

**Pine Lake (Waushara County, Wisconsin)**  
**Sensitive Area Survey Report**

Date of Surveys: July 30 & August 13, 2001

Number of Sensitive Areas: 8

Site Evaluators:

Mary Gansberg, Water Resources Biologist (Green Bay)

Alan Niebur, Fisheries Biologist (Wautoma)

Shawn Eisch, Water Management Specialist (Wautoma)

Nancy Cervantes (Christel), Wildlife Biologist (Wautoma)

Jack and Judy Kusch, Pine Lake Property Owners Association

Author: Mary Gansberg

**General Lake Information:**

Pine Lake sits in northern Waushara County approximately 10 miles south of Waupaca in the Township of Springwater (T20N, R11E, Sections 2 & 3). Pine Lake is a 143-acre hard water seepage lake with no inlet or outlet. A sand spit divides the lake; the west lobe of the lake has a maximum depth of 16 feet and the east lobe has a maximum depth of 48 feet.

There are 108 land parcels around the lake. Approximately 135 property owners are in the immediate direct drainage area to the lake. The lake's development includes a large tract of land on the north shore of the lake that includes the sand spit, which is owned by the Pine Lake Lutheran Camp. There is one public boat landing but no public beaches on the lake.

Numerous species of wildlife inhabit the shoreland areas. Standing dead and dying trees (snags) on the uplands provide habitat for various species of birds and insects. Several species of mammals and birds use cavities in trees for den sites. Salamanders, small mammals and invertebrates use downed and rotting logs for protection, feeding and breeding sites. Down trees

in or at the water's edge (woody cover) are especially valuable for resting and feeding areas. Aquatic and wetland vegetation present at or near the waters' edge provides critical habitat for small mammals, amphibians, reptiles, birds and fish at all life stages.

The best wildlife habitat around Pine Lake is where the shoreline is least impacted or the shoreline buffer is intact. Much of the woody cover has been removed along developed shorelines, both in the water and on the upland. The understory or brush layer is also absent on developed shorelines. This layer provides habitat for small mammals and numerous species of birds. Management recommendations include maintaining the undeveloped shorelines and effectively restoring the developed and disturbed shorelines and shoreland buffers.

The aquatic plant community of Pine Lake is near average quality with approximately 13 species present. The results of the aquatic plant survey conducted in the summer of 2001 is reported under separate cover (Gansberg, 2001). Aquatic plant management permits are required for chemical, mechanical and manual harvesting of aquatic plants. Please contact your Aquatic Plant Management Coordinator, Scott Provost (920) 787-4686 x-3017 before conducting any aquatic plant control activities in Pine Lake.

### **Introduction:**

Surveys were conducted on July 30 and August 13, 2001 using the Wisconsin Department of Natural Resources protocol guidelines for conducting and implementing sensitive area surveys. The purpose of the survey is to identify areas within the lake that have unique or critical characteristics based on the aquatic plant community, fish and wildlife use. Sensitive area designations provide lake organizations, shoreline property owners, county zoning officials, Department of Natural Resources personnel and other interested individuals with specific management recommendations to protect and improve the health of the lake.

The companion document "**Guidelines for protecting, maintaining, and understanding lake sensitive area**" is attached as **Appendix A**. This document is a generic document designed to be used in conjunction with specific lake sensitive area designation reports.

## **Overview of Sensitive Area Designations:**

Sensitive areas 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 buffer areas.

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

- 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 compliment 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 aquatic life habitat

## **Exotic Species**

The only invasive exotic species documented in Pine Lake to date is Eurasian water milfoil. Eurasian water milfoil is present in numerous bodies of water in the area. Exotic species are spread mainly by human activities including boating, fishing, etc. Exotic plants can easily become established in areas that are disturbed and where native plants have been removed; therefore, protection of native plant communities is vital to slow the spread of exotics once they are introduced into the system. 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 of Pine Lake.

## **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.

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, Mark Sesing (920) 485-3023 to learn more about shoreland restoration.

## **Whole Lake Management Recommendations:**

Resource managers made several recommendations on a whole lake basis.

