Town of Saint Germain

Vilas County, Wisconsin

Aquatic Plant Management Plan

DRAFT

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Town of Saint Germain

&

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ACKNOWLEDGEMENTS

This section will be included in the final document.

Figures

Tables

Maps (inserted before appendices)

Appendices

INTRODUCTION

The Town of Saint Germain contains over twenty named lakes. Each of these lakes is susceptible to or currently experiencing the negative effects brought on by the introduction of non-native and invasive species, such as Eurasian water milfoil (*Myriophyllum spicatum*), curly-leaf pondweed (*Potamogeton crispus*), and purple loosestrife (*Lythrum salicaria*). These negative effects include the loss of important native plant communities and their associated habitat value, water quality degradation, reductions in recreational opportunities, decreased aesthetic value, and loss of economic vitality. Unfortunately, introduced exotics can go unnoticed by lake users for many years and may never cause a problem; however, in some lakes, Little Saint Germain for example, a few scattered plants can explode to nuisance levels covering a hundred acres or more in just two years. Occurrences such as this have led to much concern within the town regarding the current and future condition of their highly valued lakes. However, the fallout of occurrences such as this within town lakes have not all been negative because it has done much to raise public awareness regarding not only the management of troubled systems, but possibly more importantly, the protection of the town's healthy systems. Furthermore, the town realized that there was not sufficient information currently available to assess the condition of their lakes, specifically pertaining to the structure and makeup of their lake's aquatic plant communities.

In an unprecedented and proactive effort to assess and protect the health of its lake ecosystems on a town-wide basis, the Town of Saint Germain, along with Vilas County initiated extensive surveys of the aquatic plant resources in eight of the town's lakes (Map 1). In doing so, the town worked to protect the important plant habitats vital to its fisheries and wildlife resources, while further raising the public awareness of how valuable and important these habitats are. It is important to note, that with the exception of inventories conducted on Little Saint Germain Lake in conjunction with their invasives control program and limited volunteer studies on Alma and Moon Lakes, comprehensive inventories had not been conducted on any of the project lakes until this project was completed.

There were four principal goals coupled with this project:

1. The completion of comprehensive surveys and subsequent analysis of the aquatic plant communities of eight lakes within the town.
2. The creation of individualized aquatic plant management and protection plans for each of the eight lakes.
3. The training of stakeholders associated with each lake in the identification and monitoring of both native and non-native plants within their respective lake.
4. To raise public awareness of exotic species and their negative attributes, while creating more accurate and positive public perceptions concerning the value of native aquatic plant communities.

STAKEHOLDER PARTICIPATION

Stakeholder participation was integral in two of the four goals stated above and important component of the project as a whole. Many activities were completed in order to not only raise public awareness about the project, but also about invasive aquatic plants in general. Furthermore, many of these activities engaged the stakeholders directly in the studies or the planning process. Each of these activities are detailed below. Unless otherwise noted, materials referenced in the descriptions can be found in Appendix A.

Project Kick-off Meeting

On May 23, 2004, a project kick-off meeting was held in the Town of Saint Germain Community Center to introduce the project to the general public. The meeting was announced through multiple mediums, including, a special mailing to each property owner on the eight project lakes, newspaper articles, and radio announcements. The approximate 45 attendees were welcomed by Mr. Ted Ritter, Chair, Town of Saint Germain Lakes Committee and were informed about the events that led to the initiation of the project. Mr. Ritter's opening remarks were followed by a presentation given by Tim Hoyman that started with an educational component regarding the importance of aquatic vegetation and the affect non-native invasive plants may have on it and ending with a detailed description of the project including opportunities for stakeholders to be involved. Mr. Hoyman's presentation was followed by a question and answer session.

Planning Meeting I

The first planning meeting with the town lakes committee was held following the kick-off meeting. During this meeting, Mr. Hoyman introduced the committee members to the process that would be used to create the management plan. Volunteer needs for the project were also discussed.

Newspaper Articles

Press releases and word-of-mouth resulted in three newspaper article being written about the project; two of which occurred even before the project began. All three articles were important in informing the general public about the project and more specifically, about the Kick-off Meeting.

Volunteer Voucher Specimen Pressing

Two vouchers of each species located during the plant studies were pressed, one for a town collection that will be kept at the library and the other for inclusion in the UW-Stevens Point Herbarium. Early in the summer of 2004, volunteers from each lake were trained to press the aquatic specimens. Following the completion of the comprehensive survey on their lake, the volunteers were supplied with pressing materials and bagged specimens. The pressed plants and remaining supplies were retrieved the following week by Onterra staff.

Volunteer Invasive Aquatic Plant Monitors Training

A primary goal of this project was to prepare area lake users to monitor their respective lakes for invasive species, most specifically, curly-leaf pondweed and Eurasian water milfoil. Each of the project lakes has a high level of recreational use by both shoreland property owners and short-term users such as, tourists utilizing resorts, anglers, and day-trip boaters. This means that each lake is exposed greatly to invasive species introductions. Early detection of pioneer colonies often leads to excellent control or possibly the eradication of the exotic species; therefore, periodic monitoring is essential. Properly training volunteers to complete the monitoring is more economically feasible than hiring professionals to perform the same task.

Sixteen people comprising of representatives from Big Saint Germain, Little Saint Germain, Lost, Found, Alma, and Moon Lakes along with others from outside of the project attended a volunteer training session facilitated by Onterra on June 17, 2005. The session was completed in two phases, the first being in the classroom where participants were introduced to the monitoring protocol (Appendix B), the identification of the target species and common look-alikes, and methods to divide their respective lakes between multiple monitoring teams. The second phase was conducted on Little Saint Germain Lake where participants were shown examples of Eurasian water milfoil, its common look-alikes and common look a-likes of curly-leaf pondweed. Fortunately, examples of curly-leaf pondweed were not found in the lake to use as examples.

Saint Germain Lake Fair

On July 7, 2005 the Town of Saint Germain Lakes Committee hosted their second annual Saint Germain Lakes Fair. The fair exposes lake users and other interested individuals to experts from multiple agencies and organizations, allowing participants to gather information and ask questions pertaining to topics they are interested in. Onterra displayed a 72 x 40 inch, color poster exhibiting the sponsors, goals, and draft maps and results of the project. The poster also explained the importance of the project and how the data would be interpreted.

Planning Meeting II

On October 27, 2005, the second planning meeting was held with the Town of Saint Germain Lakes Committee. During the meeting, Mr. Hoyman presented a detailed description of the project results along with information as to how those results were analyzed and compiled. Species diversity, frequency of occurrence, and floristic quality were discussed to familiarize committee with these topics so they may answer questions by riparians from their respective lakes. Mr. Hoyman also presented and discussed his ideas for the focus of the management plan. Members of the committee also provided valuable input to how the plan should be compiled and what it should contain.

Implementation Plan Development

Following Planning Meeting II, a draft implementation plan was developed. The draft was provided to the Town of Saint Germain Lakes Committee and reviewed during their January 2006 meeting. Each management action was refined during this process to assure that the town’s goals would be met while not exceeding its financial or volunteer capacity.

Based upon the committee’s review, a second draft of the implementation plan was developed. The second draft was reviewed during the Lakes Committee’s April 2006 meeting with only minor revisions being suggested.

Project Wrap-up Meeting

To be added later.

RESULTS & DISCUSSION

Aquatic Plants and the Lake Ecosystem

Although some lake users consider aquatic macrophytes to be "weeds" and a nuisance to the recreational use of the lake, they are actually an essential element in a healthy and functioning lake ecosystem. It is very important that the lake stakeholders understand the importance of lake plants and the many functions they serve in maintaining and protecting a lake ecosystem. With increased understanding and awareness, most lake users will recognize the importance of the aquatic plant community and their potential negative affects on it.

Diverse aquatic vegetation provides habitat and food for many kinds of aquatic life, including fish, insects, amphibians, waterfowl, and even terrestrial wildlife. For instance, wild celery (*Vallisneria americana)* and wild rice (*Zizania aquatica* and *Z. palustris*) both serve as excellent food sources for ducks and geese. In addition, many of the insects that are eaten by young fish rely heavily on aquatic plants and the *periphyton* attached to them as their primary food source. The plants also provide cover for feeder fish and *zooplankton*, stabilizing the predator-prey relationships within the system. Furthermore, rooted aquatic plants prevent shoreline erosion and the resuspension of sediments and nutrients by absorbing wave energy and locking sediments within their root masses. In areas were plants do not exist, waves can resuspend bottom sediments decreasing water clarity and increasing plant nutrient levels that may lead to algae blooms. Lake plants also produce oxygen through photosynthesis and use nutrients that may otherwise be used by *phytoplankton*, which helps to minimize nuisance algal blooms.

Under certain conditions, a few species may become a problem and require control measures. Excessive plant growth can limit recreational use by deterring navigation, swimming, and fishing activities. It can also lead to changes in fish population structure by providing too much cover for feeder fish resulting in reduced numbers of predator fish and a stunted pan-fish population. *Exotic* plant species, such as Eurasian water-milfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Potamogeton crispus*) can also upset the delicate balance of a lake ecosystem by out competing *native* plants and reducing *species diversity*. These *invasive* plant species can form dense stands that are a nuisance to humans and provide low-value habitat for fish and other wildlife.

When plant abundance negatively affects the lake ecosystem and limits the use of the resource, plant management and control may be necessary. The management goals should always include the control of invasive species and restoration of native communities through environmentally sensitive and economically feasible methods. No aquatic plant management plan should only contain methods to control plants, they should also contain methods on how to protect and possibly enhance the important plant communities within the lake. Unfortunately, the latter is often neglected and the ecosystem suffers as a result.

Introduction to Aquatic Plant Management and Protection

Many times an aquatic plant management plan is aimed at only controlling nuisance plant growth that has limited the recreational use of the lake, usually navigation, fishing, and swimming. It is important to remember the vital benefits that native aquatic plants provide to lake users and the lake ecosystem, as described above. Therefore, all aquatic plant management plans also need to address the enhancement and protection of the aquatic plant community. Below are general descriptions of the many techniques that can be utilized to control and enhance aquatic plants. Each alternative has benefits and limitations that are explained in its description. Please note that only legal and commonly used methods are included. For instance, the herbivorous grass carp (*Ctenopharyngodon idella*) is illegal in Wisconsin and rotovation, a process by which the lake bottom is tilled, is not a commonly accepted practice. Unfortunately, there are no "silver bullets" that can completely cure all aquatic plant problems, which makes planning a crucial step in any aquatic plant management activity. Many of the plant management and protection techniques commonly used in Wisconsin are described below.

Please note: Even though all of these techniques may not be applicable to the project lakes, it is still important for lake users to have a basic understanding of all the techniques so they can better understand why particular methods are or are not applicable in their lake**.** If particular methods are suited for use within a project, they are outlined within that lake's section

Permits

The signing of the 2001-2003 State Budget by Gov. McCallum enacted many aquatic plant management regulations. The rules for the regulations have been set forth by the WDNR as NR 107 and 109. A major change includes that all forms of aquatic plant management, even those that did not require a permit in the past, require a permit now, including manual and mechanical removal. Manual cutting and raking are exempt from the permit requirement if the area of plant removal is no more than 30 feet wide and any piers, boatlifts, swim rafts, and other recreational and water use devices are located within that length. Furthermore, installation of aquatic plants, even natives, requires approval from the WDNR. It is important to note that local permits and U.S. Army Corps of Engineers regulations may also apply. For more information on permit requirements, please contact the WDNR Regional Water Management Specialist or Aquatic Plant Management and Protection Specialist.

Native Species Enhancement

The development of Wisconsin's shorelands has increased dramatically over the last century and with this increase in development a decrease in water quality and wildlife habitat has occurred. Many people that move to or build in shoreland areas attempt to replicate the suburban landscapes they are accustomed to by converting natural shoreland areas to the "neat and clean" appearance of manicured lawns and flowerbeds. The conversion of these areas immediately leads to destruction of habitat utilized by birds, mammals, reptiles, amphibians, and insects. The maintenance of the newly created area helps to decrease water quality by considerably increasing inputs of phosphorus and sediments into the lake. The negative impact of human development does not stop at the shoreline. Removal of native plants and dead, fallen timbers from shallow, near-shore areas for boating and swimming activities destroys habitat used by fish, mammals, birds, insects, and amphibians, while leaving bottom and shoreline sediments vulnerable to wave action caused by boating and wind. Many homeowners significantly decrease the number of trees and shrubs along the water's edge in an effort to increase their view of the lake. However, this has been shown to locally increase water temperatures, and decrease infiltration rates of potentially harmful nutrients and pollutants. Furthermore, the dumping of sand to create beach areas destroys spawning, cover and feeding areas utilized by aquatic wildlife.

In recent years, many lakefront property owners have realized increased aesthetics, fisheries, property values, and water quality by restoring portions of their shoreland to mimic its unaltered state. An area of shore restored to its natural condition, both in the water and on shore, is commonly called a *shoreland buffer zone*. The shoreland buffer zone creates or restores the ecological habitat and benefits lost by traditional suburban landscaping. Simply not mowing within the buffer zone does wonders to restore some the shoreland's natural function.

Enhancement activities also include additions of *submergent*, *emergent*, and *floating-leaf* plants within the lake itself. These additions can provide greater species diversity and may compete against exotic species.

Cost

The cost of native, aquatic and shoreland plant restorations is highly variable and depend on the size of the restoration area, planting densities, the species planted, and the type of planting (e.g. seeds, bare-roots, plugs, live-stakes) being conducted. Other factors may include extensive grading requirements, removal of shoreland stabilization (e.g., rip-rap, seawall), and protective measures used to guard the newly planted area from wildlife predation, wave-action, and erosion. In general, a restoration project with the characteristics described below would have an estimated materials and supplies cost of approximately $4,200.

- The single site used for the estimate indicated above has the following characteristics:
  - An upland buffer zone measuring 35' x 100'.
  - An aquatic zone with shallow-water and deep-water areas of 10' x 100' each.
  - Site is assumed to need little invasive species removal prior to restoration.
  - Site has a moderate slope.
  - Trees and shrubs would be planted at a density of 435 plants/acre and 1210 plants/acre, respectively.
  - Plant spacing for the aquatic zone would be 3 feet.
  - Each site would need 100' of biolog to protect the bank toe and each site would need 100' of wavebreak and goose netting to protect aquatic plantings.
  - Each site would need 100' of erosion control fabric to protect plants and sediment near the shoreline (the remainder of the site would be mulched).
  - There is no hard-armor (rip-rap or seawall) that would need to be removed.
  - The property owner would maintain the site for weed control and watering.

Advantages

Improves the aquatic ecosystem through species diversification and habitat enhancement.
Assists native plant populations to compete with exotic species.

Increases natural aesthetics sought by many lake users.
Decreases sediment and nutrient loads entering the lake from developed properties.
Reduces bottom sediment resuspension and shoreline erosion.
Lower cost when compared to rip-rap and seawalls.
Restoration projects can be completed in phases to spread out costs.
Many educational and volunteer opportunities are available with each project.

Disadvantages

Property owners need to be educated on the benefits of native plant restoration before they are willing to participate.
Stakeholders must be willing to wait 3-4 years for restoration areas to mature and fill-in.
Monitoring and maintenance are required to assure that newly planted areas will thrive.
Harsh environmental conditions (e.g., drought, intense storms) may partially or completely destroy project plantings before they become well established.

Manual Removal

Manual removal methods include hand-pulling, raking, and hand-cutting. Hand-pulling involves the manual removal of whole plants, including roots, from the area of concern and disposing them out of the waterbody. Raking entails the removal of partial and whole plants from the lake by dragging a rake with a rope tied to it through plant beds. Specially designed rakes are available from commercial sources or an asphalt rake can be used. Hand-cutting differs from the other two manual methods because the entire plant is not removed, rather the plants are cut similar to mowing a lawn; however Wisconsin law states that all plant fragments must be removed. One manual cutting technique involves throwing a specialized "V" shaped cutter into the plant bed and retrieving it with a rope. The raking method entails the use of a two-sided straight blade on a telescoping pole that is swiped back and forth at the base of the undesired plants.

In addition to the hand-cutting methods described above, powered cutters are now available for mounting on boats. Some are mounted in a similar fashion to electric trolling motors and offer a 4-foot cutting width, while larger models require complicated mounting procedures, but offer an 8-foot cutting width. When using these methods, it is very important to remove all plant fragments from the lake to prevent re-rooting and drifting onshore followed by decomposition. It is also important to preserve fish spawning habitat by timing the treatment activities after spawning. In Wisconsin, a general rule would be to not start these activities until after June 15th.

