Marl Lake
Aquatic Plant Management Plan

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Chapter I

INTRODUCTION

In 1989 the State of Wisconsin enacted the Lake Management Planning Grant program. The program was designed to provide cost-sharing assistance and incentives to local communities because they are the front line for lake management. The development of this aquatic plant management plan is one part of a continued effort by local residents to improve Marl Lake. Marl Lake is a 41 acre lake located in the Town of Deerfield, Waushara County, Wisconsin. The lake has a maximum depth of 34 feet. The land area immediately surrounding the lake is low density residential on the south and east. A park, with boat launch, picnic area, and swimming beach is on the north shore.

Concern over the condition of the lake prompted the community to create the Marl Lake District (District). The District was successful in securing the cooperation of the Township to solve an agricultural runoff problem on the northwest end of the lake. In January 1995 the District hired Aron & Associates to conduct an aquatic plant survey and plant management plan.

PUBLIC INTERACTION

The plant management plan was developed by Aron & Associates. Public input and historical records were an important part of the development of this plan. Comments and information were solicited from:

- residents and board members,
- lake users,
- community meetings,
- WDNR resource managers, and
- WDNR records

The District intends to use this plan to guide future plant management decisions and to educate the residents on the merits of the issues addressed in the plan.

GOALS & OBJECTIVES

The difficult task facing those who attempt to manage their lake is that user needs often conflict. Fish and wildlife need aquatic plants to thrive. Boaters and swimmers desire relief from nuisance aquatic plants. Those depending on the lake for "aesthetic viewing" desire an undisturbed lake surface.

The District's goal is to optimize the preservation of aquatic systems that includes water quality, fisheries, and wildlife while minimizing the conditions resulting from aquatic nuisances and to preserve and maintain recreational uses of Marl Lake. The development of this plan is one component of a continuing effort to improve the quality of life on Marl Lake.

The District desires to (listed in order of local importance):

- Prevent invasions of exotic plant species.
- Control nuisance levels of aquatic plants
- Preserve the natural lake environment.
- Identify local educational efforts that the District may undertake to improve the public's understanding of lake issues.

Chapter II
BACKGROUND

PHYSICAL DESCRIPTION

Marl Lake is a small seepage lake. Hydrographic and morphologic data are provided in Table 1. There is a small inlet on the west end of the lake. However, very little water enters the lake through the small stream. The current lake level varies significantly. The lake sediment is primarily marl. The west end of the lake bed at one time was dredged to remove the marl. The sediment in the dredged area is now more organic and silty. The lake is nearly circular in shape. Most of the shorelines are steeply sloped. The steep slopes extend into the lake.

SHORELINE DEVELOPMENT & AESTHETIC FEATURES

Marl Lake and its watershed are primarily agriculture and rural land use. This seepage lake has a small inlet. A small wetland is located to the west of the lake. The park land on the north provides an undeveloped view from the south. Although motors are permitted on the lake, a slow no wake law is in effect at all times. This contributes to the quiet, undisturbed nature of the lake.

Land use activities can directly affect the chemical and biological components of a lake, as well as plant growth patterns in a lake. The runoff from individual homesites, development, and agricultural lands add to the nutrients and sediments in a lake. That in turn increases the plant growth, sometimes to nuisance conditions. Nutrients, sediments and other materials entering the lake can severely impact the plants, fish and wildlife. Lower oxygen levels, fish kills, and sedimentation of spawning beds can result. Lake use activities, such as boating, that are conducted in areas of a lake with insufficient depths, can also result in the disruption of sediments. Education of the general public, especially the lake front property owners, should focus on activities to minimize impact on the lake.

The lake has quiet bays that provide refuge for fish and wildlife. Although homes are visible from the lake, the varied landscape and steep slopes provide a more pleasurable aesthetic view than usually found on developed lakes. The steep shorelines can also contribute significant problems for the lake: disturbances or construction by residents can result in serious erosion if preventive steps are not taken. The large wetland and woodland areas in the watershed provide a degree of water quality protection for the lake.

ACCESS LOCATIONS

Marl Lake meets the WDNR standards for public access to an inland lake. Boat access to the lake is provided at a Town launch located on the north shore (Map 1). A beach is located next to the launch.

Table 1. Hydrography and Morphology of Marl Lake
Waushara County, Wisconsin, 1995

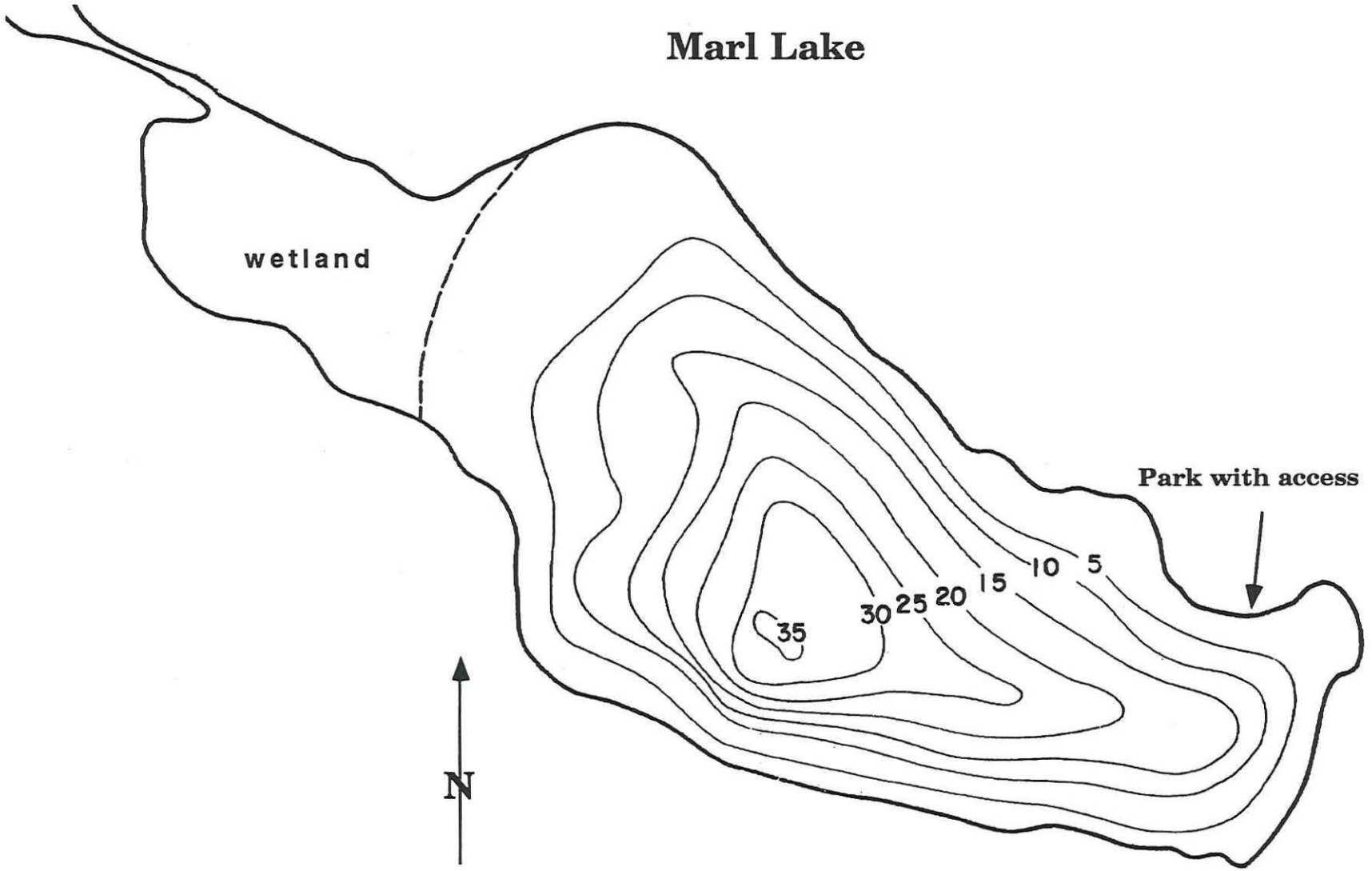
Area = 41 acres
Shore length = 1.4 miles
Shore development factor* = 1.56
Maximum depth = 34 feet
Mean depth = 16 feet

* Shore development factor is defined as the ratio of shoreline to the circumference of a circle with the same area as the lake.

Sources: WDNR, Aron & Associates

Map 1 - Marl Lake, 1995

Marl Lake



Aron & Associates, 1996

AQUATIC PLANTS

Aquatic plants are very important to the health of a lake. They provide food and cover for fish and wildlife as well as contributing to dissolved oxygen production. Plants also stabilize sediments, helping control shoreline erosion, and turbidity. An aquatic plant monitoring program may also provide an early warning signal that the lake is reacting to negative impacts from the watershed or recreational use activities.

An aquatic plant survey was conducted by Aron & Associates (A&A) in June of 1995. The field work was conducted in accordance with DNR approved methods for aquatic plant surveys. Fifteen transects were established around the lake and extended from shore to the maximum rooting depth. Four depths were sampled along the transects at the 2, 5, 8, and 12 foot depths. Map 2 shows where the transects were established. To ensure that all plant communities were documented, a general survey was conducted on the rest of the lake. Plant specimens were collected, identified, pressed and mounted. The District will be given a collection of the plants. Duplicate collections will be preserved by Aron & Associates and the Milwaukee Public Museum.

Map 3 shows the area of Marl Lake that was able to support aquatic plants in 1995. The 1995 survey data is included in the Appendix. Maximum rooting depth in 1995 was found to be 16 feet.

During the 1995 survey, a total of 19 species was observed (Table 2). In general, Marl Lake has a good diversity of aquatic plants. None of the 19 were exotic (non-native) species. Native plant species in general provide more benefits than do exotics.

Many aquatic plants are important food sources for waterfowl. Others provide habitat, spawning and shelter areas for fish. Exotic plant species do not provide these benefits as well as the native plant species. Exotic plant species tend be more dense, and often grow to the surface where they interfere with recreational uses. Some exotic plant species will create 'canopies' that prevent light from reaching native plants underneath. Protection of native species is an important means of reducing problems from exotic species. In Marl Lake, early detection and removal of exotic plant species is important.

The greatest diversity of aquatic plants was found at the 2 foot sampling depth where a total of sixteen plant species were found. Muskgrass (Chara sp.) was the dominant species at all depths. Variable-leaf pondweed (Potamogeton gramineus) was the next dominant at all depths. Seven species were found at all sample depths: muskgrass, variable-leaf pondweed, sago pondweed (P. pectinatus), floating-leaf pondweed (P. natans), Fries pondweed (P. Friesii), Illinois pondweed (P. illinoensis) and flat-stem pondweed (P. zosterformis).

Diversity declined in Marl Lake as the depth increased. Sixteen species were found at the 2 foot depth, thirteen at the 5 foot depth, ten at the 8 foot depth and seven at the 12 foot depth.

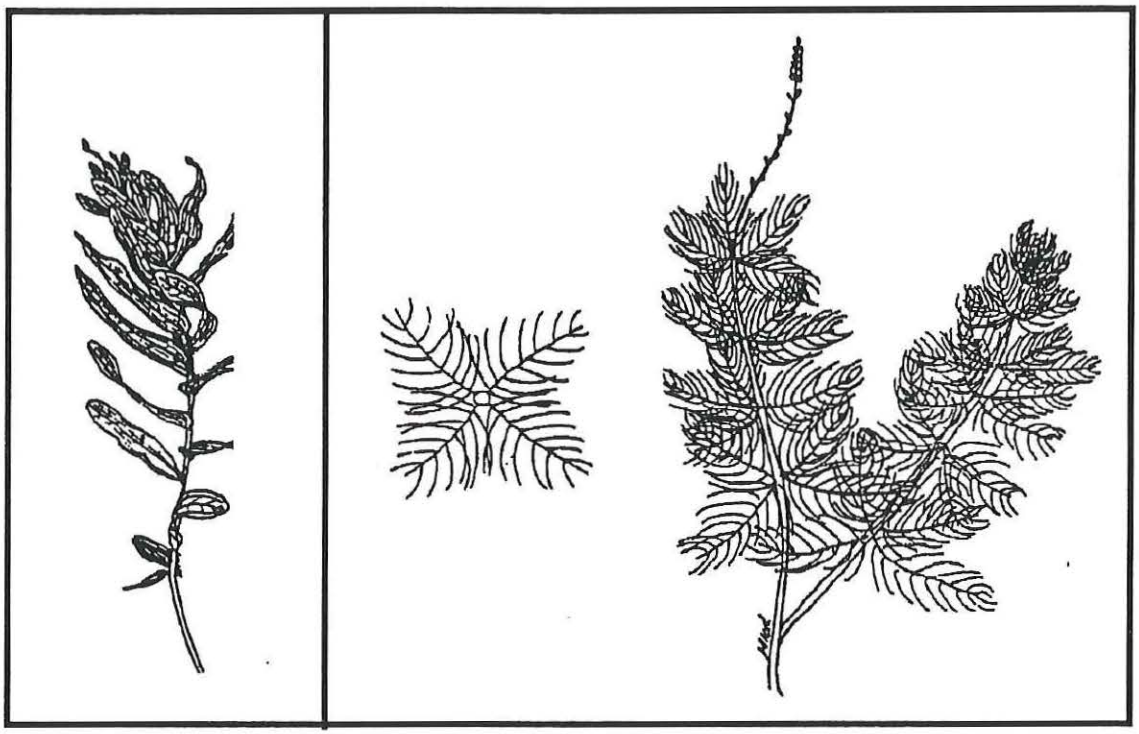


Figure 1. Two exotic species: curly-leaf pondweed (left) and Eurasian water milfoil.

Muskgrass (Chara sp.) is actually an algae, but is usually included in discussions of aquatic plant management. Muskgrass is low growing and can help prevent or reduce the growth of Eurasian water milfoil. It can also protect lake sediments from the effects of boaters. Muskgrass will not thrive in lakes with high turbidity problems. Muskgrass is an excellent producer of fish food for large and small mouth bass (Fassett 1985).

Muskgrass was found in 58 of the 60 sample points. It was found in all depth ranges, however, it was found in the lowest density at the 2 foot depth and in the greatest density at the 12 foot depth. It can become very dense and problematic in some lakes, prompting management actions to improve recreational access to waterways. It did not appear to be a problem in Marl Lake and should for the most part, be protected to help prevent infestations of other potential nuisances such as Eurasian water milfoil or curly-leaf pondweed.

Eurasian water milfoil (Myriophyllum spicatum), Figure 1, is an exotic plant that quickly takes advantage of opportunities for growth. In many lakes it can become a severe nuisance, creating dense plants with large canopies on the surface that shade out other more desirable plant species. Fishing and boating is impaired or restricted and swimming becomes dangerous in the long stringy plants. Eurasian water milfoil also can contribute to stunted panfish populations by providing too much protection from predator fish (WDNR 1988). Eurasian water milfoil stands have been found to support fewer macroinvertebrates than comparable stands of pondweeds and wild celery (Smith & Barko 1990). This in turn affects the fisheries that can be supported by the plants. Eurasian water milfoil was not found on Marl Lake during the 1995 survey. There should be an aggressive watch program for early detection of Eurasian water milfoil.

Curly-leaf pondweed (Potamogeton crispus), Figure 1, tends to be more dominant in early summer, dying off in mid-July and August. Like Eurasian water milfoil, curly-leaf pondweed is an exotic plant species. It begins growing very early in the season. Curly-leaf produces dormant structures called turions by the end of June and early July. These turions rest on the bottom until fall when they begin to germinate and produce small plants. The fall growth then over-winters in a green condition (Nichols and Shaw, 1990). In spring, when water temperature and light intensities increase curly-leaf is ready to grow thereby out competing other plants that must germinate from seeds or re-establish rootstocks. Curly-leaf pondweed provides a good food source for waterfowl, especially as an invertebrate substrate, which is also used by fish. It may provide good cover for fish as long as densities do not reach a nuisance level. Curly-leaf pondweed was not found on Marl Lake during the 1995 survey. There should be an aggressive watch program for early detection of curly-leaf pondweed.

Pondweeds are important species of plants for a lake. Pondweeds do not grow as dense nor create a dense canopy as does Eurasian water milfoil. Pondweeds support food and provide cover for fish. Most pondweeds provide good to excellent food for waterfowl, and different species of pondweeds become important at different times of the year. As indicated earlier, pondweeds support much greater populations of macroinvertebrates than Eurasian water milfoil. Plant management should focus on protection and enhancement of the pondweeds, while controlling the nuisance populations of milfoil.

