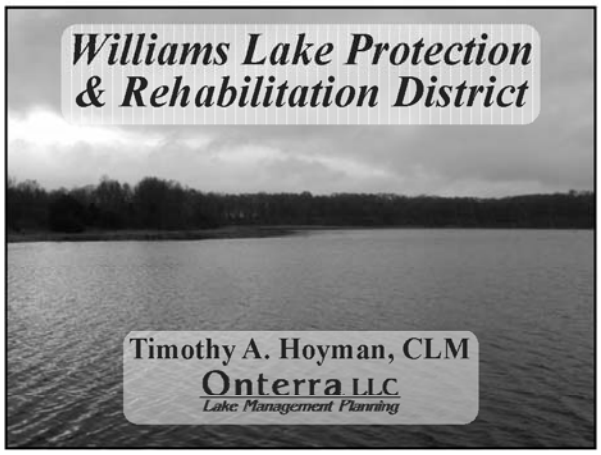
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APPENDIX A

Stakeholder Participation Materials



Presentation Outline

- Introduction to Lake Ecology
- Current Lake Project
  - Goals
  - Components
  - Timeline



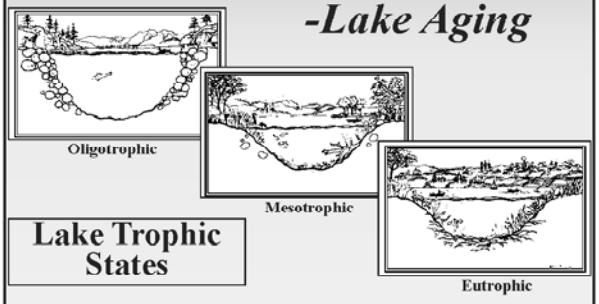
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General Lake Ecology



General Lake Ecology

Eutrophication -Lake Aging

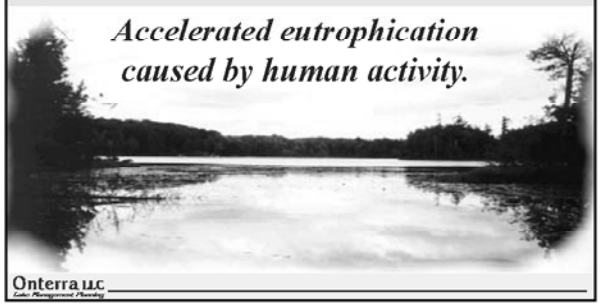


Lake Trophic States

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General Lake Ecology

Cultural Eutrophication



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General Lake Ecology

Phosphorus

- *Limiting Nutrient*
- *Controls Plant Abundance (Productivity)*
  - *Algae*
  - *Macrophytes*



General Lake Ecology

Aquatic Plants (macrophytes)

- *Native Plants*
- *Exotic Plants (non-native)*



Native Aquatic Plants

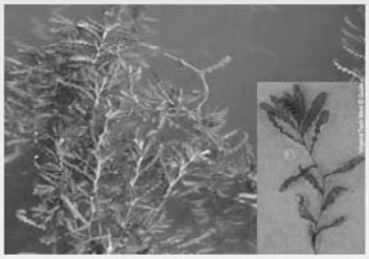


- Base of the Food Web
- Cover (not only fish)
- Nursery
- Sediment Stabilization

General Lake Ecology

Non-native Aquatic Plants

Curly-leaf Pondweed



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General Lake Ecology

Non-native Aquatic Plants

Eurasian Water-Milfoil



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General Lake Ecology

Consequences of Exotics

- Competition with Natives
  - Monotypic Community
- Decreased Recreational Value
- Decreased Property Value



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Comprehensive Lake Management Plan

Current Project

Study and Plan Goals

- Collect & Analyze Data
- Construct Long-Term & Useable Plan



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Current Project

Study Components

- Public Participation
- Watershed Modeling
- Water Quality
- Aquatic Vegetation
  - Curly-leaf Survey
  - Comprehensive Survey
- Plan Development



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Current Project

Project Timeline

Task	2005 J	F	M	A	M	J	J	A	S	O	N	D	2006 J	F	M	A	M	J
Field Season & Prelim Map Prep																		
Kick-off Meeting																		
Curly-leaf Survey																		
Water Quality Sample																		
Watershed Assessment																		
Comprehensive Plant Survey																		
Project Update																		
Data Analysis																		
Report Prep																		
Report – First Draft																		
Steering Comm. Meeting																		
Report – Final Draft																		
Final Report Meeting																		

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Current Project

Your Participation is Important to the Success of this Project





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Current Project

- Concerns
- Observations
- Questions





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Thank You

Many of the graphics used in this presentation were supplied by:

Wisconsin Lakes Partnership

UW Extension

Wisconsin DNR Dept. of Natural Resources

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Lake Management Planning

Williams Lake Comprehensive Management Plan
Results, Conclusions, and Preliminary Options
May 2006

The studies and analysis associated with the development of the Williams Lake Comprehensive Management Plan are complete and it is now time to actually create the plan. On April 1, 2006, your district planning committee met with Tim Hoyman and Eddie Heath, who are aquatic ecologists and planners with Onterra, LLC, the lake management planning firm that the district hired to assist in the completion of the plan. The planning committee met for nearly three hours that day and spent the first half of the meeting learning about Williams Lake, its watershed and its plant community.

This document contains two types of information; 1) a summarization of the results and conclusions of the studies completed on Williams Lake, and 2) two of the options the district may be able to implement concerning the management of the plants in Williams Lake. You are being provided this document as a project update and as an opportunity to reflect upon the information and if you are willing, provide written comments.

Three aspects of the Williams Lake ecosystem were studied as a part of this project, the watershed, lake water quality, and aquatic plants. The water quality component included six sampling trips to Williams Lake to collect samples and perform on-site tests. Nutrients, suspended mater, water clarity, chlorophyll-*a*, alkalinity, pH, and dissolved oxygen among other parameters were determined. The watershed component included the delineation of the lake's drainage basin and a parsing of the major land cover (land use) types within the watershed. The land cover types and acreages were used to model the hydrologic and phosphorus inputs to the lake from the watershed. Two aquatic plant surveys were completed; the first, completed in late May 2005 was specific to the exotic plant, curly-leaf pondweed. The second, completed in late July 2005, looked at all aquatic plants.

The water quality assessment indicates that Williams Lake is eutrophic system. In other words, Williams Lake is a highly productive system, which is likely not a surprise to anyone considering the amount of plant growth the lake supports. The assessment also showed that phosphorus is the nutrient that controls amount of plant growth.

It was found that the watershed draining to Williams Lake is approximately 2097 acres with about 650 acres of that land draining through Metcalf Lake first. Much of the watershed is forested, which happens to be the land cover type that on a per acre basis, exports the least amount of phosphorus to Williams Lake. Only a small portion of the watershed is in row crops, which by far exports the most phosphorus on a per acre basis. Interestingly, the modeling indicates that nearly 363 lbs of phosphorus enters Williams Lake from its watershed and 32% of that phosphorus originates in row crop areas, while only 19% originates in forested areas.

Curly-leaf pondweed is an exotic plant that begins growing much earlier in the spring than our native plants and dies back during mid July when the native species are just reaching their maximum growth. Unfortunately, this troublesome species was found in many areas of Williams Lake and Packers Bay during the plant survey completed in May 2005. The distribution of the species at this time indicates that it has not spread to all areas of the lake that it could. In other words, the plant has likely only been in the lake for a few years and can be expected to continue to spread.

The plant survey completed in July 2005 discovered that the native plant population of Williams Lake and Packers Bay is in relatively good health when compared to other lakes in the state and ecoregion. Unfortunately, Eurasian water milfoil, another exotic plant was found to occupy almost every area of Williams Lake and Packers Bay. The continued spread of Eurasian water milfoil and curly-leaf pondweed are likely the largest threat to the overall health of Williams Lake.

Overall, there were no unexpected findings that arose from the studies. The lake is considered eutrophic because of the amount of plant nutrients that are supplied through its watershed. The high amount of nutrients, of which phosphorus is the primary concern, fuels the incredible plant growth in the lake. As mentioned above, the row crops in the watershed export the greatest amount of phosphorus to the lake. Additional watershed modeling using an imaginary scenario converting all of the row crops to forests indicated that sufficient phosphorus would still enter the lake to keep it in its eutrophic state. This is the case because the watershed draining to Williams Lake is so large compared to the lake itself. In the end, even with major changes to the watershed, there will still be enough phosphorus entering the lake to support a high rate of plant growth.

In shallow, productive lakes, like Williams Lake, there is a constant battle between two plant groups – the macrophytes (also know as vascular plants or weeds) and algae. The two groups compete for nutrients, space, and light and in the end, one group will dominate the lake. In Williams Lake, the macrophytes are in control. If the macrophytes were not the dominate plant group, Williams Lake would be very turbid with algal growth, much like Lake Winnebago is during most of the summer. Therefore, it is obvious that the aquatic plants in Williams Lake are important to the health (and clarity) of the lake.

One of the biggest concerns among district members is the amount of plants in Williams Lake and their affect on the recreational use. This concern spurred the purchase of a harvester and its volunteer operation by district members. As described above, the plant biomass is driven by nutrients entering the lake through its watershed and even major changes in the watershed are not going to reduce the nutrient levels sufficiently to reduce the productivity of the lake. Furthermore, if those plants were not in the lake, the lake would be pea-green with algae. Unfortunately, a large portion of those plants are non-native, specifically Eurasian water milfoil.

Eurasian water milfoil out competes our native species in two ways; 1) it gets a jump on the natives by starting to grow much earlier in the spring than the natives, and 2) unlike native species, Eurasian water milfoil continues to grow after it reaches the surface causing dense mats to form which shade out the native species. It is the surface matting that causes the most navigation problems on the lake and leads to the need for harvesting. Eurasian water milfoil's primary mode of reproduction is through fragmentation, so harvesting actually increases its spread and competitiveness against native species. Naturally, as harvesting continues at the lake, Eurasian water milfoil (and curly-leaf pondweed) will continue to spread. As it spreads, more harvesting will be required to temporarily reduce its negative impacts.

One of the goals the Planning Committee would like to fulfill is to reduce the amount of harvesting required on the lake. Two options are available to meet this goal:

1. **Reduce the acreage harvested on the lake.**

   There are two reasons that the district harvests plants on Williams Lake, the first is to allow recreational activity on the lake, including boating, fishing and even swimming. The second is aesthetics. The combination of these two reasons has led the district to harvest large portions of the main lake and almost all of Packers Bay. As alluded to above, all of this harvesting has hurt the lake by spreading non-native species which are steadily replacing the important native species. When the health of a lake is a concern, a reasonable amount of plant harvesting for navigation and recreation is acceptable. However, if the harvesting is completed for aesthetic reasons only, than the benefits do not out weigh impacts on the native plant community. The harvesting on the main lake is reasonable because it opens up a portion of the lake for recreational boating, but leaves much of it intact for fish and wildlife. The same cannot be said for Packers Bay, which is entirely slow-no-wake. Unfortunately, the clear-cutting that is done in Packers Bay is strictly for aesthetic purposes, which is bad for the lake's plant community.

