Sensitive Area Survey

a lake management tool for critical habitat protection

***W**hat are lake sensitive areas?* Sites within or around lakes that have been designated as "sensitive" typically fall under one or two categories: an area might provide unique and/or critical ecological habitat; and/or it might have historical, geological, and/or archaeological significance.

Who conducts the sensitive area survey?

These surveys are an integrated approach to resource management because they utilize the expertise of many natural resource managers. A team of professionals such as fishery biologists, water resource specialists, water regulations personnel, aquatic plant specialists, and wildlife biologists collaborate to identify the existing critical habitat areas within and around a lake.

What data is gathered during a sensitive area survey?

Sensitive area surveys are comprehensive in nature. That means a lot of information is gathered in several categories: general information about the site and the primary reason/s for site designation; water quality attributes that the site offers; a detailed physical description of the site; information about the site's fishery and wildlife diversity; identification of the existing aquatic vegetation; a listing of the site specific management recommendations, as well as an evaluation of the site's status regarding water regulation laws.

Where may sensitive areas be found?

Sensitive area designations exist in a wide variety of locations within and around the shoreline of a lake. It's a good bet that areas around the shoreline rich in aquatic and wetland vegetation would be designated as a critical habitat area. This is because vegetation is so crucial to the healthy functioning of a lake ecosystem. There may be an area around the shoreline of a lake that offers a unique or endangered species. Again, chances are good that the area would be selected as sensitive. More and more, scientists are finding the benefits that large submersed wood (downed trees) offer to a lake's fishery and wildlife. This wood provides wonderful habitat for shade, protective cover for young fish, and a place for fish to feed on the invertebrates that flourish in this type of habitat. For these reasons alone, an area that contains downed woody structures would probably be cited as critical habitat. Shoreline areas that contain clean gravel as the dominant bottom type are likely to be important spawning sites for certain species of fish like walleye or bass. In the interest of protecting the natural reproduction requirements of these fish, a fishery biologist would select this type of area as sensitive. There may be certain locations on Wisconsin lakes that offer unique or beautiful historical, geological, and/or archaeological significance. Since we wouldn't want to jeopardize these types of sites in any way, they would likely be selected as a sensitive areas.

Who can use sensitive area surveys?

Lake organizations, existing and potential shoreland residents, historical preservation groups, town governments, aquatic plant managers, fishery managers, water regs personnel, county zoning personnel, and people involved in the preservation of endangered plants and animals can all utilize sensitive area survey data and reports.

How can sensitive area survey results be Used?

The results of this type of survey can be used in many different capacities. Lake organizations have used results for planning and decision making for lake management or protection projects, WDNR personnel use the results for permit decisions regarding shoreline modifications and aquatic plant management. Comprehensive survey results can also be used to spur lake stewardship activities or to provide a wealth of educational information about a specific lake.

For more information contact:

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or
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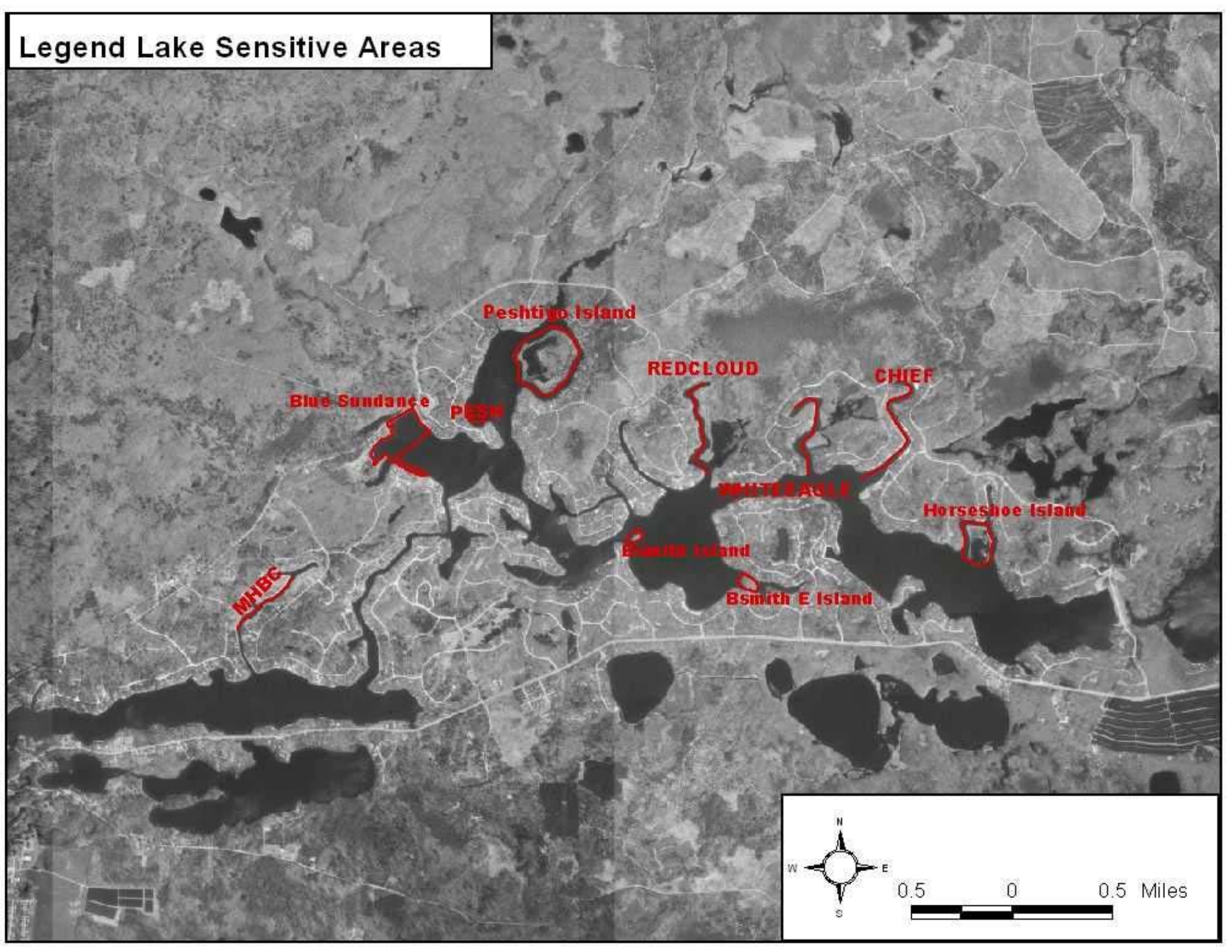
Legend Lake Sensitive Areas
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CHIEF
Blue Sundance
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Bsmith Island
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Legend Lake (Menominee County, Wisconsin)
Sensitive Area Survey Report