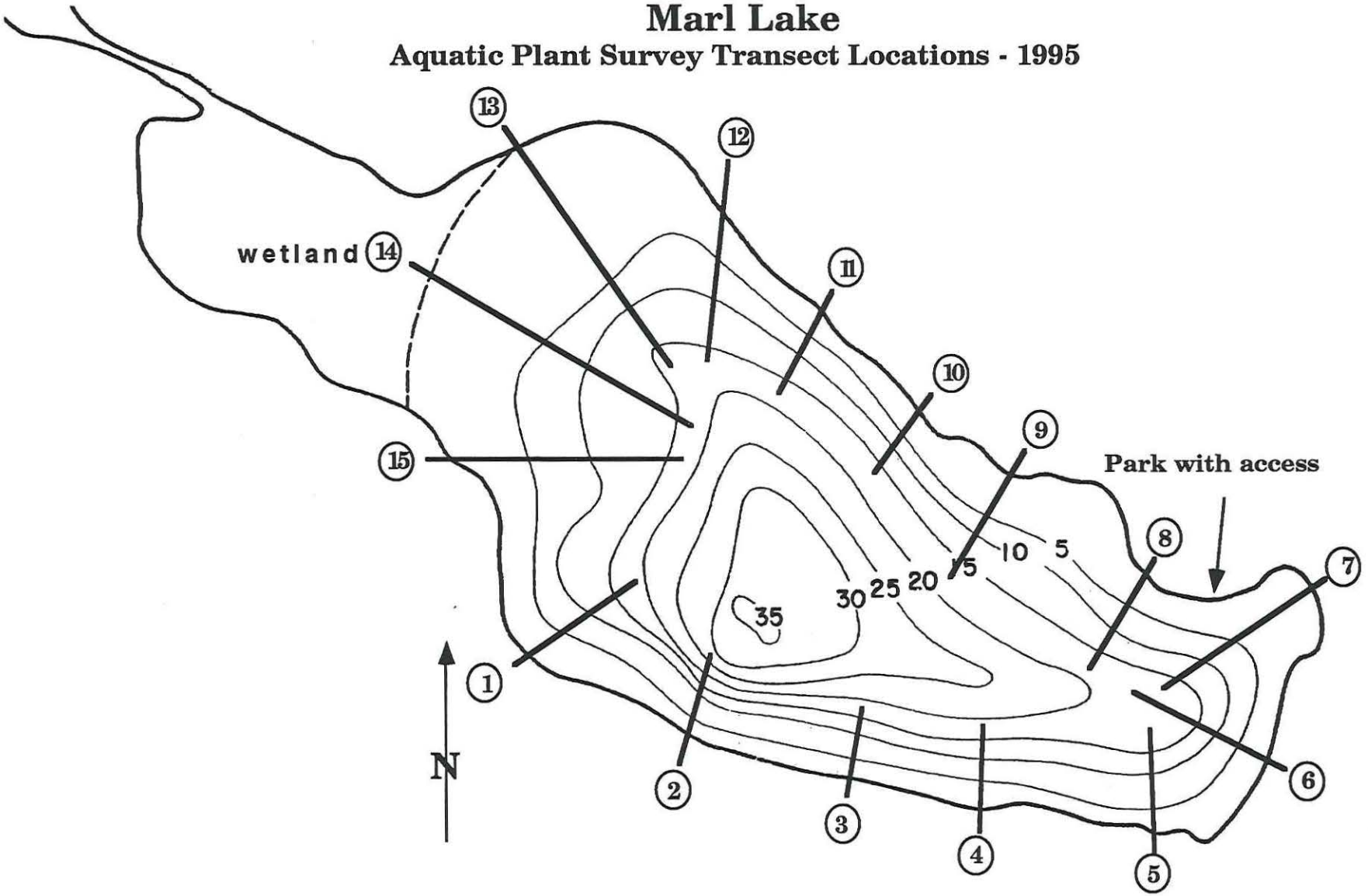
In particular, one large plant bed on the east end of the lake contained a very high quality stand of Fries pondweed, sago pondweed and variable-leaf pondweed. During the survey, this bed contained many bass and panfish. This area is a good example of native species in relatively large densities that do not impair other lake uses. These plants are 'narrower' in stature and produce a lace-y community, invaluable for fish.

Recent attempts by the Wisconsin Legislature to protect native pondweeds were enacted in 1989 with the passage of NR 107. That legislation specifies that 'high value species' should be protected and includes 12 aquatic plant species by name. Those specifically mentioned protected plants that are found in Marl Lake include sago pondweed (Potamogeton pectinatus) and Illinois pondweed (P. illinoensis). Other high value plant species that should be protected include: Fries pondweed (P. Friesii), variable-leaf pondweed, floating-leaf pondweed (P. natans), flat-stem pondweed (P. zosterformis) and knotweed (Polygonum amphibian) Because of the diversity and high quality of species in Marl Lake, care should be taken to protect the aquatic plant communities.

Map 2 - Transect Locations

Marl Lake

Aquatic Plant Survey Transect Locations - 1995



Aron & Associates, 1996

Table 2. List of Plant Species in Marl Lake, 1995

Scientific Name	Common Name
Ceratophyllum demersum*	Coontail
Chara sp.	Muskgrass
Elodea canadensis	Elodea
Heteranthera dubia	Water Stargrass
Lemna minor**	Small Duckweed
Myriophyllum exalbescens	Northern Milfoil
Nuphar sp.	Yellow Water Lily
Nymphaea sp.	White Water Lily
Polygonum amphibian	Knotweed
Potamogeton Friesii	Fries Pondweed
P. gramineus	Variable-leaf Pondweed
P. illinoensis	Illinois Pondweed
P. natans	Floating-leaf Pondweed
P. pectinatus	Sago Pondweed
P. zosterformis	Flat-stem Pondweed
Ranunculus longirostris	White Water Crowfoot
Sagittarius sp.* **	Arrowhead
Scirpus sp.**	Bulrush
Utricularia vulgaris	Great Bladderwort

* Found in general survey only
** No specimen collected

Source: Aron & Associates

Table 3. Species Distribution by Water Depth, June 1995.

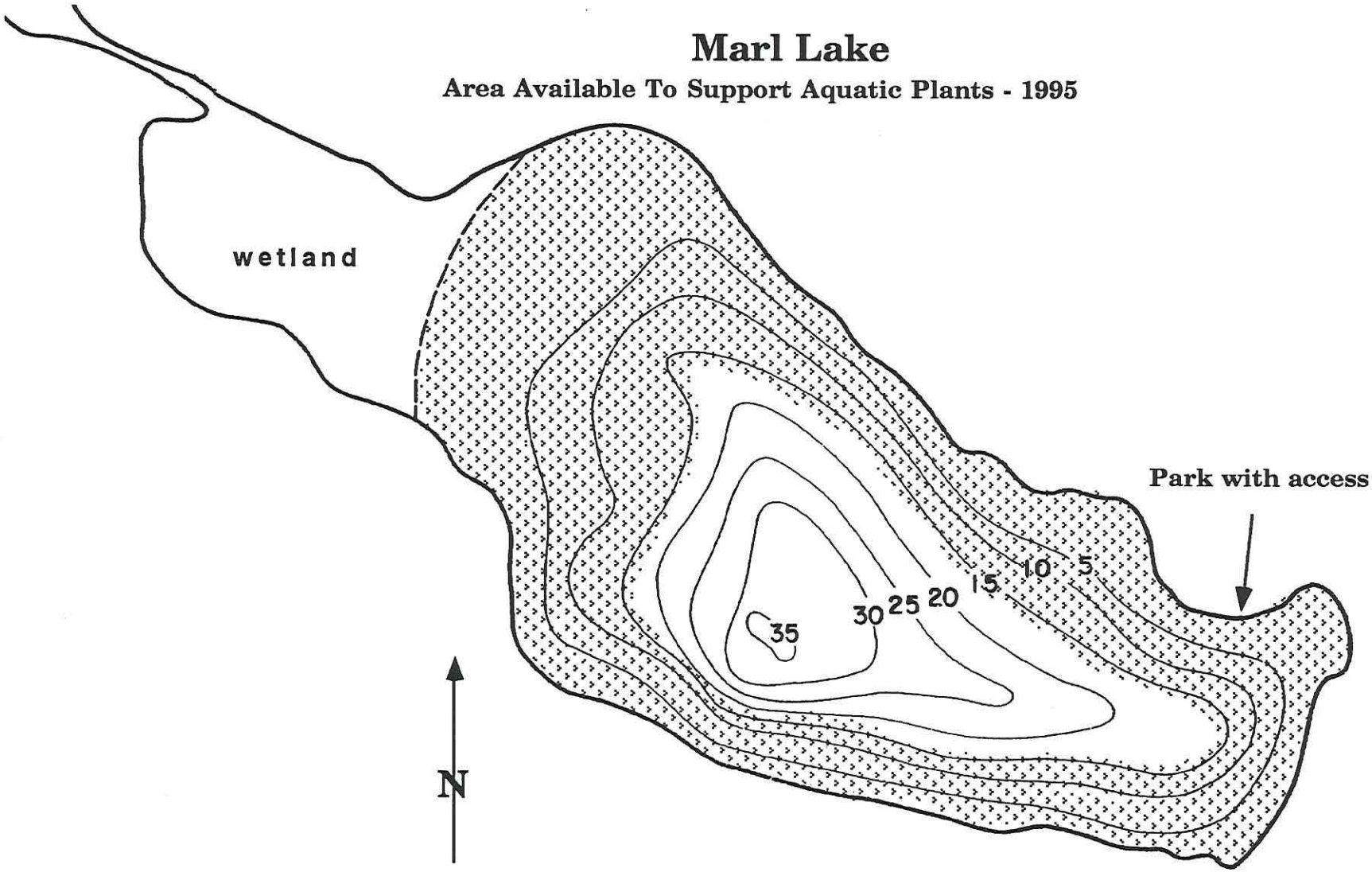
Species	2.0	4.0	7.0	10.0
Chara sp.	X	X	X	X
Elodea canadensis	X	X		
Heteranthera dubia			X	
Lemna minor	X			
Myriophyllum exalbescens	X	X		
Nuphar sp.	X	X	X	
Nymphaea sp.	X	X		
Polygonum amphibian.	X	X	X	
Potamogeton gramineus	X	X	X	X
P. Friesii	X		X	X
P. Illinoensis	X	X	X	X
P. natans	X	X	X	X
P. pectinatus	X	X	X	X
P. zosterformis	X	X	X	X
Ranunculus longirostris	X			
Scirpus sp.	X	X		
Utricularia vulgaris	X	X		

Source: Aron & Associates

Map 3 - Area Available for Aquatic Plant Growth, 1995

Marl Lake

Area Available To Support Aquatic Plants - 1995



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HISTORICAL CONDITIONS

There is limited, detailed historical information available on many lakes in Wisconsin. In 1987, the Wisconsin Department of Natural Resources (DNR) conducted an aquatic plant survey. The report is included in the Appendix. Two species that were found in 1987 were not found in 1995: large-leaf pondweed (P. amplifolius) and slender naiad (Najas flexilis). Water lilies (Nuphar sp. and Nymphaea sp.) and Fries pondweed (P. Friesii) were not found in 1987, but were identified in 1995. A significant change between 1987 and 1995 appears to be the density of coontail (Ceratophyllum demersum). Coontail was listed as the second most abundant plant in the 1987 survey but was only found in two areas in 1995. Muskgrass was listed as the most abundant species in both surveys.

The maximum rooting depth in 1995 was 16 feet. This is similar to the depth indicated in the 1987 report of 4.5 to 5 meters (14.75 to 16.4 feet).

Some of the differences between the surveys may be due to methodology. The general survey portion of the work conducted in 1995 along with the transect survey should identify additional plant species that may not be found otherwise. The placement of the transects also can affect the results. The 1995 survey included five more transects than the 1987.

SENSITIVE AREAS

The level of development around lakes and the amount of recreational use lakes receive often diminish the value of the resources to fish and wildlife. Often, people tend to underestimate the affect they have on the rest of their environment. But indeed, the affect can be significant. Wildlife will avoid areas frequented by boats and noisy lake users. Waves from the continuous use of watercraft can erode shorelines and drive furbearers from their nests. Neatly manicured urban lawns do not protect shorelines from the corrosive action of waves, nor do they provide wildlife with shelter or shade. Retaining walls do not provide areas for small invertebrates, an essential element in the food supply for fish. Retaining walls are barriers to amphibians, turtles, and frogs who need access to shoreland areas. Spawning areas can be disrupted by propellers or personal watercraft. Migrating birds and waterfowl seek quiet resting places or nesting areas.

In March 1989, the State enacted legislation to protect special or 'Sensitive' lake areas from some negative impacts. The WDNR was charged to administer an aquatic nuisance control program which includes Sensitive Area Designation. Administrative Code NR 107 provides the guidance used to administer the WDNR's aquatic plant management program. The program seeks to protect native vegetation that are important to fish and wildlife. The

WDNR may also restrict other activities that would prove detrimental to the native plants. These restricted activities may include dredging, filling, shoreline alterations or sand blankets.

The use of chemical treatment in Sensitive Areas is currently the only specific plant management activity that is regulated by the state, although there is growing desire for expansion of the program. A recent report to the legislature written by the WDNR in 1993, Eurasian water milfoil in Wisconsin: A Report to the Legislature, calls for expanded controls on harvesting and planting in Wisconsin lakes. The report addresses the increasing spread of Eurasian water milfoil and other exotics. Because protection of native plants appears to provide some protection against milfoil invasions, protection is a logical first step. The WDNR report mentioned above indicates that few lakes in southeast Wisconsin have undeveloped shorelines and wetlands. Those with any remaining undeveloped shorelines and wetlands should be preserved and protected.

The WDNR has not conducted a Sensitive Area designation on Marl Lake. Map 4 shows the areas of the lake that would be considered 'sensitive'. The native species in these areas are extremely important to the long term health of the fisheries and vegetation diversity on Marl Lake and should be protected.

Marl Lake has extensive areas of natural shoreline. Residents should be encouraged to maintain their shorelines in a natural condition. Aquatic vegetation in the nearshore areas stabilize soft sediments, preventing them from becoming resuspended into the water column because of wind or boating. The shallow areas of native aquatic plants should be preserved.

FISH AND WILDLIFE

Marl Lake maintains a warm water fishery with northern pike, large mouth bass and panfish are plentiful. The low degree of residential development enhances the value of the resource to wildlife. The lake may be used by ducks, geese and other waterfowl during migration and during breeding. Natural shorelines allow frogs and turtles a way to obtain access to land.

LAKE USE

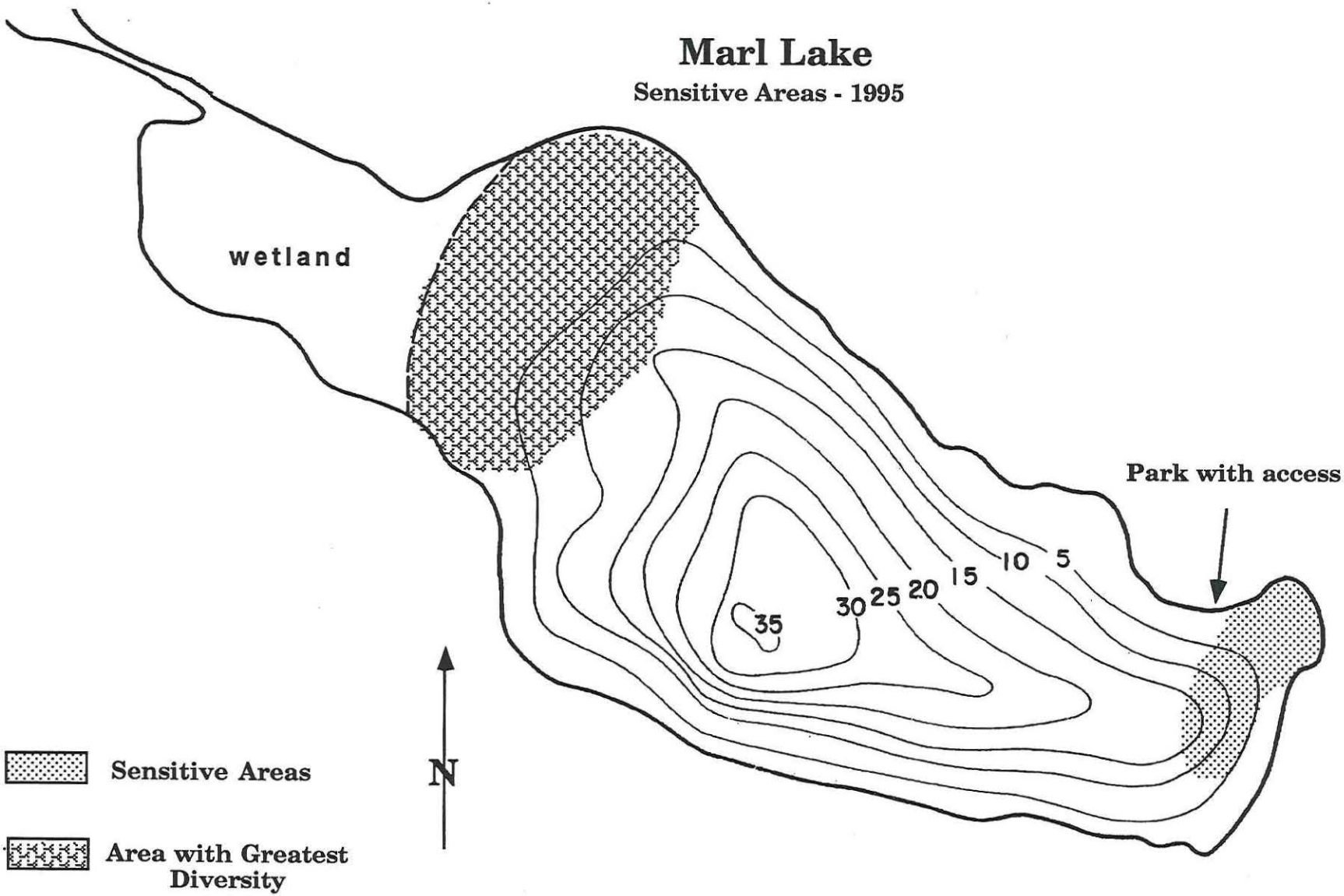
Marl Lake receives a low degree of recreational pressure. The majority of recreational uses are swimming and fishing. Swimming conditions on some lakes can be affected by nuisance quantities of aquatic plants. The small size of Marl Lake protects it from the harmful affects of speed boating activities. Slow no wake speed restrictions help protect shorelines

from erosion. Control of nuisance plant species invasions will also protect the quality recreational uses.