   One way to reduce the amount of harvesting completed on the lake would be to cut only navigation lanes in Packers Bay. These would be 30-foot wide lanes cut as close to piers as possible around the entire bay and one or two cut across the bay. This would allow recreational boating and would also open cruising lanes for predator fish. To reduce the harvesting efforts further, the northwest bay of the main lake could follow the same procedure, leaving the largest area of the main lake for high speed boating.

   The biggest drawback of implementing this option would be the sudden change in aesthetics in the areas that would not be harvested any longer. The benefits would be the reductions in both harvesting time and in the spreading rate of Eurasian water milfoil and curly-leaf pondweed.

It should be mentioned here, that the WDNR may require this type of modification as a condition on a new harvesting permit. This is the case because of the known negative impacts clear cutting can have on a lake.

2. Reduce the occurrence of Eurasian water milfoil.

The objective of this option would be to reduce the amount of Eurasian water milfoil within Williams Lake and as a result reduce the amount of harvesting required. In reality, reducing the amount of Eurasian water milfoil can be very difficult, if not impossible. There certainly are no silver bullets to eradicate this noxious plant from a lake and in some cases even achieving some level of control can be tricky. The aquatic herbicide, 2,4-D has proven to be useful in the control of Eurasian water milfoil. It is selective against broadleaf species, like milfoils, lilies, and coontail, but is nearly ineffective against grass-like species such as pondweeds and most other aquatic species. Its selectivity against Eurasian water milfoil can be increased by completing treatments early in the spring when only Eurasian water milfoil is actively growing.

Completing a whole-lake treatment using 2,4-D would not be practical because of the expense and the ecological risk; however, completing a "test" application on Packers Bay would be a good method to discover if a sufficient amount of control could be achieved so harvesting efforts could be reduced.

The disadvantage to this option may be that control will not be achieved and the time, effort, and money allocated would be wasted. It is likely that some level of control would be achieved following the treatment, but would it be enough to lead to a reduction in harvesting effort required? The only way to find out would be to monitor the results of the treatment during the summer following a spring application. If sufficient control were achieved, expanding applications to areas of the main lake may be warranted. If the project were designed correctly, 50% of the costs associated with the herbicide application and subsequent monitoring may be covered by a WDNR Aquatic Invasive Species Grant.

As mentioned in early on, your comments concerning this document and the management plan are very much welcomed. All comments must be documented; therefore, only written comments will be accepted. Please submit your written comments by June 15, 2006 to:

Ms. Mary Murren
Williams Lake P & R District
505 Lincoln Ave.
Fox River Grove, IL 60021

Williams Lake Stakeholder Comment Survey
Summary of Comments & Questions

Below is a summary of the comments and questions received from district members in response to the summary and update that was supplied in May. The intent of the results summary and the solicitation of comments were to bring the district membership up-to-date and provide an opportunity for lake stakeholders to offer input that would be used in the creation of the plan. The dissemination of information and collection of stakeholder response and thoughts is part of an *effective* planning effort. In order for a realistic and implementable plan to be created, the stakeholders and the planners must educate each other based upon their experience and knowledge. Our job as your contracted ecologists/planners is to collect the necessary data, analyze that data, draw conclusions, and relate that information back to the district membership. Our responsibilities also include providing recommendations and advice relating to the realistic management of your lake in terms of meeting your recreational and personal enjoyment needs. However, the recommendations and advice must stay within the confines of protecting your lake from degradation (keeping it healthy) and within what we anticipate the WDNR will accept. Your job as lake stakeholders is to educate us on how you use your lake and what your expectations are concerning its future health. The comments that were received and the work with your Planning Committee have done much to fulfill both of our commitments in the completion of the Williams Lake Management Plan. Hopefully, the update and summary increased the understanding of the Williams Lake ecosystem among the membership – many of the responses indicate that this is the case. The responses definitely increased our understanding of how you use the lake and how important Williams Lake is to its users. For instance, many of the respondents commented on how they enjoy using Packer's Bay for passive recreation, such as canoeing, swimming, fishing, and just cruising around without the worry of being upset by high-speed boating. They also related that the current harvesting activities allow this enjoyment to continue. These comments enlightened us and created a more accurate perspective on how Packer's Bay is utilized. We really had not thought of it that way, and that is exactly why we requested the input. So, the process is working!

The following is a summary of the comments and questions received from 13 district members. Where applicable, we provide response and clarification. Please note that not all comments/questions are addressed because this would require a much longer document. Only common comments/questions are discussed below.

Many respondents commented that the summary implied that the *harvesting* of Packer's Bay was completed strictly for aesthetic purposes. Actually, the summary uses the term *clear-cutting*, which is different than harvesting. As discussed above, many members enjoy using Packer's Bay for passive recreation; that type of recreation could continue even if the harvesting were to only include navigation lanes. However, it is a moot point because the comments received bettered our understanding of how the bay is used as a whole and in its relationship to the main lake. The current draft of the implementation plan takes this use into account.

Some of the comments requested a discussion of other alternative for Eurasian water milfoil (EWM) control besides the use of chemicals and harvesting. Three alternative methods were brought up within the comments:

Milfoil weevil The milfoil weevil (*Euhrychiopsis lecontei*) is a native aquatic beetle that reproduces on, lives in, and eats native milfoils. Some studies have shown that when presented with native and non-native milfoils, lab-raised weevils actually prefer the non-native (EWM) and can impact its growth to the point that the EWM populations decrease. Based upon these findings, researchers introduced large numbers of weevils to EWM stands in lakes and found that in some cases the EWM was reduced.

EnviroScience of Ohio currently grows and sells the milfoil weevil for the control of EWM in lakes. Many lakes in Wisconsin have used EnviroScience's service to seed their lakes with weevils. Some lakes have seen positive results, while many others have not. The cost ranges between $1.00 and $1.25 per weevil including introduction and monitoring. The target weevil level is approximately 2 weevils/stem. As mentioned above, many lakes have not shown positive results and the projects were considered failures. The reasons for failure are not always clear, but research indicates that the habitat requirements of the weevil and predation by sunfish may be possible determinants to success. The adult weevils are very weak fliers and require natural habitat for overwintering. It is believed that some of the failures were caused because the seeded weevils and their offspring were not able to locate proper overwintering habitat and as a result, the next year's weevil population were well below required densities for EWM control. In other lakes, natural sunfish populations were believed to have eaten sufficient amounts of weevils to bring the weevil densities below the threshold level.

So, is the weevil control technique applicable to Williams Lake? Probably not for two reasons: first, the large amount of EWM in Williams Lake would require that many weevils would be needed to reach the threshold density. This could cost tens of thousands, if not hundreds of thousands of dollars. Second, much of the shoreline of Williams Lake is developed and maintained as unnatural shoreline. As a result, the seeded weevil population would not have sufficient overwintering habitat to support the required densities needed for EWM control. Yes, a large portion of the main lake's shoreline is natural, but much of the EWM does not occur in proximity of that shoreline.

Dredging Removing sediments from the lake bottom or lake deepening, is not a good technique for EWM or any other plant control in Williams Lake. There are primarily two rationales for using dredging to control aquatic plants; 1) to deepen the lake to the point that sufficient light will not reach the bottom to support plant growth, and 2) to physically remove the entire plant from the lake and as a result reduce the plant's densities. At the surface (no pun intended) both of these

concepts seem logical; however, in the vast majority of lakes, including Williams Lake, they are incorrect.

The *photic zone* is the water depth at which sufficient light penetrates the water to support plant growth. The photic zone depth is variable between lakes, but a general rule of thumb is to multiply average Secchi disk transparencies for the lake by 2.5-3.0 to estimate the depth at which plants will grow. The average growing season Secchi disk transparency for Williams Lake during 2005 was 5.4 feet. Using the estimate above indicates that plants would grow in water depths ranging between 13.5 and 16.2 feet. This means that in order for the dredging to work, large portions of the lake would need to be dredged to depths over twice its current maximum depth (roughly 6 feet). The cost for completing this would be great. For example if 5 acres of the lake were dredged 8 feet deeper to increase the maximum depth to 14 feet, that would mean that approximately 64, 500 cubic yards of sediment would need to be removed. At a conservative cost of $3.00/cu.yd. of sediment dredged, the cost would be approximately $193,500.

Removing the plant biomass along with a foot of sediment would definitely supply some short-term relief; however, that would leave those areas open to immediate invasion by EWM. Like most weedy species, EWM is a *pioneering species* that has a strong ability to occupy open areas of sediment where competition is low. Dredging a portion of the lake to remove the plants would be analogous to digging out a portion of your lawn to remove the grass. In your back yard, the first species to occur would be weeds like dandelions and thistle – in the lake, the first species would be EWM and likely curly-leaf pondweed (CLP).

Rototilling One respondent asked if dragging or aqua-tilling the lake would be a good method of controlling EWM. Much like dredging, tilling the lake bottom to control EWM would just open up areas to invasion by more EWM and CLP and in the end, would likely lead to denser populations in those areas. For this reason and because of increased turbidity, rototilling is not permitted in Wisconsin by the WDNR.

Some correspondence called for the eradication of EWM and CLP from the lake. As alluded to in the summary, eradication of these species from a lake once they become established is impossible using current technology.

Many of the commenters stated that they do not believe that reducing harvesting would lead to decreased rates of EWM spread. The fragmentation of EWM associated with its harvest does allow the plant to spread because the majority of its reproduction is thought to be via fragmentation. Yes, boating does cause fragmentation and spread, but the amount of fragmentation caused by motorboats on the lake is negligible when compared to what harvesting does. Most of the people that brought up this point also stated that they did not believe that the reduced harvesting would be beneficial to the lake considering that the plant would still be spread by recreational use. Whether these people realize it or not, their thought process is a form of *risk assessment*. Risk assessment is a

big part of the planning process and their conclusions are valid. Reducing harvesting would slow the spread of EWM, but that benefit does not outweigh the benefits of the current harvesting activities as they relate to the use of the lake by its stakeholders.

Some comments brought up that reduced harvesting could lead to dissolved oxygen problems in the lake as the plants decompose. A definite benefit of harvesting is that plant biomass is physically removed from the lake and as a result, the chance of anoxic (devoid of oxygen) conditions occurring during decomposition is reduced. Although the reductions in harvesting proposed for Packer's Bay may not have increased the chance of anoxic conditions, the point expressed by the commenters is valid and will likely be incorporated within the management plan.

Williams Lake Protection & Rehabilitation District

Wrap-up Meeting
August 26, 2006

Timothy A. Hoyman, CLM
Onterra LLC
Lake Management Planning

Presentation Outline

- Project Refresher
- General Lake Ecology
- Study Results
- Conclusions



Study and Plan Goals

- Collect & Analyze Data
- Construct Long-term & Useable Management Plan



Study Components

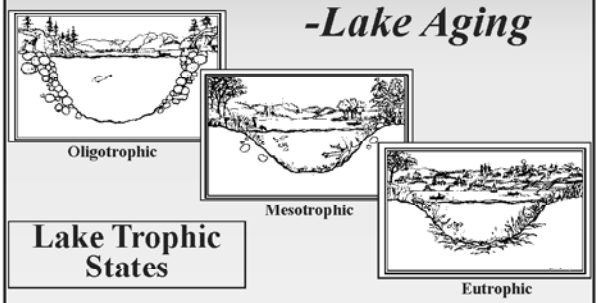
- Public Participation
- Watershed Modeling
- Water Quality
- Aquatic Vegetation
  - Curly-leaf Pondweed Survey
  - Comprehensive Survey
- Plan Development



General Lake Ecology



Eutrophication -Lake Aging



Lake Trophic States

General Lake Ecology

Cultural Eutrophication

Accelerated eutrophication caused by human activity.