Cost

Commercially available hand-cutters and rakes range in cost from $85 to $150. Power-cutters range in cost from $1200 to $11,000.

Advantages

Very cost effective for clearing areas around docks, piers, and swimming areas.
Relatively environmentally safe if treatment is conducted after June 15th.

Allows for selective removal of undesirable plant species.
Provides immediate relief in localized area.
Plant biomass is removed from waterbody.

Disadvantages

Labor intensive.
Impractical for larger areas or dense plant beds.
Subsequent treatments may be needed as plants recolonize and/or continue to grow.
Uprooting of plants stirs bottom sediments making it difficult to harvest remaining plants
May disturb *benthic* organisms and fish-spawning areas.
Risk of spreading invasive species if fragments are not removed.

Bottom Screens

Bottom screens are very much like landscaping fabric used to block weed growth in flowerbeds. The gas-permeable screen is placed over the plant bed and anchored to the lake bottom by staking or weights. Only gas-permeable screen can be used or large pockets of gas will form under the mat as the result of plant decomposition. This could lead to portions of the screen becoming detached from the lake bottom, creating a navigational hazard. Normally the screens are removed and cleaned at the end of the growing season and then placed back in the lake the following spring. If they are not removed, sediments may build up on them and allow for plant colonization on top of the screen.

Cost

Material costs range between $.20 and $1.25 per square-foot. Installation cost can vary largely, but may roughly cost $750 to have 1,000 square feet of bottom screen installed. Maintenance costs can also vary, but an estimate for a waterfront lot are about $120 each year.

Advantages

Immediate and sustainable control.
Long-term costs are low.
Excellent for small areas and around obstructions.
Materials are reusable.
Prevents fragmentation and subsequent spread of plants to other areas.

Disadvantages

Installation may be difficult over dense plant beds and in deep water.
Not species specific.
Disrupts benthic fauna.
May be navigational hazard in shallow water.
Initial costs are high.
Labor intensive due to the seasonal removal and reinstallation requirements.
Does not remove plant biomass from lake.
Not practical in large-scale situations.

Water Level Drawdown

The primary manner of plant control through water level drawdown is the exposure of sediments and plant roots/tubers to desiccation and either heating or freezing depending on the timing of the treatment. Winter drawdowns are more common in temperate climates like that of Wisconsin and usually occur in reservoirs because of the ease of water removal through the outlet structure. An important fact to remember when considering the use of this technique is that only certain species are controlled and that some species may even be enhanced. Furthermore, the process will likely need to be repeated every two or three years to keep target species in check.

Cost

The cost of this alternative is highly variable. If an outlet structure exists, the cost of lowering the water level would be minimal; however, if there is not an outlet, the cost of pumping water to the desirable level could be very expensive.

Advantages

Inexpensive if outlet structure exists.
May control populations of certain species, like Eurasian water-milfoil for up to two years.
Allows some loose sediments to consolidate.
May enhance growth of desirable emergent species.
Other work, like dock and pier repair may be completed more easily and at a lower cost while water levels are down.

Disadvantages

May be cost prohibitive if pumping is required to lower water levels.
Has the potential to upset the lake ecosystem and have significant affects on fish and other aquatic wildlife.
Adjacent wetlands may be altered due to lower water levels.
Disrupts recreational, hydroelectric, irrigation and water supply uses.
May enhance the spread of certain undesirable species, like common reed (*Phragmites australis*) and reed canary grass (*Phalaris arundinacea*).
Permitting process requires an environmental assessment that may take months to prepare.
Unselective.

Harvesting

Aquatic plant harvesting is frequently used in Wisconsin and involves the cutting and removal of plants much like mowing and bagging a lawn. Harvesters are produced in many sizes that can cut to depths ranging from 3 to 6 feet with cutting widths of 4 to 10 feet. Plant harvesting speeds vary with the size of the harvester, density and types of plants, and the distance to the off-loading area. Equipment requirements do not end with the harvester. In addition to the harvester, a shore-conveyor would be required to transfer plant material from the harvester to a dump truck for transport to a landfill or compost site. Furthermore, if off-loading sites are limited and/or the lake is large, a transport barge may be needed to move the harvested plants from the harvester to the shore in order to cut back on the time that the harvester spends traveling to the shore conveyor.

Some lake organizations contract to have nuisance plants harvested, while others choose to purchase their own equipment. If the later route is chosen, it is especially important for the lake group to be very organized and realize that there is a great deal of work and expense involved with the purchase, operation, maintenance, and storage of an aquatic plant harvester. In either case, planning is very important to minimize environmental effects and maximize benefits.

Costs

Equipment costs vary with the size and features of the harvester, but in general, standard harvesters range between $45,000 and $100,000. Larger harvesters or stainless steel models may cost as much as $200,000. Shore conveyors cost approximately $20,000 and trailers range from $7,000 to $20,000. Storage, maintenance, insurance, and operator salaries vary greatly.

Advantages

Immediate results.
Plant biomass and associated nutrients are removed from the lake.
Select areas can be treated, leaving sensitive areas intact.
Plants are not completely removed and can still provide some habitat benefits.
Opening of cruise lanes can increase predator pressure and reduce stunted fish populations.
Removal of plant biomass can improve the oxygen balance in the litoral zone.
Harvested plant materials produce excellent compost.

Disadvantages

Initial costs and maintenance are high if the lake organization intends to own and operate the equipment.
Multiple treatments may be required during the growing season because lower portions of the plant and root systems are left intact.
Many small fish, amphibians and invertebrates may be harvested along with plants.
There is little or no reduction in plant density with harvesting.
Invasive and exotic species may spread because of plant fragmentation associated with harvester operation.
Larger harvesters are not easily maneuverable in shallow water or near docks and piers.
Bottom sediments may be resuspended leading to increased turbidity and water column nutrient levels.

Chemical Treatment

There are many herbicides available for controlling aquatic macrophytes and each compound is sold under many brand names. Aquatic herbicides fall into two general classifications:

1. *Contact herbicides* act by causing extensive cellular damage, but usually do not affect the areas that were not in contact with the chemical. This allows them to work much faster, but does not result in a sustained effect because the root crowns, roots, or rhizomes are not killed.
2. *Systemic herbicides* spread throughout the entire plant and often result in complete mortality if applied at the right time of the year.

Both types are commonly used throughout Wisconsin with varying degrees of success. The use of herbicides is potentially hazardous to both the applicator and the environment, so all lake organizations should seek consultation and/or services from professional applicators with training and experience in aquatic herbicide use.

Below are brief descriptions of the aquatic herbicides currently registered for use in Wisconsin.

Fluridone (Sonar®, Avast!®) Broad spectrum, systemic herbicide that is effective on most submersed and emergent macrophytes. It is also effective on duckweed and at low concentrations has been shown to selectively remove Eurasian water-milfoil. Fluridone slowly kills macrophytes over a 30-90 day period and is only applicable in whole lake treatments or in bays and backwaters were dilution can be controlled. Required length of contact time makes this chemical inapplicable for use in flowages and impoundments. Irrigation restrictions apply.

Glyphosate (Rodeo®) Broad spectrum, systemic herbicide used in conjunction with a *surfactant* to control emergent and floating-leaved macrophytes. It acts in 7-10 days and is not used for submergent species This chemical is commonly used for controlling purple loosestrife (*Lythrum salicaria*).. Glyphosate is also marketed under the name Roundup®; this formulation is not permited for use near aquatic environments because of its harmful effects on fish, amphibians, and other aquatic orgainsims.

Diquat (Reward®, Weedtrine-D®) Broad spectrum, contact herbicide that is effective on all aquatic plants and can be sprayed directly on foliage (with surfactant) or injected in the water. It is very fast acting, requiring only 12-36 hours of exposure time. Diquat readily binds with clay particles, so it is not appropriate for use in turbid waters. Consumption restrictions apply.

Endothal (Hydrothol®, Aquathol®) Broad spectrum, contact herbicides used for spot treatments of submersed plants. The mono-salt form of Endothal (Hydrothol®) is more toxic to fish and aquatic invertebrates, so the dipotassium salt (Aquathol®) is most often used. Fish consumption, drinking, and irrigation restrictions apply.

2,4-D (Navigate®, Aqua-Kleen®, etc.) Selective, systemic herbicide that only works on broad-leaf plants. The selectivity of 2,4-D towards broad-leaved plants (dicots) allows it to be used for Eurasian water-milfoil without affecting many of our native plants, which are monocots. Drinking and irrigation restrictions apply.

Advantages

Herbicides are easily applied in restricted areas, like around docks and boatlifts.
If certain chemicals are applied at the correct dosages and at the right time of year, they can selectively control certain invasive species, such as Eurasian water-milfoil.
Some herbicides can be used effectively in spot treatments.

Disadvantages

Fast-acting herbicides may cause fishkills due to rapid plant decomposition if not applied correctly.
Many people adamantly object to the use of herbicides in the aquatic environment; therefore, all stakeholders should be included in the decision to use them.

Many herbicides are nonselective.
Most herbicides have a combination of use restrictions that must be followed after their application.
Many herbicides are slow-acting and may require multiple treatments throughout the growing season.

Cost

Herbicide application charges vary greatly between $400 to $1000 per acre depending on the chemical used, who applies it, permitting procedures, and the size of the treatment area.

Biological Controls

There are many insects, fish and pathogens within the United States that are used as biological controls for aquatic macrophytes. For instance, the herbivorous grass carp has been used for years in many states to control aquatic plants with some success and some failures. However, it is illegal to possess grass carp within Wisconsin because their use can create problems worse than the plants that they were used to control. Other states have also used insects to battle invasive plants, such as waterhyacinth weevils (*Neochetina spp.*) and hydrilla stem weevil (*Bagous spp.*) to control waterhyacinth (*Eichhornia crassipes*) and hydrilla (*Hydrilla verticillata)*, respectively. Fortunately, it is assumed that Wisconsin's climate is a bit harsh for these two invasive plants, so there is not need for either biocontrol insect. However, Wisconsin, along with many other states, is currently experiencing the expansion of lakes infested with Eurasian water-milfoil and as a result has supported the experimentation and use of the milfoil weevil (*Euhrychiopsis lecontei*) within its lakes. The milfoil weevil is a native weevil that has shown promise in reducing Eurasian water-milfoil stands in Wisconsin, Washington, Vermont, and other states. Research is currently being conducted to discover the best situations for the use of the insect in battling Eurasian water-milfoil. Wisconsin is also using two species of leaf-eating beetles (*Galerucella calmariensis* and *G. pusilla*) to battle purple loosestrife. These biocontrol insects are not covered here because purple loosestrife is predominantly a wetland species.

Advantages

Milfoil weevils occur naturally in Wisconsin.
This is likely an environmentally safe alternative for controlling Eurasian water-milfoil.

Disadvantages

Stocking and monitoring costs are high.
This is an unproven and experimental treatment.
There is a chance that a large amount of money could be spent with little or no change in Eurasian water-milfoil density.

Cost

Stocking with adult weevils costs about $1.20/weevil and they are usually stocked in lots of 1000 or more.

Analysis of Current Aquatic Plant Data

Aquatic plants are an important element in every healthy lake. Changes in lake ecosystems are often first seen in the lake's plant community. Whether these changes are positive, like variable water levels or negative, like increased shoreland development or the introduction of an exotic species, the plant community will respond. Plant communities respond in a variety of ways; there may be a loss of one or more species, certain life forms, such as emergents or floating-leaf communities, may disappear from certain areas of the lake, or there may be a shift in plant dominance between species. With periodic monitoring and proper analysis, these changes can be detected and provide very useful information for management decisions.

As described in more detail in the methods section, two aquatic plant surveys were completed on each of the project lakes; the first looked strictly for curly-leaf pondweed, and the second inventoried all aquatic species found in each lake. Combined, these surveys provide a great deal of information about the aquatic vegetation of the lake in question. These data are analyzed and presented in numerous ways; each is discussed in more detail below.

Primer on Data Analysis & Data Interpretation

Species List

The species list is simply a list of all of the species that were found within the lake, both exotic and native. The list also contains the life-form of each plant found, its scientific name, and its coefficient of conservatism. The latter is discussed in more detail below. Changes in this list over time, whether it is differences in total species present, gains and loses of individual species, or changes in life-forms that are present, can be an early indicator of changes in the health of the lake ecosystem. The species list for each project lake can be found in that lake's section; a list of town species by each lake is located in Appendix C

Frequency of Occurrence

Frequency of occurrence describes how often a certain species is found within a lake. Obviously, all of the plants cannot be counted in a lake, so samples are collected from pre-determined areas laid out on a grid or transect. Using the data collected from these plots, an estimate of occurrence of each plant species can be determined. In this section, relative frequency of occurrence is used to describe how often each species occurred in the plots that contained vegetation. These values are presented in percentages and if all of the values were added up, they would equal 100%. For example, if water lily had a relative frequency of 0.1 and we described that value as a percentage, it would mean that water lily made up 10% of the population.

In the end, this analysis indicates the species that dominate the plant community within the lake. Shifts in dominant plants over time may indicate disturbances in the ecosystem. For instance, low water levels over several years may increase the occurrence of emergent species while decreasing the occurrence of floating-leaf species. Introductions of invasive exotic species may result in major shifts as they crowd out native plants within the system.

Species Diversity

Species diversity is probably the most misused value in ecology because it is often confused with species richness. Species richness is simply the number of species found within a system or community. Although these values are related, they are far from the same because diversity also takes into account how evenly the species occur within the system. A lake with 25 species may not be more diverse than a lake with 10 if the first lake is highly dominated by one or two species and the second lake has a more even distribution.

A lake with high species diversity is much more stable than a lake with a low diversity. This is analogous to diverse financial portfolio in that a diverse lake plant community can withstand environmental fluctuations much like a diverse portfolio can handle economic fluctuations. For example, a lake with a diverse plant community is much better suited to compete against exotic infestation than a lake with a lower diversity.

Floristic Quality Assessment

Floristic Quality Assessment (FQA) is used to evaluate the closeness of a lake's aquatic plant community to that of an undisturbed, or pristine, lake. The higher the floristic quality, the closer a lake is to an undisturbed system. FQA is an excellent tool for comparing individual lakes and the same lake over time. In this section, the floristic quality of the project lakes will be compared to lakes in the same ecoregion and in the state (Figure 1).

Ecoregions are areas related by similar climate, physiography, hydrology, vegetation and wildlife potential. Comparing ecosystems in the same ecoregion is sounder than comparing systems within manmade boundaries such as counties, towns, or states.

The floristic quality of a lake is calculated using its species richness and average species conservatism. As mentioned above, species richness is simply the number of species that occur in the lake, for this analysis, only native species are utilized. Average species conservatism utilizes the coefficient of conservatism values for each of those species in its calculation. A species coefficient of conservatism value indicates that species likelihood of being found in an undisturbed (pristine) system. The values range from one to ten. Species that are normally found in disturbed systems have lower coefficients, while species frequently found in pristine systems have higher values. For example, cattail, an invasive native species, has a value of 1, while common hard and softstem bulrush have values of 5, and Oakes pondweed, a sensitive and rare species, has a value of 10. On their own, the species richness and average conservatism values for a lake are useful in assessing a lake's plant community; however, the best assessment of the lake's plant community health is determined when the two values are used to calculate the lake's floristic quality.

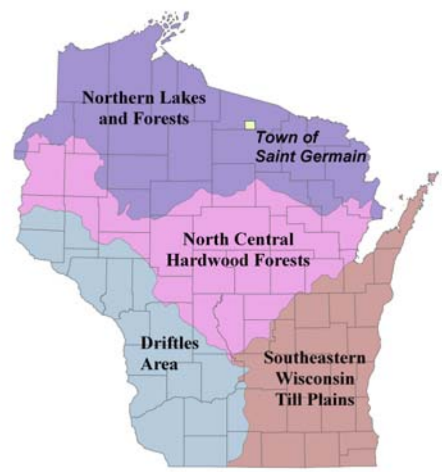

Figure 1. Town of St. Germain in relation to Ecoregions of Wisconsin. After Nichols 1999 and Omernick & Gallant 1988.

