A

APPENDIX A

Public Participation Materials

Friends of Lower Nine Mile Lake, Inc.

Lower Nine Mile Lake Management Planning Project

Kick-off Meeting

July 9, 2011

Timothy A. Hoyman, CLM

Onterra LLC

Presentation Outline

- Onterra, LLC
- Why Create a Management Plan?
- Elements of a Lake Management Planning Project
  - Data & Information
  - Planning Process

Onterra, LLC

- Founded in 2005
- Staff
  - Four full-time ecologists
  - One part-time ecologist
  - One field technician
  - Two summer interns
- Services
  - Science and planning
- Philosophy
  - Promote realistic planning
  - Assist, not direct

Why Create a Lake Management Plan?

- To create a better understanding of lake's positive and negative attributes.
- To discover ways to minimize the negative attributes and maximize the positive attributes.
- To foster realistic expectations and dispel myths.
- To create a snapshot of the lake for future reference and planning.

Elements of an Effective Lake Management Plan

Data and Information Gathering

Environmental & Sociological

Planning Process

Brings it all together

Data and Information Gathering

- Study Components
  - Water Quality Analysis
  - Watershed Assessment
  - Shoreline Assessment
  - Aquatic Plant Surveys
  - Fisheries Data Integration
  - Stakeholder Survey

Water Quality

- General water chemistry (current & historic)
  - Citizens Lake Monitoring Network
- Nutrient analysis
  - Lake trophic state (Eutrophication)
  - Limiting plant nutrient
- Supporting data for watershed modeling

Watershed

- Delineation of drainage basin
- Modeling
  - Landcover
  - Phosphorus loading
  - Scenario development

Shoreline Assessment

- Shoreland area is important for buffering runoff and provides valuable habitat for aquatic and terrestrial wildlife.
- It does not look at lake shoreline on a property-by-property basis.
- Assessment ranks shoreland area from shoreline back 35 feet

Urbanized

Range

Natural

Aquatic Plants

- Concerned with both native and non-native plants
- Multiple surveys used to assess aquatic plant community
  - Curly-leaf pondweed survey
  - Point-intercept survey
  - Plant Community Mapping
- Compare with 2006 results

Curly-leaf pondweed

Eurasian Water Milfoil

Fisheries Information

- No fish sampling completed
- Assemble data from WDNR, USGS, USFWS, & GLIFWC
- Fish survey results summaries (if available)
- Use information in planning as applicable

Stakeholder Survey

- Standard survey used as base
  - Planning committee potentially develops additional questions and options
  - Must not lead respondent to specific answer through a "loaded" question
- Survey must be approved by WDNR
- Base survey will be provided planning committee today

Planning Process

Planning Committee Meetings

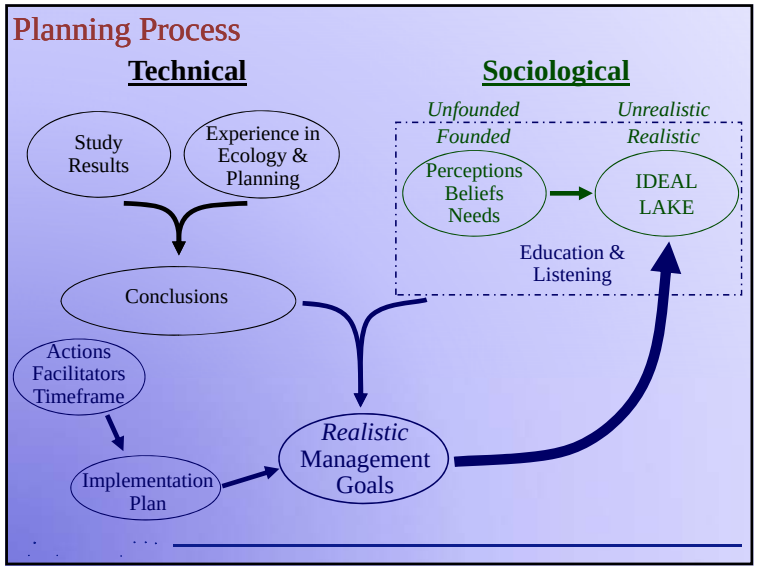
- Study Results (including a stakeholder survey)
- Conclusions & Initial Recommendations
- Management Goals
- Management Actions
  - Timeframe
  - Facilitator(s)

Presentation Outline

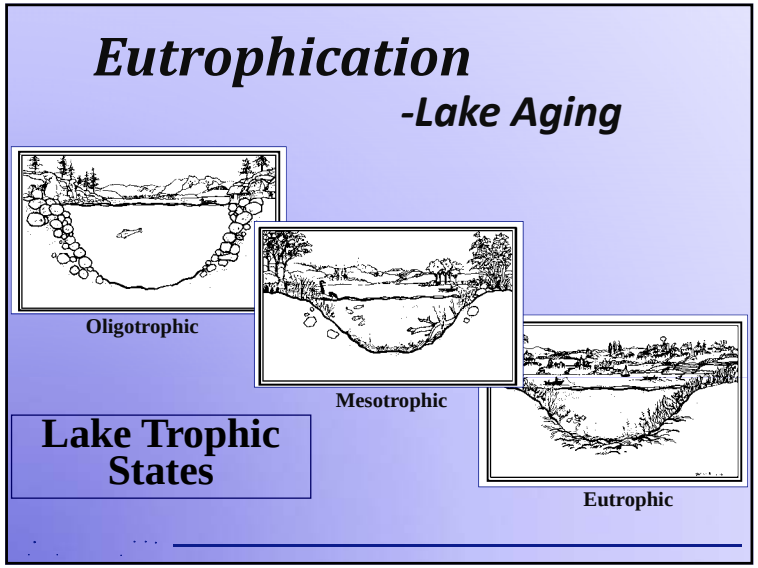
- **Lake Management Planning Project Overview**
- **Study Results**
  - Water Quality
  - Watershed
  - Aquatic Plants
  - Fishery
- **"Big Picture"**

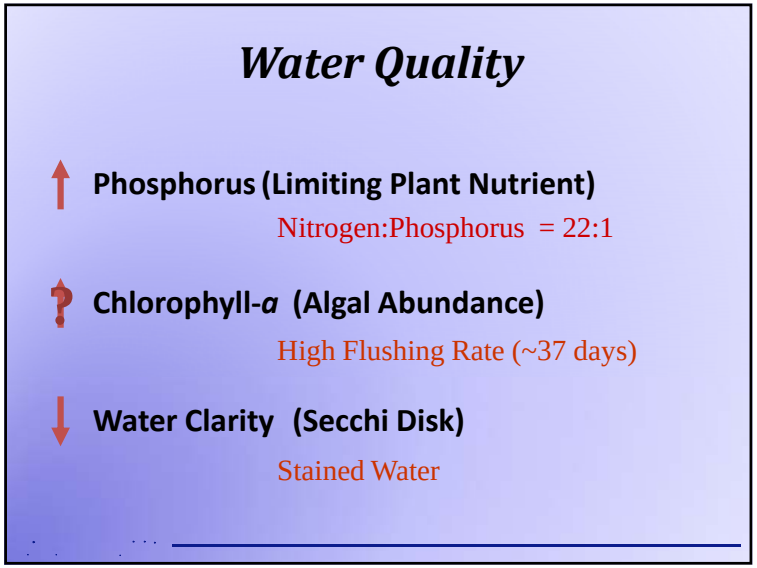
Study and Plan Goals

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

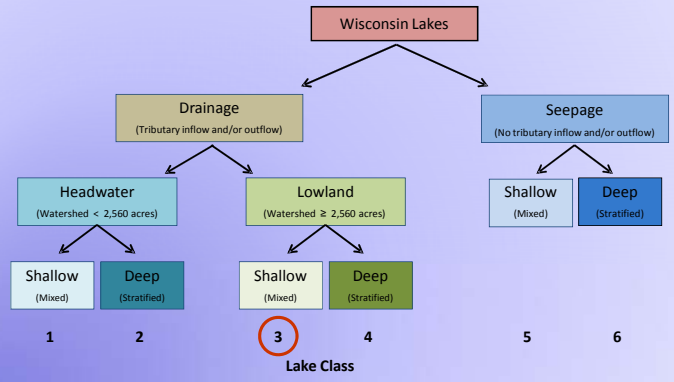

Planning Process
Technical
Sociological
Unfounded
Founded
Unrealistic
Realistic
Study Results
Experience in Ecology & Planning
Perceptions Beliefs Needs
IDEAL LAKE
Education & Listening
Conclusions
Actions Facilitators Timeframe
Implementation Plan
Realistic Management Goals

Water Quality


Eutrophication
-Lake Aging
Oligotrophic
Mesotrophic
Eutrophic
Lake Trophic States

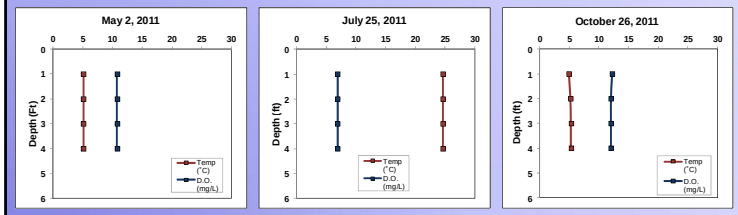

Water Quality
Phosphorus (Limiting Plant Nutrient)
Nitrogen:Phosphorus = 22:1
Chlorophyll-a (Algal Abundance)
High Flushing Rate (~37 days)
Water Clarity (Secchi Disk)
Stained Water

Wisconsin Lakes Classification



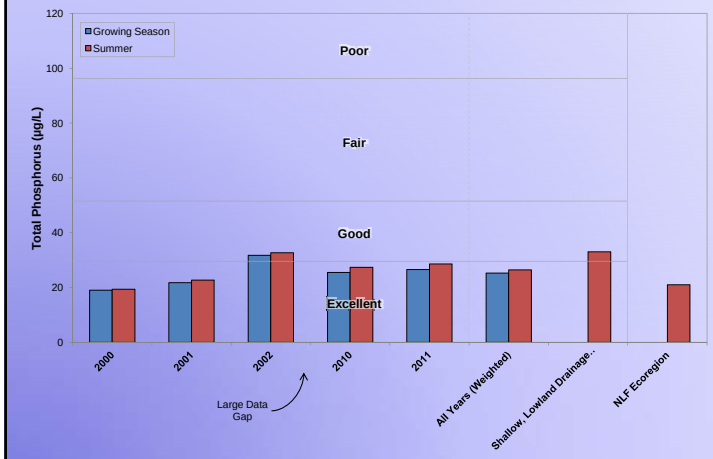
Dissolved Oxygen and Temperature Profiles

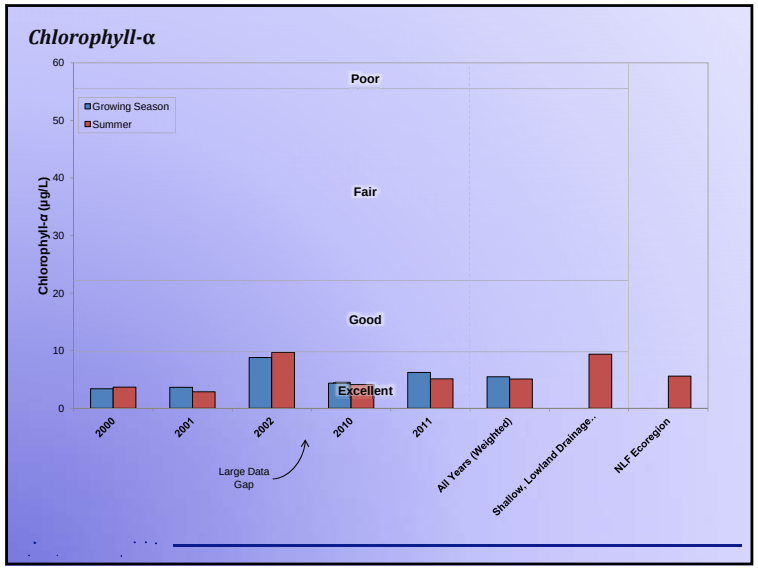
- **Dissolved Oxygen and Temperature Profiles**
  - Lake does not stratify in the summer
    - Oxygen present throughout water column
  - Winter?

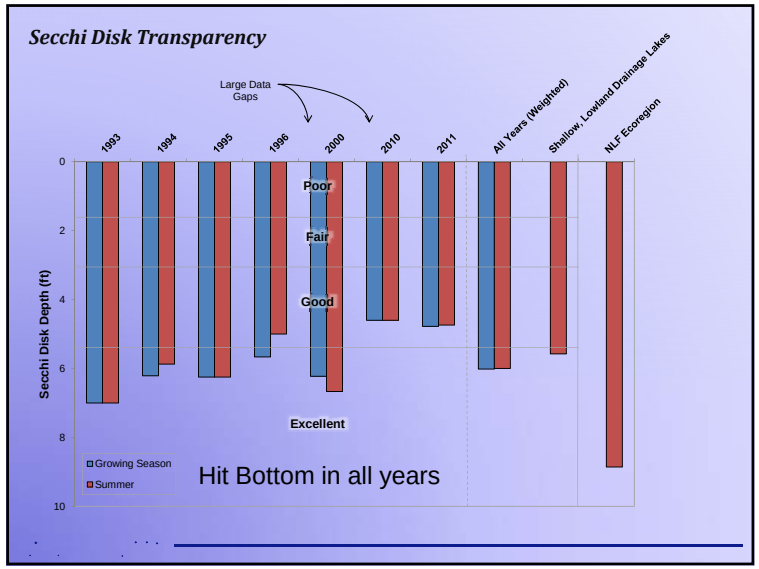


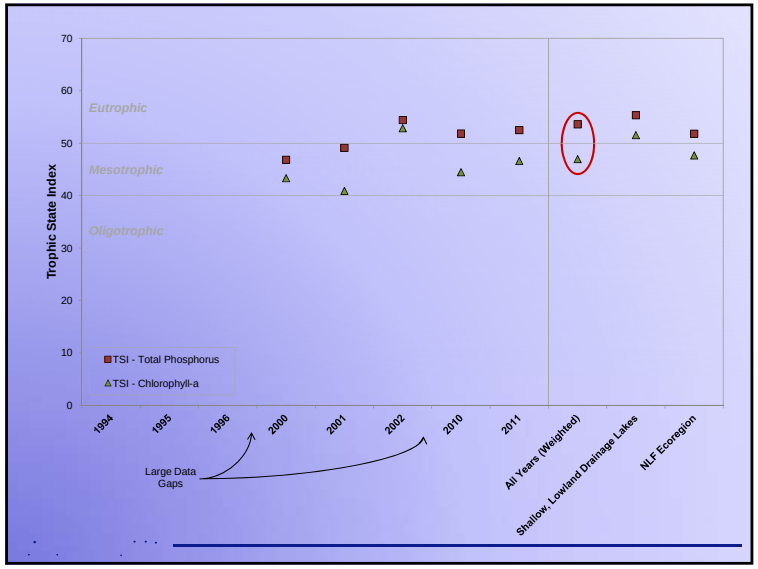
Wisconsin Ecoregions

Total Phosphorus





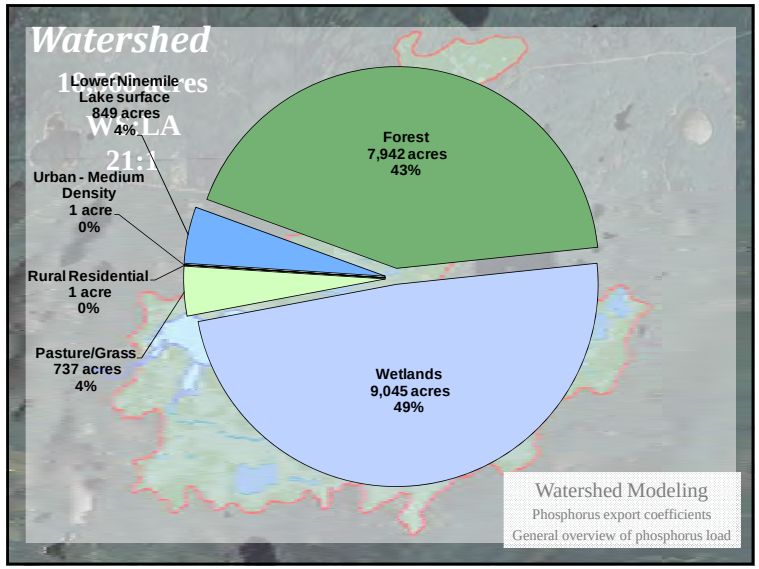


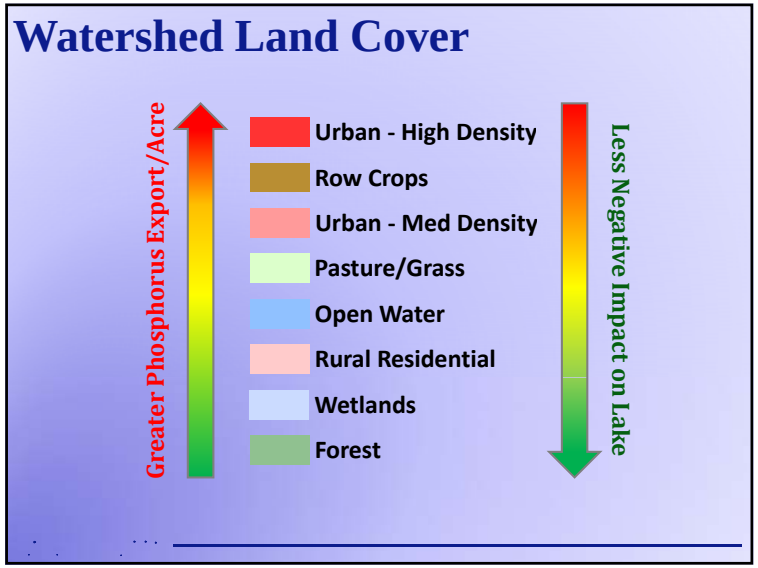


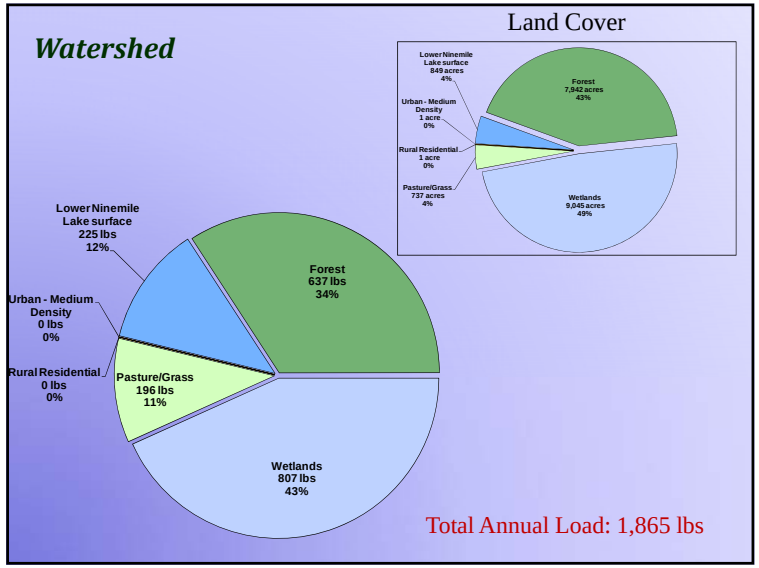
Additional Water Quality Parameters

- **Combination of pH and calcium indicates LNM has *very low* susceptibility for zebra mussel establishment**
  - 2011 plankton tows were negative for zebra mussel veligers

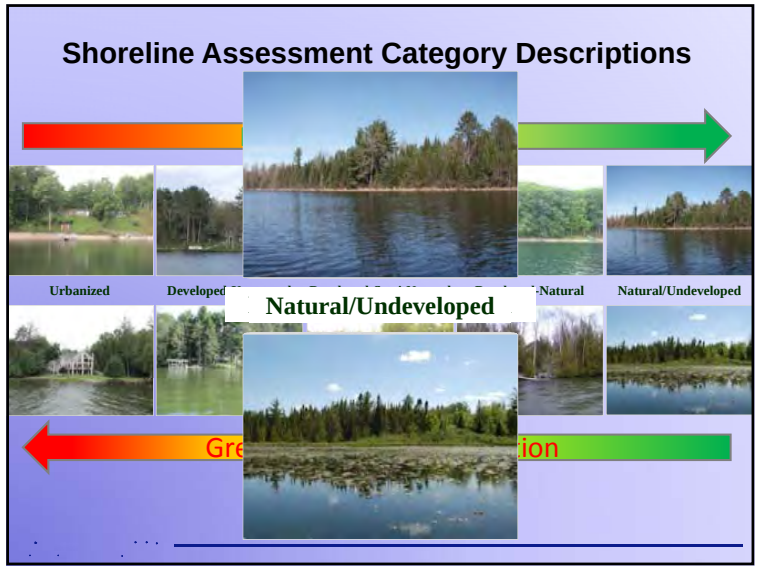
Watershed

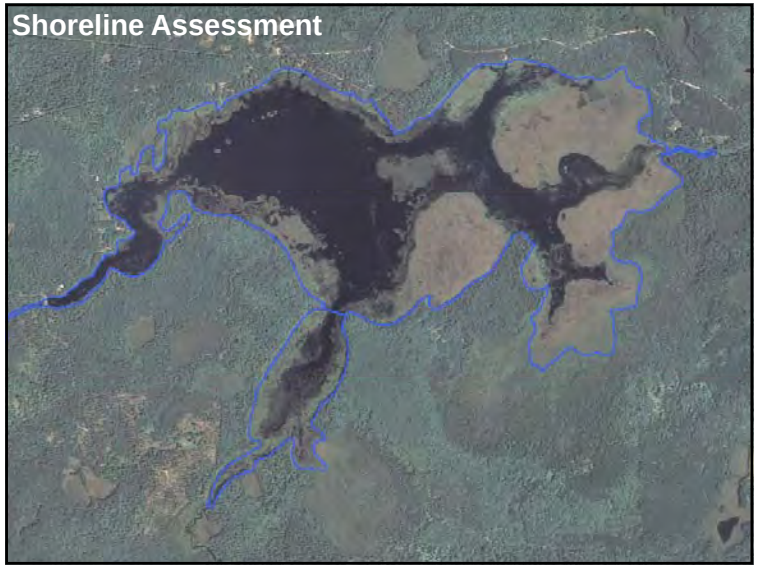

Watershed
Lower Ninemile Lake surface 849 acres 4%
Urban - Medium Density 1 acre 0%
Rural Residential 1 acre 0%
Pasture/Grass 737 acres 4%
Forest 7,942 acres 43%
Wetlands 9,045 acres 49%
Watershed Modeling
Phosphorus export coefficients
General overview of phosphorus load

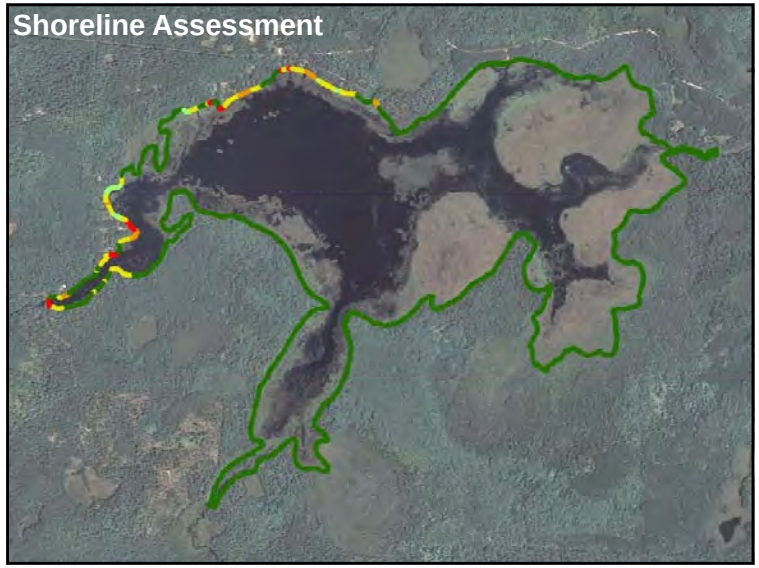

Watershed Land Cover
Greater Phosphorus Export/Acre
Urban - High Density
Row Crops
Urban - Med Density
Pasture/Grass
Open Water
Rural Residential
Wetlands
Forest
Less Negative Impact on Lake

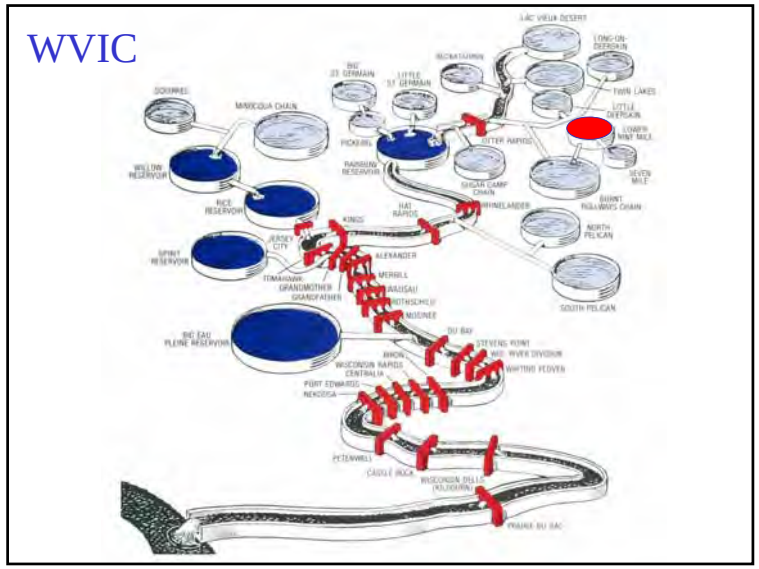

Watershed
Land Cover
Lower Ninemile Lake surface 225 lbs 12%
Urban - Medium Density 0 lbs 0%
Rural Residential 0 lbs 0%
Pasture/Grass 196 lbs 11%
Forest 637 lbs 34%
Wetlands 807 lbs 43%
Total Annual Load: 1,865 lbs

Shoreland Assessment
Shoreland area is important for buffering runoff and provides valuable habitat for aquatic and terrestrial wildlife.
It does not look at lake shoreline on a property-by-property basis.
Assessment ranks shoreland area from shoreline back 35 feet
Urbanized
Natural
Range


Shoreline Assessment Category Descriptions
Urbanized
Developed
Natural
Natural/Undeveloped
Natural/Undeveloped