Date of Survey: July 30, 2002 Number of Sensitive Areas: 9

Site Evaluators:

Scott Koehnke, Water Management Specialist (Shawano)
Crystal Olson, Water Resource Management Specialist (Shawano)
Jeremy Johnson, Menominee County Conservationist

Author: Crystal Olson

General Lake Information:

Legend Lake in Menominee County has a surface area of 1,230 acres and a maximum depth of 70 feet. The lake is approximately seven miles long from western tip to eastern tip. Legend Lake is an impoundment made of eight groundwater drainage lakes. Six basins are connected by Linzy Creek, which flows east to the South Branch of the Oconto River. The two western most basins drain to the Wolf River via a small creek. A watershed divide occurs within Legend Lake. (Shaw, Houston, Provost, Troge & Weber, 1995)

Numerous species of wildlife inhabit shoreland areas. Standing dead and dying trees (snags) on the uplands provide habitat for various species of birds and insects, including bald eagles, bats, woodpeckers and songbirds. 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.

Legend Lake provides the best wildlife habitat where the shoreline is undeveloped 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.

Legend Lake demonstrates good plant diversity with approximately 23 species present. This diversity is above average in comparison with other lakes in northeast Wisconsin. Plant densities vary depending on recreational use and the area of harvester operation. Generally speaking, the lower the recreational use, the higher the plant density and diversity. Aquatic plant management permits are required for chemical, mechanical and manual harvesting of aquatic plants. A permit is not required for manual removal of plants in a 30-foot wide zone along the shoreline per property. Please contact your

aquatic plant manager, Crystal Olson (715) 526-4220 before conducting any aquatic plant control in Legend Lake.

There are five boat landings on Legend Lake, along with several walk-in access points. Several beach clubs, owned and maintained by the Legend Lake Property Owners Association, exist to provide off-lake property owners access points and recreational areas.

Introduction:

The survey was conducted on July 30, 2002 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 characteristics based on their aquatic plant community, fish and wildlife use. Sensitive area designations provide lake organizations, shoreline property owners, county zoning officials, tribal environmental services, tribal government, DNR 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"** (contact your local DNR lakes coordinator, Crystal Olson, (715) 526-4220, for a copy) may be used for additional information to help understand lake sensitive area designations. This document contains information to help understand the factors that influence the health of the lake.

Nine sites on Legend Lake contain critical habitat and were designated as sensitive areas (see Map 1). These areas are highly recommended for additional protection.

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.

The purpose of determining sensitive areas in lakes is to provide a tool for the goals listed below and to provide baseline field survey data for lake management records. The main goals of a sensitive area designation include:

- Use by managers to guide permitting processes of aquatic plant management, water regulations, fisheries management, wildlife management and local zoning activities
- Use to assist in the planning of various lake management projects
- Use as a tool in aquatic habitat protection activities
- Use by local lake organizations to help guide lake use and management activities
- Use as a compliment to local land-use planning activities
- Provide a guide to potential shoreland buyers and existing shoreland owners with development and lake use issues

- Provide baseline data for various resource management decisions
- Provide an educational tool to the public about natural areas and to initiate stewardship for lake and habitat protection

Exotic Species

During this survey two species of exotic plants were documented. Purple Loosestrife was observed in two locations along the shorelines, including one sensitive area, the Medicine Hat Beach Club site. Management options include pulling of plants by hand and chemical treatment with herbicides such as Rodeo. Menominee County has been active in preventing the spread by documenting locations and removing the plants. Opportunities exist for the Legend Lake Protection & Rehabilitation District and Legend Lake Property Owners to be actively involved in the control of Purple Loosestrife. (contact your local DNR aquatic plant manager, Crystal Olson, (715) 526-4220, or the Menominee County conservationist, Jeremy Johnson (715) 799-5710,) Curly-leaf pondweed is another exotic plant observed in several locations throughout the lake. Cleaning all plant material from watercraft before moving to other parts of the lake can prevent the spread of this plant.

After the survey was conducted, the exotic plant Eurasian Watermilfoil was discovered within Legend Lake. Eurasian Watermilfoil is present in numerous bodies of water in the Legend Lake area, including Shawano Lake, Loon Lake, Lulu Lake, Koonz & Beaulieau Lakes and the Wolf River below the Keshena Falls dam. Exotic species are spread mainly by human activities including boating, fishing, etc. Wisconsin law requires the removal of all aquatic plants and animals from watercraft and trailers before launching in water not currently infested with exotic species. Exotic plants can easily become established in areas that are disturbed and native plants are removed. Protection of native plant communities is vital to slow the spread of exotics once they are introduced into the system. A plan to eradicate and control the spread of Eurasian Watermilfoil within Legend Lake should be developed immediately.

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, 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 and all layers of the canopy, herbaceous, shrub and tree layers. Please contact your local DNR lake coordinator, Crystal Olson (715) 526-4220, or Menominee county conservationist, Jeremy Johnson, (715) 799-5710 or Menominee Tribal Environmental Services, Doug Cox (715) 799-4937 to learn more shoreland restoration.

Whole Lake Management Recommendations:

Resource managers made several recommendations on a whole lake basis.

1. Eliminate or reduce chemicals and fertilizers on lawns. Phosphorus-free fertilizers should be used if fertilization is necessary.
2. Restore shoreland buffers on developed sites with small viewing and access corridors.
3. Protect aquatic vegetation. Allow mechanical harvesting of vegetation only in navigation channels. No mechanical harvesting in or near beds of Eurasian Watermilfoil. No chemical treatment of aquatic vegetation. Limit manual removal of aquatic vegetation to no more than 30 feet along the shoreline per property.
4. Dredging is not necessary at any location in the Legend Lake system.
5. Remove any oversized docks and minimize all structures in the littoral zone.
6. Bioengineering or other soft engineering techniques should be used in place of rock riprap or seawalls.
7. Eliminate the placement of sand below the ordinary high water mark. Placing fill material below the ordinary high water mark violates Chapter 30.12, Wisconsin State Statute. Eliminate the placement of sand in the shoreland zone. The placement of sand in the shoreland zone eliminates the vital shoreland buffer areas and eventually runs off into the lake, destroying the littoral zone habitat.
8. Do not remove coarse woody cover both in the water and in the shoreland zone.
9. Prevent the spread and establishment of exotic species such as Eurasian Watermilfoil and zebra mussels by posting signs and education. Prevent the spread of Curly-leaf pondweed and Eurasian Watermilfoil by removing all plant material from watercraft before moving to other parts of the lake.
10. Maintain septic systems properly to prevent water quality problems.
11. Obey all slow no-wake areas.
12. Continue current zoning regulations in Conservancy areas and limit any development.
13. Eliminate disturbance of the bank for construction of beach areas. In addition, cease all land disturbances within 50 feet of the ordinary high water mark.

