Pearl Lake
WIBIC # 195400
Sensitive Area Designation Report

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28 July 2004
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General Lake Information:
Pearl Lake located in central Waushara County is a glacial kettle lake approximately 92 acres in size. The maximum depth is 49 feet and has a relatively small littoral zone. Observed Maximum Colonization Depth (MCD) of aquatic plants is 26 feet according to data gathered from the Aquatic Plant Survey.

The shoreline on Pearl Lake is prone to surges of natural growth of near shore vegetation due to fluctuating water levels. This natural process should be accepted and welcomed because of the high value these plants have to water quality, fish and wildlife. In fact, thousands of dollars a year are spent on shoreline restoration work – what this lake does naturally. The same plants nurseries grow for restoration work grow naturally along Pearl Lake's shore. As an example, another lake subject to similar water level fluctuations in Marquette County had shown to have $880.00 of plants generated naturally along 50 feet of frontage. This is a natural shoreline restoration phenomenon that has been occurring for millennia, which fish and wildlife have evolved around and actually depend on today. From 1975 to 1996, water levels were monitored sporadically showing less than 1.0 foot of fluctuation. However there is anecdotal evidence that the water elevations fluctuates have ranged 2-3 feet.

Low-lying areas and shorelines that are dry one year can be flooded the next. Plants respond accordingly and either grow or retreat in response to the water level. During high water years species of fish like northern pike may use these areas intensively to spawn on the inundated vegetation. During drier years when fish can not migrate to these areas, other animals such as herps and birds will use the same areas.

The fishery is chiefly composed of largemouth bass, northern pike and panfish. Despite an extensive history of stocking, from 1933 to present, thousands of fish have been stocked without any noticeable spawning of walleyes, smallmouth bass and trout. The

lake is capable of supporting a two-story fishery through stocking, which the WDNR stocked trout historically from 1951 to 1970. Trout stocking ceased due to very low survivability from year to the next.

Wildlife consists of waterfowl, furbearers, herps, reptiles and raptors. On several occasions eagles have been seen by residents. It is likely other raptors such as ospreys often utilize the lake for fishing also. Some areas of the lake are more conducive to certain species of wildlife than others. Development pressure and habitat types play an important role in what kind of wildlife can be expected. For instance, some high value upland areas that are connected to the lake are just as important to wildlife as the lake is. These areas with diverse shorelines, provides a connection or travel corridor from water to the land. The occasional sightings of eagles, ospreys and animals near the shore are a testament to this. Protecting and maintaining sensitive areas is important to ensure that wildlife, fish; water quality and aesthetics are present for future generations.

In the early 1990's Eurasian Watermilfoil (*Myriophyllum spicatum*) was found. Since then, milfoil density and distribution have increased until herbicide treatments started. Eurasian Watermilfoil (EWM) appears to be decreasing however eradication has not been achieved. This is not unusual as very few lakes, if any, can claim 100% eradication once this plant has been established. The presence of EWM can have a negative impact on the flora and fauna of the lake by out competing native vegetation leaving monotypic stands of EWM. These stands obviously have lower diversity and can become a nuisance to users. Any EWM found in the lake regardless of its location should be removed in a sensible manner.

Introduction:

The intent of a Sensitive Area Designation (SAD) are to identify areas as offering critical or unique fish and wildlife habitat, including seasonal or lifestage requirements, or offering water quality or erosion control benefits to the body of water. The entire shoreline of a lake meets these criteria, however some exhibit more unique characteristics that surpass the rest of the shoreline. In some cases, these areas are undisturbed and are still in a natural state. They may be designated out in the water, on land or both. Three areas were designated as areas that show special characteristics above and beyond the rest of the shoreline. The areas had exceptional fishery, wildlife, water quality protection abilities or aesthetics. In all cases, every SAD had a combination of these. This SAD can provide lake organizations, shoreline property owners, county zoning officials, DNR personnel and other users with specific information that can be used for management recommendations and for educational efforts.

The companion document "Guidelines for Protecting, Maintaining, and Understanding Lake Sensitive Area" is attached in Appendix I. This is a generic document designed to be used in conjunction with specific lake sensitive area designation reports to help the user plan for future needs such as, zoning changes, specific town ordinances or land purchases for protection.

What is a Sensitive Area Designation?
Sensitive area designations are defined in Wisconsin Administrative Code NR 107.05(3)(i)(1) – *Sensitive Areas are areas of aquatic vegetation identified by the department as offering critical or unique fish and wildlife habitat, including seasonal or life-stage requirements, or offering water quality or erosion control benefits to the body of water.* These areas may consist of valuable aquatic/wetland vegetation, terrestrial vegetation, gravel/rubble substrate, downed woody cover and water quality buffers.

Following is a list of potential ways sensitive area designations could be used:

- To inform and educate the public of potential impacts to the aquatic ecosystem from shoreline alteration
- By managers to guide permitting processes of aquatic plant management, water regulations, fisheries management, wildlife management and local zoning activities
- By local lake organizations to help guide lake use and management activities
- As a foundation for further research or study
- As a complement to local land-use planning activities
- To provide information to potential shoreland buyers and existing shoreland owners
- As baseline data for various resource management decisions
- To provide education to the public about the benefits of protecting and restoring habitat.

It is a goal of this SAD to include an educational component as well. A "Lake Water Trail" is also included so an interested party can follow a path through each sensitive area to gain a better understanding of why these areas were selected. We encourage you to explore these sensitive areas and witness the many living things that use these unique areas. Appendix II has a map of the SAD, a suggested travel route, and a brief narrative to explain some of the uniqueness associated with the area.

The Sensitive Area Designations:
Three sites during field surveys were designated as sensitive areas because they contain critical or unique habitat (see figure 1.). No removal of any native rooted aquatic vegetation or shoreline alterations should take place unless the appropriate DNR staff has been contacted. Table 1 below contains the GPS coordinates for the start and end of each SAD.

Coordinates for SAD's , Pearl Lake

	Start		Finish	
SAD No.	Lat.	Long	Lat.	Long.
1	44 05' 12.3"	89 07' 1.6"	44 05' 10.3"	89 07 1.5"
2	44 05' 21.5"	89 06' 54.7"	44 05' 17.9"	89 06' 59.9"
3	44 05' 30.8"	89 07' 30.2"	44 05' 28.7"	89 07' 29.9"

Table 1. GPS coordinates for the start and end of all SAD's for Pearl Lake, Waushara County, Wisconsin.

Survey Methods:
An Aquatic Plant Survey was conducted in July of 2004. Aquatic plant communities were mapped and results were tabulated (see Aquatic Plant Survey). In the fall of 2003 and spring of 2004, WDNR Fishery crew also conducted a comprehensive fish survey. Fish data were collected and were analyzed. Data from these surveys, combined with the aquatic plant survey, were used to identify areas around the lake that resource specialist felt are high quality or have unique habitats. The final phase involved a field survey by local Fisheries Technician – Scott Bunde, Wildlife Biologist – Paul Samerdyke, Water Management Specialist – Shawn Eisch, Sub Team Water Leader – Linda Hyatt and Water Resources Specialist – Scott Provost. Each specialist discussed areas and decided which areas to include in the formal SAD.

Resource Value of Site 1:
This site begins from north side of the point located east of the landing. The littoral zone has fair diversity in a rather abundant aquatic plant community, offering habitat for fish and wildlife. Eurasian Watermilfoil is found in isolated cases and should be managed to retard spreading. Despite the moderately developed shoreline, shrub and trees dominate the sloping landscape to the sand and gravel shore. The shore is mixed with submergent vegetation comprised of coontail (*Ceratophyllum demersum*), floating leaf pondweed (*Potamogeton natans*), chara (*Chara spp*.) and slender naiad (*Najas flexilis*). The aquatic plant community is healthy and probably a result of a lack of wind derived waves. The point at the beginning of the SAD provides protection from the prevailing winds.

Primary reasons for site selection were fishery values, wildlife values, water quality protection, and aesthetic qualities. Many of the plants found in this area provide essential habitat needs for fish and wildlife. They are also important to the production of macro-invertebrates (aquatic insects) that benefit the fishery and wildlife utilizing the area. Like most of the lake, this area has decreased habitat value in the shallow areas. Although establishment of more plants would enhance all of the aforementioned values, this area has more aquatic plants than the other near shore areas around the lake. This area is expected to serve as a nursery area for the nearby spawning areas of centrarchids (sunfish family). Mini-fyke netting in this area on 16 July 2003 showed forage species and young-of-the-year panfish using this area. Forage species consisted of golden and blacknose shiners and young-of-the-year panfish were, green sunfish, bluegill, yellow perch and bullhead.

Larger trees and overhanging vegetation along the shore provides roosting and hunting areas for birds, such as kingfishers and herons. However, there is a lack of fallen woody debris along the shore, which could be mitigated by allowing fallen trees to remain in place provided they are not a hazard to navigation. The near shore plants, including the trees, serve as a physical buffer that protects water quality by anchoring sediments and protecting shorelines from wave erosion. Due to the presence of the point, a protected bay offers quiescent waters for birds and animals to retreat to during inclement weather. The entire SAD also adds a relaxing area that is used by boaters who can anchor there to enjoy the peace and aesthetics this SAD offers.