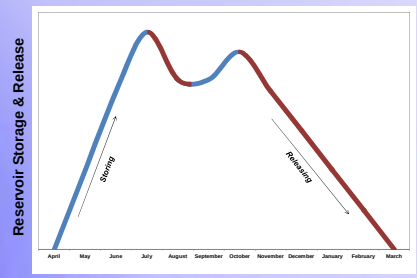

Shoreline Assessment

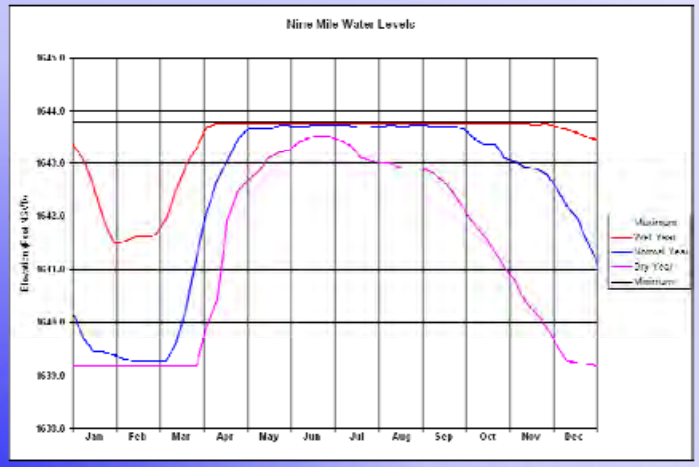

Shoreline Assessment

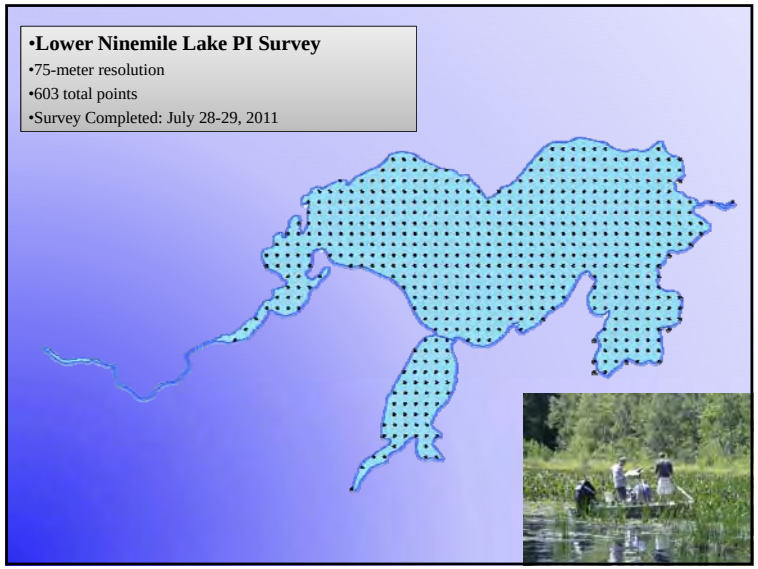


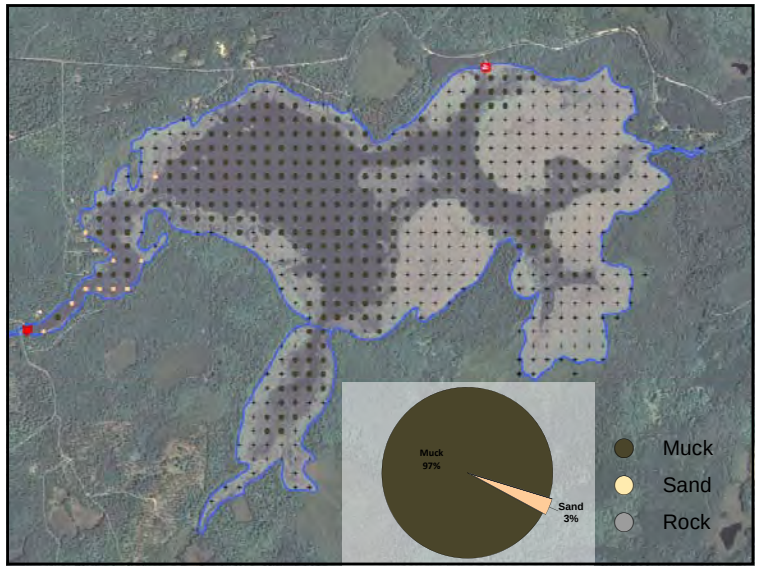
WVIC Operations Plan

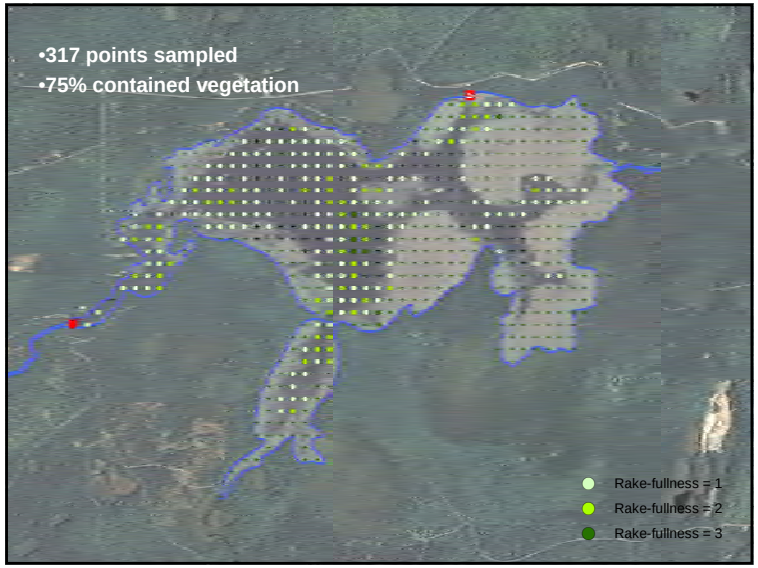
- Store when precipitation abundant
  - Spring & late-summer
- Release to augment low precipitation
  - Summer & winter
- Operation Range
  - Min/Max Level
  - Min outflow

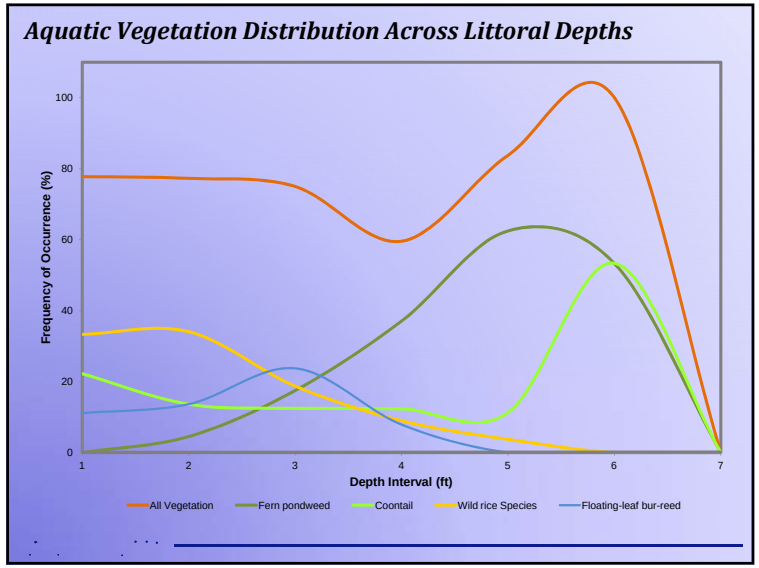





•Lower Ninemile Lake PI Survey
•75-meter resolution
•603 total points
•Survey Completed: July 28-29, 2011


Muck
97%
Sand
3%
Muck
Sand
Rock


•317 points sampled
•75% contained vegetation
Rake-fullness = 1
Rake-fullness = 2
Rake-fullness = 3


Aquatic Vegetation Distribution Across Littoral Depths
Frequency of Occurrence (%)
0
20
40
60
80
100
1
2
3
4
5
6
7
Depth Interval (ft)
All Vegetation
Fern pondweed
Coontail
Wild rice Species
Floating-leaf bur-reed

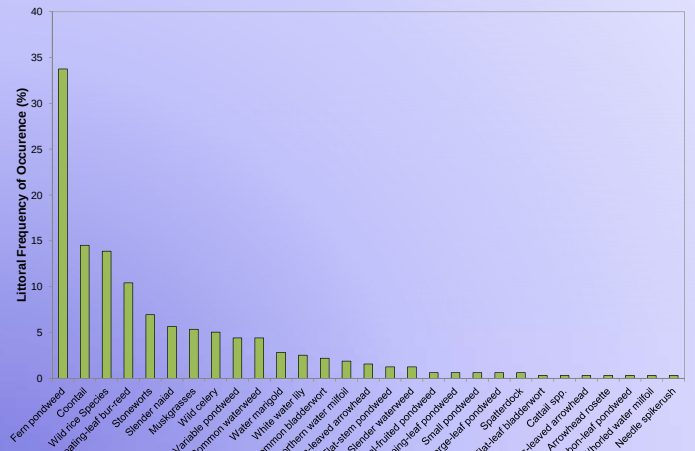
Species List

- **Native species richness: 49**
- **No Non-native Species**
- **Average Coservatism (C):**
  - **2007: 6.7**
  - **2008: 6.6**

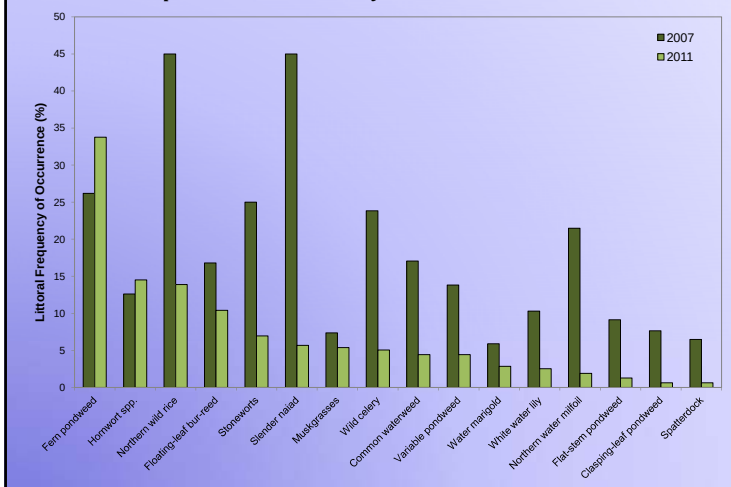
Life Form	Scientific Name	Common Name	Coefficient of Conservatism (C)	2007 (Northern Ens.)	2011 (Onterra)
Emergent	*Carex aquatilis*	Water sedge	7		I
	Carex bebbii	Bebb's owl sedge	4		I
	Carex comosa	Bristly sedge	5		I
	Carex crinita	Fringed sedge	6		I
	Carex lasiocarpa	Woody-fruit sedge	9		I
	Carex utriculata	Yellow lake sedge	7		I
	Decodon verticillatus	Water-willow	7		I
	Dulichium arundinaceum	Three-way sedge	9		I
	Eleocharis erythropoda	Bald spike-rush	3		I
	Eleocharis palustris	Creeping spikerush	6		I
	Equisetum fluviatile	Water horsetail	7		I
	Glyceria canadensis	Rattlesnake grass	7		I
	Iris versicolor	Northern blue flag	5		I
	Sagittaria latifolia	Common arrowhead	3		I
	Schoenoplectus tabernaemontani	Softstem bulrush	4		I
	Scirpus cyperinus	Wool grass	4		I
	Typha spp.	Cattail spp.	1		X
	Zizania palustris	Northern wild rice	8	X	X
FL	*Nuphar variegata*	Spatterdock	6	X	X
	Nymphaea odorata	White water lily	6	X	X
FL/E	*Sparganium emersum*	Short-stemmed bur-reed	8		I
	Sparganium fluctuans	Floating-leaf bur-reed	10	X	X
Submergent	*Bidens beckii*	Water marigold	8	X	X
	Ceratophyllum demersum	Coontail	3	X	X
	Ceratophyllum echinatum	Spiny hornwort	10	X	
	Chara spp.	Muskgrasses	7	X	X
	Elodea canadensis	Common waterweed	3	X	X
	Elodea nuttallii	Slender waterweed	7		X
	Heteranthera dubia	Water stargrass	6	X	
	Myriophyllum sibiricum	Northern water milfoil	7	X	X
	Myriophyllum verticillatum	Whorled water milfoil	8		X
	Najas flexilis	Slender naiad	6	X	X
	Nitella spp.	Stoneworts	7	X	X
	Potamogeton amplifolius	Large-leaf pondweed	7	X	X
	Potamogeton epihydrus	Ribbon-leaf pondweed	8		X
	Potamogeton foliosus	Leafy pondweed	6		I
	Potamogeton gramineus	Variable pondweed	7	X	X
	Potamogeton natans	Floating-leaf pondweed	5	X	I
	Potamogeton obtusifolius	Blunt-leaf pondweed	9		I
	Potamogeton pusillus	Small pondweed	7	X	X
	Potamogeton richardsonii	Clasping-leaf pondweed	5	X	X
	Potamogeton robbinsii	Fern pondweed	8	X	X
	Potamogeton spirillus	Spiral-fruited pondweed	8		X
	Potamogeton zosteriformis	Flat-stem pondweed	6	X	X
	Sagittaria sp. (rosette)	Arrowhead rosette	N/A		X
	Utricularia intermedia	Flat-leaf bladderwort	9		X
	Utricularia vulgaris	Common bladderwort	7	X	X
	Vallisneria americana	Wild celery	6	X	X
S/E	*Eleocharis acicularis*	Needle spikerush	5		X
	Sagittaria cristata	Crested arrowhead	9	X	
	Sagittaria cuneata	Arum-leaved arrowhead	7		X
	Sagittaria graminea	Grass-leaved arrowhead	9		X

FL = Floating Leaf; FL/E = Floating Leaf and Emergent; S/E = Submergent and Emergent
X = Located on rake during point-intercept survey; I = Incidental Species

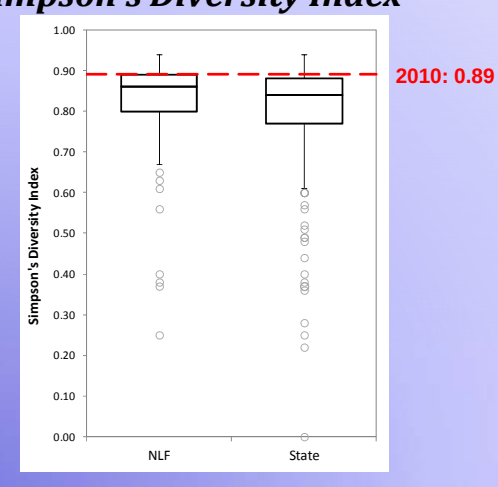
2011 Aquatic Plant Community Littoral Occurrence

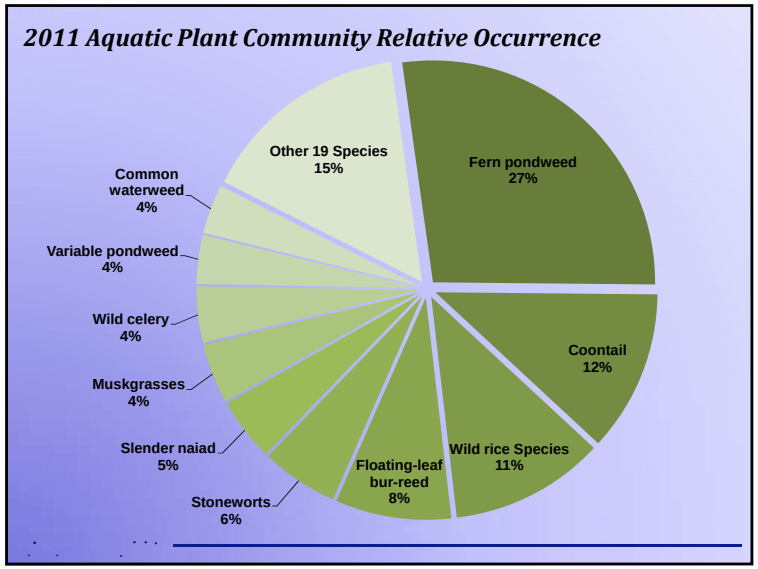


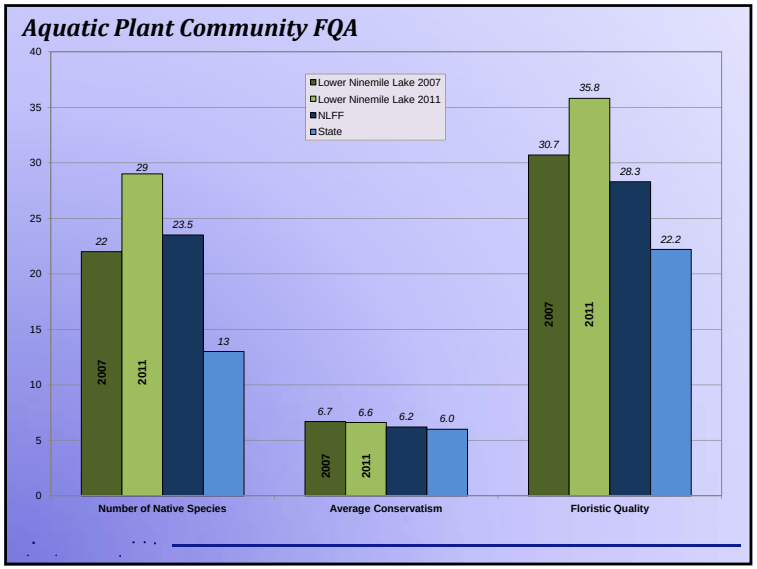
2007 & 2011 Aquatic Plant Community Littoral Occurrence

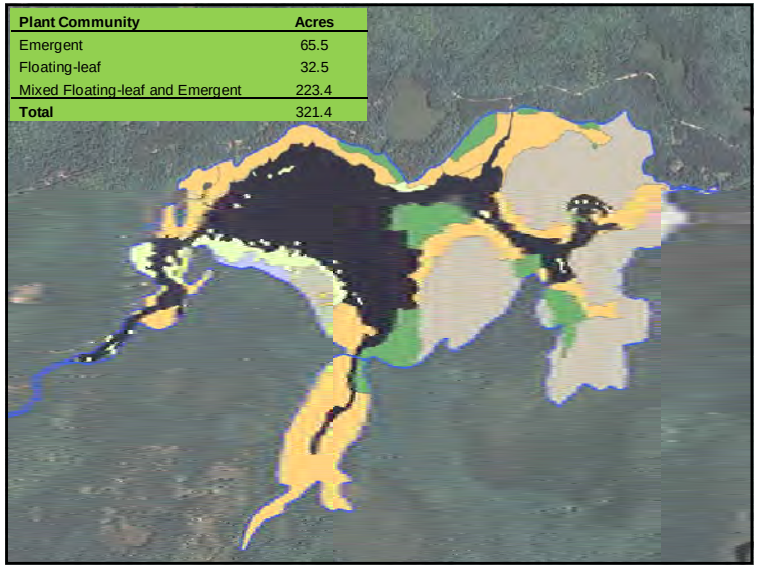


Simpson's Diversity Index

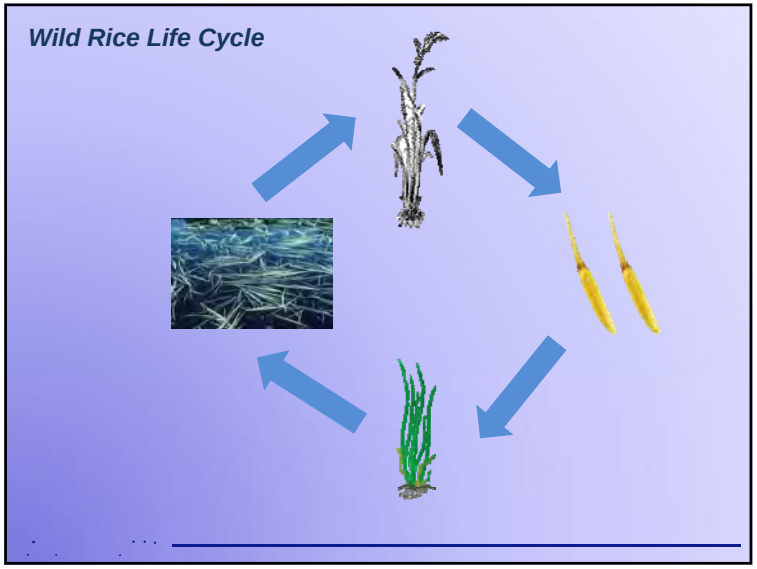








Plant Community	Acres
Emergent	65.5
Floating-leaf	32.5
Mixed Floating-leaf and Emergent	223.4
Total	321.4



Northern Wild Rice (Zizania palustris)

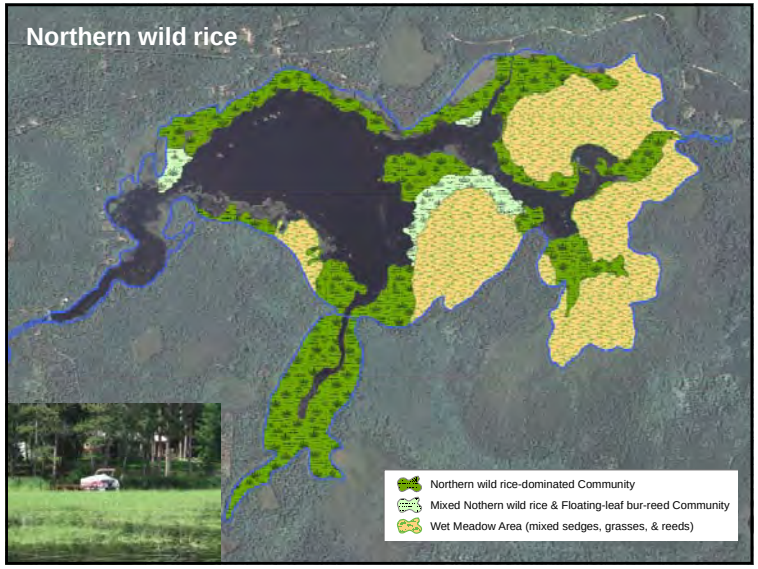
Optimal Habitat

- **Flowing water (Rivers & Flowages)**
- **Clear Water; Depth of 0.5-3 feet; pH 6.0-8.0**
- **Periodic Water Level Fluctuations**
  - **Stable/Slight Decline Growing Season**
  - **Winter drawdown**
- **Soft Organic Muck**

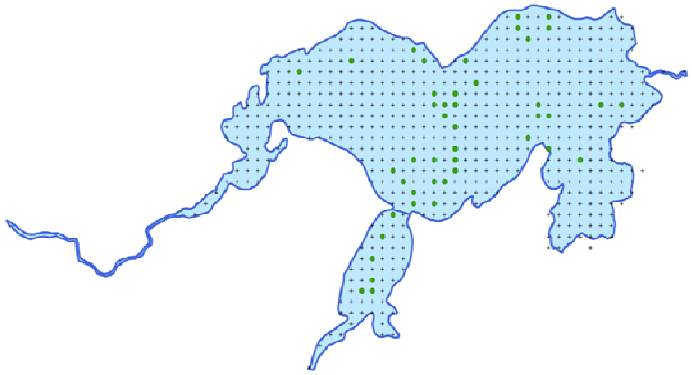
Floating-leaf bur-reed (Sparganium fluctuans)

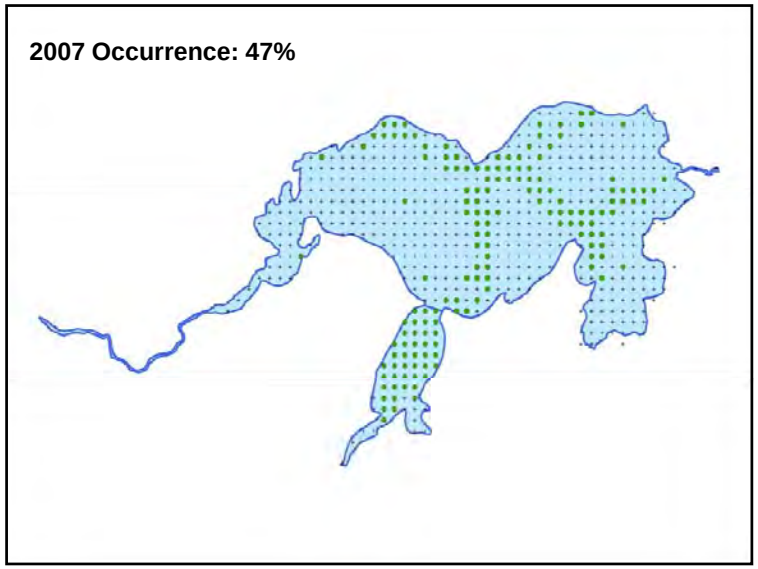
Floating-leaf bur-reed

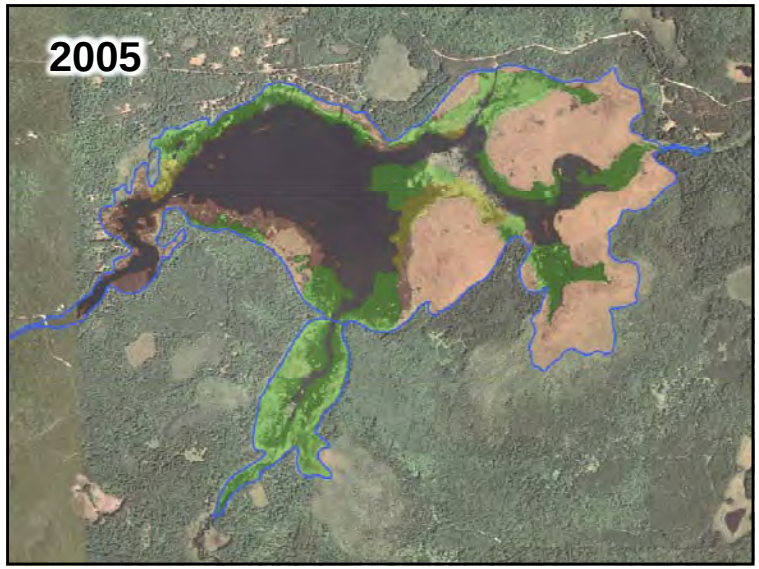
Wild Rice

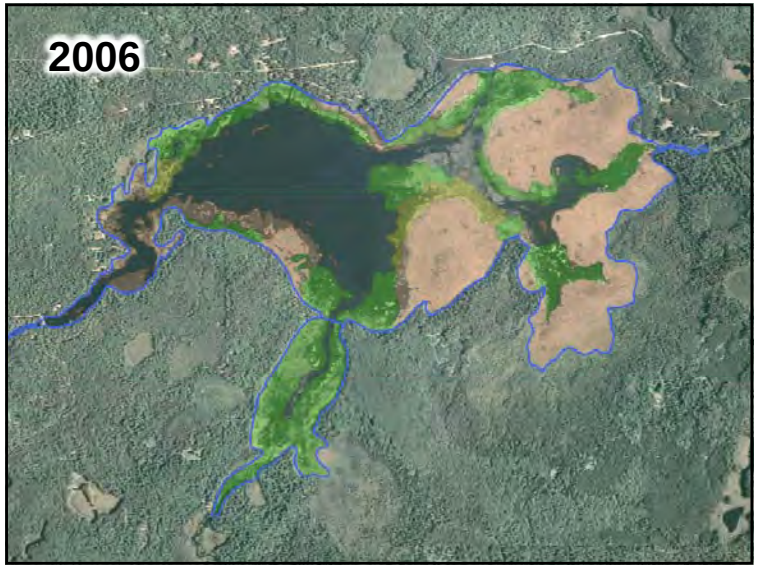


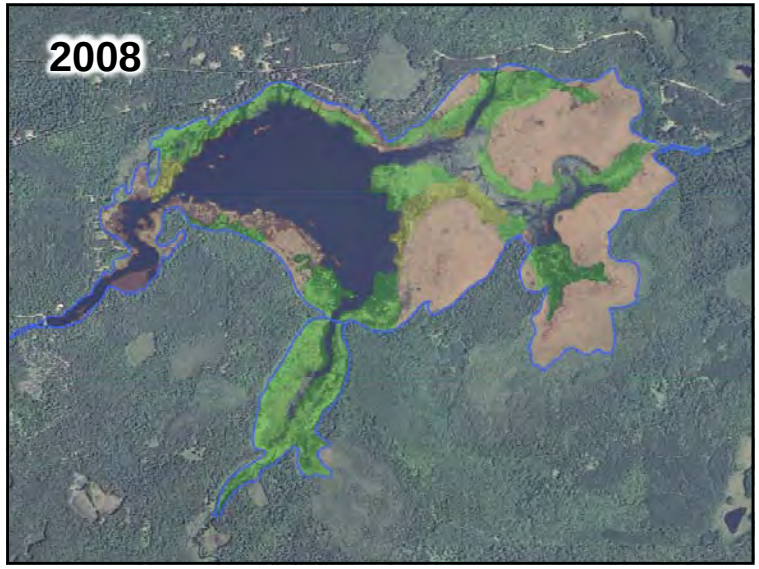
2011 Occurrence: 14%




2007 Occurrence: 47%


2005


2006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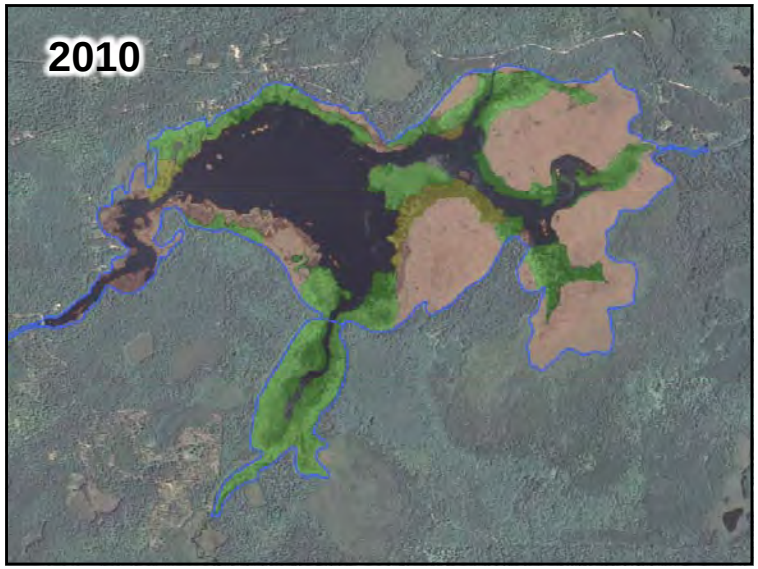
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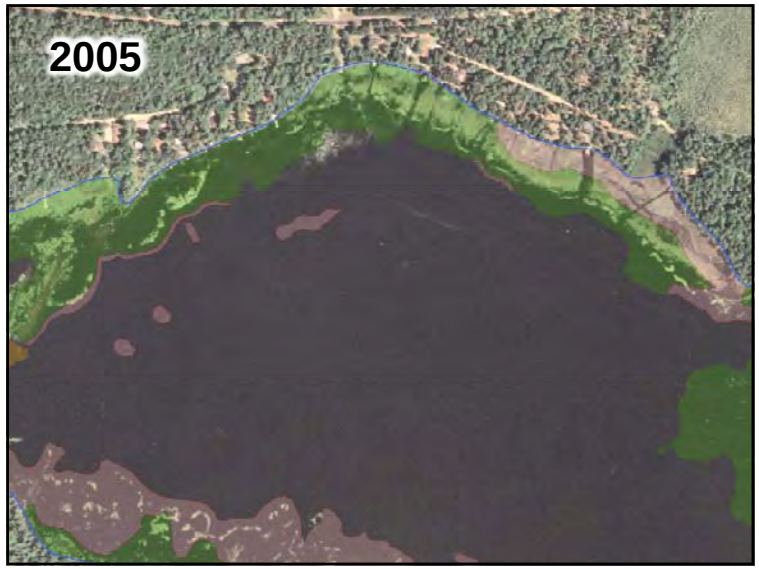
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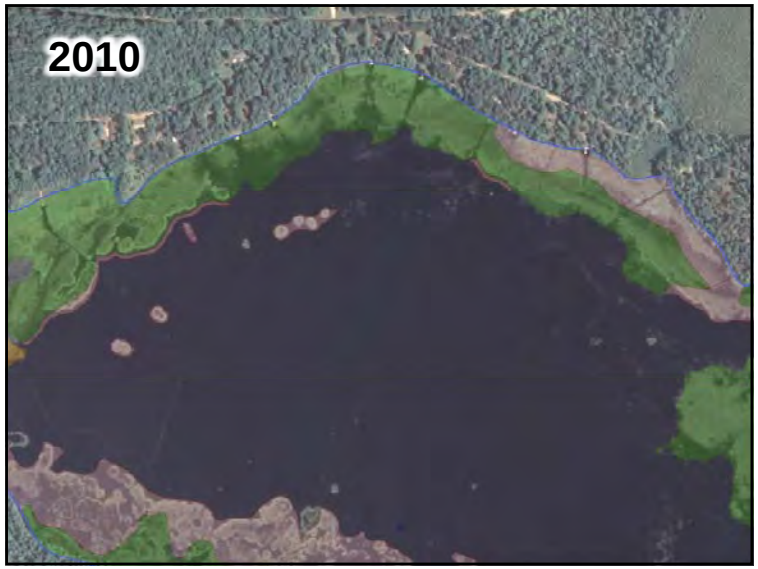
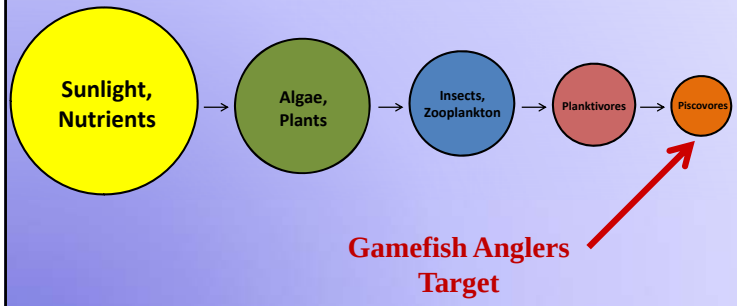