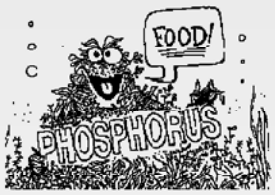


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General Lake Ecology

Phosphorus

- *Limiting Nutrient*
- *Controls Plant Abundance (Productivity)*
  - *Algae*
  - *Macrophytes*



General Lake Ecology

Aquatic Plants (macrophytes)

- *Native Plants*
- *Exotic Plants (non-native)*



Native Aquatic Plants



- Base of the Food Web
- Cover (not only fish)
- Nursery
- Sediment Stabilization

Introduction to Aquatic Plants

Non-native Aquatic Plants

Curly-leaf Pondweed



Eurasian Water Milfoil



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General Lake Ecology

Consequences of Exotics

- Competition with Natives
  - Monotypic Community
- Decreased Recreational Value
- Decreased Property Value



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Study Results

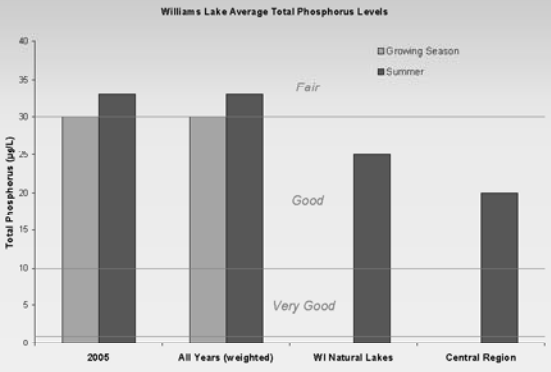
Water Quality

- Phosphorus (Limiting Plant Nutrient)
- Chlorophyll-*a* (Algal Abundance)
- Water Clarity (Secchi Disk)



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Lake Management Planning

Study Results



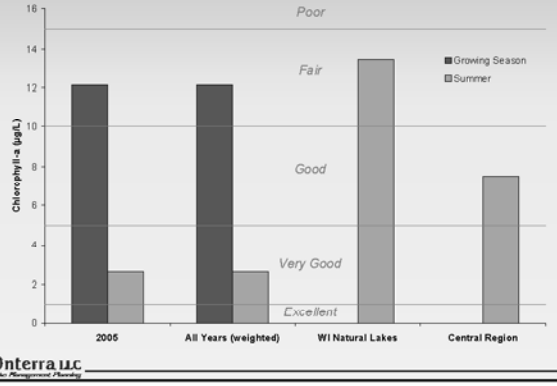
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Lake Management Planning

Study Results



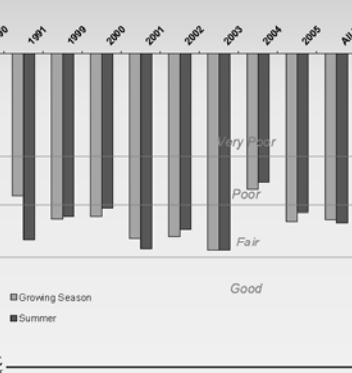
Onterra LLC
Lake Management Planning

Study Results

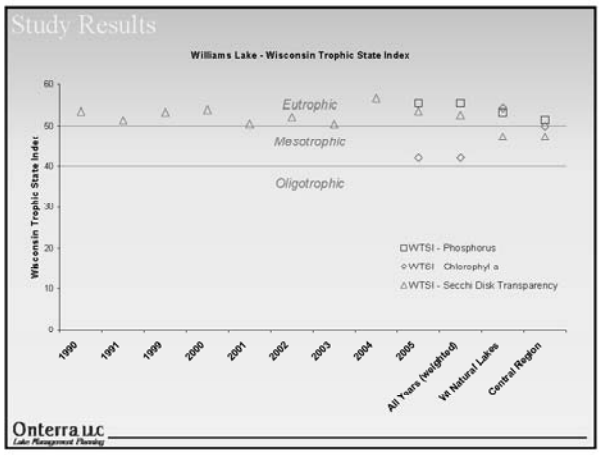


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Lake Management Planning

Study Results

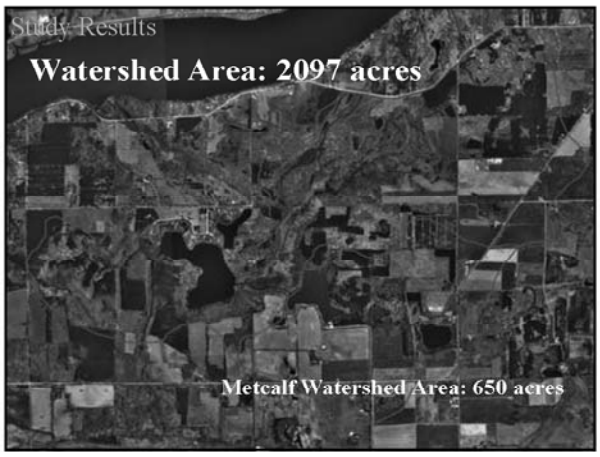


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Lake Management Planning

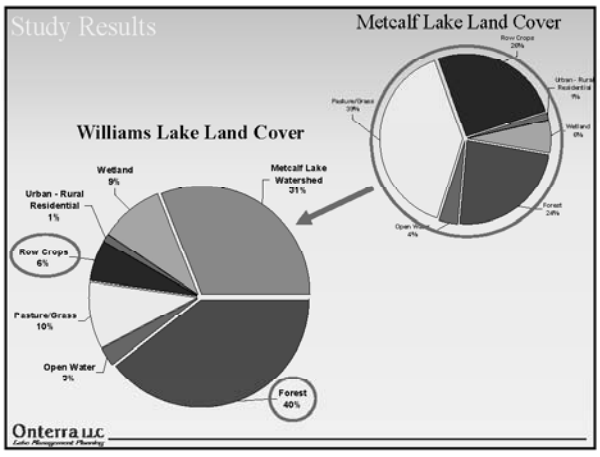

Study Results
Williams Lake - Wisconsin Trophic State Index
Wisconsin Trophic State Index
Eutrophic
Mesotrophic
Oligotrophic
WTSI - Phosphorus
WTSI - Chlorophyll a
WTSI - Secchi Disk Transparency
1990
1991
1999
2000
2001
2002
2003
2004
2005
All Years (weighted)
Yet Natural Lakes
Central Region
Onterra LLC


Study Results


Study Results
Watershed Area: 2097 acres

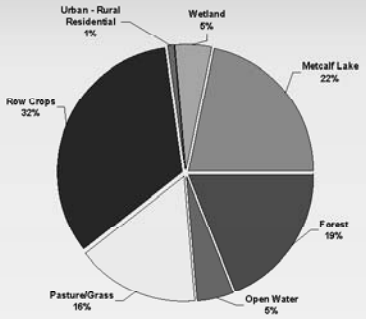

Study Results
Watershed Area: 2097 acres
Metcalf Watershed Area: 650 acres


Study Results


Study Results
Metcalf Lake Land Cover
Williams Lake Land Cover
Wetland 9%
Metcalf Lake Watershed 31%
Urban - Rural Residential 1%
Row Crops 6%
Pasture/Grass 10%
Open Water 3%
Forest 40%
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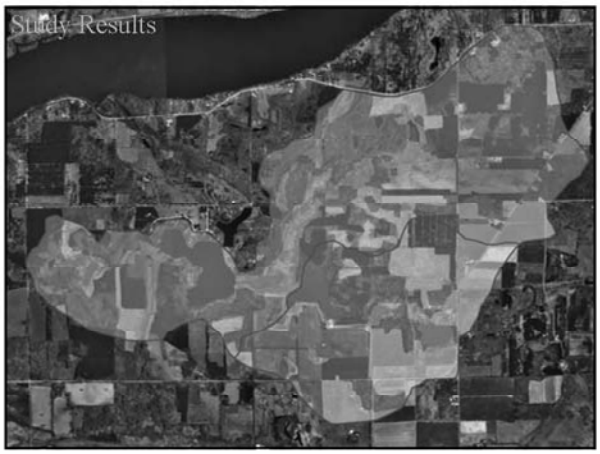
Study Results

Williams Lake
Annual Phosphorus Load: 363 lbs



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Lake Management Planning

Study Results



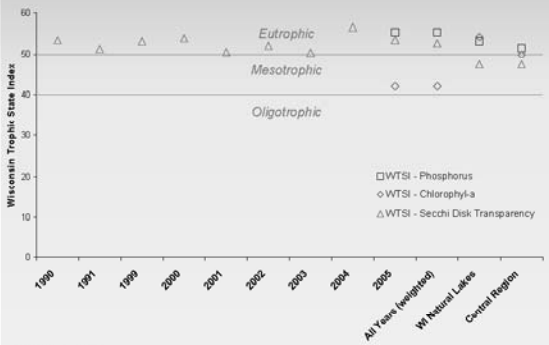
Study Results

Current Annual P Load: 363 lbs
Reforest Row Crops P Load: 216 lbs

40% Reduction

Study Results

Williams Lake - Wisconsin Trophic State Index



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Lake Management Planning

Study Results

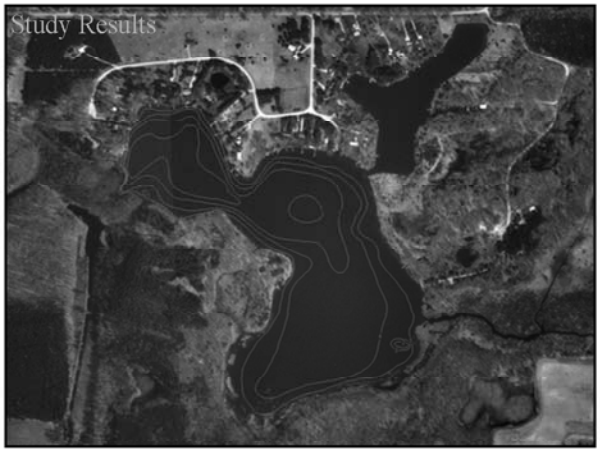
Williams Lake - Wisconsin Trophic State Index