Resource Value of Site 1
Medicine Hat Beach Club Channel

This site is located in the channel adjacent to the Medicine Hat Beach Club. The site is approximately 2,040 feet long with an average water depth of approximately 4-5 feet. Primary reasons for site selection were aquatic vegetation, terrestrial vegetation and natural scenic beauty. Terrestrial plants including white pines, paper birch, oaks, maple and various species of shrubs and grasses act as a vegetative buffer, taking up nutrients before they reach the water, thus reducing nuisance algae blooms. Sediments are composed of mainly sand and muck. The shoreland buffer type is comprised of the herbaceous layer (25-50%), shrub layer (50-75%), tree layer (50-75%), and lawn (1-

25%). The lawn exist where the Legend Lake Property Owners Association has provided access to common docking sites for off-shore property owners. Coarse woody cover was estimated at 3-6 pieces/30 meters of shoreline. The Natural Scenic Beauty rating, herein referenced to as NSB, was average, with minimal human influence.

Observed on this site were several species of panfish, including bluegills. This site offers several important habitat components for fish including large woody cover, emergent, submerged, floating-leaf vegetation and over-hanging vegetation. Centrarchids (sunfish family), Esocids (northern pike) and forage species utilize this area for spawning, rearing, feeding and protective cover.

The substrate and aquatic vegetation present provides for 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.

This site also offers several important wildlife habitat components for a variety of species. Furbearers including muskrats and beavers utilize this area for feeding. Upland wildlife including deer, several species of birds including ducks, geese, songbirds and herons use this area for feeding, breeding, cover and nesting. Emergent vegetation, floating leaf vegetation, shrubs/brush and snag trees were all present on this site and offer habitat.

Aquatic vegetation was one of the primary reasons for site selection based on the diversity present. The existence of native plants at this site protects against the likelihood of exotic species. Also, the existing vegetation provides protection against shoreline erosion and plant fragmentation. (See Table 1.)

Management Recommendations:

1. Restore native plant species in the upland area to prevent spread of Purple Loosestrife.
2. Post “Exotic Alert” signs at shared access points along the beach club property.
3. Create and protect shoreline/bank vegetation buffers.
4. Protect emergent aquatic plants to prevent erosion and nutrient runoff.
5. Do not remove coarse woody cover both in the water and in the shoreland area.
6. Limit aquatic plant removal to navigation channels. Protect all existing plant communities to prevent the spread of Eurasian Watermilfoil.
7. Minimize shoreland disturbance.

Resource Value of Site 2
Blue Heron & Sundance

This site is located in Spring Lake and begins west of where the Main Channel enters Spring Lake. The site continues around in a clock-wise fashion along the west end of Spring Lake and forms an area consisting of approximately 25 acres. Primary reasons for site selection include fishery, aquatic vegetation, wildlife values, terrestrial

vegetation, NSB and water quality. Sediments are composed of sand, clay and muck. The shoreland buffer type is 50% wetland and 50% wooded. The layers of the shoreland buffer are herbaceous (25-50%), shrub (25-50%), and trees (50-75%). The wetland type within the littoral zone and shoreland buffer is a deep marsh composed of cattail, yellow water lilies, wild rice and a shallow marsh composed of soft stem bulrush, arrowhead and pickerelweed. Large woody cover is common and averages 3-6 pieces/30 meters of shoreline. The NSB rating of this site is outstanding with no human influence and unique aesthetics.

Fisheries values were outstanding on this site. Species present include Esocids (northern pike), Centrarchids (sunfish family), perch, large mouth bass and forage species. This site offers a spawning, nursery, feeding and protective cover area. Important habitat components include emergent vegetation, submergent vegetation, floating leaf vegetation and over-hanging vegetation. This site is most likely the prime fisheries site within Legend Lake based upon the habitat present.

The substrate and aquatic vegetation present provides for 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.

Wildlife habitat is also excellent on this site. Furbearers utilizing this area include muskrats and beavers. Squirrels, opossums, raccoons, and fox are also present. Several species of birds including ducks, geese, songbirds and shorebirds such as herons and kingfishers utilize this area for shelter/cover, nesting and feeding areas. A snow egret was also observed feeding at this site. Deer utilize the upland areas for all life activities. Amphibians and reptiles depend on this site for cover, breeding and nesting. Important habitat components of this site include emergent vegetation, floating leaf vegetation, shrubs/brush and snag trees.

Water quality was another reason for site selection. This area includes an inlet and the dense plant beds allow for nutrients to settle out, thus preventing nuisance algae blooms in other parts of the lake. The terrestrial vegetation on the upland also allows for nutrient filtration and prevents runoff. In addition, one-half of the shoreland and upland buffer area is zoned conservancy (CV-1), adding to the protection of the site.

Aquatic vegetation diversity and density are exceptional at this site. This site has the highest diversity of any plant community within Legend Lake. The existence of native plants at this site protects against the likelihood of exotic species. Also, the existing vegetation provides protection against shoreline erosion and plant fragmentation. (See Table 2.)

Management Recommendations:

1. Protect upland buffer areas and restore disturbed/developed shorelines.
2. Post "Exotic Alert" signs at walk-in access near inlet.
3. Protect emergent vegetation to prevent erosion and nutrient runoff.
4. Do not remove coarse woody cover in both the water and in the shoreland areas.
5. Limit aquatic plant removal to one navigation channel, i.e. the width of the mechanical harvester. Protect all existing plant communities to prevent the spread of Eurasian Watermilfoil.
6. Minimize shoreland disturbance.
7. Establish a slow no-wake buffer zone in entire sensitive area.
8. No dredging should be allowed at this site at any time.

