LPL-660

Williams Lake

Aquatic Plant Management Plan, 2000

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Chapter I

INTRODUCTION

Williams Lake is a 62 acre lake located in the Marquette County just south of Buffalo and Montello Lakes. The lake has an average depth of 4 feet and a maximum depth of 6 feet. The Williams Lake Management District (WLMD) was created in 1987 in response to growing concerns regarding the quality of Williams Lake. The WLMD took possession of the dam in 1987. The shallow nature of the lake, along with the increase in non-native plant species, creates a situation where much of the lake is unusable by the public or residents. Following the formation of the district, the WLMD undertook the acquisition of a weed harvester, and the creation of a weed harvesting program. The WLMD has been harvesting since 1991.

GOALS & OBJECTIVES

The goals and objectives on Williams Lake continue to focus on balancing the various uses and needs. 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" frequently desire an undisturbed lake surface.

The increase in non-native plants, specifically, Eurasian watermilfoil (*Myriophyllum spicatum*), is of great concern to the WLMD. Controlling the exotic plant and protecting the native plant population is crucial to the ecological balance of the resource.

The District desires to:

- Preserve native plants
- Protect sensitive areas
- Control exotic and nuisance plant species
- Provide improved navigation
- Educate district members on the value of aquatic plants and the threats to a balanced population.
- Educate district members on shallow lake ecology.

Chapter II

BACKGROUND

SHORELINE DEVELOPMENT

Williams Lake and its watershed is relatively undeveloped. The drainage area to Williams Lake is primarily rural. Rural land uses are dominated by agricultural and other open space lands. Because the watershed is dominated by rural uses, there are opportunities for further development which could further impact Williams Lake.

Land use activities can directly affect plant growth patterns in the lake. The runoff from individual homesites adds to the nutrients and sediments in a lake. Overloaded holding tanks and sewer systems can also greatly increase the nutrient loading to the lake. That in turn increases the plant growth, sometimes to nuisance conditions. While the loadings may occur in relatively small doses, over time, the impact can be significant.

A similar effect may be seen near the outfall of storm drains. These areas frequently show the concentrated effects of urban impacts. Often, the lake area near a storm drain outfall has different plant and sediment characteristics than other areas of the lake. 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. Public and property owner education should focus on activities that will minimize their impact on the lake.

ACCESS LOCATIONS

Williams Lake has a public access site, owned by Packwaukee Township, as shown on Map 1.

