

## **Golden Lake (Waukesha and Jefferson Counties, Wisconsin) Integrated Sensitive Area Report**

Assessment Dates: August 30, 2005  
September 20, 2005

Number of Sensitive Areas Surveyed: 1

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### **General Lake Information**

Golden Lake is located within the Town of Summit in Waukesha County and the Town of Concord in Jefferson County. The lake has a maximum depth of 46 feet, a surface area of approximately 250 acres, and is located in a terminal moraine. The lake has primarily a sandy bottom and the main source of water is through groundwater percolation and precipitation. A deep marsh at the far northern end of the lake contains multiple dredged channels. These channels drain intermittently in a northwest direction to the marshland located adjacent to Goose Lake (SEWRPC 2003). Public access to Golden Lake is available through a public boat launch located on the southeastern shoreline of the lake.

Golden Lake has a watershed (drainage area) of about 490 acres. The watershed consists of approximately 85 percent rural land use, and about 15 percent urban land use. Wetlands, woodlands, surface waters, and other open spaces comprise about 300 acres or 60 percent of the total land cover. Agricultural land use makes up about 120 acres or 15 percent of the total land cover. Residential land use comprises about 55 acres or 10 percent of the total land cover. Commercial, recreational, and transportation infrastructure land use makes up the remaining 15 acres. Waukesha County does not include any of the Golden Lake watershed in its urban development plan.

Waterfowl are reported to make migratory and resident use of the extensive wetlands at the north end of the lake. Northern pike, largemouth bass and panfish are common in the lake and walleyed pike are present according to a 2001 DNR report. Fish surveys conducted in 1974 and 1978 by the DNR showed grass pickerel, lake chubsucker, bluegill, largemouth bass, walleyed pike, northern pike, rock bass, warmouth, black crappie, golden shiner, mimic shiner, blacknose shiner, pumpkin seed, and yellow perch to all be present in Golden Lake.

## Exotic Species

Exotic species, most notably zebra mussels, Eurasian watermilfoil, and purple loosestrife have invaded many lakes in Wisconsin including Golden Lake. Boaters traveling from lake to lake often facilitate the propagation of exotic species. The introduction of exotic species into a lake ecosystem can lead to a decline in the native plant population and cause problems with nutrient loading. In addition, the disturbance of lake sediments from human activity (boating, plant harvesting, chemical treatments, etc.) enhances the colonization and/or expansion of exotic species. Two simple steps to prevent the spread of exotic species include: 1) Removing aquatic plants, animals, and mud from trailers and boats before leaving the boat launch and 2) Draining water from boats, motors, bilges, live wells, and bait containers before leaving the boat launch.

Eurasian watermilfoil is present in Golden Lake. Eurasian watermilfoil is one of eight milfoil species currently found in Wisconsin. It is often misidentified as one of its seven native cousins, and vice versa. This non-native milfoil has a tendency to establish large monocultures (colonies of single plants) and outcompete many native plants. These dense beds of milfoil not only impede the growth of native plant species but also inhibit fish movement and create navigational problems for boaters.

The regenerative ability of Eurasian watermilfoil is an obstacle when attempting to control this species. Fragments of Eurasian watermilfoil detached by harvesting, boating, and other recreational activities can float to non-colonized areas of the lake or downstream to additional lakes in the drainage system and create new colonies. Chemical treatment is often used when an isolated stand of Eurasian watermilfoil is identified. A few lakes have successfully used the milfoil weevil to suppress milfoil populations. However, the most effective “treatment” of exotic milfoil is prevention through public education.

Curly-leaf pondweed is another submerged, exotic species found Golden Lake. Like Eurasian watermilfoil, curly-leaf often grows into large, homogenous stands. It can crowd out native vegetation, create navigational problems, and limit fish movement. Curly-leaf pondweed dies off in mid-summer, increasing nutrient availability in the water column. This often contributes to summer algal blooms and decreasing water quality.

