3.82	2.80	1.32	15	1.00
Schoenoplectus acutus, Hardstem bulrush	2.54	1.87	0.88	10	1.00
Pontederia cordata, Pickerelweed	2.29	1.68	0.79	9	1.00
Utricularia gibba, Creeping bladderwort	2.29	1.68	0.79	9	1.00
Sagittaria graminea, Grass-leaved arrowhead	2.04	1.49	0.70	8	1.00
Juncus paleocarpus f. submersus, Brown-fruited rush	1.78	1.31	0.62	7	1.00
Eleocharis palustris, Creeping spikerush	1.53	1.12	0.53	6	1.00
Myriophyllum sibiricum, Northern water milfoil	1.53	1.12	0.53	6	1.00
Utricularia geminiscapa, Twin-stemmed bladderwort	1.27	0.93	0.44	5	1.00
Aquatic moss	1.02	0.75	0.35	4	1.00
Potamogeton natans, Floating-leaf pondweed	1.02	0.75	0.35	4	1.00
Eriocaulon aquaticum, Pipewort	0.51	0.37	0.18	2	1.00
Ranunculus aquatilis, Stiff water crowfoot	0.51	0.37	0.18	2	1.00
*Juncus brevicaudatus, N*arrow panicle rush	0.51	0.37	0.18	2	1.00
Carex comosa, Bottle brush sedge	0.25	0.19	0.09	1	1.00
Dulichium arundinaceum, 3-way sedge	0.25	0.19	0.09	1	1.00
Elatine minima, Waterwort	0.25	0.19	0.09	1	1.00
Myriophyllum alterniflorum, Alternate-leaved water milfoil	0.25	0.19	0.09	1	1.00
Potamogeton foliosus, Leafy pondweed	0.25	0.19	0.09	1	2.00
Potamogeton richardsonii, Clasping-leaf pondweed	0.25	0.19	0.09	1	1.00
Ranunculus flammula, Creeping spearwort	0.25	0.19	0.09	1	1.00
Sagittaria latifolia, Common arrowhead	0.25	0.19	0.09	1	1.00
Carex sp., Sedge	0.25	0.19	0.09	1	1.00
Asclepias incarnata, Swamp milkweed	0.25	0.19	0.09	1	1.00
Callitriche palustris, Common water starwort	Viewed			1	
Lythrum salicaria, Purple loosestrife	Viewed			1	
Polygonum amphibium, Water smartweed	Viewed			3	
Potamogeton epihydrus, Ribbon-leaf pondweed	Viewed			1	
Schoenoplectus tabernaemontani, Softstem bulrush	Viewed			1	
Sparganium angustifolium, Narrow-leaved bur-reed	Viewed			1	
Typha latifolia, Broad-leaved cattail	Viewed			1	

The distribution of the most common lake plants are illustrated in Figures 13 through 15 on following pages. These plants, Robbin's pondweed, common waterweed, and large-leaf pondweed have relative frequencies of 13.2%, 10.5% and 7.9% respectively. This indicates that no species dominates the plant community. All three of these species are very desirable plants to have in a lake ecosystem because they provide key habitat for fish and invertebrates.

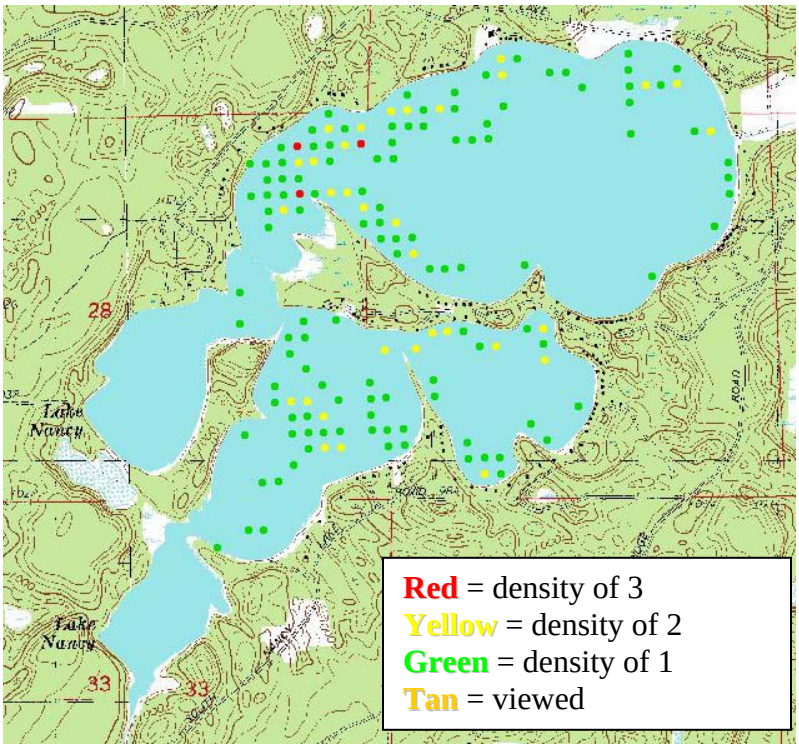

Figure 13. Distribution of Robbins Pondweed

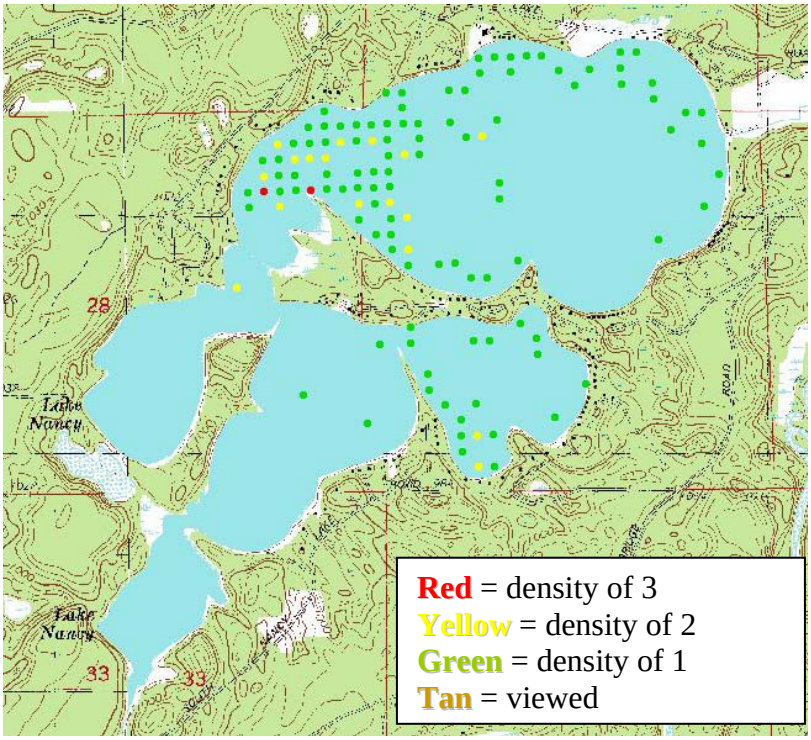

Figure 14. Distribution of Common Waterweed

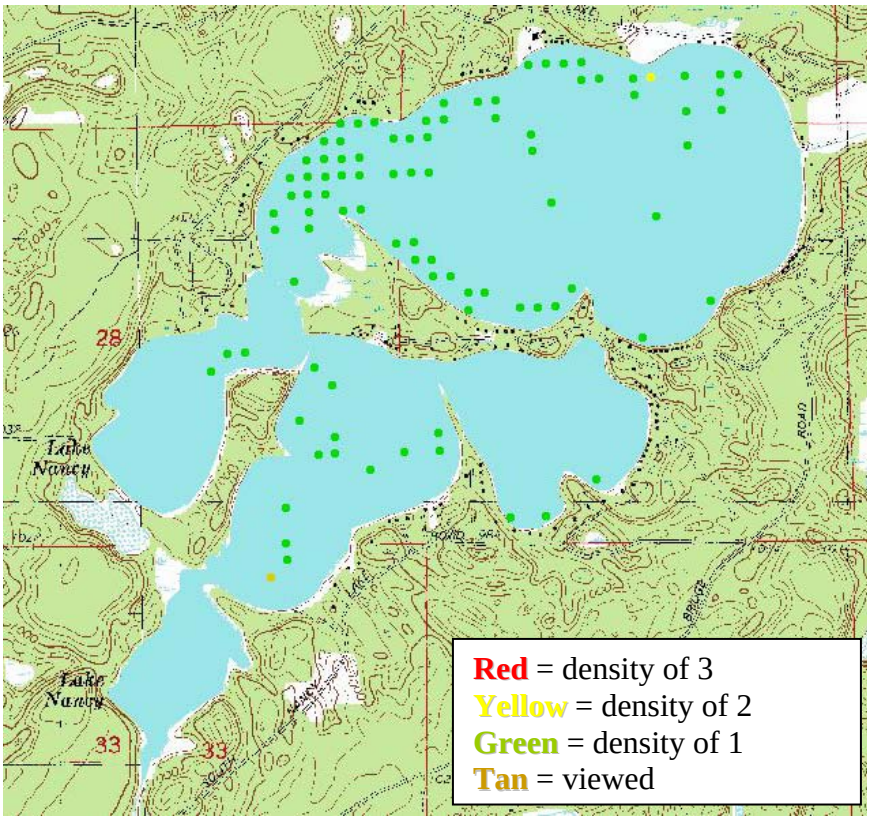

Figure 15. Distribution of Large Leaf Pondweed

Floristic Quality Index

The Floristic Quality Index (FQI) is an index developed by Dr. Stanley Nichols of the University of Wisconsin-Extension. This index is a measure of the plant community response to development (and human influence) on the lake. It takes into account the species of aquatic plants found and their tolerance for changing water quality and habitat quality. The index uses a conservatism value assigned to various plants ranging from 1 to 10. A high conservatism value indicates that a plant is intolerant to disturbance and/or water quality changes while a lower value indicates tolerance. Those plants with higher values are more apt to respond adversely to water quality and habitat changes, largely due to human influence.