1. Eliminate chemical and fertilizer use on lawns and reduce lawn size.
2. Restore shoreland buffers on developed sites.
3. Educate landowners about the importance of a healthy lakeshore buffer.
4. Protect existing native aquatic vegetation, especially floating-leaf and emergent plants.  
Because of the low relative abundance of water lily, rushes, and sedges, the harvest or elimination of these types of plants through shoreline manipulation, mechanical harvesting, boating impacts, hand pulling or other means should not occur.
5. Do not remove coarse woody cover both in the water and in the shoreland zone.
6. Reduce entire tree removal to see the lake from the picture window by trimming a few choice limbs.

7. Prevent the spread and establishment of exotic species such as Eurasian water milfoil, curly-leaf pondweed, and zebra mussels.
8. Properly maintain septic systems to protect water quality.
9. Obey all slow no-wake areas.

Eight sites on Pine Lake were designated as sensitive areas because they contain critical or unique habitat (**Figure 1**). These areas are highly recommended for additional protection. Below is a description of each site with specific management recommendations for that site.

### **Resource Value of Site 1**

This site starts at the north side of the boat landing and goes northwest approximately 150 feet along the shoreline and is about 25 feet wide (start- 44°13.870N, 89°10.246W; end- 44°13.878N, 89°10.278W). The site consists of sedges and rushes along the shoreline that stand in the water when water levels are higher, but are completely on shore when water levels are lower.

Primary reasons for site selection were fishery values, wildlife values, and water quality protection. During high water times, these plants provide important spawning, nursery, and cover area for fish and substrate for invertebrates. Aquatic vegetation provides excellent habitat for the production of macroinvertebrates (aquatic insects). The invertebrates are an essential part of the food chain. They provide food for several fish species, amphibians, reptiles, birds and larger insects. This site also is an important wildlife area. Emergent aquatic vegetation provides various species of furbearers, birds, amphibians, and reptiles with valuable habitat that is essential for one or more of their functional needs. Frogs and toads rely on this area for nesting, cover, and feeding. The site also offers a physical buffer that protects water quality by anchoring and stabilizing sediments and protecting shorelines from wave erosion.

### **Management Recommendation:**

1. Protect the sedges and rushes in this area regardless of the water level to prevent erosion and to provide habitat for fish and wildlife. Do not remove these plants by physical, mechanical, or chemical means.

## **Resource Value of Site 2**

This site makes up the entire shoreline of the Pine Lake Lutheran Camp excluding the outdoor chapel/beach area. The site starts on the north shore of the west basin follows the shoreline out to the sand spit then continues along the west shore of the east basin until it reaches private property (start- 44°14.005N, 89°10.074W; end- 44°13.989N, 89°09.879W). The site consists of sedges and rushes along the shoreline. Lake water levels determine if the plants stand in water or are on shore.

Primary reasons for site selection include fishery values, wildlife values, water quality protection, and natural scenic beauty. The sedges and rushes provide important spawning areas for northern pike and a nursery, feeding, and cover area for large-mouth bass and panfish. Forage species also utilize this area. The aquatic vegetation provides excellent habitat for the production of macroinvertebrates. This site also is an important wildlife area. Emergent aquatic and near-shore terrestrial areas provide various species of furbearers, birds, amphibians, and reptiles with valuable habitat that is essential for one or more of their functional needs. The site also offers a physical buffer that protects water quality by anchoring and stabilizing sediments and protecting shorelines from wave erosion.

The natural scenic beauty rating of this site was very good compared to other areas of the lake. Since the Lutheran Camp is only utilized for a few short weeks out of the year, the shoreline and upland areas are fortunately relatively undisturbed. This large contiguous minimally disturbed shoreline not only provides an aesthetic value, but also water quality, fisheries, and wildlife values.

### **Management Recommendations:**

1. Protect the sedges and rushes in this area regardless of water levels to prevent erosion and to provide habitat for fish and wildlife. Do not remove these plants by physical, mechanical, or chemical means.
2. Protect the near-shore terrestrial vegetation for shoreland and upland wildlife.