BOATING ORDINANCE

State laws are in effect on the lake and enforcement is the responsibility of the DNR Conservation Wardens. Because the lake is under fifty acres, it is posted as a slow no wake lake.

Map 4 -Sensitive Areas on Marl Lake



Aron & Associates, 1996

Chapter III
PROBLEMS

Marl Lake is considered a quality water resource even though sediments contain sufficient amounts of nutrients to promote aquatic plant growth. Phosphorus and nitrogen have been determined to be the most critical components that drive aquatic plant growth. Phosphorus is likely that limiting nutrient in Marl Lake.

In many lakes, dense plant beds in the shallow areas clog boat motors and pier areas, impairing boat traffic. Dense weeds impair swimming along shorelines and contribute to stunted panfish populations by reducing opportunities for grazing by predators. Additionally, the excessive plants mar the aesthetic value of a lake when surface weeds collect algae and debris and become odoriferous.

Marl Lake has a high quality aquatic plant community. The greatest problem area is on the west end of the lake where dredging had been done years ago. The soft sediments in that area are significantly different than the marl sediments found in the rest of the lake. The aquatic plants are found in greater quantities in the west area. High value plants such as muskgrass, Fries pondweed, sago pondweed and variable-leaf pondweed are not as common in this area. Instead northern milfoil, coontail, waterweed (elodea canadensis) are much more common, in some areas restricting use.

The District has been attempting to improve the quality of the watershed runoff. The northwestern watershed area through the inlet was a primary concern. The Town, County, DNR and a local landowner worked with the District to improve the quality of runoff from an adjacent farm. Nutrients that enter a lake can continue to contribute to water quality or aquatic plant problems for many years after a pollution source has been corrected because the plants recycle the nutrients.

Invasions of exotic plant species, aquatic and wetland, can create significant water quality, wildlife and lake use problems. Adjacent wetlands should be carefully monitored for purple loosestrife. The lake should be monitored carefully for curly-leaf pondweed and Eurasian watermilfoil. Early discovery and removal will protect the quality resources present in and around Marl Lake.

Chapter IV
PLANT MANAGEMENT ALTERNATIVES

DRAWDOWN

Drawdown can be used to control some plant growth. Use of this method entails dropping the lake X number of feet for a period of time. This exposes the plants to extreme temperatures, drying and freezing. Some plants respond very favorably to drawdown, while other plants react negatively, or unpredictably. Eurasian water milfoil and coontail react unpredictably (Nichols 1991). A source of water to refill the lake, and a means to draw the lake down, are also important considerations. The procedure is rarely effective. Some valuable plants can be destroyed while more nuisance plants can be encouraged. Time is also a factor in drawdowns. Usually a lake is drawn down for 4 to 6 months and often needs to be repeated for maximum effectiveness. Drawdown also reduces the recreational opportunities on the lake. Timing of a drawdown can have a negative impact on fisheries if spawning areas are no longer reachable by fish. Turtles and frogs hibernate in shoreline muds and can also be affected by drawdowns.

Costs associated with drawdowns depend on the outlet control structure. Pumping to lower the lake requires costs for equipment, electricity and staff. Costs can be minimal if the lake can be lowered by opening a gate.

Because the lake level already fluctuates significantly, because of the lack of a control structure on Marl Lake and because plant problems are found only in one area of the lake, drawdown for the purpose of aquatic plant control on Marl Lake is not recommended.

NUTRIENT INACTIVATION

Nutrient inactivation is used to control the release of nutrients, primarily phosphorus, from the sediments. One of the most common substances used is aluminum sulfate, or alum. The alum treatment creates a floc formation covering the bottom sediments, preventing phosphorus from being released into the water. Nonpoint source pollution controls must be implemented prior to the use of alum, or the floc will be covered with newer nutrients. Based on the volume of the lake and the cost of alum, an alum treatment on Marl Lake would cost approximately $25,000. This treatment will not prevent plant growth but will reduce problems from algae growth. Improved water clarity from an alum treatment may increase aquatic plant densities. WDNR approval is required. Only waters deeper than eight feet can be treated with Alum. Without a more thorough review of water quality that

determines nutrient release from the sediments is a problem on Marl Lake, nutrient inactivation is not recommended at this time.

DREDGING FOR AQUATIC PLANT CONTROL

Dredging is most often used to increase depths for navigation in shallow waters, especially for channels, rivers, and harbors. Dredging for the sole purpose of plant control has met with mixed success. To be considered successful for aquatic plant control, dredging would need to bring the lake bed to depths beyond 15 feet deep. It is the most costly form of plant management control. Costs range from $3.00 per cubic yard up to $14.00 per cubic yard depending on site conditions, method used and disposal costs. A WDNR permit is required. Depending on the individual lake situation, dredging can aggravate aquatic plant problems by becoming a sink for sediments. This can be seen on the west end of Marl Lake.

Dredging for aquatic plant control would not be considered a viable alternative for Marl Lake without a very high cost and considerable disruption of the aquatic environment.

AERATION

Aeration entails installation, operation and maintenance of a system to artificially pump oxygen into the lake depths. Artificial aeration has been used to correct oxygen deficiency problems in lakes that produce numerous algae blooms and subsequent fish kills. Aeration is used when internal nutrient sources are high compared to external sources, if nuisance algae conditions exist, or if low oxygen levels are a problem. It is most useful on lakes with low dissolved oxygen levels and large internal releases of phosphorus.

Aeration is an expensive lake management technique. Initial capital costs for a lake this size is approximately $20,000 to $30,000 and an annual maintenance and operational cost of approximately $5,000. Problems may result with improperly sized aeration systems so initial planning and engineering must be done carefully to prevent creating greater problems. Annual operational problems and costs are difficult for small lake organization budgets and staff.

There has been no documented effect of aeration on plant growth. WDNR approval is required. Marl Lake has good water clarity, and good dissolved oxygen levels so aeration should not be considered at this time.

SCREENS

Light screens are similar to window screens that are placed on the lake bottom to control plant growth. Screens come in rolls that are spread out along the bottom and anchored by stakes, rods, or other weights. Screens replace the use of plastic that did not allow gases to be released from the sediments.

Screens create little environmental disturbance if confined to small areas that are not important fish or wildlife habitat. Although they are relatively easy to install over small areas, installation in deep water may require SCUBA. Screens must be removed each fall and reinstalled in spring. Care must be taken to use screens where sufficient water depth will reduce the opportunity for damage by outboard motors. Screens cost approximately $200 for a 700 sq. ft. roll. Screens may be used by individual home owners along their shorelines or piers to create swimming areas. WDNR approval is required.

Screens are a viable alternative for the limited applications by individual property owners to improve conditions in swimming areas, however, they should not be used for large areas in Marl Lake.

CHEMICAL TREATMENT

Chemical treatment for the control of aquatic plants is a controversial method of aquatic plant control. Debate over the toxicity and long term effects of chemicals continues. WDNR permit is required prior to any chemical treatment.

With chemical treatments, the plant material impacted by the treatment dies and contributes to the sediment accumulation on the lake bed. The decaying process of the plants uses oxygen so that if too much plant matter is treated at once, oxygen depletion may occur, stressing or killing fish.

Identification of the target species is very important. Different chemicals must be used for different plants. Dosage also affects the results. Too little chemical may stunt growth but not kill the plant. Too much chemical may negatively impact fish or invertebrates. If native plant communities are destroyed by chemicals, the areas may be invaded by exotic plants such as Eurasian water milfoil and curly-leaf pondweed.

Chemical treatment has the advantage of being more selective than harvesting. Chemical treatment may also be more appropriate in some situations, especially where mono-typic stands of exotics exist. It may also be the method of choice to treat early infestations of

Eurasian water milfoil. Chemical treatment may also be favored when water depths are insufficient to support mechanical harvesting.

Prior to any treatment, a permit is required from the DNR. Only Wisconsin and EPA registered herbicides may be used, following all label directions and restrictions. In most situations, herbicides may only be applied by applicators certified in aquatic application by the Wisconsin Department of Agriculture. Proper handling and application techniques must be followed, including those to protect applicators. All applications must comply with current laws in the State of Wisconsin.

Included herein are discussions of the more widely used chemicals for the treatment of aquatic vegetation and algae. Also included in the Appendix are the fact sheets published by the DNR for these chemicals.

Copper sulfate is used for the control of algae. Cutrine Plus is an herbicide that uses copper as its active ingredient. This is used to control various types of algae, including muskgrass, which usually is a more desirable algae. Liquid formulations, especially the copper chelated products (those combined with other compounds that help prevent the loss of active copper from the water) are more effective. These tend to remain in solution longer, allowing more contact time between soluble copper and the algae cells.

Aquathol K is a formulation containing the active ingredient endothall. This is a contact herbicide that prevents certain plants from producing needed proteins for growth. Aquathol K is used to control certain pondweeds, coontail, and water milfoil.

Diquat is a non-selective contact herbicide that is used to control a wide variety of plants. It is absorbed by plants and damages cell tissues. Diquat kills the parts of plants that it directly comes into contact with. Diquat loses its effectiveness in muddy, silt laden waters. If too much plant material is killed in an area, the decomposing vegetation may result in very low oxygen levels that may be harmful or fatal to fish. There are public use restrictions that apply when Diquat has been used. The treated areas cannot be used for activities requiring full or partial body contact for 24 hours. Animal consumption, irrigation, and other domestic purposes require waiting 14 days. Diquat is used to control widgeon grass.

2,4-D (2,4-dichlorophenoxyacetic acid) is a systemic herbicide which interferes with normal cell growth and division. Plants begin to die within a few days of liquid formulation treatments, and within a week to ten days when granular formulations are used. The aquatic formulations of 2,4-D are only effective on certain species of aquatic plants. It is most commonly used to treat Eurasian water milfoil. Because it can treat several desirable species including bladderwort, water lilies and watershield, care should be taken to ensure that only

the target nuisance is present before treatment.

Any use of chemical treatment on Marl Lake should be confined to only very limited areas after very careful consideration. Because of the variety of species present in the west end, obtaining selective control to minimize a nuisance would be difficult.

NATIVE SPECIES REINTRODUCTION

Area lakes are beginning to experiment with aquatic plant management. Native plants are being reintroduced into lakes to try to diminish the spread of exotics, and to try to reduce the need for other, more costly, plant management tools. Native plants are usually less of a management problem in that they tend to grow in less dense populations and are more low growing. Native plants also provide better food and habitat for fish and wildlife.

There needs to be careful consideration of the species introduced to avoid creating another problem. Small, isolated destruction or removal of Eurasian water milfoil and curly-leaf pondweed when present is sometimes combined with planting muskgrass or various pondweeds.

Costs to conduct plantings vary with the number and type of plants, and whether volunteers or paid staff do the work. Successful planting can be affected by a number of factors, including health of the plant, weather, timing, and waterfowl grazing. Because of the high quality of aquatic plants in Marl Lake, native species *protection* should be a priority rather than reintroduction.

HARVESTING

Selective harvesting is used by many lakes to control aquatic plants. Plants are cut off about five feet below the surface and conveyed to shore where they are then trucked to a disposal site. Harvesting aquatic plants removes biomass from the lake as well as nutrients. In the past the presumption was that eventually plant growth in a lake with harvesting would cease to be a problem when nutrients have been removed. This will not normally be seen because incoming nutrients from the watershed will usually offset any nutrients removed during harvesting (Engel, 1990).

Harvesting of fish lanes can open up areas so game fish can feed upon panfish and therefore increases the size of panfish that remain; and can increase the size of the predator fish (Nichols, 1988).

Harvesting can reduce the impact from recreational boating on aquatic plants by opening navigation lanes and lessening the amount of plants that are cut off by boating activities.

Recreational use in dense milfoil beds can create large amounts of "floaters" that can increase the spread of milfoil. Careful collection of these floaters by harvesters can help reduce the spread of milfoil.

Harvesting can also cause problems if it is not done properly. Machines that are not properly maintained can discharge gas, oils and grease into lakes. Cutting too close to shore or into the bottom sediments can disrupt fish spawning and nursery areas. Harvesting is non-selective, that is, it harvests all plants in its path. Areas with 'good' plants must be avoided to prevent damage to the plants. Harvesting can also contribute to the spread of Eurasian water milfoil by increasing the numbers of plant fragments.

The sediments are very damaging to the harvesting equipment and will increase maintenance cost significantly when operated in shallow water. Attempting to operate the equipment in shallow water (less than three feet) will disrupt the sediments and the plants.

New harvester costs range from $50,000 to $110,000. Used equipment is also available in a wide range of costs. Contract harvester costs are around $100 per hour and there is often a charge for loading and unloading the harvester (around $500-600).

There are small cutters available that do not remove harvested material. These are more easily maneuvered and can work in shallower water. Because the cut material is not removed, plant fragments may create problems with wind blown debris, leading to neighbor conflicts. Some plant species spread by fragmentation, so the overall plant problem could be aggravated by the use of a cutter. An aggressive program of plant removal could offset the problems of using a small cutter.

Harvesting could be used on Marl Lake, although potential harvest areas are small. If plant nuisances warrant, the District, or private landowners, may consider hiring an independent contract harvester. It is unlikely that there will be sufficient cause to purchase a harvester. The program must emphasize reducing nuisances rather than clear cutting.

HAND CONTROLS

A method of aquatic plant control on a small scale is hand or manual controls. These can consist of hand pulling or raking plants. A rake with a rope attached is thrown out into the water and dragged back into shore. Plants are then removed and disposed of. Skimmers

or nets can be used to scrape filamentous algae or duckweed off the lake surface. These methods are more labor intensive and should be used by individuals to deal with localized plant problems such as those found around individual piers and swimming areas.

Hand controls are very inexpensive when compared to other techniques. Various rakes and cutters are available for under $100. However, hand control is very labor intensive.

Hand controls may be used by individual landowners to clear small swimming areas. Landowners should be encouraged to be selective in their clearing minimizing the disruption as much as possible. Landowners should maintain a natural area of vegetation both on their shoreline and in the water. The District may wish to acquire some rakes and cutters to loan out to property owners.

BIOMANIPULATION

The use of biological controls for aquatic plant management purposes is currently limited to the grass carp and a few species of insects.

Grass Carp (Ctenopharyngodon idella Val.) is an exotic species originally imported from Malaysia. It is considered to be a voracious eater of aquatic plants and prefers elodea, pondweeds and hydrilla. Studies have shown that Grass Carp can reduce or eliminate vegetation at low densities. Grass Carp generally will graze on more beneficial plants before going after Eurasian water milfoil, thereby compounding nuisance problems. Overstocking can eliminate all plants. In the United States, only a few states allow the use of a sterile form of Grass Carp (WDNR, 1988). Grass Carp are illegal in the State of Wisconsin.