Management Recommendations:

- Exotic species should be monitored and removed
- No removal of native plant species unless navigation from shore is prohibited
- No bank armorment such as rip rap should be permitted, bio-engineer as much as possible
- Enhance natural woody debris along the shore where possible
- Pursue grant options for shoreline restoration(s) where applicable

Resource Value of Site 2:

This site is located on the north shore across from SAD #1. The shoreline is mainly undeveloped (see figure 2.). Threesquare bulrush (*Scirpus americanus*) common to abundant along the sandy shore. The spreading of bulrushes along the shore typify how bulrushes will colonize beaches during low water. As the water levels increase the flooded area will provide excellent habitat for fish and wildlife, especially during spawning and mating seasons. Bulrushes have more mass than submergent species, which can help control wave energy from eroding the banks, while absorbing unwanted nutrients to the lake.

Figure2. Photograph of SAD #2 looking south. Bulrushes and sedges grow on the lake bed. This will be nesting cover in dry years and fish habitat in wet years.

This is exactly the kind of spawning habitat pike and perch need. Even flooding one year out of 5 – 10 can produce a good age class of fish. This area has other benefits as well. Herps and other animals will you use this area as water levels decrease especially salamanders and frogs. Herps will use this area for breeding and shelter also. During low water years when the shore seems to be dry, emergent and wetland plants will begin to grow and reclaim the area, offering habitat for different species. As plant species change, diversity will increase especially during the transitional years. This is another benefit to the lake. Diversity of plant species will equate to a diverse fish and wildlife community.

Some woody debris is present along the shore. During the survey it was estimated that there were 1-2 pieces per 30 meters. This is not considered common but nonetheless it still serves many needs (see woody debris discussion). Wildflowers were also present. Blue Flag (*Iris versicolor*) and Blue Vervain (*Verbena hastata*) were growing along the shore. This area is an oasis for reptiles and birds.

Not only is this SAD important for reptiles and birds, it is very important to forage fish and young-of-the-year panfish. A mini-fyke net set in 2004 had the highest recordings of

forage fish than any other area on the lake. Forage species consisted of Golden Shiners, Bluntnose Shiners, Blacknose Shiners and Banded Killifish. The Banded Killifish is considered a species of special concern by the Bureau of Endangered Resources and is also listed as a "Species of Greatest Conservation Need". The presence of this fish shows the importance of near shore vegetation found on this shoreline. This particular minnow spawns on vegetation when water temperatures reach the mid-70's. The Banded Killifish was found only at this location on Pearl Lake, which can be attributed to the presence of near shore vegetation.

Management Recommendations:

- Protect the natural growth of plants - do not mow during dry periods.
- Do not armor the shoreline; consult with a resource professional before commencing on any disturbances
- Protect the area from any upland erosion.
- Leave the shoreline in a natural state.
- Enhance fallen woody debris at the shoreline.

Resource Value of Site 3:

Site #3 is located on the west end of the lake. The site has a large amount of gravel, cobble and boulders ideal for spawning and fish cover (see figure 3.). The site is also unique on an aesthetics standpoint. The clear water over this glacial deposition plunges into depths beyond the littoral zone, offering a wide range of diverse cover types. This is a rarity in Waushara County Lakes. Typically, lakes in the area were formed in pitted sandy outwash, with few cobbles and boulders. Pearl Lake has been fortunate to acquire this deposit in the littoral zone of the lake. The presence of the cobble and boulders coupled with the submergent vegetation adds diversity to the aquatic habitat of the lake. The "rocky point" is well known to anglers – both human and animals. Eurasian Watermilfoil was encountered in the area, not at nuisance levels but the presence in this area should be dealt with appropriately.

Figure 3. Shows the gravel, cobble and boulders associated with this shoreline and this SAD. This is truly an unique site in Waushara County.

Management Recommendations:

- Exotic species should be monitored and removed
- No removal of native plant species unless navigation from shore is prohibited
- No bank armorment such as rip rap should be permitted, bio-engineer as much as possible
- Enhance natural woody debris along the shore where possible
- Pursue grant options for shoreline restoration(s)

- Maintain wildlife corridors
- Protect natural rock deposition that occurs

Exotic Species:
There was one exotic aquatic plant species found in Pearl Lake - Eurasian Watermilfoil (*Myriophyllum spicatum*) from our survey. An aquatic plant survey from Aquatic Biologists, Inc., found Curly-leaf Pondweed (*Potomogeton crispus*) earlier in the season. This is not surprising as most Curly-leaf Pondweed has senesced and died back by early July. Eurasian Watermilfoil was found in various locations around the lake and appear to be concentrated near disturbed shorelines. Efforts should be continued to curb the spread of this exotic. Aggressive monitoring and removal will aid greatly in this endeavor.

Exotics are mainly spread by human activities. Therefor, efforts should concentrate on controlling the spread by 1) Prevention of new introductions, 2) Preventing the spread of existing stands. These exotics are not uncommon in area lakes, but preventing the spread to other lakes by properly cleaning equipment before entering other bodies of water will ultimately help the local ecosystem and break the "circle" of re-infestation. This is required by law, however it will take cooperation from the public to ensure the spread is stopped.

The dedication of SAD's will also help prevent the spread. Exotic plants can easily become established in areas that are disturbed and where native plants have been removed. Protection of native plant communities is vital to slow the spread of exotics once they are introduced into the lake. Management efforts should continue to try to control this exotic species as much as possible to preserve the overall integrity of the aquatic plant community.

For additional information on the exotics mentioned above and others now entering Waushara County, please call Scott Provost, Wisconsin Department of Natural Resources at (920) 787-4686 extension 3017 or Dick Sachs at (920) 492-5887.

Threatened, Endangered and Species of Concern:
Currently, there are no registered threatened, endangered or species of concern found in the lake. However, during the mini-fyke survey of 2004, the Banded Killifish *(Fundulus diaphanus*) was found and reported to the Natural Heritage Inventory. There are also areas that are adjacent to the lake that offer habitat for endangered species. Different upland species, that usually require open areas, were found within one-mile of the lake. The Karner Blue Butterly (*Lycaeides melissa samuelis*) and the Western Slender Glass Lizzard (*Ophisaurus attenuatus*) were the two species found within one mile of the lake. Activities on the lake such as shoreline alteration can directly affect these species. For more information on Threatened and Endangered species go to www.dnr.state.wi.us/orgland/er or contact the Bureau of Endangered Resources at (608) 264-6057.

Emergent Aquatic Plants:
All of the sensitive areas designated on Pearl Lake have emergent species of aquatic plants. Emergent aquatic plants are defined as plants that have the majority of their vegetative material above the surface of the water. Examples include cattails, bulrush, blue-flag iris, bottle brush sedge, pickerelweed and arrowhead. Emergent plants can tolerate fluctuating water levels and dense stands can dampen shoreline waves.

Emergent plants are highly valuable in aquatic communities for several reasons. The standing dead stalks in the early spring are primary spawning habitat for northern pike and perch. These species of fish do not spawn on beds like bass and other panfish but spawn by broadcasting their eggs on standing material such as old stems, aquatic plants or fallen timber. Without this material spawning will not be successful. Another benefit these plants have is the extensive spongy tissue and air spaces in the leaves. This makes them great nesting material for ducks shorebirds and muskrats. Nest made of these buoyant leaves float up and down with changing water levels.

Roots of emergent plants spread horizontally creating an interlocking network like a jute-backed carpet. This growth pattern is very important for stabilizing sediment. It also helps these plants withstand wave action and dissipate the force of upland runoff. Flexible reproductive strategies allow emergents to take advantage of variable conditions. When water levels are low, they reproduce from seeds that germinate on exposed lakebed. When water levels are high, they are equally successful at staking out territory with spreading roots and horizontal buried stems, called rhizomes that send up new shoots.

There is an important connection with emergent plants to the shoreline and all aquatic organisms. Emergent plants are part of the "Transitional Area" between the aquatic world and the terrestrial (land) world. Fish utilize these areas for cover from predators and to feed on a large array of invertebrates such as insects that uses these plants. Not only do fish use these areas year-round, but also many animals you typically don't associate with lakes utilize these areas. Raccoon, Whitetail Deer, Red Fox, songbirds and reptiles are just some animals from a long list of organisms that depend on these areas. An interesting fact, 80 percent of all the threatened and endangered species live near the shore. It's no wonder when you think about the diversity of plant life near the shoreline.

Many lakes in the area were once home too vast and extensive stands of emergent vegetation. These areas are disappearing due to development and human activities near the shore. A recent study found nearly a 66 percent reduction of vegetative cover in developed lots when compared to undeveloped lots. That can be interpreted as 66 percent less habitat for fish and wildlife.