Table 1. Hydrography and Morphology of Williams Lake

Marquette County, Wisconsin, 2000

Area = 62 acres

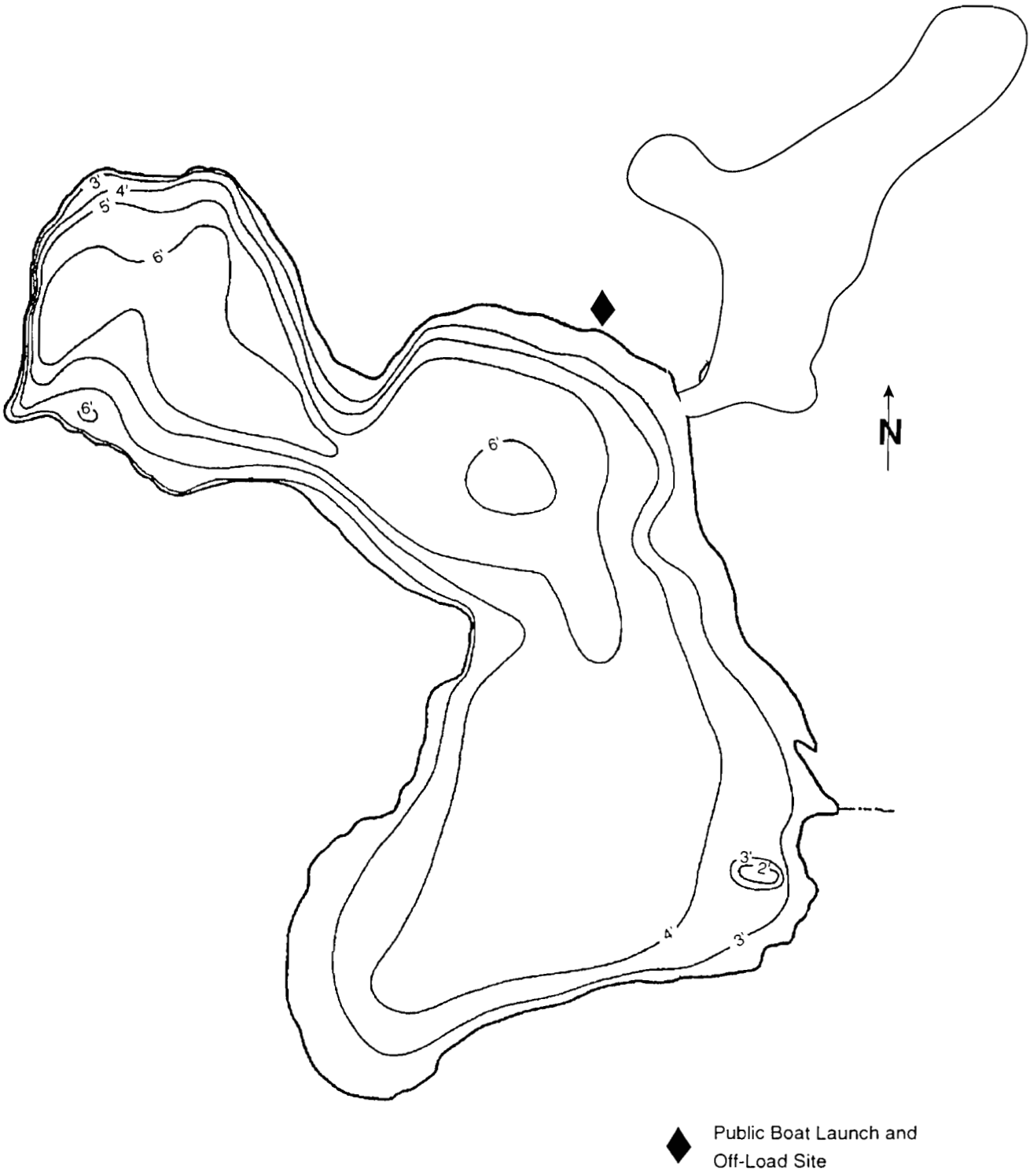
Maximum depth = 6 feet

Mean depth = 4 feet

Volume = 248 acre feet

Sources: WDNR

Map 1 - Williams Lake, 2000



VALUE OF 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 contribute to dissolved oxygen production. Invertebrates upon which fish depend for food, spend much of their life cycle on or near plants. Young fish and wildlife use plants for shelter and protection from predators. Plants also stabilize sediments, helping control shoreline erosion, and turbidity. Without plants, nutrients in the water column are readily available to fuel algae blooms. Native plant beds rarely experience oxygen or pH problems that are often associated with exotic species. An aquatic plant monitoring program may also provide an early warning signal that the lake is reacting to negative impacts from the watershed. Loss of diversity or an increase in nuisance species can signal the existence of watershed problems.

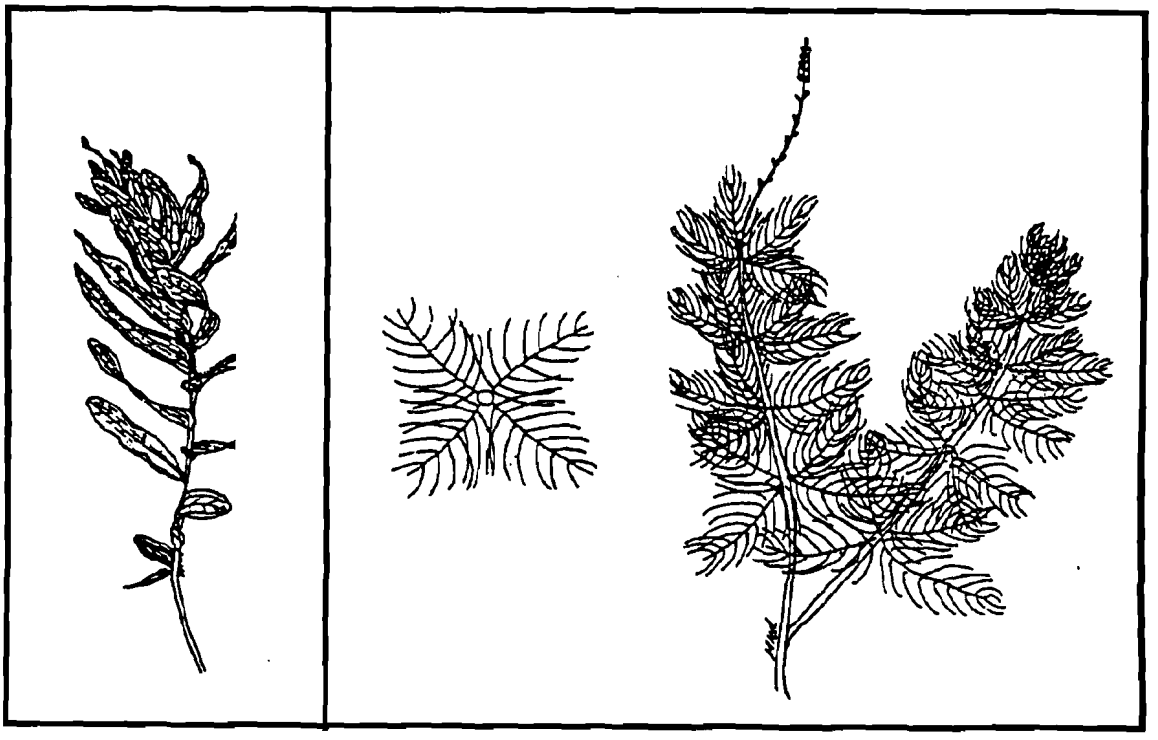


Figure 1. Two exotic species: curly-leaf pondweed (left) and Eurasian watermilfoil.

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.

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 watermilfoil. 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 is one of the dominant plants in Williams Lake. It is found throughout the lake. Muskgrass was not found to be present in nuisance conditions although it can sometimes become very dense and problematic, prompting management actions to improve recreational access to waterways. Muskgrass should for the most part, be protected to help reduce infestations of other potential nuisances such as Eurasian watermilfoil.

Eurasian watermilfoil (*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 watermilfoil also can contribute to stunted panfish populations by providing too much protection from predator fish (WDNR 1988). Eurasian watermilfoil 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 watermilfoil is found throughout the lake.

Curly-leaf pondweed (*Potamogeton crispus*), also shown in Figure 1, was not found in Williams Lake. The plant tends to be more dominant in early summer, dying off in mid-July and August. This may account for not finding the plant in the lake since the survey was done in late July. Like Eurasian watermilfoil, curly-leaf pondweed is an exotic plant species. It has several advantages over native plants that allows it to become established 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 dies back in mid-July when other plants are beginning their peak growth periods. The die-off can create algae problems when the decaying plants release nutrients that fuel algae blooms. This can be very severe if curly-leaf dominates the plant community. Curly-leaf pondweed provides a good food source for waterfowl, especially as an invertebrate substrate, which is also used by fish. Curly-leaf may provide good cover for fish as long as densities do not reach a nuisance level.