Lower Ninemile Lake Fisheries

Energy Flow



Lower Ninemile Lake Fisheries

Lower Ninemile Lake Fisheries

Fish Stocking

Year	Species	Strain (Stock)	Age Class	# Fish Stocked	Avg Fish Length (in)
1987	Walleye	Unspecified	Fingerling	43,200	2
1989	Walleye	Unspecified	Fingerling	20,060	1
1991	Walleye	Unspecified	Fingerling	10,017	3
1992	Walleye	Unspecified	Fingerling	10,038	2
1994	Walleye	Unspecified	Fingerling	20,390	2

Conclusions

- Water quality excellent for lake of this type.
  - No evidence that any trends (positive or negative) are occurring.
- Watershed is in excellent condition.
  - Vast majority comprised of intact forests and wetlands.
- Aquatic Plant Community
  - Standard analysis indicates plant community is of high quality.
  - Comparison with 2007 dataset indicates community composition is highly dynamic – including wild rice.

Thank You

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

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UW Extension

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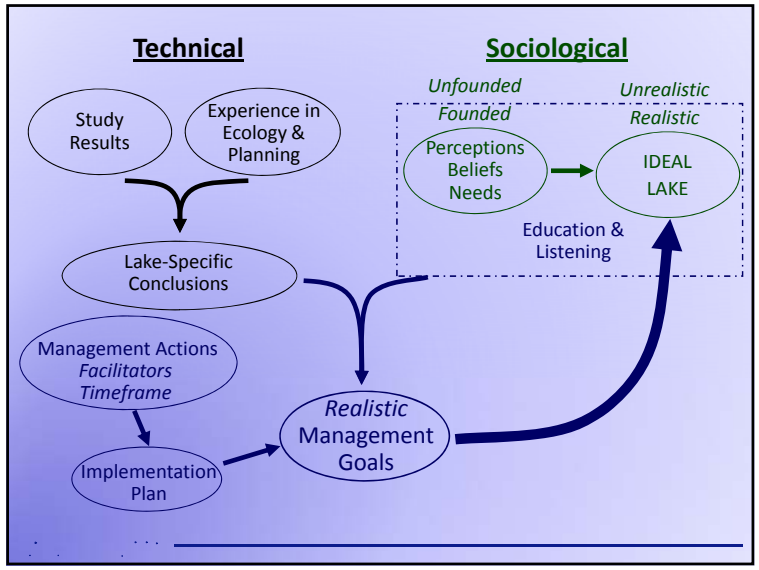
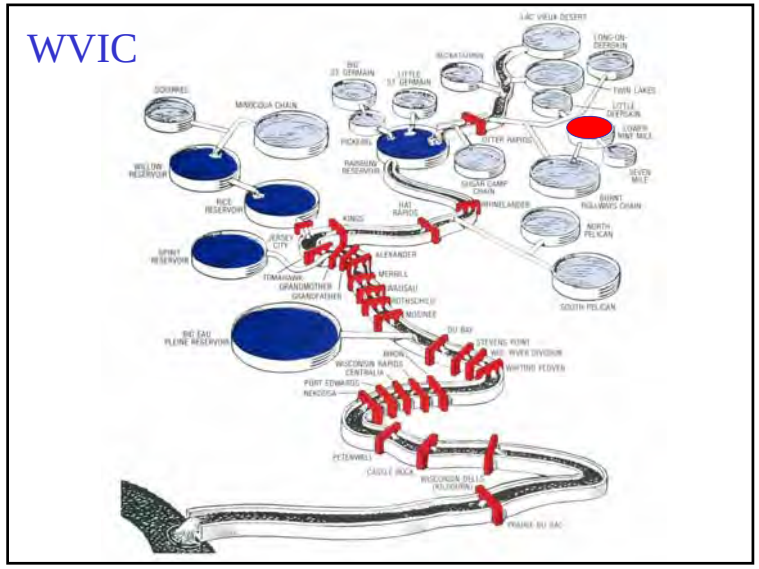


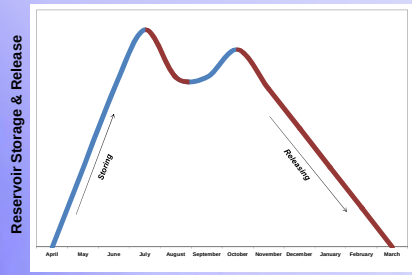
Conclusions

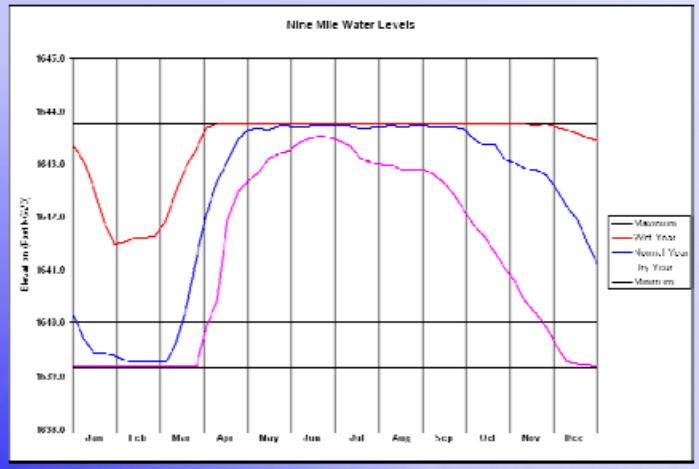
- Water quality excellent for lake of this type.
  - No evidence that any trends (positive or negative) are occurring.
- Watershed is in excellent condition.
  - Vast majority comprised of intact forests and wetlands.
  - Majority of shoreline condition is "natural/undeveloped"
- Aquatic Plant Community
  - Standard analysis indicates plant community is of high quality.
  - Comparison with 2007 dataset indicates community composition is highly dynamic – including wild rice.

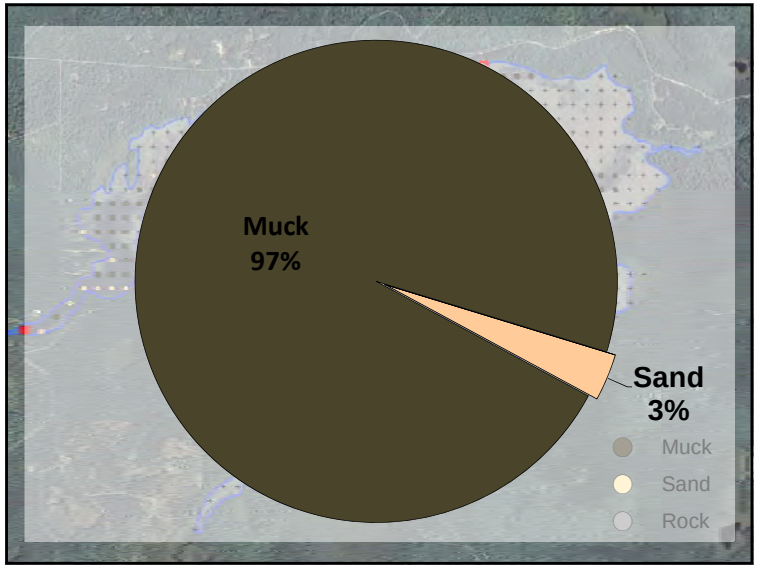


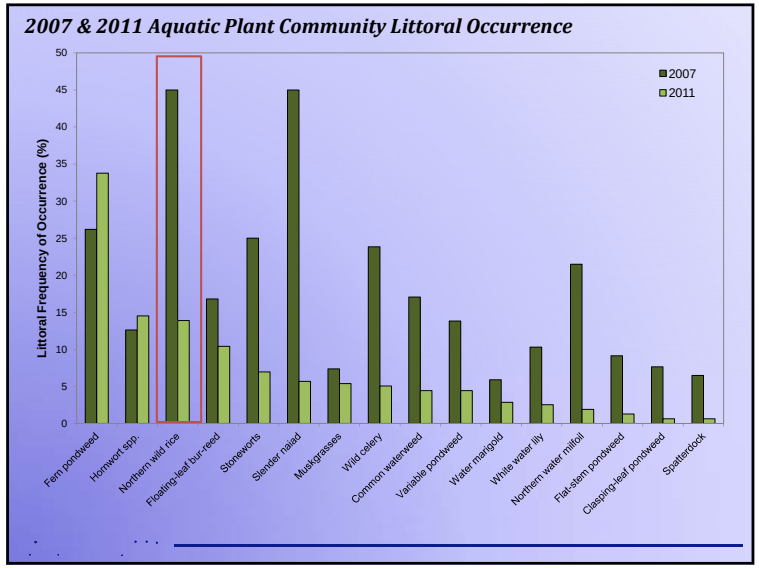
WVIC Operations Plan

- Store when precipitation abundant
  - Spring & late-summer
- Release to augment low precipitation
  - Summer & winter
- Operation Range
  - Min/Max Level
  - Min outflow

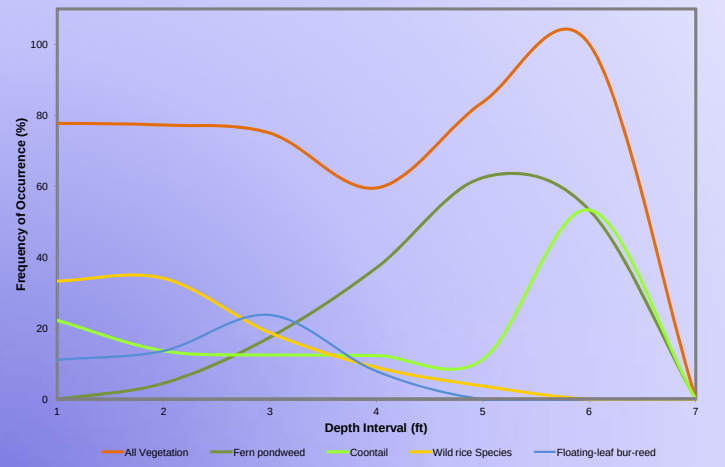








Aquatic Vegetation Distribution Across Littoral Depths

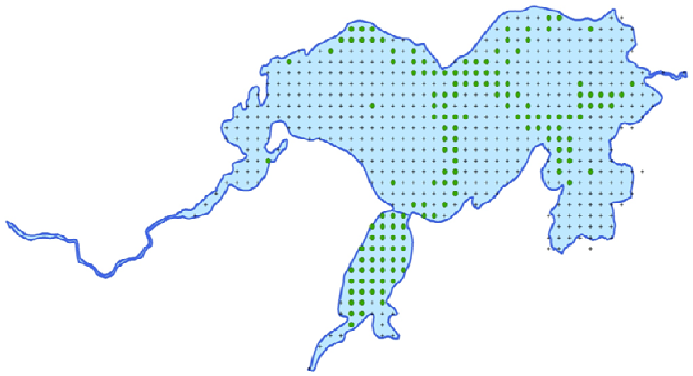


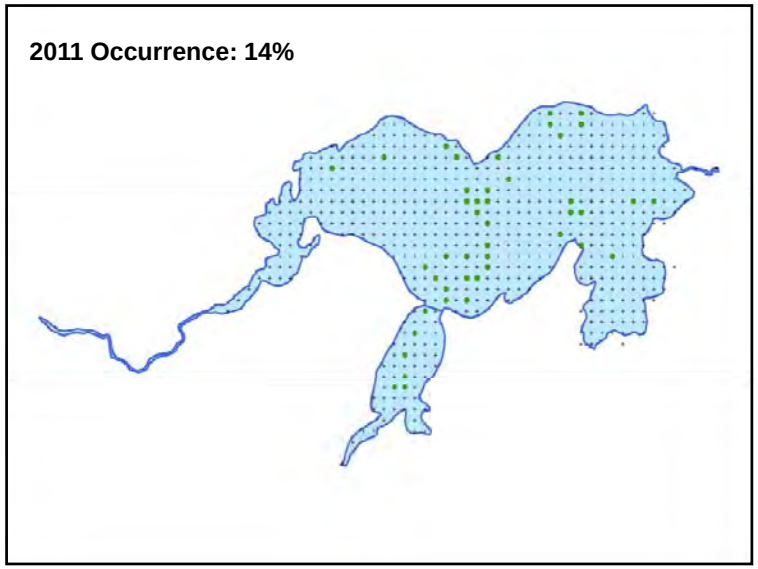
Northern Wild Rice (Zizania palustris)

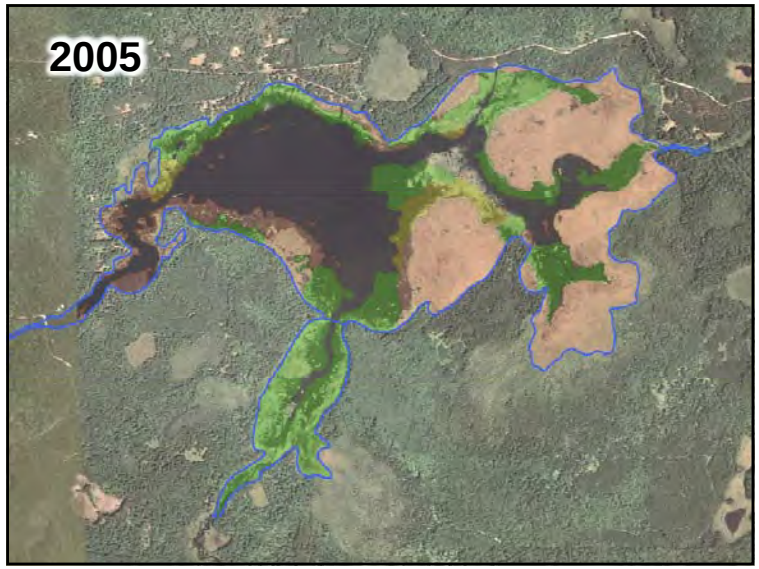
Optimal Habitat

- **Flowing water (Rivers & Flowages)**
- **Clear Water; Depth of 0.5-3 feet; pH 6.0-8.0**
- **Periodic Water Level Fluctuations**
  - **Stable/Slight Decline Growing Season**
  - **Winter drawdown**
- **Soft Organic Muck**

2007 Occurrence: 47%




2011 Occurrence: 14%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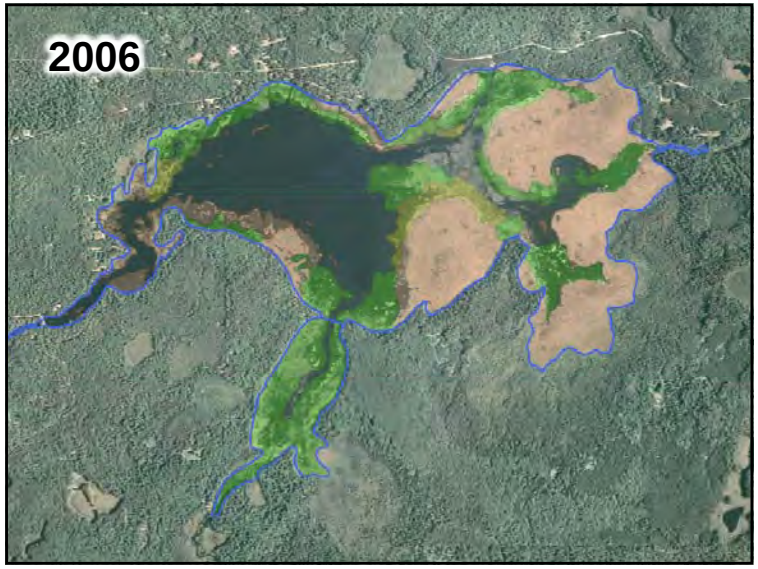
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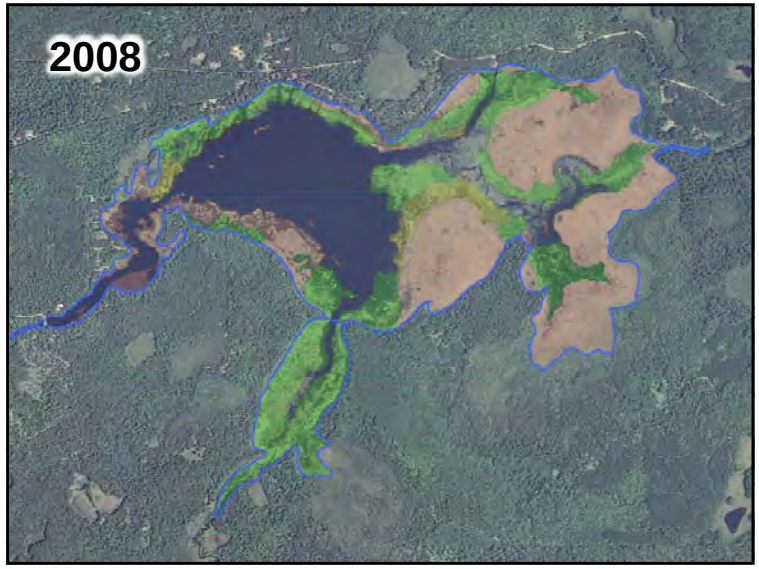
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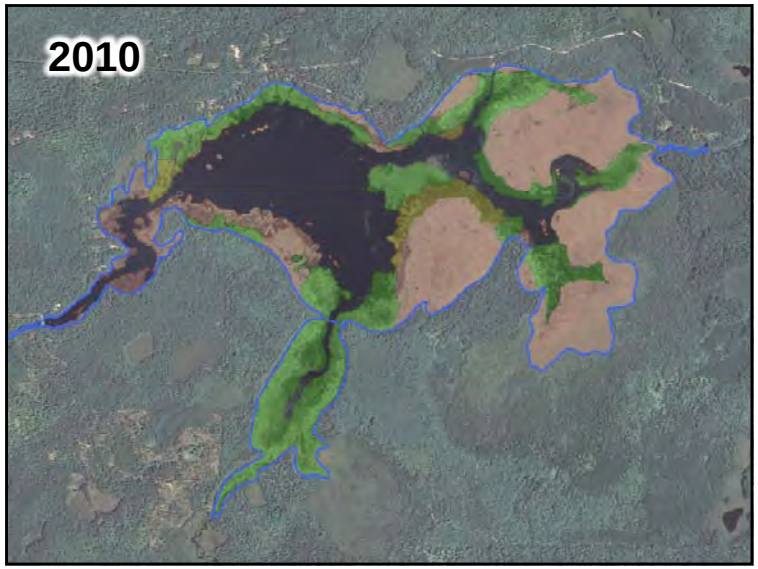
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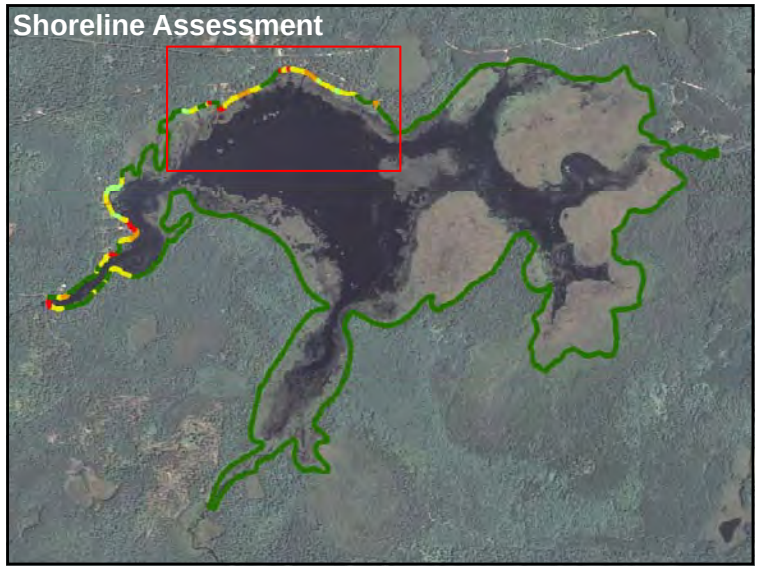
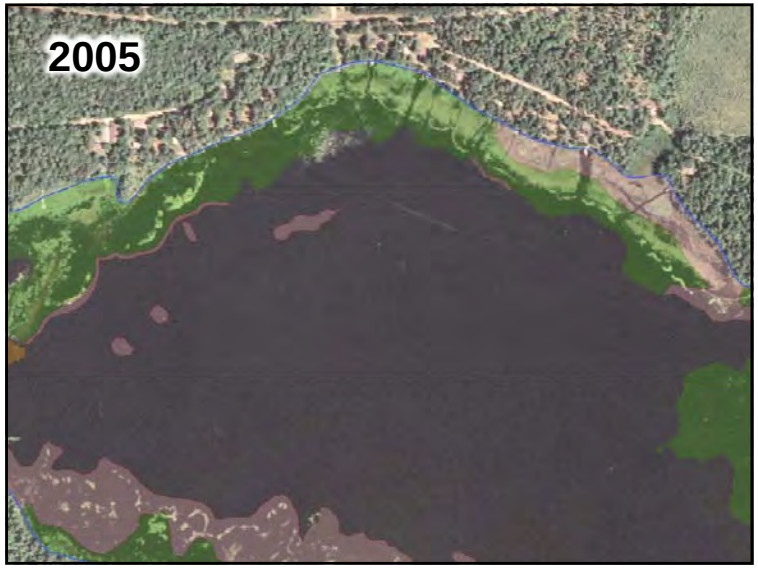
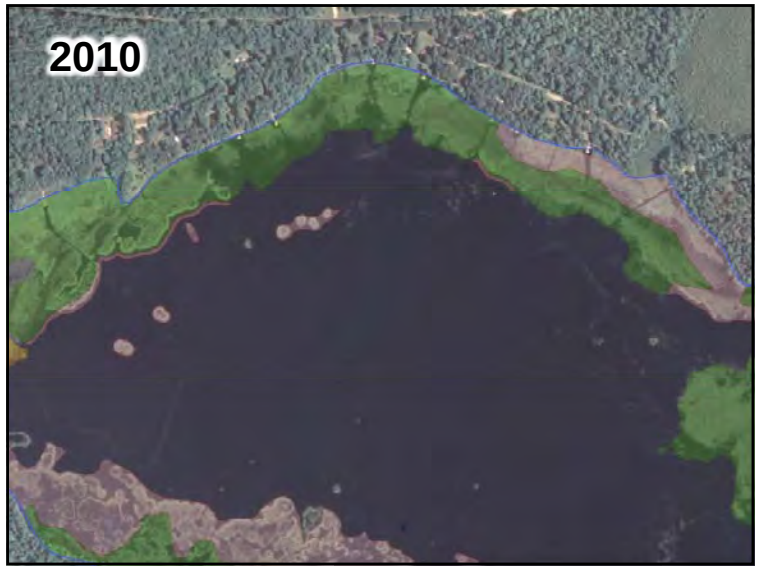
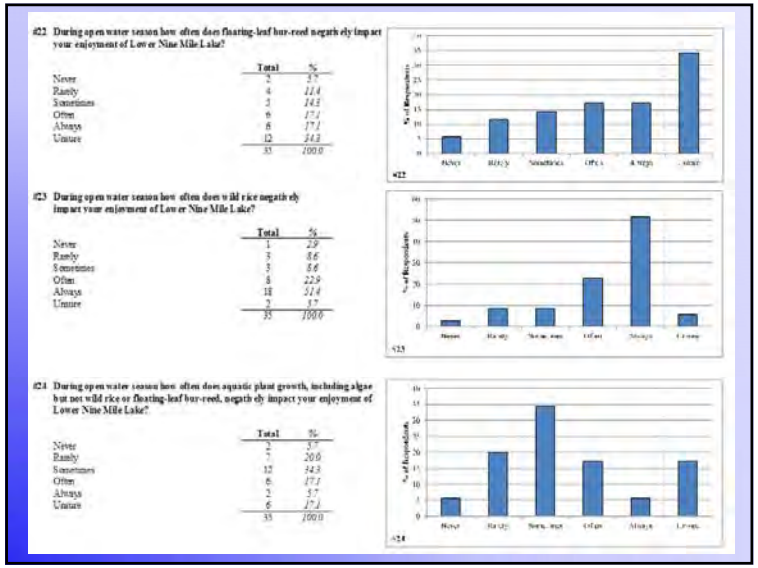

Shoreline Assessment


2005

2006





#22 During open water season how often does floating-leaf bur-reed negatively impact your enjoyment of Lower Nine Mile Lake?

	Total	%
Never	2	5.7
Rarely	4	11.4
Sometimes	5	14.3
Often	6	17.1
Always	6	17.1
Unsure	12	34.3
	35	100.0

#23 During open water season how often does wild rice negatively impact your enjoyment of Lower Nine Mile Lake?