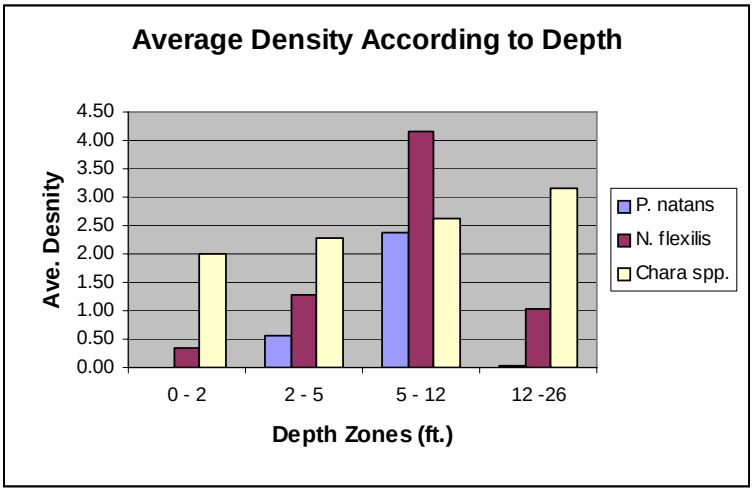
The resource values of emergent vegetation have been pointed out but there are several values to the riparian landowner. Stands of emergent vegetation prevent mats of free floating plants or plant fragments from reaching the shoreline, thus preventing the nuisance to the landowner. Emergent vegetation also protects against shoreline erosion,

thus reducing the need for bank armorment along the shoreline such as rock riprap or concrete seawalls. These plants can also be very aesthetically pleasing.

Habitat Enhancement:

There is a general theme in this report about the lack of vegetation, specifically habitat in the near shore area of the lake. Using data from the Aquatic Plant Survey, it becomes apparent where the need for habitat enhancement exists. Figure 4 shows the aquatic plant density at varying depths. The low density of plants in the 0-2.0 foot range show where habitat is lacking.

Figure 4. shows aquatic plant density at different depth zones. Plan habitat enhancement projects to fill the void of habitat along the shore.



All too often the remedy to this seems to be the installation of fish cribs or other structures in deeper water. However we see that the highest density of plants (habitat), are found there. This suggests that any habitat enhancement should rather be done near the shore where it is needed the most. Addition of cribs and other structures in the deeper water should not be the priority. Different strategies can be employed to allow safe and reasonable habitat enhancement activities in the near shore areas. Allowing fallen trees to remain in the water when possible and decrease aquatic plant removal from raking are some important steps. Participating in shoreline restoration projects and educating riparian owners of the importance of the near shore areas can also be effective in restoring the necessary habitat fish and wildlife need.

Fish and Habitat:

In 2004, DNR fishery crews conducted a comprehensive fish survey. A comprehensive fish survey is an assessment of the entire fish community in a lake. Different survey methods are used to sample all the different fish species that inhabit a lake (including the smaller forage fish). Fyke-netting and boomshocking are the primary fish capture methods, however, seines and other gear may also be utilized. Once fish are captured, information can be collected as it relates to species composition, abundance, size structure, age classes, growth, survival, and reproductive success. The following summary provides some of this information for most major species.

Major highlights are listed below:
Largemouth bass is the dominant gamefish (or predator)
Northern pike are also present but in lesser numbers
Both predators exhibit below average growth rates
Largemouth Bass are considered abundant estimated population of 15 bass/acre
Largemouth Bass have poor size structure (Length Range = 5.7-18.2 inches)
Very few bass are making it over 14 inches (see figure 5.).
Below Average growth rates (bass not legal size (14 inches) until their 7th year of life.

Slow growth rates of bass (see figure 5) could be the result of a combination of two main issues, overharvest of legal bass and limited near shore habitat. Overharvesting of legal bass results in high numbers of smaller bass competing for the same forage base. Limited near shore habitat (aquatic vegetation and wood) results in fewer forage fish, bluegill make up almost the entire non-gamefish forage base for bass and northern pike.

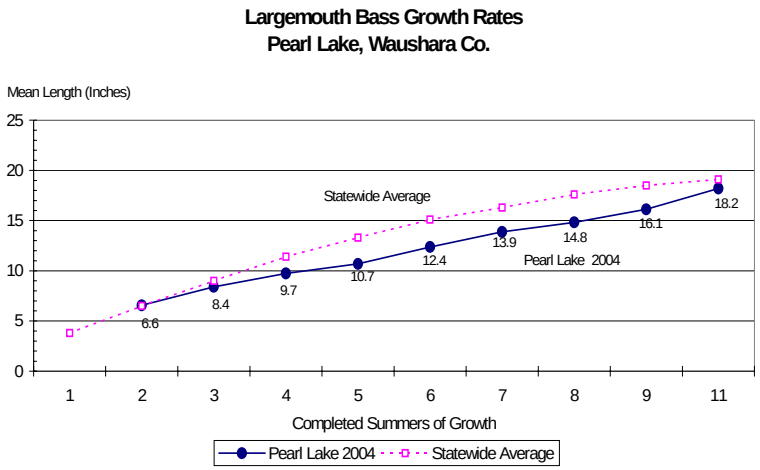


Figure 5 shows the average growth rate of largemouth bass in Pearl Lake compared to the statewide average. According to these data, Pearl Lake bass reach the legal size almost 2 years later than the statewide average.

Northern Pike show similar results. The population of Northern Pike is considered average abundance with and estimated population of 4 northern pike/acre. The size structure is poor with a length range of 9.1-28.3 inches. As with the largemouth bass the growth rates for northern pike are below average with few fish attaining legal size (see figure 6.).

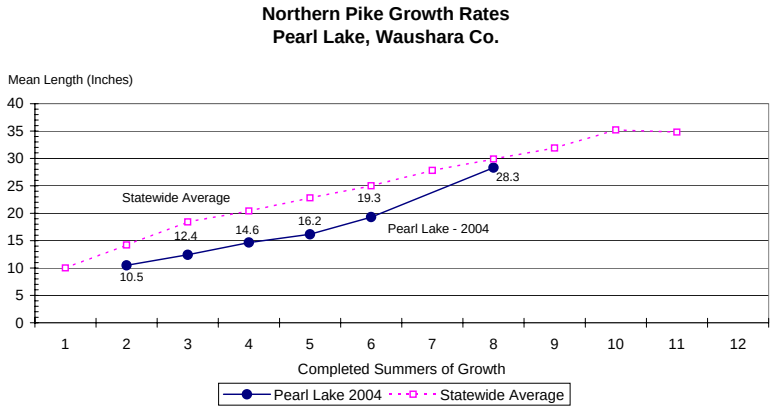


Figure 6. shows the average growth rate of northern pike in Pearl Lake compared to the statewide average. According to these data, Pearl Lake pike reach the legal size later than the statewide average.

Bluegill is the dominant panfish (or prey) in Pearl Lake. The population was found in good abundance with average to slightly above average growth rates. Size structure is good with 65% of bluegill larger than 3 inches are also larger than 6 inches. Abundant mid size bass has had an impact on the number of smaller bluegills (83% of all bluegills sampled were larger than 5 inches). Black crappie, yellow perch, green sunfish were present in much lower numbers. Lack of suitable spawning habitat is a limiting factor in the success of black crappie and yellow perch.

The population of Bluegill is considered good (electrofishing catch was 737 bluegills over three inches per hour). The size structure is good with a range observed at 2.2-10.4 inches. Growth rates for fish less than 5 inches are below average but then increase after their fifth growing season (see figure 7.).

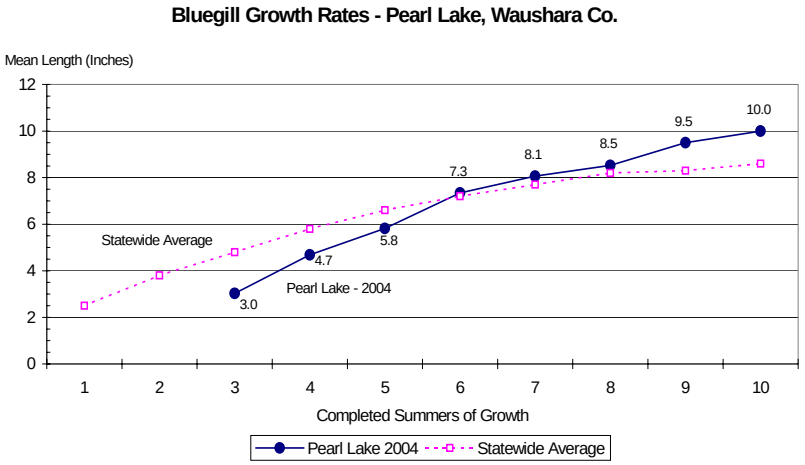


Figure 7. shows average growth rate of bluegill in Pearl Lake. Growth rates are below average on fish <5 inches and above average on fish >5 inches.