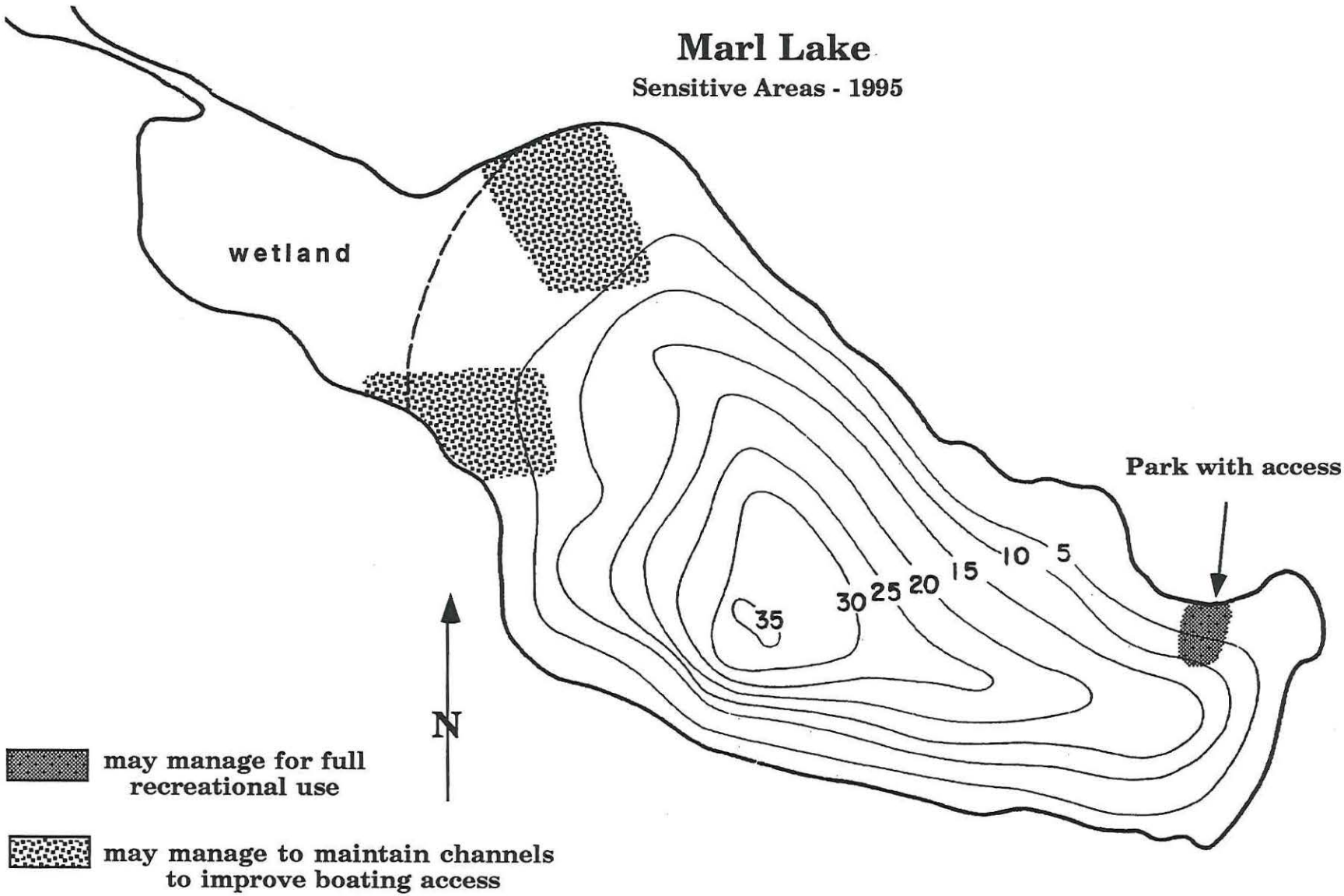
In British Columbia, Canada, the larval stage of two aquatic insects, the caddis fly (Triaenodes tarda Milne.) and the chironomid larvae (Cricotopus sp.) have been observed to graze on milfoil plants. These two insect species are currently being studied as forms of biological controls.

Recently, a naturally occurring fungus (Mycoleptodiscus terredtris) has been observed to effectively control a species of milfoil in New Hampshire.

Additional research is needed before biomanipulation techniques can be implemented in lake management. Of greatest importance is the need to establish whether a given biological control organism will become a nuisance itself.

At this time neither the Grass Carp, insects, nor fungus are viable alternatives in Marl Lake.

Map 5 - Management Areas on Marl Lake



Aron & Associates, 1996

Chapter V
PLANT MANAGEMENT PLAN

GOALS AND OBJECTIVES

The District's aquatic plant management goals should be to optimize the preservation of aquatic systems that includes water quality, fisheries, and wildlife while minimizing the conditions resulting from aquatic nuisances and to preserve and maintain recreational uses of Marl Lake.

RECOMMENDATIONS

Chemical Treatment

The District may use chemicals to control nuisance levels of plants in the management area of Marl Lake (Map 5). Treatment areas should be small and should use selective chemicals to minimize impacts to non-target plants. The swimming beaches may be treated with non-selective chemicals to allow safe swimming conditions.

WDNR Administrative Rule NR 107 should be consulted for the specific requirements for conducting a treatment. The following are some of the steps that should be followed by the District when preparing to conduct chemical treatments.

- Complete and submit WDNR permit application forms. Include treatment map, area sizes and name and addresses of all affected riparian landowners.
- Contact licensed firm to coordinate proposed treatment.
- Although not required, a public notice should be placed in the local paper informing the public about the proposed treatment. This will inform those who may be using the public beaches.
- Provide a copy of the WDNR application to any riparian landowner who is adjacent to the proposed treatment areas.
- Just prior to the treatment, WDNR approved yellow posting signs must be posted in and adjacent to treatment areas. The signs must indicate what chemical has been used, and any use restrictions and must remain posted for at least the time of any restrictions.

The recommendations in this plan assume that treatments will be conducted according to label restrictions and permits.

Harvesting

The District may wish to consider the use of occasional contract harvesting to provide relief

from nuisance levels of dense plants. Any harvesting done should then be carefully planned to avoid beneficial pondweeds. No harvesting should be done in shallow waters less than three feet deep. It is not recommended at this time that harvesting equipment be purchased. The Appendix includes general guidelines that should be followed if a contractor is hired for harvesting.

Hand Controls

Riparians should be encouraged to use the least intensive method to remove nuisance vegetation. This could include minimal raking and pulling. If screens are considered by individuals, a WDNR permit will be required.

Riparians should be encouraged to allow some native plants to remain. This will help prevent infestation by Eurasian water milfoil or curly leaf pondweed. The native plants will also help stabilize the sediments.

The District should encourage landowners to use hand controls to manage the aquatic nuisances. Small swimming areas can be manually cleared without damaging the resource. The District may wish to consider acquiring rakes and cutters to loan to lake residents. Another idea the District may consider is to match energetic teens seeking summer employment with those physically unable to do hand clearing.

The District should inform landowners about the importance of keeping their shorelines free of plant debris. Wave action can carry plant fragments into new areas, possibly aggravating nuisance conditions. Plant debris can be used in mulch piles or gardens.

Education and Information:

The District should take steps to educate property owners regarding their activities and how they may affect the plant community in Marl Lake. Informational material should be distributed regularly to residents, landowners, and lake users and local government officials. A newsletter to landowners and residents should be part of the plant management budget. These should be distributed at least twice a year. Topics should include information relating to lake use impacts, importance and value of aquatic plants, land use impacts, etc. One of the most important issues to discuss is the protection from nuisance plant invasions: Eurasian watermilfoil, curly-leaf ponweed and purple loosestrife. Other issues that should be addressed may include landscape practices, fertilizer use, and erosion control. Existing materials are available through the WDNR and the UWEX. Other materials should be developed as needed. The District should also enlist the participation of the local schools. The schools could use Marl Lake as the base for their environmental education programs.

Regular communication with residents will improve their understanding of the lake ecosystem and should lead to long term protection.

Watershed Controls

The District should continue to pursue the selection of their watershed as a priority watershed by DNR and the County. Until then, the District could begin a volunteer program of watching for watershed problems. All areas of the watershed should be toured regularly looking for changes, signs of sediment runoff, etc. The District should continue to work with the County conservationist for guidance on the watershed boundaries and potential problems.

Chapter VI
PLAN REASSESSMENT

The District should review or contract to review, the plant populations of Marl Lake every three to five years. A summary of the past years management activities should be developed annually to facilitate comprehensive review of the entire program and effectiveness. The management plan should also be reviewed, and if necessary modified, every three to five years.

Chapter VIII
SUMMARY

- The management of aquatic plants on Marl Lake should focus on preventative measures and protection of native plants.

- The District should encourage landowners to maintain natural shorelines.

- The District should provide landowners with information on erosion control, especially on the steeper shorelines.

- The District should distribute informational materials regularly to residents on such topics as proper lawn and garden practices, land use impacts and the importance and value of aquatic plants.

- Property owners should restrict the use of hand controls and bottom barriers to as small areas as possible, minimizing the size of any areas that are cleared.

- Property owners should keep their shorelines free of plant debris to prevent spreading nuisance plants.

- The District may consider acquiring hand rakes and cutters to loan to property owners for localized control.

- If densities of problem species increase significantly, the District may consider the use of contract harvesting.

- Chemical treatments may be considered, planning each treatment to ensure that only the target plants are affected in minimal areas.

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APPENDIXES

MARL LAKE AQUATIC PLANT SURVEY, JUNE 1995

LAKE	YEAR	TRAN	DEPT	CHARA	POTZO	POTGR	POLAM	POTPE	POTNA	POTFR	NYMPH	POTIL	SCIRPUS	ELOCA	MYREX	RANLO	LEMMI	UTRVU	NUPHAR
MARL	95	1	2	3	1	1	1	1											
MARL	95	2	2			1													
MARL	95	3	2	5				1											
MARL	95	4	2	2		4													
MARL	95	5	2	2															
MARL	95	6	2	2															
MARL	95	7	2	2	3				2	2	1								
MARL	95	8	2	5		2	1		1										
MARL	95	9	2	5	3	3		2	1		1	1							
MARL	95	10	2	2		1	1						1						
MARL	95	11	2	3		2	1												
MARL	95	12	2	5		3			1				1						
MARL	95	13	2	5		2		1					1	1	2				
MARL	95	14	2											1	2	1	1		
MARL	95	15	2	5		1			1		1							1	1

	CHARA	POTZO	POTGR	POLAM	POTPE	POTNA	POTFR	NYMPH	POTIL	SCIRPUS	ELOCA	MYREX	RANLO	LEMMI	UTRVU	NUPHAR
FREQUENCY	13	3	10	4	4	5	1	3	1	3	2	2	1	1	1	1
% FREQUENCY	86.67	20.00	66.67	26.67	26.67	33.33	6.67	20.00	6.67	20.00	13.33	13.33	6.67	6.67	6.67	6.67
SUM DEMSITY	46	7	20	4	5	6	2	3	1	3	2	4	1	1	1	1
SPEC MEAN DENSITY	3.54	2.33	2.00	1.00	1.25	1.20	2.00	1.00	1.00	1.00	1.00	2.00	1.00	1.00	1.00	1.00
TOT MEAN DENSITY	3.07	0.47	1.33	0.27	0.33	0.40	0.13	0.20	0.07	0.20	0.13	0.27	0.07	0.07	0.07	0.07
TMD W/PLANTS	3.07	0.47	1.33	0.27	0.33	0.40	0.13	0.20	0.07	0.20	0.13	0.27	0.07	0.07	0.07	0.07

MARL LAKE AQUATIC PLANT SURVEY, JUNE 1995

LAKE	YEAR	TRAN	DEPTH	CHARA	POTZO	POTGR	POLAM	POTPE	POTNA	NYMPH	POTIL	SCIRPUS	ELOCA	MYREX	UTRVU	NUPHAR
MARL	95	1	5	5	2											
MARL	95	2	5	4		1	1									
MARL	95	3	5	5		2										
MARL	95	4	5	5												
MARL	95	5	5	5	2	2										
MARL	95	6	5	5			1									
MARL	95	7	5	5		1			2	1						1
MARL	95	8	5	5		2										
MARL	95	9	5	5	2			1	1		2					
MARL	95	10	5	4		1										
MARL	95	11	5	5												
MARL	95	12	5	4		1				1						1
MARL	95	13	5	5		1	2					1				1
MARL	95	14	5	3	1		1	1		1			3	2	1	1
MARL	95	15	5	5	2			2	1				1	1	1	

	CHARA	POTZO	POTGR	POLAM	POTPE	POTNA	NYMPH	POTIL	SCIRPUS	ELOCA	MYREX	UTRVU	NUPHAR
FREQUENCY	15	5	8	4	3	3	3	1	1	2	2	2	4
% FREQUENCY	100	33	53	27	20	20	20	7	7	13	13	13	27
SUM DEMSITY	70	9	11	5	4	4	3	2	1	4	3	2	4
SPEC MEAN DENSITY	4.67	1.80	1.38	1.25	1.33	1.33	1.00	2.00	1.00	2.00	1.50	1.00	1.00
TOT MEAN DENSITY	4.67	0.60	0.73	0.33	0.27	0.27	0.20	0.13	0.07	0.27	0.20	0.13	0.27
TMD W/PLANTS	4.67	0.60	0.73	0.33	0.27	0.27	0.20	0.13	0.07	0.27	0.20	0.13	0.27

MARL LAKE AQUATIC PLANT SURVEY, JUNE 1995

LAKE	YEAR	TRAN	DEPTH	CHARA	POTZO	POTGR	POLAM	POTPE	POTNA	POTFR	POTIL	NUPHAR	HETDU
MARL	95	1	8	5	1								
MARL	95	2	8	5	1	1							
MARL	95	3	8	5									
MARL	95	4	8	5		1							
MARL	95	5	8	5		2		1					
MARL	95	6	8	2		2							
MARL	95	7	8	5	1	2		1					
MARL	95	8	8	5		2		1					
MARL	95	9	8	4				2	2		1		
MARL	95	10	8	5		1							
MARL	95	11	8	5									
MARL	95	12	8	5		3		2					
MARL	95	13	8	2				1	2	1		2	
MARL	95	14	8	5	3	2		1		1		1	1
MARL	95	15	8	4	1	2	1		1				

	CHARA	POTZO	POTGR	POLAM	POTPE	POTNA	POTFR	POTIL	NUPHAR	HETDU
FREQUENCY	15	5	10	1	7	3	2	1	2	1
% FREQUENCY	100.00	33.33	66.67	6.67	46.67	20.00	13.33	6.67	13.33	6.67
SUM DEMSITY	67	7	18	1	9	5	2	1	3	1
SPEC MEAN DENSITY	4.47	1.40	1.80	1.00	1.29	1.67	1.00	1.00	1.50	1.00
TOT MEAN DENSITY	4.47	0.47	1.20	0.07	0.60	0.33	0.13	0.07	0.20	0.07
TMD W/PLANTS	4.47	0.47	1.20	0.07	0.60	0.33	0.13	0.07	0.20	0.07

MARL LAKE AQUATIC PLANT SURVEY, JUNE 1995

LAKE	YEAR	TRAN	DEPTH	CHARA	POTZO	POTGR	POTPE	POTNA	POTFR	POTIL
MARL	95	1	12	4	4					
MARL	95	2	12	5	1	2				
MARL	95	3	12	5						
MARL	95	4	12	5						
MARL	95	5	12	5		1				
MARL	95	6	12	4	2		1			
MARL	95	7	12	5						
MARL	95	8	12	5	1	1				
MARL	95	9	12	4	4					
MARL	95	10	12	5	1	1				
MARL	95	11	12	5	1					
MARL	95	12	12	5	1	1	1		1	
MARL	95	13	12	5	1			1		
MARL	95	14	12	5	1	1	2			
MARL	95	15	12	4	2	2				1

	CHARA	POTZO	POTGR	POTPE	POTNA	POTFR	POTIL
FREQUENCY	15	11	8	3	1	1	2
% FREQUENCY	100	73	53	20	7	7	13
SUM DEMSITY	71	19	9	4	1	1	1
SPEC MEAN DENSITY	4.73	1.73	1.13	1.33	1.00	1.00	0.50
TOT MEAN DENSITY	4.73	1.27	0.60	0.27	0.07	0.07	0.07
TMD W/PLANTS	4.73	1.27	0.60	0.27	0.07	0.07	0.07

Marl Lake - Waushara County
Macrophyte Survey
conducted: August 8, 1987

INTRODUCTION

Marl Lake T-19-N, R-9-E, Section 23 in Waushara County is a small 41 acre, 34 feet maximum depth seepage lake. A public access with picnic area, beach, and boat launch is maintained by the Town of Deerfield. A macrophyte survey was conducted August 8, 1987 on the lake. The purpose of the survey was to gather base line information on the number and kinds of aquatic macrophytes supported by the lake. Future surveys could demonstrate a shift in the population over time. Michael Reif from DNR in Oshkosh, Michael Michuk a limnologist from the Institute of Paper Chemistry in Appleton and I participated in the survey. Michael Reif has been working on the lake as a result of a complaint he received regarding animal waste draining to the lake from an adjacent dairy farm.