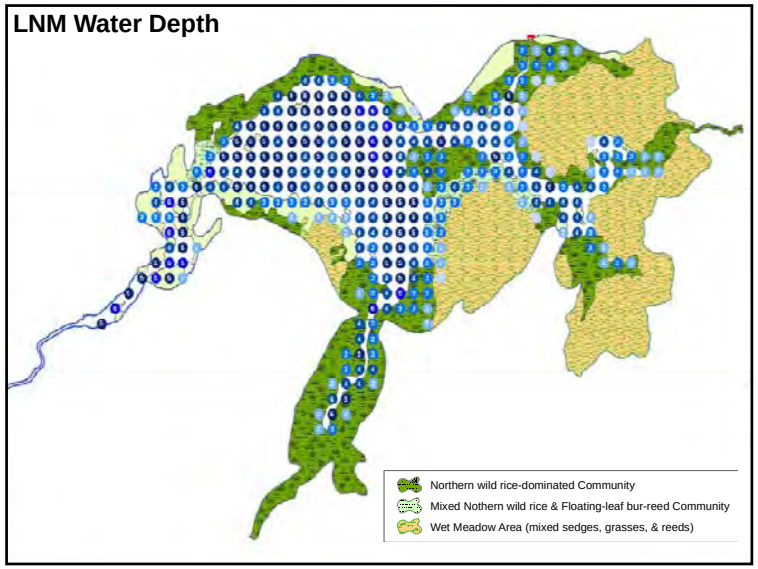
	Total	%
Never	1	2.9
Rarely	3	8.6
Sometimes	3	8.6
Often	8	22.9
Always	18	51.4
Unsure	2	5.7
	35	100.0

#24 During open water season how often does aquatic plant growth, including algae but not wild rice or floating-leaf bur-reed, negatively impact your enjoyment of Lower Nine Mile Lake?

	Total	%
Never	2	5.7
Rarely	7	20.0
Sometimes	12	34.3
Often	6	17.1
Always	2	5.7
Unsure	6	17.1
	35	100.0

Rice-related Concerns

- Navigation
  - Will rice expand to all areas of lake?
  - Access from individual properties to open water
  - Access from public boat landing to open water
  - Access to traditionally-used swimming beaches
  - Access to bays of the lake
- Methodology to allow access
  - Regular boat use
  - Manual-removal (w/ permit)
    - Individuals vs coordinated
  - Mechanical removal
  - Herbicide application


LNM Water Depth
Northern wild rice-dominated Community
Mixed Nothern wild rice & Floating-leaf bur-reed Community
Wet Meadow Area (mixed sedges, grasses, & reeds)

B

APPENDIX B

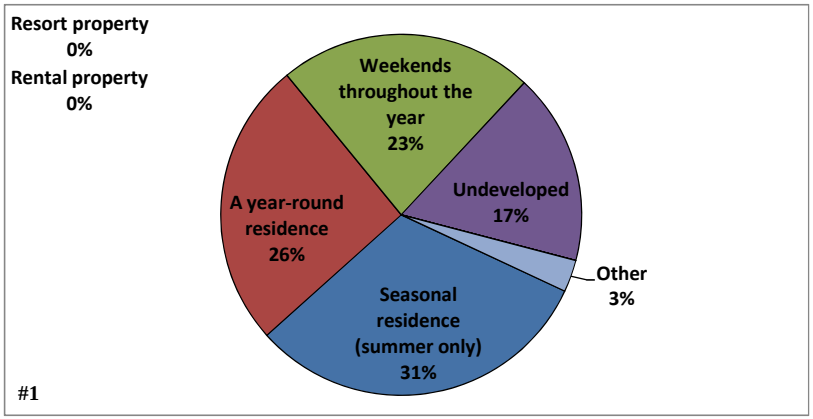
Stakeholder Survey Response Charts and Comments

Returned Surveys	35
Sent Surveys	49
Response Rate (%)	71%

LOWER NINE MILE LAKE PROPRTY

#1 What type of property do you own on Lower Nine Mile Lake?

	Total	%
Seasonal residence (summer only)	11	*31.4*
A year-round residence	9	*25.7*
Weekends throughout the year	8	*22.9*
Undeveloped	6	*17.1*
Resort property	0	*0.0*
Rental property	0	*0.0*
Other	1	*2.9*
	35	*100.0*

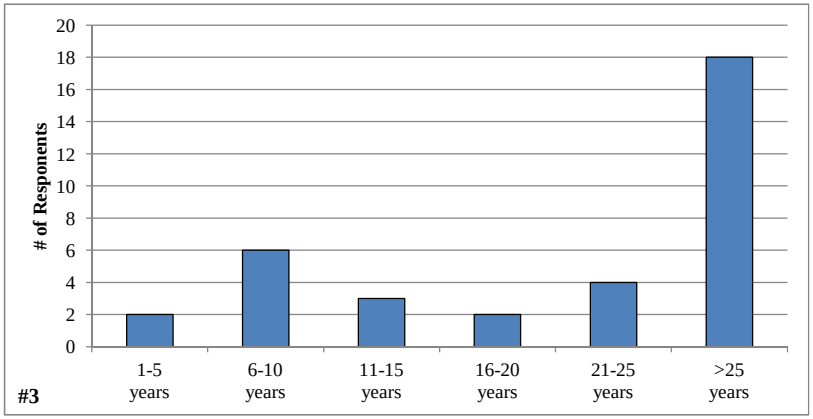


#2 How many days each year is your property used by you or others?

Answered Question	34
Average	126.4
Standard deviation	124.9

#3 How long have you owned your property on Lower Nine Mile Lake?

	Total	%
1-5 years	2	*5.7*
6-10 years	6	*17.1*
11-15 years	3	*8.6*
16-20 years	2	*5.7*
21-25 years	4	*11.4*
>25 years	18	*51.4*
	35	*100.0*

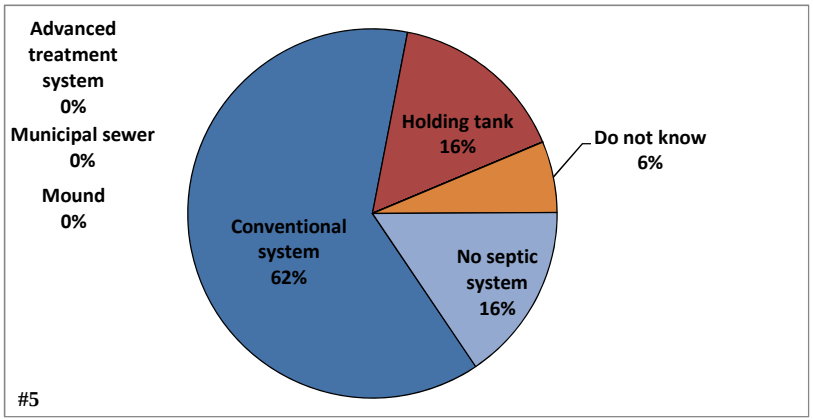


#4 Do you own waterfront property?

	Total	%
Yes	33	*94.3*
No	2	*5.7*
	35	*100.0*

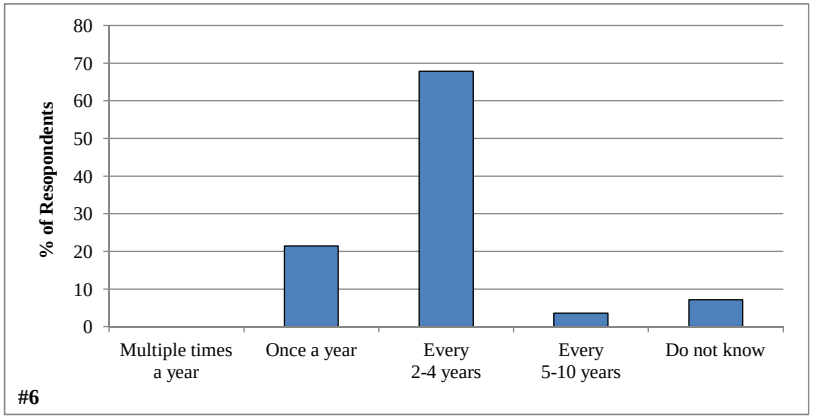
#5 What type of septic system does your property utilize?

	Total	%
Conventional system	20	*62.5*
Holding tank	5	*15.6*
Mound	0	*0.0*
Advanced treatment system	0	*0.0*
Municipal sewer	0	*0.0*
Do not know	2	*6.3*
No septic system	5	*15.6*
	32	*100.0*



#6 How often is the septic tank on your property pumped?

	Total	%
Multiple times a year	0	*0.0*
Once a year	6	*21.4*
Every 2-4 years	19	*67.9*
Every 5-10 years	1	*3.6*
Do not know	2	*7.1*
	28	*100.0*



RECREATIONAL USE ON LOWER NINE MILE LAKE

#7 How many years ago did you first visit Lower Nine Mile Lake?

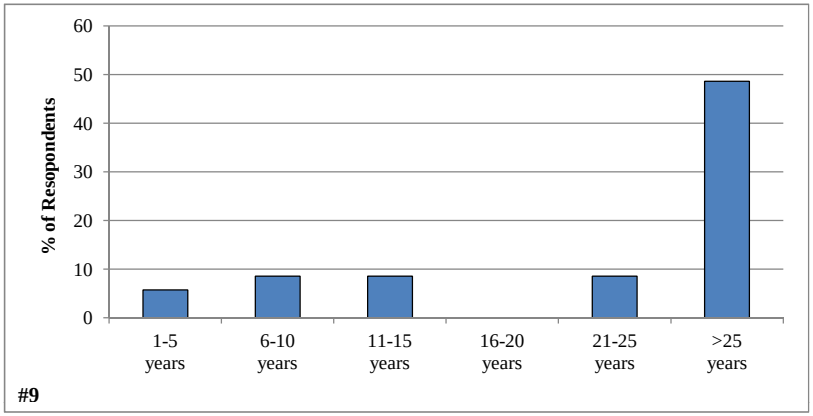
Answered Question	35
Average	37.3
Standard deviation	22.4

#8 Have you personally fished on Lower Nine Mile Lake?

	Total	%
Yes	28	*80.0*
No	7	*20.0*
	35	*100.0*

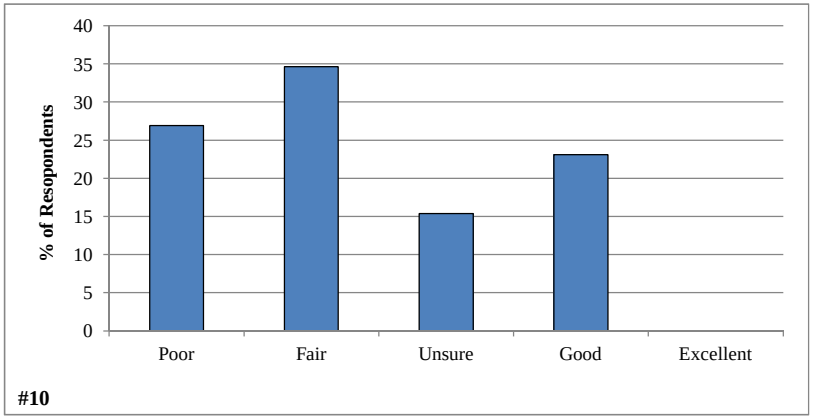
#9 For how many years have you fished Lower Nine Mile Lake?

	Total	%
1-5 years	2	*5.7*
6-10 years	3	*8.6*
11-15 years	3	*8.6*
16-20 years	0	*0.0*
21-25 years	3	*8.6*
>25 years	17	*48.6*
	28	*80.0*



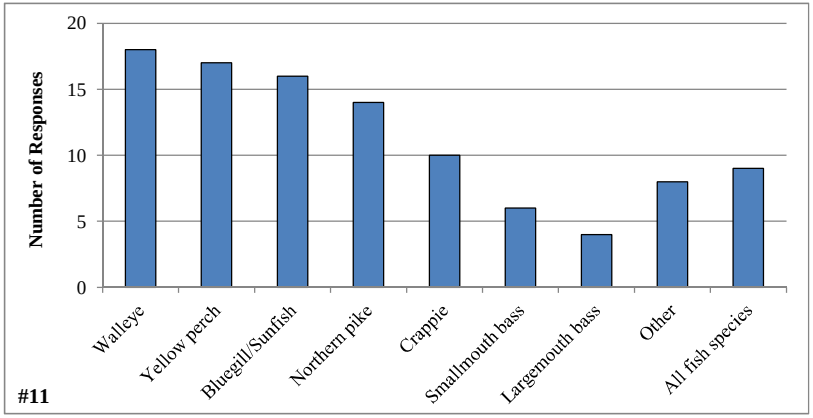
#10 How would you describe the current quality of fishing on Lower Nine Mile Lake?

	Total	%
Poor	7	*26.9*
Fair	9	*34.6*
Unsure	4	*15.4*
Good	6	*23.1*
Excellent	0	*0.0*
	26	*100.0*



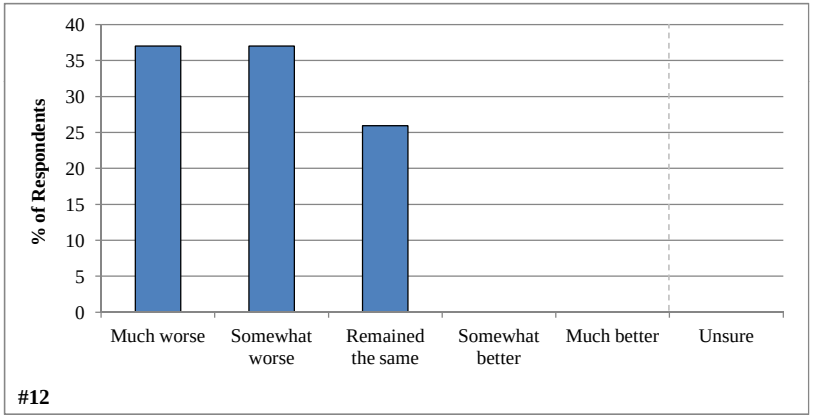
#11 What species of fish do you like to catch on Lower Nine Mile Lake?

	Total
Walleye	18
Yellow perch	17
Bluegill/Sunfish	16
Northern pike	14
Crappie	10
Smallmouth bass	6
Largemouth bass	4
Other	8
All fish species	9



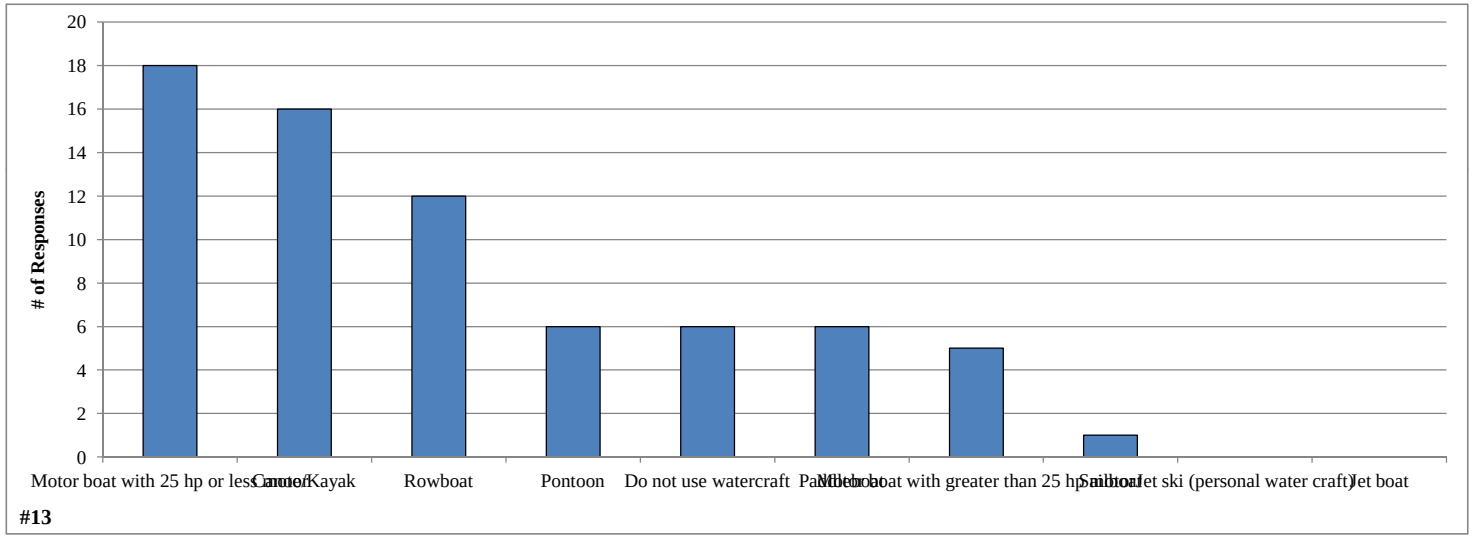
#12 How has the quality of fishing changed since you started fishing on the lake?

	Total	%
Much worse	10	*37.0*
Somewhat worse	10	*37.0*
Remained the Same	7	*25.9*
Somewhat better	0	*0.0*
Much better	0	*0.0*
Unsure	0	*0.0*
	27	*100.0*



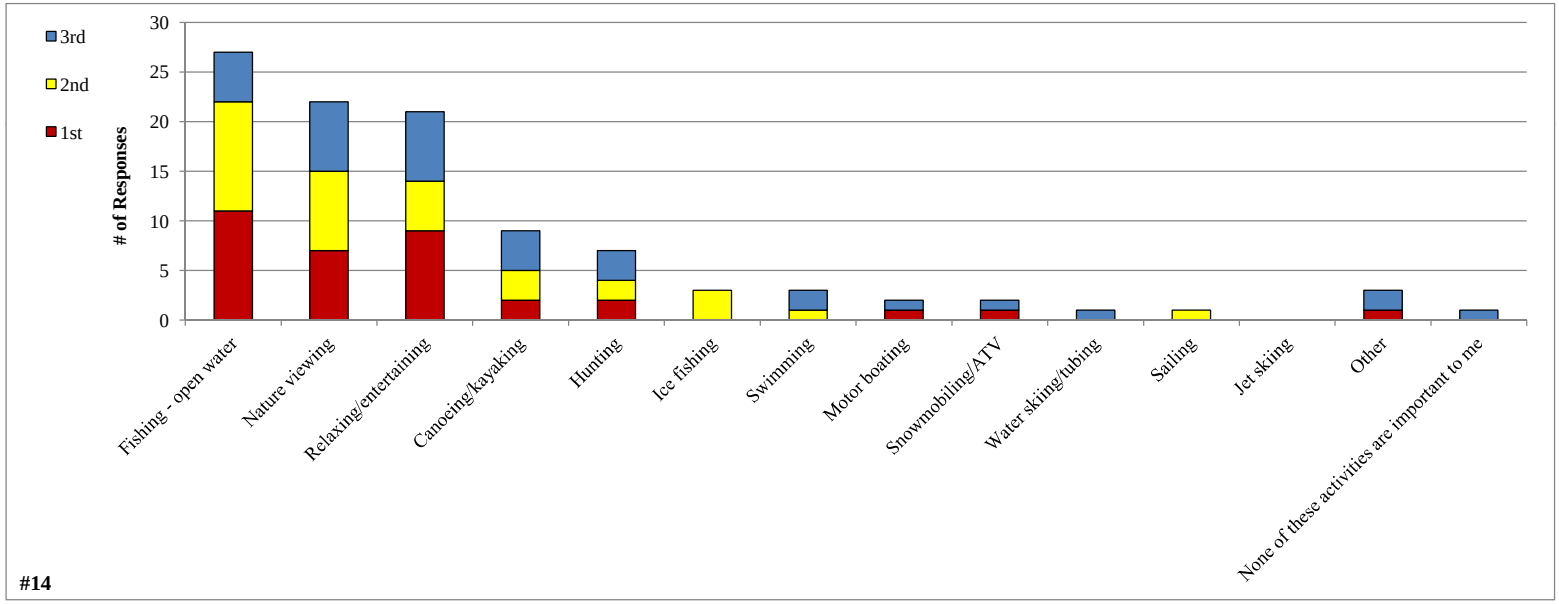
#13 What types of watercraft do you currently use on the lake?

	Total
Motor boat with 25 hp or less motor	18
Canoe/Kayak	16
Rowboat	12
Pontoon	6
Do not use watercraft	6
Paddleboat	6
Motor boat with greater than 25 hp motor	5
Sailboat	1
Jet ski (personal water craft)	0
Jet boat	0



#14 Please rank up to three activities that are important reasons for owning your property on or near the lake.

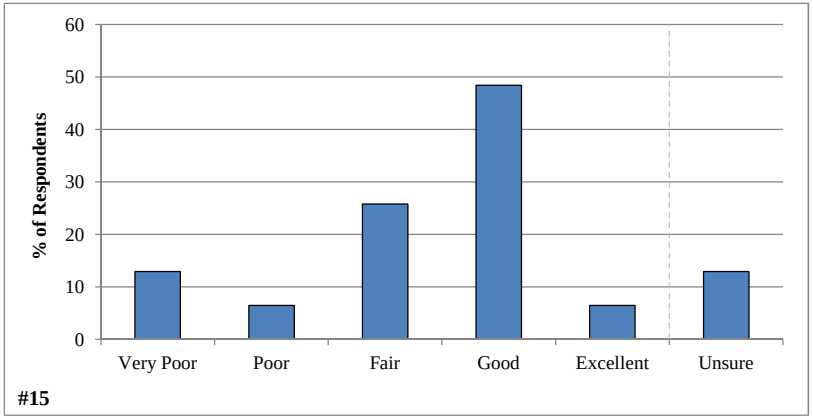
	1st	2nd	3rd	*% ranked*
Fishing - open water	11	11	5	*26.5*
Nature viewing	7	8	7	*21.6*
Relaxing/entertaining	9	5	7	*20.6*
Canoeing/kayaking	2	3	4	*8.8*
Hunting	2	2	3	*6.9*
Ice fishing	0	3	0	*2.9*
Swimming	0	1	2	*2.9*
Motor boating	1	0	1	*2.0*
Snowmobiling/ATV	1	0	1	*2.0*
Water skiing/tubing	0	0	1	*1.0*
Sailing	0	1	0	*1.0*
Jet skiing	0	0	0	*0.0*
Other	1	0	2	*2.9*
None of these activities are important to me	0	0	1	*1.0*
	34	34	34	*100.0*



LOWER NINE MILE LAKE CURRENT AND HISTORIC CONDITION, HEALTH AND MANAGEMENT

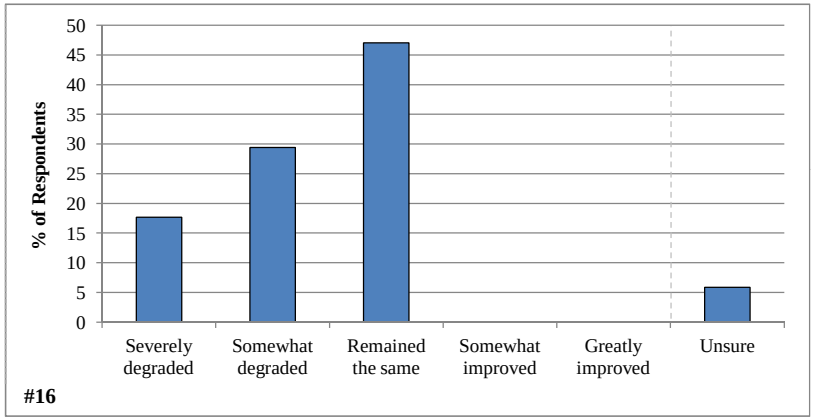
#15 How would you describe the current water quality of Lower Nine Mile Lake?

	Total	%
Very Poor	4	*12.9*
Poor	2	*6.5*
Fair	8	*25.8*
Good	15	*48.4*
Excellent	2	*6.5*
Unsure	4	*12.9*
	31	*100.0*



#16 How has the water quality changed in Lower Nine Mile Lake since you visited the lake?

	Total	%
Severely degraded	6	*17.6*
Somewhat degraded	10	*29.4*
Remained the same	16	*47.1*
Somewhat improved	0	*0.0*
Greatly improved	0	*0.0*
Unsure	2	*5.9*
	34	*100.0*



#17 Have you ever heard of aquatic invasive species?

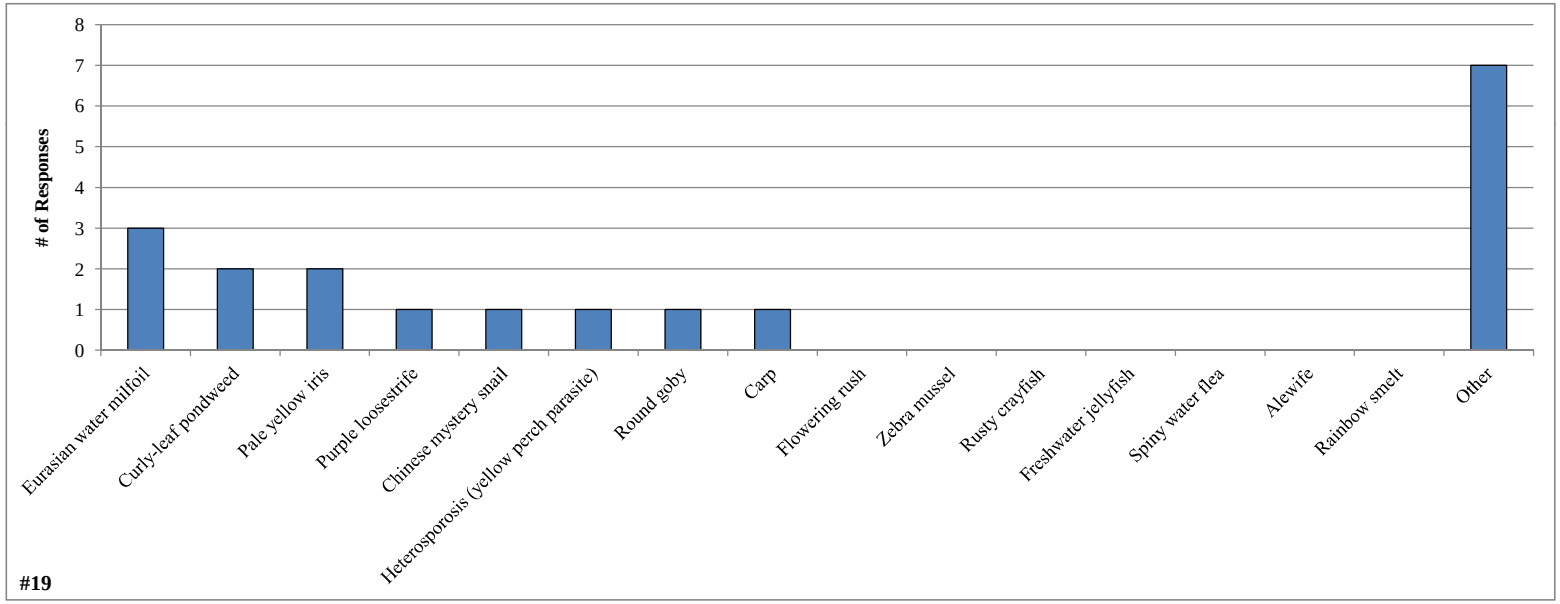
	Total	%
Yes	32	*91.4*
No	3	*8.6*
	35	*100.0*

#18 Are you aware of aquatic invasive species in the lake?

	Total	%
Yes	9	*30.0*
No	21	*70.0*
	30	*100.0*

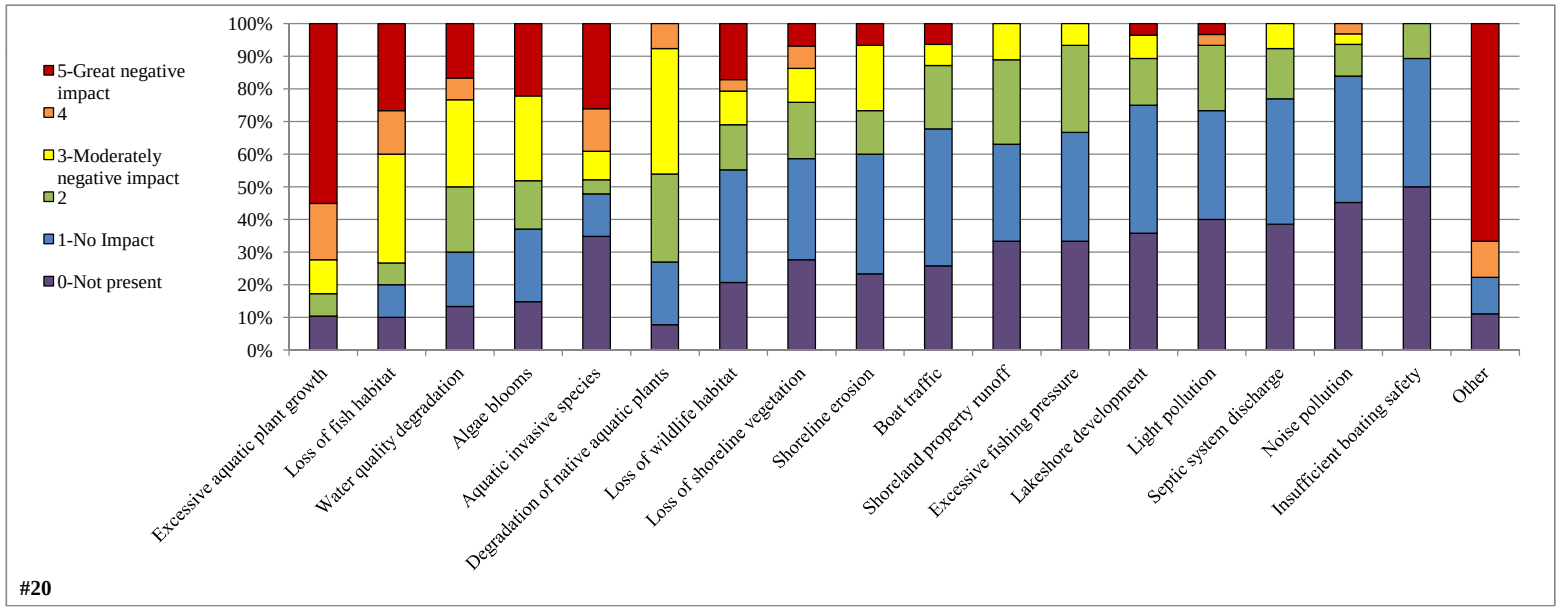
#19 Which aquatic invasive species are you aware of in the lake?