### **Resource Value of Site 3**

This site is on the north shore of the east basin. The site consists of sparse sedges and rushes both in the water and along approximately 150 feet of shore and approximately 20 feet out into the water (start- 44°14.190N, 89°09.627W; end- 44°14.203N, 89°09.592W).

Primary reasons for site selection include fishery values, wildlife values, water quality protection, and natural scenic beauty. The sedges and rushes provide important spawning areas for northern pike and a nursery, feeding, and cover area for large-mouth bass and panfish. Forage species also utilize this area. The aquatic vegetation provides excellent habitat for the production of macroinvertebrates. This site is also an important wildlife area. Emergent aquatic and near-shore terrestrial areas provide various species of furbearers, birds, amphibians, and reptiles with valuable habitat that is essential for one or more of their functional needs. The site also offers a physical buffer that protects water quality by anchoring and stabilizing sediments and protecting shorelines from wave erosion.

The natural scenic beauty rating was above average compared to other areas of the lake. Although this area is quite small, the more natural looking minimally disturbed shoreline provides an aesthetic value as well as water quality, fisheries, and wildlife values. Because so much of the shore is sand beach, these small pockets are important to the overall health of the lake.

#### **Management Recommendation:**

1. Protect the sedges and rushes in this area regardless of water levels to prevent erosion and to provide habitat for fish and wildlife. Do not remove these plants by physical, mechanical, or chemical means.

### **Resource Value of Site 4**

This site is also on the north shore of the east basin and just northwest of Site #3. The site consists of sparse sedges and rushes approximately 40 feet along the shore by 20 feet wide (middle of site- 44°14.20N, 89°09.39W).

Primary reasons for site selection include fishery values, wildlife values, and water quality protection. The sedges and rushes provide important spawning areas for northern pike and a nursery, feeding, and cover area for large-mouth bass and panfish when water levels are high. Forage species also utilize this area. The aquatic vegetation provides excellent habitat for the production of macroinvertebrates. This site is also an important wildlife area. Emergent aquatic and near-shore terrestrial areas provide various species of furbearers, birds, amphibians, and reptiles with valuable habitat that is essential for one or more of their functional needs. The site also offers a physical buffer that protects water quality by anchoring and stabilizing sediments and protecting shorelines from wave erosion. Even small pockets of emergent and near-shore vegetation are preferred over no available habitat.

**Management Recommendation:**

1. Protect the sedges and rushes in this area regardless of water levels to prevent erosion and to provide habitat for fish and wildlife. Do not remove these plants by physical, mechanical, or chemical means.

**Resource Value of Site 5**

This site is on the south shore of the east basin. It contains approximately 400 feet of shoreline and extends approximately 20 feet into the lake (start- 44°13.855N, 89°09.565W; end- 44°13.917N, 89°09.425W). The site consists of rubble and gravel along the shoreline and out into the water.

The primary reason for site selection was fishery values. This site provides an important walleye and sucker spawning area. It provides even better habitat when water levels are higher because more coarse substrate is available in deeper water for fish to utilize. The substrate also provides excellent habitat for the production of macroinvertebrates. The invertebrates are an essential part of the food chain. They provide food for several fish species, amphibians, reptiles, birds and larger insects. Coarse substrate like this is very limited in Pine Lake.

**Management Recommendation:**

1. Protect this unique and valuable rubble/gravel substrate for fish spawning and macroinvertebrate production.

**Resource Value of Site 6**

This site is on the south shore of the west basin. It contains approximately 300 feet of shoreline and extends approximately 20 feet into the lake (start- 44°13.775N, 89°09.830W; end- 44°13.777N, 89°09.903W). The site consists of diverse near-shore terrestrial vegetation.

The primary reason for site selection was wildlife and natural scenic beauty. This site is an important wildlife area. The shoreline and upland area are relatively un-impacted. A diverse minimally disturbed near-shore terrestrial plant community provides habitat for a variety of wildlife species. The natural scenic beauty rating was above average compared to others areas of the lake. This site not only provides an aesthetic value but also wildlife values. Because so much of the shore is sand beach and developed, these relatively small areas are important to the overall health and aesthetics of the lake.