The unusual life cycle of curly-leaf pondweed makes management difficult. The plant germinates as temperatures decrease in fall. Curly-leaf is highly tolerant of cold temperatures and reduced sunlight, continuing to grow under lake ice and snow cover. With ice-off and increasing water temperatures in the spring, the plant produces fruit, flowers, and buds (turions). Turions are the main reproductive mechanism of curly-leaf. To control the species in lakes, the plant must be combated before turions become viable. Most plant harvesters have not started cutting when curly-leaf is most susceptible and a small window of opportunity exists for chemical treatment. Therefore, prevention through public education is once again very important.

Purple loosestrife, a hardy perennial native to Europe, is another exotic species common to Wisconsin and Golden Lake. Since its introduction to North America in the early 1800s, purple loosestrife has become common in gardens and wetlands, and around lakes, rivers, and roadways. The species is highly invasive and thrives in disturbed areas. Dense stands of purple loosestrife plants often out compete native plants, resulting in the destruction of food, cover, and nesting sites for wildlife and fish.

Purple loosestrife most often spreads when seeds adhere to animals. Humans should be aware of picking up seeds on clothing and equipment when in the vicinity of the plant. Loosestrife can be controlled manually, biologically, or with a broad-leaf herbicide. Young plants can be pulled, but adult plants have large root structures and must be excavated with a garden fork. Biological control is most effective on large stands of purple loosestrife. Five different insects are known to feed on this plant. Four of those have been used as control agents in the United States. Of the five species, *Galerucella pusilla* and *G. californiensis* are leaf-eating beetles; *Nanophyes brevis* and *N. marmoratus* are flower-eating beetles; and *Hylobius transversovittatus* is a root-boring weevil. Only *N. brevis* has not been released in the United States (WDNR 2003). Lastly and most importantly, prevention through public education plays an important role in the management of this species.

## Shoreland Management

Wisconsin's Shoreland Management Program, a partnership between state and local governments, 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 1000 feet of lakes, 300 feet of rivers, and floodplains. Current research shows that present standards are probably inadequate for the protection of water resources (Woodford and Meyer 2003, Garn 2002). Therefore, many communities have chosen to go beyond minimum standards to ensure protection of our natural resources. This report provides management guidelines for activities within the lake and in the immediate shoreland areas. Before any recommendations in this report are completed, please check with the Department of Natural Resources and local units of government for required approvals.

A vital step in protecting our water resources is to maintain effective vegetative buffers. A shoreland buffer should extend from the water onto the land at least 35 to 50 feet. Studies have shown that buffers less than 35 feet are not very effective in reducing nutrient loading. Wider buffers of 50 feet or more can help provide important wildlife habitat for songbirds, turtles, frogs, and other animals, as well as filter pollutants from runoff. In general, no mowing should occur in the buffer area, except perhaps in a viewing access corridor. The plant composition of a buffer should match the flora found in natural Wisconsin lakeshores. A buffer should include three layers - herbaceous, shrub, and tree.

In addition, citizens living on Golden Lake and the community at large should investigate other innovative ways to reduce the impacts of runoff flowing into the lake while improving critical shoreline habitat (see Greene 2003). This may include the use of phosphorus-free fertilizers, installing rain gardens, setting the lawnmower at a higher mower height, decreasing the area of impervious surfaces, or restoring aquatic plant communities.

## Introduction

Department personnel conducted a Golden Lake sensitive area designation survey on August 30, 2005 and September 20, 2005, following the Wisconsin Department of Natural Resources' sensitive area survey protocol. This study utilized an integrated team of DNR resource managers with input from multiple disciplines: water regulation and zoning, fisheries, lake biology, and wildlife.

Sensitive areas are defined in Wisconsin Administrative Code NR 107.05 (3)(i)(1) as *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*. Department resource managers determined that the area located on the north side of Golden Lake met this definition (Figure 1). This area is locally known as either the “marsh area” or “kettle area”.