	Total
Eurasian water milfoil	3
Curly-leaf pondweed	2
Pale yellow iris	2
Purple loosestrife	1
Chinese mystery snail	1
Heterosporosis (yellow perch parasite)	1
Round goby	1
Carp	1
Flowering rush	0
Zebra mussel	0
Rusty crayfish	0
Freshwater jellyfish	0
Spiny water flea	0
Alewife	0
Rainbow smelt	0
Other	7



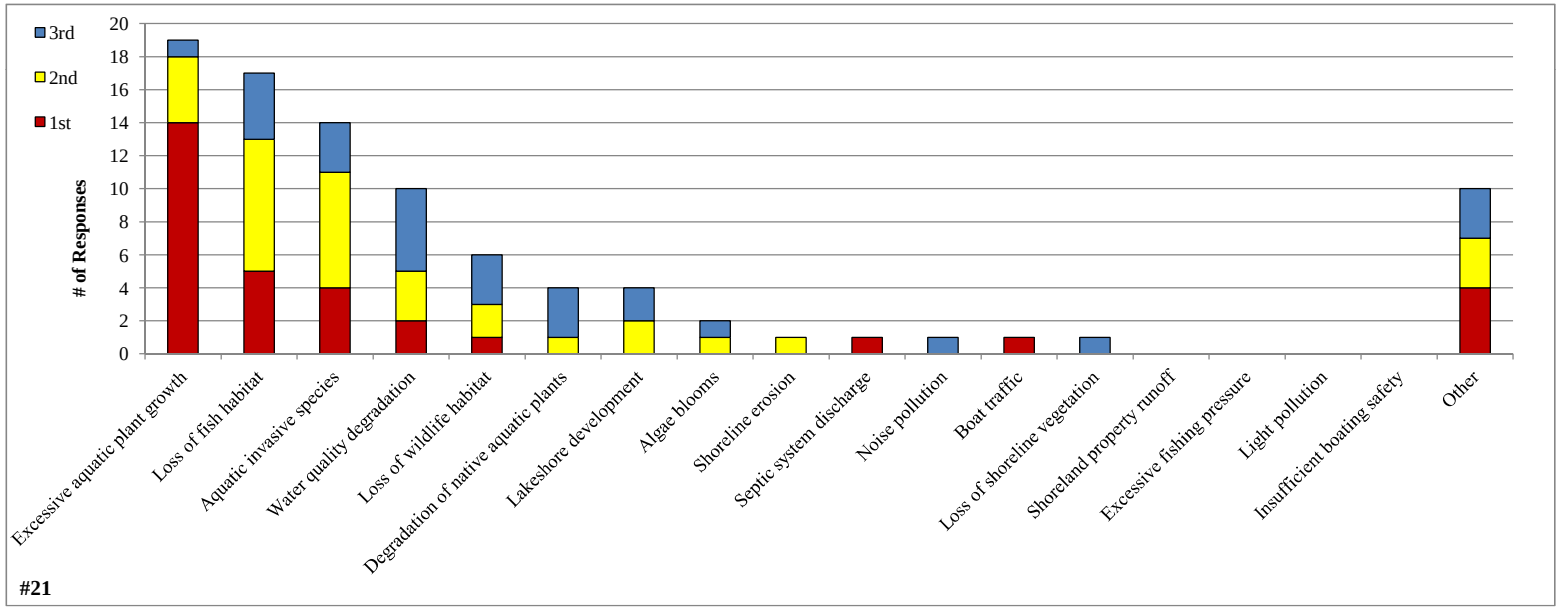
#20 To what level do you believe each of the following factors may be negatively impacting Lower Nine Mile Lake?

	0-Not present	**1-No Impact**	**2**	**3-Moderately negative impact**	**4**	**5-Great negative impact**	*Total*	*Average*
Excessive aquatic plant growth	3	0	2	3	5	16	*26*	*3.9*
Loss of fish habitat	3	3	2	10	4	8	*27*	*3.1*
Water quality degradation	4	5	6	8	2	5	*26*	*2.5*
Algae blooms	4	6	4	7	0	6	*23*	*2.4*
Aquatic invasive species	8	3	1	2	3	6	*15*	*2.3*
Degradation of native aquatic plants	2	5	7	10	2	0	*24*	*2.2*
Loss of wildlife habitat	6	10	4	3	1	5	*23*	*1.9*
Loss of shoreline vegetation	8	9	5	3	2	2	*21*	*1.6*
Shoreline erosion	7	11	4	6	0	2	*23*	*1.6*
Boat traffic	8	13	6	2	0	2	*23*	*1.3*
Shoreland property runoff	9	8	7	3	0	0	*18*	*1.1*
Excessive fishing pressure	10	10	8	2	0	0	*20*	*1.1*
Lakeshore development	10	11	4	2	0	1	*18*	*1.1*
Light pollution	12	10	6	0	1	1	*18*	*1.0*
Septic system discharge	10	10	4	2	0	0	*16*	*0.9*
Noise pollution	14	12	3	1	1	0	*17*	*0.8*
Insufficient boating safety	14	11	3	0	0	0	*14*	*0.6*
Other	1	1	0	0	1	6	*8*	*3.9*



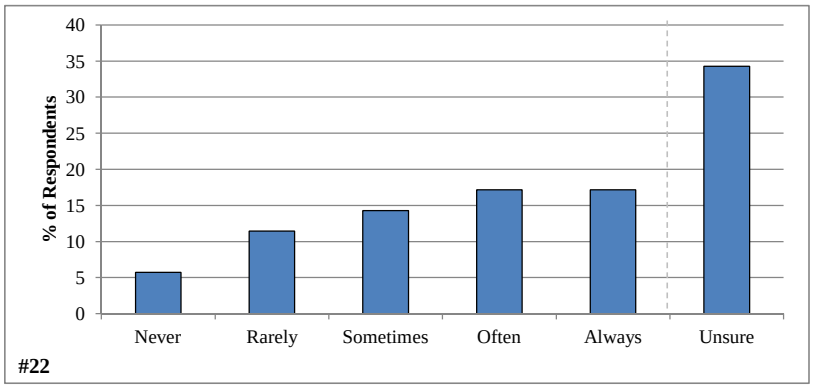
#21 From the list below, please rank your top three concerns regarding the lake.

	1st	2nd	3rd	*% Ranked*
Excessive aquatic plant growth	14	4	1	*20.9*
Loss of fish habitat	5	8	4	*18.7*
Aquatic invasive species	4	7	3	*15.4*
Water quality degradation	2	3	5	*11.0*
Loss of wildlife habitat	1	2	3	*6.6*
Degradation of native aquatic plants	0	1	3	*4.4*
Lakeshore development	0	2	2	*4.4*
Algae blooms	0	1	1	*2.2*
Shoreline erosion	0	1	0	*1.1*
Septic system discharge	1	0	0	*1.1*
Noise pollution	0	0	1	*1.1*
Boat traffic	1	0	0	*1.1*
Loss of shoreline vegetation	0	0	1	*1.1*
Shoreland property runoff	0	0	0	*0.0*
Excessive fishing pressure	0	0	0	*0.0*
Light pollution	0	0	0	*0.0*
Insufficient boating safety	0	0	0	*0.0*
Other	4	3	3	*11.0*
	32	32	27	*100.0*



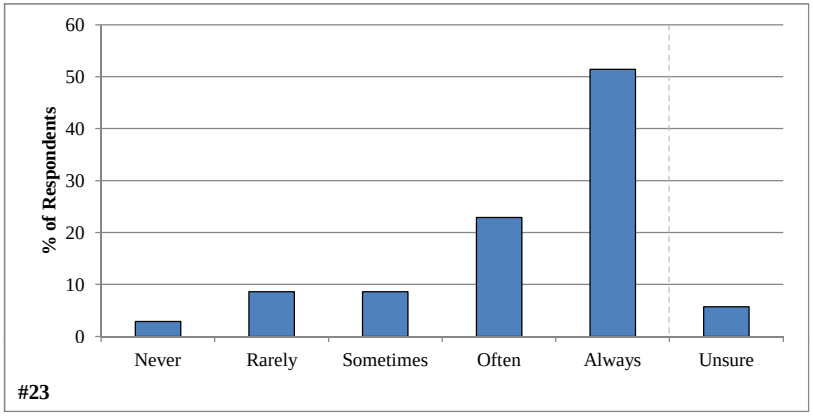
#22 During open water season how often does floating-leaf bur-reed negatively impact your enjoyment of Lower Nine Mile Lake?

	Total	%
Never	2	*5.7*
Rarely	4	*11.4*
Sometimes	5	*14.3*
Often	6	*17.1*
Always	6	*17.1*
Unsure	12	*34.3*
	35	*100.0*



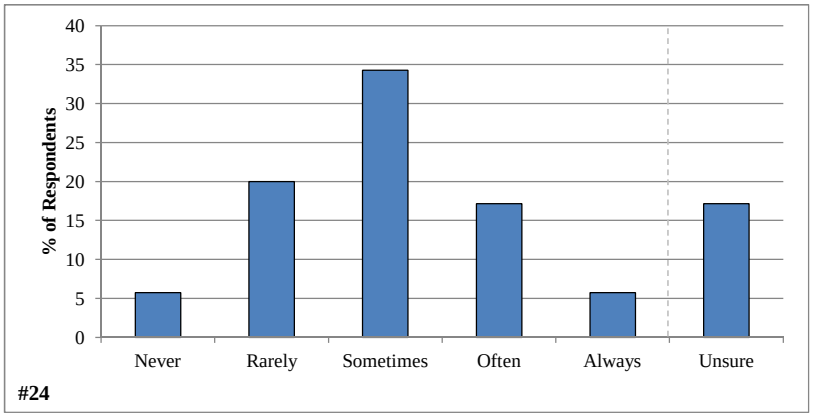
#23 During open water season how often does wild rice negatively impact your enjoyment of Lower Nine Mile Lake?

	Total	%
Never	1	*2.9*
Rarely	3	*8.6*
Sometimes	3	*8.6*
Often	8	*22.9*
Always	18	*51.4*
Unsure	2	*5.7*
	35	*100.0*



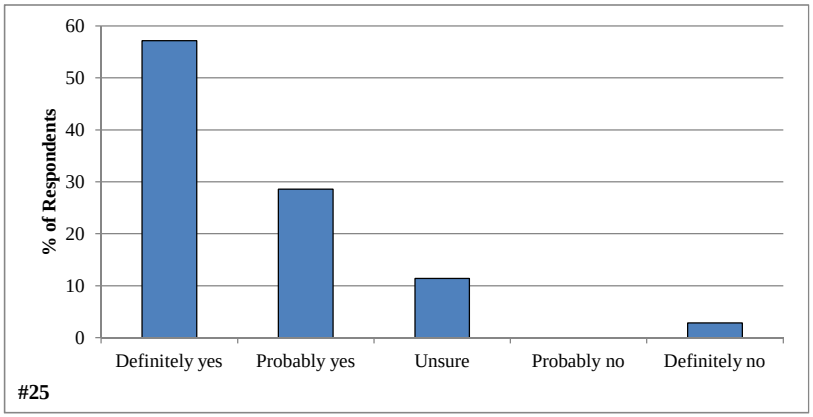
#24 During open water season how often does aquatic plant growth, including algae but not wild rice or floating-leaf bur-reed, negatively impact your enjoyment of Lower Nine Mile Lake?

	Total	%
Never	2	*5.7*
Rarely	7	*20.0*
Sometimes	12	*34.3*
Often	6	*17.1*
Always	2	*5.7*
Unsure	6	*17.1*
	35	*100.0*



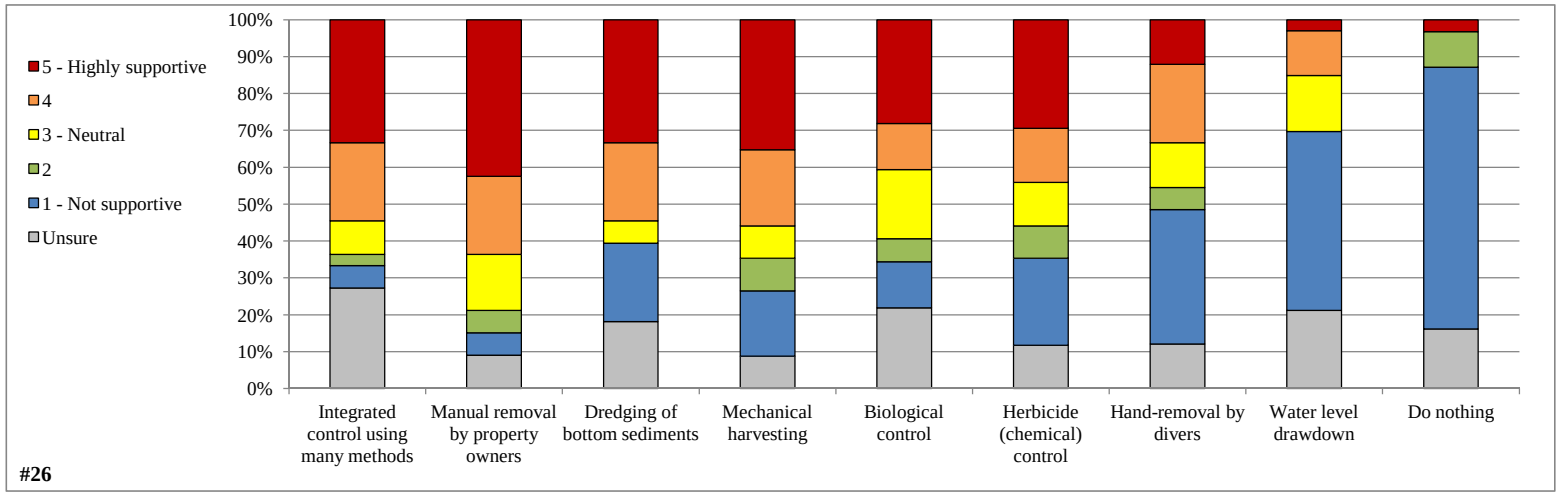
#25 Considering your answer to questions 22-24, do you believe aquatic plant control is needed on Lower Nine Mile Lake?

	Total	%
Definitely yes	20	*57.1*
Probably yes	10	*28.6*
Unsure	4	*11.4*
Probably no	0	*0.0*
Definitely no	1	*2.9*
	35	*100.0*



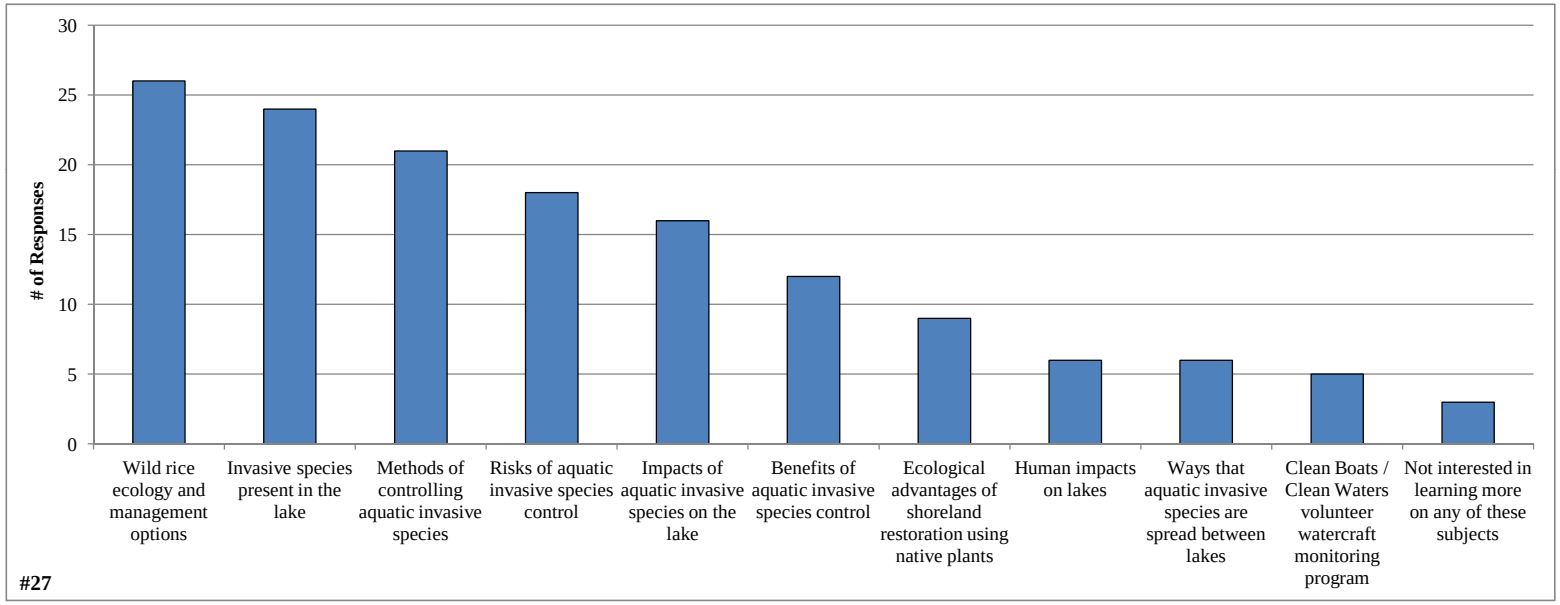
#26 What is your level of support for the responsible use of the following techniques on the lake?

	1 - Not supportive	2	3 - Neutral	4	5 - Highly supportive	Unsure	Total	Average
Integrated control using many methods	2	1	3	7	11	9	*24*	*4.0*
Manual removal by property owners	2	2	5	7	14	3	*30*	*4.0*
Dredging of bottom sediments	7	0	2	7	11	6	*27*	*3.6*
Mechanical harvesting	6	3	3	7	12	3	*31*	*3.5*
Biological control	4	2	6	4	9	7	*25*	*3.5*
Herbicide (chemical) control	8	3	4	5	10	4	*30*	*3.2*
Hand-removal by divers	12	2	4	7	4	4	*29*	*2.6*
Water level drawdown	16	0	5	4	1	7	*26*	*2.0*
Do nothing	22	3	0	0	1	5	*26*	*1.3*



#27 Which of these subjects would you like to learn more about?

	Total
Wild rice ecology and management options	26
Invasive species present in the lake	24
Methods of controlling aquatic invasive species	21
Risks of aquatic invasive species control	18
Impacts of aquatic invasive species on the lake	16
Benefits of aquatic invasive species control	12
Ecological advantages of shoreland restoration using native plants	9
Human impacts on lakes	6
Ways that aquatic invasive species are spread between lakes	6
Clean Boats / Clean Waters volunteer watercraft monitoring program	5
Not interested in learning more on any of these subjects	3



FRIENDS OF LOWER NINE MILE LAKE

#28 Before receiving this mailing, have you ever heard of the Friends of Lower Nine Mile Lake?

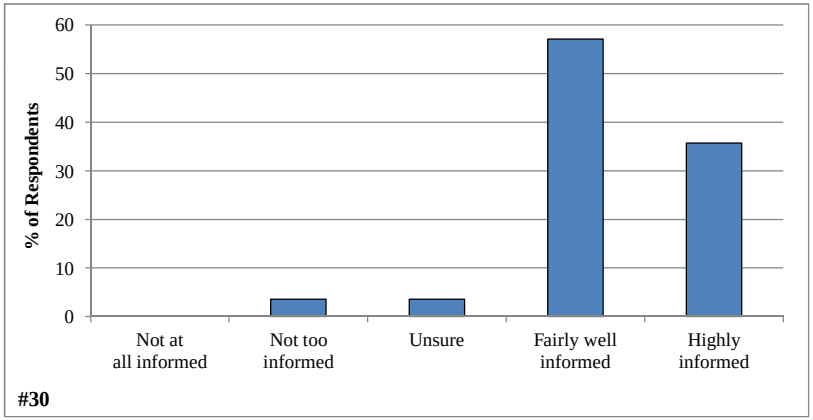
	Total	%
Yes	34	*97.1*
No	1	*2.9*
	35	*100.0*

#29 What is your membership status with the Friends of Lower Nine Mile Lake?

	Total	%
Current member	27	*84.4*
Former member	1	*3.1*
Never been a member	4	*12.5*
	32	*100.0*

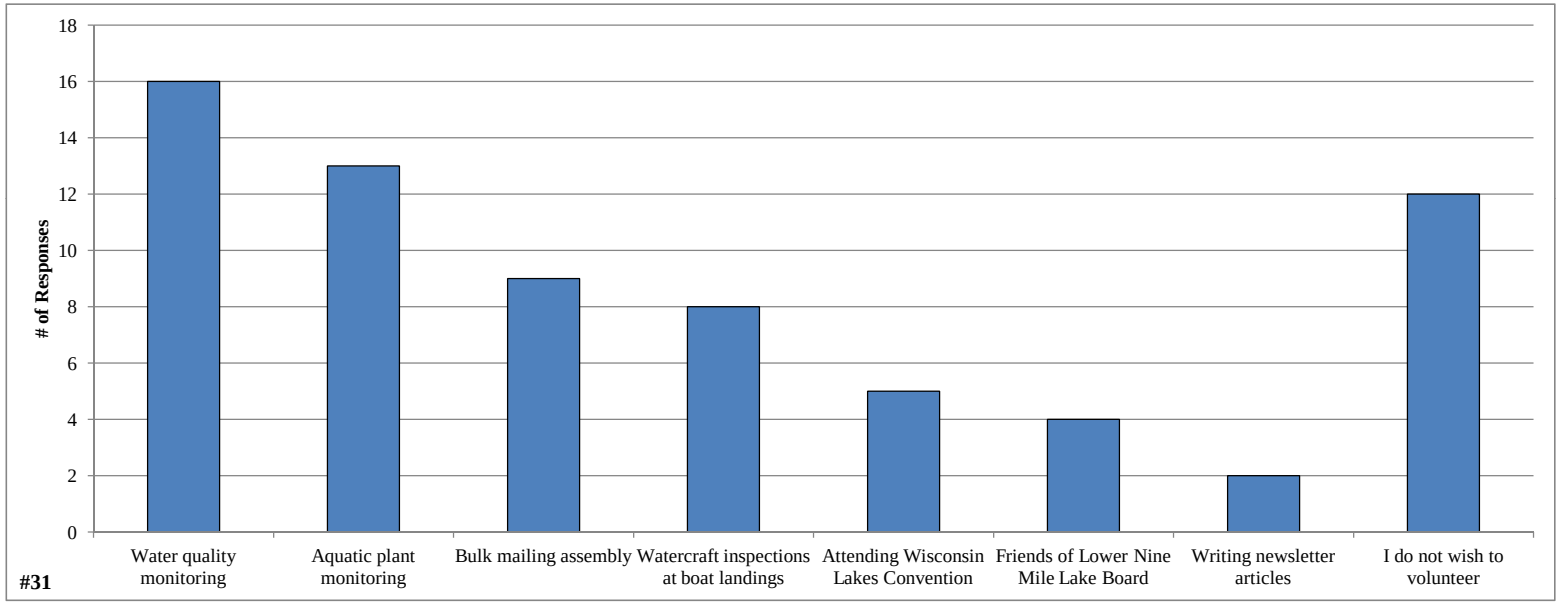
#30 How informed has the Friends of Lower Nine Mile Lake kept you regarding issues with the lake and its management?

	Total	%
Not at all informed	0	*0.0*
Not too informed	1	*3.6*
Unsure	1	*3.6*
Fairly well informed	16	*57.1*
Highly informed	10	*35.7*
	28	*100.0*



#31 Please circle the activities you would be willing to participate in if the Friends of Lower Nine Mile Lake requires additional assistance.

	Total
Water quality monitoring	16
Aquatic plant monitoring	13
Bulk mailing assembly	9
Watercraft inspections at boat landings	8
Attending Wisconsin Lakes Convention	5
Friends of Lower Nine Mile Lake Board	4
Writing newsletter articles	2
I do not wish to volunteer	12



Survey Number	1g Comment	11h Comment	14m Comment	19p Comment	20r Comment	21r Comment	Other Comments
1					wild rice	wild rice invasion bur-reed invasion	
2							
3		Musky			wild rice	wild rice	Q#3 A few family visits
4							Q#21 I rice
5							Q#6c wasn't pumped for 20 years but now by requirement, every 3 years Q#13g for 4 years
6			Long Walks			east end @ 9 mile creek	Q#5d cabin plus regular residential dwelling @ 8945 Hwy X, Q#9 stopped in 1990, Q#11a Rockbass, Q#18b Not on the west end and just east of the channel toward the Dam at Hwy X
7			Ice Skating		getting boats in and out	getting boats in & out	Q#7 Born there, was in family almost 100 yrs back when a river, Q#13 will be canoe in low area
8		Musky			rice taking over		Q#*31* We are seasonal
9		Musky			Rice!	rice taking over	Q#27j Yes!, Q31h Being a seasonal/weekend resident it is very difficult to participate.
10				Rice		Rice	Q#26d Because of our age we are not able to cut the wild rice. Also do not see the need for "permits" to get rid of something the DNR erroneously put in the lake!!
11							
12		Musky		Don't know			Q#1b same Fall, Q#3 Family Trust, Q#7 72 years family, 60 yrs personally, Q#18 Not sure is Wild Rice one?, Q#20e (5) Rice, Q#29 Not sure, Q#30 I assume info has been sent to the Trustee. He, however, is not very good at communicating with the rest of the family. I was sent this survey by my cousin, Q#31h not enough time to do any of the above
13							
14				Rice		Rice	
15							
16					Wild Rice	Rice	
17	Property used at any time			Excessive wild rice			
18				I call them ribbon weeds?			
19		Musky			Water levels are lower now than in the past by 1 foot	Wild Rice	
20							
21		Musky					
22			Investment				
23							Q#21 1st None, 2nd None, 3rd None
24							
25							
26				Wild Rice ??		Wild Rice	
27				Wild Rice, Bur-Reed	Wild Rice, Bur-Reed	Wild Rice, Bur-Reed	
28							
29							
30							
31		Musky					Q.#31 Out of state property owner.
32							
33		Rock Bass					
34							
35							
36							
37							
38							
39							
40							
41							
42							
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44							
45							
46							
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48							
49							
50							

Lower Nine Mile Lake Management Planning Project Stakeholder Survey
Responses to Question 32

1. The spread of wild rice and bur-reed has eliminated the beach/swimming areas that the campers and others have used. We can't even get to some of the campsites because the rice is so thick. A lot of young campers have this as their wilderness experience and this has greatly been impacted due to the rice and bur-reed.

2. Wild rice devalues property/greatly reduces enjoyment of lake

3. The increased growth of aquatic plants has increased tremendously in recent years. Fishing has slowed down. Boat traffic remains the same. The draw down has not been as early or as severe in recent years. A good thing to shore line exposure.

4. Uncontrolled rice is major concern.

5. Would like to see a specific area of the lake to be used exclusively as a swimming area which could be sanded down so we don't have to stand in the muck.

6. When the lake water level is honored (drawn down) during winter does it make sense to survey the enlarged shore line for inspection of damages otherwise not visible in other seasons i.e. fish line that may entangle around species-pick up, clean up? This has been a concern of mine for many years.

7. I'm hoping to someday build on my lot but as I see it now I would never get a boat through or have nice scenery or be able to fish off a dock on mine I have the worst lot.

8. We are very concerned about the rice that took over the front of our property. We go out on the boat and find the entire lake is looking like the front of our property. What do you say when you can't see the water from the front of your cottage. You could fish off the shore line when we first bought the property. Maybe someday that dream will come true (again.)