Resource Value of Site 3
Peshtigo Lake

This site is located with Peshtigo Lake, in the southwest corner of the basin. The site is approximately 508 feet long. Primary reasons for site selection include fishery values, aquatic vegetation, natural scenic beauty, wildlife values and terrestrial vegetation. Sediments are composed mainly of sand and muck. The shoreland buffer type is 5% wetland and 95% wooded. The buffer consists of the herbaceous layer (1-25%), shrub layer (51-75%), and the tree layer (76%-100%). Terrestrial vegetation includes paper birch, maple and oak trees. The wetland type within the littoral zone is characterized as a deep marsh with cattail, yellow water lilies and a shallow marsh with soft stem bulrush and arrowhead. Coarse woody cover was estimated at 3-6 pieces/30 meters of shoreline. The NSB rating is outstanding with no human influence and unique aesthetics.

Fishery values were one of the primary reasons for site selection. Species present include largemouth bass, Centrachrids (sunfish family), perch, and forage fish. This site provides spawning, nursery and feeding areas, as well as protective cover for all species present. Habitat components at this site include large woody cover, emergent, submerged, floating leaf and over-hanging vegetation.

The substrate and aquatic vegetation present provides for 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.

Wildlife habitat is also excellent on this site. This site is excellent habitat for muskrats. Several species of birds including ducks, geese, songbirds and shorebirds such as herons utilize this area for shelter/cover, nesting and feeding areas. Deer utilize the upland areas for all life activities. Amphibians and reptiles depend on this site for cover, breeding and nesting. Important habitat components of this site include emergent vegetation, floating leaf vegetation, shrubs/brush and snag trees.

Water quality was another reason for site selection. The terrestrial vegetation on the upland allows for nutrient filtration and prevents runoff. The dense plant beds help to stabilize the sediments and reduce nutrient recycling and the likelihood of algae blooms.

Aquatic vegetation was another primary reason for site selection. The existence of native plants at this site protects against the likelihood of exotic species. Also, the existing vegetation provides protection against shoreline erosion and plant fragmentation. (See Table 3.)

Management Recommendations:

1. Protect upland buffer areas and restore disturbed/developed shorelines.
2. Protect emergent vegetation to prevent erosion and nutrient runoff.
3. Do not remove coarse woody cover in both the water and in the shoreland areas.
4. Limit aquatic plant removal to one navigation channel, i.e. the width of the mechanical harvester. Protect all existing plant communities to prevent the spread of Eurasian Watermilfoil.
5. Minimize shoreland disturbance.
6. Establish a slow no-wake buffer zone in entire sensitive area.
7. No dredging should be allowed at this site at any time.

Resource Value of Site 4
Peshtigo Island

This site consists of the island located within Peshtigo Lake. The island and the associated buffer total approximately 48 acres in size. Primary reason for site selection was wildlife values. Secondary reasons include fishery value, aquatic vegetation, natural scenic beauty, terrestrial vegetation and water quality. Terrestrial vegetation included many wetland type trees such as tag alder, tamarack and black spruce. Other species present included white pines and aspens. Sediments consisted of sand and muck. The shoreland buffer type is 50% wetland and 50% wooded. The layers of the buffer include herbaceous (1-25%), shrub (50-75%) and tree (76%-100%). The wetland types include deep marsh with cattails and yellow water lilies, shallow marsh with soft stem bulrush and arrowhead, shrub carr with willows and shrubs and bog with tamarack and leatherleaf. Large woody cover was estimated as common with 3-6/30 meters of shoreline. The NSB rating was outstanding with no human influence and unique aesthetics.

Wildlife values on this site are exceptional. In general, islands provide excellent habitat for many species of wildlife. Many species including waterfowl and reptiles use islands as breeding and nesting sites to escape predators such as raccoons and skunks. Several broods of ducks were observed on this site during the survey. Species present include beavers, muskrats, ducks, songbirds, blue herons, kingfishers, frog/toads, salamanders and turtles. Several painted turtles were observed sunning themselves on logs in the littoral zone. This site provides shelter/cover, nesting areas and feeding areas for all species listed. Important habitat components present at this site include emergent and floating leaf vegetation, shrubs/brush and snag trees.

Fishery values were another reason for site selection. Species present include Esocids (northern pike), largemouth bass, Centrarchids (sunfish family), perch, and forage fish. Other species of fish use this site for spawning, nursery and feeding areas, as well as

protective cover for all species present. Habitat components at this site include large woody cover, emergent, submerged, floating leaf and over-hanging vegetation.

The substrate and aquatic vegetation present provides for 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.

Water quality was another reason for site selection. This area includes an inlet and the dense plant beds allow for nutrients to settle out, thus preventing nuisance algae blooms in other parts of the lake. The existing vegetation provides protection against shoreline erosion of the island. (See Table 4.)

Management Recommendations:

1. Strictly enforce no-wake zone
2. Limit aquatic plant removal to one navigation channel. Protect all existing plant communities to prevent the spread of Eurasian Watermilfoil.
3. No chemical control of aquatic vegetation.
4. Protect emergent vegetation to prevent erosion and nutrient runoff and to provide habitat for spawning northern pike.
5. Do not remove coarse woody cover in both the water and in the shoreland areas.
6. Minimize shoreland disturbance.
7. No dredging should be allowed at this site at any time.

Resource Value of Site 5
Red Cloud Channel

This site is located within the channel leading to the Red Cloud subdivision. The site includes the entire channel, beginning at the entrance from Big Blacksmith Lake. The total length is approximately 2,887 feet. Primary reasons for site selection were fishery values, aquatic vegetation, natural scenic beauty, wildlife, terrestrial vegetation and water quality. The shoreland buffer type is 20% wetlands, located to the east of the channel and 80% wooded buffer. The herbaceous layer comprises (1-25%), the shrub layer (25-50%), and the tree layer (51-75%). The wetland consists of a deep marsh, including cattails, yellow water lilies and a shallow marsh including bulrush and arrowhead. The estimate of large woody cover is present at 1-2-pieces/30 meters of shoreline. The NSB rating was good, with no human influence. Shoreland areas within this site are zoned conservancy and no development is allowed. The west side of the channel is currently zoned to prevent development. This zoning makes this site unique as the vast majority of the remaining lake is developed.

Fisheries values were one of the primary reasons for site selection. Species present included Esocids (northern pike), largemouth bass, Centrachrids (sunfish family) and forage fish. All species use this area for spawning, nurseries, feeding and protective cover. The wetlands located east of the channel will provide excellent habitat for

northern pike and largemouth bass. Important habitat components include emergent, submergent, floating leaf and over-hanging vegetation.