Wild celery (*Vallisneria americana*) is a perennial plant that prefers hard substrates. The plant has long grass-like leaves that rise from the sediments. The seeds and foliage are considered an excellent food source for waterfowl. Wild celery is a prime spawning habitat

for northern pike. In late March to early April, the northern pike spawn on the wild celery that is left from the previous summer's growth. Wild celery also provides cover for fish as well as supporting fauna that are utilized by fish for food. Wild celery may also grow to nuisance levels. Wild celery is found in Williams Lake but does not require any nuisance controls at this time.

Pondweeds are important species of plants for a lake. Pondweeds do not grow as dense nor create a dense canopy as does Eurasian watermilfoil. 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 watermilfoil. Plant management should focus on protection and enhancement of the pondweeds, while controlling the nuisance populations of milfoil. Williams lake has good populations of a variety of native pondweeds.

The Wisconsin Legislature has attempted to protect native pondweeds with the passage of NR 107 in 1989. 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 Williams Lake include sago pondweed (*Potamogeton pectinatus*), White-stem pondweed (*P. praelongus*), Illinois pondweed (*P. Illinoensis*), and wild celery (*Vallisneria americana*).

Williams Lake has a good variety of native plants (see Table 2) however, the densities of the plants make it extremely difficult for the public or riparians to use the lake. Watermilfoil species are found throughout the lake. The prolific nature of the plant, growing stems twice as long as the water is deep, combined with the shallow nature of the lake, create nearly impassable conditions without active management.

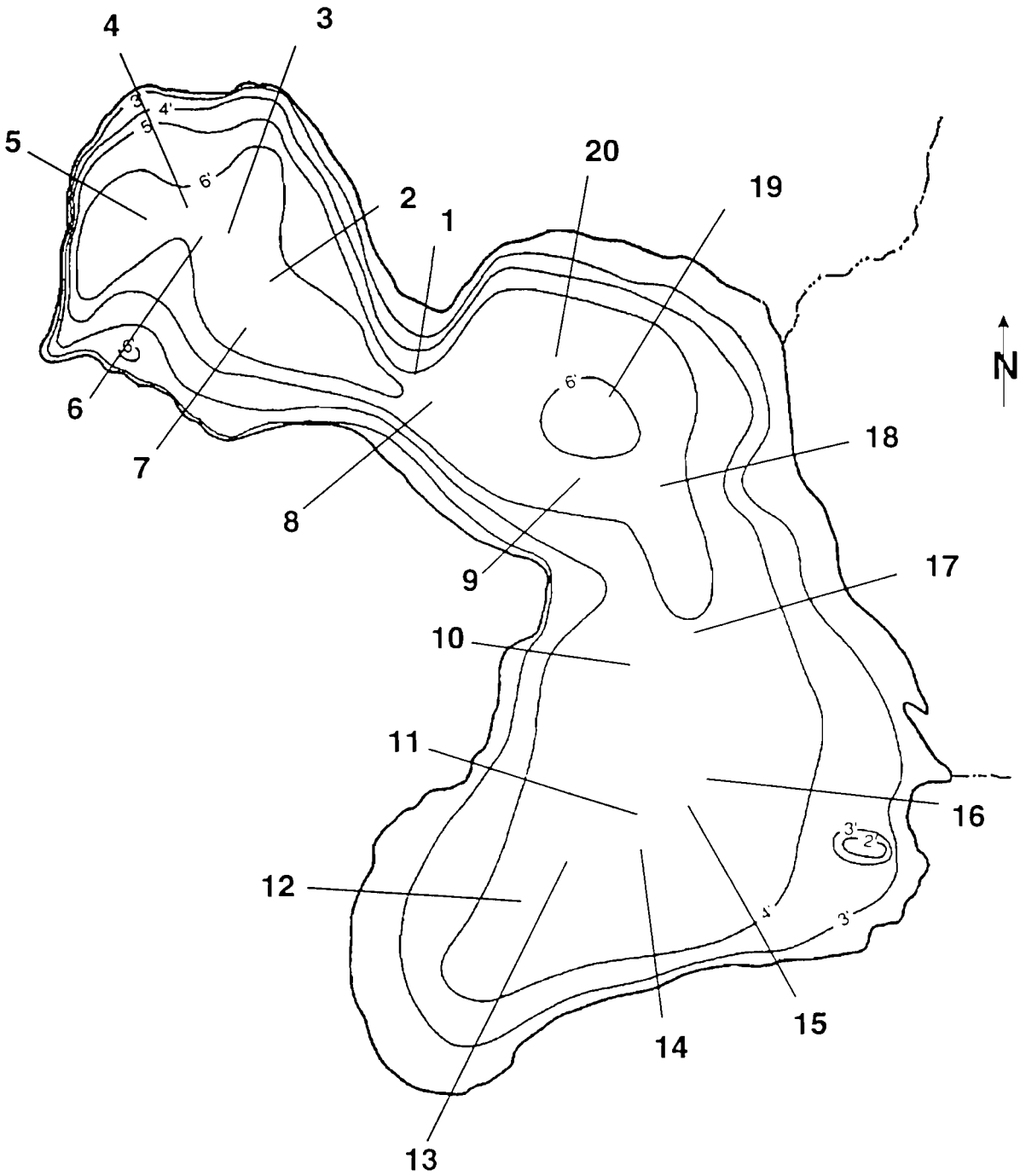
Table 2. List of Plant Species in Williams Lake, 2000

Scientific Name	Common Name
Chara sp.	Muskgrass
Elodea canadensis	Elodea, waterweed
Lemna minor	Small duckweed
Myriophyllum spicatum	Eurasian Watermilfoil
M. sibiricum*	Northern Watermilfoil
Najas flexilis	Slender Naiad
Nuphar sp.**	Yellow Water Lily
Nymphaea sp.	White Water Lily
Potamogeton illinoensis	Illinois Pondweed
P. pectinatus	Sago Pondweed
P. praelongus	White-stem Pondweed
Utricularia vulgaris	Great Bladderwort
Vallisneria americana	Water Celery, Eel Grass

*formerly known as Myriophyllum exalbescens.