The FQI is calculated using the number of species and the average conservatism value of all species used in the index. A higher FQI generally indicates a healthier aquatic plant community. Not all species found in Lake Nancy have conservatism values assigned to them.

The FQI of Lake Nancy is very high. This is due both to the high number of species located in Lake Nancy and the high mean conservatism values of the plants sampled. There were 48 species used to calculate the FQI. The species and their conservatism values are included in Table 8 .

The FQI of Lake Nancy is 47.34. This value is very high for a lake. An FQI this high indicates that the plant community is healthy and has changed little in response to human impact on water quality and habitat (sediment) changes. The high FQI in Lake Nancy is due both to high species

richness and a rather high mean conservatism value. The Lake Nancy FQI values are also high when compared to the median values for lakes in this ecoregion (Northern Lakes and Forests) (Nichols 1999). Figure 16 shows this comparison graphically.

Table 8. FQI Species and Conservatism Values

Species	Common Name	C
Brasenia schreberi	**Watershield**	**7**
Callitriche palustris	**Common water starwort**	**8**
Carex comosa	**Bottle brush sedge**	**5**
Ceratophyllum demersum	**Coontail**	**3**
Chara sp.	**Muskgrasses**	**7**
Dulichium arundinaceum	**Three-way sedge**	**9**
Elatine minima	**Waterwort**	**9**
Eleocharis acicularis	**Needle spikerush**	**5**
Eleocharis palustris	**Creeping spikerush**	**6**
Elodea canadensis	**Common waterweed**	**3**
Eriocaulon aquaticum	**Pipewort**	**9**
Juncus palocarpus f. submersus	**Brown-fruited rush**	**8**
Megalodonta beckii	**Water marigold**	**8**
Myriophyllum alterniflorum	**Alternate-flowered water-milfoil**	**10**
Myriophyllum sibericum	**Northern water-milfoil**	**7**
Myriophyllum tenellum	**Dwarf water-milfoil**	**10**
Najas flexilis	**Bushy pondweed**	**6**
Najas gracillima	**Slender water-nymph**	**7**
Nitella sp	**Nitella**	**7**
Nuphar variegata	**Spatterdock**	**6**
Nymphaea odorata	**White water lily**	**6**
Polygonum amphibium	**Water smartweed**	**5**
Pontederia cordata	**Pickerelweed**	**9**
Potamogeton amplifolius	**Large-leaf pondweed**	**7**
Potamogeton epihydrus	**Ribbon-leaf pondweed**	**8**
Potamogeton foliosus	**Leafy pondweed**	**6**
Potamogeton gramineus	**Variable pondweed**	**7**
Potamogeton illinoensis	**Illinois pondweed**	**6**
Potamogeton natans	**Floating-leaf**	**5**
Potamogeton praelongis	**White-stem pondweed**	**8**
Potamogeton pusillus	**Small pondweed**	**7**
Potamogeton richardsonii	**Clasping-leaf pondweed**	**5**
Potamogeton robbinsii	**Robbins pondweed**	**8**
Potamogeton strictifolius	**Stiff pondweed**	**8**
Potamogeton zosteriformis	**Flat-stem pondweed**	**6**
Ranunculus aquatilis	**Stiff water crowfoot**	**7**
Ranunculus flammula	**Creeping spearwort**	**9**
Sagittaria graminea	**Grass-leaved arrowhead**	**9**
Sagittaria latifolia	**Common arrowhead**	**3**
Schoenoplectus acutus	**Hardstem bulrush**	**5**
Schoenoplectus subterminalis	**Water bulrush**	**9**
Schoenoplectus tabernaemontani	**Softstem bulrush**	**4**
Sparganium angustifolium	**Narrow-leaved bur-reed**	**9**
Typha latifolia	**Broad-leaved cattail**	**1**
Utricularia geminiscapa	**Twin-stemmed bladderwort**	**9**
Utricularia gibba	**Creeping bladderwort**	**9**
Utricularia vulgaris	**Common bladderwort**	**7**
Vallisneria americana	**Wild celery**	**6**

Table 9. Floristic Quality Index Values

Floristic Quality Values	
Number of species[11]	**48**
Mean Conservatism	**6.83**
FQI	**47.34**

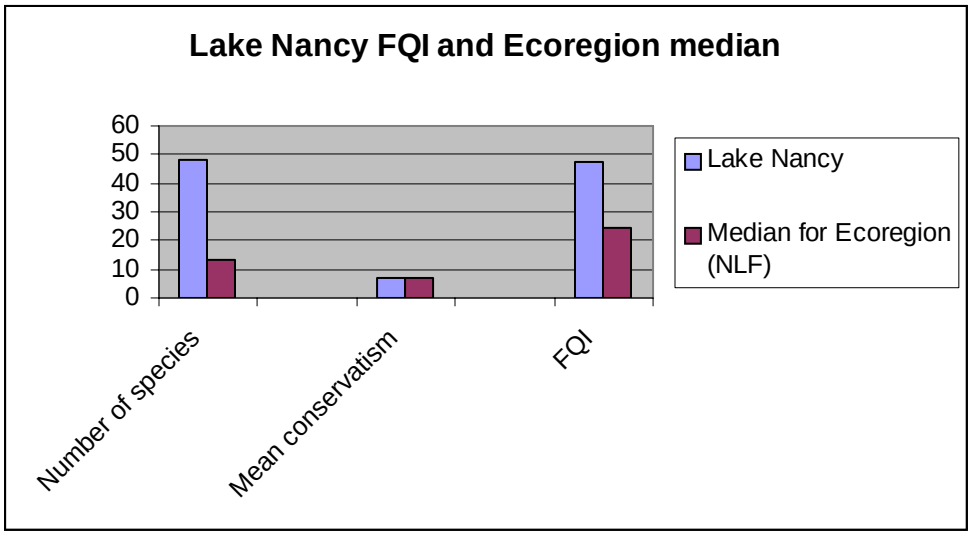

Figure 16. Comparison of Lake Nancy FQI Values and Median for Ecoregion Lakes

[11] This is the number of species used in the FQI calculation, not the total number of species surveyed in Lake Nancy.

Invasive Species

Two species of non-native plants were found in Lake Nancy. These are Eurasian water milfoil, (*Myriophyllum spicatum*) and purple loosestrife (*Lythrum salicaria*).

Eurasian water milfoil

Eurasian water milfoil (EWM) was sampled and viewed at numerous locations. Any plants or clumps of plants viewed while navigating were marked by GPS coordinates. In the point intercept survey, EWM was sampled at 45 points with a frequency of occurrence of 9.7%. Nearly all EWM is contained in 4 to 10 feet of water in the two areas of the lake that have fairly deep water. This includes the area adjacent to the boat landing at Deep Lake and the throughout much of the Big Lake basin. Some areas had large beds that were quite dense. In the Big Lake basin, some EWM beds are near the middle portions of the lake. Only one area of the Shallow Lake basin contained EWM. This was a small bed in the southeast bay.

It is important to note that EWM had been treated with herbicide prior to the survey on June 27, 2008. The point intercept survey was conducted on July 28th, August 4, and August 5th. This herbicide treatment could have affected the results of the EWM sampled and/or viewed in this survey.