9. The rice situation is the main concern - we need to pull it out manually just to create a path from the pier to the lake proper. It really distracts from the beauty of our lake which needs to be addressed.

10. Since coming to LNML in 1946 the lake had been well maintained by all the residents. When the wild rice was incorporated into the lake we saw deterioration each year. Being elderly we cannot cut the rice to keep it at bay. The wild rice has a very negative impact on the value of our properties. We appreciate the water lilies & other aquatic plants.

11. No comment

12. Needless to say, after so many years there are bound to be a lot of changes in the lake. In addition to man-made changes the natural breakdown of all the underwater wood material makes changes in the ph and quality of the water. Short of manually re-stocking the lake with wood (i.e. tree trunks, stumps, limbs, etc) this breakdown of what is/was there will continue. The lake H2O used to be very dark-clear, but full of tannin. Would be interesting to know how the winter draw-down affects the lake. One would think it would be dramatic depending on how much H2O is released. Pan fishing has changed dramatically and bullheads are gone. As kids/teens it was the norm to catch a fish almost every trip out, rock bass, blue gill, perch, and sunfish-all good size-7 inches and higher. Now you are lucky to get a 2-3 incher!!

13. No comment

14. Let's start: We used to be able to sit on the pier at anytime of the day & fish, watch mother duck with all the ducklings & see the minnows by the shorelines. That is all gone now. You could always see people fishing the different shorelines here. Not anymore because getting close to the shore is impossible. Scenic boat rides is almost impossible because of all the rice, it literally gets clogged in the motors. People used to row boats and take canoes slowly by the shores to see the many wonders. The value of everyone's property is diminishing because of the rice. Who is going to want to purchase a home on our "once beautiful lake" when they're not able to use it for its many recreations values it had to offer? Let's hope we're able to find a solution to this grave problem before it gets out of hand. The DNR needs to do something to help us now.

15. While I am unsure of invasive species I know that my neighbors are concerned about wild rice. I wonder is the rice there due to the unsatisfactory rights of the native Americans?

16. No comment

17. I and my family love our lake. Family ownership goes back to 1950. It breaks my heart to see the rice slowly but surely take over the lake. It's at the point now that rowing a 12 ft boat from my frontage is next to impossible. The only way the lake will recover is with the cooperation of all owners to make and support the actions required. Let's pray that happens. I thank the board members for their excellent effort and leadership.

18. Over the years I have witnessed many changes that have occurred with the structure of the lake. To try to pin point any one cause of this occurrence would not do justice. What I believe added to the changes was the weather we have had in the past years/this I believe added to the changes that have taken place in the quality of the lake. Hope your survey proves beneficial.

19. Our cottage was owned by my father in law and mother in law – my wife and I just purchased the property this year. We have fished this lake for 48 years. The water levels were higher in the past. There were always a lot of weed in the lake, but they were different. I don't know what kind they were, but they were leafy, not same as now. Am big duck hunter. Ducks do not like this lake anymore, might come in overnight, but leave next morning at dawn, and don't come back. Used to see many broods of ducklings during summer, now they are rare. Our cottage is on eastern shoreline, now silted in and filled with cattails and rice. Can't even get my boat to dock – could do this 10 yr. ago we won 300' frontage. What we own in reality is 15' rest is solid weeds & silt.

20. No comment

21. No comment

22. Purchased for retirement. Now cannot afford to build. Trying to sell and value has decreased.

23. I think the reason the Friends of 9 Mile was formed is because of the wild rice. 50 years ago wild rice covered the east end of the lake. From it peak growth it took 3-4 years to totally disappear. There ws no rice in the lake for about 35 yrs. It came back a few years ago but now it's starting to decline again. In a few years I will bet you it will be gone again. You may not know this but 2 bushel of rice was planted in Lower 9 & Upper 9 each. Every year for about 45 yrs I cover every inch of 9 Mile Lake and the creeks leading into it. In my opinion this is the nicest lake around. Clear water, wild shore line, not jet skies, not large boats speeding around. If you want fish & waterfowl you have to have a certain amount of aquatic plants. They aren't as bad as people think. If some of the people that live on 9 Mile Lake don't like the weeds they should pack their bags and move to the Eagle River of 3 Lakes chain. I noticed that you got $22,000 grant for a study. I bet some consultant has the $22,000 and you have a piece of paper from him. My suggestion to you is to leave well enough alone.

24. No comment

25. No comment

26. Restart stocking Walleyes Because the Wild rice slows or stops the wave action, our shorelines have algae blooms, heavy weed growth and many, many dead snails.

27. We are very concerned about the plant and weed growth primarily the Wild Rice which is not native to Lower Nine Mile Lake. As the wild rice grows year after year and is not controlled it dies and lays at the bottom of the lake suffocating the aquatic life of the lake. If not controlled it will populate the entire lake and invade the Eagle River and Three Lakes chains. With excess aquatic growth boating is very difficult because the propellers get full of weeds and growth. It would also be great to do something about the numerous stumps which are dangerous to boating.

28. No comment

29. It has not been until the last 5-6 years that rice (wild) was a problem in front of my property. The major effect is that I see silt accumulation possible because of less water flow/circulation. This seems to be killing the native plant growth and promoting cattail growth as well as lily pad growth. I am not sure if the growth of plants further out in the lake is wild rice or is floating bur-reed but by late July it is so thick one cannot row through it without considerable work. The shoreline is definitely wild rice.

30. No comment.

31. Beautiful lake but something must be done to control aquatic plant (weeds) growth. Lake has become very difficult to fish. Sediment build up on lake bottom is becoming a problem also. I believe water depth is becoming too shallow. Sediment dredging would be very welcome to increase lake depth.

32. When we are in debt to countries hostile to our constitutional republic, why in the hell are we taking $22,000 from our fellow tax slaves to fund another unconstitutional committee to control private property. How much liberty are we going to give up? Are we going to stop at current socialism/intrusive government or go all the way to the North Korean model? Why can't we just talk respectfully to each other as neighbors and pay ourselves for the things we are persuaded are important?

33. No comment.

34. No comment.

35. No comment.

C

APPENDIX C

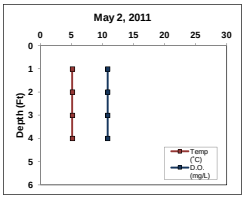
Water Quality Data

Lower Nine Mile Lake

Date: 5/2/2011
Time: 14:45
Weather: 100% clouds, breezy, snowing, 32°F
Entry: TWH

Max Depth: 5.2
LNMLS Depth (ft): 2.0
LNMLB Depth (ft): N/A
Secchi Depth (ft): 4.0

Depth (ft)	Temp (˚C)	D.O. (mg/L)	pH	Sp. Cond. (µS/cm)
1	5.1	10.8	7.6	39.0
2	5.1	10.8	7.6	38.0
3	5.1	10.8	7.6	39.0
4	5.1	10.8	7.6	39.0



Parameter	LNMLS	LNMLB
Total P (µg/L)	27.00	
Dissolved P (µg/L)	2.00	
Chl-a (µg/L)	10.50	
TKN (µg/L)	360.00	
$NO_3 + NO_2$-N (µg/L)	ND	
NH_3-N (µg/L)	ND	
Total N (µg/L)	360.00	
Lab Cond. (µS/cm)	41.00	
Lab pH	7.18	
Alkalinity (mg/L $CaCO_3$)	16.30	
Total Susp. Solids (mg/L)	3.00	
Calcium (mg/L)	4.60	

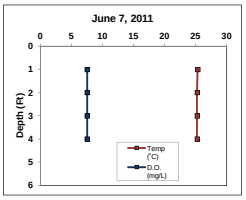
Data collected by TAH (Onterra)
Note: WQ samples collected with Van Dorn. New WQ point taken, GPS 3014.

Lower Nine Mile Lake

Date: 6/7/2011
Time: 12:30
Weather: 90% sun, hazy, breezy, 85°F
Entry: TWH

Max Depth: 4.4
LNMLS Depth (ft): 2.0
LNMLB Depth (ft): NA
Secchi Depth (ft): 4.4

Depth (ft)	Temp (˚C)	D.O. (mg/L)	pH	Sp. Cond. (µS/cm)
1	25.3	7.5	7.9	57.0
2	25.2	7.5	7.8	57.0
3	25.2	7.5	7.8	57.0
4	25.2	7.5	7.8	57.0



Parameter	LNMLS	LNMLB
Total P (µg/L)	22.00	
Dissolved P (µg/L)		
Chl-a (µg/L)	3.04	
TKN (µg/L)		
$NO_3 + NO_2$-N (µg/L)		
NH_3-N (µg/L)		
Total N (µg/L)		
Lab Cond. (µS/cm)		
Lab pH		
Alkalinity (mg/L $CaCO_3$)		
Total Susp. Solids (mg/L)	2.00	
Calcium (mg/L)		

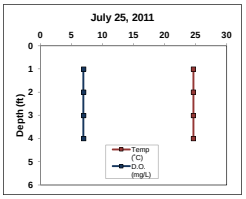
Data collected by TWH, MMF and EEC (Onterra)

Lower Nine Mile Lake

Date: 7/25/2011
Time: 11:35
Weather: 80˚F 10% clouds and breezy
Entry: MMF

Max Depth: 5.9
LNMLS Depth (ft): 3.0
LNMLB Depth (ft): N/A
Secchi Depth (ft): 5.9

Depth (ft)	Temp (˚C)	D.O. (mg/L)	pH	Sp. Cond. (µS/cm)
1	24.6	6.9	7.9	77.0
2	24.6	6.9	7.9	77.0
3	24.6	6.9	7.9	77.0
4	24.6	6.9	7.9	77.0



Parameter	LNMLS	LNMLB
Total P (µg/L)	26.00	
Dissolved P (µg/L)	ND	
Chl-a (µg/L)	3.32	
TKN (µg/L)	620.00	
$NO_3 + NO_2$-N (µg/L)	ND	
NH_3-N (µg/L)	36.00	
Total N (µg/L)	620.00	
Lab Cond. (µS/cm)	79.00	
Lab pH	7.53	
Alkalinity (mg/L $CaCO_3$)	33.80	
Total Susp. Solids (mg/L)	ND	
Calcium (mg/L)		

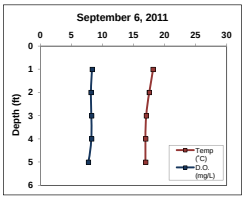
Data collected by TWH and MMF (Onterra) Secchi hit bottom.

Lower Nine Mile Lake

Date: 9/6/2011
Time: 11:15
Weather: clear, no wind, 48°
Entry: TWH

Max Depth: 5.5
LNMLS Depth (ft): 3
LNMLB Depth (ft):
Secchi Depth (ft): 5.5

Depth (ft)	Temp (˚C)	D.O. (mg/L)	pH	Sp. Cond. (µS/cm)
1	18.1	8.3		
2	17.5	8.1		
3	17	8.2		
4	16.9	8.2		
5	16.9	7.7		



Parameter	LNMLS	LNMLB
Total P (µg/L)	19.00	
Dissolved P (µg/L)		
Chl-a (µg/L)	1.10	
TKN (µg/L)		
$NO_3 + NO_2$-N (µg/L)		
NH_3-N (µg/L)		
Total N (µg/L)		
Lab Cond. (µS/cm)		
Lab pH		
Alkalinity (mg/L $CaCO_3$)		
Total Susp. Solids (mg/L)	ND	
Calcium (mg/L)		

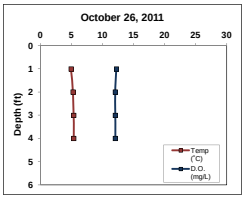
Data collected bt TAH and TWH (Onterra) Secchi hit bottom.

Lower Nine Mile Lake

Date: 10/26/2011
Time: 8:40
Weather: 100% clouds, calm, 38°F
Entry: TWH

Max Depth: 5.2
LNMLS Depth (ft): 3
LNMLB Depth (ft): N/A
Secchi Depth (ft): 5.2

Depth (ft)	Temp (˚C)	D.O. (mg/L)	pH	Sp. Cond. (µS/cm)
1	4.9	12.2		
2	5.2	12		
3	5.3	12		
4	5.3	12		



Parameter	LNMLS	LNMLB
Total P (µg/L)	21.00	
Dissolved P (µg/L)		
Chl-a (µg/L)	7.47	
TKN (µg/L)		
$NO_3 + NO_2$-N (µg/L)		
NH_3-N (µg/L)		
Total N (µg/L)		
Lab Cond. (µS/cm)		
Lab pH		
Alkalinity (mg/L $CaCO_3$)		
Total Susp. Solids (mg/L)	3.00	
Calcium (mg/L)		

Data collected by TWH (Onterra)

Water Quality Data

2011	Surface		Bottom	
Parameter	Count	Mean	Count	Mean
Secchi Depth (feet)	5	4.2	NA	NA
Total P (µg/L)	6	23.0	0	NA
Dissolved P (µg/L)	3	2.0	0	NA
Chl a (µg/L)	6	5.1	0	NA
TKN (µg/L	3	490.0	0	NA
NO3+NO2-N (µg/L)	3	ND	0	NA
NH3-N (µg/L)	3	36.0	0	NA
Total N (µg/L)	3	490.0	0	NA
Lab Cond. (µS/cm)	3	60.0	0	NA
Lab pH	3	7.4	0	NA
Alkal (mg/l CaCO3)	3	25.1	0	NA
Total Susp Sol (mg/l)	6	2.7	0	NA
Calcium (µg/L)	2	4.6	0	NA

Morphological / Geographical Data

Parameter	Value
Acreage	
Volume (acre-feet)	
Perimeter (miles)	
Shoreland Developmetnt Factor	
Maximum Depth (feet)	
County	
WBIC	
Lillie Mason Region (1983)	NLF Ecoregion
Nichols Ecoregion (1999)	NLFL

Watershed Data

WiLMS Class	Acreage	kg/yr	lbs/yr
Forest			0.0
Open Water			0.0
Pasture/Grass			0.0
Row Crops			0.0
Urban - Rural Residential			0.0
Wetland			0.0
Watershed to Lake Area			

Trophic State Index (TSI)

Year	TP	Chl-a	Secchi
1993			49.1
1994			51.6
1995			50.7
1996			53.9
2000	46.9	43.3	49.8
2001	49.2	40.9	
2002	54.4	52.9	
2010	51.9	44.5	55.1
2011	52.5	46.6	54.7
All Years (Weighted)	53.6	47.0	51.3
Shallow, Lowland Drainage Lakes	55.4	51.6	52.3
NLF Ecoregion	51.8	47.7	45.7

	Secchi (feet)				Chlorophyll-a (µg/L)				Total 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
1993	14	7.0	10	7.0								
1994	14	6.2	8	5.9								
1995	2	6.3	2	6.3								
1996	3	5.7	1	5.0								
2000	4	6.2	3	6.7	4	3.4	3	3.7	4	19.0	3.0	19.3
2001					4	3.7	3	2.9	4	21.8	3.0	22.7
2002					4	8.8	3	9.7	4	31.8	3.0	32.7
2010	4	4.6	3	4.6	4	4.4	3	4.1	4	25.5	3.0	27.3
2011	9	4.8	5	4.7	9	6.2	5	5.1	9	26.6	5.0	28.6
All Years (Weighted)		6.0		6.0		5.5		5.1		25.2		26.4
Shallow, Lowland Drainage Lakes				5.6				9.4				33.0
NLF Ecoregion				8.9				5.6				21.0

D

APPENDIX D

Watershed Analysis WiLMS Results

Date: 5/8/2012 Scenario: Lower Ninemile Lake Current

Lake Id: Lower Ninemile Lake
Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 17726.0 acre
Total Unit Runoff: 14 in.
Annual Runoff Volume: 20680.3 acre-ft
Lake Surface Area <As>: 841 acre
Lake Volume <V>: 2003 acre-ft
Lake Mean Depth <z>: 2.4 ft
Precipitation - Evaporation: 5.5 in.
Hydraulic Loading: 21065.8 acre-ft/year
Areal Water Load <qs>: 25.0 ft/year
Lake Flushing Rate <p>: 10.52 1/year
Water Residence Time: 0.10 year
Observed spring overturn total phosphorus (SPO): 27.0 mg/m^3
Observed growing season mean phosphorus (GSM): 26.6 mg/m^3
% NPS Change: 0%
% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre (ac)	Low Loading (kg/ha-year)	Most Likely Loading (kg/ha-year)	High Loading (kg/ha-year)	Loading %	Low Loading (kg/year)	Most Likely Loading (kg/year)	High Loading (kg/year)
Row Crop AG	0.0	0.50	1.00	3.00	0.0	0	0	0
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	737	0.10	0.30	0.50	10.6	30	89	149
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0
MD Urban (1/4 Ac)	1.0	0.30	0.50	0.80	0.0	0	0	0
Rural Res (>1 Ac)	1.0	0.05	0.10	0.25	0.0	0	0	0
Wetlands	9045	0.10	0.10	0.10	43.2	366	366	366
Forest	7942	0.05	0.09	0.18	34.1	161	289	579
Lake Surface	841.0	0.10	0.30	1.00	12.1	34	102	340

POINT SOURCE DATA

Point Sources	Water Load (m^3/year)	Low (kg/year)	Most Likely (kg/year)	High (kg/year)	Loading %

SEPTIC TANK DATA

Description		Low	Most Likely	High	Loading %
Septic Tank Output (kg/capita-year)		0.3	0.5	0.8	
# capita-years	0.0				
% Phosphorus Retained by Soil		98	90	80	
Septic Tank Loading (kg/year)		0.00	0.00	0.00	0.0

TOTALS DATA

Description	Low	Most Likely	High	Loading %
Total Loading (lb)	1302.4	1867.6	3162.5	100.0
Total Loading (kg)	590.8	847.2	1434.5	100.0
Areal Loading (lb/ac-year)	1.55	2.22	3.76	0.0
Areal Loading (mg/m^2-year)	173.58	248.91	421.49	0.0
Total PS Loading (lb)	0.0	0.0	0.0	0.0
Total PS Loading (kg)	0.0	0.0	0.0	0.0
Total NPS Loading (lb)	1227.4	1642.5	2412.2	100.0
Total NPS Loading (kg)	556.7	745.0	1094.2	100.0

Phosphorus Prediction and Uncertainty Analysis Module

Date: 5/8/2012 Scenario: 40
Observed spring overturn total phosphorus (SPO): 27.0 mg/m^3
Observed growing season mean phosphorus (GSM): 26.6 mg/m^3
Back calculation for SPO total phosphorus: 0.0 mg/m^3
Back calculation GSM phosphorus: 0.0 mg/m^3
% Confidence Range: 70%
Nurenberg Model Input - Est. Gross Int. Loading: 0 kg

Lake Phosphorus Model	Low Total P (mg/m^3)	Most Likely Total P (mg/m^3)	High Total P (mg/m^3)	Predicted -Observed (mg/m^3)	% Dif.
Walker, 1987 Reservoir	20	28	47	1	4
Canfield-Bachmann, 1981 Natural Lake	19	27	43	0	0
Canfield-Bachmann, 1981 Artificial Lake	18	24	38	-3	-11
Rechow, 1979 General	8	12	20	-15	-56
Rechow, 1977 Anoxic	20	28	48	1	4
Rechow, 1977 water load<50m/year	17	25	42	-2	-8
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	18	25	43	-2	-7
Vollenweider, 1982 Combined OECD	16	22	33	-5	-19
Dillon-Rigler-Kirchner	7	10	18	-17	-63
Vollenweider, 1982 Shallow Lake/Res.	13	17	27	-10	-37
Larsen-Mercier, 1976	17	25	42	-2	-7
Nurnberg, 1984 Oxic	9	14	23	-13	-49

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	19	43	z Tw	0	GSM
Canfield-Bachmann, 1981 Natural Lake	8	78	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	7	69	FIT	1	GSM
Rechow, 1979 General	8	19	FIT	0	GSM
Rechow, 1977 Anoxic	19	43	FIT	0	GSM
Rechow, 1977 water load<50m/year	16	39	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	14	43	FIT	0	SPO
Vollenweider, 1982 Combined OECD	12	38	FIT	0	ANN
Dillon-Rigler-Kirchner	7	16	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	9	30	FIT	0	ANN
Larsen-Mercier, 1976	17	38	P Pin	0	SPO
Nurnberg, 1984 Oxic	8	23	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 5/8/2012 Scenario: 29
Average Annual Surface Total Phosphorus: 26.6mg/m^3
Annual Discharge: 2.11E+004 AF => 2.60E+007 m^3
Annual Outflow Loading: 1457.7 LB => 661.2 kg

E

APPENDIX E

Aquatic Plant Survey Data

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
1	5	Sand	Pole	45.892839	-89.120184		1																																	
2	6	Muck	Pole	45.893506	-89.119207																1																			
3	5	Sand	Pole	45.894174	-89.118229																																			
4	0			45.898216	-89.117199	NONNAVIGABLE (PLANTS)																																		
5	3	Sand	Pole	45.897541	-89.117209				1										V												V			1						
6	5	Sand	Pole	45.894841	-89.117252							1														1									1					
7	3	Muck	Pole	45.898883	-89.116221		1												V												V									
8	4	Muck	Pole	45.898209	-89.116232						1				1	1		V							1															
9	3	Muck	Pole	45.897534	-89.116243														V						2															
10	5	Muck	Pole	45.895509	-89.116275		1											V							2													1		
11	6	Sand	Pole	45.894834	-89.116285								1						V					1																
12	0			45.899551	-89.115244	NONNAVIGABLE (PLANTS)																																		
13	4	Muck	Pole	45.898876	-89.115255																																1			
14	6	Muck	Pole	45.898201	-89.115265																				2															
15	3	Muck	Pole	45.897526	-89.115276																				1															
16	6	Muck	Pole	45.896851	-89.115287		1																																	
17	4	Sand	Pole	45.896176	-89.115297						1								V																					
18	6	Muck	Pole	45.895501	-89.115308		1									1		V																						
19	5	Sand	Pole	45.894826	-89.115319						1						1	V		1			1																	
20	0			45.900218	-89.114266	NONNAVIGABLE (PLANTS)																																		
21	0			45.899543	-89.114277	NONNAVIGABLE (PLANTS)																																		
22	3	Muck	Pole	45.898868	-89.114288																				1															
23	5	Muck	Pole	45.898194	-89.114299		1					1													1										1					
24	5	Muck	Pole	45.897519	-89.114309														V						2						V									
25	5	Muck	Pole	45.896844	-89.114320		1									1	1														V				1					
26	5	Muck	Pole	45.896169	-89.114331											1	1																							
27	6	Muck	Pole	45.895494	-89.114341		2											V																	1					
28	2	Sand	Pole	45.894819	-89.114352						1					2																			1					
29	0			45.901561	-89.113278	NONNAVIGABLE (PLANTS)																																		
30	0			45.900886	-89.113289	NONNAVIGABLE (PLANTS)																																		
31	0			45.900211	-89.113300	NONNAVIGABLE (PLANTS)																																		
32	3	Muck	Pole	45.899536	-89.113310																										1					V				
33	5	Muck	Pole	45.898861	-89.113321																																			
34	0			45.898186	-89.113332	NONNAVIGABLE (PLANTS)																																		
35	0			45.897511	-89.113343	NONNAVIGABLE (PLANTS)																																		
36	2	Sand	Pole	45.896161	-89.113364														1							1					V									
37	0			45.902228	-89.112301	NONNAVIGABLE (PLANTS)																																		
38	0			45.901553	-89.112311	NONNAVIGABLE (PLANTS)																																		
39	0			45.900878	-89.112322	NONNAVIGABLE (PLANTS)																																		
40	3	Sand	Pole	45.900203	-89.112333																				1						1									
41	6	Muck	Pole	45.899528	-89.112344		1																		1															
42	4	Muck	Pole	45.898854	-89.112354																				1						V									
43	0			45.896829	-89.112387	TERRESTRIAL																																		
44	0			45.902221	-89.111334	NONNAVIGABLE (PLANTS)																																		
45	0			45.901546	-89.111345	NONNAVIGABLE (PLANTS)																																		
46	3	Muck	Pole	45.900871	-89.111355																				1															
47	5	Muck	Pole	45.900196	-89.111366																				2															
48	4	Muck	Pole	45.899521	-89.111377																				1															
49	4	Muck	Pole	45.898846	-89.111388		1																					1			V									
50	0			45.898171	-89.111398	NONNAVIGABLE (PLANTS)																																		
51	0			45.902888	-89.110356	NONNAVIGABLE (PLANTS)																																		
52	0			45.902213	-89.110367	NONNAVIGABLE (PLANTS)																																		
53	4	Muck	Pole	45.901538	-89.110378																				1											1				
54	5	Muck	Pole	45.900863	-89.110389																				1															
55	5	Muck	Pole	45.900188	-89.110399																				1												1			
56	4	Muck	Pole	45.899513	-89.110410																				2															
57	5	Muck	Pole	45.898838	-89.110421		1																		1															
58	4	Muck	Pole	45.898164	-89.110432																										1				1					
59	0			45.902206	-89.109400	NONNAVIGABLE (PLANTS)																																		

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
60	5	Muck	Pole	45.901531	-89.109411																				1															
61	5	Muck	Pole	45.900856	-89.109422																				1															
62	5	Muck	Pole	45.900181	-89.109433																				1										1					
63	5	Muck	Pole	45.899506	-89.109443																				2															
64	5	Muck	Pole	45.898831	-89.109454																				1						V									
65	4	Muck	Pole	45.898156	-89.109465																										1						1			
66	0			45.897481	-89.109476	NONNAVIGABLE (PLANTS)																																		
67	0			45.883307	-89.109702	NONNAVIGABLE (PLANTS)																																		
68	0			45.902873	-89.108423	NONNAVIGABLE (PLANTS)																																		
69	4	Muck	Pole	45.902198	-89.108434																				1						1									
70	5	Muck	Pole	45.901523	-89.108444																				1															
71	5	Muck	Pole	45.900848	-89.108455																																			
72	5	Muck	Pole	45.900173	-89.108466																				2															
73	5	Muck	Pole	45.899498	-89.108477																				2															
74	5	Muck	Pole	45.898823	-89.108488			1																																
75	3	Muck	Pole	45.898148	-89.108498																										1									
76	0			45.897473	-89.108509	NONNAVIGABLE (PLANTS)																																		
77	0			45.884649	-89.108714	NONNAVIGABLE (PLANTS)																																		
78	4	Muck	Pole	45.902866	-89.107456																				1											V				
79	4	Muck	Pole	45.902191	-89.107467																				1															
80	5	Muck	Pole	45.901516	-89.107478																				1															
81	4	Muck	Pole	45.900841	-89.107488																				1															
82	5	Muck	Pole	45.900166	-89.107499		1																		1															
83	5	Muck	Pole	45.899491	-89.107510																														1					
84	4	Muck	Pole	45.898816	-89.107521		1																																	
85	3	Muck	Pole	45.898141	-89.107532																										1									
86	0			45.897466	-89.107542	NONNAVIGABLE (PLANTS)																																		
87	0			45.885317	-89.107737	NONNAVIGABLE (PLANTS)																																		
88	0			45.903533	-89.106478	NONNAVIGABLE (PLANTS)																																		
89	5	Muck	Pole	45.902858	-89.106489																																			
90	5	Muck	Pole	45.902183	-89.106500																				1						V									
91	5	Muck	Pole	45.901508	-89.106511																																			
92	5	Muck	Pole	45.900833	-89.106522																																			
93	5	Muck	Pole	45.900158	-89.106532																				1															
94	4	Muck	Pole	45.899483	-89.106543																				1															
95	5	Muck	Pole	45.898808	-89.106554																	1																		
96	3	Muck	Pole	45.898133	-89.106565																										V									
97	2	Muck	Pole	45.897458	-89.106576																										V					V	1			
98	0			45.887334	-89.106738	NONNAVIGABLE (PLANTS)																																		
99	0			45.886659	-89.106749	NONNAVIGABLE (PLANTS)																																		
100	0			45.885309	-89.106771	NONNAVIGABLE (PLANTS)																																		
101	0			45.904200	-89.105501	NONNAVIGABLE (PLANTS)																																		
102	4	Muck	Pole	45.903525	-89.105512																				1															
103	5	Muck	Pole	45.902850	-89.105522																				1															
104	5	Muck	Pole	45.902176	-89.105533																										V					1				
105	4	Muck	Pole	45.901501	-89.105544					1															1															
106	5	Muck	Pole	45.900826	-89.105555																																			
107	4	Muck	Pole	45.900151	-89.105566																																			
108	4	Muck	Pole	45.899476	-89.105577																																	1		
109	4	Muck	Pole	45.898801	-89.105587																	1									V									
110	3	Muck	Pole	45.898126	-89.105598																										1									
111	0			45.897451	-89.105609	TERRESTRIAL																																		
112	0			45.896776	-89.105620	NONNAVIGABLE (PLANTS)																																		
113	0			45.889351	-89.105739	NONNAVIGABLE (PLANTS)																																		
114	0			45.888676	-89.105750	NONNAVIGABLE (PLANTS)																																		
115	0			45.888001	-89.105761	NONNAVIGABLE (PLANTS)																																		
116	0			45.887326	-89.105772	NONNAVIGABLE (PLANTS)																																		
117	0			45.886652	-89.105782	NONNAVIGABLE (PLANTS)																																		
118	0			45.885977	-89.105793	NONNAVIGABLE (PLANTS)																																		