**found in the general survey.

Map 2 - Transect Locations on Williams Lake



CURRENT CONDITIONS

An aquatic plant survey was conducted on Williams Lake in July, 2000. The secchi disk reading the day of the survey showed a six foot water clarity. Plants were found up to the maximum rooting depth of 6 feet.

Because of the shallow nature of Williams Lake, the entire lake is available to, and has abundant aquatic plants. The plant community is very consistent throughout the lake, whether the shorelines are developed or not. The plant community is a mix of *Myriophyllum spicatum, M. sibiricum, Najas flexilis, Chara* sp, *Potamogeton Illinoensis,* and*Vallisneria americana.*

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 that are an essential element in the food supply for fish. 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 watermilfoil 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 because so few lakes in southeast

Wisconsin have undeveloped shorelines and wetlands, areas such as these that do still exist should be preserved and protected.

The WDNR has not conducted a Sensitive Area designation on Williams Lake. The extensive, undeveloped shoreline on Williams Lake provides many of the features needed by wildlife, including natural vegetation on the shorelines, wooded areas, and places of refuge.

The WLMD has "set aside" areas on Williams Lake as No Harvesting. These are areas that are important to the long term health of the fisheries on Williams Lake. The No Harvesting areas are shown on Map 3.

FISH AND WILDLIFE

Williams Lake is considered a quality fishing lake with northern pike, large mouth bass and panfish. The extensive natural shoreline areas provide plenty of spawning and nursery habitat. The dense Watermilfoil tends to provide large areas that protect the panfish from the larger predator fish. This can lead to stunted panfish and smaller predator fish.

Wildlife is able to use the quiet areas of the lake and surrounding natural areas. Waterfowl also frequent the lake during spring and fall migrations.

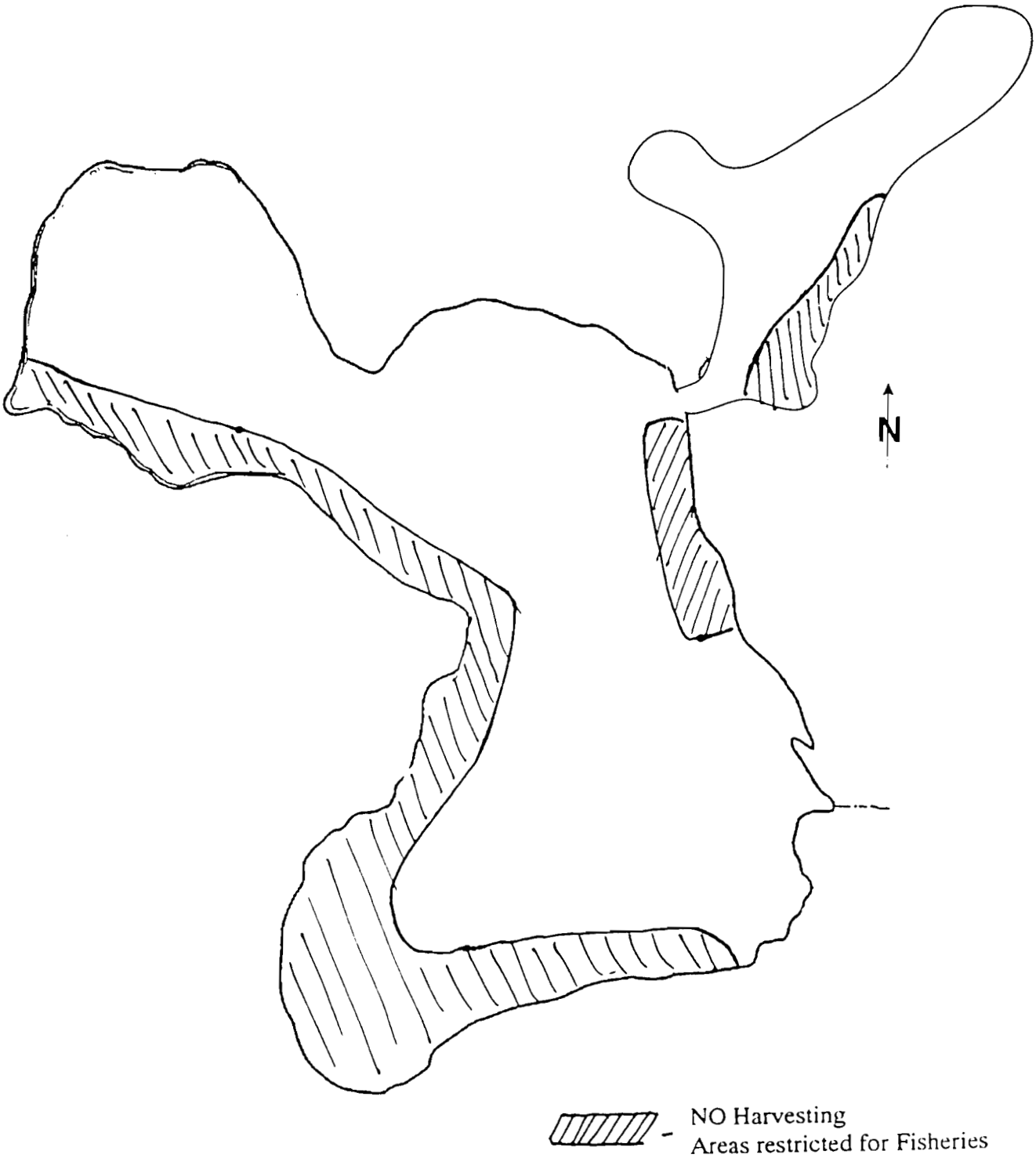
LAKE USE

Williams Lake receives a moderate degree of recreational pressure. The majority of recreational uses are scenic viewing, swimming, and fishing. The lake has moderate lake use during weekdays, however, weekends and holidays have the highest use levels on Williams Lake. The dense plant beds that cover almost 100% of the lake are currently restricting lake use.