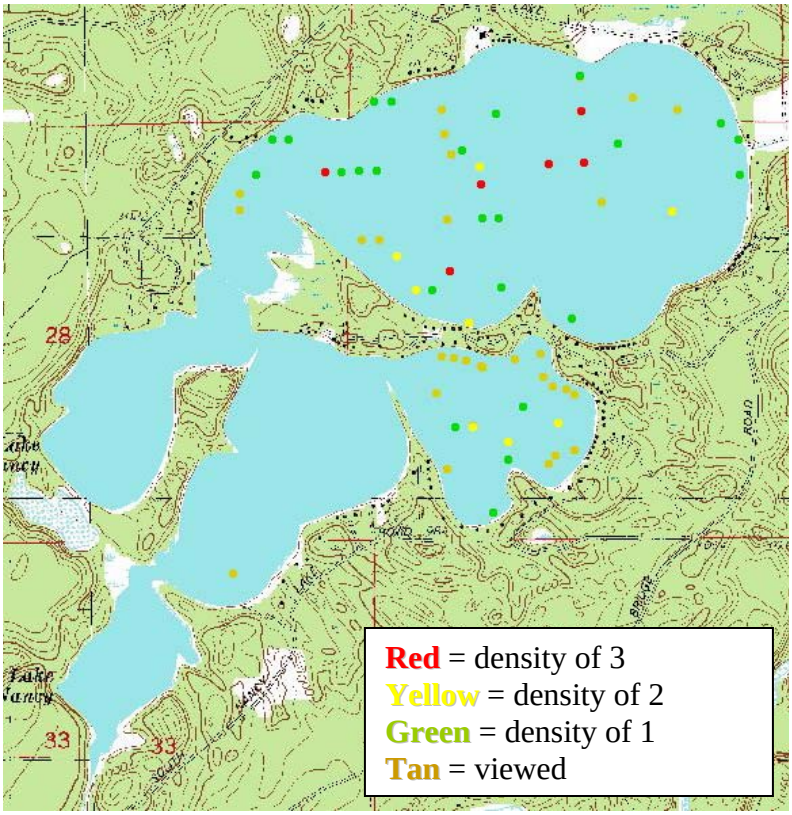

Figure 17. EWM Distribution (August 2008)

Lake Association volunteer, Pat Wier, identified EWM beds and recorded GPS points in September 2008 in preparation for potential treatment of these areas in 2009. Steve Schieffer, Ecological Integrity, mapped the beds and recorded their acreage. EWM beds located in the Deep Lake basin total 2.2 acres and EWM beds located in the Big Lake Basin total 3.4 acres for a total of 5.6 acres of EWM in Lake Nancy.

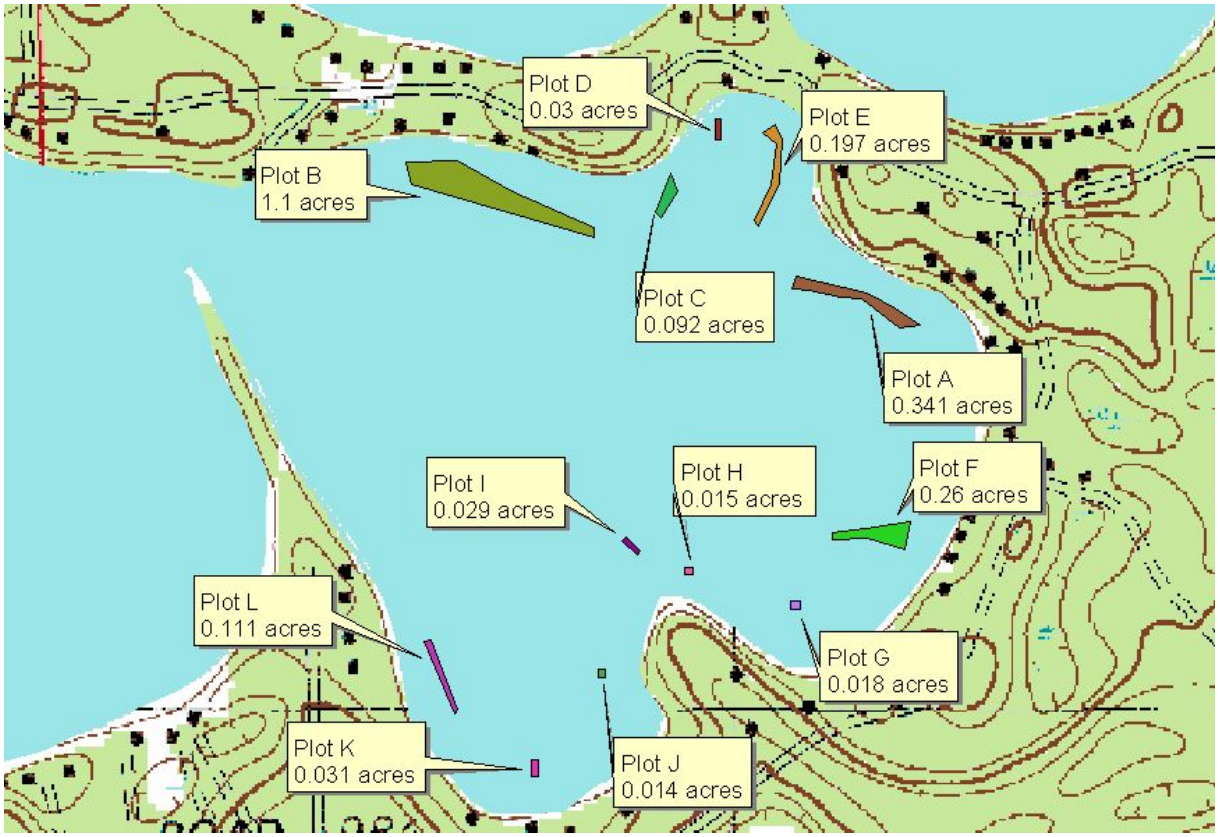

Figure 18. EWM Beds in Deep Lake Basin (September 2008)

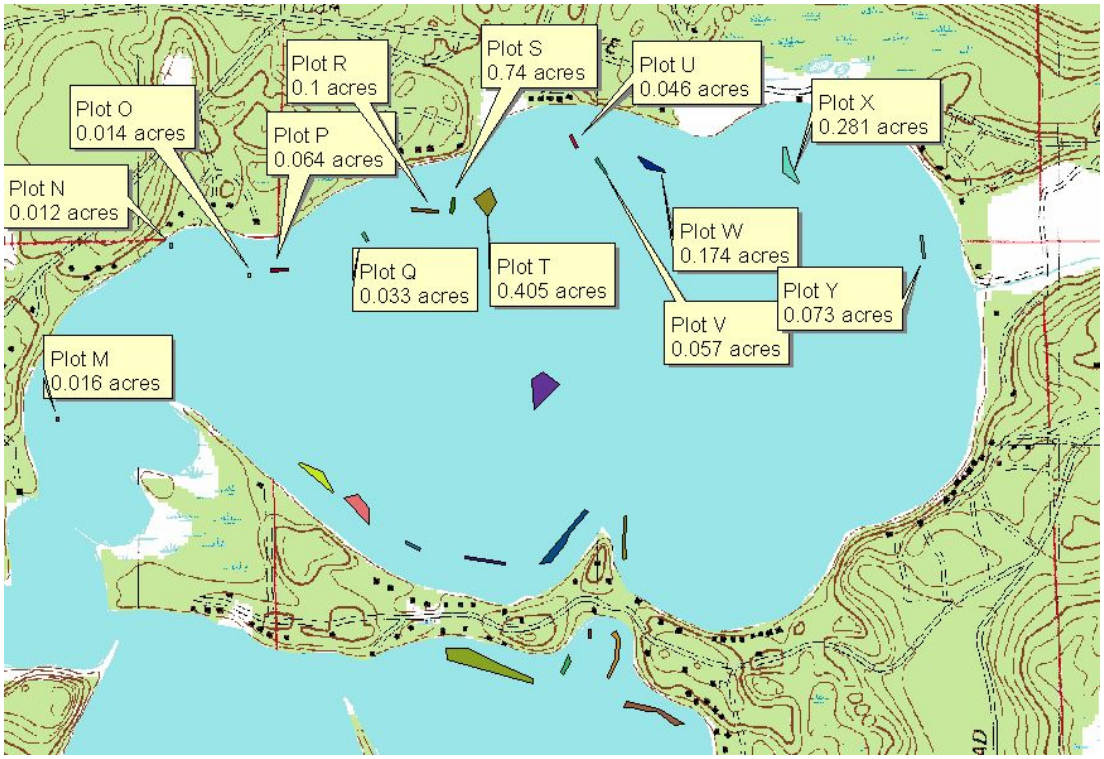

Figure 19. EWM Beds in North Big Lake Basin (September 2008)