**Management Recommendation:**

1. Protect the near-shore terrestrial vegetation that currently exists at this site. Maintain shrubs, herbaceous cover, snags, cavity trees, and perch trees for wildlife and aesthetic benefits.

**Resource Value of Site 7**

This site is on the south shore of the west basin. It contains approximately 150 feet of shoreline and extends approximately 25 feet into the lake (start- 44°13.818N, 89°10.011W; end- 44°13.802N, 89°10.029W). The site consists of diverse aquatic vegetation in the littoral area.

The primary reason for site selection was aquatic vegetation. This site has a diverse desirable aquatic plant community in the littoral area from shore out approximately 25 feet. Aquatic plants observed here include chara (*Chara* spp), bushy pondweed (*Najas flexilis*), water celery (*Valisneria americana*), flatstem pondweed (*Potamogeton zosteriformis*), sago pondweed

(*Potamogeton pectinatus*), whitestem pondweed (*Potamogeton praelongus*), elodea (*Elodea canadensis*), northern water milfoil (*Myriophyllum sibiricum*), variable pondweed (*Potamogeton gramineus*), and Illinois pondweed (*Potamogeton illinoensis*). This diverse plant community just off shore is unique on Pine Lake and provides critical habitat for fish, macroinvertebrates, and other aquatic organisms. Because so much of the littoral zone is sand beach on Pine Lake, small areas like this site are important to the overall health of the lake ecosystem.

**Management Recommendations:**

1. Protect the diversity of the existing aquatic plant community in this area for aquatic life habitat.

**Resource Value of Site 8**

This site is on the south shore of the west basin. It contains approximately 150 feet long by 40 foot wide patch of white water lily (*Nymphaea odorata*) and floating leaf pondweed (*Potamogeton natans*) that is unique on Pine Lake (start- 44°13.793N, 89°10.133W; end- 44°13.821N, 89°10.161W).

The primary reasons for site selection were aquatic vegetation and natural scenic beauty. This site offers a desirable aquatic plant community in the littoral area that is not present anywhere else on the lake. The floating-leaf vegetation provides a feeding area for northern pike, large-mouth bass, and panfish and protective cover for large-mouth bass, panfish, and minnows. The aquatic vegetation also provides excellent habitat for the production of macroinvertebrates. The natural scenic beauty rating was above average compared to others areas of the lake because of the abundance of the beautiful fragrant white water lilies.

**Management Recommendation:**

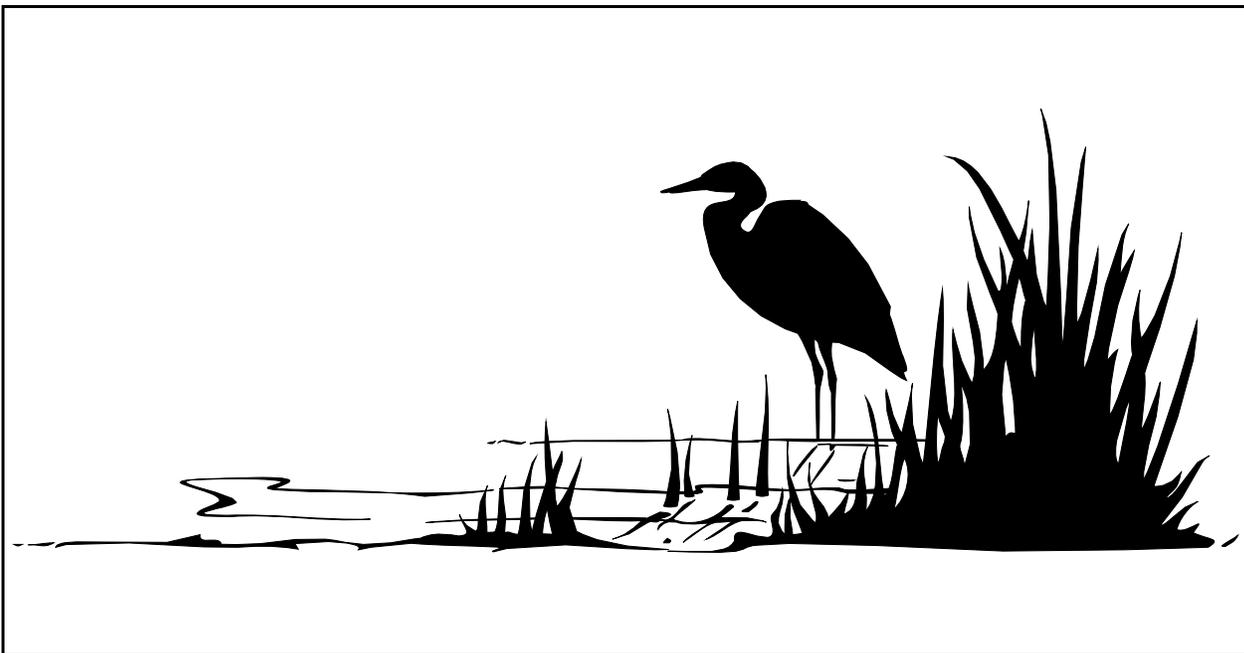
1. Protect the existing floating-leaf aquatic plant community in this area for aquatic life habitat and for the aesthetic quality it provides.