BOATING ORDINANCE

There is no local boating ordinance for Williams Lake. State regulations on boating apply to the lake.

Map 3 - No Harvest Areas on Williams Lake



Chapter III

PROBLEMS

Although Williams Lake is considered a quality water resource, its waters and sediments contain sufficient amounts of nutrients to promote aquatic plant and algae 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 Williams Lake.

Plants have been reported to have increased over time, most likely as Eurasian watermilfoil has increased. The shallow nature of the lake, along with clarity levels to the lake bottom, provides the opportunity for plants to cover 100% of the lake. The very dense milfoil beds, even in the shoreline zone, restricts lake use.

Chapter IV

HISTORICAL PLANT MANAGEMENT

Historical plant management generally consists of chemical treatment or harvesting. Williams Lake has used minimal plant control.

CHEMICAL TREATMENT

Williams Lake residents have used chemicals to control Eurasian watermilfoil on the shorelines of the developed areas. In 1999, a couple of local residents became licensed by the State to apply aquatic chemicals. Residential shorelines, up to 50 feet in length, were chemically treated in 1999 and 2000, in an attempt to provide nuisance relief for the landowners. Map 4 shows the areas that were chemically treated in 2000.

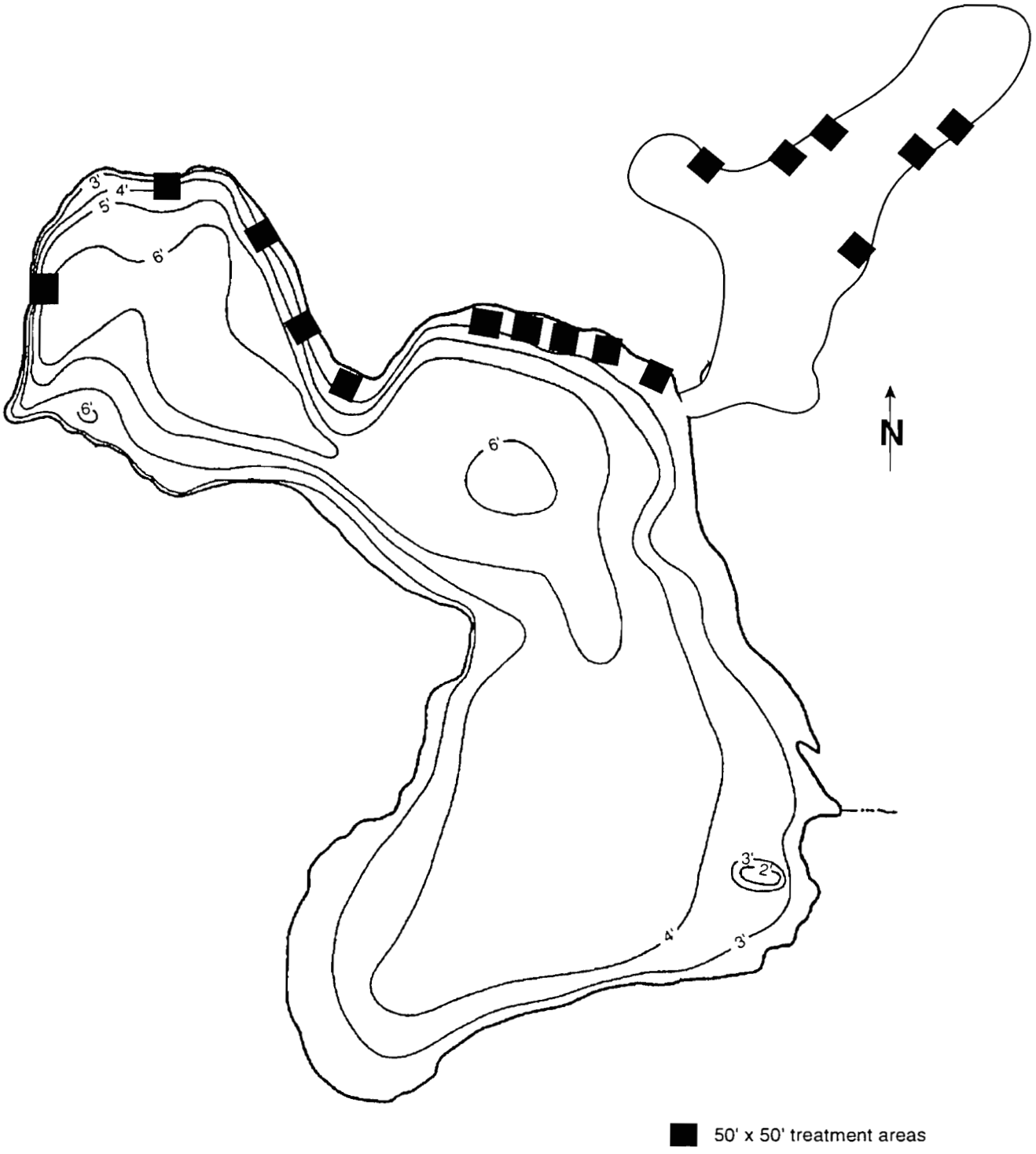
HARVESTING

There has been mechanical harvesting on Williams Lake since 1991. The program is conducted by volunteers following carefully developed procedures for operating the harvester, and the truck. A minimum of 32 acres are harvested annually.

The harvester is an Aquarius HM 420 and was purchased in 1991 for $33,000. An old truck was replaced in 2000 with a 1981 International for $3,000. The annual budget for the harvesting program is $4,000. This also pays for the hired equipment maintenance person. The WLMD carries insurance for the program.