Community Mapping

A key component of the aquatic plant survey is the creation of an aquatic plant community map. The map represents a snapshot of the important plant communities in the lake as they existed in during the survey and is valuable in the development of the management plan and in comparisons with surveys completed in the future. A mapped community can consist of submergent, floating-leaf, or emergent plants, or a combination of these life-forms. Examples of submergent plants include wild celery and pondweeds; while emergents include cattails, bulrushes, and arrowheads, and floating-leaf species include white and yellow pond lilies. Emergents and floating-leaf communities lend themselves well to mapping because there are distinct boundaries between communities. Submergent species are often mixed throughout large areas of the lake and are seldom visible from the surface; therefore, mapping of submergent communities is more difficult and often impossible.

Exotic Plants

Because of their tendency to upset the natural balance of an aquatic ecosystem, exotic species are paid particular attention to during the aquatic plant surveys. Two exotics, curly-leaf pondweed and Eurasian water milfoil are the primary targets of this extra attention.

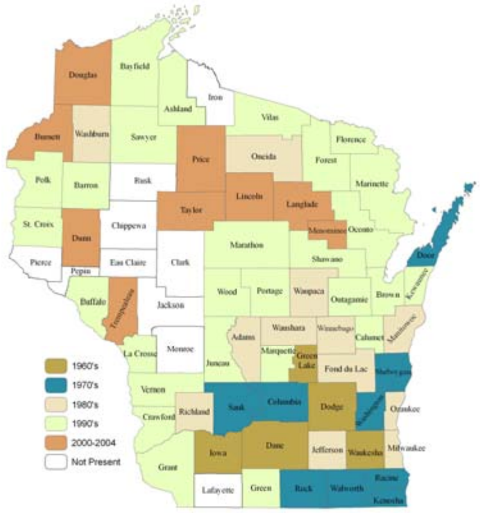

Figure 2. Spread of Eurasian water milfoil throughout Wisconsin counties. WDNR Data 2004.

Eurasian water-milfoil is an invasive species, native to Europe, Asia and North Africa, that has spread to most Wisconsin counties (Figure 2). Eurasian water-milfoil is unique in that its primary mode of propagation is not by seed. It actually spreads by shoot fragmentation, which has supported its transport between lakes via boats and other equipment. In addition to its propagation method, Eurasian water-milfoil has two other competitive advantages over native aquatic plants, 1) it starts growing very early in the spring when water temperatures are too cold for most native plants to grow, and 2) once its stems reach the water surface, it does not stop growing like most native plants, instead it continues to grow along the surface creating a canopy that blocks light from reaching native plants. Eurasian water-milfoil can create dense stands and dominate submergent communities, reducing important natural habitat for fish and other wildlife, and impeding recreational activities such as swimming, fishing, and boating.

Curly-leaf pondweed is a European exotic first discovered in Wisconsin in the early 1900's that has an unconventional lifecycle giving it a competitive advantage over our native plants. Curly – leaf pondweed begins growing almost immediately after ice-out and by mid-June is at peak biomass. While it is growing, each plant produces many turions (asexual reproductive shoots) along its stem. By mid-July most of the plants have senesced, or died-back, leaving the turions in the sediment. The turions lie dormant until fall when they germinate to produce winter foliage, which thrives under the winter snow and ice. It remains in this state until spring foliage is produced in early May, giving the plant a significant jump on native vegetation. Like Eurasian water-milfoil, curly-leaf pondweed can become so abundant that it hampers recreational activities within the lake. Furthermore, its mid-summer die back can cause algal blooms spurred from the nutrients released during the plant's decomposition.

Because of its odd life-cycle, a special survey is conducted early in the growing season to inventory and map curly-leaf pondweed occurrence within the lake. Although Eurasian water milfoil starts to grow earlier than our native plants, it is at peak biomass during most of the summer, so it is inventoried during the comprehensive aquatic plant survey completed in mid to late summer.

2004 & 2005 Surveys

A primary goal of this project was to create an in-depth assessment of eight project lakes within the Town of Saint Germain. The surveys were designed to not only search out exotic plants, but also to inventory the native species found in each lake. As detailed above, these data are analyzed and interpreted using numerous methods that lend insight to the overall condition of the plant community in the lake beyond that of just creating a list of what plants were found. Each of these forms of analysis can be used as a solid baseline for future surveys and assessments. They accurately provide a snapshot of each lake's plant community during 2004 or 2005 and will be invaluable in monitoring changes within these lakes over time. Many lake groups that are dealing with aquatic plant problems, whether they are caused by native or non-native species, wish that they had access to reliable information concerning their lake's plant community before the problems started. Most lake organizations do not have this kind of information because the prevailing mindset is that if there is not a perceived problem there is nothing that needs to be done. The initiation and completion of this project is a true indication of the commitment of the Town of Saint Germain, its board, and its lakes committee towards protecting their valuable and important lake ecosystems.

Overall, the aquatic plant survey results provide two conclusions; 1) that all of the project lakes contain outstanding plant communities worth protecting, and 2) that there is strong evidence that exotic species only occur in a single project lake, that being Little Saint Germain. The survey results as they pertain to the project as a whole are discussed in this section; results as they pertain to each lake in particular, are detailed in the sections that follow. Details concerning Little Saint Germain Lake are briefly discussed below, and elaborated upon in the Little Saint Germain Lake section.

All project lakes were discovered to contain highly diverse plant communities (Figure 3). There is some variation between the project lakes, but all have values of 0.90 or above, indicating a high level of diversity. As described above, diversity leads to stability; therefore, these lakes would likely be able to withstand moderate environmental changes without catastrophic results. Moderate environmental changes would include variations in water level or temperature and perhaps the introduction of non-native species as long as those species were kept under control. A perfect example is Little Saint Germain Lake, where nearly 100 acres of curly-leaf pondweed were found during the summer of 2002 and a limited amount of Eurasian water milfoil during the during the summer of 2003. Upon discovering that nearly 10% of the lake's total surface area was infested with exotics, the district leapt into action and within two years has made obvious progress in controlling both exotics. The lake's diverse plant community likely hampered the spread of the exotics, while the district's quick response has now brought them under control.

All of the project lakes also have high floristic quality values; in fact, all of the lakes fall into the upper quartile (above the 75^{th} percentile) of lakes within the ecoregion (Figure 4). Again, there is variation among the project lakes, but as with the diversity values, all of these lakes would be considered to have outstanding values. The floristic quality of the project lakes further demonstrates the need to protect these valuable and unique lake ecosystems.

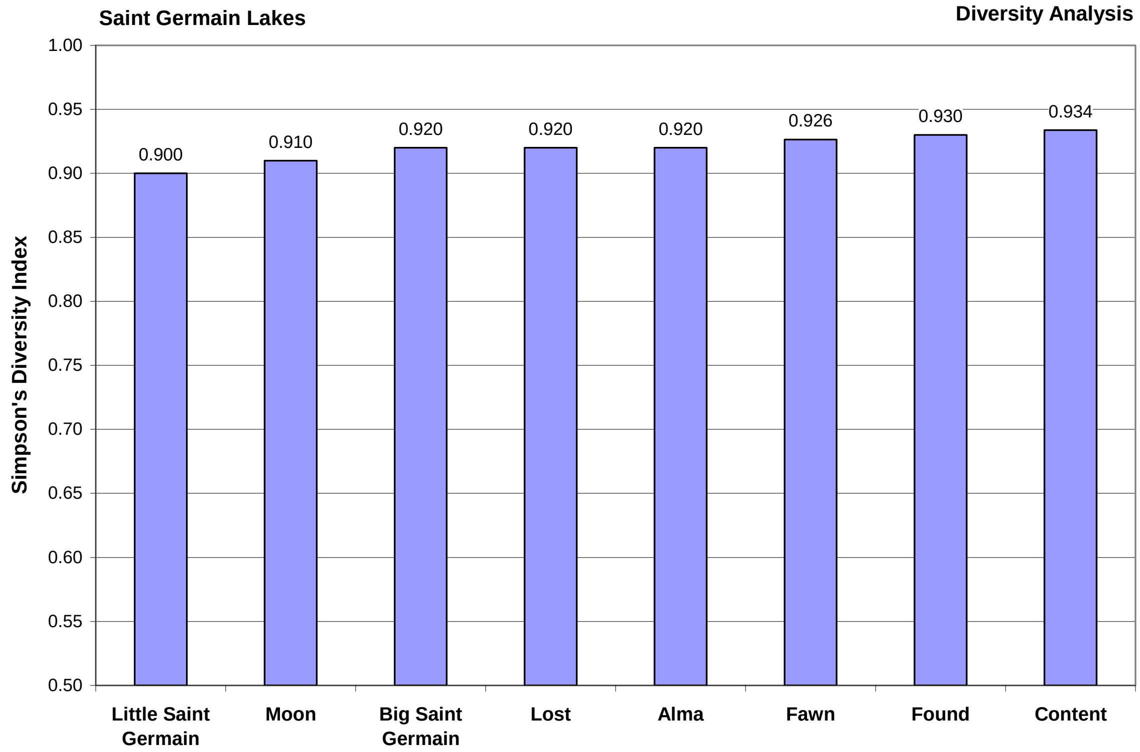

Figure 3. Diversity of project lakes. Simpson's diversity index.

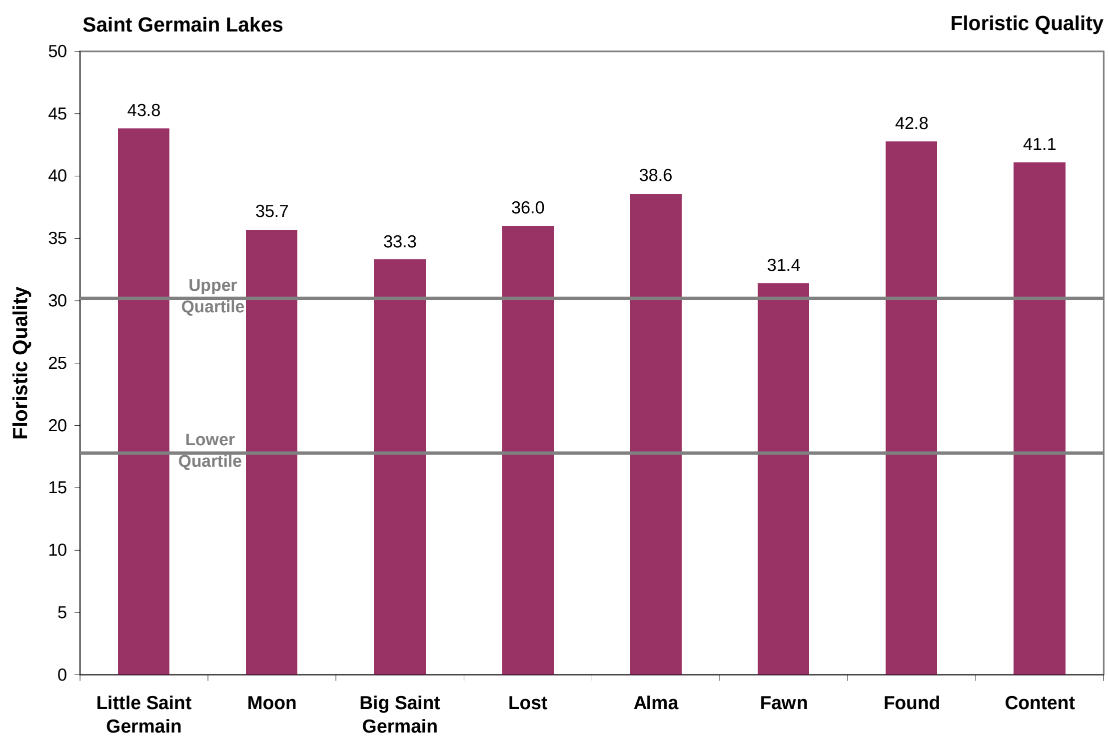

Figure 4. Floristic quality of project lakes. Northern Lakes & Forests, Lakes quartiles from Nichols 1999.

Alma Lake

Alma Lake At-A-Glance
Acreage: 58
Maximum Depth (ft):18
Mean Depth (ft): 11
Curly-leaf Survey: June 10, 2004
Comprehensive Survey: July 28-29, 2004
Native Species: 28
Exotic Species: 0
Simpson's Diversity: 0.920
Floristic Quality: 38.6

Alma Lake is probably the least disturbed of the eight project lakes and as a result has a high average conservatism value (Figure 5). In fact, when compared to the other project lakes, only Alma and its sister lake, Moon, have average conservatism values over that of the ecoregion median. The species list of Alma Lake (Table 1) is stacked with species of high conservatism, and unlike many lakes, these sensitive species are abundant throughout the system (Figure 6). For instance, dwarf water milfoil and water lobelia, two species with coefficients of conservatism of 10 are among the five most frequent plants found in the lake.

Like all of the project lakes, Alma is quite diverse. True, it does not have as many species as some of the lakes in the town, but when compared to the state and ecoregion medians, it has many. When comparing Alma's species richness to the other lakes in the project we must remember that in general, smaller lakes do not offer a high variety of environmental habitats to support a wide array of species. In other words, smaller lakes tend to have less species than larger lakes. Also, lakes that are less used tend to have less species introduced to them. However, in the case of Alma Lake, that lack of utilization is what has allowed the high quality species to thrive. This has lead to the high average species conservatism and the high floristic quality of the lake.

The community map for Alma Lake (Map 2) shows the shoreline dotted with emergent and floating-leaf communities. These communities along with the downed trees that also occur in many areas provide valuable habitat for fish and other wildlife, while adding to the natural aesthetics of the area.

Overall, the aquatic plant community of Alma Lake is excellent, as evidenced by its high diversity, outstanding floristic quality, and abundant floating-leaf and emergent communities.

Management Actions for Alma Lake

Follow Town of Saint Germain Implementation Plan
Maintain slow-no-wake status on lake.

Table 1. Alma Lake species list.

Life Form	Scientific Name	Common Name	Coefficient of Conservatism (c)
Emergent	*Calla palustris*	Wild calla	9
	Dulichium arundinaceum	Three-way sedge	9
	Eleocharis palustris	Creeping spike-rush	6
	Glyceria canadensis	Rattlesnake grass	7
	Juncus effusus	Soft rush	4
	Juncus pelocarpus	Brown-fruited rush	8
	*Iris versicolor**	Northern blue flag	5
	Schoenoplectus acutus[1]*	Hardstem bulrush	5
	*Typha latifolia**	Broad-leaved cattail	1
FL	*Brasenia schreberi*	Watershield	7
	Nuphar variegata	Spatterdock	6
	Nymphaea odorata	White water lily	6
	Polygonum amphibium	Water smartweed	5
FL/E	*Sparganium angustifolium*	Narrow-leaf bur-reed	9
Submergent	*Elatine minima*	Waterwort	9
	Elodea nuttallii	Slender waterweed	7
	Eriocaulon aquaticum	Pipewort	9
	Gratiola aurea	Golden pert	10
	Isoetes lacustris	Lake quillwort	8
	Lobelia dortmanna	Water lobelia	10
	Myriophyllum tenellum	Dwarf water milfoil	10
	Nitella sp.	Stoneworts	7
	Potamogeton amplifolius	Large-leaf pondweed	7
	Potamogeton pusillus	Small pondweed	7
	Ranunculus flammula	Creeping spearwort	9
	Ruppia maritima	Ditch-grass	8
	Vallisneria americana	Wild celery	6
S/E	*Sagittaria graminea*	Grass-leaved arrowhead	9

FL = Floating Leaf FL/E = Floating Leaf and Emergent S/E = Submergent and Emergent
* = Incidental (not found in plot)
[1]Formally known as *Scirpus acutus.*