## **Conclusions**

Pine Lake is a beautiful little lake that deserves special attention. Eight sensitive areas were designated on the lake because they are unique or critical areas for the lake as a whole. Special care should be taken to protect these areas and other areas on the lake from further disturbance. The small patches of sedge/rushes, water lily, aquatic vegetation, and rubble/gravel are critical areas; however, even larger more contiguous patches would greatly benefit the lake ecosystem as a whole. Restoring disturbed shorelines and shoreland buffers to a more natural state would provide even more desirable aquatic life and wildlife habitat. Sand beaches are great for swimming, but are basically unutilized by aquatic inhabitants. The more diverse and abundant emergent, submergent, and floating-leaf aquatic plant community in the west basin provides habitat for all life stages for fish and other aquatic life which benefits the whole lake. 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.

**Appendix A.**

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



**A companion document to better help  
understand lakes sensitive area reports**

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AND UNDERSTANDING LAKE SENSITIVE AREAS  
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**James M. Cahow  
Water Resources Biologist  
DNR, Northern Region, Barron**

**Richard R. Cornelius  
Fisheries Biologist  
DNR, Northern Region, Barron**

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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 and are not out of place and as previously stated 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 lakes 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 so 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 are often inappropriate for the existing site conditions or species present resulting in potential impacts without real nuisance relief.

The herbicides that don't require a permit are restricted to granular or pelletized forms and usually will only work in a narrow set of environmental conditions. If the site conditions include much of any fine flocculant sediments effectiveness can be dramatically reduced or eliminated. Many of these herbicides will work on only a limited number of species which may not even occur on the site increasing the importance of having a qualified applicator capable of identifying the species present and the site conditions which can limit herbicide effectiveness. In the long run most people would be far better off trying to limit vegetation by hand pulling or raking and if these are not feasible contacting a DATCP certified aquatic herbicide applicator to have them assess the different control methods suitable for the site.

In most cases aquatic herbicide applications should be discouraged because:

- 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.

**Before taking action a careful assessment of existing conditions should be conducted and should include: importance of existing habitat areas, actual needs for clearing of aquatic plant habitat (navigational access does not require removal of all vegetation; only a reduction in density), and consideration of the cumulative impacts of removing aquatic plant habitat or treating it and the organisms living in it or around it with herbicides.**

- II. Can result in an overall reduction or fragmentation of important native aquatic plant habitat.
- III. Creates openings in areas that should be colonized by native aquatic plant species. These openings provide increased opportunities for exotic species to become established in the lake and once established provide opportunities for their expansion.
- IV. Results in direct and indirect mortality of sensitive or intolerant immobile 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. For this reason aquatic herbicide treatments containing copper should be

restricted to exceptional circumstances and not used on a regularly reoccurring basis.