Other panfish and forage species found in Pearl Lake consist of white bass, white sucker, golden shiner, blacknose shiner, bluntnose minnow, banded killifish, fathead minnow, yellow and brown bullheads, were other species found in lower abundance and made up a smaller portion of the panfish/prey population. The presence of forage fish is absolutely critical to maintain a balanced fishery. Without forage fish, the beginning of the food chain is absent which can contribute to the growth and abundance of the sought after fish species. Near shore habitat must be present to for many of the forage species found in Pearl Lake. Thus protecting the near shore habitat for forage species will ultimately enhance the lake's game fish fishery.

Shoreland Management:

Wisconsin's Shoreland Management Program, a partnership between state and local government, works to protect clean water, habitat for fish and wildlife, and natural scenic beauty. The program establishes minimum standards for lot sizes, structural setbacks, shoreland buffers, vegetation removal and other activities within the shoreland zone. The shoreland zone includes land within 1,000 feet of lakes and 300 feet of rivers and floodplains.

A critical part of protecting our water resources is the establishment and protection of an adequate buffer. A shoreland buffer should extend from the water onto the land at least 35 to 50 feet. Recent studies have shown that many species of wildlife may require up to 500 feet of buffer for habitat. Buffers of 50 feet and more help filter pollutants from runoff associated with impervious surfaces such as driveways, rooftops, roads and fertilized lawns.

Water gardens have been an increasing trend in the United States the last decade. By using native shoreline plants a riparian owner may have a very exquisite water garden with very little effort. Many of these species are visually attractive and serve an important function. By leaving these plants undisturbed, or by adding more native species, one can add a water garden to your property that would benefit everything on the lake. Incorporating aquatic plants with other natural features a very relaxing space can be developed that would still allow room for watercraft. If any plantings are proposed in the lake, be sure plant only native species.

Shoreland restorations should focus on native plant communities and should include aquatic vegetation as well as the canopy, herbaceous, shrub and tree layers. Please contact your local DNR Lake Management Coordinator, Scott Provost (920) 787-4686 ext. 3017 learn more about shoreland restoration and associated grant programs.

There are also programs through the Waushara County Land Conservation Department that can offer grants to qualifying applicants to help pay up to 70 percent of the cost of shoreline restoration. Please contact the Waushara County Land Conservation Department at (920) 787-0443.

Woody Debris:
The loss of woody debris in lakes is a concern across the State. The removal is usually associated with increased development and shoreline alteration. Although woody debris may seem unhealthy to the lake it is in fact a very important component to the life cycle of insects, fish and reptiles. It is also critical to protect shorelines from erosion.

If we relate woody debris to near shore vegetation it becomes clear that like fluctuating water levels, trees have been following into lakes for millennia also. Like near shore vegetation, many insects, fish and reptiles have evolved around this and now depend on it. Thousands of years of evolution of species have taken place around this and then in the last few decades woody debris has been removed leaving the dependant organisms without a crucial component to their life cycles. There is no doubt the loss of woody debris near the shore has affected the biology of a lake.

The loss of woody debris can be mitigated fairly easy in a physical sense. However it will take adjustment on riparian owners perception to make this a feasible habitat enhancement option. Allowing fallen trees to span into the water from shore can be accomplished by simply allowing it to happen or by strategically placing dead trees in areas where they are not a navigational hazard. As mentioned before, placing habitat

structures in the appropriate areas is much more beneficial than placing submerged structures where plant habitat already exists.

History and Cultural Sites:

Humans have inhabited Waushara County for millennia. Native Americans utilize the rich diversity of the native flora and fauna for everyday purposes and actually were the first residents around the lake. Burial sites, campgrounds, food caches and mounds have all been found in the area. Some of these are believed to be along the shores and nearby the lake. Native Americans used these areas for gathering and storing food, as well as for ceremonial purposes. Perhaps they may have been some spiritual connection to the lake. We may not exactly know why these areas were chosen but we can rely on history to tell us something. A historical search of the area would be something to consider in the future, but it is beyond the scope of this project. The point to remember is that these areas were considered "special" for many years, which leads to further need to protect these areas.

Whole Lake Management Recommendations:

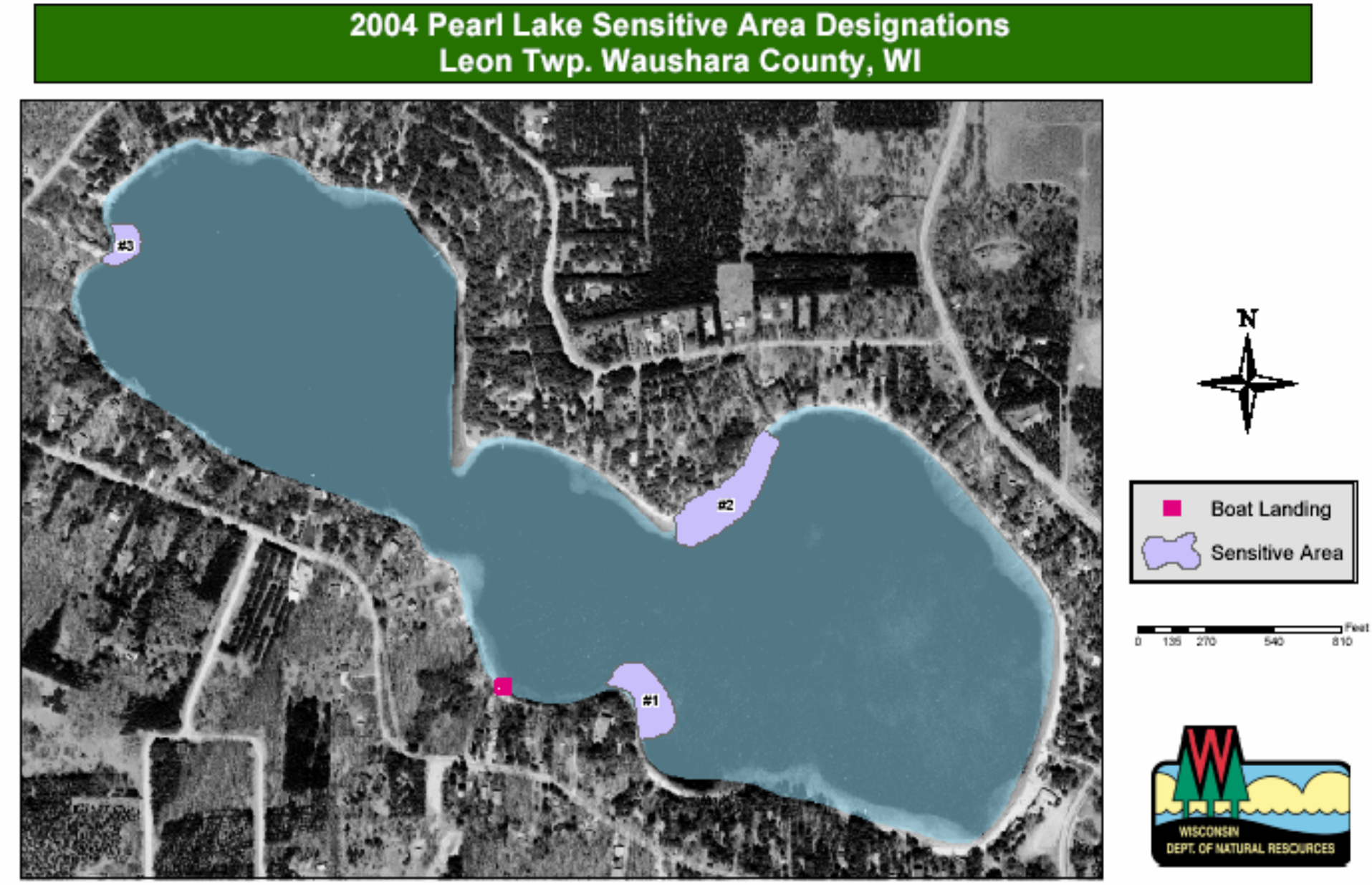
Resource managers made several recommendations on a whole lake basis.