The program's focus is to open a minimal area of the lake for recreational use. Direct access lanes are harvested first, and then areas are opened up for visual aesthetics, if time permits. In 2000, truck problems restricted the amount of harvesting that was done. The new truck is expected to allow normal harvesting to return. An average of approximately 800 truck loads are harvested per year.

Map 4 - Chemical Treatment Areas on Williams Lake



Chapter V

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 at least 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 raises the cost for equipment, electricity and staff. Costs can be minimal if the lake can be lowered by opening a gate.

Although there is a dam on Williams Lake, drawdown for the purpose of aquatic plant control on Williams Lake is not recommended because it has not been proven to be effective for controlling milfoil.

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.This treatment will not prevent plant growth but will reduce problems from algae growth. Improved water clarity achieved with an alum treatment may increase aquatic plant densities. WDNR approval is required. Only waters deeper than five feet are usually treated with Alum.

Nutrient release from the sediments has not been determined to be a problem on Williams Lake. Because of the shallow nature of the 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 $5.00 per cubic yard up to $15.00 per cubic yard depending on site conditions, method used and disposal costs. A WDNR permit is required.

Dredging may be considered to maintain the narrow navigation channel on Williams Lake. Extra precautions should then be taken to protect the rest of the lake from problems during the dredging. Dredging for aquatic plant control would not be considered a viable alternative for Williams 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 and annual maintenance and operational costs must be considered. 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. Unless Williams Lake shows depleted oxygen levels to be a problem, 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 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 $300 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 are not viable for Williams Lake as a whole.

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. Depending upon the chemical used, 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 watermilfoil and curly-leaf pondweed. The formulation of the chemical, whether liquid or granular, is another factor to consider. Another factor is the contact period the chemical would have with the vegetation.

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 watermilfoil when hand-pulling cannot be used.

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, 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.

Reward, previously called 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. Reward kills the parts of plants that it directly comes into contact with. Reward 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 Reward 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. Reward works relatively quickly, with results usually seen in 6 to 10 days.

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.

Fluridone is a herbicide which inhibit's the plant's ability to make food. Without that ability, the plant dies. The visual symptom of the effects of fluridone is bleaching of the terminal buds or growing points on the plant. This herbicide takes approximately 30 to 45 days to kill the plant. This prevents problems with low dissolved oxygen in treated areas. Fluridone is rapidly diluted and best used in larger treatment areas, generally 5 acres or more in size, and preferably on a whole-lake basis. There are no swimming, fishing, or lake use restrictions with Fluridone. Fluridone achieves its selectivity by the use of varying dosages. High treatment dosages control a wide variety of aquatic plants, while low dosages maintained over long periods of time have been used to control Eurasian watermilfoil without impacting native plants.

Native aquatic plants should not be chemically treated without a thorough review of the existing conditions, or by WDNR personnel. Changing plant conditions that create significant shoreline nuisances may warrant chemical treatment of exotics even with a harvesting program. If the decision is made to use chemical treatment, it should be carefully conducted so that it only targets the immediate nuisance.

Prior to any treatment, a permit is required from the DNR. Only Wisconsin and EPA approved 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.

There may be consideration given to treating Eurasian watermilfoil with 2-4-D or other approved, selective chemical. This should be done after an evaluation of current conditions and potential impacts to native species. The treatments should be confined to only that needed to maintain riparian lake use activities. Extensive natural shorelines should not be chemically treated unless it is done as part of a long term project to reduce or eliminate Eurasian watermilfoil.

Native plants that interfere with use in small riparian areas may be treated to maintain a swimming area and pier zone. These treatment areas should be restricted to areas 50-75 feet in shoreline length.

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.

Careful consideration of the species introduced needs to be given to avoid creating another problem. 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.

Due to the good species diversity and high densities of plants in Williams Lake, native species reintroduction or expansion has minimal application as an alternative. Protection of existing native plants is a more feasible management alternative.

HARVESTING

Selective harvesting is used by many lakes to control aquatic plants. Plants are cut off about five to six 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.

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

New harvester costs range from $80,000 to $120,000. Used equipment is also available in a wide range of costs. Additionally, a truck, conveyor, and sometimes a barge is needed to conduct an effective program.

Because of the extensive plants and the shallow nature of Williams Lake, harvesting is an alternative that can be used to manage the nuisance conditions.

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 swimming areas. Landowners should be encouraged to be selective in their clearing, again focusing on Eurasian water milfoil. Any vegetation that is cut must be removed from the lake.

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 and should not be used.

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.

A weevil (*eurhychiopsis*) has been found to help control Eurasian watermilfoil in some lakes in Wisconsin and Illinois. The weevil does major damage to the milfoil plant as it is closely associated with it during its entire life cycle. The adult female lays eggs on the tips of the milfoil. When the larvae hatch, they feed in the growing tips and then burrow into the stem. Pupation (when the larvae changes to an adult) occurs in the stem. In fall, adult weevils burrow into the shoreline litter until spring. Weevils mature from egg to adult within 30 days and reproduce from May through September. Lakes with intensive management using harvesters or chemicals are less likely to support good populations of the weevil. Weevils do not usually like other plants so will not affect other plant species. Weevils are available commercially, however, they are expensive to purchase to attempt to establish a population. There is a statewide research project involving introduction of weevils to attempt to control Eurasian watermilfoil.

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 Williams Lake. No signs of the weevil were identified in Williams Lake in 2000.

Chapter VI

PLANT MANAGEMENT PLAN

GOALS AND OBJECTIVES

The goal of the aquatic plant management program are 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 Williams Lake.

RECOMMENDATIONS

Williams Lake has a good aquatic plant community with a wide range of diversity. However, watermilfoil species are dominant plants throughout the lake, hindering navigation.

Management efforts should be directed toward protection and maintenance of the resource with a focus on controlling Eurasian watermilfoil. This will be difficult since the plant is found lakewide.