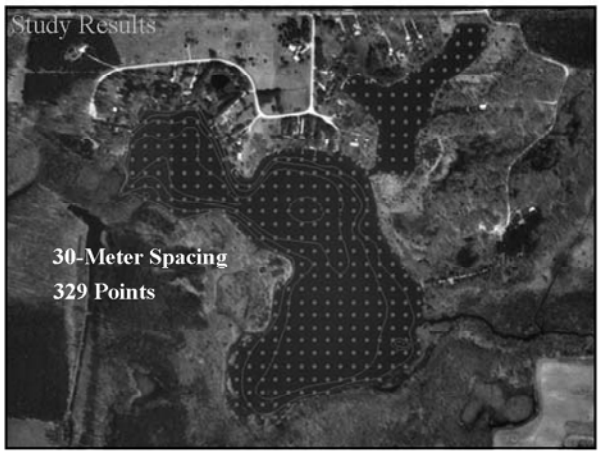


33:1

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Lake Management Planning

Study Results





Study Results

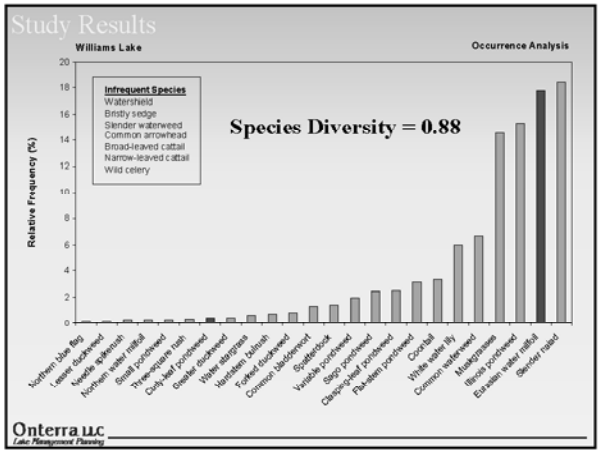
Williams Lake

Life Form	Scientific Name	Common Name	Coefficient of Conservatism (c)
Emergent	*Carex comosa*	Bristly sedge	5
	Iris versicolor	Northern blue flag	5
	Sagittaria latifolia	Common arrowhead	3
	Schoenoplectus acutus	Hardstem bulrush	5
	Schoenoplectus pungens	Three-square rush	5
	*Typha angustifolia**	Narrow-leaved cattail	1
	Typha latifolia	Broad-leaved cattail	1
FF	*Lemna minor*	Lesser duckweed	5
	Lemna trisulca	Forked duckweed	6
	Spirodela polyrhiza	Greater duckweed	5
FL	*Brasenia schreberi*	Watershield	7
	Nuphar variegata	Spatterdock	6
	Nymphaea odorata	White water lily	6
Submergent	*Ceratophyllum demersum*	Coontail	3
	Chara sp.	Muskgrasses	7
	Elodea canadensis	Common waterweed	3
	Elodea nuttallii	Slender waterweed	7
	Heteranthera dubia	Water stargrass	6
	Myriophyllum sibiricum	Northern water milfoil	7
	Myriophyllum spicatum	Eurasian water milfoil	Exotic
	Najas flexilis	Slender naiad	6
	Potamogeton crispus	Curly-leaf pondweed	Exotic
	Potamogeton gramineus	Variable pondweed	7
	Potamogeton illinoensis	Illinois pondweed	6
	Potamogeton pusillus	Small pondweed	7
	Potamogeton richardsonii	Clasping-leaf pondweed	5
	Potamogeton zosteriformis	Flat-stem pondweed	6
	Stuckenia pectinata	Sago pondweed	3
	Utricularia vulgaris	Common bladderwort	7
	Vallisneria americana	Wild celery	6
S/E	*Eleocharis acicularis*	Needle spikerush	5

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

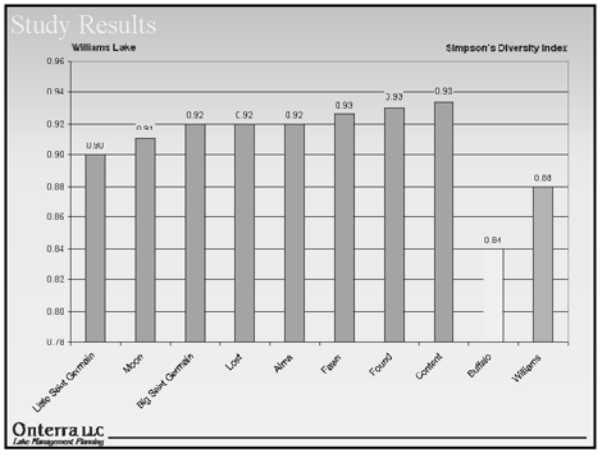
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Lake Management Planning

Study Results



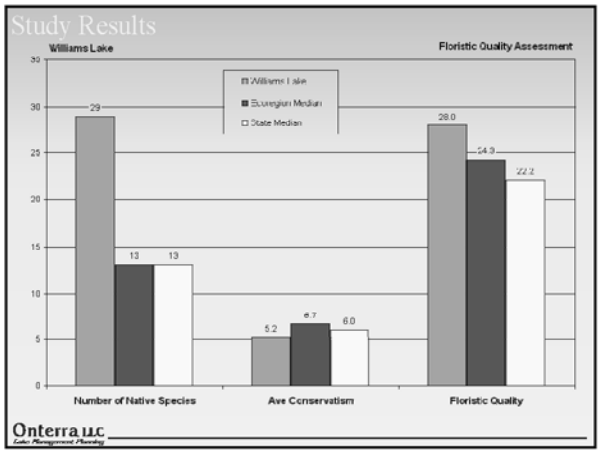
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Study Results



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Lake Management Planning

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Onterra LLC
Lake Management Planning

Study Results

Williams Lake

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	*Typha angustifolia**	Narrow-leaved cattail	1
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FF	*Lemna minor*	Lesser duckweed	5
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FL	*Brasenia schreberi*	Watershield	7
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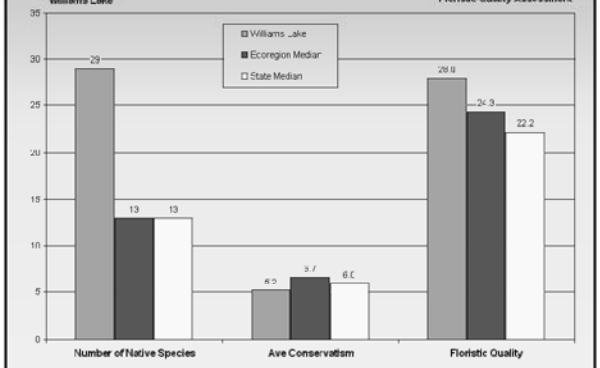
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Lake Management Planning

Study Results

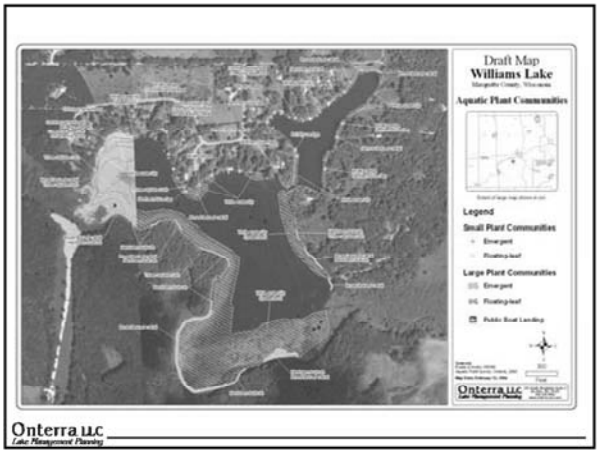


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Study Results

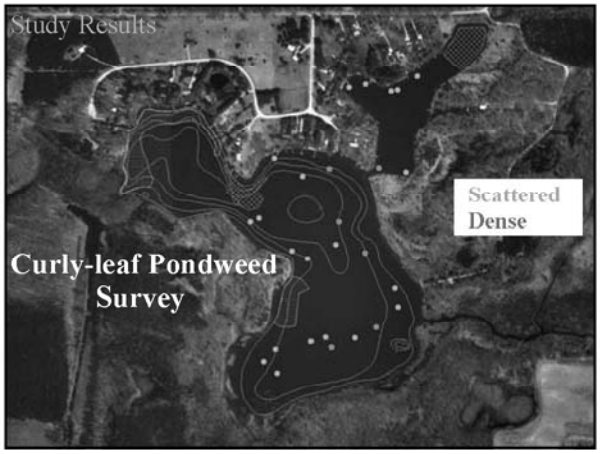


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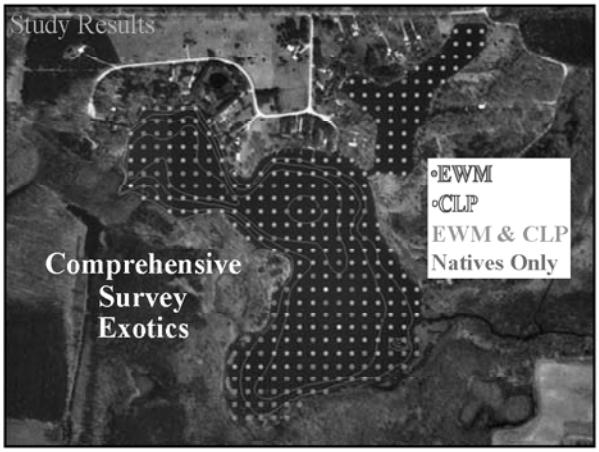


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Study Results



Study Results



Study Results

Conclusions

- Williams Lake is a eutrophic *and* shallow lake.
- Its productivity is exhibited by a high macrophyte biomass

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Shallow Lakes are Special

Clear State



Turbid State



Aquatic Plants are Important

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Study Results

Conclusions

- Williams Lake is a eutrophic and shallow lake.
- Its productivity is exhibited by a high macrophyte biomass
- Changes in the watershed will reduce phosphorus loading, but will not significantly decrease lake's trophic state.

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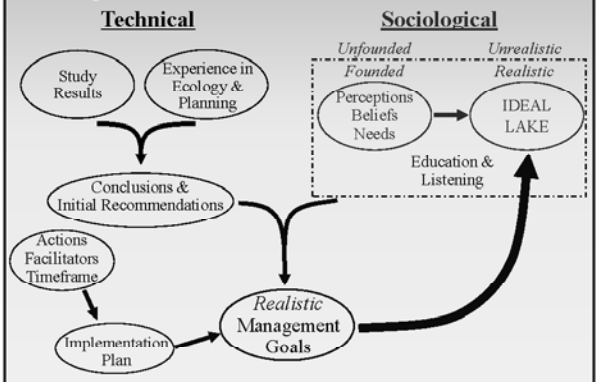
Study Results

Conclusions

- EWM is prevalent in the lake.
  - •Harvesting will continue spread of EWM.
  - •Discontinuing harvesting is unrealistic.
- CLP occurs within lake, but is not as widespread as EWM and is more colonized.
  - •Harvesting (as is) may spread CLP and create water quality issues (phosphorus & algae).

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Planning Process



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Implementation Plan

Goal 1: Maintain Current Recreational Opportunities & Aesthetics of Williams Lake

Management Actions

1. Mechanical harvesting to control Eurasian water milfoil.

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Implementation Plan

2000 Harvest Plan



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Implementation Plan

Proposed Harvest Plan



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Implementation Plan

Goal 2: Reduce Occurrence of Curly-leaf Pondweed

Management Actions

1. Early-season harvesting of curly-leaf pondweed.

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Implementation Plan

Proposed Harvest Plan



Onterra LLC

Implementation Plan

Goal 3: Maintain Current Water Quality Conditions

Management Actions

1. Continue water quality monitoring, but enhance to include water chemistry.
2. Reduce phosphorus and sediment loads from immediate watershed (shoreland properties).