METHOD AND PROCEDURE

Permanent reference points were established using a Micrologic ML - 7500 Loran C Navigator. Latitude-longitude was determined for a mid lake reference point and latitude-longitude reference points were also established along the shore. The Loran will allow us to return to the exact sites for future surveys. It is an important navigational instrument used at sea, on land or in the air. The attached map shows where the points are located, they are indicated by letters A thru J. Transects were then established from the shore reference points to the mid lake reference. Mike Michuk and I used SCUBA to observe numbers and kinds of vegetation along the transects. An area 1.8 meters wide along the length of each transect was used as our guide. A compass bearing was taken to the center reference before descending. Michael Reif provided surface support recording observations.

A station was established at specific depths along each transect. Each station is referenced by a combination letter/number. A1 for instance, is transect A at a depth from 0-0.5 meters. All vegetation was quantified and qualified along the transects.

RESULTS

Table 1 is a list of latitude/longitude permanent reference points in Marl Lake. Figure 1 is a map outlining the transects from permanent reference points along shore to the mid point reference.

The depth of observations ranged from:

1. 0.0 - 0.5 meters
2. 0.5 - 1.5 "
3. 1.5 - 3.0 "
4. 3.0 - 6.0 "
5. >6.0 "

Relative abundance of the vegetation is represented numerically.

1. Rare
2. Occasional
3. Common
4. Very Common
5. Abundant

Sample Segment	Taxa/Density
A1	NAJFL - 1
A2	MYRSPI - 1 POTIL - 1 POTAM - 1 CHASP - 5 CERDE - 1 UTRSP - 2
B1	POTPE - 2 POLSP - 1 CHASP - 4 POTAM - 1
B2	POLSP - 2 SCISP - 1 CHASP - 5 POTIL - 3 POTZO - 3 POTPE - 2 HETDU - 2 POTZO - 1 POTPE - 1
C1	POTIL - 3 CHASP - 2 POTZO - 1 MYRSP - 1 POTNA - 1
C2	POTIL - 2 CHASP - 5 POTZO - 2

C3		CHASP - 5 UTRSP - 1 CERDE - 2 MYRSP - 3
D1		CHASP - 4 POTIL - 2 POTZO - 3 NYMSP - 1 POLYSP - 1
D2		POTNA - 2 POTIL - 2 POLYSP - 1 CHASP - 4 HETDU - 1
D3		CHASP - 5 MYRSP - 1 CERDE - 2
E1		POTNA - 3 NYMSP - 1 MYRSP - 3 POTIL - 4 CHASP - 4 POLYSP - 1
G1	(lot of shade)	POTZO - 2
G2		POTIL - 2 CERDE - 3
G3		CHASP - 5 POTZO - 2
G4		CERDE - 3 ELOSP - 1
H1		0
H2		NAJFL - 2 POTZO - 2 POTIL - 2 CHASP - 3
H3		CHASP - 5
H4		CERDE - 3 POTIL - 1

Transect I was the same as transect H.

J1	POTPE - 3 POTIL - 2 CERDE - 2 NAJFL - 2
J2	MYRSPE - 2 HETDU - 2 POTIL - 2 CHASP - 4 UTRSP - 1
J3	CHASP - 5 POTIL - 1 UTRSP - 1
J4	CERDE - 3 HETDU - 2

The following is a list of transects that will allow a permanent reference for sample sites. The transects are listed alphabetically on the attached map.

Transect	Latitude	Longitude
Mid Point Reference	44 06.51	89 23.40
A	44 06.50	89 23.25
B	44 06.58	89 22.40
C	44 06.61	89 23.46
D	44 06.68	89 23.48
E	44 06.63	89 23.57
F	44 06.62	89 23.54
F'	44 06.57	89 23.53
G	44 06.49	89 23.54
H	44 06.41	89 23.43
I	44 06.45	89 23.31
J	44 06.46	89 23.20

DISCUSSION

Water chemistry samples collected from 1980-82 every quarter showed dissolved phosphorus below the detectable level. Nitrogen samples exceeded 300 ug/l on several occasions. This is the cut off based on Sawyer 1948. Phosphorus and nitrogen concentrations are very low indicating good water quality. Water clarity as measured by the secchi disc ranged from 3.3 meters to 6.5 meters, demonstrating very good water clarity.

The cut off point for secchi disc transparency is 1.5 meters. Secchi transparency that is less than 1.5 meters indicates poor visibility normally attributed to algae abundance. Chemistry samples collected by Michael Reif in 1983 substantiate the good water quality of Marl Lake.

The accumulation of soft organic matter in the shallow portions of the Lake (littoral zone) supports an abundance of vegetation. The good water clarity allows the sun to penetrate deep enough to support vegetation at a maximum depth of 4.5 to 5.0 meters. Chara or muskgrass, a type of algae that resembles some forms of rooted vegetation was the most abundant vegetation from the shore to a maximum depth of 3.0 meters. Coontail or Ceratophyllum demersum was the next most abundant vegetation. Coontail is a nuisance type of vegetation found in surface waters in Wisconsin. It out competes the more desirable vegetation such as the pond weeds or Potamogetons. Variable pondweed, Potamogeton illinoensis and flatstem pondweed, P. zosteriformes were the most abundant pondweeds. Sand was the common bottom material to a maximum depth of 0.5 meters. Beyond the common bottom material was muck with some sand.

Emergent vegetation consisted of rushes, sedges and some cattail.

Attached is a list of lake plants common in Wisconsin, their scientific name, common name, and identification code.

This survey supplements previous efforts to quantify the vegetation (macrophytes) of Marl Lake. The information will provide reproducible data to determine a trend in numbers and kinds of aquatic vegetation over time.

Tim Rasman, DNR
June 20, 1988

CHEMICAL FACT SHEET:

COPPER COMPOUNDS

Manufacturers and Formulators

Copper compounds for aquatic use are manufactured either as copper sulfate (pentahydrate), or as a copper chelate product. Both forms contain metallic copper as the active ingredient, but in the chelate forms the copper is combined with other compounds to help prevent the loss of active copper from the water.

Several companies produce copper formulations. Some of the U.S. producers are: Applied Biochemists, A & V Inc., Great Lakes Biochemical, Griffin Corporation, Phelps Dodge Corporation, and Tennessee Chemical Company. The following copper products are registered with the Department of Agriculture, Trade and Consumer Protection (DATCP) for aquatic use in Wisconsin:

Product Name	% Copper	Formulation
Copper Sulfate Products:		
Copper Sulfate Medium Crystals	25.2%	crystals
Triangle Brand Copper Sulfate	25.2%	crystals
Copper Sulfate Instant Bluestone	25.2%	powder
Copper Sulfate Superfine Crystals	25.2%	crystals
Kocide Copper Sulfate Crystals	25.2%	crystals
Copper Chelate Products:		
Algimycin Pll-C	5.0%	liquid
Aquatrine Algaecide	9.0%	liquid
AV-70 (also AV-70 plus)	8.0% (9.0%)	liquid
Cutrine-Plus Algaecide/Herbicide	9.0%	liquid
Slow Release Algimycin	5.0%	pellets
Cutrine Plus Algaecide/Herbicide	3.7%	granular
Stocktrine II	1.25%	liquid
K-Tea Algaecide	8.0%	liquid

PUBL-WR-238 90

Basic copper sulfate is also registered as an herbicide and fungicide, with numerous uses other than aquatic applications. Only copper sulfate pentahydrate formulations labeled for aquatic use are effective and legal to use in aquatic environments.

Copper compounds have also been used in Wisconsin lakes to kill snails that harbor swimmers' itch organisms. These treatments required very high dosages of copper sulfate that were not consistent with label application rates.

Herbicide Effectiveness and Selectivity

Copper is a nutrient required by plants and animals in very small concentrations. However, application of copper formulations at label rates supplies a level of copper that is toxic to algae. Algal cells begin to take up copper immediately after application. High levels of copper rapidly kill algae by preventing photosynthesis and growth. Decay occurs within three to five days after exposure to the algaecide.

In Wisconsin, copper compounds have been used to control nuisance algae primarily in lakes and ponds. Copper is toxic to most species of planktonic (free-floating) and filamentous (mat-forming) species of algae in concentrations of 0.2 to 1.5 parts per million (ppm) of copper. Blue-green algae are especially susceptible to copper toxicity. Chara and Nitella, large erect algae, are controlled at concentrations of 0.4 to 2 ppm. Copper formulations can also be toxic to higher plants, but their use as an aquatic herbicide is limited outside the southern states.

Copper treatments can be effective in controlling nuisance algae. However, algae treatments with copper products are short-term measures. Effects of the algaecide rapidly dissipate, and nutrients from the decaying algae are released to the water column where they are available for new algae growth. In addition, there has been concern that some species of algae may develop a higher tolerance to copper so that eventually the amount required for effective control can become ecologically unsound.

Use Considerations

Any person using aquatic herbicides in Wisconsin waters must obtain a permit from the Department of Natural Resources (DNR). If an independent contractor is hired to perform treatment, the contractor must be currently certified by the DATCP. In addition, all applications of liquid or restricted-use pesticides, or any herbicide treatment of more than 1/4 acre, must be performed by a certified chemical applicator except on private ponds. A private pond is a body of water located entirely on the land of a permit applicant, with no surface water discharge or with a discharge that can be controlled to prevent chemical loss, and without access by the public.

Determining the correct copper formulation and calculating the proper dosage are key factors in determining how well copper will control undesirable algae. Applicators need to consider target species, water hardness, water temperature, amount of algae present, as well as water clarity and flow. For best results copper products should be applied between 9 a.m. and noon on sunny days when the water temperature is above 60 degrees F.

Copper sulfate is most effective under slightly acid or neutral conditions. In hard or alkaline waters, copper sulfate tends to precipitate rapidly and settle to the bottom within 24 hours following application. Chelated copper remains in solution longer, allowing more contact time between soluble copper and algal cells.

All copper formulations can be toxic to trout and other species of fish at recommended application rates, especially if the water has less than 50 ppm of carbonate hardness (soft water). However, toxicity generally decreases as water hardness increases.

Decaying algae may deplete the oxygen content of the water, killing fish. If the algae cover more than one-third of the total water area, treatments should be done in sections, and applied in a pattern that allows fish an escape route to untreated water. Ten to fourteen days are needed between treatments to protect fish and aquatic life.

Copper products are corrosive to spray equipment and will corrode aluminum boats if residues

are continually present. Individuals mixing or applying copper products should have appropriate equipment and protective clothing including goggles and rubber gloves. Other important safety features appear on the product labels and must be followed.

Water Use Restrictions

There are no restrictions on water use after copper treatments. Water may be used for swimming, fishing, animal consumption, and domestic purposes (e.g., bathing, watering vegetation, cooking) immediately after application. If treated water is to be used as potable water, the residual copper content must not exceed 1 ppm.

Registration Status

Federal law requires pesticides to be registered with the Environmental Protection Agency (EPA) before they can be sold or used. Due to significant changes in the federal pesticide laws, the EPA is reassessing the potential hazards arising from the currently registered uses of the pesticide.

This re-registration process will determine the need for additional data on health and environmental effects, and determine whether the pesticide meets the "no unreasonable adverse effects" criteria of federal law. "Unreasonable" means the risk of using a pesticide exceeds the benefits. The EPA registers pesticides based on information submitted by product manufactureers, not on EPA's own tests.

The distinction between "EPA registered" and the terms "approved" or "safe" is important. Registration by the EPA means only that the benefits have been determined to outweigh the risks. Because product use is not without risk, the EPA does not define any pesticide as "safe".

Copper sulfate is currently undergoing the re-registration process. Manufacturers need to submit the results of additional, more modern testing to meet the current data requirements by the end of 1990. Data on the toxicity of copper sulfate formulations to non-target aquatic life are needed. The EPA has required certain precautionary statements be placed on labels to mitigate the hazards until the evaluation can be completed.

As of early 1990, a comprehensive evaluation by the EPA has not been conducted on the copper chelate formulations. These formulations appear on an EPA list that will be reviewed at a later date. In the meantime, copper chelates will continue to be manufactured and marketed under the older registration guidelines.

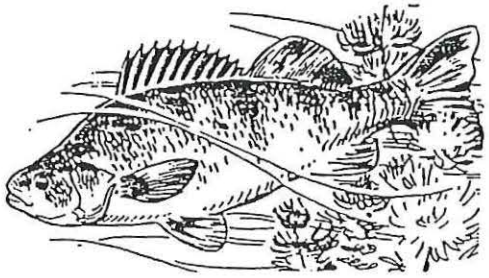
Impacts on Fish and Other Aquatic Organisms

Although copper is widely distributed in the environment, many aquatic organisms are sensitive to small increases in copper concentrations in the water. In laboratory tests, some species of water fleas, crustaceans, mollusks, mayflies, snails, and crayfish are adversely affected by label application rates.

Accumulations of copper in the bottom sediments can adversely effect important food chain organisms living there. However, the toxicity of copper in the sediments can vary greatly due to environmental conditions and is not entirely understood.

Trout and other species of fish may be killed at application rates of copper products. However, fish kills have occurred in soft water lakes when high concentrations of copper sulfate were used. Fish kills may be caused by toxicity of copper, clogging of gills by dead algae, or reduction of dissolved oxygen by the decomposition of dead algae.

Certain plant and animal species listed on the federal and state endangered resources lists and the habitats they need may be affected by aquatic treatments with herbicides. A permit to use a copper product may be denied or conditioned if these resources are present.



Degradation, Persistence and Trace Contaminants

Since copper is an element, it is not broken down by plants, animals or microorganisms. Most of the copper that is used to treat algae precipitates or eventually settles to the lake bottom where it persists indefinitely and accumulates with further treatments.

A buildup of copper in the sediments can be a concern in future management decisions. High concentrations of copper can be toxic to plant and animal life, and may limit disposal of sediments from lake or pond dredging projects.

Chelating agents (ethanalomine, ethylenediamine, or triethanolamine), which are organic compounds, degrade into various by-products. The manufacturers of copper chelate products claim the by-products are not known to form toxic concentrations nor persist within the environment.

The nitrosamine N-nitrosodiethanolamine, a known carcinogen, is present at concentations of less than one ppm in copper products chelated with ethanolamine. Upon application, the concentration drops to the parts per trillion range. Tests to determine the potential health risks of nitrosamines are normally not required by the EPA unless the nitrosamine level exceeds 1.0 ppm.

Human Health

Concerns about human health effects of copper use primarily revolve around applicator exposure. Copper products may cause severe eye and skin irritation and may cause skin sensitization reactions in certain individuals. Wearing skin and eye protection is recommended when applying copper products.

There is no known evidence of chronic adverse human health effects to copper exposure. Humans have a natural, efficient mechanism for regulating copper in the body in which copper is absorbed or excreted to stabilize the required amount.

For Additional Information

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Office of Pesticides and Toxic Substances
Washington, D.C. 20460

Wisconsin Department of Justice
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P.O. Box 7857
Madison, WI 53707-7857
(608) 266-8985

Wisconsin Department of Agriculture, Trade, and Consumer Protection
801 W. Badger Road
Madison, WI 53713
(608) 266-1721

Applied Biochemists
5300 West County Line Road, 96N
Mequon, WI
(414) 242-5870

NOTE: This fact sheet is published in accordance with chapter NR 107, Wis. Adm. Code. No endorsement of any chemical pesticide or plant control method is stated or implied. The DNR accepts no liability for damage or injury that may result from use of chemical pesticides under NR 107.

Applicants for permits under NR 107 are required to provide copies of applicable chemical fact sheets to any affected property owners' association and inland lake district. Copies of chemical fact sheets are also available upon request from the DNR.

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

CHEMICAL FACT SHEET:

2,4-D

Manufacturers and Formulators

There are approximately 1500 products containing 2,4-D registered with the Environmental Protection Agency. Most of the products are labelled only for agricultural and non-crop use to control terrestrial broadleaf weeds and are very unsafe as well as illegal to use in aquatic environments.