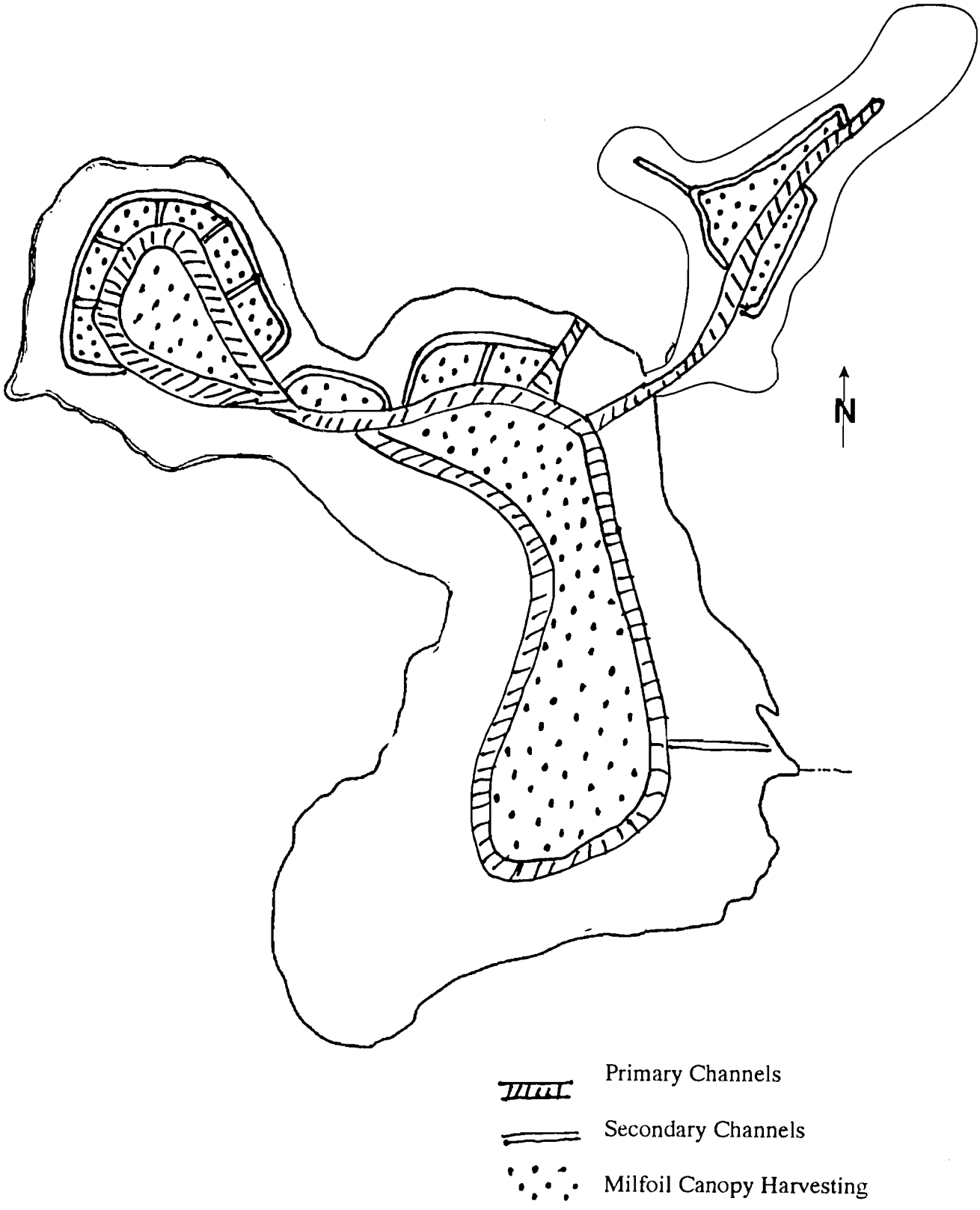
Three categories of harvesting should be conducted on Williams Lake. Primary channels, providing general navigational lanes; secondary channels, providing direct access to primary channels from developed shorelines; and milfoil canopy harvesting, removing the milfoil canopy only to a depth of 1 - 2 feet. Primary and secondary channels may be harvested to 4 - 5 feet in depth, water depth permitting. Removing the milfoil canopy will improve the viability of native plants by increasing the amount of light the plants receive. The recreational benefit of removing the canopy includes easier boating access and an aesthetically pleasing vista.

The primary channels cover approximately 10 acres. Secondary channels cover approximately 4 acres. Milfoil canopy area covers approximately 31 acres. Total harvestable area is about 45 acres.

Harvesting may begin in mid-late May, concentrating on primary channels, staying away from shoreline areas (Map 5). This will prevent damage to fish spawning and rearing areas. After June 1, secondary channels may be harvested. If fish are being harvested, the harvester should move away from the area and cut elsewhere. Primary channels may range up to 50 feet wide by 4 - 5 feet deep. Secondary channels should be limited to two cutting paths in width (about 15 feet).

Because volunteers are used for the program, operation time is limited. The primary channels (traffic lanes) should be harvested first to maintain general access on the lake. Additional time available should be used to maintain pier zone access into developed shorelines.

Map 5 - Harvesting Plan on Williams Lake



Harvesting random paths throughout the lake will create cruising lanes for predator fish and may help prevent stunted panfish. The random paths should be established through areas of primarily Eurasian watermilfoil and should avoid native plants where possible.

If plant growth is such that the harvesting cannot keep up with the growth, one option is to reduce the cutting depth to two or three feet. This will allow the machine to cover more acreage. If plant regrowth occurs rapidly, this option should not be used.

Operators needs to make sure that cutter bars and the paddle wheels are kept out of the sediments or to cut one foot above the plant beds. At no time should cutting remove all plant material down to the sediments. This will protect the lake bed and will prevent equipment damage.