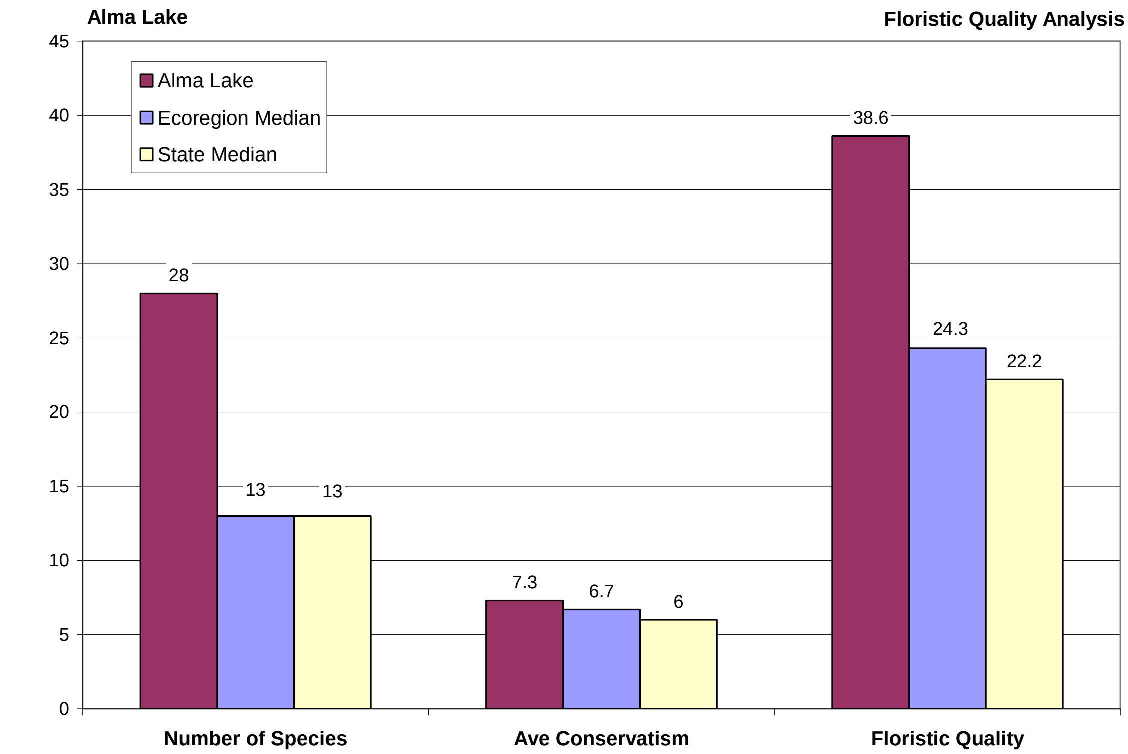

Figure 5. Alma Lake Floristic Quality Analysis. Based upon Nichols (1999)**.**

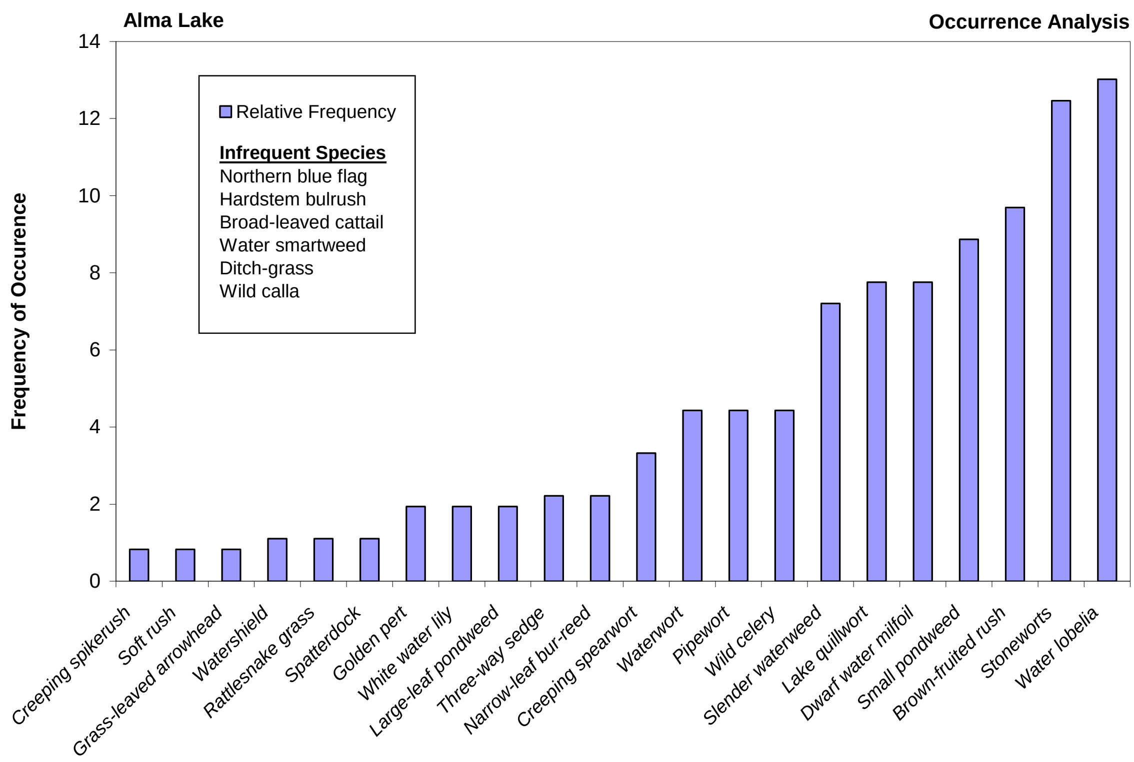

Figure 6. Alma Lake Occurrence Analysis. Based upon data collected during 2004.

Moon Lake

Moon Lake contains a unique aquatic plant community. Like the other project lakes, Moon Lake is highly diverse - its uniqueness rises from the fact that it contains three species with coefficients of conservatism equaling 10 (Table 2) and all three of those species occur frequently throughout the lake (Figure 7). Furthermore, its most prevalent species, lake quillwort, has a coefficient of 8. Among the project lakes only Moon and its sister lake, Alma, have average coefficient of conservatism values higher than the ecoregion median (Figure 8). Combined, these facts indicate that even though Moon is not a slow-no-wake lake, its level of disturbance is such that it can still support a sensitive plant community.

Moon Lake At-A-Glance
Acreage: 131
Maximum Depth (ft): 38
Mean Depth (ft): 17
Curly-leaf Survey: June 10, 2004
Comprehensive Survey: July 30, 2004
Native Species: 21
Exotic Species: 0
Simpson's Diversity: 0.910
Floristic Quality: 35.7

Out of the eight project lakes, Moon was found to have the least amount of species; however, much like Alma Lake, Moon would be considered a small lake. In general, smaller lakes tend to have less species (see explanation in Alma Lake section). Regardless, the high diversity and floristic quality of the lake, along with its variety of floating-leaf and emergent communities (Map 3) indicate that the lake is healthy and that it has an outstanding aquatic plant community.

It should be noted here that Moon Lake is connected by a shallow channel to Engel Lake. Although Engle Lake is not officially a part of Moon Lake, many Moon and Alma Lake riparians associate it with the system. The surveys and subsequent analysis performed on Moon Lake did not include Engle Lake; however, its uniqueness and diversity enhances the Alma-Moon ecosystem greatly.

Management Actions for Moon Lake

- Follow Town of Saint Germain Implementation Plan
- Inform camp management of the town plan and provide information on how they can help to implement it through their camp.
- Maintain and enforce current slow-no-wake hours of 5:00pm – 10:00am.

Table 2. Moon Lake species list.

Life Form	Scientific Name	Common Name	Coefficient of Conservatism (c)
Emergent	*Eleocharis palustris*	Creeping spikerush	6
	Juncus pelocarpus	Brown-fruited rush	8
	*Carex comosa**	Bristly sedge	5
	*Zizania palustrus**	Northern Wild rice	8
FL	*Brasenia schreberi*	Watershield	7
	Nymphaea odorata	White water lily	6
FL/E	*Sparganium angustifolium*	Narrow-leaf bur-reed	9
Submergent	*Elatine minima*	Waterwort	9
	Elodea nuttallii	Slender waterweed	7
	Eriocaulon aquaticum	Pipewort	9
	Gratiola aurea	Golden pert	10
	Isoetes lacustris	Lake quillwort	8
	Lobelia dortmanna	Water lobelia	10
	Myriophyllum tenellum	Dwarf water milfoil	10
	Nitella sp.	Stoneworts	7
	Potamogeton pusillus	Small pondweed	7
	Potamogeton epihydrus	Ribbon-leaf pondweed	8
	Ruppia maritima	Ditch-grass	8
	Utricularia resupinata	Small purple bladderwort	9
	Vallisneria americana	Wild celery	6
	*Utricularia vulgaris**	Common bladderwort	7

FL = Floating Leaf FL/E = Floating Leaf and Emergent
* = Incidental

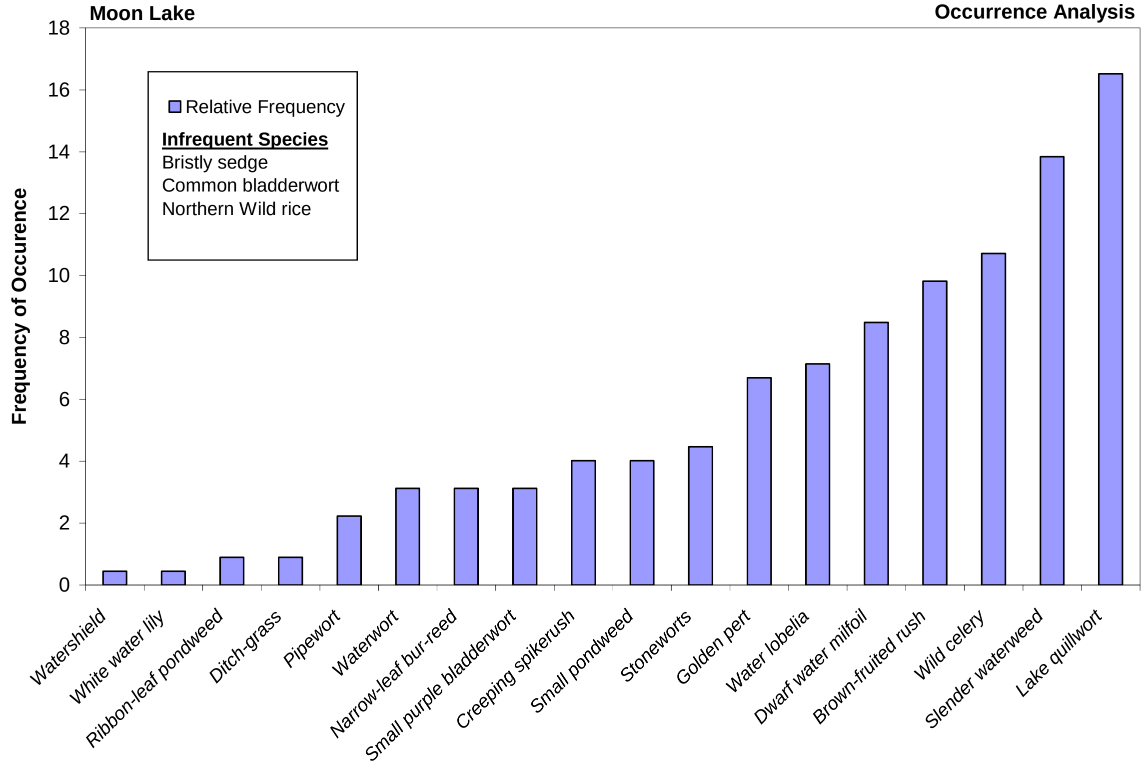

Figure 7. Moon Lake Occurrence Analysis. Based upon data collected during 2004.

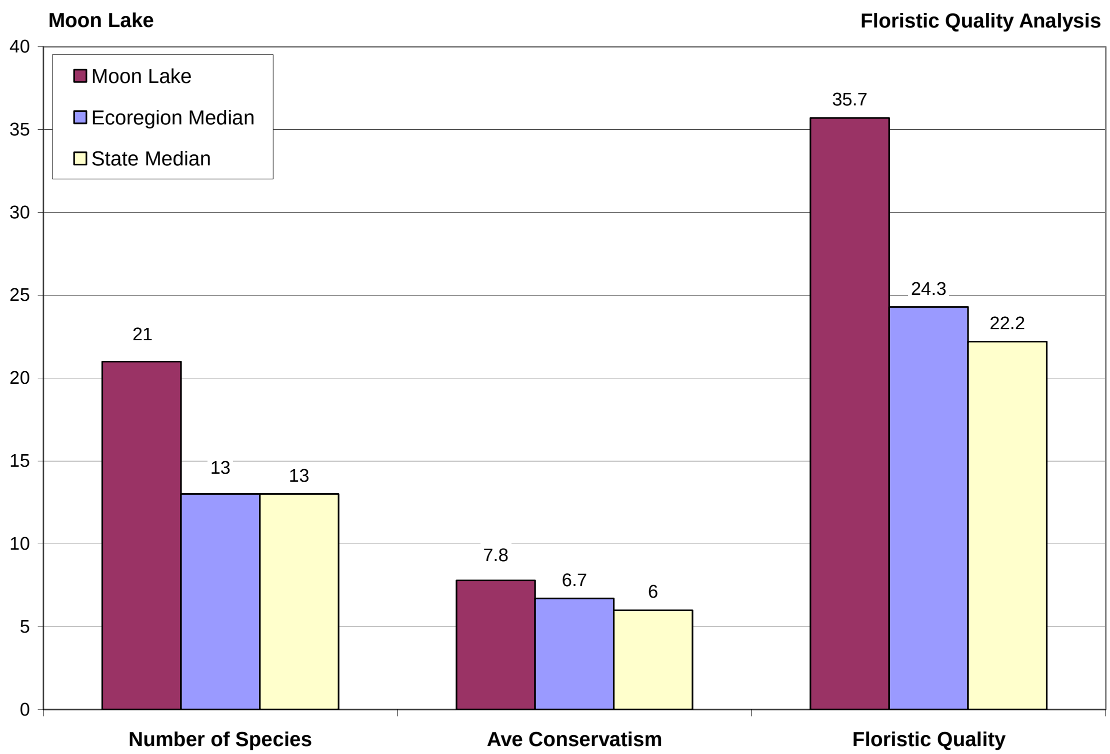

Figure 8. Moon Lake Floristic Quality Analysis. Based upon Nichols (1999).

Big Saint Germain Lake

Big St. Germain Lake At-A-Glance
Acreage: 1,617
Maximum Depth (ft): 42
Mean Depth (ft): 21
Curly-leaf Survey: June 4, 2004
Comprehensive Survey: August 19-20 & 24-25, 2004
Native Species: 28
Exotic Species: 0
Simpson's Diversity: 0.920
Floristic Quality: 33.3

Table 3 contains a list of species located in Big Saint Germain Lake during the comprehensive plant survey. The species composition of the lake was found to be quite diverse, but dominated primarily by three species, slender naiad, coontail, wild celery (Figure 9). However, the lake also has high occurrences of other valuable submergents, especially those in the pondweed family. The lake was also found to support healthy occurrences more sensitive species like lake quillwort, waterwort, and grass-leaved arrowhead.

Floristic Quality Analysis (FQA) indicates that Big Saint Germain Lake has an outstanding plant community when compared to median data from the state and ecoregion (Figure 10). Although Big Saint Germain Lake has a lower average conservatism than the ecoregion and only slightly higher than that of the state median, the lake's high number of species results in a significantly higher floristic quality.

Map 4 displays the occurrence of emergent and floating-leaf plants found within the lake. The largest emergent beds occur on the lake's eastern shore. Emergent and floating-leaf colonies are important habitat areas for fish, birds, insects, and amphibians. In fact, some game fish, including northern pike (*Esox lucius*) and yellow perch (*Perca flavescens*) use these areas for spawning and nursery habitat. On large open lakes with high rates of recreational use, like Big Saint, emergent beds are often the first indicators of lake degradation; therefore, these areas should be monitored closely.

Management Actions for Big Saint Germain Lake
- Follow Town of Saint Germain Implementation Plan
- Strengthen lake association so it is prepared to act in the event invasive species are found.

Table 3. Big Saint Germain Lake species list.