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
119	0			45.904193	-89.104534																																			
120	4	Muck	Pole	45.903518	-89.104545																															V				
121	5	Muck	Pole	45.902843	-89.104556																				1															
122	5	Muck	Pole	45.902168	-89.104566																																			
123	5	Muck	Pole	45.901493	-89.104577																																			
124	5	Muck	Pole	45.900818	-89.104588																				1										1					
125	5	Muck	Pole	45.900143	-89.104599																				1												1			
126	4	Muck	Pole	45.899468	-89.104610																																			
127	4	Muck	Pole	45.898793	-89.104621																																			
128	4	Muck	Pole	45.898118	-89.104632																																			
129	2	Muck	Pole	45.897443	-89.104642														V																	V	1			
130	0			45.896768	-89.104653	TERRESTRIAL																																		
131	0			45.896093	-89.104664	TERRESTRIAL																																		
132	0			45.890694	-89.104751	NONNAVIGABLE (PLANTS)																																		
133	0			45.890019	-89.104762	NONNAVIGABLE (PLANTS)																																		
134	0			45.889344	-89.104773	NONNAVIGABLE (PLANTS)																																		
135	2	Muck	Pole	45.888669	-89.104783					1															1											V	2			
136	2	Muck	Pole	45.887994	-89.104794					1						1	1	V																		1				
137	0			45.887319	-89.104805	NONNAVIGABLE (PLANTS)																																		
138	0			45.886644	-89.104816	NONNAVIGABLE (PLANTS)																																		
139	0			45.904185	-89.103567	NONNAVIGABLE (PLANTS)																																		
140	3	Muck	Pole	45.903510	-89.103578																				2															
141	5	Muck	Pole	45.902835	-89.103589																				1											V				
142	5	Muck	Pole	45.902160	-89.103600			1																	1															
143	5	Muck	Pole	45.901485	-89.103611							1													1															
144	4	Muck	Pole	45.900810	-89.103621																																			
145	4	Muck	Pole	45.900135	-89.103632																																			
146	4	Muck	Pole	45.899461	-89.103643																																1			
147	5	Muck	Pole	45.898786	-89.103654																																			
148	3	Muck	Pole	45.898111	-89.103665																																			
149	2	Muck	Pole	45.897436	-89.103676													V													V									
150	0			45.896761	-89.103687	TERRESTRIAL																																		
151	0			45.896086	-89.103697	TERRESTRIAL																																		
152	0			45.895411	-89.103708	TERRESTRIAL																																		
153	0			45.894736	-89.103719	TERRESTRIAL																																		
154	0			45.892036	-89.103763	NONNAVIGABLE (PLANTS)																																		
155	0			45.891361	-89.103773	NONNAVIGABLE (PLANTS)																																		
156	0			45.890686	-89.103784	NONNAVIGABLE (PLANTS)																																		
157	2	Muck	Pole	45.890011	-89.103795																															1	1			
158	4	Muck	Pole	45.889336	-89.103806					1															1											V	2			
159	5	Muck	Pole	45.888661	-89.103817											1		V	V															1		1				
160	3	Muck	Pole	45.887986	-89.103828		2			1									V																	1				
161	0			45.887311	-89.103839	NONNAVIGABLE (PLANTS)																																		
162	0			45.886636	-89.103849	NONNAVIGABLE (PLANTS)																																		
163	3	Muck	Pole	45.903503	-89.102611		1																								1									
164	5	Muck	Pole	45.902828	-89.102622			1																																
165	5	Muck	Pole	45.902153	-89.102633																				1															
166	5	Muck	Pole	45.901478	-89.102644							1																												
167	5	Muck	Pole	45.900803	-89.102655																				1												1			
168	5	Muck	Pole	45.900128	-89.102666																				2												1			
169	4	Muck	Pole	45.899453	-89.102676																																			
170	5	Muck	Pole	45.898778	-89.102687																																			
171	3	Muck	Pole	45.898103	-89.102698																				1															
172	2	Muck	Pole	45.897428	-89.102709																																			
173	2	Muck	Pole	45.896753	-89.102720																										V									
174	0			45.896078	-89.102731	TERRESTRIAL																																		
175	0			45.895403	-89.102742	NONNAVIGABLE (PLANTS)																																		
176	0			45.894728	-89.102753	NONNAVIGABLE (PLANTS)																																		
177	0			45.894053	-89.102763	NONNAVIGABLE (PLANTS)																																		

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
178	0			45.892703	-89.102785	NONNAVIGABLE (PLANTS)																																		
179	0			45.892028	-89.102796	NONNAVIGABLE (PLANTS)																																		
180	3	Muck	Pole	45.891353	-89.102807																				1											1				
181	3	Muck	Pole	45.890679	-89.102818					1							1								2						V					V	1			
182	4	Muck	Pole	45.890004	-89.102829					1															1											V				
183	5	Muck	Pole	45.889329	-89.102839		1											1																		V				
184	2	Muck	Pole	45.888654	-89.102850							1																								V	2			
185	0			45.887979	-89.102861	NONNAVIGABLE (PLANTS)																																		
186	0			45.887304	-89.102872	NONNAVIGABLE (PLANTS)																																		
187	0			45.886629	-89.102883	NONNAVIGABLE (PLANTS)																																		
188	0			45.885954	-89.102894	NONNAVIGABLE (PLANTS)																																		
189	0			45.885279	-89.102905	NONNAVIGABLE (PLANTS)																																		
190	0			45.903495	-89.101644	NONNAVIGABLE (PLANTS)																																		
191	4	Muck	Pole	45.90282	-89.101655																				1											V	1			
192	6	Muck	Pole	45.902145	-89.101666		1																		1															
193	4	Muck	Pole	45.90147	-89.101677			1																	1															
194	5	Muck	Pole	45.900795	-89.101688							1													1															
195	5	Muck	Pole	45.90012	-89.101699																				1												1			
196	5	Muck	Pole	45.899445	-89.10171																				1												1			
197	5	Muck	Pole	45.89877	-89.101721																				1										1					
198	4	Muck	Pole	45.898095	-89.101731			1								1																								
199	4	Muck	Pole	45.89742	-89.101742																																			
200	4	Muck	Pole	45.896746	-89.101753																																1			
201	4	Muck	Pole	45.896071	-89.101764																				1												1			
202	3	Muck	Pole	45.895396	-89.101775																															1	1			
203	0			45.894721	-89.101786	NONNAVIGABLE (PLANTS)																																		
204	2	Muck	Pole	45.894046	-89.101797														V												1					V	2			
205	0			45.893371	-89.101808	NONNAVIGABLE (PLANTS)																																		
206	4	Muck	Pole	45.892696	-89.101819		1												1																	1				
207	4	Muck	Pole	45.892021	-89.101829												2														V									
208	5	Muck	Pole	45.891346	-89.10184											1	2								1										1	V				
209	4	Muck	Pole	45.890671	-89.101851												1		1												V			1		V				
210	4	Muck	Pole	45.889996	-89.101862		1										1								1											V				
211	0			45.889321	-89.101873	NONNAVIGABLE (PLANTS)																																		
212	0			45.888646	-89.101884	NONNAVIGABLE (PLANTS)																																		
213	0			45.886621	-89.101916	NONNAVIGABLE (PLANTS)																																		
214	0			45.885271	-89.101938	NONNAVIGABLE (PLANTS)																																		
215	0			45.903487	-89.100678	NONNAVIGABLE (PLANTS)																																		
216	3	Muck	Pole	45.902813	-89.100688		1																								1					V	1			
217	6	Muck	Pole	45.902138	-89.100699		1																		1															
218	4	Muck	Pole	45.901463	-89.10071		1																		1															
219	6	Muck	Pole	45.900788	-89.100721																				2															
220	6	Muck	Pole	45.900113	-89.100732																				2															
221	5	Muck	Pole	45.899438	-89.100743																				2															
222	5	Muck	Pole	45.898763	-89.100754			1																																
223	4	Muck	Pole	45.898088	-89.100765			1																											1					
224	4	Muck	Pole	45.897413	-89.100776																																1			
225	4	Muck	Pole	45.896738	-89.100787																				1												1			
226	3	Muck	Pole	45.896063	-89.100797			1																											1		1			
227	3	Muck	Pole	45.895388	-89.100808			1																												V	1			
228	3	Muck	Pole	45.894713	-89.100819			1																											1	1				
229	3	Muck	Pole	45.894038	-89.10083												1					1									1									
230	6	Muck	Pole	45.893363	-89.100841					1							2																							
231	3	Muck	Pole	45.892688	-89.100852																	1														V	2			
232	3	Muck	Pole	45.892013	-89.100863											1		V																		V				
233	3	Muck	Pole	45.891338	-89.100874		2																														1			
234	4	Muck	Pole	45.890663	-89.100885		1			1						1			V				1														1			
235	2	Muck	Pole	45.889988	-89.100895														V														1				2			
236	0			45.889313	-89.100906	NONNAVIGABLE (PLANTS)																																		

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
237	2	Muck	Pole	45.902805	-89.099722										1																1					1	1	1		
238	4	Muck	Pole	45.90213	-89.099733			1																													1			
239	6	Muck	Pole	45.901455	-89.099744		1																		1															
240	5	Muck	Pole	45.90078	-89.099754																																			
241	5	Muck	Pole	45.900105	-89.099765																																			
242	6	Muck	Pole	45.89943	-89.099776																				2															
243	5	Muck	Pole	45.898755	-89.099787																				2												1			
244	5	Muck	Pole	45.89808	-89.099798																				1															
245	5	Muck	Pole	45.897405	-89.099809																				1												1			
246	4	Muck	Pole	45.89673	-89.09982																				2															
247	4	Muck	Pole	45.896055	-89.099831			1				1													1											1	1			
248	5	Muck	Pole	45.89538	-89.099842																				1												1			
249	4	Muck	Pole	45.894705	-89.099853		1																		2												1			
250	4	Muck	Pole	45.894031	-89.099864			1																												1				
251	4	Muck	Pole	45.893356	-89.099874		1	1																							1					1	1			
252	0			45.902797	-89.098755	NONNAVIGABLE (PLANTS)																																		
253	2	Muck	Pole	45.902122	-89.098766													V																		1	1			
254	4	Muck	Pole	45.901447	-89.098777																																			
255	4	Muck	Pole	45.900772	-89.098788																				1												1			
256	4	Muck	Pole	45.900097	-89.098799																										1						1			
257	4	Muck	Pole	45.899423	-89.09881																	1			1															
258	5	Muck	Pole	45.898748	-89.09882																				3															
259	5	Muck	Pole	45.898073	-89.098831		1			1															2															
260	5	Muck	Pole	45.897398	-89.098842																				3															
261	5	Muck	Pole	45.896723	-89.098853																				3															
262	5	Muck	Pole	45.896048	-89.098864																				2															
263	5	Muck	Pole	45.895373	-89.098875																				2															
264	5	Muck	Pole	45.894698	-89.098886																				1												1			
265	6	Muck	Pole	45.894023	-89.098897		1										1																				1			
266	3	Muck	Pole	45.893348	-89.098908					1								V																		V	2			
267	0			45.892673	-89.098919	NONNAVIGABLE (PLANTS)																																		
268	1	Muck	Pole	45.902115	-89.097799														V										1			V				V				
269	3	Muck	Pole	45.90144	-89.09781																										2									
270	4	Muck	Pole	45.900765	-89.097821																																			
271	2	Muck	Pole	45.90009	-89.097832																				1											2				
272	3	Muck	Pole	45.899415	-89.097843																				1											1				
273	4	Muck	Pole	45.89874	-89.097854																				1															
274	5	Muck	Pole	45.898065	-89.097865																				2															
275	5	Muck	Pole	45.89739	-89.097876																				2										1					
276	5	Muck	Pole	45.896715	-89.097887																				3															
277	4	Muck	Pole	45.89604	-89.097897														V						1											1	1			
278	4	Muck	Pole	45.895365	-89.097908																															V				
279	4	Muck	Pole	45.89469	-89.097919																				1											1	1			
280	3	Muck	Pole	45.894015	-89.09793											2																				V				
281	3	Muck	Pole	45.89334	-89.097941			1																							1					1	1	1		
282	0			45.892665	-89.097952	NONNAVIGABLE (PLANTS)																																		
283	3	Muck	Pole	45.901432	-89.096843																										2									
284	4	Muck	Pole	45.900757	-89.096854																																1			
285	3	Muck	Pole	45.900082	-89.096865													V							2															
286	4	Muck	Pole	45.899407	-89.096876																				1											1				
287	2	Muck	Pole	45.898732	-89.096887																	1														1				
288	3	Muck	Pole	45.898057	-89.096898																																			
289	4	Muck	Pole	45.897382	-89.096909																																			
290	3	Muck	Pole	45.896707	-89.09692																																			
291	3	Muck	Pole	45.896032	-89.096931																																			
292	3	Muck	Pole	45.895358	-89.096942																																			
293	3	Muck	Pole	45.894683	-89.096953			1																												1		1		
294	3	Muck	Pole	45.894008	-89.096964			1				1																								V	1			
295	2	Muck	Pole	45.893333	-89.096975		1											V																			3			

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
296	2	Muck	Pole	45.892658	-89.096986														V																		3			
297	0			45.902099	-89.095866	NONNAVIGABLE (PLANTS)																																		
298	4	Muck	Pole	45.901424	-89.095877		1																		1						1						1			
299	5	Muck	Pole	45.90075	-89.095887																				1												1			
300	3	Muck	Pole	45.900075	-89.095898																															1				
301	3	Muck	Pole	45.8994	-89.095909																										1					1				
302	3	Muck	Pole	45.898725	-89.09592																	1			1						1						1			
303	3	Muck	Pole	45.89805	-89.095931																	1														1				
304	3	Muck	Pole	45.897375	-89.095942											1															1									
305	3	Muck	Pole	45.8967	-89.095953																										1					1				
306	2	Muck	Pole	45.896025	-89.095964																															1				
307	2	Muck	Pole	45.89535	-89.095975							1																								1		1		
308	1	Muck	Pole	45.894675	-89.095986																															V	2			
309	0			45.894	-89.095997	NONNAVIGABLE (PLANTS)																																		
310	0			45.893325	-89.096008	NONNAVIGABLE (PLANTS)																																		
311	2	Muck	Pole	45.902092	-89.094899																										1					1	1			
312	4	Muck	Pole	45.901417	-89.09491																																			
313	4	Muck	Pole	45.900742	-89.094921																				1															
314	0			45.900067	-89.094932	NONNAVIGABLE (PLANTS)																																		
315	0			45.899392	-89.094943	NONNAVIGABLE (PLANTS)																																		
316	4	Muck	Pole	45.898717	-89.094954																										1									
317	3	Muck	Pole	45.898042	-89.094965																										1					V				
318	0			45.897367	-89.094976	TERRESTRIAL																																		
319	0			45.896692	-89.094987	TERRESTRIAL																																		
320	0			45.896017	-89.094998	TERRESTRIAL																																		
321	0			45.895342	-89.095008	TERRESTRIAL																																		
322	0			45.894667	-89.095019	TERRESTRIAL																																		
323	0			45.893992	-89.09503	TERRESTRIAL																																		
324	2	Muck	Pole	45.902759	-89.093921																	1														V				
325	3	Muck	Pole	45.902084	-89.093932													V																		V				
326	4	Muck	Pole	45.901409	-89.093943																																			
327	3	Muck	Pole	45.900734	-89.093954																															1	2			
328	0			45.900059	-89.093965	NONNAVIGABLE (PLANTS)																																		
329	3	Muck	Pole	45.899384	-89.093976																										V					V				
330	3	Muck	Pole	45.898709	-89.093987													V				1									1					V				
331	0			45.898034	-89.093998	TERRESTRIAL																																		
332	0			45.897359	-89.094009	TERRESTRIAL																																		
333	0			45.896684	-89.09402	TERRESTRIAL																																		
334	0			45.89601	-89.094031	TERRESTRIAL																																		
335	0			45.895335	-89.094042	TERRESTRIAL																																		
336	0			45.89466	-89.094053	TERRESTRIAL																																		
337	0			45.893985	-89.094064	TERRESTRIAL																																		
338	0			45.89331	-89.094075	TERRESTRIAL																																		
339	0			45.903426	-89.092943	TERRESTRIAL																																		
340	0			45.902751	-89.092954	NONNAVIGABLE (PLANTS)																																		
341	4	Muck	Pole	45.902076	-89.092965																	1			1											V	1			
342	4	Muck	Pole	45.901401	-89.092976																																1			
343	4	Muck	Pole	45.900727	-89.092987																																			
344	3	Muck	Pole	45.900052	-89.092998																															V	1			
345	3	Muck	Pole	45.899377	-89.093009																										1									
346	2	Muck	Pole	45.898702	-89.09302		1												1													V				V				
347	0			45.898027	-89.093031	TERRESTRIAL																																		
348	0			45.897352	-89.093042	TERRESTRIAL																																		
349	0			45.896677	-89.093053	TERRESTRIAL																																		
350	0			45.896002	-89.093064	TERRESTRIAL																																		
351	0			45.895327	-89.093075	TERRESTRIAL																																		
352	0			45.894652	-89.093086	TERRESTRIAL																																		
353	0			45.893977	-89.093097	TERRESTRIAL																																		
354	0			45.904094	-89.091966	TERRESTRIAL																																		

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
355	0			45.903419	-89.091977	NONNAVIGABLE (PLANTS)																																		
356	3	Muck	Pole	45.902744	-89.091988													V	V								1										1			
357	3	Muck	Pole	45.902069	-89.091999																																2			
358	4	Muck	Pole	45.901394	-89.09201																																			
359	4	Muck	Pole	45.900719	-89.092021																																			
360	5	Muck	Pole	45.900044	-89.092032													1																						
361	3	Muck	Pole	45.899369	-89.092043													V													V									
362	0			45.898694	-89.092054	NONNAVIGABLE (PLANTS)																																		
363	0			45.898019	-89.092065	TERRESTRIAL																																		
364	0			45.897344	-89.092076	TERRESTRIAL																																		
365	0			45.896669	-89.092087	TERRESTRIAL																																		
366	0			45.895994	-89.092098	TERRESTRIAL																																		
367	0			45.895319	-89.092109	TERRESTRIAL																																		
368	0			45.894644	-89.09212	TERRESTRIAL																																		
369	0			45.893969	-89.092131	TERRESTRIAL																																		
370	0			45.904761	-89.090988	TERRESTRIAL																																		
371	0			45.904086	-89.090999	NONNAVIGABLE (PLANTS)																																		
372	3	Muck	Pole	45.903411	-89.09101											1	1		V																	V	1			
373	5	Muck	Pole	45.902736	-89.091021		1									1																					1			
374	4	Muck	Pole	45.902061	-89.091032																																1			
375	3	Muck	Pole	45.901386	-89.091043																										V									
376	3	Muck	Pole	45.900711	-89.091054													V																						
377	3	Muck	Pole	45.900036	-89.091065																																			
378	4	Muck	Pole	45.899361	-89.091076													V																						
379	2	Muck	Pole	45.898686	-89.091087																															V				
380	0			45.898011	-89.091098	TERRESTRIAL																																		
381	0			45.897336	-89.091109	TERRESTRIAL																																		
382	0			45.896661	-89.09112	TERRESTRIAL																																		
383	0			45.895986	-89.091131	TERRESTRIAL																																		
384	0			45.895312	-89.091142	TERRESTRIAL																																		
385	0			45.894637	-89.091153	TERRESTRIAL																																		
386	3	Muck	Pole	45.904753	-89.090021		1								1			V	V					1												1	1			
387	3	Muck	Pole	45.904078	-89.090032											1	1																			1				
388	3	Muck	Pole	45.903403	-89.090043		1																													V	1			
389	2	Muck	Pole	45.902728	-89.090054													V									1									V	2			
390	2	Muck	Pole	45.902053	-89.090065																															V	3			
391	1	Muck	Pole	45.901378	-89.090076		1											V	1													V				V				
392	2	Muck	Pole	45.900703	-89.090087		1																													V	1			
393	3	Muck	Pole	45.900029	-89.090098																										V					V				
394	3	Muck	Pole	45.899354	-89.090109																																			
395	3	Muck	Pole	45.898679	-89.09012													V													V					V				
396	2	Muck	Pole	45.898004	-89.090131													V													V					V				
397	0			45.897329	-89.090142	NONNAVIGABLE (PLANTS)																																		
398	0			45.896654	-89.090153	TERRESTRIAL																																		
399	0			45.895979	-89.090164	TERRESTRIAL																																		
400	0			45.895304	-89.090175	TERRESTRIAL																																		
401	2	Muck	Pole	45.904745	-89.089054														V			1														V	1			
402	3	Muck	Pole	45.904071	-89.089065		1												V						1											V	1		1	
403	1	Muck	Pole	45.903396	-89.089076														1								1							1		1	1			
404	0			45.902721	-89.089087	TERRESTRIAL																																		
405	0			45.902046	-89.089098	NONNAVIGABLE (PLANTS)																																		
406	0			45.901371	-89.089109	NONNAVIGABLE (PLANTS)																																		
407	0			45.900696	-89.08912	NONNAVIGABLE (PLANTS)																																		
408	1	Muck	Pole	45.900021	-89.089131		1											V	V													V								
409	4	Muck	Pole	45.899346	-89.089142																									1										
410	4	Muck	Pole	45.898671	-89.089153																																			
411	4	Muck	Pole	45.897996	-89.089164																									1										
412	1	Muck	Pole	45.897321	-89.089175																									1						1	2	1		
413	0			45.896646	-89.089187	NONNAVIGABLE (PLANTS)																																		

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
414	4	Muck	Pole	45.904738	-89.088087					1					1		1		V	1																V				
415	3	Muck	Pole	45.904063	-89.088098													V	1			1									1					V	1			
416	1	Muck	Pole	45.903388	-89.088109											1	1	V	1												1				1	V				
417	0			45.902713	-89.08812	TERRESTRIAL																																		
418	0			45.902038	-89.088131	NONNAVIGABLE (PLANTS)																																		
419	0			45.901363	-89.088143	TERRESTRIAL																																		
420	0			45.900688	-89.088154	TERRESTRIAL																																		
421	0			45.900013	-89.088165	TERRESTRIAL																																		
422	1	Muck	Pole	45.899338	-89.088176					1								V														V				1				
423	5	Muck	Pole	45.898663	-89.088187																															1				
424	4	Muck	Pole	45.897988	-89.088198																									1										
425	0			45.897313	-89.088209	NONNAVIGABLE (PLANTS)																																		
426	2	Muck	Pole	45.90473	-89.08712											1	1	V	V			1														1	1			
427	2	Muck	Pole	45.904055	-89.087132													V	V																	1	3			
428	0			45.90338	-89.087143	NONNAVIGABLE (PLANTS)																																		
429	0			45.902705	-89.087154	TERRESTRIAL																																		
430	0			45.90203	-89.087165	TERRESTRIAL																																		
431	0			45.901355	-89.087176	TERRESTRIAL																																		
432	0			45.90068	-89.087187	TERRESTRIAL																																		
433	0			45.900005	-89.087198	TERRESTRIAL																																		
434	0			45.89933	-89.087209	TERRESTRIAL																																		
435	3	Muck	Pole	45.898655	-89.08722																															1				
436	4	Muck	Pole	45.897981	-89.087231																															V				
437	4	Muck	Pole	45.897306	-89.087242																																			
438	2	Muck	Pole	45.896631	-89.087253																															1	1			
439	0			45.895956	-89.087264	NONNAVIGABLE (PLANTS)																																		
440	0			45.895281	-89.087275	TERRESTRIAL																																		
441	0			45.894606	-89.087286	TERRESTRIAL																																		
442	0			45.892581	-89.08732	TERRESTRIAL																																		
443	0			45.891231	-89.087342	TERRESTRIAL																																		
444	0			45.890556	-89.087353	TERRESTRIAL																																		
445	2	Muck	Pole	45.904722	-89.086154														V																	V	1		1	
446	0			45.904047	-89.086165	NONNAVIGABLE (PLANTS)																																		
447	0			45.903372	-89.086176	NONNAVIGABLE (PLANTS)																																		
448	0			45.902697	-89.086187	TERRESTRIAL																																		
449	0			45.902023	-89.086198	TERRESTRIAL																																		
450	0			45.901348	-89.086209	TERRESTRIAL																																		
451	0			45.900673	-89.08622	TERRESTRIAL																																		
452	0			45.899998	-89.086231	TERRESTRIAL																																		
453	0			45.899323	-89.086242	NONNAVIGABLE (PLANTS)																																		
454	4	Muck	Pole	45.898648	-89.086253																				1															
455	4	Muck	Pole	45.897973	-89.086264																																			
456	4	Muck	Pole	45.897298	-89.086275																																			
457	4	Muck	Pole	45.896623	-89.086287																																			
458	0			45.895948	-89.086298	NONNAVIGABLE (PLANTS)																																		
459	0			45.895273	-89.086309	NONNAVIGABLE (PLANTS)																																		
460	0			45.894598	-89.08632	TERRESTRIAL																																		
461	0			45.893248	-89.086342	TERRESTRIAL																																		
462	0			45.892573	-89.086353	TERRESTRIAL																																		
463	0			45.891898	-89.086364	TERRESTRIAL																																		
464	0			45.891223	-89.086375	TERRESTRIAL																																		
465	0			45.890548	-89.086386	TERRESTRIAL																																		
466	0			45.90404	-89.085198	NONNAVIGABLE (PLANTS)																																		
467	0			45.903365	-89.085209	TERRESTRIAL																																		
468	0			45.90269	-89.08522	TERRESTRIAL																																		
469	0			45.902015	-89.085231	TERRESTRIAL																																		
470	0			45.90134	-89.085242	NONNAVIGABLE (PLANTS)																																		
471	1	Muck	Pole	45.900665	-89.085253																															V				
472	0			45.89999	-89.085264	TERRESTRIAL																																		

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
473	2	Muck	Pole	45.899315	-89.085276																										1					V				
474	4	Muck	Pole	45.89864	-89.085287		1																													V				
475	0			45.897965	-89.085298	TERRESTRIAL																																		
476	2	Muck	Pole	45.89729	-89.085309																											1								1
477	3	Muck	Pole	45.896615	-89.08532																																			
478	3	Muck	Pole	45.89594	-89.085331																																			
479	0			45.895265	-89.085342	NONNAVIGABLE (PLANTS)																																		
480	0			45.89459	-89.085353	NONNAVIGABLE (PLANTS)																																		
481	0			45.893915	-89.085364	TERRESTRIAL																																		
482	0			45.89324	-89.085375	TERRESTRIAL																																		
483	0			45.892565	-89.085386	TERRESTRIAL																																		
484	0			45.891891	-89.085397	TERRESTRIAL																																		
485	0			45.891216	-89.085409	TERRESTRIAL																																		
486	0			45.904032	-89.084231	NONNAVIGABLE (PLANTS)																																		
487	0			45.903357	-89.084242	TERRESTRIAL																																		
488	0			45.902682	-89.084253	TERRESTRIAL																																		
489	0			45.902007	-89.084264	TERRESTRIAL																																		
490	0			45.901332	-89.084276	NONNAVIGABLE (PLANTS)																																		
491	4	Muck	Pole	45.900657	-89.084287		1										1																			V				
492	3	Muck	Pole	45.899982	-89.084298					1																								1		V				
493	3	Muck	Pole	45.899307	-89.084309		1																																	
494	3	Muck	Pole	45.898632	-89.08432																															V				
495	0			45.897957	-89.084331	NONNAVIGABLE (PLANTS)																																		
496	0			45.897282	-89.084342	TERRESTRIAL																																		
497	0			45.896607	-89.084353	TERRESTRIAL																																		
498	2	Muck	Pole	45.895932	-89.084364														V												1					1				
499	2	Muck	Pole	45.895258	-89.084375												1																			V				
500	0			45.894583	-89.084386	TERRESTRIAL																																		
501	0			45.893908	-89.084398	TERRESTRIAL																																		
502	0			45.893233	-89.084409	TERRESTRIAL																																		
503	0			45.892558	-89.08442	TERRESTRIAL																																		
504	0			45.891883	-89.084431	TERRESTRIAL																																		
505	0			45.891208	-89.084442	TERRESTRIAL																																		
506	0			45.904024	-89.083264	NONNAVIGABLE (PLANTS)																																		
507	0			45.903349	-89.083275	TERRESTRIAL																																		
508	0			45.902674	-89.083287	TERRESTRIAL																																		
509	0			45.901999	-89.083298	TERRESTRIAL																																		
510	0			45.901324	-89.083309	NONNAVIGABLE (PLANTS)																																		
511	3	Muck	Pole	45.900649	-89.08332												1																			V				
512	3	Muck	Pole	45.899974	-89.083331												1																			V				
513	3	Muck	Pole	45.899299	-89.083342																				1											V				
514	0			45.898625	-89.083353	NONNAVIGABLE (PLANTS)																																		
515	0			45.89795	-89.083364	NONNAVIGABLE (PLANTS)																																		
516	0			45.897275	-89.083375	TERRESTRIAL																																		
517	0			45.8966	-89.083387	TERRESTRIAL																																		
518	0			45.895925	-89.083398	TERRESTRIAL																																		
519	3	Muck	Pole	45.89525	-89.083409												1																			V			1	
520	0			45.894575	-89.08342	TERRESTRIAL																																		
521	0			45.8939	-89.083431	TERRESTRIAL																																		
522	0			45.893225	-89.083442	TERRESTRIAL																																		
523	0			45.89255	-89.083453	TERRESTRIAL																																		
524	0			45.891875	-89.083464	TERRESTRIAL																																		
525	0			45.8912	-89.083475	TERRESTRIAL																																		
526	0			45.890525	-89.083486	TERRESTRIAL																																		
527	0			45.904016	-89.082298	NONNAVIGABLE (PLANTS)																																		
528	0			45.903341	-89.082309	TERRESTRIAL																																		
529	0			45.902666	-89.08232	TERRESTRIAL																																		
530	0			45.901992	-89.082331	TERRESTRIAL																																		
531	0			45.901317	-89.082342	NONNAVIGABLE (PLANTS)																																		