The active ingredient of 2,4-D is 2,4-dichlorophenoxyacetic acid. Some of the major U.S. manufacturers are: Agrolinz, Inc., BASF Corp., DowElanco, and Rhone-Poulenc Ag Company. Other companies purchase 2,4-D from the manufacturers to formulate their own products. The following 2,4-D formulations are registered with the Department of Agriculture, Trade and Consumer Protection (DATCP) for aquatic use in Wisconsin:

Product Name	% Active Ingredient	Formulation	Application Rate
Aquacide	17.5%	pellets (sodium salt)	108 - 175 lbs/acre
Weedtrine II	18.8%	granular (iso-octyl ester)	100 - 200 lbs/acre
Aqua-kleen	19.0%	granular (butoethyl ester)	100 - 200 lbs/acre
Visko-Rhap A-3D	33.9%	liquid (dimethylamine salt)	1 gal/acre
See 2,4-D	40.9%	liquid (iso-octyl ester)	2.5 - 4.5 pints/acre

Note: Follow herbicide label directions for specific application rates

Herbicide Effectiveness and Selectivity

2,4-D is a systemic herbicide which moves throughout the plant and interferes with normal cell growth and division. Plants begin to die within a few days following treatment with liquid formulations and within a week to ten days with granular formulations. It takes several weeks for the plants to decompose.

Aquatic formulations of 2,4-D are selective herbicides - they are only effective on certain species of aquatic plants. In Wisconsin, 2,4-D is most commonly used to control watermilfoil (*Myriophyllum* spp.). 2,4-D will also control species that may be desirable such as waterlilies (*Nymphaea* spp.), watershield (*Brasenia shreberi*), and bladderwort (*Utricularia* spp.).

Use Considerations

Any person using aquatic herbicides for control of aquatic plants in Wisconsin waters must obtain a permit from the Department of Natural Resources. If an independent contractor is hired to perform a treatment, the contractor must be currently certified by the DATCP. In addition, all liquid applications, restricted use pesticides, or any herbicide treatment of more than 1/4 acre must be performed by a certified chemical applicator except on private ponds. A private pond is a body of water located entirely on the land of a permit applicant, with no surface water discharge or with a discharge that can be controlled to prevent chemical loss, and without access by the public.

2,4-D needs to be applied to plants that are actively growing. Effectiveness of granular formulations may be reduced if applied to soft organic bottoms; granular products work best on firm sediments. If granular products are used on floating-leafed plants, care must be taken to ensure that the product is in contact with the leaves for a minimum of 24 hours before it is washed off by wave action or blown off by wind.

If 2,4-D is applied to a pond or enclosed bay with abundant vegetation, no more than 1/3 to 1/2 of the surface should be treated at one time because excessive decaying vegetation may deplete the oxygen content of the water and kill fish. Untreated areas should not be treated until the vegetation exposed to the initial application decomposes.

Individuals applying 2,4-D products should have appropriate application equipment and protective clothing. Other important safety precautions appear on the label and must be followed.

Water Use Restrictions

There are no established waiting periods in the state of Wisconsin for recreational activities such as swimming and fishing in waters treated with 2,4-D formulations. However, 2,4-D may cause an off flavor in fish for several days after application.

2,4-D products are not to be applied to waters used for irrigation, animal consumption, drinking, or domestic uses such as cooking and watering vegetation.

Registration Status

Federal law requires pesticides to be registered with the Environmental Protection Agency (EPA) before they can be sold or used. Due to significant changes in the federal pesticide laws, the EPA is reassessing the potential hazards arising from the currently registered uses of the pesticide.

This re-registration process will determine if additional data on health and environmental effects is needed, and determine whether the pesticide meets the "no unreasonable adverse effects" criteria of federal law. "Unreasonable" means the risk of using a pesticide exceeds the benefits. EPA registers pesticides based on information submitted by product manufacturers, not on EPA's own tests.

The distinction between "EPA registered" and the terms "approved" or "safe" is important. Registration by the EPA means only that the benefits have been determined to outweigh the risks. Because product use is not without risk, the EPA does not define any pesticide as "safe".

2,4-D is currently undergoing the re-registration process. In 1980, a 2,4-D Industry Task Force was formed to jointly provide the new data. It will take several years to complete the required tests and the re-registration process.

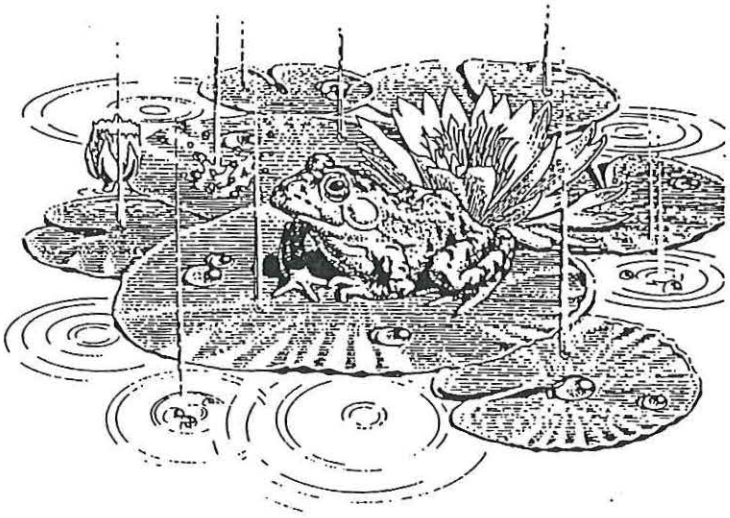
Impacts on Fish and Other Aquatic Organisms

Because of limited ecological effects data, the EPA has not conducted a complete hazard assessment of all the various 2,4-D formulations. Laboratory tests have indicated that the formulations approved for aquatic use are toxic to the fish species tested only in dosages above the labelled rates. However, certain species of important aquatic organisms such as Daphnia (water fleas) and midges may be adversely affected by some formulations, especially liquid esters, at label application rates. Direct toxicity as well as loss of habitat are believed to be the causes. These organisms only recolonize the treated areas as vegetation becomes re-established.

In natural systems, 2,4-D interactions with other chemicals and different environmental conditions may alter the ability of organisms to tolerate 2,4-D. In addition, fish and other aquatic organisms are sometimes sensitive to the inactive ingredients contained in 2,4-D formulations. It is important to follow the label carefully for application restrictions and rates.

Available data indicate 2,4-D does not accumulate at significant levels in the bodies of fish that have been tested. Although fish that are exposed to 2,4-D will take up some of the chemical, the small amounts that accumulate are evidently eliminated a few days after exposure to 2,4-D ceases.

Certain plant and animal species listed on the federal and state endangered resources lists and the habitats they need may be affected by herbicide use. A permit to use 2,4-D may be denied or conditioned if these resources are present in the proposed treatment area.



Herbicide Degradation, Persistence and Trace Contaminants

In water, the concentration of 2,4-D is reduced through dispersal by water movement, breakdown by microorganisms, and by adsorption to sediments. Degradation studies have indicated half-lives (the time it takes for half the active ingredient to degrade) generally range from a few days to occasionally several months.

Laboratory tests have indicated that 2,4-DCP, a breakdown product of 2,4-D, appears to be toxic to some organisms. In natural systems, application of 2,4-D formulations results in low levels of 2,4-DCP that remain in the water for up to two weeks following treatment. Adverse effects to aquatic life in the field from 2,4-DCP have not been documented.

2,4-D occasionally contains dioxins as contaminants. Dioxins are unwanted by-products that occur in the manufacturing process of some pesticides. 2,4-D has been combined with another compound, 2,4,5-T, in some herbicide mixtures, most notably in the defoliant Agent Orange used in Vietnam. A highly toxic dioxin, 2,3,7,8-TCDD, had been found in 2,4,5-T, but has not been detected in 2,4,-D. The questions of how much (if any) and which dioxins may be present in 2,4-D are unanswered at this time. In

addition, little is known about the toxicity of dioxin to fish and other aquatic life and much uncertainty remains about the effects of low level dioxin exposure to people.

Carcinogenic impurities, n-nitrosamines, have been detected at low levels in certain samples of 2,4-D. A risk assessment on nitrosamines done by the U.S. National Academy of Sciences indicates that the amounts found in 2,4-D formulations tested present negligible risk to human health. However, the EPA is requiring analytic data from manufacturers to identify and quantify nitrosamines and dioxins in 2,4-D products.

Human Health

Since their introduction, 2,4-D and other related herbicides have attracted considerable public and scientific attention. Recent epidemiological studies have linked 2,4-D use among agricultural workers with an increased cancer risk. However, the evidence is controversial, and the EPA has determined that the available data are currently inadequate to classify 2,4-D as a carcinogen. Further studies are in progress and will continue to be evaluated. The EPA may initiate a special review a later time depending on the findings of the studies in progress.

Adverse health effects can be produced by acute and chronic exposure to 2,4-D. Persons who mix or apply 2,4-D need to protect their skin and eyes from contact with 2,4-D products to minimize irritation, and avoid inhaling the spray. In its consideration of exposure risks, the EPA believes no significant risks will occur to recreational users of water treated with 2,4-D.

For Additional Information

United States Environmental Protection Agency
Office of Pesticides and Toxic Substances
Washington, D.C. 20460

Wisconsin Department of Justice
Office of the Public Intervenor
123 West Washington Ave.
P.O. Box 7857
Madison, WI 53707-7857
(608) 266-8985

Wisconsin Department of Agriculture, Trade, and Consumer Protection
801 W. Badger Road
Madison, WI 53712
(608) 266-1721

Industry Task Force on 2,4-D Research Data
Information Line: 1-800-345-5109

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WISCONSIN DEPARTMENT OF NATURAL RESOURCES

CHEMICAL FACT SHEET:

DIQUAT

Manufacturers and Formulators

Valent U.S.A. Corporation is the sole distributor of the active ingredient diquat dibromide (6,7 dihydrodipyrido (1,2-a:2',1'-c) pyrazinediium dibromide, commonly referred to simply as "diquat") in the United States. Valent sells a formulated diquat product. Other companies purchase concentrated diquat from Valent to formulate their own products. The following diquat products are currently registered with the Department of Agriculture, Trade, and Consumer Protection (DATCP) for aquatic use in Wisconsin:

Product Name	% Active Ingredient	Formulation	Application Rate
Valent Diquat H/A	35.3%	liquid	1-2 gallons/surface acre
Ortho Diquat H/A*	35.3%	liquid	1-2 gallons/surface acre
Aquaquat	8.5%	liquid	5-10 gallons/surface acre
Weedtrine-D	8.5%	liquid	5-10 gallons/surface acre

*Available through Dec. 1990.

Herbicide Effectiveness and Selectivity

Diquat is a non-selective herbicide which will kill or injure a wide variety of plants on contact. It is absorbed by plant foliage and works by direct damage to cell tissues. Diquat does not kill parts of the plant that it does not directly contact. Application of diquat at labelled rates results in plant decline or death in less than 7 days.

On most sites in Wisconsin, diquat may currently be used to control only three plant species: duckweed (*Lemna* spp.), watermilfoil (*Myriophyllum* spp.), and elodea (*Elodea* spp.). Diquat may be used to control other species listed on the product label only in aquatic sites where there is little or no outflow of water and which are totally under the control of the product's user. Any other use of diquat is a violation of federal and state law.

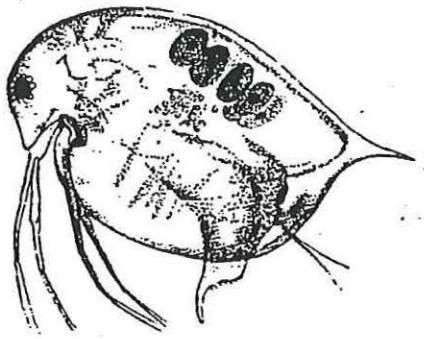
Use Considerations

Any person using aquatic herbicides for control of aquatic plants in Wisconsin waters must obtain a permit from the Department of Natural Resources (DNR). In addition, all liquid applications, or any herbicide treatment of more than 1/4 acre must be performed by a certified chemical applicator. Diquat is available only in liquid form.

Because of its high concentration of active ingredient, Valent Diquat H/A (previously sold as Ortho Diquat H/A) may only be applied by an applicator certified by the DATCP.

Individuals applying diquat products need to have protective clothing (faceshield and rubber gloves, aprons and footwear). Liquid herbicides should be applied with calibrated and properly functioning spray equipment. Other important safety precautions appear on the product label and must be followed.

Diquat will not be effective in lakes or ponds with muddy water or where plants are covered with silt because it is strongly attracted to silt and clay particles in the water. Therefore, bottom sediments must not be disturbed during treatment, as they may be from outboard motors. If applied to ponds or enclosed bays, only partial treatment (1/2 to 1/3 of the water surface) should be conducted. If the entire pond is treated, the decomposing vegetation may result in very low oxygen levels in the water. This can be harmful or lethal to fish and other aquatic organisms. Untreated areas can be treated 10-14 days after the first treatment.



Water Use Restrictions

The following waiting periods must be observed in using water treated with diquat:

Activity	Waiting Period
Swimming	24 hours
Animal Consumption, Domestic Purposes, Drinking, Irrigation	14 days

Alternatively, treated areas can be used if approved analytical tests indicate diquat concentrations are 0.01 parts per million or less in the treated water. These water use restrictions are set to minimize public exposure to diquat.

Registration Status

Federal law requires pesticides to be registered with the Environmental Protection Agency (EPA) before they can be sold or used. Due to significant changes in the federal pesticide laws, the EPA is reassessing the potential hazards arising from the currently registered uses of the pesticide.

This re-registration process will determine if additional data on health and environmental effects is needed, and whether the pesticide meets the "no unreasonable adverse effects" criterion of Federal law. "Unreasonable" means the risk of using a pesticide exceeds the benefits. EPA registers pesticides based on information submitted by product manufacturers, not on EPA's own tests.

The distinction between "EPA registered" and the terms "approved" or "safe" is important. Registration by the EPA means only that the benefits have been determined to outweigh the risks. Product use is not without risk.

Diquat is currently undergoing the re-registration process. Environmental fate studies and additional, more modern toxicity testing to meet current data requirements have been submitted and are being assessed by the EPA.

Diquat is sold and used in Wisconsin under a state special local need registration. This registration allows diquat to be used on sites not allowed by the federal registration, but imposes additional restrictions on the manner in which diquat can be used in order to prevent unreasonable adverse effects from occurring on these additional sites.

Impacts on Fish and Other Aquatic Organisms

At the approved application rate, diquat does not have any apparent short-term effects on most of the aquatic organisms that have been tested. However, certain species of important aquatic food chain organisms such as amphipods and *Daphnia* (water fleas) are adversely affected at label application rates. Direct toxicity as well as loss of habitat are believed to be the causes. These organisms only recolonize the treated area as vegetation becomes re-established.

Laboratory tests indicate walleye are the fish most sensitive to diquat, displaying toxic symptoms when confined in water treated with diquat at label application rates. Other game and panfish (e.g. northern pike, bass, and bluegills) are apparently not affected at these application rates. Limited field studies to date have not identified significant short or long-term impacts on fish and other aquatic organisms in lakes or ponds treated with diquat.

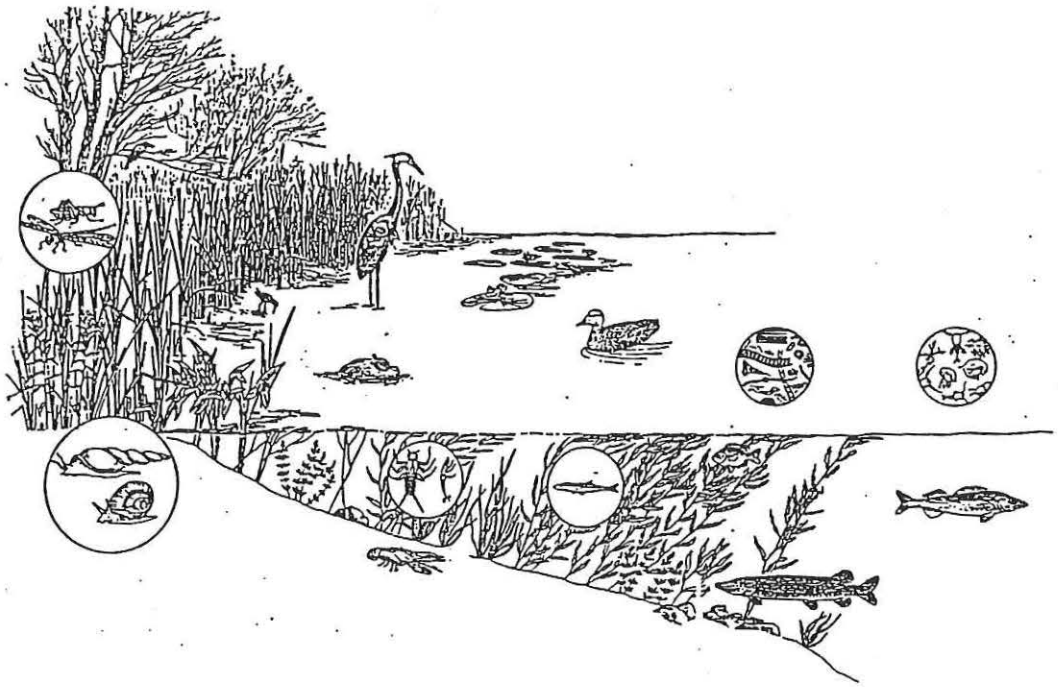
No studies have been completed on flesh tainting of fish from diquat treatments.