Life Form	Scientific Name	Common Name	Coefficient of Conservatism (c)
Emergent	*Eleocharis palustris*	Creeping spikerush	6
	Juncus pelocarpus	Brown-fruited rush	8
	Schoenoplectus acutus [1]	Hardstem bulrush	5
	*Typha latifolia**	Broad-leaved cattail	1
FL	*Nuphar variegata*	Spatterdock	6
	Nymphaea odorata	White water lily	6
FL/E	*Sparganium eurycarpum**	Common bur-reed	5
Submergent	*Ceratophyllum demersum*	Coontail	3
	Chara sp.	Muskgrasses	7
	Elatine minima	Waterwort	9
	Elodea canadensis	Common waterweed	3
	Heteranthera dubia [2]	Water stargrass	6
	Isoetes lacustris	Lake quillwort	8
	Myriophyllum sibiricum	Northern water milfoil	7
	Nitella sp.	Stoneworts	7
	Potamogeton amplifolius	Large-leaf pondweed	7
	Potamogeton gramineus	Variable pondweed	7
	Potamogeton illinoensis	Illinois pondweed	6
	Potamogeton praelongus	White-stem pondweed	8
	Potamogeton pusillus	Small pondweed	7
	Potamogeton richardsonii	Clasping-leaf pondweed	5
	Potamogeton spirillus	Spiral-fruited pondweed	8
	Potamogeton zosteriformis	Flat-stem pondweed	6
	Ranunculus aquatilis	White water-crowfoot	8
	Vallisneria americana	Wild celery	6
	Najas flexilis	Slender naiad	6
S/E	*Eleocharis acicularis*	Needle spikerush	5
	Sagittaria graminea	Grass-leaved arrowhead	9

FL = Floating Leaf FL/E = Floating Leaf and Emergent S/E = Submergent and Emergent
* = Incidental
[1] Formally known as *Scirpus acutus.*
[2] Formally known as *Zosterrella dubia.*

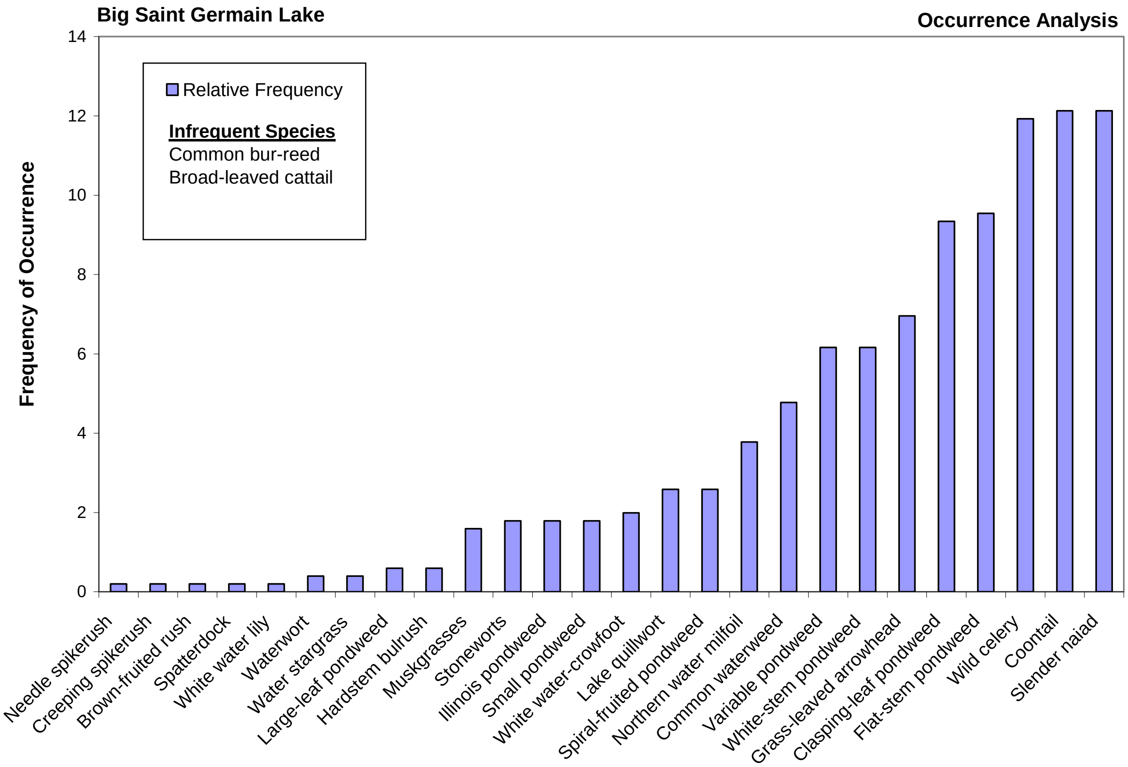

Figure 9. Big Saint Germain Lake Occurrence Analysis. Based upon data collected during 2004.

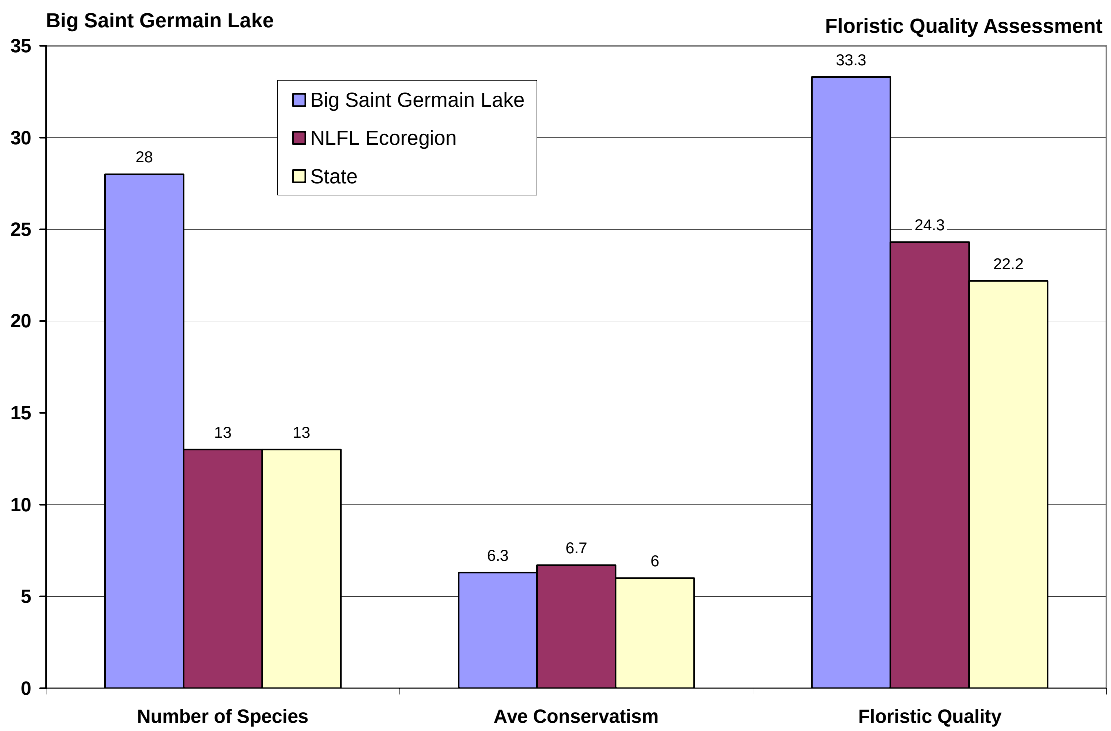

Figure 10. Big Saint Germain Lake Floristic Quality Analysis. Based upon Nichols (1999).

Fawn Lake

Fawn Lake At-A-Glance
Acreage: 22
Maximum Depth (ft): 10
Mean Depth (ft): Undetermined
Curly-leaf Survey: June 4, 2004
Comprehensive Survey: August 17, 2005
Native Species: 28
Exotic Species: 0
Simpson's Diversity: 0.926
Floristic Quality: 31.4

At 22 acres, Fawn is by far the smallest of the project lakes and with a maximum depth of 10 feet, it is also the shallowest. The fact that it is connected by channel to Big Saint Germain likely exposes this little lake to more disturbance than if it were not connected to its big neighbor. This, along with its shallow depth, probably hinders the growth of more sensitive species as indicated by Fawn Lake's low average conservatism value (Figure 11) and dominance by disturbance-tolerant species such as common waterweed and coontail (Figure 12). Still, the lake contains 28 species (Table 4), which is over twice the state and ecoregion medians, and many of those species, such as water arum, waterwort, and grass-leaved arrow head are not only considered sensitive to disturbance, but they also occur frequently around the lake.

A big plus of Fawn Lake is its expansive floating-leaf and emergent colonies (Map 5). These colonies supply important fisheries and wildlife habitat while helping to add to the lake's high level of diversity. These colonies also help to minimize shoreline erosion that may result when larger boats venture into Fawn from Big Saint Germain. Fawn Lake also contains abundant submergent species that occupy nearly the lake's entire bottom. Although these plants may occasionally make navigation difficult, they do much to compete against invasive infestations.

Management Actions for Fawn Lake

Follow Town of Saint Germain Implementation Plan

Strengthen lake association so it is prepared to act in the event invasive species are found.

Table 4. Fawn Lake species list.

Life Form	Scientific Name	Common Name	Coefficient of Conservatism (c)
Emergent	*Calla palustris*	Water arum	9
	Carex comosa	Bristly sedge	5
	Eleocharis palustris	Creeping spike-rush	6
	*Iris versicolor**	Northern blue flag	5
	Sagittaria latifolia	Common arrowhead	3
	Schoenoplectus acutus[1]	Hardstem bulrush	5
	Typha latifolia	Broad-leaved cattail	1
FF	*Lemna minor*	Lesser duckweed	5
	Spirodela polyrhiza	Greater duckweed	5
	Wolffia columbiana	Common watermeal	5
FL	*Nuphar variegata*	Spatterdock	6
	Nymphaea odorata	White water lily	6
FL/E	*Sparganium emersum*	Short-stemmed bur-reed	8
	Sparganium eurycarpum	Common bur-reed	5
Submergent	*Ceratophyllum demersum*	Coontail	3
	Elatine minima	Waterwort	9
	Elodea canadensis	Common waterweed	3
	Megalodonta beckii[2]	Water marigold	8
	Myriophyllum heterophyllum	Various-leaved water milfoil	7
	Myriophyllum sibiricum	Northern water milfoil	7
	Najas flexilis	Slender naiad	6
	Potamogeton amplifolius	Large-leaf pondweed	7
	Potamogeton richardsonii	Clasping-leaf pondweed	5
	Potamogeton foliosus	Fern pondweed	8
	Potamogeton zosteriformis	Flat-stem pondweed	6
	Vallisneria americana	Wild celery	6
S/E	*Sagittaria graminea*	Grass-leaved arrowhead	9

FL = Floating Leaf FF = Free Floating FL/E = Floating Leaf & Emergent S/E = Submergent & Emergent

* = Incidental

[1]Formally known as *Scirpus acutus.*

[2]Formally known as *Bidens beckii.*

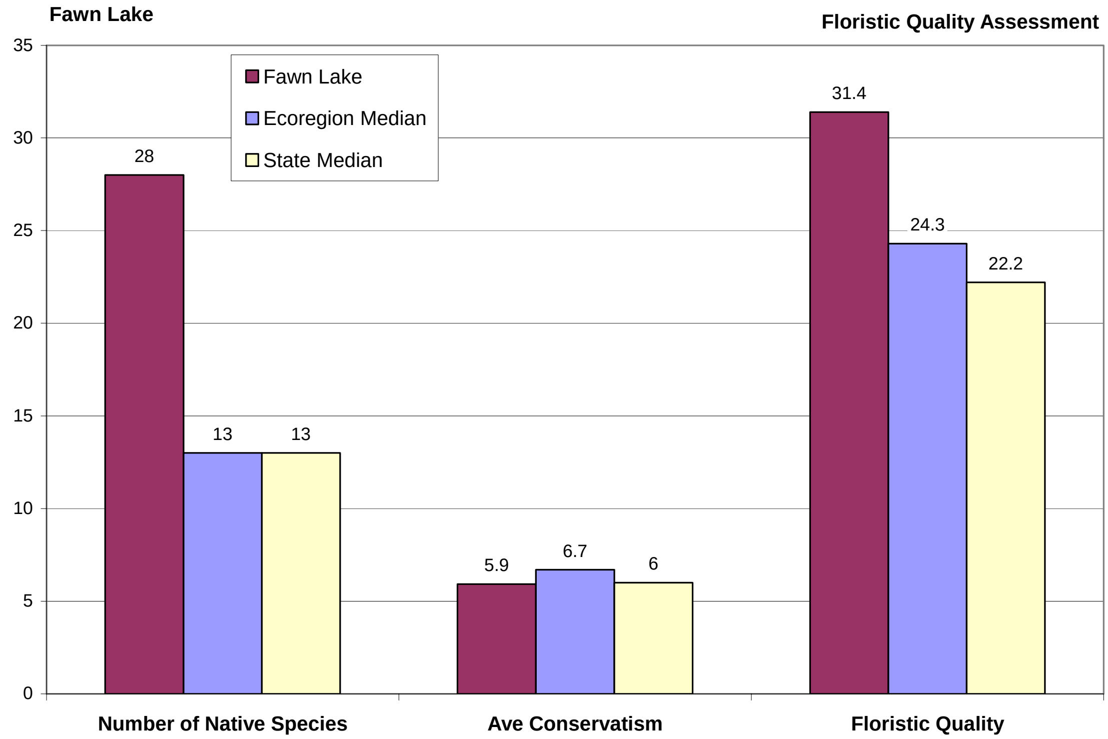

Figure 11. Fawn Lake Floristic Quality Analysis. Based upon Nichols (1999).

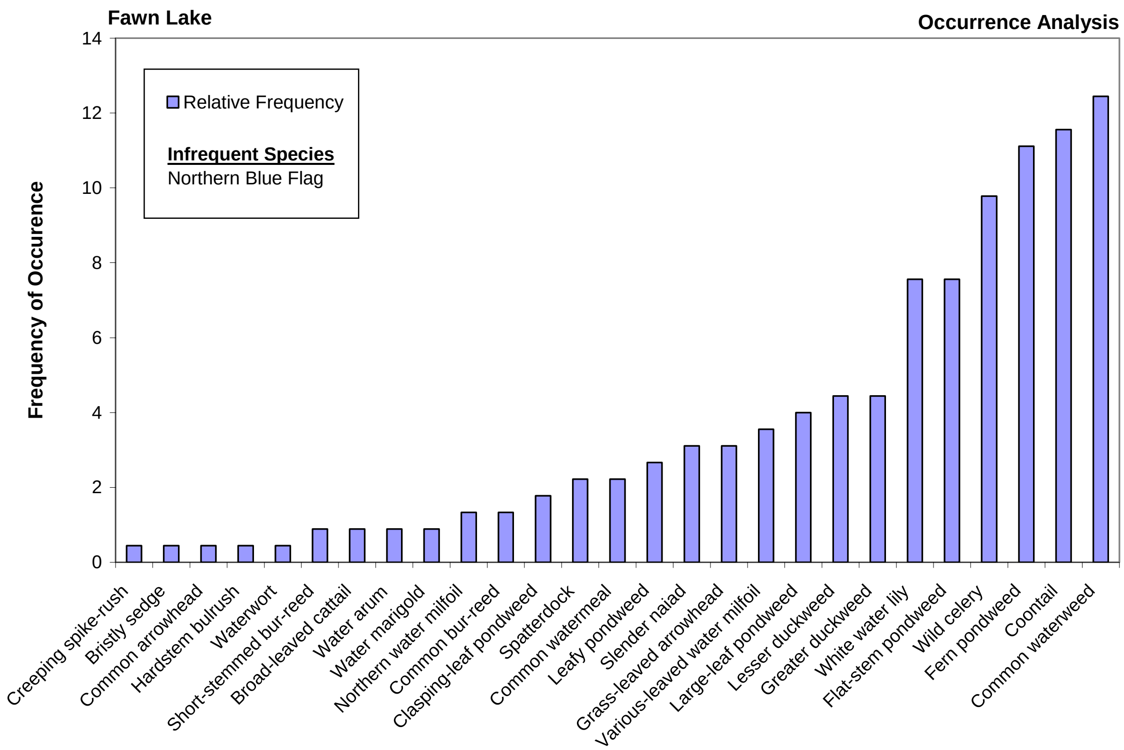

Figure 12. Fawn Lake Occurrence Analysis. Based upon data collected during 2005.

Lake Content

Lake Content At-A-Glance
Acreage: 244
Maximum Depth (ft): 14
Mean Depth (ft): Undetermined
Curly-leaf Survey: June 9, 2004
Comprehensive Survey: August 18, 2005
Native Species: 40
Exotic Species: 0
Simpson's Diversity: 0.934
Floristic Quality: 41.1

Lake Content contains an incredible aquatic plant community. The lake has high species richness and few of those species are considered to sensitive to disturbed areas (Table 5). Furthermore, many of the lake's most dominant species (Figure13), for instance fern pondweed, lake quillwort, and grass-leaved arrowhead, all have coefficient of conservatism values over 8. Lake Content also has the highest diversity of the eight project lakes as a result of its high number of species and the fact that those species are relatively close to being evenly distributed around the lake (Figure 13). Finally, Lake Content contains diverse and prevalent emergent and floating-leaf stands (Map 6) that add to its an outstanding floristic quality (Figure 14), which is the third highest among the project lakes.