The substrate and aquatic vegetation present provides for 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.

Water quality was another reason for site selection. The terrestrial vegetation on the upland allows for nutrient filtration and prevents runoff. The dense plant beds help to stabilize the sediments and reduce nutrient recycling and the likelihood of algae blooms. The wetlands located to the east of the channel provide a stabilization site for nutrients and sediments.

This site also offers several important wildlife habitat components for a variety of species. Furbearers including muskrats and beavers utilize this area for feeding. Upland wildlife including deer, several species of birds including ducks, geese, songbirds, herons, amphibians and reptiles use this area for feeding, breeding, cover and nesting. Emergent vegetation and floating leaf vegetation were present on this site and offer habitat.

Aquatic vegetation was one of the primary reasons for site selection based on the diversity present. The existence of native plants at this site protects against the likelihood of exotic species. Also, the existing vegetation provides protection against shoreline erosion and plant fragmentation. (See Table 5.)

Management Recommendations:

1. Strictly enforce no-wake zone
2. Limit aquatic plant removal to one navigation channel. Protect all existing plant communities to prevent the spread of Eurasian Watermilfoil.
3. No chemical control of aquatic vegetation.
4. Protect emergent vegetation to prevent erosion and nutrient runoff and to provide habitat for spawning northern pike.
5. Do not remove coarse woody cover in both the water and in the shoreland areas.
6. Minimize shoreland disturbance.
7. No dredging should be allowed at this site at any time.
8. Current zoning standards of Conservancy should be maintained.

Resource Value of Site 6 &7
Islands within Big Blacksmith Lake

This site includes both islands located with Big Blacksmith Lake. One island, approximately 2 acres in size, lies on the west end of the basin, near the channel to Little Blacksmith Lake. The second island, approximately 3.5 acres in size, is located at the east end of Big Blacksmith Lake. The total acreage for the islands includes a buffer area. Both islands were chosen for wildlife values and natural scenic beauty. The shoreland

buffer types on both islands were 100% wooded. The tree layer is comprised of trees (76-100%). Large woody cover is estimated as common with 3-6 pieces/30 meters of shoreline. The NSB was rated at outstanding with no human influence and unique aesthetics.

Wildlife values on this site are exceptional. In general, islands provide excellent habitat for many species of wildlife. Many species including waterfowl and reptiles use islands as breeding and nesting sites to escape predators such as raccoons and skunks. Species present include beavers, muskrats, ducks, songbirds, blue herons, kingfishers, frog/toads, salamanders and turtles. Raptors such as bald eagles and ospreys may use islands are perch sites while feeding. This site provides shelter/cover, nesting areas and feeding areas for all species listed. Important habitat components present at this site include emergent and floating leaf vegetation, shrubs/brush and snag trees.

Large woody cover, emergent and submergent vegetation provides valuable habitat for species present. Northern pike, largemouth bass, centrachrids, perch, suckers and forage fish are all present. These islands provide spawning, nursery, feeding and protective cover areas for fish present.

The substrate and aquatic vegetation present provides for 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.

Although aquatic vegetation was not one of the primary reasons for site selection, the community is still diverse and abundant. (See Table 6.)

Management Recommendations:

1. Strictly enforce no-wake zone
2. Limit aquatic plant removal to one navigation channel. Protect all existing plant communities to prevent the spread of Eurasian Watermilfoil.
3. No chemical control of aquatic vegetation.
4. Do not remove coarse woody cover in both the water and in the shoreland areas.
5. Minimize shoreland disturbance.
6. No dredging should be allowed at this site at any time.

Resource Value of Site 8
White Eagle Channel

This site is located within the channel adjacent to the White Eagle subdivision. The site includes the entire channel is approximately 3,000 feet. Primary reasons for site selection were fishery values, aquatic vegetation, natural scenic beauty, wildlife, terrestrial vegetation and water quality. The shoreland buffer type is 10% wetlands located adjacent to the inlet creek, and 80% wooded buffer. The herbaceous layer comprises (1-25%), the shrub layer (25-50%), and the tree layer (51-75%). The wetland consists of a deep marsh, including cattails, yellow water lilies and a shallow marsh including bulrush

and arrowhead. The estimate of large woody cover is present at 1-2-pieces/30 meters of shoreline. The NSB rating was outstanding with no human influence and unique aesthetics. The majority of the shoreline is zoned tribal recreational so no future development is anticipated.

Fisheries values were one of the primary reasons for site selection. Species present included Esocids (northern pike), largemouth bass, Centrachrids (sunfish family and forage fish. All species use this area for spawning, nurseries, feeding and protective cover. The wetlands and inlet creek located east of the channel will provide excellent habitat for northern pike. This area should be seasonally protected to enhance northern pike. Important habitat components include large woody cover, emergent, submergent, floating leaf and over-hanging vegetation.

The substrate and aquatic vegetation present provides for 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.

Water quality was another reason for site selection. The terrestrial vegetation on the upland allows for nutrient filtration and prevents runoff. The dense plant beds help to stabilize the sediments and reduce nutrient recycling and the likelihood of algae blooms.

This site also offers several important wildlife habitat components for a variety of species. Furbearers including muskrats and beavers utilize this area for feeding. Upland wildlife including deer, several species of birds including ducks, geese, songbirds, herons, amphibians and reptiles use this area for feeding, breeding, cover and nesting. Shrubs/brush, snag trees, emergent, floating leaf and over-hanging vegetation is present on this site and offer habitat.

Aquatic vegetation was one of the primary reasons for site selection based on the diversity present. The existence of native plants at this site protects against the likelihood of exotic species. Also, the existing vegetation provides protection against shoreline erosion and plant fragmentation. (See Table 7.)

Management Recommendations:

1. Strictly enforce no-wake zone
2. Limit aquatic plant removal to one navigation channel. Protect all existing plant communities to prevent the spread of Eurasian Watermilfoil.
3. No chemical control of aquatic vegetation.
4. Protect emergent vegetation to prevent erosion and nutrient runoff and to provide habitat for spawning northern pike.
5. Do not remove coarse woody cover in both the water and in the shoreland areas.
6. Minimize shoreland disturbance.
7. No dredging should be allowed at this site at any time.
8. Current zoning standards of Conservancy/Tribal Recreational should be maintained.