Operators should operate equipment at speeds only sufficient to harvest the plant material. Excessive speeds will increase the inefficiency of the harvester, causing plants to lay over rather than be cut, and it will increase the numbers of fish trapped.

Operators should work to aggressively control the number of "floaters" and if they do occur, should be removed immediately. Equipment should be operated so that cut plant material does not fall off the harvester.

The harvester should unload before entering the area known as Packers Bay. This will help prevent damage from the shallow channel leading into Packers Bay. The harvester should be unloaded frequently when working in Packers Bay to prevent trying to pass through the channel with too much weight. Consideration may be given to dredging the channel to improve access for both the harvesting program and boating use.

Williams Lake residents may continue to use chemical treatment to clear pier and swimming zones along developed shorelines. Although small patches are more difficult to treat, long, extensive shoreline area treatments should be avoided. If conducted, a WDNR permit must be obtained and selective herbicides should be used to protect native aquatic plant species as much as possible.

Active plant management, whether chemical or mechanical harvesting, should avoid undeveloped shorelines. This will protect the refuge areas that the shorelines provide shelter and habitat.

PROCEDURES

At the start-up of each day all equipment should be greased and checked for proper operation. All hydraulic and oil levels should be checked, fittings greased and a visual inspection should be performed. All fluid levels and proper function of moving parts should be checked. Harvester operators should fill out a daily log that includes hours worked, time start, mileage start, harvested loads, dump truck loads, shoreline pick-up loads, gas used on

all equipment, breakdowns, and bulk motor oil and hydraulic fluid used if necessary. An example of the harvesters log is provided in the Appendix.

OPERATOR TRAINING AND SAFETY

Each harvester operator should be properly trained on the equipment. The training should consist of a combination of "classroom training" and hands-on training. The training should focus on equipment operation and maintenance procedures. Training should also be provided for the identification of aquatic plants. Safety measures should be emphasized for all operators of the equipment.

Operators should never swim or dive from the equipment. Sunscreen should be applied regularly. Life preservers should be provided on the equipment and worn by operators. So not operate the equipment in bad weather, especially electrical storms. A first aid kit and a fire extinguisher should be on board the harvester.

Equipment should be turned off and allowed to come to a complete stop prior to doing any adjustments or repairs. This includes removing any obstacles from the cutter knives. No loose clothing or jewelry should be worn when operating the equipment. All guards and shields should be in place. Try to keep the harvested plants moving onto the conveyor in an even manner. This will prevent overloading one side of the equipment, causing it to list or tip.

RECORD KEEPING

Comprehensive and detailed records should be kept documenting:

1. Date
2. Hours worked -including harvesting and equipment down time
3. Loads harvested -including plant types and densities
4. Areas harvested -located on a map
5. Weather conditions
6. Other pertinent information

STORAGE

The equipment should be properly winterized by a trained serviceman. This will extend the life of the equipment.

EQUIPMENT NEEDS

The WLMD needs to obtain a conveyor. This will provide more efficient unloading of the harvester into the truck and will prevent the truck from backing into the lake. This will reduce the plant debris in the offload area, will help control the nuisance conditions, and will limit potential discharges from the truck into the lake.

The existing harvester and newer truck appears to be meeting the current needs of the WLMD.

The WLMD wants to pursue acquisition of conveyor that has been used as a demo. The equipment is in like-new condition and will sell for approximately $12,000.

OTHER RECOMMENDATIONS

Education and Information:

The District should take steps to educate property owners regarding their activities and how they may affect the plant community in Williams Lake. Informational material should be distributed regularly to residents, landowners, and lake users and local government officials. A newsletter, biannually or quarterly, distributed to landowners and residents should be part of the plant management budget. Topics should include information relating to lake use impacts, importance and value of aquatic plants, land use impacts, etc. Another important educational topic is shallow lake ecology. 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 might also consider enlisting the participation of the local schools. The schools could use Williams 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.

The District should work with residents so they have realistic expectations with respect to the harvesting program. A number of items which should be discussed:

- A harvester is limited to working in good weather. High winds can create dangerous situations and can increase the opportunity for damage to residents boats and piers.

- The harvester's operation is limited by water depth. Harvesting in shallow water must be done very slowly to minimize damage to the lake and the equipment. Near shore areas, within the piers, should not be harvested. Harvesting should be restricted to areas outside the piers.

- Native plants are important to a lake and should be avoided when possible. Harvesting should focus on removing Eurasian watermilfoil.

Plan Reassessment

The District should review or contract to review, the plant populations of Williams Lake every three to five years. Eurasian watermilfoil removal efforts should be reviewed for effectiveness. The management plan should also be reviewed, and if necessary modified, every three to five years. This will be especially important to determine if the decline of native plants is an ongoing problem.

FINDING OF FEASIBILITY

The harvesting program is necessary to maintain even minimal recreational access to Williams Lake. It is also necessary to improve predator fish access to panfish.

The WLMD has shown the ability to maintain and operate an effective harvesting program, even with volunteers. The area of Williams Lake that can be harvested is approximately 45 acres. This includes the entire lake area outside of the pier zone, excluding the area shown on Map 3.

Chapter VII

SUMMARY

- The District should work with landowners' education to encourage protection of natural shorelines and emergent plant species such as sedges and rushes and floating leaf species like waterlilies and floating-leaf pondweeds.
- The District should provide landowners with information on erosion control, especially on the steeper shoreline areas.
- Every effort should be made to reduce the amount of floating plant debris, especially milfoil fragments.
- The District should acquire a conveyor to unload plant debris.
- The District should distribute informational materials regularly to residents on such topics as proper lawn and garden practices, land use impacts, the importance and value of aquatic plants, and shallow lake ecology.
- The District should train all volunteers who operate the equipment to ensure safe compliance with guidelines.
- Primary channels should be harvested first. Secondary channels may be harvested after June 1. Milfoil canopy harvesting should be done next, harvesting only 1 - 2 feet deep.

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