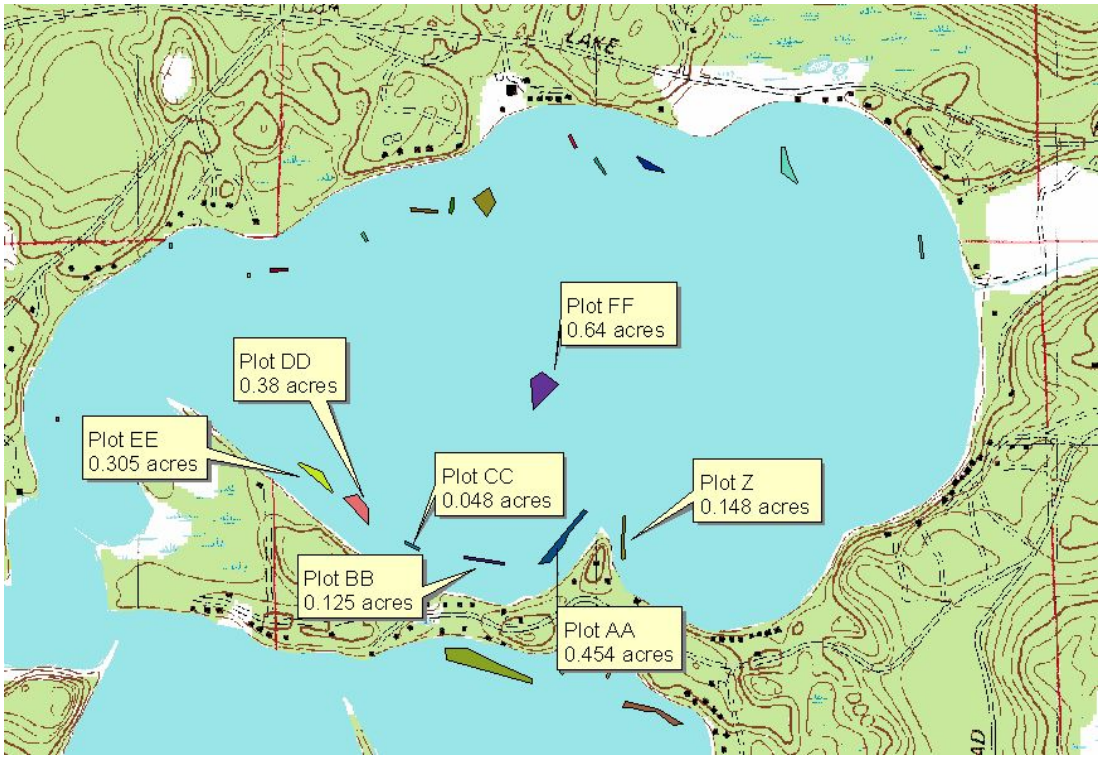

Figure 20. EWM Beds in South Big Lake Basin (September 2008)

Purple Loosestrife

Purple loosestrife was found in only one location along the narrow point straight west of the boat landing. There were approximately twelve plants present. All of these plants were pulled and removed from the lake. Although it appeared that all plants were removed, this area should be checked to make sure no plants return.

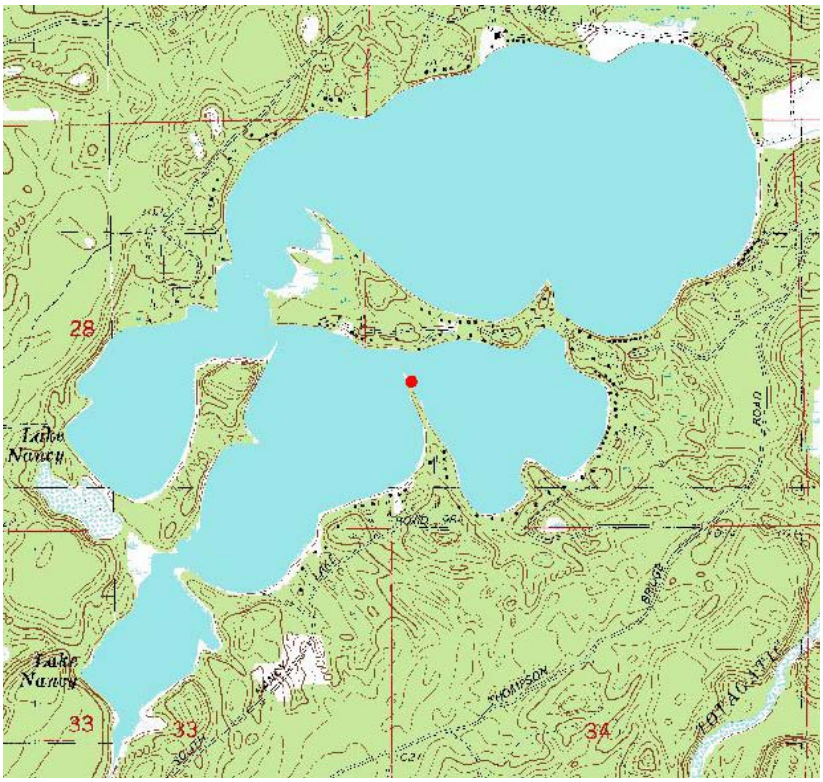

Figure 21. Purple Loosestrife Location

Eurasian Water Milfoil[12]

The following Eurasian water milfoil information is taken from a Wisconsin DNR fact sheet.

Identification

Eurasian water milfoil is a submersed aquatic plant native to Europe, Asia, and northern Africa. It is the only non-native milfoil in Wisconsin. Like the native milfoils, the Eurasian variety has slender stems whorled by submersed feathery leaves and tiny flowers produced above the water surface. The flowers are located in the axils of the floral bracts, and are either four-petaled or without petals. The leaves are threadlike, typically uniform in diameter, and aggregated into a submersed terminal spike. The stem thickens below the inflorescence and doubles its width further down, often curving to lie parallel with the water surface. The fruits are four-jointed nut-like bodies. Without flowers or fruits, Eurasian water milfoil is difficult to distinguish from Northern water milfoil. Eurasian water milfoil has 9-21 pairs of leaflets per leaf, while Northern milfoil typically has 7-11 pairs of leaflets. Coontail is often mistaken for the milfoils, but does not have individual leaflets.

Characteristics

Eurasian water milfoil grows best in fertile, fine-textured, inorganic sediments. In less productive lakes, it is generally restricted to areas of nutrient-rich sediments. It has a history of becoming dominant in eutrophic, nutrient-rich lakes, although this pattern is not universal. It is an opportunistic species that prefers highly disturbed lakebeds, lakes receiving nitrogen and phosphorous-laden runoff, and heavily used lakes. Optimal growth occurs in alkaline systems with a high concentration of dissolved inorganic carbon. High water temperatures promote multiple periods of flowering and fragmentation.

Reproduction and dispersal

Unlike many other plants, Eurasian water milfoil does not rely on seed for reproduction. Its seeds germinate poorly under natural conditions. It reproduces vegetatively by fragmentation, allowing it to disperse over long distances. The plant produces fragments after fruiting once or twice during the summer. These shoots may then be carried downstream by water currents or inadvertently picked up by boaters. Milfoil is readily dispersed by boats, motors, trailers, bilges, live wells, or bait buckets, and can stay alive for weeks if kept moist.

Once established in an aquatic community, milfoil reproduces from shoot fragments and stolons (runners that creep along the lake bed). As an opportunistic species, Eurasian water milfoil is adapted for rapid growth early in spring.

[12] Wisconsin DNR Invasive Species Factsheets from www.dnr.state.wi.us.

Ecological impacts

Eurasian water milfoil's ability to spread rapidly by fragmentation and effectively block out sunlight needed for native plant growth often results in monotypic stands. Monotypic stands of Eurasian milfoil provide only a single habitat, and threaten the integrity of aquatic communities in a number of ways. For example, dense stands disrupt predator-prey relationships by fencing out larger fish and reducing the number of nutrient-rich native plants available for waterfowl.

Dense stands of Eurasian water milfoil also inhibit recreational uses like swimming, boating, and fishing. Some stands have been dense enough to obstruct water intakes for industrial and power generation. The visual impact that greets the lake user on milfoil-dominated lakes is the flat yellow-green of matted vegetation, often prompting the perception that the lake is "infested" or "dead". Cycling of nutrients from sediments to the water column by Eurasian water milfoil may also lead to deteriorating water quality and algae blooms in infested lakes.

Control methods

Preventing a Eurasian water milfoil invasion requires various efforts. The first component is public awareness of the necessity to remove aquatic plant fragments at boat landings. Inspection programs should provide physical inspections as well as a direct educational message. The public awareness and inspection programs supported by Wisconsin DNR and UW Extension are called Clean Boats, Clean Waters programs in Wisconsin. Native plant beds must be protected from disturbance caused by boaters and careless plant control methods. A watershed management program should decrease nutrients reaching the lake thereby reducing the likelihood that Eurasian milfoil colonies will establish and spread.