Resource Value of Site 8
Chief Waukechon Channel

This site is located within the channel adjacent to the Chief Waukechon subdivision. The site includes the entire channel is approximately 3,900 feet. Primary reasons for site selection were fishery values, aquatic vegetation, natural scenic beauty, wildlife, and terrestrial vegetation. The shoreland buffer type is 100% wooded. The herbaceous layer comprises (26-50%), the shrub layer (26-50%), and the tree layer (76-100%). The estimate of large woody cover is present at 1-2-pieces/30 meters of shoreline. The NSB rating was outstanding with no human influence and unique aesthetics. Shoreland areas within this site are zoned conservancy and no development is allowed. This zoning makes this site unique as the vast majority of the remaining lake is developed.

Fisheries values were one of the primary reasons for site selection. Species present include largemouth bass, centrachrids, suckers and minnows. All species use this area for spawning, nurseries, feeding and protective cover. Important habitat components include large woody cover, emergent, submergent, floating leaf and over-hanging vegetation.

The substrate and aquatic vegetation present provides for 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.

This site also offers several important wildlife habitat components for a variety of species. Furbearers including muskrats and beavers utilize this area for feeding. Upland wildlife including deer, several species of birds including ducks, geese, songbirds, herons, amphibians and reptiles use this area for feeding, breeding, cover and nesting. Shrubs/brush, snag trees, emergent, floating leaf and over-hanging vegetation is present on this site and offer habitat.

Aquatic vegetation was one of the primary reasons for site selection. The existence of native plants at this site protects against the likelihood of exotic species. Also, the existing vegetation provides protection against shoreline erosion and plant fragmentation. (See Table 8.)

Management Recommendations:

1. Strictly enforce no-wake zone
2. Limit aquatic plant removal to one navigation channel. Protect all existing plant communities to prevent the spread of Eurasian Watermilfoil.
3. No chemical control of aquatic vegetation.
4. Protect emergent vegetation to prevent erosion and nutrient runoff and to provide habitat for spawning northern pike.
5. Do not remove coarse woody cover in both the water and in the shoreland areas.
6. Minimize shoreland disturbance.
7. No dredging should be allowed at this site at any time.
8. Current zoning standards of Conservancy should be maintained.

Resource Value of Site 9
Horseshoe Island

This site consists of Horseshoe Island and an associated buffer totaling approximately 17 acres. Primary reasons for site selection include fishery values, aquatic vegetation, natural scenic beauty, wildlife values, terrestrial vegetation and water quality. The sediment consisted of sand and muck. The shoreland buffer type is wetlands (75%) and wooded (25%). The herbaceous, shrub and tree layer account for 25-50% each. The wetland type is deep marsh with cattails and yellow water lily and shallow marsh with bulrush and arrowhead. The interior portion of the wetland is mixed with bog and hardwood swamp. Large woody cover is present at 1-2/30 meters of shoreline. The NSB rating is outstanding with no human influence and unique aesthetics.

Fisheries values are outstanding on this site. This site provides spawning, nursery, feeding and protective cover areas for Esocids (northern pike), largemouth bass, Centrarchids (sunfish family), perch and forage fish. Important habitat components include large woody cover, emergent, submergent, floating leaf and over-hanging vegetation.

The substrate and aquatic vegetation present provides for 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.

Wildlife values are also excellent on this site. As stated before, islands are important areas for waterfowl, amphibians and reptiles to escape predators such as raccoons and skunks. Horseshoe Island has several snag trees that provide perch sites for raptors such as eagles and osprey. During the site survey, one adult and two juvenile bald eagles were observed on this site. Human disturbance should be minimized on this site to not disturb the bald eagles.

Aquatic vegetation was very dense and diverse at this site. The shape of the island allows for a complex community of terrestrial vegetation, wetland and true aquatic vegetation. (See Table 9.)

Management Recommendations:

1. Strictly enforce no-wake zone.
2. Limit aquatic plant removal to one navigation channel. Protect all existing plant communities to prevent the spread of Eurasian Watermilfoil.
3. No chemical control of aquatic vegetation.
4. Protect emergent vegetation to prevent erosion of the island.
5. Do not remove coarse woody cover in both the water and in the shoreland areas.
6. Minimize shoreland disturbance.
7. No dredging should be allowed at this site at any time.
8. Post educational signs to promote good lake stewardship.
9. Create a permanent fish refuge to promote habitat protection.

Conclusion

In conclusion, nine sensitive areas were designated on Legend Lake. This report identified important areas of habitat and management recommendations for each site. Lakes are one of the state's most valuable resources and without proper protection the water quality of our lakes will quickly deteriorate, resulting in degradation of fish and wildlife habitat. All lake ecosystems are sensitive to change and man's impact. It is critical that we protect and restore these valuable resources.

All the data that was used to complete this report can be obtained at the Shawano DNR service center.

Table 1

PRESENT	COMMON	ABUNDANT	DOMINANT
Sedges Scirpus (bul-rush) Carex (sedge)			
Herbs Verbena (blue vervain)			
Shrubs Alnus (tag alder)			
Emergents Sagittaria (arrowhead) Pontederia (pickerelweed) Typha (cattail) Sparganium (bur-reed)			
Floating Leaf Brasenia (watershield)	**Floating Leaf** Nymphaea (white water lily)		**Floating Leaf** Nuphar (yellow pond lily & spatterdock)
Potamogetons P. pectinatus (sago) P. robbinsii (fern) P. zosteriformis (flat-stem)			
		Submergents Elodea (waterweed) Ceratophyllum (coontail)	
	Algae Filamentous	**Algae** Chara (muskgrass)	
Exotics Lythrum (purple loosestrife) P. crispus (curly-leaf)			

Table 2

PRESENT	COMMON	ABUNDANT	DOMINANT
		Sedges Scirpus (bul-rush) Carex (sedge) Eleocharis (spike-rush)	
		Rushes Juncus (rush)	
		Herbs Verbena (blue vervain) Iris (blue flag iris)	
	Shrubs Alnus (tag alder)	**Shrubs** Salix (willow) Cornus (dogwood)	
	Emergents Zizania (wild-rice)	**Emergents** Sagittaria (arrowhead) Pontederia (pickerelweed) Typha (cattail) Sparganium (bur-reed)	
			Floating Leaf Nuphar (yellow pond lily & spatterdock) Brasenia (watershield) Nymphaea (white water lily)
Submergents Bidens (water marigold) Ranunculus (crowfoot) Myriophyllum (Nor. Watermilfoil) Zosterella (water stargrass)	**Submergents** Najas (bushy pondweed)	**Submergents** Elodea (waterweed) Ceratophyllum (coontail) Utricularia (bladderwort) Vallisneria (water celery)	
Potamogetons P. epihydrun (ribbon-leaf)		**Potamogetons** P. pectinatus (sago) P. robbinsii (fern) P. zosteriformis (flat-stem) P. richardsonii (clasping-leaf)	
		Submergents Elodea (waterweed) Ceratophyllum (coontail)	
Algae Nitella (stonewort)	**Algae** Chara (muskgrass)		