- V. If the average landowner width is 100' or less and the minimum effective herbicide treatment width of 30' is applied by most shoreline property owners around a lake, the cumulative impacts of the treatment could eliminate or seriously impact greater than 30% of 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.
- V. Aquatic plants lock up available phosphorus which would otherwise be available to drive undesirable algae blooms.
- VI. Aquatic plants serve an important function in reducing the shoreline erosion associated with wave action while stabilizing sediments in place.
- VII. Aquatic plant management staff routinely hear complaints from shoreline property owners who expected their contracted aquatic herbicide application to eliminate all of the vegetation from the treatment area for a significant portion of the summer period. Most aquatic herbicides are effective on only a portion of the total aquatic plant community at a given site (species selective).

Free-floating species such as coon tail (*Ceratophyllum* sp.) and duckweed (*Lemna* sp.) also often drift back into treated areas with the next pervasive wind, eliminating the benefits they had expected from the chemical treatment. Other species such as Elodea, curly-leaf pondweed, milfoil, and other species easily fragment at times of the year and also drift into treatment areas eliminating or reducing the benefits of the previous treatment.

Hand raking or pulling near docks and in front of private developed properties eliminates the guess work out of what will be removed or eliminated when compared to expensive herbicide treatments with health concerns, use restrictions, and limited effectiveness.

Recent changes affecting mechanical removal and hand pulling of aquatic vegetation

Prior to the passing of Senate Bill 55 in September 2001, mechanical removal of aquatic plants was unregulated provided the lake bottom was not disturbed, the cut plants were removed from the lake and not allowed to drift free, and the plants cut and removed did not include rice or those that are a part of a floating bog mat.

As exotic species, such as Eurasian Water Milfoil, expand their distribution within the state, more opportunities for spreading these exotics will occur. The risk of an exotic becoming established in a new lake is dramatically increased if the native species of aquatic plants that normally occupy a specific habitat type have been eliminated or reduced. 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 of SB 55. 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 limit shoreline removals of aquatic plant habitat without a permit to less than a 30' width; with the restrictions that this 30' width also include docks and other human activity areas that result in the loss or degradation of aquatic plant habitat.

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. It is unlikely that the Department will approve many alterations beyond the standard 30' width because of the concerns related to: creating more areas devoid of native vegetation which increases opportunities for possible colonization sites for exotics, cumulative losses of overall habitat, and the fragmentation and degradation that impairs the remaining habitat.

### **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 from historic coverages.
  - B. There is no other management alternative that will work to clear necessary navigational access channels identified in a Department approved management plan (post 2000)
  - 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 and provides 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 strict enforcement of existing zoning regulations and encourage their strengthening and uniform enforcement.
7. Provide follow through and feed back with public officials when it comes to waivers and variances of existing zoning regulations and building codes
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, 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 with extensive aquatic plant communities to insure that future development does not result in an impact or a loss of this valuable habitat.

## **SHORELINE LANDUSE AND LAKESHORE BUFFERS**

The impacts that can result from shoreline development can be greatly reduced if done carefully with respect to 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 with small berms and humps to prevent runoff from flowing directly down the path and preventing the path from become an area of concentrated flow for the direct delivery of sediments and nutrients.

The importance of maintaining the zone of no disturbance of the 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 or simplify the layers present (trees, shrubs, and unmowed herbaceous ground cover) in the shoreline areas we decrease the layers present for the interception of rainfall; each layer present reduces the energy and volume of rainfall striking the ground's surface thereby reducing what is available for the mobilization and transport of sediments and nutrients from the ground's surface to the lake. The greater the volume of runoff the more energy available for the transport of nutrients and sediments from surrounding land uses into the lake to drive algae blooms and bury important shoreline habitats.

Shoreline buffers also increase the build up of leaf litter forming a spongy layer to absorb more precipitation and runoff reducing the amount of sediment and nutrients reaching the lake and negatively impacting water quality and habitat. The denser unmowed vegetation also filters sediments and nutrients from runoff.

Each of these three layers (trees, shrubs, and herbaceous ground cover) provide different important habitat components for different life cycle requirements of various wildlife. If any one layer is missing the ability of certain wildlife species to survive may be compromised. Leaving wider areas of uncut vegetation (Buffer Zones) increases the likelihood that adequate habitat will exist for many species of songbirds, who are at risk from the loss of this valuable lake shoreline habitat. Furbearers, raptors, frogs, deer, and other wildlife also benefit from these wider natural areas.