## Overview of Sensitive Area Designations

Sensitive areas often have aquatic or wetland vegetation, terrestrial (land) vegetation, gravel or rubble lake substrate, or areas that contain large woody cover (fallen trees or logs). These areas provide water quality benefits to the lake, reduce shoreline erosion, and provide habitat necessary for seasonal and/or life stage requirements of fish, invertebrates, and wildlife. A designated sensitive area alerts interested parties (i.e., DNR personnel, county zoning personnel, lake associations, etc.) that the area contains critical habitat vital to sustaining a healthy lake ecosystem, and/or may feature an endangered plant or animal. Information presented in a sensitive area report may discourage certain permits from being approved within these sites.

## Whole Lake Recommendations:

Several recommendations from Department staff pertain to Golden Lake as a whole rather than to the sensitive area:

1. Native aquatic plant beds should be protected and maintained.
2. Prevent the spread of exotic species through sign postings, education, etc. and control exotic species where established.

3. Comply with State and Local Shoreland Zoning standards by maintaining no-cut buffers and setbacks, removing non-conforming structures, and limiting impervious surfaces.
4. Create shoreland buffers and maintain existing buffers, especially in areas not currently developed.
5. Monitor water quality for early detection of changes and possible degradation.

### **Resource Value of Sensitive Area– Golden Lake**

The sensitive area on Golden Lake is located in the northern basin of the lake, locally known as the “Kettle” or “Marsh Area”. This sensitive area, with its rich ecological diversity, serves as a nutrient buffer for reducing algae blooms, a biological buffer reducing the likelihood of exotic species invasions, a physical buffer against shoreline erosion, a micro-habitat increasing biodiversity, and allows for sediment stabilization.

The substrate (lake bottom) in Golden Lake’s sensitive area consists of sand, silt with marl, muck and detritus. The water depth is about 3 ft in most places, getting shallower near the lilly pads (2 feet of less water depth), and reaching 8 feet at the entrance to the kettle. Sediment depth ranged from 6 inches to 4 feet throughout the kettle area.

Sensitive area habitat is located along the shoreline, near-shore terrestrial (land), and littoral (vegetated edge of lake) zones. The shoreland buffer in this sensitive area is made up of approximately 70 percent wetland, 25 percent wooded area, and is 5 percent developed. The wetland consists primarily of deep marsh containing cattail, yellow water lilly, and soft stem bulrush. Large woody cover is not present in the water along the shoreline of this sensitive area. Herbaceous plants are dominant, covering at least 75% of the shoreline buffer zone. Shrubs cover up to 25 % of the shoreline buffer. Trees are common along one quarter to one half of the shoreline buffer zone. Lawns are present along approximately 5% of the shoreline buffer zone. This area has unique aesthetics and has undergone very little human influence; therefore the natural scenic beauty (NSB) rating of this sensitive area is listed as “outstanding”.

The sensitive area also provides life requisites for a variety of wildlife species. Submergent, floating, and emergent vegetation within the sensitive provides nest sites, nest building materials, and nutritional values for birds and mammals. Wild celery predominates and is one of the most valuable duck foods. All parts of the plants are consumed. Sago pondweed is also present and is by far the most valuable pondweed species for wildlife. All parts of the plant are consumed including its tubers and large seeds. The seeds of the soft stem bulrush are also an important food source for ducks, geese, marsh birds and shorebirds. Geese and muskrats consume the bulrush stems and underwater parts as well. Bulrush also provides important nesting cover for waterfowl and marsh birds and provides concealing protection from predators. Cattails are also

abundant and provide food and nesting material for muskrats and geese. This emergent vegetation also serves as shelter and nesting cover for songbirds.

The shoreline of Golden Lake provides a relatively uninterrupted tree canopy with variation in understory canopy. This vegetational structure, next to a large water body, provides important habitat as a travel corridor for a variety of mammals, as well as feeding, nesting, roosting, and migratory habitat for a variety of songbirds. The northern shoreline is especially valuable due to its lack of development and marsh habitat.