Table 3

PRESENT	COMMON	ABUNDANT	DOMINANT
Sedges Scirpus (bul-rush) Carex (sedge)			
Herbs Verbena (blue vervain)			
		Shrubs Alnus (tag alder) Cornus (dogwood)	
Emergents Typha (cattail) Sparganium (bur-reed)	**Emergents** Sagittaria (arrowhead) Pontederia (pickerelweed)		
			Floating Leaf Nuphar (yellow pond lily & spatterdock) Brasenia (watershield) Nymphaea (white water lily)
Submergents Myriophyllum (Nor. Watermilfoil)	**Submergents** Utricularia (bladderwort) Vallisneria (water celery) Najas (bushy pondweed)	**Submergents** Elodea (waterweed) Ceratophyllum (coontail)	
Potamogetons P. epihydrus (ribbon-leaf) P. pectinatus (sago) P. robbinsii (fern) P. zosteriformis (flat-stem) P. richardsonii (clasping-leaf)			
Algae Filamentous	**Algae** Chara (muskgrass)		

Table 4

PRESENT	COMMON	ABUNDANT	DOMINANT
Ferns Osmunda (cinnamon fern) Onoclea (sensitive fern)			
	Sedges Scirpus (bul-rush) Carex (sedge)		
Herbs Verbena (blue vervain) Iris (blue flag iris) Caltha (marsh marigold)			
		Shrubs Alnus (tag alder) Cornus (dogwood) Salix (willow)	
	Emergents Sagittaria (arrowhead) Pontederia (pickerelweed)	**Emergents** Typha (cattail) Sparganium (bur-reed)	
		Floating Leaf Nuphar (yellow pond lily & spatterdock) Brasenia (watershield) Nymphaea (white water lily)	
Submergents Elodea (waterweed) Ceratophyllum (coontail) Utricularia (bladderwort)	**Submergents** Myriophyllum (nor watermilfoil) Vallisneria (water celery) Najas (bushy pondweed)		
Potamogetons P. epihydrus (ribbon-leaf) P. pectinatus (sago) P. robbinsii (fern) P. zosteriformis (flat-stem) P. richardsonii (clasping-leaf)			
Algae Filamentous Chara (muskgrass)			

Table 5

PRESENT	COMMON	ABUNDANT	DOMINANT
Sedges Scirpus (bul-rush) Carex (sedge) Eleocharis (spike-rush			
Herbs Verbena (blue vervain) Iris (blue flag iris) Caltha (marsh marigold)			
Shrubs Alnus (tag alder) Cornus (dogwood) Salix (willow)			
Emergents Sparganium (bur-reed)	**Emergents** Sagittaria (arrowhead) Pontederia (pickerelweed) Typha (cattail)		
		Floating Leaf Nuphar (yellow pond lily & spatterdock) Brasenia (watershield) Nymphaea (white water lily)	
Submergents Elodea (waterweed) Ceratophyllum (coontail) Utricularia (bladderwort) Vallisneria (water celery) Najas (bushy pondweed) Ranunculus (crowfoot)			
Potamogetons P. robbinsii (fern) P. zosteriformis (flat-stem) P. richardsonii (clasping-leaf) P. amplifolius (large-leaf)			
Algae Filamentous Chara (muskgrass)			

Table 6

PRESENT	COMMON	ABUNDANT	DOMINANT
Sedges Scirpus (bul-rush)			
Shrubs Salix (willow)			
Emergents Sagittaria (arrowhead) Pontederia (pickerelweed) Typha (cattail) Sparganium (bur-reed)			
Floating Leaf Nuphar (yellow pond lily & spatterdock) Brasenia (watershield) Nymphaea (white water lily)			
Submergents Elodea (waterweed) Ceratophyllum (coontail)	**Submergents** Najas (bushy pondweed) Vallisneria (water celery) Myriophyllum (nor watermilfoil)		
Potamogetons P. pectinatus (sago) P. zosteriformis (flat-stem) P. richardsonii (clasping-leaf)			
Algae Nitella (stonewort)	**Algae** Chara (muskgrass)		

Table 7

PRESENT	COMMON	ABUNDANT	DOMINANT
Sedges Scirpus (bul-rush) Carex (sedge) Eleocharis (spike-rush)			
Herbs Verbena (blue vervain) Iris (blue flag iris) Caltha (marsh marigold)			
Shrubs Alnus (tag alder) Cornus (dogwood) Salix (willow)			
Emergents Sparganium (bur-reed)	**Emergents** Sagittaria (arrowhead) Pontederia (pickerelweed) Typha (cattail)		
		Floating Leaf Nuphar (yellow pond lily & spatterdock) Brasenia (watershield) Nymphaea (white water lily)	
Submergents Elodea (waterweed) Ceratophyllum (coontail) Utricularia (bladderwort) Vallisneria (water celery) Najas (bushy pondweed) Ranunculus (crowfoot)			
Potamogetons P. robbinsii (fern) P. zosteriformis (flat-stem) P. richardsonii (clasping-leaf) P. amplifolius (large-leaf)			
Algae Filamentous Chara (muskgrass)			