Monitoring is also important so that introduced plants can be controlled immediately. The lake association and lakeshore owners should check for new colonies and control them before they spread. The plants can be hand pulled or raked. It is imperative that all fragments be removed from the water and the shore. If Eurasian water milfoil is present, additional control methods should be considered including mechanical control, chemical control, and biological control. As always, prevention is the best approach to invasive species management.

A good strategy for a systematic monitoring program is to target areas where the native Northern water milfoil (*Myriophyllum sibiricum)* is found. From a management perspective, the location of northern water milfoil can be important, because EWM and Northern water milfoil grow in similar conditions. This plant is often confused with Eurasian water milfoil, which looks relatively similar. Unlike Eurasian water milfoil (EWM), northern water milfoil is native and a desirable plant to have in the lake. It has very fine leaves that provide habitat for small planktonic organisms, which make up an important part of the food chain.

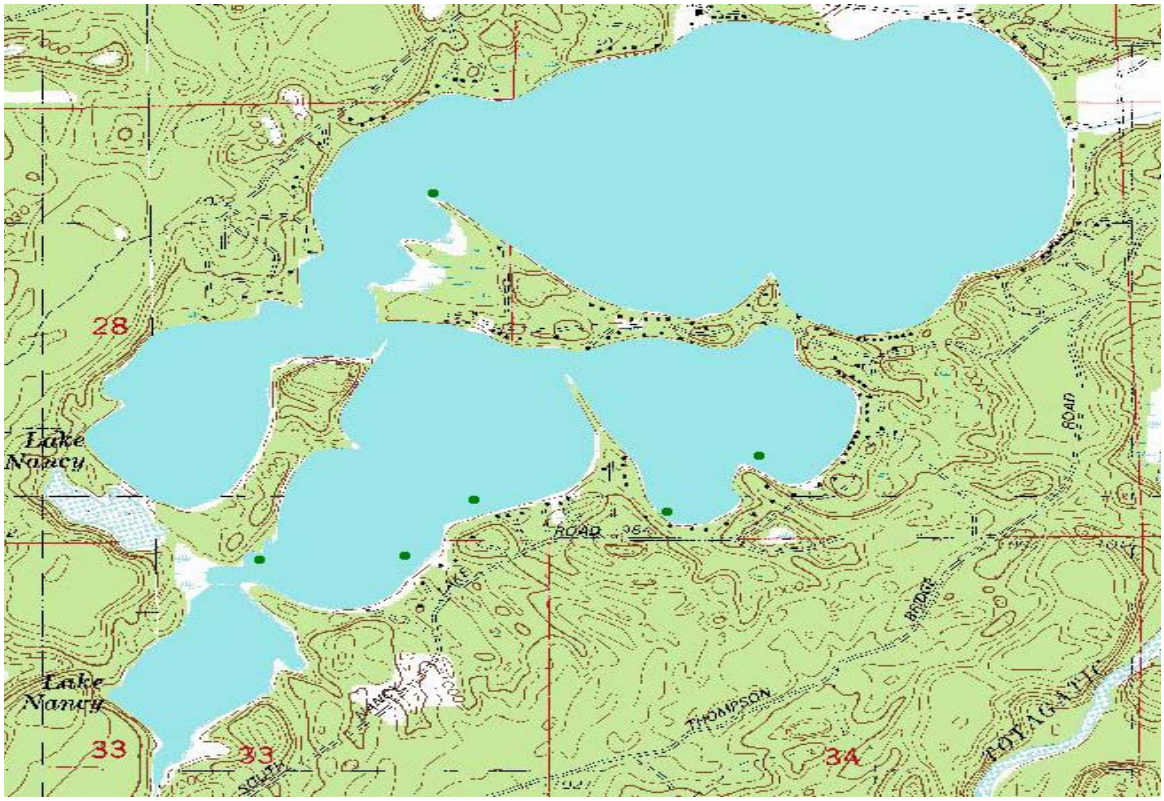

Figure 22. Northern Water Milfoil (*Myriophyllum sibiricum*) Distribution, August 2008.

Aquatic Plant Management

This section reviews the potential management methods available to reach plan goals, reports existing management activities, and presents aquatic plant management goals and strategies for Lake Nancy.

Discussion of Management Methods

Techniques to control the growth and distribution of aquatic plants are discussed in Appendix E. Permitting requirements and herbicide use to manage invasive species are discussed below. The application, location, timing, and combination of techniques must be considered carefully.

Permitting Requirements

The Department of Natural Resources regulates the removal of aquatic plants when chemicals are used, when plants are removed mechanically, and when plants are removed manually from an area greater than thirty feet in width along the shore. The requirements for chemical plant removal are described in Administrative Rule NR 107 – Aquatic Plant Management. A permit is required for any aquatic chemical application in Wisconsin.

The requirements for manual and mechanical plant removal are described in NR 109 – Aquatic Plants: Introduction, Manual Removal & Mechanical Control Regulations. A permit is required for manual and mechanical removal except for when a riparian (waterfront) landowner manually removes or gives permission to someone to manually remove plants, (with the exception of wild rice) from his/her shoreline up to a 30-foot corridor. A riparian landowner may also manually remove the invasive plants Eurasian water milfoil, curly leaf pondweed, and purple loosestrife along his or her shoreline without a permit. Manual removal means the control of aquatic plants by hand or hand–held devices without the use or aid of external or auxiliary power.[13]

Herbicide Use to Manage Eurasian Water Milfoil

The Army Corps of Engineers Aquatic Plant Information System (APIS) identifies the following herbicides for control of Eurasian water milfoil: 2,4-D, diquat, endothall, fluridone, and triclopyr.[14] All of these herbicides with the exception of diquat have granular and liquid formulations. It is possible to target invasive species by using the appropriate herbicide and timing. The herbicide 2,4-D is most commonly used to treat EWM in Wisconsin. This herbicide kills dicots including native aquatic species such as northern water milfoil, coontail, water lilies, spatterdock, and watershield. Early season (April to May) treatment of Eurasian water milfoil is recommended to limit the impact on native aquatic plant populations because EWM tends to grow before native aquatic plants.

Granular herbicide formulations are more expensive than liquid formulations (per active ingredient). However, granular formulations release active ingredient over a longer period of

[13] More information regarding DNR permit requirements and aquatic plant management contacts is found on the DNR web site: www.dnr.state.wi.us.

[14] Additional information provided by John Skogerboe, Army Corps of Engineers, personal communication. February 14, 2008.

time. Granular formulations, therefore, may be more suited to situations where herbicide exposure time will likely be limited such as in small bands or blocks. In large, shallow lakes with widespread EWM, a whole lake treatment with a low rate of liquid herbicide may be most cost effective because exposure time is greater. Factors that affect exposure time are size and configuration of treatment area, water flow, and wind.

Application rates for liquid and granular formulations are not interchangeable. A rate of 1 to 1.5 mg/L 2,4-D applied as a liquid is a middle rate that will require a contact time of 36 to 48 hours. Application rates recommended for Navigate (granular 2,4-D) are 100 pounds per acre for depths of 0 to 5 feet, 150 pounds per acre for 5 to 10 feet, and 200 pounds per acre for greater than 10 foot depths. Navigate has been applied to Lake Nancy at rates of 100 to 150 pounds per acre.

Current and Past Plant Management Activities

Eurasian Water Milfoil Management[15]

Eurasian water milfoil (EWM) was first identified in Lake Nancy in 1991. Since then, the Lake Nancy Association actively sought to control the EWM population beginning with seeking permits for treatment in the mid to late 1990s. It took approximately two years of communication with DNR and Wisconsin legislators for the lake association to be able to actively pursue milfoil control.

In 1996-7 Nancy participated along with eleven other lakes in the *Wisconsin Milfoil Weevil Project* conducted by the DNR and UW Stevens Point Wisconsin Cooperative Fishery Research Unit. Weevils were sampled on the EWM in 1996. In 1997, 3,870 weevils and larvae were stocked in the lake in EWM beds. Data subsequently collected over a three year period showed a slight overall increase in the number of weevils in the EWM beds, but the number of weevils varied greatly from time to time. The major conclusion of the study was "EWM biomass decreased slightly from 1996 to 1998, however, this change was not significant." The authors of the report concluded that 1) even though there was some growth in weevil numbers in Nancy, they could not keep up with the spread of EWM and 2) that stocking more weevils would not be an effective method of control. Among the eleven other study lakes no significant increases in weevil density or significant declines in EWM were found.

In 2000 LNPA attempted to "deep cut" EWM using a bladed cutter in the "mother bed" (largest area) of EWM. Staff from Blue Water Science cut the milfoil, and LNPA volunteers raked it together and loaded it into boats. Volunteers then transported the weeds to the shore and to a local farm for disposal. Volunteers felt that the work needed to do this in just one bed of EWM in the lake was excessive, and they stated that they would not undertake such a project again. Also, they were concerned that uncollected plant fragments would spread milfoil around the lake.