On its own, Lake Content is an important lake resource; considering it in the context of being physically attached to Big Saint Germain Lake makes it even more important because it is actually sharing its habitat value with its large neighbor. In other words, Lake Content could be considered a very diverse and species-rich "bay" of Big Saint Germain Lake. Unfortunately, the relationship goes both ways. Because of that physical connection, Lake Content is also exposed to invasive introductions at the same level as Big Saint Germain Lake, which is arguably one of the two most visited lakes in the town.

Management Actions for Lake Content

Follow Town of Saint Germain Implementation Plan
Strengthen lake association so it is prepared to act in the event invasive species are found.
Consider making Lake Content slow-no-wake to reduce disturbance and exposure to exotics.

Table 5. Lake Content species list.

Life Form	Scientific Name	Common Name	Coefficient of Conservatism (c)
Emergent	*Calla palustris*	Water arum	9
	Carex comosa	Bristly sedge	5
	Dulichium arundinaceum	Three-way sedge	9
	Eleocharis palustris	Creeping spike-rush	6
	Iris versicolor	Northern blue flag	5
	Juncus pelocarpus	Brown-fruited rush	8
	Pontederia cordata	Pickerelweed	9
	Sagittaria latifolia	Common arrowhead	3
	Schoenoplectus pungens[1]	Three-square rush	5
	Schoenoplectus tabernaemontani[2]	Softstem bulrush	4
	Typha latifolia	Broad-leaved cattail	1
FF	*Lemna minor*	Lesser duckweed	5
	Spirodela polyrhiza	Greater duckweed	5
	Wolffia columbiana	Common watermeal	5
FL	*Brasenia schreberi*	Watershield	7
	Nuphar variegata	Spatterdock	6
	Nymphaea odorata	White water lily	6
FL/E	*Sparganium angustifolium*	Narrow-leaf bur-reed	9
	Sparganium emersum	Short-stemmed bur-reed	8
	Sparganium eurycarpum	Common bur-reed	5
Submergent	*Ceratophyllum demersum*	Coontail	3
	Elatine minima	Waterwort	9
	Elodea canadensis	Common waterweed	3
	Eriocaulon aquaticum	Pipewort	9
	Heteranthera dubia[3]	Water stargrass	6
	Isoetes lacustris	Lake quillwort	8
	Lobelia dortmanna	Water lobelia	10
	Megalodonta beckii[4]	Water marigold	8
	Myriophyllum sibiricum	Northern water milfoil	7
	Myriophyllum tenellum	Dwarf water milfoil	10
	Potamogeton amplifolius	Large-leaf pondweed	7
	Potamogeton illinoensis	Illinois pondweed	6
	Potamogeton praelongus	White-stem pondweed	8
	Potamogeton richardsonii	Clasping-leaf pondweed	5
	Potamogeton robbinsii	Fern pondweed	8
	Potamogeton zosteriformis	Flat-stem pondweed	6
	Utricularia vulgaris	Common bladderwort	7
	Vallisneria americana	Wild celery	6
S/E	*Eleocharis acicularis*	Needle spike-rush	5
	Sagittaria graminea	Grass-leaved arrowhead	9

FL = Floating Leaf FF = Free Floating FL/E = Floating Leaf and Emergent S/E = Submergent and Emergent

[1]Formally known as *Scirpus americanus*. *3Formally known as Zosterella dubia.*

[2]Formally known as *Scirpus validus*. *4Formally known as Bidens beckii.*

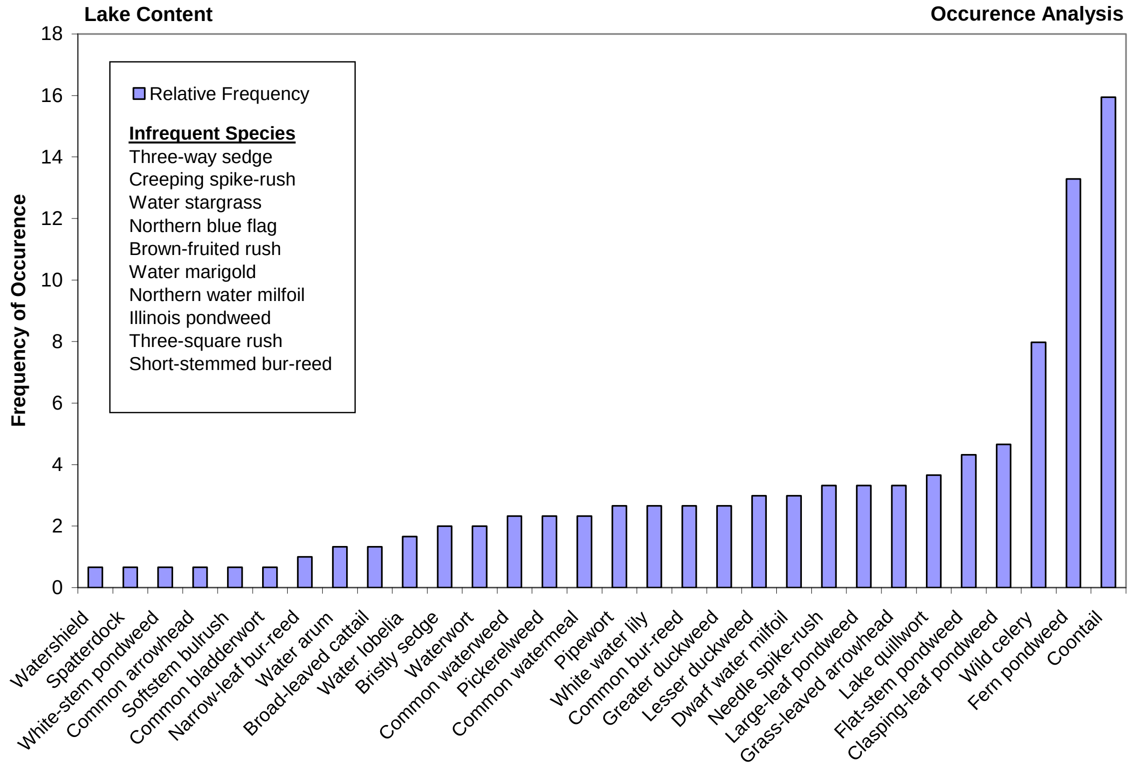

Figure 13. Lake Content Occurrence Analysis. Based upon data collected during 2005.

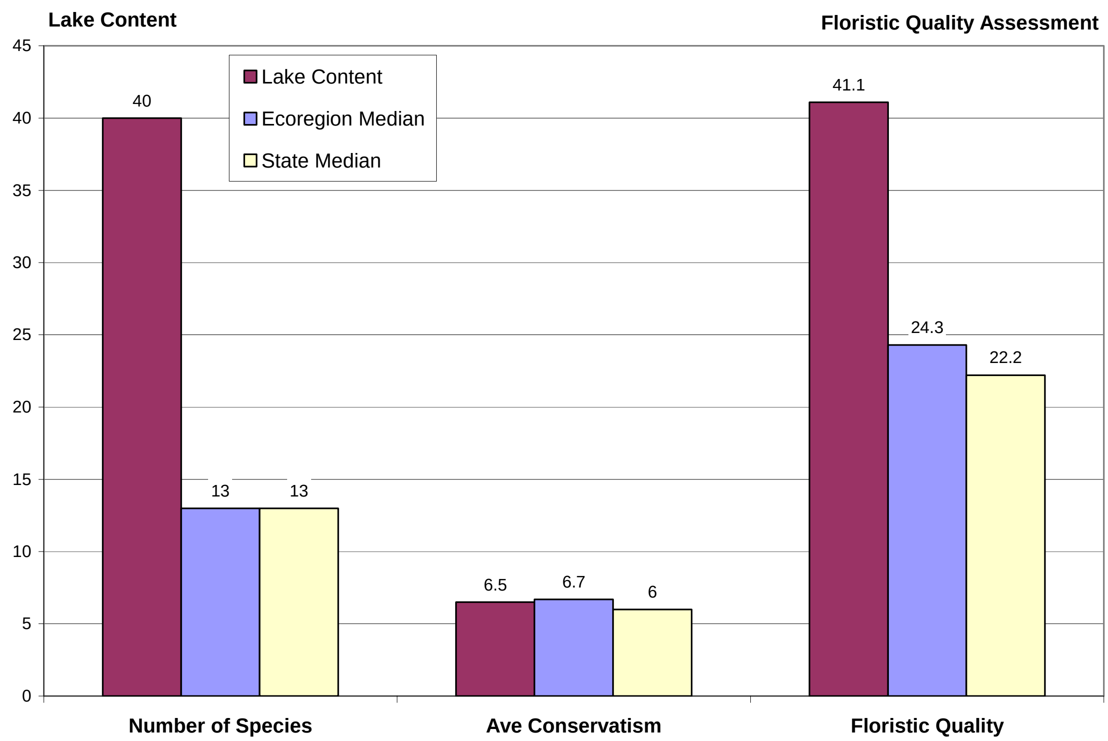

Figure 14. Lake Content Floristic Quality Analysis. Based upon Nichols (1999).

Lost Lake

Lost Lake contains a diverse and species-rich aquatic plant community (Table 6). Many of its dominant species are common submergent plants (Figure 15), like common waterweed, coontail, water celery, and miscellaneous pondweeds, but the lake also supports expansive colonies of emergent and floating-leaf species (Map 7). All of these life-forms provide important habitat for the lake's fish and wildlife populations. The lake's large rock piles and occasional downed tree also provide important structure in the system.

Lost Lake At-A-Glance
Acreage: 544
Maximum Depth (ft): 20
Mean Depth (ft): Undetermined
Curly-leaf Survey: June 9, 2004
Comprehensive Survey: August 10-12, 2004
Native Species: 36
Exotic Species: 0
Simpson's Diversity: 0.920
Floristic Quality: 36.0

Lost Lake's floristic quality, like the other seven project lakes, is very high when compared to the median values of the ecoregion and the state. In Lost Lake's case, much of its floristic quality is accountable to its high species richness and not to its average conservatism value, which is below the ecoregion median and even with that of the state (Figure 16). Basically, this means that the plant community of Lost Lake is comprised of many species of which most are somewhat tolerant of disturbance.

Management Actions for Lost Lake
Follow Town of Saint Germain Implementation Plan

Table 6. Lost Lake species list.

Life Form	Scientific Name	Common Name	Coefficient of Conservatism (c)
Emergent	*Carex comosa*	Bristly sedge	5
	Pontederia cordata	Pickerelweed	9
	Sagittaria latifolia	Common arrowhead	3
	Schoenoplectus acutus[1]	Hardstem bulrush	5
	*Eleocharis palustris**	Creeping spike-rush	6
	*Typha latifolia**	Broad-leaved cattail	1
Free Floating	*Lemna minor*	Lesser duckweed	5
	Spirodela polyrhiza	Greater duckweed	5
	Wolffia columbiana	Common watermeal	5
	*Lemna trisulca**	Forked duckweed	6
FL	*Nuphar variegata*	Spatterdock	6
	Nymphaea odorata	White water lily	6
FL/E	*Sparganium eurycarpum*	Common bur-reed	5
Submergent	*Ceratophyllum demersum*	Coontail	3
	Chara sp.	Muskgrasses	7
	Elodea canadensis	Common waterweed	3
	Isoetes lacustris	Lake quillwort	8
	Megalodonta beckii[2]	Water marigold	8
	Myriophyllum sibiricum	Northern water milfoil	7
	Najas flexilis	Slender naiad	6
	Nitella sp.	Stoneworts	7
	Potamogeton amplifolius	Large-leaf pondweed	7
	Potamogeton gramineus	Variable pondweed	7
	Potamogeton illinoensis	Illinois pondweed	6
	Potamogeton praelongus	White-stem pondweed	8
	Potamogeton pusillus	Small pondweed	7
	Potamogeton richardsonii	Clasping-leaf pondweed	5
	Potamogeton robbinsii	Fern pondweed	8
	Potamogeton spirillus	Spiral-fruited pondweed	8
	Potamogeton zosteriformis	Flat-stem pondweed	6
	Ranunculus aquatilis	White water-crowfoot	8
	Stuckenia pectinata[3]	Sago pondweed	3
	Utricularia vulgaris	Common bladderwort	7
	Vallisneria americana	Wild celery	6
S/E	*Eleocharis acicularis*	Needle spike-rush	5
	Sagittaria graminea	Grass-leaved arrowhead	9

FL = Floating Leaf FL/E = Floating Leaf and Emergent S/E = Submergent and Emergent
* = Incidental
[1]Formally known as *Scirpus acutus.*
[2]Formally known as *Bidens beckii.*
[3]Formally known as *Potamogeton pectinatus.*

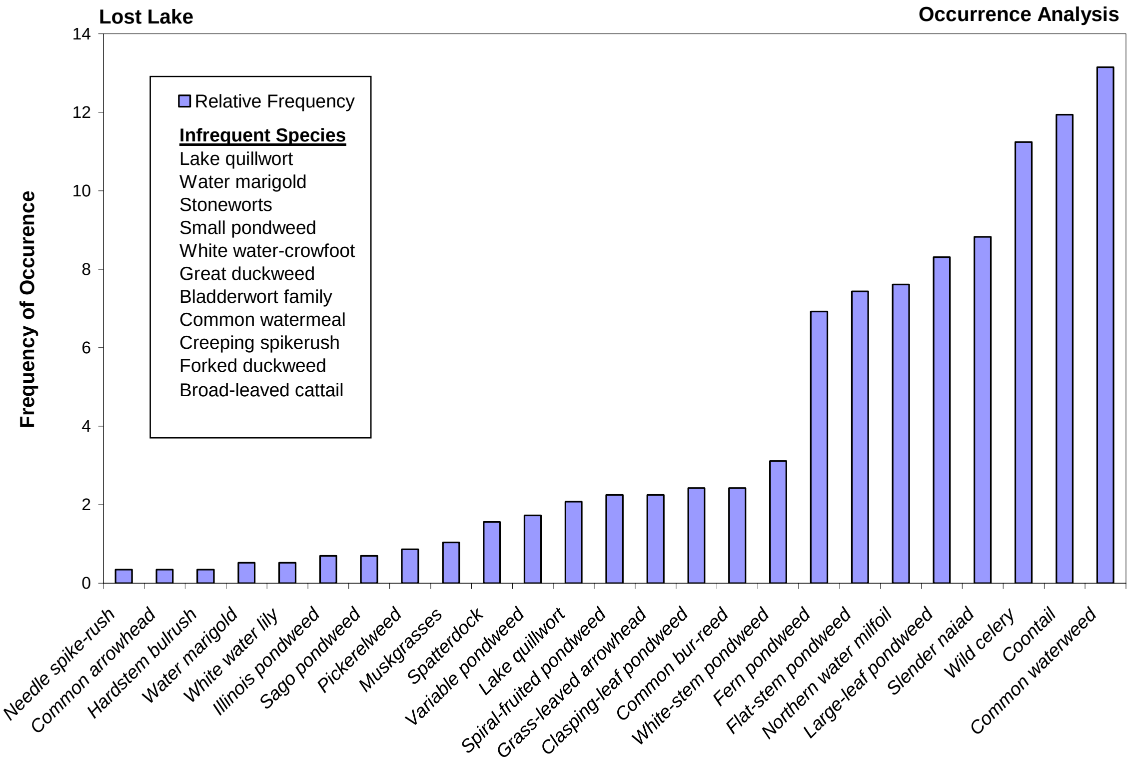

Figure 15. Lost Lake Occurrence Analysis. Based upon data collected during 2004.