Table 8

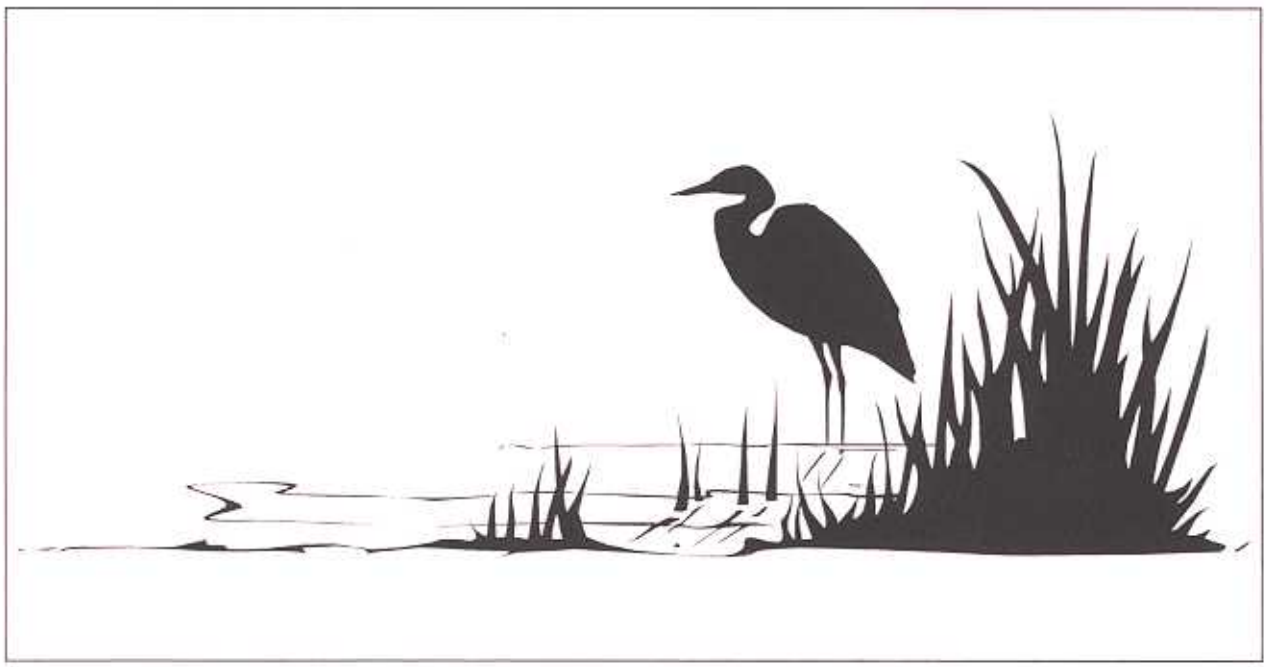
PRESENT	COMMON	ABUNDANT	DOMINANT
Sedges Scirpus (bul-rush) Carex (sedge) Eleocharis (spike-rush)			
Herbs Verbena (blue vervain)			
Shrubs Alnus (tag alder) Cornus (dogwood) Salix (willow)			
Emergents Sparganium (bur-reed)	**Emergents** Sagittaria (arrowhead) Pontederia (pickerelweed) Typha (cattail)		
		Floating Leaf Nuphar (yellow pond lily & spatterdock) Brasenia (watershield) Nymphaea (white water lily)	
Submergents Elodea (waterweed) Ceratophyllum (coontail) Utricularia (bladderwort) Vallisneria (water celery) Najas (bushy pondweed) Ranunculus (crowfoot)			
Potamogetons P. robbinsii (fern) P. zosteriformis (flat-stem) P. richardsonii (clasping-leaf) P. pectinatus (sago)			
Algae Filamentous Chara (muskgrass)			

Table 9

PRESENT	COMMON	ABUNDANT	DOMINANT
Sedges Scirpus (bul-rush) Carex (sedge) Juncus (rush)			
Herbs Verbena (blue vervain) Caltha (marsh marigold)			
		Shrubs Alnus (tag alder) Cornus (dogwood) Salix (willow)	
			Emergents Sagittaria (arrowhead) Pontederia (pickerelweed) Typha (cattail) Sparganium (bur-reed)
		Floating Leaf Nuphar (yellow pond lily & spatterdock) Brasenia (watershield) Nymphaea (white water lily)	
Submergents Elodea (waterweed) Ceratophyllum (coontail) Utricularia (bladderwort) Ranunculus (crowfoot) Myriophyllum (Nor. Watermilfoil)		**Submergents** Vallisneria (water celery) Najas (bushy pondweed)	
Potamogetons P. amplifolius (large-leaf) P. richardsonii (clasping-leaf)	**Potamogetons** P. pectinatus (sago)	**Potamogetons** P. natans (floating-leaf) P. zosteriformis (flat-stem) P. robbinsii (fern)	
Algae Nitella (stonewort)		**Algae** Chara (muskgrass)	

April 2003 "Draft"

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



A companion document to better help understand lakes sensitive area reports

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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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 resticted 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 floculant 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 capabale 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 Eurasion Water Milfoil, expand their distribution within the state, more opportunities for spreading these exotics will occurr. 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 grounds 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 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 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 it's self 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 assistence or to report a problem area which may be negatively impacting lake water quality or habitat. A list of locally available technical assistence 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 maintainence 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 conservationist** and determine what the specific requirements are for shoreline buffers on their lake. A list of locally available technical assistence 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 assistence in restoring your shoreline buffer please contact your local county conservationist 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 draintiles, 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 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 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 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 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 the any lake's ecosystem health and should be discouraged. The way we look at large woody debris should 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 then 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 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.

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

Barron County:

County Conservationist: Dale Hansen – 715/ 537-6315
DNR Water Regulations: Dan Harrington – 715/ 822-3590 ext. #108
DNR Water Resources Biologist: Jim Cahow – 715/537-5046

Bayfield County (In Part):

County Conservationist: Diane Dalton – 715/682-7187 ext. #3
DNR Water Regulations:John Spangberg – 715/682-2923
DNR Water Resources Biologist: Jim Cahow – 715/537-5046

Burnett County:

County Conservationist: Dave Ferris – 715/349-2185

DNR Water Regs: Ed Slaminski – 715/635-4097
DNR Water Resources Biologist: Jim Cahow – 715/537-5046

Douglas County (In Part):
County Conservationist: Diane Dalton – 715/682-7187 ext #3
DNR Water Regs: John Spangberg – 715/685-2923
DNR Water Resources Biologist: Jim Cahow – 715/537-5046

Polk County:
County Conservationist: Jeff Timmons – 715/485-8631
DNR Water Regs: Dan Harrington – 715/822-3590 ext. 108
DNR Water Resources Biologist: Jim Cahow – 715/537-5046

Sawyer County (In Part):
County Conservationist: Dale Olson – 715/ 634-6463
DNR Water Regs: Jon Kleist – 715/532-3911
DNR Water Resources Biologist: Jim Cahow – 715/537-5046

Washburn County:
County Conservationist: Craig Conroy – 715/468-2666
DNR Water Regs: Ed Slaminski – 715/635-4097
DNR Water Resources Biologist: Jim Cahow – 715/537-5046