The Lake Nancy Management Plan (McComas, 2001) recommended treating EWM with herbicides. The Department of Natural Resources approved the plan and treatment method, and the LNPA began treatment of EWM beds with the herbicide 2,4-D beginning in 2001. This treatment was at a rate of 100 pounds per acre until 2008 when the rate was increased to 150

[15] Information from Sam Lewis, President, Lake Nancy Protective Association. October 2008.

pounds per acre.[16] EWM herbicide treatment is summarized in Table 10 below and illustrated in Figure 23 on the following page.

Table 10. EWM Treatment Records for Lake Nancy[17]

Year	Date of Treatment	Applicator	Locations	Total Acres
2001	8/06/01	Midwest AquaCare	Mother Bed (Big) Maloneys (Big) Ehler's Point (Big) Deep (Map w/permit)	0.8
2002			Six Areas	2.5
2003	7/08/03	Midwest AquaCare	Near Marsh Creek (Big) Scatter in Deep (Map w/permit)	9.8
2004	6/28/04	Midwest AquaCare	Seven Areas (No Map)	5.9
2005	6/29/05	Midwest AquaCare	Eight Areas Big Lake (Map w/permit)	5.2
2006	6/22/06	Midwest AquaCare	Eight Areas (No Map)	5.3
2007	6/28/07	Midwest AquaCare	Nine Areas Big Lake Deep Lake (Map w/permit)	6.5
2008	6/27/08	Midwest AquaCare		7.4

[16] Personal communication. Pat Wier, LNPA. October 2008.
[17] Where treatment dates are shown, information is from DNR permit records or memos.

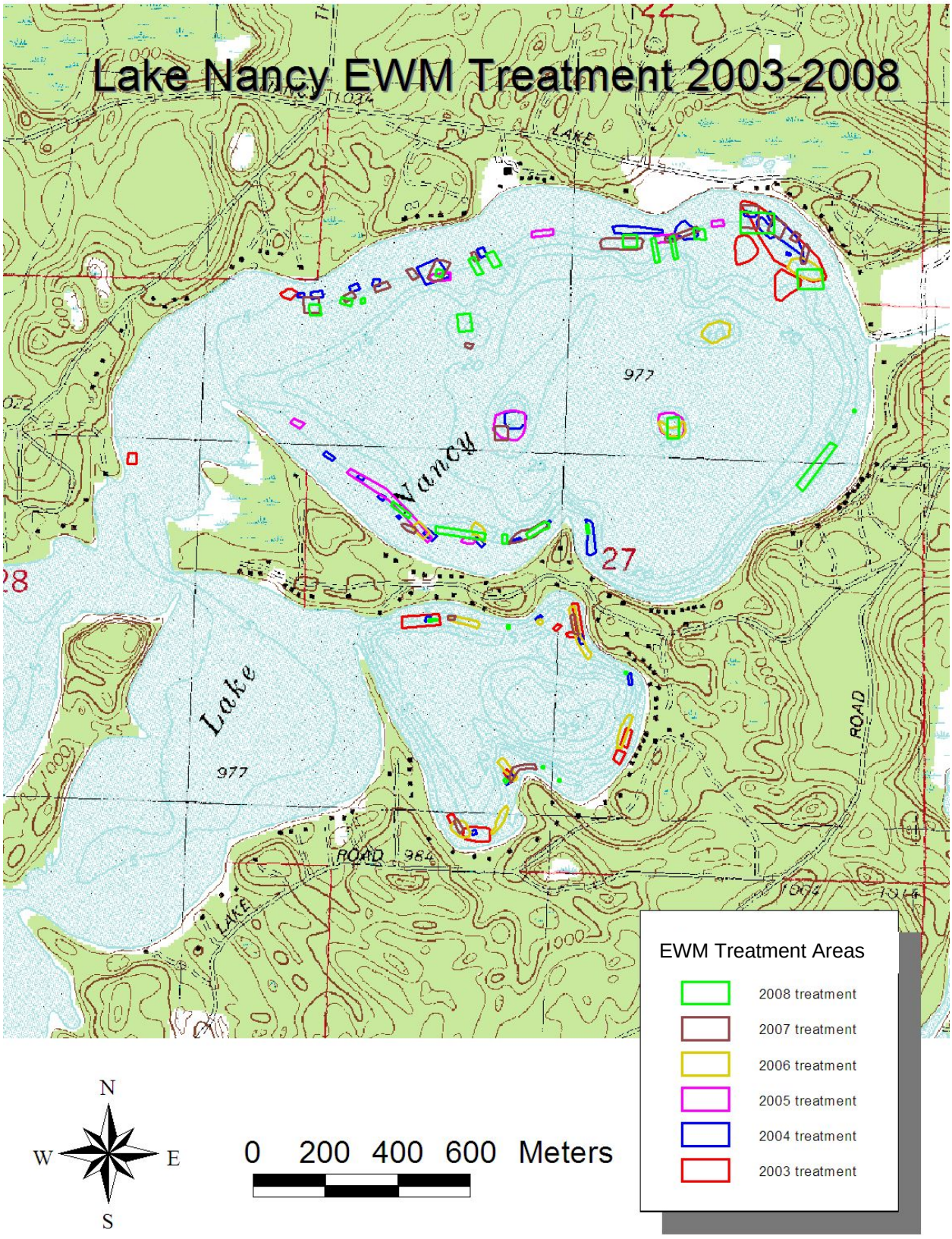

Figure 23. EWM Treatment Areas 2003 - 2008

Monitoring and Education[18]

Shoreline and AIS Education

In 2007 LNPA initiated an effort to educate shoreline property owners about good lakeshore practices. Board members assessed shoreline parcels to identify concerns such as trailers parked illegally, malfunctioning septic systems, areas of shoreline erosion, phosphorus runoff and clear cutting of lakefront. LNPA board members have also hand delivered materials relating to good shoreline practices to all owners around the lake. The LNPA spring and annual association meetings included talks given by DNR staff and county conservation officials about AIS and good shoreline practices. LNPA newsletter and handouts have included information about similar topics. Newsletters are sent to all owners regardless of whether they have joined the LNPA.

Water Quality

LNPA completed volunteer water quality monitoring since 2001.

Clean Boats, Clean Waters

Paid staff provided boat monitoring and education in the spring and summer of 2006, 2007, and 2008. The project, funded by a DNR AIS grant, was in conjunction with Kimball Lake, which is in the watershed. Most of the monitoring on Lake Nancy (over 95%) is done at the Deep Lake landing since this is where most boats come into the lake. Some monitoring is completed at the end of Three Mile Road. This project educates property owners and visitors about milfoil and other invasive species.

Maintaining Boating and Swimming Access Corridors

No records were found of property owners maintaining an opening in front of their waterfront by using herbicides on Lake Nancy. However, many lake residents report that aquatic plants have been "sprayed in front of your property within the last five years" as shown in Figure 20 below. It is possible that residents are reporting that EWM was sprayed in front of their property recently rather than the having contracted to have weeds sprayed around their dock. Survey results show that many residents use manual methods to maintain a waterfront access corridor.

[18] Much of the information in this section is taken from the Nancy Lake 2008 Aquatic Invasive Species Grant application.