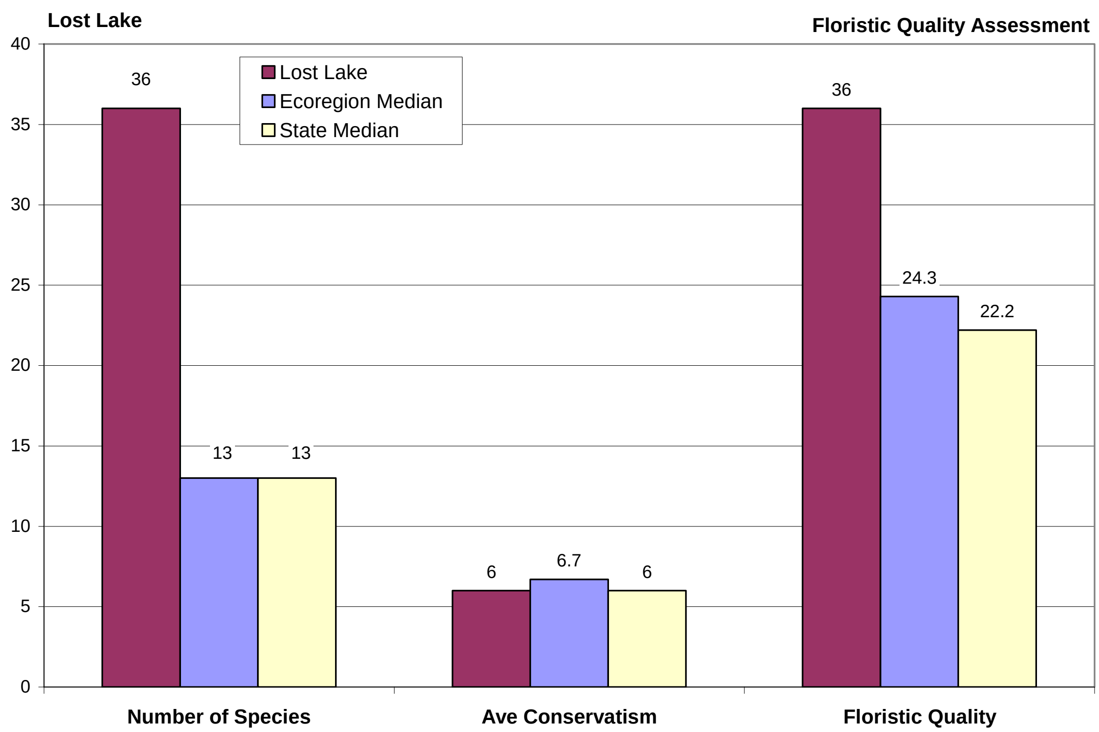

Figure 16. Lost Lake Floristic Quality Analysis. Based upon Nichols (1999).

Found Lake

Found Lake At-A-Glance
Acreage: 326
Maximum Depth (ft): 21
Mean Depth (ft): 11
Curly-leaf Survey: June 1, 2004
Comprehensive Survey: August 13 & 17-19, 2004
Native Species: 42
Exotic Species: 0
Simpson's Diversity: 0.930
Floristic Quality: 42.8

Of all the project lakes, Found Lake probably has the most outstanding aquatic plant community. It is highly diverse (0.930) and species-rich (Table 7). Many of its species have high coefficients of conservatism, which results in an average coefficient of conservatism just below the ecoregion median, but well above that of the state. Combining Found Lake's average conservatism value with its high number of species results in the second highest level of floristic quality (Figure 17) among project lakes. The lake is dominated by common submergents, but also supports abundant communities of other forms of high-value species, such as pickerelweed, narrow-leaf bur-reed, waterwort, lake quillwort, dwarf water milfoil, and grass-leaved arrowhead (Figure 18). Many of these species make up the extensive floating-leaf and emergent communities that occur around much of the lake's shoreline, but are most heavily concentrated on the lakes southeast side.

Together all of these attributes indicate that Found Lake is unique and like the other project lakes, an important aquatic ecosystem worth protecting.

Management Actions for Found Lake
Follow Town of Saint Germain Implementation Plan

Table 7. Found Lake species list.

Life Form	Scientific Name	Common Name	Coefficient of Conservatism (c)
Emergent	*Carex comosa*	Bristly sedge	5
	Dulichium arundinaceum	Three-way sedge	9
	Eleocharis palustris	Creeping spike-rush	6
	Equisetum fluviatile	Water horsetail	7
	Iris versicolor	Northern blue flag	5
	Juncus effusus	Soft rush	4
	Juncus pelocarpus	Brown-fruited rush	8
	Pontederia cordata	Pickerelweed	9
	Sagittaria latifolia	Common arrowhead	3
FF	*Lemna minor*	Lesser duckweed	5
	Spirodela polyrhiza	Greater duckweed	5
FL	*Brasenia schreberi*	Watershield	7
	Nuphar variegata	Spatterdock	6
	Nymphaea odorata	White water lily	6
	*Polygonum amphibium**	Water smartweed	5
FL/E	*Sparganium angustifolium*	Narrow-leaf bur-reed	9
Submergent	*Ceratophyllum demersum*	Coontail	3
	Chara sp.	Muskgrasses	7
	Elatine minima	Waterwort	9
	Elodea nuttallii	Slender waterweed	7
	Eriocaulon aquaticum	Pipewort	9
	Gratiola aurea	Golden pert	10
	Isoetes lacustris	Lake quillwort	8
	Myriophyllum tenellum	Dwarf water milfoil	10
	Najas flexilis	Slender naiad	6
	Nitella sp.	Stoneworts	7
	Potamogeton amplifolius	Large-leaf pondweed	7
	Potamogeton foliosus	Leafy pondweed	6
	Potamogeton gramineus	Variable pondweed	7
	Potamogeton illinoensis	Illinois pondweed	6
	Potamogeton natans	Floating-leaf pondweed	5
	Potamogeton praelongus	White-stem pondweed	8
	Potamogeton pusillus	Small pondweed	7
	Potamogeton richardsonii	Clasping-leaf pondweed	5
	Potamogeton robbinsii	Fern pondweed	8
	Potamogeton spirillus	Spiral-fruited pondweed	8
	Potamogeton zosteriformis	Flat-stem pondweed	6
	Stuckenia pectinata[1]	Sago pondweed	3
	Utricularia vulgaris	Common bladderwort	7
	Vallisneria americana	Wild celery	6
S/E	*Eleocharis acicularis*	Needle spike-rush	5
	Sagittaria graminea	Grass-leaved arrowhead	9

FL = Floating Leaf FF = Free Floating FL/E = Floating Leaf and Emergent S/E = Submergent and Emergent

* = Incidental   1Formally known as Potamogeton pectinatus

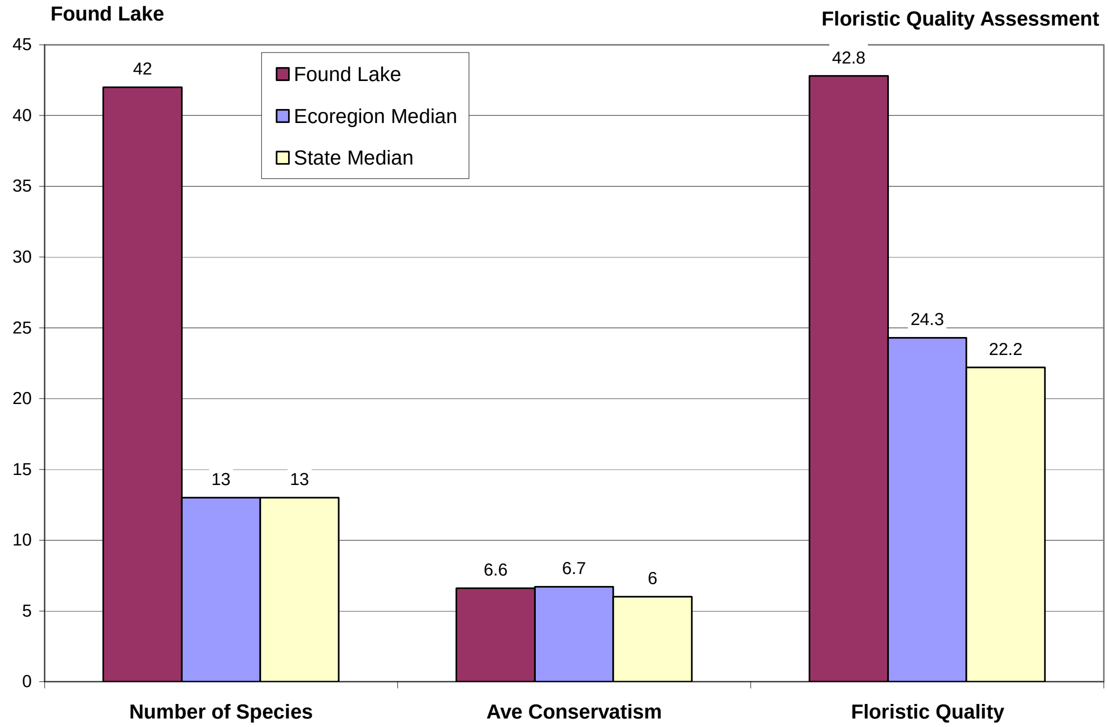

Figure 17. Found Lake Floristic Quality Analysis. Based upon Nichols (1999).

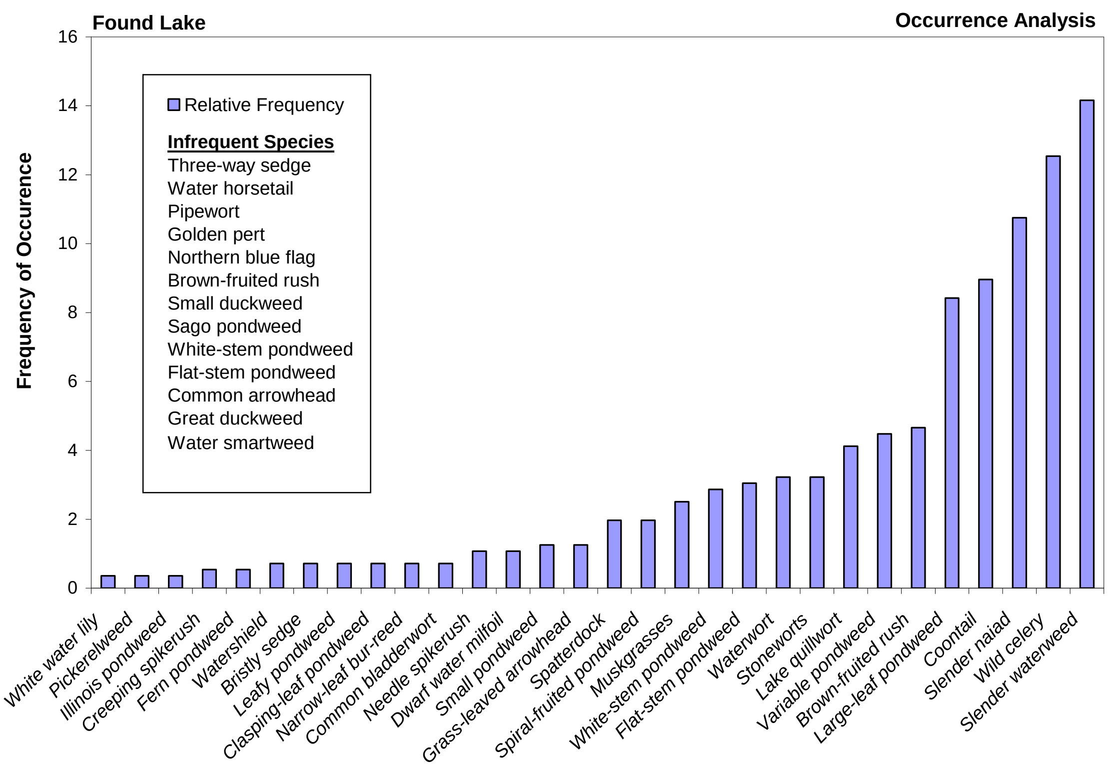

Figure 18. Found Lake Occurrence Analysis. Based upon data collected during 2004.

Little Saint Germain Lake

Little Saint Germain Lake was the only lake of the eight surveyed to have exotics found in it. Those exotics included curly-leaf pondweed and Eurasian water milfoil. Fortunately, both of these plants were discovered early and with the incredible efforts of the Little Saint Germain Protection and Rehabilitation, are now very likely under control. This control has been achieved after two years of a 5-year aquatic invasive species control plan. A project update is included in Appendix D.

Little St. Germain Lake At-A-Glance
Acreage: 980
Maximum Depth (ft): 53
Mean Depth (ft): 11
Curly-leaf Survey: June 1-3, 2004
Comprehensive Survey: August 25-27, 2004
Native Species: 44
Exotic Species: 2
Simpson's Diversity: 0.900
Floristic Quality: 43.8

Regardless of the exotics located in the lake, Little Saint Germain contains an outstanding native aquatic plant community. Compared to the other project lakes, Little Saint Germain contains the most native species (Table 8). It also has the highest floristic quality value of the project lakes (Figure 19). Its diversity is highlighted with stands of emergent and floating-leaf colonies that are prevalent within the lake's four bays (Map 9). The lake is dominated by submergent species common to many lakes in the state, but other more sensitive species, like grass-leaved arrow head, lake quillwort, and fern pondweed are also abundant (Figure 20).

Overall, the aquatic plant community of Little Saint Germain Lake is outstanding regardless of the existence of two non-native species. It is the outstanding native community that likely hindered the spread of the exotics when they were first introduced to the lake. Furthermore, they are doing much to recolonize the areas once occupied by the non-natives as they are brought under control through the district's efforts.

Management Actions for Little Saint Germain Lake

- Follow Town of Saint Germain Implementation Plan
- Continue the control strategy as described in the Little Saint Germain Exotic Aquatic Plant Species Management Plan.
- Complete formal Aquatic Plant Management Plan following completion of AIS Project.

Table 8. Little Saint Germain Lake species list.

Life-Form	Scientific Name	Common Name	Coefficient of Conservatism
Emergent	*Juncus pelocarpus*	Brown-fruited rush	8
	*Calla palustris**	Water arum	9
	*Dulichium arundinaceum**	Three-way sedge	9
	*Eleocharis palustris**	Creeping spike-rush	6
	*Pontederia cordata**	Pickerelweed	9
	*Sagittaria latifolia**	Common arrowhead	3
	Schoenoplectus acutus[1]*	Hardstem bulrush	5
	Schoenoplectus tabernaemontani[2]*	Softstem bulrush	4
	*Typha latifolia**	Broad-leaved cattail	1
FF	*Lemna minor*	Lesser duckweed	5
	Lemna trisulca	Forked duckweed	6
	Spirodela polyrhiza	Greater duckweed	5
	Wolffia columbiana	Common watermeal	5
FL	*Nuphar variegata*	Spatterdock	6
	Nymphaea odorata	White water lily	6
FL/E	*Sparganium fluctuans*	Floating-leaf bur-reed	10
	*Sparganium eurycarpum**	Common bur-reed	5
Submergent	*Ceratophyllum demersum*	Coontail	3
	Chara sp.	Muskgrasses	7
	Elatine minima	Waterwort	9
	Elodea canadensis	Common waterweed	3
	Heteranthera dubia[3]	Water stargrass	6
	Isoetes lacustris	Lake quillwort	8
	Lobelia dortmanna	Water lobelia	10
	Megalodonta beckii[4]	Water marigold	8
	Myriophyllum sibiricum	Northern water milfoil	7
	Myriophyllum spicatum	Eurasian water milfoil	Exotic
	Myriophyllum tenellum	Dwarf water milfoil	10
	Najas flexilis	Slender naiad	6
	Nitella sp.	Stoneworts	7
	Potamogeton alpinus	Alpine pondweed	9
	Potamogeton amplifolius	Large-leaf pondweed	7
	Potamogeton crispus	Curly-leaf pondweed	Exotic
	Potamogeton foliosus	Leafy pondweed	6
	Potamogeton gramineus	Variable pondweed	7
	Potamogeton illinoensis	Illinois pondweed	6
	*Potamogeton nodosus**	Long-leaf pondweed	7
	Potamogeton praelongus	White-stem pondweed	8
	Potamogeton pusillus	Small pondweed	7
	Potamogeton richardsonii	Clasping-leaf pondweed	5
	Potamogeton robbinsii	Fern pondweed	8
	Potamogeton zosteriformis	Flat-stem pondweed	6
	Ranunculus aquatilis	White water-crowfoot	8
	Vallisneria americana	Wild celery	6
S/E	*Eleocharis acicularis*	Needle spike-rush	5
	Sagittaria graminea	Grass-leaved arrowhead	9

FF= Free Floating, FL = Floating Leaf, S/E = Submergent and Emergent
FL/E = Floating Leaf and Emergent, * = Incidental
[1]Formally known as *Scirpus acutus*
[2]Formally known as *Scirpus validus*
[3]Formally known as *Zosterella dubia*
[4]Formally known as *Bidens beckii*