During the sensitive area survey on September 20, 2005, a marsh hawk, a species of special concern, was observed in the area. A pied-billed grebe was also observed. A sandhill crane was heard during the August 30, 2005 survey. Loons, ducks, geese, great blue herons, song birds, frogs and muskrats are either heard or seen at various times throughout the year (Bob Kudis and Dave Perry, personal observations). The presence of these animals indicates good wetland quality.

The extensive development of the main basin of Golden Lake has reduced the quality of the available wildlife habitat. The sensitive area provides suitable shelter, nesting area, and feeding areas for sandhill cranes, white tail deer, loons, ducks, geese, great blue herons, songbirds, frogs and muskrat. Table 1 displays all the plants found in the sensitive area and their level of abundance. 21 species and/or taxa of plants were observed during the surveys on August 30, 2005 and September 20, 2005.

Important fish habitat components present in this sensitive area include emergent vegetation, submergent vegetation, floating leaf vegetation, and sand bottom used for spawning. Northern pike, smallmouth bass, largemouth bass, panfish, perch, suckers and minnows use this sensitive area for spawning, nursery areas, feeding, and for protective cover. Walleye use the sensitive area as a nursery, feeding area, and for protective cover. See Table 2 for a summary of plants and substrates utilized by fish in Golden Lake.

Table 1. Plants observed in sensitive area.

	<b>Emergent</b>	<b>Submergent</b>	<b>Floating</b>	<b>Exotic</b>
PRESENT (0-25% Cover)		<i>Ceratophyllum</i> (coontail) <i>Myriophyllum sibiricum</i> (northern watermilfoil) <i>P. amplifolius</i> (large-leaf pondweed) <i>P. praelongus</i> (white-stemmed pondweed) <i>P. richardsonii</i> (clasping-leaf pondweed)		<i>Myriophyllum spicatum</i> (Eurasian watermilfoil) <i>P. crispus</i> (curly-leaf pondweed) <i>Lythrum</i> (purple loosestrife)
COMMON (26-50% Cover)	<i>Pontederia</i> (pickerelweed)	<i>Utricularia</i> (bladderwort) <i>Najas marina</i> (Spiny naiad)	<i>Nuphar advena</i> (yellow water lily) <i>P. natans</i> (floating-leaf pondweed)	
ABUNDANT (51-75% Cover)		<i>P. zosteriformis</i> (flat-stemmed pondweed) <i>P. illinoensis</i> (Illinois pondweed)	<i>Nymphaea odorata</i> (white water lily)	
DOMINANT (76-100% Cover)	<i>Scirpus</i> (bulrush) <i>Typha</i> (cattail)	<i>Vallisneria</i> (wild celery) <i>Najas flexilis</i> (Slender naiad) <i>Chara</i> (muskgrass) <i>Stuckenia pectinata</i> (sago pondweed)		

Table 2. Sensitive area habitat utilized by resident fish species of Golden Lake.

<b>Fish Species</b>	<b>Spawning</b>	<b>Nursery</b>	<b>Feeding</b>	<b>Protective Cover</b>
Walleye		water lily, milfoil, sago	sago, milfoil	sago, milfoil
Northern Pike	Aquatic plants (emergent)	water lily, wild celery, milfoil, pondweeds	water lily, wild celery, milfoil, pondweeds	water lily, wild celery, milfoil, pondweeds
Largemouth Bass	sand, gravel, rubble	water lily, wild celery, milfoil, pondweeds	water lily, wild celery, milfoil, pondweeds	water lily, wild celery, milfoil, pondweeds
Smallmouth Bass	sand, gravel, rubble	water lily, wild celery, milfoil, pondweeds	water lily, wild celery, milfoil, pondweeds	water lily, wild celery, milfoil, pondweeds
Bluegill and Pumpkinseed	sand	water lily, wild celery, milfoil	water lily, wild celery, milfoil	water lily, wild celery, milfoil