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Thank You

Many of the graphics used in this presentation were supplied by:

Wisconsin Lakes Partnership

UW Extension

Onterra LLC

B

APPENDIX B

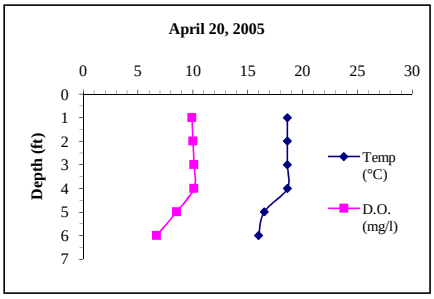
Water Quality Data

Williams Lake

Date: 04-20-05
Time: 10:15
Weather: Overcast, misting, breezy
Ent: EJH **Verf:** EJH

Max Depth (ft): 6.8
WILLS Depth (ft): 1.5
WILLB Depth (ft): 4.5
Secchi Depth (ft): 5.5

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	18.6	9.9	9.0	284
2.0	18.6	10.0	9.0	284
3.0	18.6	10.1	9.0	284
4.0	18.6	10.1	9.0	284
5.0	16.5	8.5	8.3	304
6.0	16.0	6.7	8.1	314



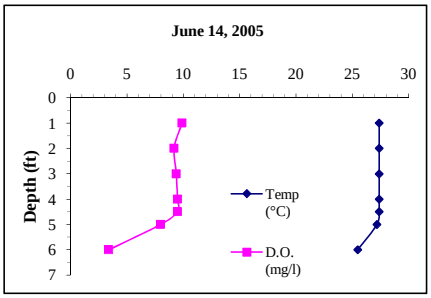
Parameter	WILLS	WILLB
Total P (µg/L)	24.00	16.00
Dissolved P (µg/L)	ND	ND
Chl a (µg/L)	7.21	
TKN (µg/L	580.00	600.00
NO4+NO3-N (µg/L)	ND	ND
NH3-N (µg/L)	21.000	29.000
Total N (µg/L)	580.00	600.00
Lab Cond. (µS/cm)	280	283
Lab pH	8.47	8.44
Alkal (mg/l CaCO3)	138	139
Total Susp Sol (mg/l)	ND	ND
Calcium (mg/l)	34.1	

Williams Lake

Date: 06-14-05
Time: 10:38
Weather: 80% Clound, Windy, 75°F
Ent: EJH **Verf:**

Max Depth (ft): 7.0
WILLS Depth (ft): 1.5
WILLB Depth (ft): 4.5
Secchi Depth (ft): 5.6

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	27.4	9.9	9.8	231
2.0	27.4	9.2	9.8	231
3.0	27.4	9.4	9.8	231
4.0	27.4	9.5	9.8	231
4.5	27.4	9.5	9.8	232
5.0	27.2	8.0	9.6	237
6.0	25.5	3.4	8.5	282



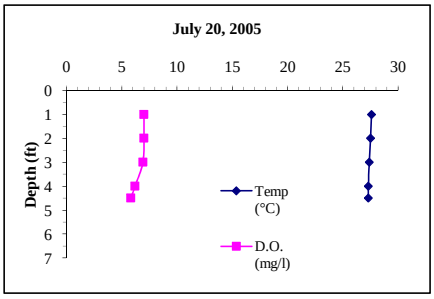
Parameter	WILLS	WILLB
Total P (µg/L)	26.000	24.000
Dissolved P (µg/L)		
Chl a (µg/L)	2.51	
TKN (µg/L		
NO4+NO3-N (µg/L)		
NH3-N (µg/L)		
Total N (µg/L)		
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	ND	ND
Calcium (mg/l)		

Williams Lake

Date: 07-20-05
Time: 10:30
Weather: Just after thunderstorm, light rain 69°F
Ent: EJH **Verf:** EJH

Max Depth (ft): 5.0
WILLS Depth (ft): 1.5
WILLB Depth (ft): 3.5
Secchi Depth (ft): 3.7

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	27.6	7.0	9.0	273
2.0	27.5	7.0	9.0	275
3.0	27.4	6.9	8.9	275
4.0	27.3	6.2	8.8	277
4.5	27.3	5.8	8.7	279



Parameter	WILLS	WILLB
Total P (µg/L)	44.000	37.000
Dissolved P (µg/L)	5.000	3.000
Chl a (µg/L)	2.77	
TKN (µg/L	990.00	970.00
NO4+NO3-N (µg/L)	ND	ND
NH3-N (µg/L)	29.000	31.000
Total N (µg/L)	990.00	970.00
Lab Cond. (µS/cm)	270	273
Lab pH	8.22	8.19
Alkal (mg/l CaCO3)	132	133
Total Susp Sol (mg/l)	4	4
Calcium (mg/l)		

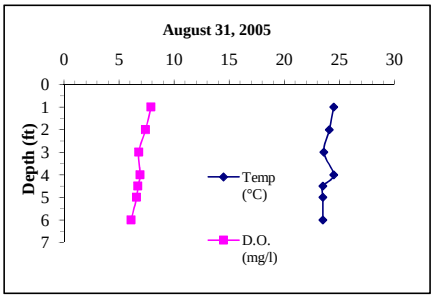
SLOH received sample with ice melted

Williams Lake

Date: 08-31-05
Time: 12:02
Weather: 30% Clouds, slight breeze, 75°F
Ent: EJH **Verf:** EJH

Max Depth (ft): 6.1
WILLS Depth (ft): 1.5
WILLB Depth (ft): 4.5
Secchi Depth (ft): 6.1

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	24.5	7.9	9.2	267
2.0	24.1	7.4	9.0	272
3.0	23.6	6.8	8.8	276
4.0	24.5	6.9	8.9	274
4.5	23.5	6.7	8.8	275
5.0	23.5	6.6	8.8	244
6.0	23.5	6.1	8.6	282



Parameter	WILLS	WILLB
Total P (µg/L)	29.00	76.00
Dissolved P (µg/L)		
Chl a (µg/L)	4.13	
TKN (µg/L		
NO4+NO3-N (µg/L)		
NH3-N (µg/L)		
Total N (µg/L)		
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	ND	41
Calcium (mg/l)		

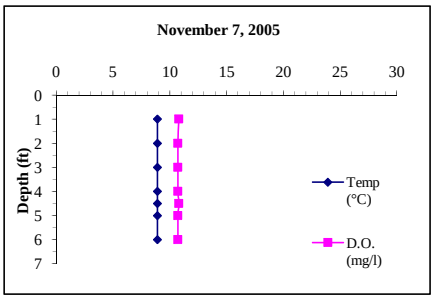
Secchi disk hit bottom

Williams Lake

Date: 11-07-05
Time: 9:06
Weather: 95% Cloud, no wind, 8°C
Ent: EJH **Verf:** EJH

Max Depth (ft): 6.2
WILLS Depth (ft): 1.5
WILLB Depth (ft): 4.5
Secchi Depth (ft): 6.2

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	8.9	10.8	6.8	250
2.0	8.9	10.7	6.8	251
3.0	8.9	10.7	6.8	250
4.0	8.9	10.7	6.8	250
4.5	8.9	10.8	6.8	250
5.0	8.9	10.7	6.8	250
6.0	8.9	10.7	6.8	250



Parameter	WILLS	WILLB
Total P (µg/L)	27.000	29.000
Dissolved P (µg/L)		
Chl a (µg/L)	6.87	
TKN (µg/L		
NO4+NO3-N (µg/L)		
NH3-N (µg/L)		
Total N (µg/L)		
Lab Cond. (µS/cm)		
Lab pH		
Alkal (mg/l CaCO3)		
Total Susp Sol (mg/l)	ND	ND
Calcium (mg/l)		

Method blank LOD Criteria exceeded for Phosphorus Secchi disk hit bottom

Water Quality Data

2005	Surface		Bottom	
Parameter	Count	Mean	Count	Mean
Secchi Depth (feet)	6	5.5		
Total P (µg/L)	5	30.000	5	36.400
Dissolved P (µg/L)	3	2.333	3	1.667
Chl a (µg/L)	5	4.698	0	
TKN (µg/L	2	785.000	2	785.000
NO4+NO3-N (µg/L)	2	0.000	2	0.000
NH3-N (µg/L)	2	25.000	2	30.000
Total N (µg/L)	2	785.000	2	785.000
Lab Cond. (µS/cm)	2	275.000	2	278.000
Lab pH	2	8.345	2	8.315
Alkal (mg/l CaCO3)	2	135.000	2	136.000
Total Susp Sol (mg/l)	6	0.667	6	7.500
Calcium (µg/L)	1	34.1	0	

Wisconsin Trophic State Index (WTSI)			
Year	TP	Chla	SD
1990			53.45
1991			51.30
1999			53.22
2000			53.92
2001			50.52
2002			52.12
2003			50.42
2004			56.55
2005	55.35	43.34	53.55
All Years (weighted)	55.35	43.34	52.67
WI Natural Lakes	53.19	54.23	47.33
Central Region	51.45	49.88	47.33

Morphological / Geographical Data

Parameter	Value
Acreage	72.4 w/ Packer's Bay
Volume (acre-feet)	258.8
Perimeter (miles)	2.35
Shoreland Development	1.97
Maximum Depth (feet)	6
County	Marquette County
WBIC	168300
Lillie Mason Region(1983)	Central Region
Nichols Ecoregion(1999)	NCSE

Watershed Data

WiLMS Class	Acreage	kg/yr	lbs/yr
Forest	849.4	31	68.3
Open Water	63.0	8	17.6
Pasture/Grass	213.3	26	57.3
Row Crops	135.7	55	121.3
Urban - Rural Residential	21.4	1	2.2
Wetland	204.0	8	17.6
Metcalf Lake Watershed	673.7	35.6	78.5

Watershed to Lake Area 33:1

	Secchi (feet)				Chlorophyll a (µg/L)				Phosphorus (µg/L)			
	Growing Season		Summer		Growing Season		Summer		Growing Season		Summer	
Year	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean
1990	6	5.3	3	5.2								
1991	5	4.6	3	6.0								
1999	7	5.3	5	5.3								
2000	7	5.3	4	5.0								
2001	5	6.0	3	6.3								
2002	5	5.9	3	5.7								
2003	4	6.4	4	6.4								
2004	5	4.4	3	4.2								
2005	5	5.4	3	5.1	5	4.70	2	3.14	5	30.00	3	33.00
All Years (weighted)		5.4		5.5		4.7		3.1		30.0		33
WI Natural Lakes				7.9				13.4				25
Central Region				7.9				7.5				20