1. Maintain as much of naturally felled woody debris as possible.
2. Restore shoreland buffers and discourage sea walls and riprap on developed sites.
3. Educate landowners about the importance of a healthy lakeshore buffer.
4. Protect terrestrial vegetation within 75 feet of the shore.
5. Manage and prevent the spread of Eurasian Watermilfoil
6. Reduce entire tree removal for viewing purposes; try to trim choice limbs.
7. Protect adjacent wetlands and spring areas from development pressures.
8. Properly maintain septic systems to protect water quality.
9. Obey the slow no-wake rules and ordinances

Conclusions:

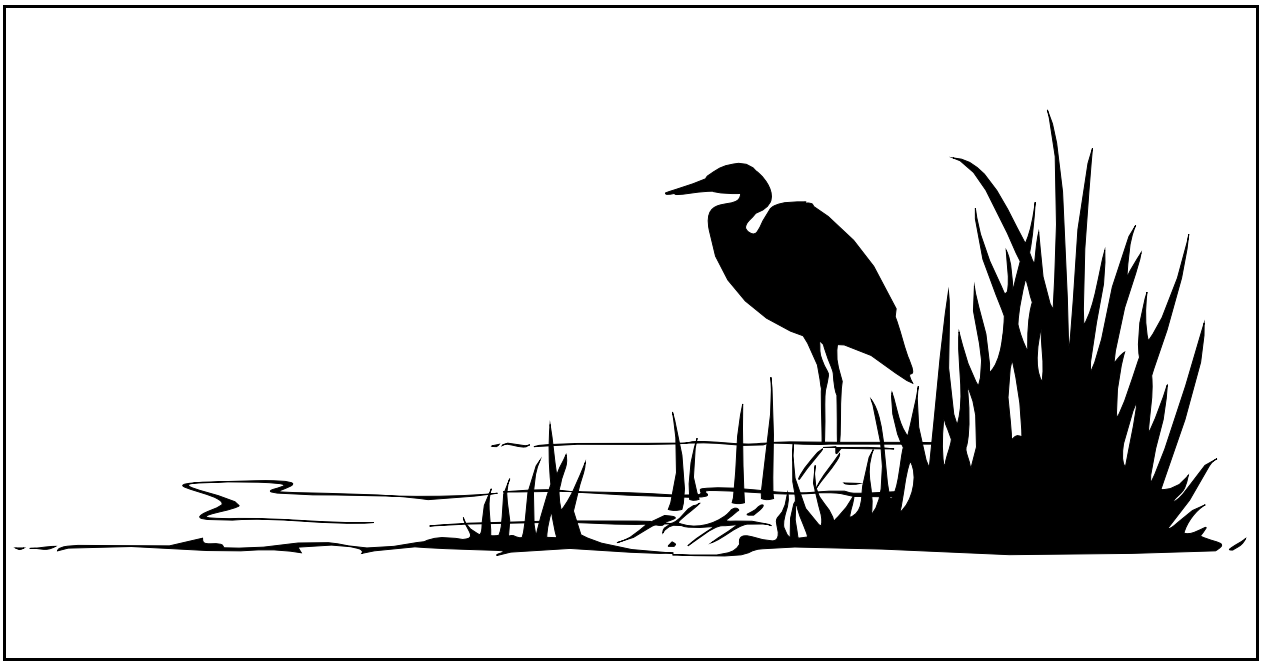
Pearl Lake is an unique lake that deserves special attention. Three sensitive areas were designated on the lake because they contribute to the uniqueness of the lake as a whole. These areas also provide essential functions that make the lake what it is. Special care should be taken to protect these areas and other areas on the lake from further disturbance. Restoring disturbed shorelines and shoreland buffers to a more natural state would be even more desirable to water quality, aquatic life and wildlife. Obeying the slow no-wake speed restrictions within 100 feet from shore will dramatically decrease shoreline erosion. Lakes are one of the state's most valuable resources and without proper protection, the water quality will quickly deteriorate resulting in degradation of fish and wildlife habitat. All lake ecosystems are sensitive to change and human impacts. It is critical that we protect and restore these valuable resources.

Figure1. Map of Sensitive Area Designation for Pearl Lake, Waushara County.



Appendix I

GUIDELINES FOR PROTECTING, MAINTAINING, AND UNDERSTANDING LAKE SENSITIVE AREAS AND CRITICAL HABITAT



A companion document to help understand lakes sensitive area reports

GUIDELINES FOR PROTECTING, MAINTAINING, AND UNDERSTANDING LAKE SENSITIVE AREAS AND CRITICAL HABITAT

A companion document to help understand lakes sensitive area reports

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GUIDELINES FOR PROTECTING, MAINTAINING, AND UNDERSTANDING LAKE SENSITIVE AREAS AND CRITICAL HABITAT

This document was originally designed to be used in conjunction with specific lake sensitive area survey reports; but it can also be useful to other parties interested in protecting lakes by helping them understand important factors which affect water quality and lake ecosystem health. This document will concentrate on several main areas within the lake and its' shoreline areas that can be protected or restored to maintain water quality and lake ecosystem health. These main areas include aquatic plant sensitive areas, shoreline land use and lakeshore buffers, gravel and coarse rock rubble habitat, large woody debris, and various water regulations and zoning concerns.

This document will not attempt to deal with land use problems that do not fall within the immediate shoreline areas; although it should be recognized that lakes may have problems that occur in these outlying areas of their watershed resulting in significant nutrient and sediments additions that threaten the overall health of the lake ecosystem and should be dealt with through land acquisition and subsequent deed restrictions and implementation of non-point source control best management practices.

UNDERSTANDING AQUATIC PLANT SENSITIVE AREAS

The importance of aquatic plant communities are frequently under appreciated and their importance to a lake's ecosystem health misunderstood. This is often evident by the way people refer to aquatic plant habitat as problem weeds or weed beds. A weed by definition is a plant that is out of place or a plant of no value. The vast majority of native aquatic plants grow where they should be growing based on available light (water clarity & light penetration), water depth, and bottom substrate or soils. They are not out of place and are extremely important for the proper functioning of a healthy lake ecosystem and are an integral part of the biotic integrity. Aquatic plants (macrophytes & algae) are the primary energy source upon which the rest of the lake food chain is based and dependent upon. Fisheries are dependent upon them for cover, spawning habitat, important habitat and cover for fingerlings and young of the year, critical habitat for aquatic insects and other important food or forage species (minnows). They also serve an important

function in reducing the shoreline erosion associated with wave action while stabilizing sediments in place, and aquatic plants lock up available phosphorus which would otherwise be available to drive undesirable algae blooms.

Aquatic plants also provide many important functional values for wildlife: Loons require aquatic vegetation for their nests, and waterfowl and furbearers require aquatic vegetation for food and cover. Songbirds, shoreline waterbirds, frogs and other amphibians, reptiles, and a host of other wildlife require aquatic vegetation for some critical need throughout different life cycles.

Use of Aquatic Herbicides

Because the potential ecological risks associated with aquatic herbicide applications are high, most aquatic herbicide applications must be approved through the DNR permitting system and the application must be completed by a DATCP certified aquatic herbicide applicator. Those herbicides that don't require a DNR permit often can't meet the intended goals of the user resulting in potential impacts without real nuisance relief.

The herbicides that don't require a permit are restricted to granular or pellatized forms and usually will only work in a narrow set of environmental conditions. If the site conditions include much of any fine flocculent sediments effectiveness can be dramatically reduced or eliminated. Many of these herbicides will work on only a limited number of species increasing the importance of having a qualified applicator retained.

Aquatic herbicide applications should be discouraged if:

I. Less invasive or less destructive methods of control are feasible for the site and may include one or more of the following: mechanical harvesting, hand pulling, hand raking, hand cutting, and nutrient controls within the watershed. All too often herbicide treatments are conducted adjacent to private docks in situations where hand pulling or raking were easily a viable option and should have been the only allowable practice.

II. A result in an overall reduction or fragmentation of important native aquatic plant habitat would occur.

III. If created openings run a high risk of exotic species invading the treated area.

IV. Results in direct and indirect mortality species such mussels and other invertebrates. Some treatments can also result in the gradual build up of copper in the lake bed sediments to the point of being toxic to aquatic organisms. Several lakes in Northwestern Wisconsin have already reached or are approaching copper concentrations or levels that would be toxic or considered a lethal dose to 50% (LD50) of selected aquatic organisms exposed to similar concentrations under laboratory conditions. A serious problem that needs to be carefully considered is that copper does not break down, and it continues to build in concentration in the lake bed sediments with each subsequent treatment containing copper.

If people are going to treat aquatic plants they must understand that the available phosphorus will be expressed in larger plants or algae. Any attempts to suppress the expression of the available phosphorus will usually be very short term (7 days). It is difficult to justify adding toxic chemicals which do not break down and continue to build up towards toxic levels with each subsequent treatment.

V. If the cumulative impacts of the treatment could eliminate or seriously impact the available habitat. This reduction in available habitat can result in an even greater percentage reduction in the overall fish populations for the lake. Elimination of habitat in even a small percentage of a lake, especially in critical habitat areas, can cause the collapse of a fishery.

VI. If nutrient management from plant recovery is practiced.

VII. If the targeted aquatic plants serve an important function in reducing the shoreline erosion associated with wave action.

VIII. If aquatic plant management staff routinely hear complaints from shoreline property owners over the quality of the treatment.

IX. If free-floating species such as coon tail (*Ceratophyllum* sp.) and duckweed (*Lemna* sp.) are expected to drift back into treated areas with the next pervasive wind.

X. If hand raking or pulling near docks or riparian property eliminates the guess work out of what plants will be removed.

Recent changes affecting mechanical removal and hand pulling of aquatic vegetation.

As exotic species, such as Eurasian Water Milfoil, expand their distribution within the state, more opportunities for spreading these exotics will occur. Removing native species can increase the risk of an exotic becoming established. When exotics are introduced into an area they have to find a suitable location to become established. If all the suitable growing sites are occupied by native species the exotic will have a much more difficult time establishing a reproducing population.