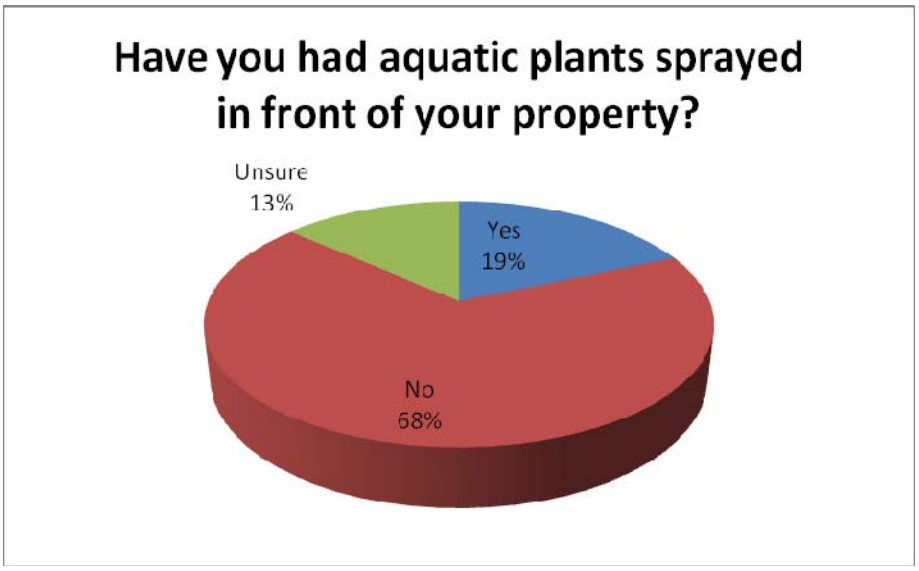

Figure 24. Response to Question 11

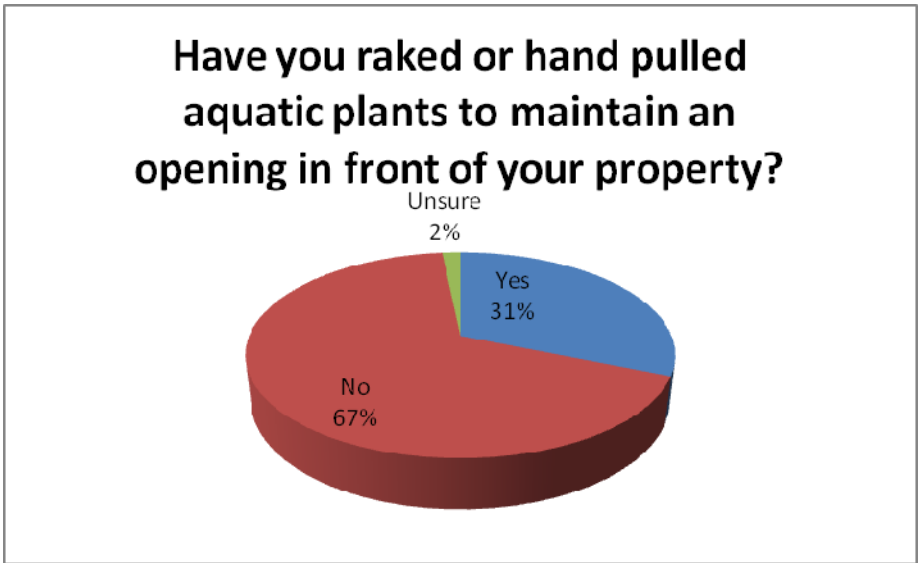

Figure 25. Response to Question 12

Using herbicides to maintain a waterfront access corridor is not recommended in this plan. The DNR recommends (and may require) that residents who wish to maintain an opening for boating and swimming use rakes or other hand methods.

The Department of Natural Resources Northern Region Aquatic Plant Management Strategy (May 2007) requires documentation of severely impaired navigation or nuisance conditions before native plants may be managed with herbicides. Severe impairment or nuisance will generally mean that vegetation grows thickly and forms mats on the water surface.

Plan Goals and Strategies

This section of the plan lists goals for aquatic plant management for Lake Nancy. It also presents a detailed strategy of actions to reach Aquatic Plant Management Plan goals. Educational strategies that outline audience, messages, and methods are included under each goal.

Overall Purpose

Preserve the Lake Nancy ecosystem for future generations.

Plan Goals

Goal 1) Prevent the spread of Eurasian water milfoil.

Goal 2) Prevent the spread of purple loosestrife.

Goal 3) Prevent the introduction of other aquatic invasive species.

Goal 4) Preserve the lake's diverse native plant communities.

Goal 5) Minimize runoff of pollutants from the Lake Nancy watershed.

Goal 1) Prevent the spread of Eurasian water milfoil (EWM).

Objective: Total growth of EWM in Lake Nancy is limited to less than ten acres in beds of 80 percent or greater density each year.

Objective: EWM does not spread and establish in Shallow Lake Basin, Pecos Bay, or Lost Lake.

Objective: EWM from Lake Nancy does not spread to other lakes.

Objective: Lakeshore owners and visitors understand appropriate actions to take to control EWM growth in Lake Nancy.

Action: Map EWM beds to establish treatment areas.

(Note treatment areas for 2009 are mapped in Figures 19 and 20.)

Action: Use DNR pre and post-monitoring protocol to monitor effectiveness of treatment efforts and re-emergence of native plant species.

Action: Place yellow milfoil buoys around significant areas of EWM infestation.

Action: Treat EWM beds according to plan standards.

Action: Consider new treatment methods based upon experience from other Wisconsin and Minnesota lakes.

Action: Regularly monitor shallow areas of the lake (Shallow Lake Basin, Pecos Bay, and Lost Lake) for EWM. *(Note: board members will initially take on this responsibility. Consultants may be hired to complete this survey periodically.)*

Action: Carry out a standard of no-tolerance if EWM is found in shallow areas of Lake Nancy.

Action: Participate in and support Town of Minong Lakes Committee.

Action: Inform Lake Nancy residents and visitors about EWM programs.

Audience
Lake owners
Lake renters
Visitors

Message
AIS identification: pictures and information
Contact a Lake Nancy board member if you find suspected EWM.
Describe EWM control program and effectiveness
Yellow buoys indicate areas of EWM infestation. Avoid these areas when using watercraft on Lake Nancy.

Methods
Distribute new shoreline homeowner packets
Post boat landing signs
Produce and mail AIS educational materials to residents.
Present information at lake association meetings

EWM Treatment Standards and Methods for Lake Nancy

Standards for treatment

High Density Growth in Deep and Big Lake Basins

- Herbicide treatment will occur in EWM beds of 80 percent and greater density.

Scattered Growth in Shallow Lake Basin, Pecos Bay, and Lost Lake

- No tolerance standard for EWM growth
- Diver pulling and/or hand pulling will be used to remove all scattered plants.
- Herbicide treatment may be used if beds of EWM become greater than 200 square feet with a density of at least 25%.

Treatment methods

Divers

- Seek volunteer divers or hire divers to hand pull EWM
- All EWM plant fragments will be removed from the lake and disposed on an upland area (to the greatest extent practical).

Herbicide treatment

- Treat Eurasian water milfoil beds early in the season when new EWM growth is from 1 – 3 inches (late May to early June).
- Use granular 2,4-D at a rate of 100 lbs./acre at depths < 5 feet, 150-175 lbs./acre at depths from 5-10 feet, and 200 lbs./acre at depths >10 feet – or as modified by best available information.
- Treat EWM early in the day when the winds are calm.

- Consider expanding treatment areas beyond the boundaries of the mapped bed of high density growth an additional 10 to 20 ft. beginning in 2011 if plan objectives are not being met and funds are available.
- Use these expanded treatment areas for no-tolerance zones of Lake Nancy.

Schedule and roles for herbicide treatments[19]

Feb/March preceding treatment
Contract with herbicide applicator. (LNPA Board)
Apply for aquatic plant management permit from DNR. Permit will be based upon potential acreage mapped in late summer of preceding year using standards for treatment of EWM areas listed previously.

Spring preceding treatment (First three weeks of May)
Residents to notify Board EWM lead of potential EWM locations via email or telephone. Board EWM lead or designee checks for presence of EWM in suspected locations and records boundaries of EWM beds using GPS equipment. This mapping will focus in and near areas where EWM has been found previously.

Prior to treatment (late May)
Consultant will map treatment areas and provide specific treatment area and location to contractor, lake association, and DNR permit staff.

Early season treatment (late May to early June)
Contractor to apply herbicide according to permit conditions when new EWM growth is from 1-3 inches. Use granular 2,4-D at a rate of 100 lbs./acre at depths < 5 feet, 150-175 lbs./acre at depths from 5-10 feet, and 200 lbs./acre at depths >10 feet – or as modified by best available information.

Board EWM lead or designee will supervise contractor, notifying contractor and DNR when new EWM growth reaches one inch and overseeing permit conditions such as location and timing of treatment, and wind conditions that preclude treatment.

Measure effectiveness of treatment according to DNR monitoring protocol (Four weeks following treatment or late June to early July)
(Board EWM lead or Consultant)
Sample EWM beds noting species rake fullness for EWM and native species at each sample point. Compare results to treatment standard and prepare potential treatment area for next season. Assess whether total acres meet treatment threshold. There will be no treatment if the total acreage is less than two.

Late Summer/Early Fall
Identify additional potential EWM treatment locations using a map of previous EWM locations– note where EWM is present/suspected with GPS equipment. (Board EWM lead)

[19] All monitoring to be completed according to DNR pre and post treatment monitoring protocol which identifies 4-10 points per acre with aquatic plant species measured by rake fullness at a scale of 0-3. Outer boundaries of beds will be mapped with GPS points to create polygons. The DNR monitoring protocol is found in Appendix G.

Goal 2) Prevent the spread of purple loosestrife (PL).

Objective: Identify purple loosestrife locations each year in August.

Objective: Remove purple loosestrife from identified locations.

Action: Train volunteers and seek expert volunteers to identify and survey for purple loosestrife along the Lake Nancy shoreline.

Action: Coordinate contracted survey for purple loosestrife with contracted EWM surveys that occur in July and August.

Action: Follow Department of Natural Resources recommended treatment methods for removal of purple loosestrife.

Action: Implement an education strategy to prevent PL spread as outlined below.