Because certain plant and animal species listed on the federal and state endangered resources lists and their habitats may be affected by aquatic treatments using diquat, a permit to use diquat may be denied or conditioned if these resources are present in the proposed treatment area.

Herbicide Degradation, Persistence and Trace Contaminants

Diquat in treated water is reduced by 90 percent or more within 13 days after application. This reduction in concentration occurs through binding of diquat to the plants and the lake sediments. The adsorption of diquat to the sediments is rapid and irreversible. Diquat is not significantly degraded by microorganisms.

Ethylene dibromide (EDB), an animal carcinogen, is a trace contaminant in diquat products. At label application rates, EDB would be present in water at the treatment site at a concentration of about 10 to 30 parts per trillion. Drift and dilution will reduce this concentration in adjacent waters. EPA, using conservative exposure considerations, believes no significant impacts will occur to water users. The impacts of EDB on aquatic organisms at labeled rates is not known.



Human Health

Concerns about human health effects of diquat use primarily revolve around applicator exposure. Diquat causes severe skin and eye irritation and is toxic or fatal if absorbed through the skin, inhaled or swallowed. Wearing skin and eye protection (e.g. rubber gloves, apron and goggles) to minimize eye and skin irritation is required when applying diquat.

The risk to water users of serious health impacts (e.g., birth defects and cancer) is not believed to be significant according to the EPA. The chemical registration process, however, is not complete and the results of the required studies will not be available for several years. Based upon existing animal studies, some risk of allergic reactions or skin irritation is present for sensitive individuals.

For Additional Information

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Environmental Protection Agency
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Wisconsin Department of Justice
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WISCONSIN DEPARTMENT OF NATURAL RESOURCES

CHEMICAL FACT SHEET:
ENDOTHALL

Manufacturers and Formulators

Endothall is the common name of the active ingredient endothal acid (7-oxabicyclo[2,2,1] heptane-2,3-dicarboxylic acid). Endothall products are used to control a wide range of terrestrial and aquatic plants. Atochem North America (formerly Pennwalt Corporation) is the sole manufacturer of endothall. The following endothall formulations are registered with the Department of Agriculture, Trade, and Consumer Protection (DATCP) for aquatic use in Wisconsin:

Product Name	% Active Ingredient	Formulation
Aquathol	10.1% (dipotassium salt)	granular
Aquathol K	40.3% (dipotassium salt)	liquid
Hydrothol 191	11.2% (monoamine salt)	granular
Hydrothol 191	53.0% (monoamine salt)	liquid

Rates of application vary with density of the plants, water depth and types of plants present; consult the product labels for specific rates.

Herbicide Effectiveness and Selectivity

Endothall is a contact herbicide that prevents certain plants from making the proteins they need. Factors such as density and size of the plants present, water movement, and water temperature determine how quickly endothall works. Under favorable conditions, plants begin to weaken and die within a few days after application.

Aquathol and Aquathol K are used to control certain pondweeds (*Potamogeton* spp.), coontail (*Ceratophyllum* spp.), and watermilfoil (*Myriophyllum* spp.). Hydrothol 191 formulations are effective on the previously mentioned plants, and may also kill wild celery (*Valisneria americana*) and some species of algae (*Chara, Cladophora, Spirogyra, and Pithophora*). Refer to the product labels for a complete list of aquatic plant species controlled.

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Use Considerations

Any person using aquatic herbicides for control of aquatic plants in Wisconsin waters must obtain a permit from the Department of Natural Resources (DNR). If an independent contractor is hired to perform treatment, the contractor must be currently certified by the DATCP. In addition, all liquid applications, restricted use pesticides, or any herbicide treatment of more than 1/4 acre must be performed by a certified chemical applicator except on private ponds. A private pond is a body of water located entirely on the land of a permit applicant, with no surface water discharge or with a discharge that can be controlled to prevent chemical loss, and without access by the public.

Endothall formulations will kill several high value species of aquatic plants (especially *Potamogeton* spp.) in addition to nuisance species. The plants that offer important values to aquatic ecosystems often resemble, and may be growing with those plants targeted for treatment. Careful identification of plants and application of endothall products is necessary to avoid killing high value species.

For effective control, endothall should be applied when the plants are actively growing. Most submersed weeds are susceptible to Aquathol formulations. The choice of liquid or granular formulations depends on the size of the area requiring treatment. Granular Aquathol is more suited to small areas or spot treatments. Liquid Aquathol K is suitable for large areas.

Hydrothol 191 liquid is extremely toxic to fish at rates above 0.3 parts per million (ppm) and should not be applied where fish are present. Hydrothol 191 granular is also toxic to fish but may be carefully used by a professional applicator for small spot treatments.

Individuals mixing or applying endothall products should have appropriate equipment and protective clothing, (faceshield or goggles and rubber gloves, clothing that prevents skin contact) and avoid breathing the spray. Applicators should bathe and change clothing after handling endothall. Other important safety precautions appear on the label and must be followed.

If endothall is applied to a pond or enclosed bay with abundant vegetation, no more than 1/3 to 1/2 of the surface should be treated at one time because excessive decaying vegetation may deplete the oxygen content of the water and kill fish. Untreated areas should not be treated until the vegetation exposed to the initial application decomposes.

Water Use Restrictions

The following waiting periods must be observed in using water treated with endothall:

Activity	Aquathol/Aquathol K	Hydrothol 191
Swimming	24 Hours	24 Hours
Animal consumption, Domestic purposes, Drinking, Irrigation	7 - 25 Days*	7 - 25 Days* (Do not use treated water for irrigation of crops)
Fish Consumption	3 Days	3 Days

*The waiting period depends on the application rate. See product labels for more information.

Water use restrictions apply to the treated site only. Treatment size and potential drift and dilution are factors to consider for use restrictions in adjacent waters. If water is to be used as potable water, the current water tolerance is 0.2ppm.

The water use restrictions listed above are subject to change. Atochem North America is currently applying for changes in some of the listed restrictions. Follow the restrictions listed on the label of the product being used.

Registration Status

Federal law requires pesticides to be registered with the EPA before they can be sold or used. Due to significant changes in the federal pesticide laws, the EPA is reassessing the potential risks arising from the currently registered uses of the pesticide.

This re-registration process will determine the need for additional data on health and environmental effects, and determine whether the pesticide meets the "no unreasonable adverse effects" criteria of Federal law. "Unreasonable" means the risk of using a pesticide exceeds the benefits.

The distinction between "EPA registered" and the terms "approved" or "safe" is important. Registration by the EPA means only that the benefits have been determined to outweigh the risks. Because product use is not without risk, the EPA does not define any pesticide as "safe".

Endothall is currently undergoing the re-registration process. Atochem North America is submitting the results of additional, more modern testing to meet the current data requirements. The re-registration process should be completed in 2 to 3 years.

Impacts on Fish and Other Aquatic Organisms

At recommended rates, the dipotassium salts (Aquathol and Aquathol K) do not have any apparent short-term effects on the fish species that have been tested. In addition, numerous studies have shown the dipotassium salts induce no significant adverse effects in aquatic invertebrates (such as snails, aquatic insects, and crayfish) when used at label application rates. However, some plant-dwelling populations of aquatic organisms may be adversely affected by application of endothall formulations due to habitat loss.

In contrast to the low toxicity of the Aquathol formulations, laboratory studies have shown the monoamine salts (Hydrothol 191 formulations) are toxic to fish at dosages above 0.3 parts per million (ppm). In particular, the liquid formulation will readily kill fish present in a treatment site. By comparison, EPA approved label rates for plant control range from 0.05 to 2.5 ppm. In recognition of the extreme toxicity of the monoamine salt, the manufacturer recommends no treatment with Hydrothol 191 where fish are an important resource.

Other aquatic organisms can also be adversely affected by Hydrothol 191 formulations depending upon the concentration used and duration of exposure.

Tadpoles and freshwater scuds have demonstrated sensitivity to Hydrothol 191 at levels ranging from 0.5 to 1.8 ppm.

Findings from field and laboratory studies with bluegills suggest that bioaccumulation of Aquathol formulations by fish from water treated with the herbicide is unlikely. Tissue sampling has shown residue levels become undetectable a few days after treatment.

Plant and animal species on the federal and state endangered resources lists and the habitats they need may be affected by aquatic treatments using endothall. A permit for endo-

thall may be denied or conditioned to protect these resources if they are present in the proposed treatment area.

Herbicide Degradation, Persistence and Trace Contaminants

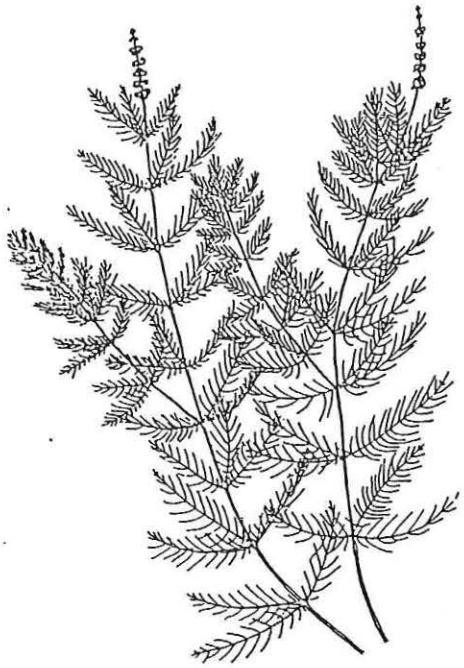
Studies in aquatic environments have shown that endothall disperses with water movement and is broken down into simpler molecules of carbon, hydrogen and oxygen by microorganisms. Field studies indicate reduced concentrations of endothall persist in water for several days to several weeks (half-life average of 5 days) depending on environmental conditions.

By-products of endothall's manufacturing process include trace amounts of succinic, fumaric, malic, and maleic acids. These acids occur widely in nature and are not hazardous to aquatic organisms.

Human Health

Most concerns about adverse health effects revolve around applicator exposure. Liquid endothall formulations in concentrated form are highly toxic. Because endothall can cause eye damage and skin irritation, users should minimize exposure by wearing suitable eye and skin protection.

At this time, the EPA believes endothall poses no unacceptable risks to water users if water use restrictions are followed. However, the chemical registration process is not complete and the results of the required studies will not be available for several years.



For Additional Information

Environmental Protection Agency
Office of Pesticides and Toxic Substances
Washington, D.C. 20460

Wisconsin Department of Justice
Office of the Public Intervenor
123 West Washington Ave.
P.O. Box 7857
Madison, WI 53707-7857
(608)266-8985

Wisconsin Department of Agriculture, Trade, and Consumer Protection
801 West Badger Road
Madison, WI 53712
(608)266-1721

Atochem North America
3 Parkway
Philadelphia, PA 19102
(215) 587-7000

NOTE: This fact sheet is published in accordance with chapter NR 107, Wis. Adm. Code. No endorsement of any chemical pesticide or plant control method is stated or implied. The DNR accepts no liability for damage or injury that may result from use of chemical pesticides under NR 107.

Applicants for permits under NR 107 are required to provide copies of applicable chemical fact sheets to any affected property owners' association and inland lake district. Copies of chemical fact sheets are also available upon request from the DNR.

WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

Specimen Label

SePRO

Sonar® A.S.

Herbicide

A herbicide for management of aquatic vegetation in fresh water ponds, lakes, reservoirs, drainage canals and irrigation canals

Active Ingredient:
fluridone: 1-methyl-3-phenyl-5-[3-(trifluoromethyl)phenyl]-4(1*H*)-pyridinone..... 41.7%
Inert Ingredients..... 58.3%
Total.....100.0%
Contains 4 pounds active ingredient per gallon.

EPA Reg. No. 67690-4

Precautionary Statements

Hazards to Humans and Domestic Animals

Keep Out of Reach of Children

CAUTION PRECAUCION

Precaucion al usuario: Si usted no lee inglés, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

Harmful If Swallowed, Absorbed Through Skin, Or If Inhaled

Avoid breathing of spray mist or contact with skin, eyes, or clothing. Wash thoroughly with soap and water after handling. Wash exposed clothing before reuse.

First Aid

If in eyes: Flush eyes or skin with plenty of water. Get medical attention if irritation persists.
If swallowed: Call a physician or poison control center, drink one or two glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person.
If inhaled: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

Environmental Hazards

Follow use directions carefully so as to minimize adverse effects on nontarget organisms. In order to avoid impact on threatened or endangered aquatic plant or animal species, users must consult their State Fish and Game Agency or the U.S. Fish and Wildlife Service before making applications.

Do not contaminate water when disposing of equipment washwaters. Trees and shrubs growing in water treated with Sonar A.S. herbicide may occasionally develop chlorosis. Do not apply in tidewater/brackish water.

Lowest rates should be used in shallow areas where the water depth is considerably less than the average depth of the entire treatment site, for example, shallow shoreline areas.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.
Read all Directions for Use carefully before applying.
Shake well before using.

Storage and Disposal

Do not contaminate water, food, or feed by storage or disposal.
Storage: Store in original container only. Do not store near feed or foodstuffs. In case of leak or spill, use absorbent materials to contain liquids and dispose as waste.
Pesticide Disposal: Wastes resulting from use of this product may be used according to label directions or disposed of at an approved waste disposal facility.
Container Disposal: Triple rinse (or equivalent). Then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

*Trademark of SePRO Corporation

Sonar® A.S. Herbicide

General Information

Sonar A.S. herbicide is a selective systemic aquatic herbicide for management of aquatic vegetation in fresh water ponds, lakes, reservoirs, drainage canals and irrigation canals. Sonar A.S. is absorbed from water by plant shoots and from hydrosoil by the roots of aquatic vascular plants. It is important to maintain the recommended concentration of Sonar A.S. in contact with the weeds as long as possible. Rapid water movement or any condition which results in rapid dilution of Sonar A.S. in treated water will reduce its effectiveness. In susceptible plants, Sonar A.S. inhibits the formation of carotene. In the absence of carotene, chlorophyll is rapidly degraded by sunlight. Herbicidal symptoms of Sonar A.S. appear in seven to ten days and appear as white (chlorotic) or pink growing points. Under optimum conditions 30 to 90 days are required before the desired level of aquatic weed management is achieved with Sonar A.S. Species susceptibility to Sonar A.S. may vary depending on time of year, stage of growth, and water movement. For best results, apply Sonar A.S. prior to initiation of weed growth or when weeds begin active growth.

Sonar A.S. is not corrosive to application equipment.

General Use Precautions

Obtain Required Permits: Consult with appropriate state or local water authorities before applying this product. Permits may be required by state or local public agencies.

Chemigation: Do not apply Sonar A.S. through any type of irrigation system.

Potable Water Intakes: In lakes and reservoirs, do not apply Sonar A.S. within one-fourth mile (1320 feet) of any functioning potable water intake. **Note: Existing potable water intakes which are no longer in use, such as those replaced by potable water wells or connections to a municipal water system, are not considered to be functioning potable water intakes.**

Irrigation: Irrigation with water treated with Sonar A.S. may result in injury to the irrigated vegetation. SePRO recommends informing those who irrigate from areas treated with Sonar A.S. of the irrigation time frames presented in the table below. These time frames are suggestions which should be followed to reduce the potential for injury to vegetation irrigated with water treated with Sonar A.S.:

	Days After Application		
Application Site	Established Tree Crops	Established Row Crops Turf/Plants	Newly Seeded Crops/Seedbeds or Areas to be Planted Including /Overseeded Golf Course Greens
†Ponds and Static Canals	7	30	30
Canals	7	14	30
††Lakes and Reservoirs	7	14	14

†For purposes of Sonar A.S. labeling, a pond is defined as a body of water 10 acres or less in size. A lake or reservoir is greater than 10

††In lakes and reservoirs where one-half or greater of the body of water is treated, use the pond and static canal irrigation restrictions.

Weed Control Information

Vascular Aquatic Plants Controlled by Sonar A.S.

Floating Plants:

Common duckweed (*Lemna minor*)†

Emersed Plants:

spatterdock (*Nuphar luteum*)
water-lily (*Nymphaea* spp.)