C

APPENDIX C

2005 Aquatic Plant Survey Data

Plot Number	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft) (U = unreachable)	Sediment type (M=muck, S=Sand, R=Rock)	Rake pole (R);Visual (V)	Myriophyllum spicatum	Potamogeton crispus	Nymphea odorata	Nuphar variagata	Elodea canadensis	Ceratophyllum demersum	Lemna minor	Potamogeton pussilis	Stuckenia pectinata	Potamogeton zostriformis	Najas flexilis	Utricularia vulgaris	Myriophyllum sibericum	Potamogeton illioniensis	Chara sp.	Potamogeton richardsonii	Spriodella polyrrhiza	Potamogeton gramineus	Schoenoplectus aCutus	Typha latifolia	Carex commosa	Eleocharis acicularis	Schoenoplectus pungens	Iris versicolor	Brasenia schreberi	Sagitaria latifolia	Elodea nuttalii	Lemna trisulca	Heteranthera dubia	Vallsneria americana
1	43.757875	-89.376117	U																																
2	43.757877	-89.376489	U																																
3	43.757879	-89.376862	U																																
4	43.757881	-89.377235	U																																
5	43.757883	-89.377607	U																																
6	43.758143	-89.375741	U																																
7	43.758145	-89.376114	U																																
8	43.758147	-89.376487	U																																
9	43.75815	-89.376859	U																																
10	43.758152	-89.377232	U																																
11	43.758154	-89.377605	U																																
12	43.758409	-89.374993	U																																
13	43.758411	-89.375366	U																																
14	43.758414	-89.375738	U																																
15	43.758416	-89.376111	U																																
16	43.758418	-89.376484	U																																
17	43.75842	-89.376856	U																																
18	43.758422	-89.377229	U																																
19	43.758424	-89.377602	U																																
20	43.758671	-89.3735	U																																
21	43.758673	-89.373872	U																																
22	43.758675	-89.374245	U																																
23	43.758677	-89.374618	U																																
24	43.75868	-89.37499	U																																
25	43.758682	-89.375363	U																																
26	43.758684	-89.375736	U																																
27	43.758686	-89.376108	U																																
28	43.758688	-89.376481	U																																
29	43.75869	-89.376854	U																																
30	43.758692	-89.377226	U																																
31	43.758694	-89.377599	2	M	P			1	1		1																								
32	43.758937	-89.372752	U																																
33	43.758939	-89.373124	U																																
34	43.758941	-89.373497	U																																
35	43.758944	-89.37387	U																																
36	43.758946	-89.374242	U																																
37	43.758948	-89.374615	U																																
38	43.75895	-89.374988	U																																

Plot Number	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft) (U = unreachable)	Sediment type (M=muck, S=Sand, R=Rock)	Rake pole (R);Visual (V)	Myriophyllum spicatum	Potamogeton crispus	Nymphea odorata	Nuphar variagata	Elodea canadensis	Ceratophyllum demersum	Lemna minor	Potamogeton pussilis	Stuckenia pectinata	Potamogeton zostriformis	Najas flexilis	Utricularia vulgaris	Myriophyllum sibericum	Potamogeton illioniensis	Chara sp.	Potamogeton richardsonii	Spriodella polyrrhiza	Potamogeton gramineus	Schoenoplectus acutus	Typha latifolia	Carex commosa	Eleocharis acicularis	Schoenoplectus pungens	Iris versicolor	Brasenia schreberi	Sagitaria latifolia	Elodea nuttalii	Lemna trisulca	Heteranthera dubia	Vallsneria americana
39	43.758952	-89.37536	U																																
40	43.758954	-89.375733	U																																
41	43.758956	-89.376106	5	M	P	1		1	1	1																									
42	43.758958	-89.376478	4	M	P	1		1	1				1			1	1																		
43	43.75896	-89.376851	4	M	P	1		1	1	1						1																			
44	43.758962	-89.377223	2	M	P	1		1	1					1	1	1		1	1																
45	43.758964	-89.377596	1	M	P	2		1		1	1		1																						
46	43.759205	-89.372376	U																																
47	43.759207	-89.372749	U																																
48	43.75921	-89.373121	U																																
49	43.759212	-89.373494	3	M	P	1		1						1			1																		
50	43.759214	-89.373867	U																																
51	43.759216	-89.374239	2	M	P	2		1		1	1				1	1																			
52	43.759218	-89.374612	0.5	M	P	1		1		1							1																		
53	43.75922	-89.374985	5	M	P	1		1		1					1		1																		
54	43.759222	-89.375357	5	M	P	1		1		1	1			1					1																
55	43.759224	-89.37573	5	M	P	2		1		1																									
56	43.759226	-89.376103	5	M	P	1		1		1					1	1																			
57	43.759228	-89.376475	5	M	P	1		1	1	1									1																
58	43.75923	-89.376848	U																																
59	43.759232	-89.377221	U																																
60	43.759234	-89.377593	U																																
61	43.759476	-89.372373	U																																
62	43.759478	-89.372746	U																																
63	43.75948	-89.373119	2	M	P			1																											
64	43.759482	-89.373491	2	M	P	1		1			1																								
65	43.759484	-89.373864	5	M	P	1		1		1					1	1			1	1															
66	43.759486	-89.374237	5	M	P	1		1		1						1			1	1															
67	43.759488	-89.374609	5	M	P	1				1						1			1	1															
68	43.75949	-89.374982	5	M	P	1				1						1					1														
69	43.759492	-89.375355	5	M	P											1					1														
70	43.759494	-89.375727	6	M	P											1	1				1														
71	43.759496	-89.3761	5	M	P	1		1							1	1				1	1														
72	43.759498	-89.376473	5	M	V	1		1		1		1		1	1																				
73	43.7595	-89.376845	U																																
74	43.759502	-89.377218	U																																
75	43.759748	-89.372743	1	M	V	1		1			1	1									1	1													
76	43.75975	-89.373116	3	M	P	1																													

Plot Number	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft) (U = unreachable)	Sediment type (M=muck, S=Sand, R=Rock)	Rake pole (R);Visual (V)	Myriophyllum spicatum	Potamogeton crispus	Nymphea odorata	Nuphar variagata	Elodea canadensis	Ceratophyllum demersum	Lemna minor	Potamogeton pussilis	Stuckenia pectinata	Potamogeton zostriformis	Najas flexilis	Utricularia vulgaris	Myriophyllum sibericum	Potamogeton illioniensis	Chara sp.	Potamogeton richardsonii	Spriodella polyrrhiza	Potamogeton gramineus	Schoenoplectus acutus	Typha latifolia	Carex commosa	Eleocharis acicularis	Schoenoplectus pungens	Iris versicolor	Brasenia schreberi	Sagitaria latifolia	Elodea nuttalii	Lemna trisulca	Heteranthera dubia	Vallsneria americana
77	43.759752	-89.373488	5	M	P	3										1			1																	
78	43.759754	-89.373861	5	M	P											1			1	1	1															
79	43.759756	-89.374234	5	M	P	1										1				1																
80	43.759758	-89.374606	5	M	P		1									1			1	1	1															
81	43.75976	-89.374979	5	M	P											1	1		1		1															
82	43.759762	-89.375352	5	M	P	1										1			1	1																
83	43.759764	-89.375724	6	M	P	1										1	1		1		1															
84	43.759766	-89.376097	4	M	V	1		1		1				1	1		1		1		1															
85	43.759768	-89.37647	U																																	
86	43.760016	-89.372368	2	M	P	1					1					1			1	1																
87	43.760018	-89.37274	3	M	P											1																				
88	43.76002	-89.373113	4	M	P	1										1			1																	
89	43.760022	-89.373486	4	M	P											1			1	1																
90	43.760024	-89.373858	4	M	P	1										1			1	1																
91	43.760026	-89.374231	5	M	P											1			1	1																
92	43.760028	-89.374604	5	M	P											1			1		1															
93	43.76003	-89.374976	5	M	P	1	1									1			1		1															
94	43.760032	-89.375349	5	M	P	1										1	1		1	1	1															
95	43.760034	-89.375722	6	M	P											1			1	1	1															
96	43.760036	-89.376094	5	M	P	2		1	1						1				1		1															
97	43.760038	-89.376467	U																																	
98	43.760286	-89.372365	3	M	P	1										1			1																	
99	43.760288	-89.372737	4	M	P											1			1																	
100	43.76029	-89.37311	4	M	P	1										1			1	1																
101	43.760292	-89.373483	5	M	P	1										1			1	1																
102	43.760294	-89.373855	5	M	P	1										1			1	1																
103	43.760296	-89.374228	5	M	P	1					1					1			1																	
104	43.760298	-89.374601	6	M	P											1			1																	
105	43.7603	-89.374973	6	M	P														1																	
106	43.760302	-89.375346	5	M	P	1										1		1	1																	
107	43.760304	-89.375719	4	M	P	1										1				1	1															
108	43.760306	-89.376091	U																																	
109	43.760308	-89.376464	U																																	
110	43.760556	-89.372362	1	M	P	1		1						1		1																				
111	43.760558	-89.372735	4	M	P	2					1					1			1	1																
112	43.76056	-89.373107	4	M	P	1								1		1			1	1																
113	43.760562	-89.37348	5	M	P	1										1			1	1																
114	43.760564	-89.373853	5	M	P	1										1			1		1		1													

Plot Number	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft) (U = unreachable)	Sediment type (M=muck, S=Sand, R=Rock)	Rake pole (R);Visual (V)	Myriophyllum spicatum	Potamogeton crispus	Nymphea odorata	Nuphar variagata	Elodea canadensis	Ceratophyllum demersum	Lemna minor	Potamogeton pussilis	Stuckenia pectinata	Potamogeton zostriformis	Najas flexilis	Utricularia vulgaris	Myriophyllum sibericum	Potamogeton illioniensis	Chara sp.	Potamogeton richardsonii	Spriodella polyrrhiza	Potamogeton gramineus	Schoenoplectus acutus	Typha latifolia	Carex commosa	Eleocharis acicularis	Schoenoplectus pungens	Iris versicolor	Brasenia schreberi	Sagitaria latifolia	Elodea nuttalii	Lemna trisulca	Heteranthera dubia	Vallsneria americana
115	43.760566	-89.374225	5	M	P										1			1																	
116	43.760568	-89.374598	6	M	P	1									1			1		1																
117	43.76057	-89.374971	5	M	P		1											1				1														
118	43.760572	-89.375343	5	M	P	1									1			1		1																
119	43.760574	-89.375716	4	M	P	1												1	1																	
120	43.760576	-89.376089	U																																
121	43.760578	-89.376461	U																																
122	43.760828	-89.372732	3	M	P	2				1	1				1			1																		
123	43.76083	-89.373105	4	M	P	1									1			1	1																	
124	43.760832	-89.373477	6	M	P					1					1			1	1																	
125	43.760834	-89.37385	6	M	P										1			1	1																	
126	43.760836	-89.374223	6	M	P										1	1		1	1																	
127	43.760838	-89.374595	6	M	P										1	1		1	1																	
128	43.76084	-89.374968	5	M	P	1									1	1		1		1																
129	43.760842	-89.375341	6	M	P										1			1																		
130	43.760844	-89.375713	2	M	P	2		1		1					1				1																	
131	43.7611	-89.373102	1	M	P	1		1							1				1																	
132	43.761102	-89.373474	3	M	P	1									1			1	1																	
133	43.761104	-89.373847	6	M	P	1									1			1	1																	
134	43.761106	-89.37422	6	M	P	1									1			1	1																	
135	43.761108	-89.374592	6	M	P										1			1																		
136	43.76111	-89.374965	6	M	P														1	1																
137	43.761112	-89.375338	6	M	P	1		1		1					1			1	1																	
138	43.761115	-89.37571	2	M	P	1				1					1		1	1	1																	
139	43.76137	-89.373099	1	M	P	1		1			1							1	1			1	1	1	1										
140	43.761372	-89.373472	1	M	P	1		1	1						1	1		1	1																	
141	43.761374	-89.373844	4	M	P	2									1			1	1																	
142	43.761376	-89.374217	5	M	P	1									1			1	1																	
143	43.761378	-89.37459	5	M	P										1				1																	
144	43.761381	-89.374962	5	M	P	1									1			1	1																	
145	43.761383	-89.375335	5	M	P	1									1				1		1															
146	43.761385	-89.375708	5	M	P	1									1				1																	
147	43.761387	-89.37608	2	M	P			1			1				1			1	1																	
148	43.761389	-89.376453	1	M	P	1		1	1					1									1												
149	43.761642	-89.373469	1	M	P	1		1														1	1												
150	43.761645	-89.373841	1	M	P					1					1				1																	
151	43.761647	-89.374214	1	M	P	1									1				1																	
152	43.761649	-89.374587	6	M	P										1			1	1																	