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 water's 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 strict enforcement of existing zoning regulations and encourage their strengthening and uniform enforcement.
3. Provide follow through and feed back with public officials when it comes to waivers and variances of existing zoning regulations and building codes
4. Encourage the requirement of mandatory erosion control plans for all building permits that require ground breaking
5. Provide direct oversight of all building crews and insure that as little as possible of the natural plant cover is disturbed during the construction phases.
6. Utilize only the native indigenous species for shoreline buffer restoration efforts and carefully consider site limitations (soil type, soil moisture regime, and shade preferences of plantings) when selecting appropriate species. 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 that care about the health of their lake ecosystem are encouraged to go beyond the minimum requirements of the law and increase buffer width and decrease the length of shoreline cleared of vegetation for access). 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 should expect that initial recovery of the natural vegetation within the ground cover layer may take one or two full growing seasons, after halting mowing activities. Vegetation can usually re-establish itself from the natural seed bank available within the existing soils and from the seeds and rootstalks of adjacent plant communities. Plug plantings of the native herbaceous groundcover species can be used to achieve adequate density and diversity if recovery appears to be sparse in successive years. Supplemental plantings to establish adequate densities for the tree and shrub layer will have to be used in most situations.

The native species that should be used to restore the lakeshore buffer in order to provide the proper habitat and water quality protection functions necessary to insure a healthy Northern Wisconsin lake ecosystem 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 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. Sea-walls should not be used 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 questions arise or problem areas exist lakeshore property owners should call their local DNR water regs 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 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 herbacious 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 conservacionist** 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 that belong there. For technical assistance in restoring your shoreline buffer please contact your local county conservacionist or county shoreline BPM technician 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 becoming a part of the lakes internal nutrient cycle that could cause 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 and contacting property owners to encourage proper implementation of erosion control measures. County zoning staff and officials need public support to get more effective zoning regulations on the books. Public support needs to be expressed if adequate county staff are to be hired to meet the increasing demands that are being placed on them by expanding development. As is most counties suffer from inadequate staff to deal with existing work demands. Mandatory erosion control plans should be a requirement for all building permits that will involve ground breaking. This needs to be coupled with adequate 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 the initiation of any construction, then the landowner should ensure that it is adequate. Aggressive follow through after construction has begun is also important to insure erosion control practices are properly implemented and maintained.

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 burms 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 top soil 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.

### **Management recommendations for construction site erosion control**

1. Minimize disturbance of natural plant communities within shoreline areas (50'-60' from water's edge) so they can continue to act as a buffer protecting 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 non-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 aren't being dealt with in a timely manner; before, 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 walleye stocks. 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 walleye spawning habitat**

1. Educate landowners about the importance of a healthy lakeshore buffer (filter out sediments)
2. Encourage the strict enforcement of existing zoning regulations and encourage their strengthening and uniform enforcement.
3. Provide follow through and feed back with public officials when it comes to waivers and variances of existing zoning regulations and building codes
4. Encourage the requirement of a mandatory erosion control plan for all building permits that require ground breaking
5. Provide direct oversight of all building crews and insure that as little as possible of the natural plant cover is disturbed 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 as well as other important functional areas important to the any lake's ecosystem health and should be discouraged. The way we look at large woody debris should be in the context of its importance to the health of the lake ecosystem. Preformulated 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 habitat for fish and wildlife. 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 into the recommended buffer area (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 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 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 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. Remember that fertilizer suppliers are in the business to sell chemicals. The recommended bag application rates are often too high. 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.

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 leave 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 which you will not have to replace with annual

fertilizer applications. Use a mulching lawnmower 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 soils test has determined that it is nutrient deficient and add less than the maximum recommended.
2. The use of a low phosphorus content fertilizers or no-phosphorus fertilizers is strongly recommended if the 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, especially when large portions of shoreline are developed and when the overall percentage of a lakes watershed is dominated by lakeshore properties. Septic systems that are older than 20 years should be looked at to insure that the filtration field is properly functioning and that waste is not 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.

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 the absorptive capacity of your drainfield.

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 symptoms 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.

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.