<b>Fish Species</b>	<b>Spawning</b>	<b>Nursery</b>	<b>Feeding</b>	<b>Protective Cover</b>
Yellow Perch	milfoil, pondweeds	water lily, wild celery, milfoil, pondweeds	milfoil, pondweeds	milfoil, pondweeds
Suckers	gravel	water lily, milfoil, sago	water lily, milfoil, sago	water lily, milfoil, sago
Minnows	Variable depending on species	water lily, milfoil, sago	water lily, milfoil, sago	water lily, milfoil, sago

Management Recommendations for Sensitive Area #1

1. Post “Exotics Alert” sign at boat landing. (Already Present)
2. Maintain current levels of erosion and nutrient runoff control.
3. Protect emergent aquatic plants.
4. No mechanical harvesting except for a navigational channel.
5. No chemical treatment should be allowed except to target an infestation of an exotic species such as purple loosestrife, Eurasian water milfoil or curly leaf pondweed. Biological controls such as the purple loosestrife beetle and the milfoil weevil should be considered where appropriate.
6. No alteration of the littoral zone unless to improve spawning habitat.
7. A DNR permit should not be issued for any of the following:
 

Dredging	Pea gravel/sand blankets
Filling of wetlands	Rip Rap
Aquatic plant screens	Sea Walls
8. Boardwalks will be allowed on a case by case basis to provide open water access only for a riparian landowner. Watercraft moored at the boardwalk must be able to navigate the water without any additional dredging. The number of moorings allowed will be less than “reasonable use” as defined by state law.
9. New piers will only be permitted in the very southern portion of the kettle where the existing water depth fifty feet from shore is at least 3 feet. The number of slips allowed will be less than “reasonable use” as defined by state law.
10. The Golden Lake Association should consider pursuing an ordinance to establish a “Slow, No Wake” zone for the sensitive area. This ordinance would need to be established on a local level through both the Town of Summit and the Town of Concord.

11. Recommendations regarding **local and county zoning**:

- Strictly enforce shoreland and wetland ordinances
- Restrict/limit subdivision of existing undeveloped parcels
- Require a buffer/"no touch" zone for grading projects. This buffer/"no touch" zone should be at least 100 feet from the edge of the wetland back into the (landward) upland portion of parcels.
- Require a buffer/"no touch" zone for grading projects located along steep slopes. The zone should extend at least 100 feet from the edge of a steep slope towards the landward side of the parcel.
- Grading proposals should be strictly examined for superior erosion control and nutrient management plans.

## Conclusion

Development proposals along the shoreline of Golden Lake's sensitive area should be carefully studied to prevent any further loss of habitat. This report identifies the biological components of the sensitive area, identifies sensitive area characteristics, and poses management recommendations for the sensitive area. The sensitive area provides the key fish nursery and the main wildlife refuge for Golden Lake.

In summary, the ecological community of the sensitive area has distinctly unique features when compared to the waterbody as a whole. This site provides a visual and audible buffer from shoreline structures, roads, and boat traffic. Aquatic plant types present in the sensitive area include emergents, algae, potamogetons (pondweeds), exotics, free floating, floating leaf, and submergents. Wet edge plants include rushes and herbs. Game fish, panfish, and forage fish heavily utilize the sensitive area. Wildlife species include upland wildlife, furbearers, songbirds, waterfowl, shore birds, raptors (turkey vultures, marsh hawks) amphibians and reptiles. This site offers a buffer against invasive non-native species (exotic species), and could be used to educate citizens about wetlands and sensitive areas.

Wisconsin lakes attract many users, all of whom are affected by water quality. Golden Lake attracts a diverse group of patrons, inevitably creating conflict between conservationists and recreational users. Therefore, the objective must be to create and maintain a balance between recreational use and preservation of habitat. This is essential to the long term water quality for Golden Lake. An integrated approach to lake management that includes the public and all of the lakes' governing units will help to maintain this balance. Improving or at least maintaining water quality in Wisconsin lakes is critical. By protecting and restoring lake habitat, Golden Lake will continue to sustain healthy ecosystems and responsible recreational opportunities for years to come.

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