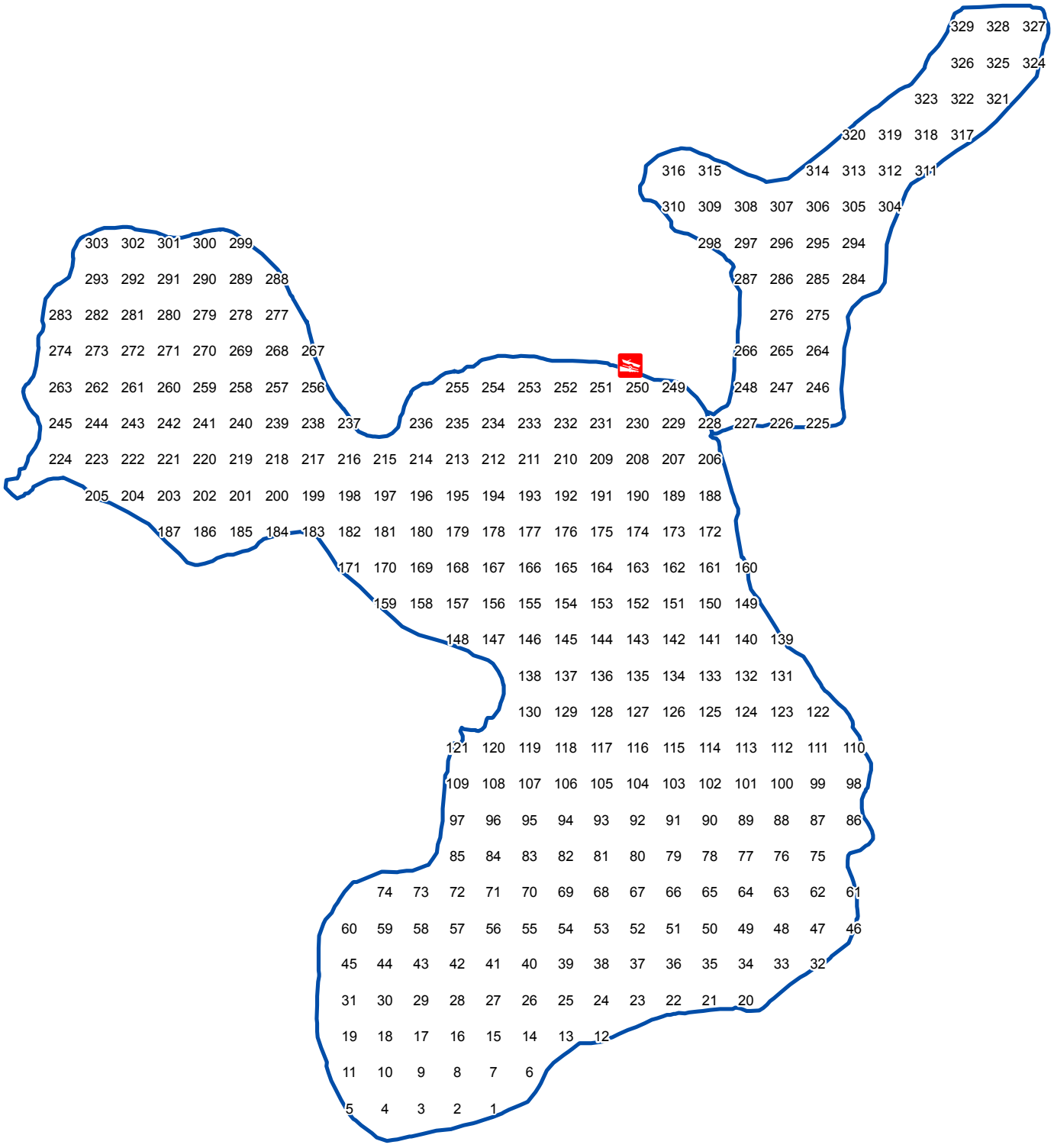
Plot Number	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft) (U = unreachable)	Sediment type (M=muck, S=Sand, R=Rock)	Rake pole (R);Visual (V)	Myriophyllum spicatum	Potamogeton crispus	Nymphea odorata	Nuphar variagata	Elodea canadensis	Ceratophyllum demersum	Lemna minor	Potamogeton pussilis	Stuckenia pectinata	Potamogeton zostriformis	Najas flexilis	Utricularia vulgaris	Myriophyllum sibericum	Potamogeton illioniensis	Chara sp.	Potamogeton richardsonii	Spriodella polyrrhiza	Potamogeton gramineus	Schoenoplectus acutus	Typha latifolia	Carex commosa	Eleocharis acicularis	Schoenoplectus pungens	Iris versicolor	Brasenia schreberi	Sagitaria latifolia	Elodea nuttalii	Lemna trisulca	Heteranthera dubia	Vallsneria americana
153	43.761651	-89.374959	5	M	P	1										1			1	1																
154	43.761653	-89.375332	4	M	P	1										1			1	1																
155	43.761655	-89.375705	4	M	P	1										1			1	1																
156	43.761657	-89.376077	4	M	P	1								1		1			1																	
157	43.761659	-89.37645	4	M	P					1				1		1			1	1																
158	43.761661	-89.376823	2	M	P	1				1									1						1											
159	43.761663	-89.377195	0.5	M	P	3		1	1	1			1	1												1										
160	43.761913	-89.373466	0.5	S	P	1		1		1				1						1			1				1									
161	43.761915	-89.373839	2	M	P	2		1								1			1	1																
162	43.761917	-89.374211	4	M	P	2										1			1	1																
163	43.761919	-89.374584	6	M	P	1										1			1	1																
164	43.761921	-89.374957	6	M	P	2										1			1	1																
165	43.761923	-89.375329	6	M	P	2										1			1	1																
166	43.761925	-89.375702	6	M	P	2										1			1																	
167	43.761927	-89.376075	6	M	P	1													1	1																
168	43.761929	-89.376447	6	M	P	1										1			1	1																
169	43.761931	-89.37682	5	M	P	1								1		1			1	1																
170	43.761933	-89.377193	4	M	P	1		1								1			1	1																
171	43.761935	-89.377565	2	M	P	2		1												1	1				1											
172	43.762185	-89.373836	2	M	P			1												1			1													
173	43.762187	-89.374208	5	M	P					1						1				1																
174	43.762189	-89.374581	4	M	P	2										1																				
175	43.762191	-89.374954	5	M	P	1										1			1	1																
176	43.762193	-89.375326	6	M	P	1										1			1	1																
177	43.762195	-89.375699	6	M	P	1										1			1	1																
178	43.762197	-89.376072	6	M	P											1			1	1																
179	43.762199	-89.376445	6	M	P	1										1			1																	
180	43.762201	-89.376817	5	M	P	1										1			1	1																
181	43.762203	-89.37719	5	M	P											1			1	1																
182	43.762205	-89.377563	3	M	P	1		1		1						1			1	1	1															
183	43.762207	-89.377935	1	M	P	2		1	1						1	1				1		1		1			1								
184	43.762209	-89.378308	0.5	M	P	2		1	1					1		1						1				1	1	1								
185	43.762211	-89.378681	1	M	P	2		1	1														1						1						
186	43.762213	-89.379053	1	M	P	1		1	1	1	1									1	1															
187	43.762215	-89.379426	2	M	P	2		1	1						1											1				1					
188	43.762455	-89.373833	3	M	P	1		1											1	1			1													
189	43.762457	-89.374206	3	M	P	1										1				1																
190	43.762459	-89.374578	6	M	P	1										1			1	1																

Plot Number	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft) (U = unreachable)	Sediment type (M=muck, S=Sand, R=Rock)	Rake pole (R);Visual (V)	Myriophyllum spicatum	Potamogeton crispus	Nymphea odorata	Nuphar variagata	Elodea canadensis	Ceratophyllum demersum	Lemna minor	Potamogeton pussilis	Stuckenia pectinata	Potamogeton zostriformis	Najas flexilis	Utricularia vulgaris	Myriophyllum sibericum	Potamogeton illioniensis	Chara sp.	Potamogeton richardsonii	Spriodella polyrrhiza	Potamogeton gramineus	Schoenoplectus acutus	Typha latifolia	Carex commosa	Eleocharis acicularis	Schoenoplectus pungens	Iris versicolor	Brasenia schreberi	Sagitaria latifolia	Elodea nuttalii	Lemna trisulca	Heteranthera dubia	Vallsneria americana
191	43.762461	-89.374951	6	M	P	1										1			1	1															
192	43.762463	-89.375324	6	M	P	1										1			1	1															
193	43.762465	-89.375696	5	M	P											1			1	1															
194	43.762467	-89.376069	5	M	P	1										1			1	1															
195	43.762469	-89.376442	5	M	P	1										1			1	1															
196	43.762471	-89.376814	5	M	P	1										1			1	1															
197	43.762473	-89.377187	5	M	P	1										1			1	1															
198	43.762475	-89.37756	6	M	P														1	1															
199	43.762477	-89.377932	6	M	P	1				1						1			1	1															
200	43.762479	-89.378305	6	M	P											1			1																
201	43.762481	-89.378678	5	M	P	1							1	1		1			1																
202	43.762483	-89.37905	5	M	P	1							1	1		1			1	1															
203	43.762485	-89.379423	4	M	P	2		1								1			1	1															
204	43.762487	-89.379796	3	M	P	2		1									1				1														
205	43.762489	-89.380169	2	M	P	1		1									1				1		1												
206	43.762725	-89.37383	2	M	P	1		1												1			1												
207	43.762727	-89.374203	3	M	P									1																					
208	43.762729	-89.374575	5	M	P	1								1						1															
209	43.762731	-89.374948	6	M	P									1						1															
210	43.762733	-89.375321	6	M	P	1								1																					
211	43.762735	-89.375694	6	M	P	2										1			1	1															
212	43.762737	-89.376066	6	M	P	1										1			1	1															
213	43.762739	-89.376439	6	M	P											1			1	1															
214	43.762741	-89.376812	5	M	P											1			1	1			1												
215	43.762743	-89.377184	3	M	P	2		1															1												
216	43.762745	-89.377557	4	M	P	1										1				1															
217	43.762747	-89.37793	5	M	P											1			1																
218	43.762749	-89.378302	6	M	P											1			1																
219	43.762751	-89.378675	6	M	P											1			1																
220	43.762753	-89.379048	6	M	P											1			1																
221	43.762755	-89.37942	6	M	P											1			1																
222	43.762757	-89.379793	6	M	P											1			1																
223	43.762759	-89.380166	3	M	P			1		1	1					1				1															
224	43.762761	-89.380538	1	M	P		1	1												1															
225	43.762989	-89.372709	5	M	P	2					1				1	1				1													1			
226	43.762991	-89.373082	1	M	P	3		1		1																							1			
227	43.762993	-89.373455	0.5	M	v	2		1																				1							
228	43.762995	-89.373827	0.5	M	v	2		1						1																				1	1