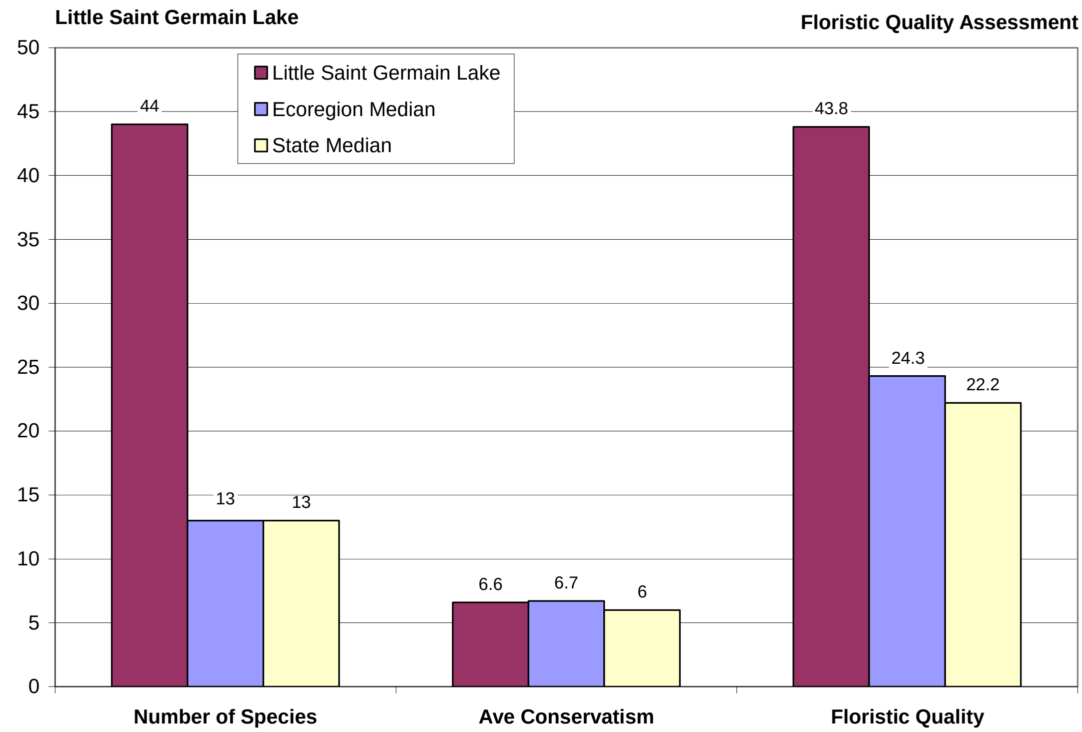

Figure 19. Little Saint Germain Lake Floristic Quality Analysis. Based upon Nichols (1999).

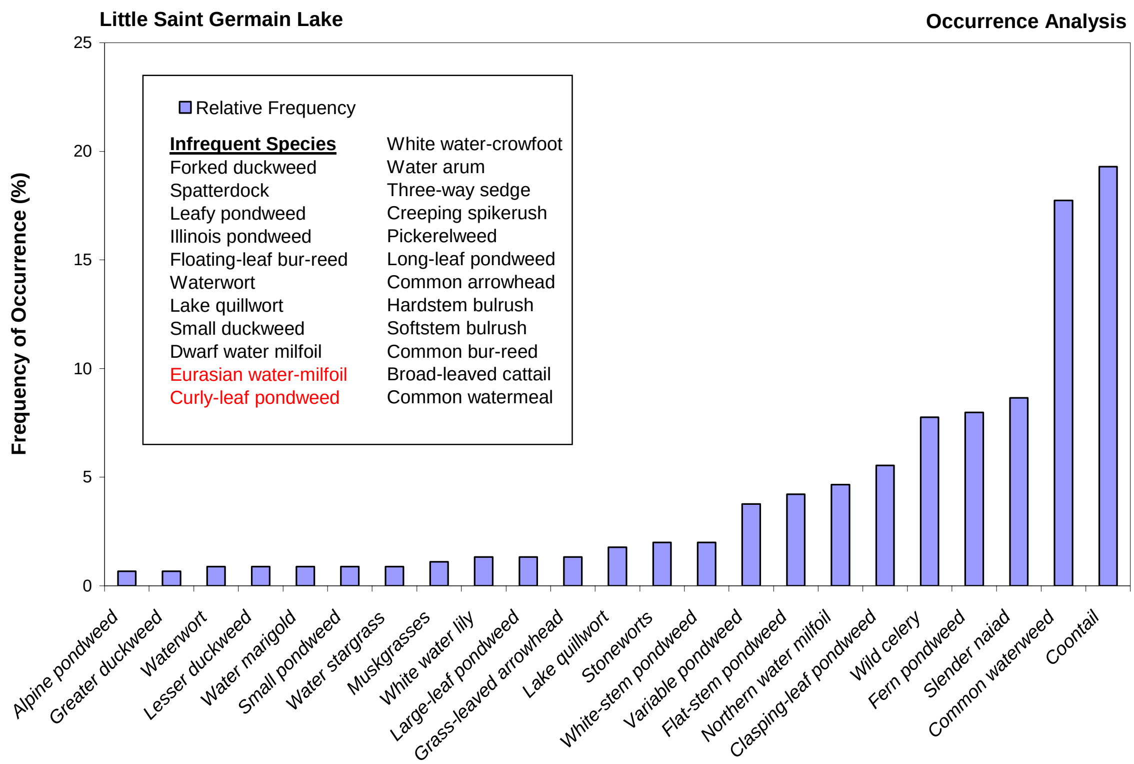

Figure 20. Little Saint Germain Lake Occurrence Analysis. Based upon data collected during 2004.

IMPLEMENTATION PLAN

From the very beginning of this management effort, the focus has been the preservation of native aquatic habitat. The results of the aquatic plant studies indicate that the town's lakes are in exceptional condition; therefore, the chief goal of the management plan is to protect these valuable plant communities and in turn, preserve the town's lakes.

This focus on preservation now carries through to the implementation plan and is the driving force behind the management actions described within it. The implementation plan aims to protect the native habitat by not only preventing the spread of exotics, but also by preserving the current state of each lake's aquatic plant community by limiting in-lake impacts. Each management action naturally falls into one or more of three categories; prevention, education, or early detection. Essentially, these categories describe a three-prong approach that will be used to meet the town's goal of preserving their lakes.

Prevention
Prevention actions include those designed to directly prevent the introduction of exotics and those that prevent degradation of the plant communities through in-lake processes from anthropogenic sources.

Educational
Educational actions are those designed to inform lake users about their impacts on lakes. The educational initiatives may be aimed at large groups of people in hope of reaching lake users or more directly at lake groups or individual users.

Early Detection
Early detection actions are included to increase the chances that pioneer infestations of exotic plants are found early thereby increasing the chance of effective control or possibly eradication.

Management Action: Saint Germain Summer Lakes Coordinator
Category: Prevention, Education, Early Detection
Timeframe: Initiate in 2006
Facilitator: Town of Saint Germain Lakes Committee
Description: The primary responsibility of this position would be to oversee all aspects of the town's watercraft inspection program, including the management and delivery of the associated data. The coordinator will also dedicate a portion of their time to the monitoring of lakes in accordance with the WDNR AIS lake monitoring guidelines.

The Town of Saint Germain has received AIS Grant funding for this management action. The position description can be found in Appendix E.

Action Steps:

1. Advertise for applicants.
2. Select best qualified applicant.
3. Provide suitable training of employee.
4. Provide appropriate supervision of employee throughout the summer.

Management Action: Town of Saint Germain Lakes Fair
Category: Education
Timeframe: As deemed appropriate.
Facilitator: Town of Saint Germain Lakes Committee
Description: The first Town of Saint Germain Lakes Fair was conducted by a handful of dedicated volunteers in the summer of 2003 and met with great success. Subsequent lake fairs in 2004 and 2005 were conducted by the Lakes Committee and met with equal success. The positive effects of the lake fairs will be continued to further raise the awareness of the impacts of AIS on town lakes and other natural resources.
Action Steps:

1. Determine the timing of the fair (likely biannual) with consideration to other town activities.

Management Action: Town-wide Clean Boats Clean Waters watercraft inspection program.
Category: Prevention
Timeframe: Indefinite – dependant on impact.
Facilitator: Town of Saint Germain Lakes Committee & Town Lakes Coordinator
Description: The 2005 program was less than optimal in results, but a good learning experience. 364 hours of volunteer time were logged, however coordinator time was included in those hours and too much of the coordinator's time was dedicated to finding and training volunteers. The 2006 program will be coordinated by a paid full time summer employee. A larger pool of volunteers will be provided for the coordinator to work with. Approximately 950 volunteer hours are being targeted for watercraft inspections. The coordinator will also dedicate approximately one quarter of the summer to on-lake monitoring for invasive species. An additional 950 hours are being targeted for volunteer lake monitoring. In total, 900 hours of volunteer time will be sought to inspect boats at the town's five public landings and monitor nearly 4,000 acres of water for invasive species.
Action Steps:

1. Solicit public participation through a variety of avenues including, but not limited to, lake organization newsletters, newspaper and radio outreach, communications with the business community via the local Chamber of Commerce, Coordinator appearances at local civic groups, Coordinator conducting door-to-door or dock-to-dock visits with property owners

Management Action: Reassessment of Town Lakes Aquatic Plant Communities
Category: Early Detection & Prevention
Timeframe: 2010
Facilitator: Town of Saint Germain Lakes Committee
Description: Changes in the health of a lake, both positive and negative, are often manifested as changes in the lake's plant community; therefore, periodic monitoring of aquatic plants is an essential element in any lake management plan. The aquatic plant surveys completed as a part of this project will act as excellent baseline data for future monitoring efforts. The reassessments will be completed by qualified

professionals and follow the same methodology utilized in the surveys conducted during 2004 and 2005, or as prescribed by the WDNR. Comparisons between the two datasets will be made in order to evaluate changes within the individual lakes and to adjust this management plan as applicable.

A WDNR Lake Protection Grant would be an appropriate funding source for this action as they are intended to provide matching funds (capped at $200,000) for the implementation of a lake management plan. All lakes would be reassessed during the same year to maximize cost effectiveness.

Action Steps:

1. Request proposals for reassessments during fall 2009.
2. Choose qualified firm, group, or individual.
3. Apply for WDNR Lake Protection Grant during May 2010 cycle.
4. Complete reassessment surveys during summer of 2010.
5. Analyze results and modify management/implementation plan during winter of 2010/2011.

Management Action: Print AIS Message on Grocery Bags
Category: Education
Timeframe: Indefinite – dependant on impact..
Facilitator: Town of Saint Germain Lakes Committee
Description: During 2005 84,000 grocery bags were printed with the Clean Boats Clean Waters logo and an AIS message at the cost of approximately $300. The supply of these bags will be monitored and reprinted with the same or an updated message as applicable.

Action Steps:

1. Reassess usefulness (impact) of message on annual basis.

Management Action: Distribute Labels to be placed on Bait Containers at Town Bait Shops and Suppliers
Category: Education
Timeframe: Indefinite – dependant on impact.
Facilitator: Town of Saint Germain Lakes Committee
Description: In 2005 the Lakes Committee printed and distributed bait container labels with and AIS message that were supplied to local bait shops and place on their containers. This is an excellent method of raising awareness among anglers who are the most likely to spread exotic species through their extensive use of the town lakes. The supply of these labels will be monitored and reprinted with the same or an updated message as applicable. The Lakes Committee would establish the impact that this action is having on an annual basis and determine if it will be renewed.

Action Steps:

1. See description above.

Management Action: Creation of Town-wide Lakes Database
Category: Education, Prevention, & Early Detection
Timeframe: 2006 in perpetuity
Facilitator: Town of Saint Germain Lakes Committee
Description: The creation and implementation of this management plan has and will result in a tremendous amount of information and data. Tracking and recording of this information on a town-wide basis will be the most efficient method for its management and future use. The key goal of this action would be the centralization of this information at a single site to ensure its stability and maximize its usefulness. Examples of information and data contained within the database may include the results of the plant surveys completed during 2004 and 2005, information pertaining to the Clean Boats Clean Waters watercraft inspections, data collected as a part of the Self-Help water quality monitoring (see below), results of annual volunteer monitoring of exotic plants within the town lakes, and links to sites where more information and data can be obtained.

The Town of Saint Germain currently employs a webmaster and maintains a web site where the information can be posted. The Lakes Committee would coordinate the posting and maintenance of the information through the town's webmaster. Furthermore, Vilas County will be increasing the AIS-related content on their website; therefore, the Lakes Committee should coordinate with county staff to ensure that the public has easily accessible information that is accurate and well-maintained from either source.

Action Steps:

1. Refine information types that will be contained within the database.
2. Coordinate space requirements with town webmaster.
3. Gather information and create database.
4. Maintain database.

Management Action: Self-Help Monitoring (Citizen Lake Monitoring Network) of Lake Water Quality
Category: Education, Prevention, & Early Detection
Timeframe: 2006 in perpetuity
Facilitator: Town of Saint Germain Lakes Committee & Town Lakes Coordinator
Description: Over 1,000 volunteers are currently collecting data on Wisconsin Lakes as a part of the WDNR Self-Help Lake Monitoring Program. As of 2005, all of the eight project lakes had active Self-Help Lake Monitors collecting Secchi disk clarities. Five of those lakes were active in the expanded program where additional water quality parameters are monitored, including chlorophyll-*a*, total phosphorus, and dissolved oxygen.

Although this plan is focused on aquatic plants, the Lakes Committee understands the importance of water quality monitoring in keeping track of the health of the town lakes; therefore, the goal of this action is to have an expanded programs active on all of the eight project lakes. The town lakes coordinator would be responsible for coordinating the monitoring of the lakes by enlisting volunteers to complete the monitoring or by completing it if a volunteer was not available.

Action Steps:

1. Create list of active Self-Help volunteers within the town.
2. Enlist volunteers for lakes that do not have active program.
3. Contact WDNR lakes coordinator to obtain equipment and training for the implementation of expanded Self-Help Lake Monitoring on lakes that are not currently active.

Management Action: Distribute Labels to be placed on WDNR fishing regulations at local bait shops.

Category: Education

Timeframe: Indefinite – dependant on impact.

Facilitator: Town of Saint Germain Lakes Committee

Description: In 2005 labels were created with an AIS message and distributed to local bait shops for placement on WDNR fishing regulation booklets. This is an excellent method of raising awareness among anglers who are the most likely to spread exotic species through their extensive use of the town lakes. The supply of these labels will be monitored and reprinted with the same or an updated message as applicable. It is the Lakes Committee's ultimate hope that this task would be moot in the near future because the WDNR would include the information within the fishing and boating regulations at the time of printing.

Action Steps:

1. See description above.
2. Continue encouraging WDNR to include appropriate AIS messages on the cover(s) of its fishing and boating regulations pamphlets.

Management Action: Consideration of the Development of Slow-No-Wake Areas in Town Lakes to Protect Existing Plant Communities

Category: Prevention

Timeframe: As appropriate following periodic professional surveys of aquatic plant communities.

Facilitator: Town of Saint Germain Lakes Committee

Description: Many studies have documented the adverse affects of motorboat traffic on aquatic plants (e.g. Murphy and Eaton 1983, Vermaat and de Bruyne 1993, Mumma et al. 1996, Asplund and Cook 1997). In all of these studies, lower plant biomasses and/or declines and higher turbidity were associated with motorboat traffic. Some Town of Saint Germain lakes may experience high rates of motorboat traffic and as a result may see unhealthy declines of native plant communities. A good example of a potential area is the bulrush stands that currently inhabit the east shore of Big Saint Germain Lake (Map 4). Once these valuable habitats are lost, it is very difficult to bring them back.

Many opportunities exist within the town lakes to limit these adverse affects. For instance, certain areas could be permanently set aside as slow-no-wake areas, while other areas could be temporarily set aside as a part of a rotational slow-no-wake area. Determining the areas that should be protected depend on a number factors, including; watercraft usage on each lake, the actual affects of that usage, and of course, the individual lake organization's willingness to participate.

No decision would be made regarding this management action until comparative data demonstrating degradation of specific can be collected. This of course means that any commitment regarding this course of action would not be decided upon until after the professional reassessment surveys would be completed in 2010 or sooner.

Action Steps:

1. See description above.

LITERATURE CITED

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METHODS

This section will be included in the final document.