The Department has recently developed the necessary administrative rules within NR 109 to comply with the legislative mandates. These focus on protecting native aquatic plant habitat to reduce the risk of exotic species invasions, while also recognizing the importance of protecting and maintaining the native aquatic plant habitat and the functions it performs in maintaining overall lake health. These rules allow for manual removal of plants without a permit if the removal is confined to a path 30 feet wide, and as long as any pier, boat lift or swimming raft is within that 30-foot path. If individual shoreline owners would like to consider removing vegetation by hand pulling or raking in widths greater than 30' they must apply for an aquatic plant management permit with their local DNR aquatic plant management specialist.

Summary of management recommendations for the protection and restoration of aquatic plant communities

The following management recommendations provide some basic concepts that can be used or implemented to insure the long term health of aquatic plant communities and the overall health of lakes ecosystems.

1. Prohibit chemical treatment of aquatic plants accept under extenuating circumstances such as:

    A. The habitat to be treated is a dominant feature in the lake and the cumulative treatment of small areas will not reduce the overall percentage of coverage.

    B. There is no other management alternative that will work to clear necessary navigational access channels identified in a

    C. Treatment will not result in a loss of critical habitat

    D. It can be shown that chemical treatment will result in an improvement to the overall health of the ecosystem.

    E. a serious use problem clearly exists

2. Discourage mechanical harvesting of aquatic plants in most circumstances. Clear only Department approved NR 109 permitted navigational channels 20'-30' wide. If small areas adjacent to docks are to be cleared of vegetation hand raking or pulling should be used if at all possible. Please consider the cumulative impacts if everyone was to duplicate the actions you take on your property around the rest of the lake.

3. Educate lake users about the value and importance of native aquatic plant habitats. Lake districts and associations should try to educate new property owners as soon as possible about the value of critical habitat and the laws associated with protecting lakes and lake front property.

4. Apply aggressive erosion control measures to all bare soil areas

5. Protect existing natural plant cover in upland areas within at least a 50'-60' corridor of the waters edge and reestablish an effective buffer of natural plant cover where it has been eliminated. This corridor or buffer is an important component in protecting water quality and habitat against eutrophication and sedimentation. It will also provide critical habitat for our shoreline species of wildlife. Lake districts and associations should try to educate new property owners as soon as possible about the value of shoreline buffers and the laws associated with protecting lakes and lake front property.

6. Encourage the enforcement of existing zoning regulations and uniform enforcement.

7. Provide feed back with public officials when it waivers and variances of existing zoning regulations are proposed.

8. Encourage the requirement of mandatory erosion control plans for all building permits that require ground breaking.

9. Filling, dredging, or other shoreline or littoral zone alterations covered by chapter 30, Wisconsin Statutes. These should be prohibited unless there is clear evidence that such an alteration would benefit the lake's ecosystem.

10. Lake districts should carefully consider the value of purchasing shallow water bays and designated sensitive areas.

SHORELINE LANDUSE AND LAKESHORE BUFFERS

The impacts that can result from shoreline development can be reduced if done carefully that respect the many important functional values that must exist to maintain a healthy lakes ecosystem. Natural shoreline vegetation provides important protection for lake water quality as well as ecosystem health and should be maintained for at least a 50-60' buffer strip adjacent to any waterbody. If shorelines have a steeper gradient than 10-15% the buffer strip width should be increased. Access corridors through this buffer zone are restricted by most county zoning regulations. Restrictions usually prevent the clearing of woody vegetation and mowing to no more than a 30' width of the shoreline. Property owners that care about the health of their lake's ecosystem can go a step further by reducing the clearing of vegetation to a narrow foot path. The best design for a foot path is an irregular trail that does not go in a direct line to the lake but has irregular meanders much like a stream. An irregular path will help prevent runoff from flowing directly down the path, delivering sediments and nutrients to the lake.

The importance of maintaining natural vegetation along the lake shoreline is important for several reasons. As land is cleared and developed irregular surface areas are lost, leveled, and filled in by earth moving equipment, reducing infiltration and increasing runoff. The natural spongy layer of decaying leaves and plant matter is also removed further reducing infiltration and increasing runoff. Soil porosity is also decreased, decreasing infiltration and increasing runoff. As we lose the different levels of canopy shoreline plants provide we decrease the layers present for intercepting rainfall, which can increase the liklihood of runoff. Runoff can be laden with sediments and nutrient that are detrimental to surface water.

Shoreline buffers can be used to increase the build up of leaf litter forming a spongy layer to absorb more precipitation, reducing runoff. Not only does water quality benefit, wildlife will use these buffers as corridors. Also, vegetation that overhangs into the lake, are used by fish as cover and macroinvertebrates. One benefit that is often overlooked is that buffers are the most efficient deterrent for geese. Geese do not like to walk onto shorelines with tall vegetation. They want to be able to see what is around them. This will help keep their annoying droppings from your property and prevent their aggressive behavior during the mating season.

The aesthetic perspective also needs to be evaluated. Everyone likes to look out and see the lake, but very few people like to look at an intensively developed shoreline that reminds them of the urban yards and hectic pace they were trying to get away from. Maintaining the natural wild character of a lake should be the highest priority guiding any development activities. Both man and wildlife will lose if the natural character is allowed to be manipulated to the point our lakeshores begin to resemble urban yards and lawns. This emphasizes the importance of insuring that development is done carefully to maintain as many of the important functional values that the natural undeveloped shoreline had.

The restoration of a naturally vegetated buffer for at least 50'-60' from waters edge should be a very high priority for properties that have been cleared or converted. As previously stated a healthy buffer includes the native trees, shrubs, and herbaceous ground cover that would naturally have existed on a given site or location. The native species can usually be identified by looking at undeveloped shoreline areas.

Summary of management recommendations for the protection and restoration of natural vegetative shoreline buffers

1. Educate landowners about the importance of a healthy lakeshore buffer.

2. Encourage the enforcement of existing zoning regulations and uniform enforcement.

3. Provide feed back to public officials when waivers and variances to existing zoning regulations are proposed.

4. Encourage the requirement of mandatory erosion control plans for all building permits that require ground breaking.

5. Keep as much of the natural plant cover as possible during the construction phases.

6. Utilize only native indigenous plant species for shoreline buffer restorations. Carefully consider site limitations.

Restoration efforts should follow a least disturbance scenario; by first halting mowing within at least the shoreline buffer zone (35' back from the waters edge and with no more than 30' width of the shoreline cleared for access purposes. Landowners are encouraged to go beyond the minimum requirements of the law and increase buffer width. It is important to remember that any ground breaking activities increases the opportunity for transport of sediments and nutrients into the lake; especially within the lakeshore buffer zone.

Landowners participating in shoreline restoration projects, should expect recovery of the natural vegetation within the ground cover to take one or two full growing seasons. Ceasing mowing activities in your buffer can allow the natural seed bank and adjacent root stalks to re-establish itself over several years. This can be augmented by plug plantings of the native herbs species to achieve adequate density and diversity in a faster time frame. Supplemental plantings to establish adequate densities for the tree and shrub layer will have to be used in most situations.

A list of native species that should be used to restore the lakeshore buffer are available through County Land and Water Resources District Conservation staff, please refer to the list of contact names and numbers at the end of this document.

ZONING AND REGULATION CONSIDERATIONS FOR LAKE PROTECTION

Filling, dredging, or other shoreline alterations covered by chapter 30, Wisconsin Statutes, should be prohibited unless there is clear evidence that such an alteration would benefit the lake's ecosystem. Sea-walls and sand blankets should not be allowed in almost all situations. Rock rip-rap should be used only when anchoring difficult shorelines with problematic erosion which can not be handled with just restoration of the native vegetation. If problem areas exist lakeshore property owners should call their local DNR water management specialist staff for assistance or to report a problem area which may be negatively impacting lake water quality or habitat. A list of locally available technical assistance contact names and phone numbers is provided at the end of this document for easy reference.

County shoreland and wetland zoning regulations apply to the areas within 1000 feet of lakes, ponds, and flowages and within 300 feet of rivers, streams, and creeks. The level of zoning varies from county to county. The intent of zoning regulations is to promote wise land use planning while allowing careful development around our precious surface water resources. Most of the counties in northwestern Wisconsin now have lakes classifications which require or prescribe certain setbacks for all structures and the maintenance or re-establishment of shoreline buffers to protect water quality and habitat needs. Most of them as a minimum allow for reasonable use of shoreline areas by allowing a 30’ wide access/viewing corridor through the buffer. The remainder of the lot from the waters edge back 35’should be restored to a natural condition with trees, shrubs, and unmowed herbaceous ground cover including various grasses, sedges, forbs, and wildflowers. On more sensitive lakes county classifications may require or prescribe a wider buffer width and lakeshore property owners are encouraged to contact their local county conservationist and determine what the specific requirements are for shoreline buffers on their lake. A list of locally available technical assistance contact names and phone numbers is provided at the end of this document for easy reference.

In all cases during development, the maintenance of a naturally vegetated buffer zone is critical to preserve a healthy lake ecosystem. In situations where the vegetation has been removed or altered landowners are encouraged to reestablish a buffer zone composed of the natural plant communities. For technical assistance in restoring your shoreline buffer please contact your local county conservationist or county using the names and numbers provided at the end of this document. This ensures that you not only get water quality protection, but you also get the important functional values that the native plants provide for food and cover for shoreline species of wildlife dependent upon them.