†Controlled only with a surface application of Sonar AS.

Submersed Plants:

bladderwort (*Utricularia* spp.)
common coontail (*Ceratophyllum demersum*)
common elodea (*Elodea canadensis*)
egeria, Brazilian elodea (*Egeria densa*)
fanwort, cabomba (*Cabomba caroliniana*)
hydrilla (*Hydrilla verticillata*)
naiad (*Najas* spp.)
pondweed (*Potamogeton* spp., except Illinois pondweed)
watermilfoil (*Myriophyllum* spp.)

Shoreline Grasses:

paragrass (*Brachiaria mutica*)

Vascular Aquatic Plants Partially Controlled by Sonar A.S.

alligatorweed (*Alternanthera philoxeroides*)
American lotus (*Nelumbo lutea*)
cattail (*Typha* spp.)
common watermeal (*Wolffia columbiana*)††
creeping waterprimrose (*Ludwigia peploides*)
giant cutgrass (*Zizaniopsis miliacea*)
Illinois pondweed (*Potamogeton illinoensis*)
parrotfeather (*Myriophyllum brasiliense*)
reed canarygrass (*Philaris arundinaceae*)
smartweed (*Polygonum* spp.)
spikerush (*Eleocharis* spp.)
southern watergrass (*Hydrochloa caroliniensis*)
torpedograss (*Panicum repens*)
waterpurslane (*Ludwigia palustris*)
watershield (*Brasenia schreberi*)

††Partial control only with a surface application of Sonar A.S. at the maximum labeled rate.

Vascular Aquatic Plants Not Controlled by Sonar A.S.

algae (*Chara* and *Nitella*)
American frogbit (*Limnobium spongia*)
arrowhead (*Sagittaria* spp.)
bacopa (*Bacopa* spp.)
big floatingheart, banana lily (*Nymphoides aquatica*)
bulrush (*Scirpus* spp.)
floating waterhyacinth (*Eichhornia crassipes*)
maidencane (*Panicum hemitomon*)
pickerelweed, lanceleaf (*Pontederia cordata*)
rush (*Juncus* spp.)
tapegrass, American eelgrass (*Vallisneria americana*)
waterlettuce (*Pistia stratiotes*)
water pennywort (*Hydrocotyle umbellata*)

Mixing and Application Directions

The aquatic plants present in the treatment site should be identified prior to application to determine their susceptibility to Sonar A.S. It is important to determine the area (acres) to be treated and the average depth in order to select the proper application rate. Do not exceed the maximum labeled rate for a given treatment site per annual growth cycle.

Shake Sonar A.S. well before using. Add the recommended amount of Sonar A.S. to water in the spray tank during the filling operation. Agitate while filling and during spraying. Surface or subsurface application of the spray can be made with conventional spray equipment. Sonar A.S. can also be applied near the surface of the hydrosoil using weighted trailing hoses. A spray volume of 5 to 100 gallons per acre may be used. Sonar A.S. may also be diluted with water and the concentrated mix metered into the pumping system.

Application to Ponds

Sonar A.S. may be applied to the entire surface area of a pond. Rates may be selected to provide 0.06 to 0.09 ppm of active ingredient in the treated water. Application rates necessary to obtain these active ingredient concentrations in treated water are shown in the following table. When average water depth of the treatment site is greater than 5 feet, apply 1 to 1.5 quarts of Sonar A.S. per treated surface acre.

Average Water Depth of Treatment Site (feet)	Quarts of Sonar A.S. per Treated Surface Acre
1	0.16 - 0.25
2	0.33 - 0.50
3	0.50 - 0.75
4	0.65 - 1.00
5	0.80 - 1.25

Use the higher rate within the rate range where there is a dense weed mass or when treating more difficult to control species.

Application to Lakes and Reservoirs

For best results in lakes and reservoirs, Sonar A.S. treatment areas should be a minimum of 5 acres in size. Treatment of areas smaller than 5 acres or treatment of narrow strips such as boat lanes or shorelines may not produce satisfactory results due to dilution by untreated water. In lakes and reservoirs, do not apply Sonar A.S. within one-fourth mile (1320 feet) of any functioning potable water intake.

Rates may be selected to provide 0.075 to 0.15 ppm of active ingredient in the treated water. Application rates necessary to obtain these active ingredient concentrations in treated water are shown in the following table. When average water depth of the treatment site is greater than 10 feet, apply 3 to 4 quarts of Sonar A.S. per treated surface acre.

Average Water Depth of Treatment Site (feet)	Quarts of Sonar A.S. per Treated Surface Acre
1	0.2 - 0.4
2	0.4 - 0.8
3	0.6 - 1.2
4	0.8 - 1.6
5	1.0 - 2.0
6	1.2 - 2.4
7	1.4 - 2.8
8	1.6 - 3.2
9	1.8 - 3.6
10	2.0 - 4.0

Use the higher rate within the rate range where there is a dense weed mass or when treating more difficult to control species.

Use Rates for Control of Eurasian Watermilfoil in Whole Lake or Reservoir Treatments: The following application rates may be used for control of Eurasian watermilfoil when treating lakes or reservoirs where little dilution with untreated water is expected to occur. Under these conditions, Sonar may be applied to provide a concentration of 0.01 to 0.02 ppm (10 to 20 ppb) of active ingredient in treated water. Application rates necessary to achieve these active ingredient concentrations in treated water are shown in the following table. For optimum control, it is recommended that applications be made early in the growing season.

Average Water Depth of Treatment Site (feet)	Quarts of Sonar A.S. per Treated Surface Acre
1	0.027 - 0.05
2	0.05 - 0.11
3	0.08 - 0.16
4	0.11 - 0.22
5	0.14 - 0.27
6	0.16 - 0.32
7	0.19 - 0.38
8	0.22 - 0.43
9	0.24 - 0.49
10	0.27 - 0.54

When treated with these use rates, other less susceptible species listed under Aquatic Plants Controlled may exhibit only temporary injury or stunting followed by recovery and normal growth. These 0.01 to 0.02 ppm rates may be applied where functioning potable water intakes are present. Note: When applications for management of Eurasian watermilfoil are made to only portions of lakes or reservoirs such as bays or fingers of these water bodies, the higher rates and use directions listed on this label for Applications to Lakes and Reservoirs are recommended.

Application Rate Calculation - Ponds, Lakes and Reservoirs

The amount of Sonar A.S. to be applied to provide the desired ppm concentration of active ingredient in treated water may be calculated as follows:

Quarts of Sonar A.S. required per treated surface acre = Average water depth of treatment site (feet) **x** Desired ppm concentration of active ingredient **x** 2.7

For example, the quarts per acre of Sonar A.S. required to provide a concentration of 0.075 ppm of active ingredient in water with an average depth of 5 feet is calculated as follows:

5 **x** 0.075 **x** 2.7 = 1.0 quart per treated surface acre.

When measuring quantities of Sonar A.S., quarts may be converted to fluid ounces by multiplying quarts to be measured **x** 32. For example, 0.25 quarts **x** 32 = 8 fluid ounces.

Note: Calculated rates should not exceed the maximum allowable rate in quarts per treated surface acre for the water depth listed in the application rate table for the site to be treated.

Application to Drainage Canals and Irrigation Canals

In drainage and irrigation canals, Sonar A.S. should be applied at the rate of 2 quarts per treated surface acre. Where water retention is possible, the performance of Sonar A.S. will be enhanced by restricting water flow. In moving bodies of water, use an application pattern that will provide a uniform distribution and avoid concentration of the herbicide.

Warranty Disclaimer

SePRO Corporation warrants that this product conforms to the chemical description on the label and is reasonably fit for the purposes stated on the label when used in strict accordance with the directions, subject to the inherent risks set forth below. SEPRO CORPORATION MAKES NO OTHER EXPRESS OR IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY OTHER EXPRESS OR IMPLIED WARRANTY.

Inherent Risks of Use

It is impossible to eliminate all risks associated with use of this product. Plant injury, lack of performance, or other unintended consequences may result because of such factors as use of the product contrary to label instructions (including conditions noted on the label, such as unfavorable temperatures, soil conditions, etc.), abnormal conditions (such as excessive rainfall, drought, tornadoes, hurricanes), presence of other materials, the manner of application, or other factors, all of which are beyond the control of SePRO Corporation or the seller. All such risks shall be assumed by Buyer.

Limitation of Remedies

The exclusive remedy for losses or damages resulting from this product (including claims based on contract, negligence, strict liability, or other legal theories), shall be limited to, at SePRO's election, one of the following:

(1) Refund of purchase price paid by buyer or use for product bought, or
(2) Replacement of amount of product used.

SePRO Corporation shall not be liable for losses or damages resulting from handling or use of this product unless SePRO Corporation is promptly notified of such loss or damage in writing. In no case shall SePRO Corporation be liable for consequential or incidental damages or losses.

The terms of the Warranty Disclaimer above and this Limitation of Remedies cannot be varied by any written or verbal statements or agreements. No employee or sales agent of SePRO Corporation or the seller is authorized to vary or exceed the terms of the Warranty Disclaimer or this Limitation of Remedies in any manner.

SePRO Corp. • Carmel, IN 46032 U.S.A.

Material Safety Data Sheet

SePRO

Emergency Phone: 317-580-8282
General Phone: 1-317-580-8282

EPA Reg. Number: 67690-4
Effective Date: August 25, 1994

SONAR* A.S. Herbicide

SePRO Corporation • Carmel, IN

1. INGREDIENTS: (% w/w, unless otherwise noted)

1-Methyl-3-phenyl-5-(3-(trifluoro-methyl)phenyl)-4 (1H)-pyridinone (Fluridone)
CAS# 059756-60-4.....41.7%

Other Ingredients, total, including: 58.3%
Proprietary surfactants
Propylene glycol . . . CAS# 000057-55-6
Water . . . CAS# 007732-18-5

This document is prepared pursuant to the OSHA Hazard ommunication Standard (29 CFR 1910.1200). In addition, other substances not 'Hazardous' per this OSHA Standard may be listed. Where proprietary ingredient shows, the identity may be made available as provided in this standard.

2. PHYSICAL DATA:

BOILING POINT: (@ 1 atmosphere) 212°F, 100°C

VAP. PRESS: 2.3 mm Hg at 25°C

VAP. DENSITY: 1.178 relative to air at 25°C

SOL. IN WATER: Disperses in water

SP. GRAVITY: 1.15 at 25°C

APPEARANCE: Light tan to gray opaque liquid

ODOR: Slight odor

pH: (aqueous 50/50) 8.45

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: Greater than 200°F, 93.3°C

METHOD USED: SCC

FLAMMABLE LIMITS:
LFL: Not applicable
UFL: Not applicable

AUTO-IGNITION TEMPERATURE: Not applicable

EXTINGUISHING MEDIA: SONAR A.S. is a water based suspension and will not burn. If product is involved in fire and water has evaporated, use water fog, CO2, dry chemical, or foam.

FIRE AND EXPLOSION HAZARDS: This product will not burn until a sufficient amount of water has evaporated. At this point, the product will exhibit the flammability characteristics of the organic portion of this formulation. Keep unnecessary people away; isolate hazard area and deny unnecessary entry. Highly toxic fumes are released in fire situations.

FIRE-FIGHTING EQUIPMENT: Wear positive-pressure, self-contained breathing apparatus and full protective equipment.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) None known

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) None known

HAZARDOUS DECOMPOSITION PRODUCTS: If product is allowed to dry, will emit toxic vapors as it burns.

HAZARDOUS POLYMERIZATION: Does not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ENVIRONMENTAL DATA: Follow use directions carefully so as to avoid adverse effects on nontarget organisms. In order to avoid impact on threatened or endangered aquatic plant or animal species, users must consult their state fish and game agency or the U.S. Fish and Wildlife Service before making applications. Do not contaminate water when disposing of equipment washwaters. Trees and shrubs growing in water treated with Sonar A.S. may occasionally develop chlorosis. Do not apply in tidewater or brackish waters. Lowest rates should be used in shallow areas where the water depth is considerably less than the average depth of the entire treatment site, for example, shallow shoreline areas.

ACTION TO TAKE FOR SPILLS: Use absorbent material to contain and clean up small spills and dispose as waste. Large spills report to CHEMTREC and SePro Corporation for assistance. Prevent runoff.

DISPOSAL METHOD: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

6. HEALTH HAZARD DATA:

EYE: May cause slight transient (temporary) eye irritation. Corneal injury is unlikely.

SKIN CONTACT: Prolonged exposure may cause slight skin irritation. Did not cause allergic skin reactions when tested in guinea pigs.

SKIN ABSORPTION: A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. The LD50 for skin absorption in rabbits is greater than 2000 mg/kg.

*Trademark of SePRO Corporation

SePRO

Emergency Phone: 317-580-8282
General Phone: 1-317-580-8282

EPA Reg. Number: 67690-4
Effective Date: August 25, 1994

SONAR* A.S. Herbicide

SePRO Corporation • Carmel, IN

INGESTION: Single dose oral toxicity is low. The oral LD50 for rats is greater than 500 mg/kg. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; swallowing amounts larger than that may cause injury.

INHALATION: At room temperature, vapors are minimal due to physical properties; a single exposure is not likely to be hazardous.

SYSTEMIC (OTHER TARGET ORGAN) EFFECTS: In chronic toxicity studies in animals, fluridone has been shown to cause liver and kidney effects.

CANCER INFORMATION: The components did not cause cancer in long-term animal studies.

TERATOLOGY (BIRTH DEFECTS): In animal studies on some of the components (including fluridone), this product did not cause birth defects; for fluridone, other fetal effects occurred only at doses toxic to the mother.

MUTAGENICITY (EFFECTS ON GENETIC MATERIAL): For fluridone, results of mutagenicity tests in animals have been negative; results of a battery of in-vitro mutagenicity tests, except for one, have also been negative. Based on these results and the lack of carcinogenic response in long term studies, fluridone is not considered to be mutagenic.

7. FIRST AID:

EYES: Flush eyes with plenty of water. Get medical attention if irritation persists.

SKIN: Flush skin with plenty of water. Get medical attention if irritation persists.

INGESTION: Call a physician or poison control center. Drink one or two glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person.

INHALATION: Move victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): Propylene glycol: AIHA WEEL is 50 ppm total, 10 mg/m3 aerosol only.

VENTILATION: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. If respiratory irritation is experienced, use an approved air-purifying respirator.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. Use chemically-resistant gloves when prolonged or frequently-repeated contact could occur. Wash thoroughly with soap and water after handling. Wash exposed clothing before reuse.

EYE PROTECTION: Use safety glasses.

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Keep out of reach of children. Harmful if swallowed, absorbed through skin, or if inhaled. Avoid breathing of spray mist or contact with skin, eyes, or clothing.

MSDS STATUS: Revised sections 1, 3, 5, 6, 7, 8, 9, and reg sheet.

REGULATORY INFORMATION:

(Not meant to be all-inclusive—selected regulations represented).

NOTICE: The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another; it is the buyer's responsibility to ensure that its activities comply with federal, state or provincial, and local laws. The following specific information is made for the purpose of complying with numerous federal, state or provincial, and local laws and regulations. See MSD Sheet for health and safety information.

SARA HAZARD CATEGORY: This product has been reviewed according to the EPA "Hazard Categories" promulgated under Sections 311 and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:
An immediate health hazard

TOXIC SUBSTANCES CONTROL ACT (TSCA): All ingredients are on the TSCA inventory or are not required to be listed on the TSCA inventory.

STATE RIGHT-TO-KNOW: The following product components are cited on certain state lists as mentioned. Non-listed components may be shown in Section 1 of the MSDS.

GUIDELINES FOR CONTRACT HARVESTING

The following is a list of items that the contractor and Association should follow when conducting a contract harvesting program.

- Keep cutter bars and paddle wheels out of sediment.
- Any harvested areas should have at least one foot of plant material remaining to stabilize the sediments.
- Harvester operators should be trained to identify "good plants".
- Focus on harvesting eurasian water milfoil and curly-leaf pondweed.
- Deep wtaer areas that need harvesting should be cut to a depth of five feet to prevent boating activities from cutting plants.
- Return harvested fish or wildlife to the lake.
- Keep off-load sites and adjacent lake areas clean and debris-free.
- Every effort should be made to reduce the amount of floating plant debris.
- The contractor shuld provide detailed records showing where harvesting takes place, number of loads removed, types of plants harvested, hours including maintenance and downtime.
- All harvesting should be confinced to the lake-ward side of the pier line. Shoreline nuisances should continue to be handled by riparian property owners.
- Harvesting should not begin until June 15 to protect the fisheries. If needed prior to June 15, only primary boat navigation channels should be harvested.