Audience
Lake captains (board members assigned specific stretches of Lake Nancy shoreline)
Lake residents

Messages
Purple loosestrife is present on Lake Nancy.
Trained volunteers can help identify PL.
Call lake captains (and other trained volunteers) for help with PL identification.
Mark suspected PL locations with flags before you call for help.
Call a LNPA Board member for help.

Methods
Lake captain training
Standard methods: newsletters, brochures, posters, boat landing signs, annual meetings

Goal 3) Prevent the introduction of other aquatic invasive species.

Other aquatic invasive species may include aquatic plants such as curly leaf pondweed or animals like zebra mussels among many others.

Objective: Residents, renters, and visitors understand the impacts of AIS and the actions they can take to prevent their introduction.

Objective: AIS introductions are prevented

Objective: If introduced, aquatic invasive species are discovered early

Action: Carry out Clean Boats, Clean Waters program at boat landings using paid monitors.

Action: Conduct June surveys for curly leaf pondweed in the years that whole lake point intercept surveys are completed.

Action: Conduct surveys for other invasive species as information and methods become available.

Action: Consider and potentially implement new methods for AIS prevention, such as remote camera monitoring, as they become available.

Action: Carry out a comprehensive AIS prevention education program as outlined below.

Audience
Lake residents
Renters
Visitors
Town of Minong

Messages
Report status of existing and potential Aquatic Invasive Species
Washburn County has a do not transport ordinance

Methods
Standard methods: newsletters, brochures, posters, boat landing signs, annual meetings

Goal 4) Preserve the lake's diverse native plant communities.

Objective: Prevent disturbance of native plants from watercraft

Objective: Limit disturbance of native plants from homeowner removal

Objective: Educate people regarding functions and values of native plants

Action: Implement recommendations from the DNR Lake Nancy Critical Habitat Area Study when available.

Action: Consider establishing no-wake zones to prevent the disturbance of native plants and to prevent the spread of EWM and PL.

Action: Implement an education strategy aimed at preserving native plants in Lake Nancy.

Audience
Lake residents
Renters
Visitors
Town of Minong

Messages
Shallow bays are important for wildlife diversity.
Healthy populations of native plants help to prevent introduction and spread of invasive species.
Diverse native plants provide diverse habitat for wildlife.
Invasive plants reduce plant and animal diversity.
Abundant plants keep the water clear, especially in shallow areas of the lake.
Native plant removal is discouraged because disturbance provides areas for invasive species to grow.
If you believe you have EWM, please call a board member to confirm identification.
Request/suggest that boaters and personal watercraft operators travel at no wake in certain areas to prevent plant removal and introduction of EWM and other invasive aquatic plants.
Manage waterfront properties with minimal plant removal.
If you need to remove plants in front of your property, rake to a maximum opening of no more than thirty feet. Less is better.

Methods
Standard methods: newsletters, brochures, posters, boat landing signs, annual meetings

Goal 5) Minimize runoff of pollutants from the Lake Nancy watershed.

Objective: Lake residents restore and preserve shoreline buffers of native vegetation.

Action: Continue implementation of shoreline owners' education program.

Audience
Waterfront property owners

Messages
Shoreline buffers protect water quality and provide fish and wildlife habitat.
Describe ways to restore shoreline buffers (natural recovery, stop mowing, plant natives).
Cost sharing for restoration shoreline buffers is available from Washburn County.
Describe the Washburn County shoreline buffer requirements and how to report violations of these requirements.
Highlight good examples of shoreline buffers on private waterfront property.

Methods
Standard methods: newsletters, brochures, posters, boat landing signs, annual meetings

Measurement
Ask who has changed buffer zones or other shoreline practices as a result of educational efforts.

Adaptive Management Approach

The EWM treatment areas, standards, and methods will be reviewed each year to see if they are effective and cost efficient. Changes may be made to the treatment approach based upon project results, the experience of other lake groups, and/or recommendations from the Department of Natural Resources. Significant changes will be documented as brief addendums to the aquatic plant management plan to be reviewed by the Lake Nancy Protective Association Board, the APM Committee, and the Department of Natural Resources.

Implementation Plan

Action Items[21]	Timeline	Cost 2009	Cost 2010	Cost 2011	Responsible Parties
Prevent Spread of EWM					
Map EWM treatment areas	Late Summer	16 hours	16 hours	16 hours	LNPA Board
Pre and post treatment protocols	May and Summer	$3,100	$3,100	$3,300	Consultant LNPA
Place yellow milfoil buoys	Early Summer	4 hours	4 hours	4 hours	LNPA
Treat EWM beds according to plan standards	May	$5,500	$5,500	$5,800	LNPA Treatment Contractor
Monitor shallow lake areas	Spring/Summer	8 hours	8 hours	8 hours	LNPA
Hand pull or diver pull shallow areas where EWM is discovered	Summer	$500 - $1,000	$500 - $1,000	$500 - $1,000	Contractor or LNPA
Participate in Minong Town Lakes Committee	On-going	40 hours	20 hours	20 hours	LNPA Volunteers
Apply for APM permits	December	4 hours	4 hours	4 hours	LNPA
Work with treatment applicator	May	20 hours	20 hours	20 hours	LNPA
Prevent Spread of purple loosestrife (PL)					
Train volunteers to identify PL	Late Summer	8 hours	8 hours	8 hours	LNPA, DNR
Contract for PL survey	As Needed		$800		LNPA Contractor
Follow recommended treatment methods	Late Summer	8 hours	8 hours	8 hours	LNPA

[21] See previous pages for action item detail.

Action Items[21]	Timeline	Cost 2009	Cost 2010	Cost 2011	Responsible Parties
Prevent introduction of other AIS					
Carry out Clean Boats, Clean Waters	Ongoing	$8,000	$3,000	$3,000	LNPA, DNR
Conduct June CLP survey (2013)	Spring				Consultant LNPA
Conduct other AIS surveys (as available)	Ongoing		$1,000 (unknown)	$1,000 (unknown)	LNPA Consultant
Preserve native plant communities					
Implement Critical Habitat Area Study recs.	Ongoing	Unknown	Unknown	Unknown	LNPA, DNR
Consider no-wake zones	Ongoing		$1,000		LNPA, Town
Minimize runoff of pollutants					
Develop runoff survey	Winter		$500		LNPA, County LWCD/UWEX
Conduct survey	Spring		$500		LNPA, LWC
Educational activities					
Produce AIS materials	Ongoing	$400	$400	$200	LNPA, DNR UWEX
Update signage at boat landings	Ongoing	$100	$300	$100	LNPA
Newsletter articles and special AIS mailings	Ongoing	24 hours	24 hours	40 hours	LNPA, Others
Runoff education	Ongoing	16 hours	8 hours	16 hours	LNPA, DNR
Education at association meetings	Ongoing	8 hours	8 hours	8 hours	LPNA, DNR, etc.
Critical habitat education	Ongoing	8 hours	8 hours	8 hours	LPNA, DNR
LNPA Board shoreline initiative	Ongoing	8 hours	8 hours	8 hours	LNPA County LWCD

Action Items[21]	Timeline	Cost 2009	Cost 2010	Cost 2011	Responsible Parties
Identify habitat/shoreline demo site	Summer		8 hours		LNPA
AIS workshops	Spring/Summer	8 hours	8 hours	8 hours	LNPA, DNR County LWC
Administration					
Ensure funding is available to implement plan	Ongoing	20 hours	20 hours	20 hours	LNPA Board
Apply for AIS grant funding	February 2009 August 2011	40 hours		40 hours	LNPA Board
AIS grant reporting	Ongoing	40 hours		40 hours	LNPA
Update point intercept survey and APM plan	2013				LNPA Board Consultant

Monitoring and Assessment

Aquatic Plant Surveys

Aquatic plant (macrophyte) surveys are the primary means to track achievement toward plan goals.

Action: Conduct whole lake aquatic plant surveys approximately every five years to track plant species composition and distribution.

The whole lake surveys will be conducted in accordance with the guidelines established by the Wisconsin DNR. Any new species sampled will be saved, pressed, and mounted for voucher specimens.

Aquatic Invasive Species Grants

Department of Natural Resources Aquatic Invasive Species Grants are available to assist in funding the action items in the implementation plan. Grants provide up to 75 percent funding. Applications are accepted twice each year with postmark deadlines of February 1 and August 1. With completion and approval of the aquatic plant management plan funds will be available not only for education and planning, but also for control of aquatic invasive species.

The Nancy Lake Protection Association currently has a Department of Natural Resources Grant for Aquatic Invasive Species Planning and Education. The objective of the project is to gather more information about the extent and location of native and invasive aquatic species in these lakes. The project includes public education through distribution of written materials, an educational workshop, volunteer monitoring for EWM, the aquatic plant survey completed as part of this project, and this plan. The DNR will pay 75 percent of project costs with this $17,931 grant. The grant period is from April 1, 2007 through December 31, 2008.