EROSION CONTROL DURING LOT DEVELOPMENT

This is one area that can have a dramatic effect on water quality and habitat if it is not done correctly. The volume of sediments and nutrients that can be transported to a lake during the construction phase can equal the amount that would normally have only come off from the same parcel of land over a period of hundreds of years. The compounding effect of this nutrient load can have a dramatic effect on long term lake water quality. By following some basic rules during the construction phase, we can keep most of these sediments and nutrients in place and prevent them from reaching the lake. Curtailing the nutrient load will prevent the nutrients from becoming a part of the lakes internal nutrient cycle. When this cycle becomes unbalanced, a shift from a clear lake to one that has ample nutrients to drive extensive algae blooms each year.

Adequate soil erosion control measures and their proper maintenance during construction are very important and should become a very high priority for individual property owners. Lake association members could play an active part in reaching property owners before the damage is done or minimizing impacts by identifying active sites that need erosion control measures. Contacting property owners to encourage proper implementation of erosion control measures is another step a lake association can take. Public support is needed to create the appropriate level of County Zoning involvement. Mandatory erosion control plans should be a requirement for all building permits that will involve ground breaking. This needs to be coupled with adequate county staff to insure that erosion control plans are being followed and properly implemented and that erosion control measures are properly maintained. More recently county governments have begun to deal with these difficult issues.

Until county wide erosion control ordinances can be established it is strongly recommended that individuals require contractors to develop erosion control plans prior to any construction. The landowner should ensure that the plan is adequate and should call the appropriate agency with questions. The landowner can play an important rule in assuring the compliance of the plan during construction.

By giving erosion control careful consideration prior to construction, serious impacts to our lakes and streams can be minimized or avoided entirely. Yards can be designed with subtle berms to divert runoff into internally drained areas or into constructed depressions to allow sediments and nutrients to settle out and be trapped before reaching our streams and lakes. Silt screen fences, properly installed during construction can protect against "sheet" runoff. Other erosion control methods are required on steep slopes or difficult sites. Your county land conservation staff or DNR technical support can provide expert advice about erosion control.

Protect all topsoil piles by properly locating them away from drainage ways and as far away from the lake as possible. Surround them with a ring of silt screen fence while also seeding them down with an annual rye grass to provide additional stabilization until they are needed.

Never divert rainfall runoff from driveways, roofs, or access roads directly to the lake through drain tiles, culverts, or waterways. Instead, divert runoff into internally drained areas, constructed depressions to allow for settling of sediments and nutrients, or at least into a thickly vegetated site that will provide some degree of filtration and infiltration of runoff. As of late, raingardens have become very popular. These are being employed throughout the state with great success. Information on raingardens can be found at DNR Service Center or local Land Conservation Department.

Management recommendations for constructions site erosion control

1. Minimize disturbance of natural plant communities within shoreline areas (50'-60' from waters edge) so they can continue to act as a buffer. This will protect lake water quality by filtering runoff and providing for infiltration before it reaches the lake.

2. Provide direct oversight of the construction crew during development. Insure that clearing of vegetation is kept to the minimum needed to accomplish the desired construction and avoid any disturbances within at least 50'-60' of any shoreline

   A. Insure that silt screen fences are installed and maintained.
   B. Apply mulch to all bare soil areas that may be exposed to precipitation during none work hours, and especially make sure mulch is applied before weekends. Purchase and use excelsior erosion control mats and other products where necessary.
   C. Provide coarse gravel and crushed rock cover for all areas that have regular heavy equipment traffic, i.e. driveways. Keep all vehicle traffic confined to these protected road surfaces.
   D. Include landscape designs for the protection of water quality i.e., such as holding ponds and depressions which provide for the opportunity to capture and hold runoff while maximizing infiltration and allowing sediments and nutrients to settle out.
   .
   E. Try to eliminate or minimize areas of concentrated flow by reducing the surface area draining through a single path or channel and encouraging flow over multiple paths into depressional areas through the use of berms and other best management practices (BMPs).

3. Report serious erosion control problems that are being ignored, they can result in significant impacts to water quality and habitat.

PROTECTION OF GRAVEL AND COARSE ROCK RUBBLE HABITAT

Gravel and coarse rock rubble free of silt and sediments are critical to the successful reproduction of some fish. Gravel and coarse rock rubble free of silt and sediments are also critical to the survival of different components of the aquatic food chain that supports a healthy lake ecosystem, including aquatic insects, crayfish, and other forage or food species. The greatest threat to these critical habitats is shoreline development that is not accomplished in a manner that maintains an adequate buffer of undisturbed land and does not implement and maintain proper erosion control measures. This buffer is particularly important during ground breaking and construction of lake shoreline areas, because it traps sediments and nutrients within the vegetation and irregular surface areas and small depressions preventing them from reaching the lake and driving algae blooms or burying important habitat.

Summary of management recommendations for the protection of rock rubble *spawning* habitat

1. Educate landowners about the importance of a healthy lakeshore buffer (filter out sediments)

2. Encourage the enforcement of existing zoning regulations and uniform enforcement.

3. Provide feed back to public officials when waivers and variances of existing zoning regulations are proposed.

4. Encourage the requirement of a mandatory erosion control plan for all building permits that require ground breaking.

5. Keep as much of the natural plant cover as possible during the construction phases.

6. Do not use sand blankets to convert natural bottom types to sterile beach sand.

7. Filling, dredging, or other shoreline or littoral zone alterations covered by chapter 30, Wisconsin Statutes, should be

prohibited unless there is clear evidence that such an alteration would benefit the lake's ecosystem.

MAINTENANCE OF LARGE WOODY DEBRIS

Large woody debris or trees should be left in the lake as they naturally collapse and fall into the lake. Large woody debris is often overlooked for its importance in providing critical fish habitat. Species such as largemouth bass require some sort of cover to successfully nest and rear offspring. Bluegills and other species also benefit from the presence of large woody debris. The conversion or removal of natural plant cover within a 50'-60' corridor of the lake reduces or eliminates completely the opportunity for the replacement of large woody debris to the lake. The way large woody debris is perceived, should be in the context of its importance to the health of the lake ecosystem. Pre-formulated perceptions drawn from urban experiences or practices used in urban areas can be very destructive to the way natural environments function in a complex interconnected fashion. A shoreline ringed with fallen trees should not be looked at as untidy or unkempt but one that is providing important benefits to the lake. Fishermen have recognized for decades that fallen trees are often some of the best habitat to fish for bass and panfish. This emphasizes the need to re-assess our value system and begin leaving them for important habitat. Fisheries managers in recent years have begun to increase their educational efforts in this particular area but still have a majority of the public to reach with this important message.

Management recommendations for woody debris

1. Educate lake shore owners about the value of allowing trees to fall into the lake naturally in order to provide valuable habitat for fish and wildlife.

2. Encourage lake shore property owners to become involved in the long term planning for woody debris on their property. Plant young trees for the replacement of older trees.

USE OF FERTILIZERS ON LAKE SIDE LAWNS

From a water quality standpoint lawn fertilizers are a recognizable source of nutrients that property owners can eliminate or control through proper application. More is not better. Landowners are also encouraged to strongly consider the consequences of having a large lawn that extends within 50'-60' of the lakeshore. By reducing your lawn size you not only reduce the amount of sediments and nutrients entering the lake you also provide important habitat necessary to support Wisconsin's wildlife species. Wildlife is dependent upon this important shoreline habitat that is quickly disappearing in the face of increasing development pressures. Another benefit to decreasing lawn size is the reduction in the work load necessary to maintain it; hence you can spend more time relaxing and enjoying your property.

If you feel the need to fertilize your lawn have your soil tested for phosphorus, nitrogen and potassium levels. When applying fertilizers consider the need to have soil phosphorus levels at the maximum recommended level. By applying fertilizers at a lesser rate you can still enhance your lawn without the increased risk of having excess drain into the lake to drive undesirable algae blooms. Get advice from your county or university extension offices and remind them that you are applying the fertilizers to a lakeshore lawn and do not want to over-apply. Any fertilizer use should be discouraged.

Never burn brush or leaves, especially along the lakeshore, in road ditches, or in drainage ways that drain into the lake. The ashes are very high in phosphorus and nitrogen and are soluble in rainwater. The best way to deal with leaves is to compost them. Spreading them in a wooded area that does not drain to the lake is also a good way to deal with leaf disposal. If neither of these is an option bag your leaves and take them to a yard waste collection site for proper disposal.

Do not remove grass clippings from lawns. They contain all the nitrogen and phosphorus your lawn needs. You should not have to apply annual fertilizer regimens. Use a mulching lawnmower because it recycles the clippings into your lawn more efficiently. Never spread wood stove ashes in areas draining to the lake; instead dispose of them with your household garbage during normal refuse pickup times.

Management recommendations for fertilizer use

1. Apply fertilizers only if a soil test has determined that it is nutrient deficient. Add less than the maximum recommendation.