Plot Number	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft) (U = unreachable)	Sediment type (M=muck, S=Sand, R=Rock)	Rake pole (R);Visual (V)	Myriophyllum spicatum	Potamogeton crispus	Nymphea odorata	Nuphar variagata	Elodea canadensis	Ceratophyllum demersum	Lemna minor	Potamogeton pussilis	Stuckenia pectinata	Potamogeton zostriformis	Najas flexilis	Utricularia vulgaris	Myriophyllum sibericum	Potamogeton illioniensis	Chara sp.	Potamogeton richardsonii	Spriodella polyrrhiza	Potamogeton gramineus	Schoenoplectus acutus	Typha latifolia	Carex commosa	Eleocharis acicularis	Schoenoplectus pungens	Iris versicolor	Brasenia schreberi	Sagitaria latifolia	Elodea nuttalii	Lemna trisulca	Heteranthera dubia	Vallsneria americana
229	43.762997	-89.3742	1	M	P	1										1					1															
230	43.762999	-89.374573	2	S	P	1															1			1												
231	43.763001	-89.374945	4	M	P	1										1					1															
232	43.763003	-89.375318	5	M	P	1													1		1															
233	43.763005	-89.375691	5	M	P	1										1			1		1															
234	43.763007	-89.376063	5	M	P	1													1		1															
235	43.763009	-89.376436	4	M	P	1										1																				
236	43.763011	-89.376809	1	M	P	2		1								1					1			1												
237	43.763015	-89.377554	0.5	M	P	2		1																1			1									
238	43.763017	-89.377927	6	M	P											1			1																	
239	43.763019	-89.3783	6	M	P											1			1																	
240	43.763021	-89.378672	6	M	P											1			1																	
241	43.763023	-89.379045	6	M	P														1					1												
242	43.763026	-89.379418	6	M	P														1																	
243	43.763028	-89.37979	5	M	P											1			1					1												
244	43.76303	-89.380163	5	M	P									1		1			1		1	1														
245	43.763032	-89.380536	U																																	
246	43.763259	-89.372706	5	M	P	2				1				1	1	1			1															1		
247	43.763261	-89.373079	5	M	P	1				1						1			1																	
248	43.763263	-89.373452	5	M	P	1				1						1					1															
249	43.763267	-89.374197	0.5	M	V	2		1		1						1																				
250	43.763269	-89.37457	1	M	P	2		1		1				1		1					1															
251	43.763271	-89.374943	1	M	P	2		1								1					1			1												
252	43.763273	-89.375315	3	M	P	1										1					1															
253	43.763275	-89.375688	3	M	P					1						1					1															
254	43.763277	-89.376061	4	M	P	1					1					1			1		1															
255	43.763279	-89.376433	3	M	P	1										1			1		1															
256	43.763288	-89.377924	0.5	M	V	2		1						1		1			1																	
257	43.76329	-89.378297	6	M	P											1			1		1															
258	43.763292	-89.378669	6	M	P														1		1															
259	43.763294	-89.379042	6	M	P	1										1			1																	
260	43.763296	-89.379415	6	M	P											1			1		1															
261	43.763298	-89.379787	6	M	P											1			1																	
262	43.7633	-89.38016	5	M	P	1										1			1		1															
263	43.763302	-89.380533	3	M	P	3		1		1					1	1					1															
264	43.763529	-89.372704	4	M	P	2				1						1			1		1														1	
265	43.763531	-89.373076	5	M	P	2				1						1																				
266	43.763533	-89.373449	3	M	P	1		1								1					1														1	

Plot Number	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft) (U = unreachable)	Sediment type (M=muck, S=Sand, R=Rock)	Rake pole (R);Visual (V)	Myriophyllum spicatum	Potamogeton crispus	Nymphea odorata	Nuphar variagata	Elodea canadensis	Ceratophyllum demersum	Lemna minor	Potamogeton pussilis	Stuckenia pectinata	Potamogeton zostriformis	Najas flexilis	Utricularia vulgaris	Myriophyllum sibericum	Potamogeton illioniensis	Chara sp.	Potamogeton richardsonii	Spriodella polyrrhiza	Potamogeton gramineus	Schoenoplectus acutus	Typha latifolia	Carex commosa	Eleocharis acicularis	Schoenoplectus pungens	Iris versicolor	Brasenia schreberi	Sagitaria latifolia	Elodea nuttalii	Lemna trisulca	Heteranthera dubia	Vallsneria americana
267	43.763558	-89.377921	0.5	S	V	1				1					1						1			1												
268	43.76356	-89.378294	6	M	P	1										1				1	1															
269	43.763562	-89.378667	6	M	P											1				1	1															
270	43.763564	-89.379039	6	M	P	1										1				1	1															
271	43.763566	-89.379412	6	M	P	1										1				1	1															
272	43.763568	-89.379785	5	M	P											1				1																
273	43.76357	-89.380157	5	M	P											1				1																
274	43.763572	-89.38053	3	M	P	1				1						1				1	1															
275	43.763799	-89.372701	4	M	P	1										1				1	1															
276	43.763801	-89.373073	5	M	P	1				1						1				1	1															
277	43.76383	-89.378291	2	S	P	2										1				1	1															
278	43.763832	-89.378664	6.5	M	P	1				1						1				1																
279	43.763834	-89.379036	6	M	P											1				1	1															
280	43.763836	-89.379409	6	M	P					1										1																
281	43.763838	-89.379782	6	M	P											1				1	1			1							1					
282	43.76384	-89.380155	5	M	P											1				1	1															
283	43.763842	-89.380527	2	M	P	1										1					1															
284	43.764067	-89.372325	8	M	P	1					1				1	1																	1			
285	43.764069	-89.372698	5	M	P					1						1				1																
286	43.764071	-89.373071	5	M	P	1										1					1															
287	43.764073	-89.373443	4	M	P	1				1						1					1															
288	43.7641	-89.378288	0.5	S	V	1							1			1																				
289	43.764102	-89.378661	5	M	P	1										1				1	1															
290	43.764104	-89.379034	6	M	P	1				1						1				1	1															
291	43.764106	-89.379406	6	M	P											1				1	1															
292	43.764108	-89.379779	6	M	P											1																				
293	43.76411	-89.380152	5	M	P											1				1	1															
294	43.764337	-89.372322	6	M	P	3				1			1			1																				
295	43.764339	-89.372695	6	M	P	1				1	1					1				1	1															
296	43.764341	-89.373068	5	M	P	1										1				1														1		
297	43.764343	-89.373441	4	M	P											1				1	1															
298	43.764346	-89.373813	1	M	P	1			1	1						1					1															
299	43.764372	-89.378658	3	M	P	1				1						1				1	1															
300	43.764374	-89.379031	2	M	P	2										1				1	1															
301	43.764376	-89.379404	0.5	M	P	2		1													1		1													
302	43.764378	-89.379776	3	M	P											1					1															
303	43.76438	-89.380149	1	S	V	3		1					1			1				1	1															
304	43.764605	-89.371947	1	M	P	2		1		1	1									1													1	1		

Plot Number	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)	Depth (ft) (U = unreachable)	Sediment type (M=muck, S=Sand, R=Rock)	Rake pole (R);Visual (V)	Myriophyllum spicatum	Potamogeton crispus	Nymphea odorata	Nuphar variagata	Elodea canadensis	Ceratophyllum demersum	Lemna minor	Potamogeton pussilis	Stuckenia pectinata	Potamogeton zostriformis	Najas flexilis	Utricularia vulgaris	Myriophyllum sibericum	Potamogeton illioniensis	Chara sp.	Potamogeton richardsonii	Spriodella polyrrhiza	Potamogeton gramineus	Schoenoplectus acutus	Typha latifolia	Carex commosa	Eleocharis acicularis	Schoenoplectus pungens	Iris versicolor	Brasenia schreberi	Sagitaria latifolia	Elodea nuttalii	Lemna trisulca	Heteranthera dubia	Vallsneria americana
305	43.764607	-89.37232	7	M	P	1					1					1				1																
306	43.764609	-89.372692	8	M	P	2				1	1					1			1																	
307	43.764612	-89.373065	8	M	P	2				1	1					1			1																	
308	43.764614	-89.373438	9	M	P	2				1				1		1			1	1																
309	43.764616	-89.37381	7	M	P	2					1					1			1	1																
310	43.764618	-89.374183	3	M	P	1				1				1						1																
311	43.764873	-89.371571	4	M	P	2				1	1			1	1					1																
312	43.764875	-89.371944	8	M	P	1				1	1					1			1				1													
313	43.764878	-89.372317	8	M	P	1	1			1	1				1				1				1													
314	43.76488	-89.37269	3	S	P					1																										
315	43.764886	-89.373808	4	M	P	1				1					1	1																				
316	43.764888	-89.37418	9	M	P	2					1				1				1																	
317	43.765141	-89.371196	7	M	P	2				1	1				1	1				1														1		
318	43.765144	-89.371569	8	M	P	2					1					1				1			1											1		
319	43.765146	-89.371941	8	M	P	3				1	1								1	1																
320	43.765148	-89.372314	3	M	P	1				1					1	1				1																
321	43.76541	-89.37082	5	M	P	1				1	1				1					1														1		
322	43.765412	-89.371193	8	M	P	2				1	1					1							1													
323	43.765414	-89.371566	4	M	P	1				1	1					1				1																
324	43.765678	-89.370445	2	M	P	2		1		1	1				1																			1		
325	43.76568	-89.370818	7	M	P	1				1	1			1		1			1	1														1		
326	43.765682	-89.37119	5	M	P	2				1	1			1	1	1			1	1																
327	43.765948	-89.370442	5	M	P	2				1									1	1														1		
328	43.76595	-89.370815	5	M	P	2				1					1					1			1													
329	43.765952	-89.371187	5	M	P	1				1	1				1	1				1																



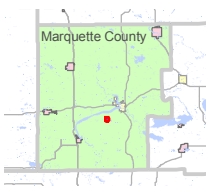
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www.onterra-eco.com

Sources:
Roads & Hydro: WDNR
P-I Locations: WDNR
Map date: December 8, 2006



Extent of large map shown in red.

Legend

\# Point-intercept Location

Public Boat Landing

Appendix C

Williams Lake

Marquette County, Wisconsin

Point-Intercept Locations