2. The use of a low phosphorus content fertilizers or no-phosphorus fertilizers is strongly recommended if fertilizer is to be applied on lakeshore property.

SEPTIC SYSTEM MAINTENANCE AND NECESSARY REPLACEMENT OF OLD FAILING SYSTEMS

Failing septic systems can pose a significant threat to water quality. This is especially true when large portions of shoreline are developed and when most the lakes watershed is dominated by lakeshore properties. Septic systems that are older then 20 years should be looked at to insure that the filtration field is properly functioning. If the system is not functioning, waste could be perching above the drain field and entering the lake directly without adequate filtration of nutrients and other components. There is no specific rule that septic systems have to be evaluated to determine if they are functioning properly, unless there is a complaint filed or expansion to the dwelling is proposed.

It is generally recommended that you have your septic system pumped of the normal sludge buildup every two to three years. This sludge removal is essential for maintaining and increasing the longevity of the system.

Inspect your system regularly for surfacing effluent around the drainfield. Are there wet areas or strong odors? Do the drains in your home seem to work properly or are they sluggish? Do they make noisy gurgling sounds? If your septic system has any of these systems you should have it inspected by a licensed installer.

Never make any changes to your sanitary system or wastewater piping. This work must be done by a licensed installer. It is not only dangerous to health and human safety, as well as water quality, it is also illegal and can result in fines or penalties. There are no “grandfather” clauses or permissible graywater discharges.

Avoid using a garbage disposal with private septic systems. Put kitchen scraps in a compost pile if at all possible; otherwise, as a last resort put them in with your household garbage. Limit the use washing machines, if possible. Laundry washwater is high in lint, synthetic fibers, and pet hair all of which can cause premature failure of your drainfield. Use a commercial laundry if possible or if you are a weekend resident with a lakeshore septic system wait until you return to your midweek residence with public water and sewer.

A septic system is only intended to break down organic wastes. Never put solvents, furniture stripping solutions, degreasers, petroleum compounds, oil based paints and stains, or other chemicals into your sanitary system.

Diverting sink and shower drains (so called gray water) to lawns and other properties adjacent to the lake will not only impact lake water quality it is also illegal. Gray water must be run through your septic system to allow for the proper filtration of pollutants. There are no exceptions to this without first obtaining necessary permits.

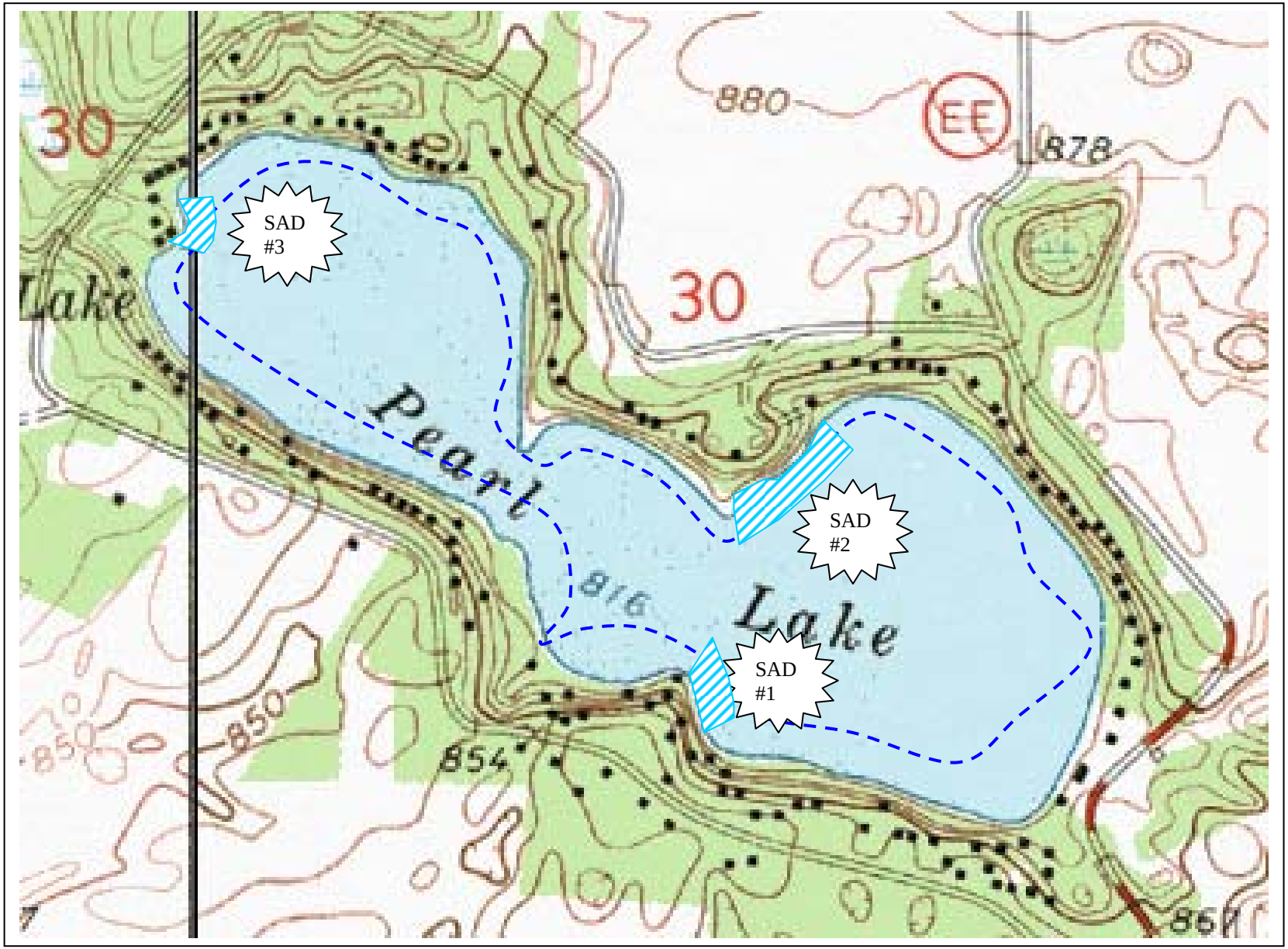
Lakes Technical Assistance Contact Information List

Waushara County:
Land Conservation Department: Mark Schumacher – 920/ 787-7819
DNR Water Regulations: Shawn Eisch – 920/ 787-4686 ext. #3016
DNR Water Resources Biologist: Scott Provost – 920/ 787-4686 ext. #3017
DNR Dam Safety and Flood Plain Engineer and Sub-basin Leader:
Linda Hyatt – 920/ 787-4686 ext. #3010
DNR Conservation Warden: Dave Algrem – 920/ 787-4686 ext. #3027
DNR Fishery Biologist: Dave Bartz – 608/ 297-7058
DNR Wildlife Biologist: Paul Samerdyke – 920/ 787-4686 ext. #3012

Appendix II

Gilbert Lake Water Trail

Pearl Lake Water Trail



The Pearl Lake Water Trail

Start at the landing and work the south shoreline:

Start at the boat landing and immediately work east. To your right you will see submergent plants and possibly colonies of spawning blue-gills with their saucer shaped beds. What else do you see? It's not unusual to see shorebirds probing the shore for insects.

As you approach the point jutting out from the shoreline, notice how steep grade is still forested. Note any birds along the trees; watch for kingfishers and herons. As you work around the point notice how the water is more quiescent. The point blocks the prevailing winds, other animals know this too. Aquatic plants are healthy here, providing habitat for fish and wildlife. What else do you see in SAD #1?

You're in for the long haul now. Follow the shoreline and look down. Notice how the plants change with depth. So will the fish...during the day you may see a large pike hiding under some pondweed waiting for his lunch to arrive. Closer to the evening you'll see bass feeding on the minnows trying to hide near shore. As you approach the north east corner of the lake notice how bulrushes have re-colonized the shore. This is instant habitat. If the water is high, are they flooded? Get close if it is and see what's there.

Cruising along the north shore you are looking ahead. See the entire landscape, the towering trees, the hill going into the water. Take a good look because that probably hasn't changed in hundreds of years. The occasional eagle or osprey knows that. In fact, they like to rest there when they are fishing. At the waters edge you see trees along the shore that's a home! Especially if you're a turtle, frog or a bass. There isn't much erosion there is there? Look at how the vegetation slowly changes as the land meets water. This is a vegetative transition zone is a goldmine for fish and animals due to the diversity.

As you work along the north shore to SAD #3, watch how the patches of bulrush appear. As they soak up nutrients and absorb wave energy, they are a hiding place for the young of the year bass to keep away from Mom and Dad Bass who might be looking to feed. A dragonfly larva crawls out of the water to metamorphose into an adult – amazing how fast they change. Slowly move into SAD #3 and see what you can find. Notice the boulders like an aquatic rock garden, but instead of birds and animals you have fish.

Work back to the landing and keep looking. Maybe you have seen something you haven't before, maybe you didn't. If you did, enjoy it and think out about how unique it was. Then imagine what didn't I see. Something to look forward to the next time around.