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
532	0			45.900642	-89.082353	NONNAVIGABLE (PLANTS)																																		
533	3	Muck	Pole	45.899967	-89.082364		1											V													V			1		V				1
534	2	Muck	Pole	45.899292	-89.082375																										1					1				1
535	0			45.898617	-89.082387	NONNAVIGABLE (PLANTS)																																		
536	0			45.897942	-89.082398	NONNAVIGABLE (PLANTS)																																		
537	0			45.897267	-89.082409	TERRESTRIAL																																		
538	0			45.896592	-89.08242	TERRESTRIAL																																		
539	0			45.895917	-89.082431	TERRESTRIAL																																		
540	2	Muck	Pole	45.895242	-89.082442																													1		V	1			
541	0			45.894567	-89.082453	TERRESTRIAL																																		
542	0			45.893892	-89.082464	TERRESTRIAL																																		
543	0			45.893217	-89.082475	TERRESTRIAL																																		
544	0			45.892542	-89.082487	TERRESTRIAL																																		
545	0			45.891867	-89.082498	TERRESTRIAL																																		
546	0			45.904684	-89.08132	NONNAVIGABLE (PLANTS)																																		
547	0			45.904009	-89.081331	NONNAVIGABLE (PLANTS)																																		
548	0			45.903334	-89.081342	TERRESTRIAL																																		
549	0			45.902659	-89.081353	TERRESTRIAL																																		
550	0			45.901984	-89.081364	TERRESTRIAL																																		
551	0			45.901309	-89.081375	NONNAVIGABLE (PLANTS)																																		
552	0			45.900634	-89.081386	NONNAVIGABLE (PLANTS)																																		
553	2	Muck	Pole	45.899959	-89.081398		1								1																					V				1
554	2	Muck	Pole	45.899284	-89.081409									1				V													V					V				1
555	0			45.898609	-89.08142	NONNAVIGABLE (PLANTS)																																		
556	0			45.897934	-89.081431	NONNAVIGABLE (PLANTS)																																		
557	0			45.897259	-89.081442	TERRESTRIAL																																		
558	0			45.896584	-89.081453	TERRESTRIAL																																		
559	0			45.895909	-89.081464	TERRESTRIAL																																		
560	0			45.895234	-89.081475	NONNAVIGABLE (PLANTS)																																		
561	0			45.894559	-89.081487	NONNAVIGABLE (PLANTS)																																		
562	0			45.893884	-89.081498	TERRESTRIAL																																		
563	0			45.893209	-89.081509	TERRESTRIAL																																		
564	0			45.892534	-89.08152	TERRESTRIAL																																		
565	0			45.891859	-89.081531	TERRESTRIAL																																		
566	0			45.891185	-89.081542	TERRESTRIAL																																		
567	0			45.904676	-89.080353	TERRESTRIAL																																		
568	0			45.904001	-89.080364	NONNAVIGABLE (PLANTS)																																		
569	0			45.903326	-89.080375	TERRESTRIAL																																		
570	0			45.902651	-89.080386	TERRESTRIAL																																		
571	0			45.901976	-89.080397	TERRESTRIAL																																		
572	0			45.901301	-89.080409	NONNAVIGABLE (PLANTS)																																		
573	0			45.900626	-89.08042	NONNAVIGABLE (PLANTS)																																		
574	2	Muck	Pole	45.899951	-89.080431		1																								V					V				
575	2	Muck	Pole	45.899276	-89.080442		1											V									1					V				1				
576	0			45.898601	-89.080453	NONNAVIGABLE (PLANTS)																																		
577	0			45.897926	-89.080464	NONNAVIGABLE (PLANTS)																																		
578	0			45.895226	-89.080509	TERRESTRIAL																																		
579	0			45.894552	-89.08052	TERRESTRIAL																																		
580	0			45.893877	-89.080531	TERRESTRIAL																																		
581	0			45.893202	-89.080542	TERRESTRIAL																																		
582	0			45.903993	-89.079397	TERRESTRIAL																																		
583	0			45.903318	-89.079408	TERRESTRIAL																																		
584	0			45.902643	-89.079419	TERRESTRIAL																																		
585	0			45.901293	-89.079442	NONNAVIGABLE (PLANTS)																																		
586	0			45.900618	-89.079453	NONNAVIGABLE (PLANTS)																																		
587	0			45.899943	-89.079464	NONNAVIGABLE (PLANTS)																																		
588	0			45.899268	-89.079475	NONNAVIGABLE (PLANTS)																																		
589	0			45.898593	-89.079486	NONNAVIGABLE (PLANTS)																																		
590	0			45.897919	-89.079498	NONNAVIGABLE (PLANTS)																																		

Point Number	DEPTH	SEDIMENT	POLE_ROPE	LATITUDE	LONGITUDE	COMMENTS	Ceratophyllum demersum	Chara spp.	Eleocharis acicularis	Elodea canadensis	Elodea nuttallii	Megalodonta beckii	Myriophyllum alterniflorum	Myriophyllum heterophyllum	Myriophyllum sibiricum	Najas flexilis	Nitella sp.	Nuphar variegata	Nymphaea odorata	Potamogeton amplifolius	Potamogeton epihydrus	Potamogeton gramineus	Potamogeton pusillus	Potamogeton richardsonii	Potamogeton robbinsii	Potamogeton spirillus	Potamogeton zosteriformis	Sagittaria sp. (rosette)	Sagittaria graminea	Sparganium sp.	Sparganium fluctuans	Typha spp.	Utricularia intermedia	Utricularia vulgaris	Vallisneria americana	Zizania sp.	Aquatic Moss	Freshwater Sponge	Filamentous Algae	Sagittaria cuneata
591	0			45.895219	-89.079542	TERRESTRIAL																																		
592	0			45.894544	-89.079553	TERRESTRIAL																																		
593	0			45.893869	-89.079564	TERRESTRIAL																																		
594	0			45.901285	-89.078475	NONNAVIGABLE (PLANTS)																																		
595	0			45.900611	-89.078486	NONNAVIGABLE (PLANTS)																																		
596	0			45.899936	-89.078497	NONNAVIGABLE (PLANTS)																																		
597	0			45.899261	-89.078509	NONNAVIGABLE (PLANTS)																																		
598	0			45.898586	-89.07852	NONNAVIGABLE (PLANTS)																																		
599	0			45.895211	-89.078576	TERRESTRIAL																																		
600	0			45.899928	-89.077531	NONNAVIGABLE (PLANTS)																																		
601	0			45.899253	-89.077542	NONNAVIGABLE (PLANTS)																																		
602	0			45.90127	-89.076542	NONNAVIGABLE (PLANTS)																																		
603	0			45.901254	-89.074608	NONNAVIGABLE (PLANTS)																																		

F

APPENDIX F

Aquatic Plant Management Strategy – WDNR Northern Region

AQUATIC PLANT MANAGEMENT STRATEGY

Northern Region WDNR
Summer, 2007

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

ISSUES

- Protect desirable native aquatic plants.
- Reduce the risk that invasive species replace desirable native aquatic plants.
- Promote "whole lake" management plans
- Limit the number of permits to control native aquatic plants.

BACKGROUND

As a general rule, the Northern Region has historically taken a protective approach to allow removal of native aquatic plants by harvesting or by chemical herbicide treatment. This approach has prevented lakes in the Northern Wisconsin from large-scale loss of native aquatic plants that represent naturally occurring high quality vegetation. Naturally occurring native plants provide a *diversity of habitat* that *helps maintain water quality*, helps *sustain the fishing* quality known for Northern Wisconsin, supports common lakeshore wildlife from loons to frogs, and helps to provide the *aesthetics* that collectively create the "up-north" appeal of the northwoods lake resources.

In Northern Wisconsin lakes, an inventory of aquatic plants may often find 30 different species or more, whereas a similar survey of a Southern Wisconsin lake may often discover less than half that many species. Historically, similar species diversity was present in Southern Wisconsin, but has been lost gradually over time from stresses brought on by cultural land use changes (such as increased development, and intensive agriculture). Another point to note is that while there may be a greater variety of aquatic vegetation in Northern Wisconsin lakes, the vegetation itself is often *less dense*. This is because northern lakes have not suffered as greatly from nutrients and runoff as have many waters in Southern Wisconsin.

The newest threat to native plants in Northern Wisconsin is from invasive species of aquatic plants. The most common include Eurasian Water Milfoil (EWM) and CurlyLeaf Pondweed (CLP). These species are described as *opportunistic invaders*. This means that these "invaders" benefit where an opening occurs from removal of plants, and without competition from other plants may successfully become established in a lake. Removal of native vegetation not only diminishes the natural qualities of a lake, it *may increase the risk that an invasive species can successfully invade onto the site where native plants have been removed*. There it may more easily establish itself without the native plants to compete against. This concept is easily observed on land where bared soil is quickly taken over by replacement species (often weeds) that crowd in and establish themselves as new occupants of the site. While not a providing a certain guarantee against invasive plants, protecting and allowing the native plants to remain may reduce the success of an invasive species becoming established on a lake. Once established, the invasive species cause far more inconvenience for all lake users, riparian and others included; can change many of the natural features of a lake; and often lead to *expensive annual control plans*. Native vegetation may cause localized concerns to some users, but as a natural feature of lakes, they generally do not cause harm.

To the extent we can maintain the normal growth of native vegetation, Northern Wisconsin lakes can continue to offer the water resource appeal and benefits they've historically provided. A regional position on removal of aquatic plants that carefully recognizes how native aquatic plants benefit lakes in Northern Region can help prevent a gradual decline in the overall quality and recreational benefits that make these lakes attractive to people and still provide abundant fish, wildlife, and northwoods appeal.

GOALS OF STRATEGY:

1. Preserve native species diversity which, in turn, fosters natural habitat for fish and other aquatic species, from frogs to birds.
2. Prevent openings for invasive species to become established in the absence of the native species.
3. Concentrate on a" whole-lake approach" for control of aquatic plants, thereby fostering systematic documentation of conditions and specific targeting of invasive species as they exist.
4. Prohibit removal of wild rice. WDNR – Northern Region will not issue permits to remove wild rice unless a request is subjected to the full consultation process via the Voigt Tribal Task Force. We intend to discourage applications for removal of this ecologically and culturally important native plant.
5. To be consistent with our WDNR Water Division Goals (work reduction/disinvestment), established in 2005, to "not issue permits for chemical or large scale mechanical control of native aquatic plants – develop general permits as appropriate or inform applicants of exempted activities." This process is similar to work done in other WDNR Regions, although not formalized as such.

BASIS OF STRATEGY IN STATE STATUTE AND ADMINISTRATIVE CODE

State Statute 23.24 (2)(c) states:

"The requirements promulgated under par. (a) 4. may specify any of the following:

1. The **quantity** of aquatic plants that may be managed under an aquatic plant management permit.
2. The **species** of aquatic plants that may be managed under an aquatic plant management permit.
3. The **areas** in which aquatic plants may be managed under an aquatic plant management permit.
4. The **methods** that may be used to manage aquatic plants under an aquatic plant management permit.
5. The **times** during which aquatic plants may be managed under an aquatic plant management permit.
6. The **allowable methods** for disposing or using aquatic

plants that are removed or controlled under an aquatic plant management permit.

7. The requirements for plans that the department may require under sub. (3) (b). "

State Statute 23.24(3)(b) states:
"The department may require that an application for an aquatic plant management permit contain a plan for the department's approval as to how the aquatic plants will be introduced, removed, or controlled."

Wisconsin Administrative Code NR 109.04(3)(a) states:
"The department may require that an application for an aquatic plant management permit contain an aquatic plant management plan that describes how the aquatic plants will be introduced, controlled, removed or disposed. Requirements for an aquatic plant management plan shall be made in writing stating the reason for the plan requirement. In deciding whether to require a plan, the department shall consider the potential for effects on protection and development of diverse and stable communities of native aquatic plants, for conflict with goals of other written ecological or lake management plans, for cumulative impacts and effect on the ecological values in the body of water, and the long-term sustainability of beneficial water use activities."

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

APPROACH

1. After January 1, 2009* no individual permits for control of native aquatic plants will be issued. Treatment of native species may be allowed under the auspices of an approved lake management plan, and only if the plan clearly documents "impairment of navigation" and/or "nuisance conditions". Until January 1, 2009, individual permits will be issued to previous permit holders, only with adequate documentation of "impairment of navigation" and/or "nuisance conditions". No new individual permits will be issued during the interim.

2. Control of aquatic plants (if allowed) in documented sensitive areas will follow the conditions specified in the report.

3. Invasive species must be controlled under an approved lake management plan, with two exceptions (these exceptions are designed to allow sufficient time for lake associations to form and subsequently submit an approved lake management plan):
   a. Newly-discovered infestations. If found on a lake with an approved lake management plan, the invasive species can be controlled via an amendment to the approved plan. If found on a lake without an approved management plan, the invasive species can be controlled under the WDNR's Rapid Response protocol (see definition), and the lake owners will be encouraged to form a lake association and subsequently submit a lake management plan for WNDR review and approval.
   b. Individuals holding past permits for control of *invasive* aquatic plants and/or "mixed stands" of native and invasive species will be allowed to treat via individual permit until January 1, 2009 if "impairment of navigation" and/or "nuisance conditions" is adequately documented, unless there is an approved lake management plan for the lake in question.

4. Control of invasive species or "mixed stands" of invasive and native plants will follow current best management practices approved by the Department and contain an explanation of the strategy to be used. Established stands of invasive plants will generally use a control strategy based on Spring treatment. (typically, a water temperature of less than 60 degrees Fahrenheit, or approximately May 31st, annually).

5. Manual removal (see attached definition) is allowed (Admin. Code NR 109.06).

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* *Exceptions to the Jan. 1, 2009 deadline will be considered only on a very limited basis and will be intended to address unique situations that do not fall within the intent of this approach.*

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

DOCUMENTATION OF IMPAIRED NAVIGATION AND/OR NUISANCE CONDITIONS

Navigation channels can be of two types:

- Common use navigation channel. This is a common navigation route for the general lake user. It often is off shore and connects areas that boaters commonly would navigate to or across, and should be of public benefit.

- Individual riparian access lane. This is an access lane to shore that normally is used by an individual riparian shore owner.

Severe impairment or nuisance will generally mean vegetation grows thickly and forms mats on the water surface. Before issuance of a permit to use a regulated control method, a riparian will be asked to document the problem and show what efforts or adaptations have been made to use the site. (This is currently required in NR 107 and on the application form, but the following helps provide a specific description of what impairments exist from native plants).

Documentation of *impairment of navigation* by native plants must include:

a. Specific locations of navigation routes (preferably with GPS coordinates)
b. Specific dimensions in length, width, and depth
c. Specific times when plants cause the problem and how long the problem persists
d. Adaptations or alternatives that have been considered by the lake shore user to avoid or lessen the problem
e. The species of plant or plants creating the nuisance (documented with samples or a from a Site inspection)

Documentation of the *nuisance* must include:

a. Specific periods of time when plants cause the problem, e.g. when does the problem start and when does it go away.
b. Photos of the nuisance are encouraged to help show what uses are limited and to show the severity of the problem.
c. Examples of specific activities that would normally be done where native plants occur naturally on a site but can not occur because native plants have become a nuisance.

AQUATIC PLANT MANAGEMENT STRATEGY
Northern Region WDNR

DEFINITIONS

Manual removal:	Removal by hand or hand-held devices without the use or aid of external or auxiliary power. Manual removal cannot exceed 30 ft. in width and can only be done where the shore is being used for a dock or swim raft. The 30 ft. wide removal zone cannot be moved, relocated, or expanded with the intent to gradually increase the area of plants removed. Wild rice may not be removed under this waiver.
Native aquatic plants:	Aquatic plants that are indigenous to the waters of this state.
Invasive aquatic plants:	Non-indigenous species whose introduction causes or is likely to cause economic or environmental harm or harm to human health.
Sensitive area:	Defined under s. NR 107.05(3)(i) (sensitive areas are areas of aquatic vegetation identified by the department as offering critical or unique fish and wildlife habitat, including seasonal or lifestage requirements, or offering water quality or erosion control benefits to the body of water).
Rapid Response protocol:	This is an internal WDNR document designed to provide guidance for grants awarded under NR 198.30 (Early Detection and Rapid Response Projects). These projects are intended to control pioneer infestations of aquatic invasive species before they become established.

G

APPENDIX G

Shoreland Habitat Best Management Practices Materials:

1. Wisconsin Biology Technical Note 1: Shoreland Habitat
2. Natural Resources Conservation Service Conservation Practice Standard: Shoreland Habitat

Wisconsin Biology Technical Note 1: Shoreland Habitat

Introduction

Definition of Shoreland Habitat:
An area adjacent to a water body in a non-agricultural setting that is vegetated with a diverse mixture of native species that include grasses, grass-like species, forbs, shrubs, and trees.

Purposes:

- Provide habitat for aquatic and terrestrial fauna
- Enhance adjacent shallow water habitat by providing shade and overhanging vegetation and promoting natural recovery of emergent species
- Promote shoreland corridors
- Increase the presence and diversity of native species
- Reduce the environmental and visual impact of nearby human activities
- Improve water quality
- Enhance bank stability

Interim Standard # 643A, Shoreland Habitat provides specific criteria for Shoreland Habitat establishment and for determining the dimensions of the practice (Section V). It identifies the necessary components of a Shoreland Habitat establishment plan (Section VII), and lists criteria for operation and maintenance of the practice (Section VIII). Local shoreland zoning ordinances and local shoreland restoration design standards may provide additional requirements and guidance. These may include greater buffer depths, more restrictive requirements for viewing/access corridors, and plant selection.

This technical note provides detailed guidance on the following:

Vegetation Establishment Technique ..... p. 2
Plan Components ..... p. 3
Plant Materials Selection and Density ..... p. 4
Additional Planning Considerations ..... p. 7
Steps for Accelerated Recovery ..... p. 9
- Site Preparation
- Planting Techniques

Site Care and Maintenance ..... p. 14
Resources ..... p. 17
Appendices ..... p. 19

Vegetation Establishment Techniques

Determining the appropriate vegetation establishment technique requires an assessment of the existing vegetative cover. In many cases a combination of the two general techniques described below will be appropriate due to varying existing vegetation conditions.

Initial site assessment should include:

- Identification of any native species present and their location, density, and vigor.
- Identification of any invasive species or noxious weeds present and their location, density, and vigor.
- Assessment of the density and vigor of any turf grasses present.

Natural Recovery

Natural recovery or "no-mow" zones are encouraged where feasible. Native vegetation will recover naturally when the site is protected from disturbance and where adequate seed and/or root sources and appropriate site conditions are present. Wet shoreline margins, where turf grasses are not well established, are particularly suited to natural recovery. Results may be slower than for planted buffers, but there is virtually no cost, and the end result may appear more natural.

An area where a dense growth of turf grasses has been maintained for several years is usually not well suited to natural recovery. Turf grasses frequently out-compete native vegetation, and the area may lack native seed sources. Areas with extensive stands of invasive weeds should also not be left to recover naturally.

Accelerated Recovery — Planted Buffers

Accelerated recovery techniques are most appropriate where insufficient native vegetation is present for natural recovery techniques, or where quick results are desired. Accelerated recovery techniques can include planting trees and shrubs, planting native grass and wildflower seedlings, or seeding native grasses and wildflowers. Steps for each of these accelerated recovery-planting techniques are described later in this Tech Note.

On many sites, natural and accelerated recovery techniques can be combined. For example, natural recovery might be used along the shoreline where there are native plants, and accelerated recovery used for the remainder of the restoration, where turf grasses dominate.

Plan Components

A plan shall be developed to guide the restoration process to ensure that restoration requirements and goals for the site are met. An example plan is included in Appendix 1.

The plan shall include:

- Site diagram or map
- Preparation schedule
- Planting dates and schedule
- Care and handling of plant materials
- Watering plan
- Maintenance plan including management of invasive species
- Plant and seed calculation worksheet

Site Diagram

Appendix 2 contains the "*Shoreland Habitat Plan – Site Diagram*" job sheet to assist with plan development.

The site diagram must be to scale and shall include:

- Location of existing primary structures
- Boundary of the practice
- Scale (1inch = 10 feet recommended)
- North arrow
- Location of ordinary high water mark
- Location of viewing/access corridor
- Existing shrubs and trees
- Locations where shrubs and trees are to be planted
- Areas where herbaceous cover will be planted and planting density
- A species list for the site
- Location of erosion control practices to be installed during practice establishment
- Location of practices to address channelized/concentrated flow

Plant Materials

Species Selection

Plants shall be selected from species lists of plant communities that are native to the county or region. Plants should further be chosen based on site soil, moisture, and light conditions. In some cases, such as lack of plant or seed availability, substitutions may be allowed. In addition, references such as those included at the end of this document may be used to make selections. For example, the herbarium website [http://wiscinfo.doit.wisc.edu/herbarium/Countysearch.html] can be queried based on counties, habitat types, or individual plant species.

Planting Densities

The table below describes planting standards for two major shoreland types: woodland, and barrens/dry prairie/wet prairie. The woodland has a nearly complete canopy of trees while the barrens/prairie and wetland are more open. Plant numbers are to be calculated based on the area in square feet to be reestablished and the appropriate density. The area to be reestablished shall be calculated for each layer. See Worksheet 1 for example area calculations.

Table 1. Shoreland Habitat Planting Densities

	Woodland		**Wetland or Barrens / Dry Prairie / Wet Prairie**	
Layer	**Minimum Number of Species[1]**	**Density**	**Minimum Number of Species[1]**	**Density**
Trees[2]	2	0.5 – 5 per 100 sq. ft.	0	0 - 0.2 per 100 sq. ft.
Shrubs	3	1 - 4 per 100 sq. ft. *If clumped, maintain min. 2 foot spacing*	2	0.2 - 0.5 per 100 sq. ft. *If clumped, maintain min. 2 foot spacing*
Herbaceous Cover[3]				
- Plant plugs	3	25 –75 plants per 100 sq. ft. *Soil must be mulched*	5	50 – 100 plants per 100 sq. ft. *Soil must be mulched*
- Seeding	3	Grass/Sedges: 4-8 oz. per 1000 sq. ft. Forbs: 2-4 oz per 1000 sq. ft.	5[4]	Grass/Sedges: 4-8 oz per 1000 sq. ft. Forbs: 2-4 oz. per 1000 sq. ft.

[1] Select species from established plant lists for shoreland habitat. Trees, shrubs, and groundcovers may be transplanted from adjacent woodland or open areas outside the restoration area.
[2] Trees must be at least 2 year old seedlings, 8 inches or taller.
[3] The herbaceous cover layer shall be comprised of a minimum of 30% grasses and/or sedges.
[4] Consider the use of plants rather than seeds in wet areas.

Planting Dates

The table below provides approximate dates for planting. Weather and soil conditions, which vary year-to-year, determine the most appropriate planting time. Please note that adequate moisture levels are assumed due to required watering practices.

Table 2. Recommended Planting Dates			
	North	**Central**	**South**
Seeded Herbaceous Covers *Seeding early favors cool season plants. Seeding after soil temperature increases above 55 degrees favors warm season plants. Seed after July 1 to reduce weed seed germination.*	May 15 – August 10 *Best dates:* *June 1 – July 15*	May 1 – August 31 *Best dates:* *May 10 – July 20*	May 1- August 31 *Best dates:* *May 5 – July 31*
Plugs (Seedlings) and Potted Herbaceous Covers *Plant after danger of frost is past, and up to first frost. Later plantings may require more frequent watering because of increased temperatures.*	May 20 – September 15	May 1- October 31	May 1 – Nov. 15
Bare-root Trees and Shrubs	Any time soil is not frozen and before leaf-out, or after leaves fall.		
Potted Trees and Shrubs	Any time soil is not frozen.		

Worksheets for Calculating Plant and Seed Needs

Worksheet 1 can be used to calculate the square footage of area to be restored for each vegetative layer. Worksheet 2 can be used to calculate the amount of trees, shrubs, plants and seeds needed.

Worksheet 1: Area Calculations							
	Total Area of Shoreland Habitat (Square Feet)		**Total Area of Viewing/ Access Corridor**		**Total Area of Existing Layer to Preserve and/or Natural Recovery Zones**		**Total Area to be Planted**
Tree Layer		-		-		=	
Shrub Layers		-		-		=	
Herbaceous Layer - Plants		-		-		=	
Herbaceous Layer - Seeds		-		-		=	
SAMPLE[5] Herbaceous Layer-Plants	***6,000***	-	***1,500***	-	***1,000***	=	***3,500***

Worksheet 2: Seed or Plant Densities							
	Total Area to be Planted (Square Feet)		**Density Factor[6]**		**Seed or Plant Densities from Table 1.**		**Total Plants or Seeds to Install**
Tree Layer		÷	100	×		=	
Shrub Layer		÷	100	×		=	
Herbaceous Layer							
Plants		÷	100	×		=	
Grass Seeds		÷	1000	×		=	
Forbs Seeds		÷	1000	×		=	
SAMPLE[7] Herbaceous Layer-Plants	***3,500***	÷	***100***	×	***70***	=	***2450***

[5] This sample is 60x100 foot restoration (6,000 sq. ft.), with a 25x60 view corridor (1,500 sq. ft), and 1,000 sq. ft. of natural recovery.

[6] See Table 1, column 3, on page 4. Trees, shrubs and plant densities are given in number of plants/100 sq. ft., and seeding densities are given in number of ounces/1000 sq. ft.

[7] Sample site is 3,500 sq. ft., to be planted at 70 plant plugs per 100 sq. ft., for a total of 2450 plants needed.

Additional Planning Considerations

Exposed soil may be encountered because of erosion from runoff, bank instability, heavy use, or construction activities. Eliminate or minimize the cause of the bare soil and then stabilize the area following the guidelines below. Filter fabric fences may be necessary to capture sediment below exposed slopes. Specifications found in the Wisconsin Construction Site Best Management Practices Handbook must be followed.

Companion Seeding for Steep Slopes

When seeding on steep slopes, a companion seeding and/or other erosion control practices shall be used. See companion seeding rates table below.

Slopes >12%: Companion seeding of oats, side oats grama, or Canada wild rye.[8]
Slopes >20%: Companion seeding of oats, side oats grama, or Canada wild rye, and use either mulch and netting or an erosion control blanket.

Table 3. Seeding Rates for Companion Crops	
Oats	0.5 lbs./1000 ft.²
Canada Wild Rye	1 oz./1000 ft.²
Side Oats Grama	1 oz./1000 ft.²

Temporary Cover Crop for Exposed Soil

A temporary cover crop should be planted only if soils have been exposed, and the restoration planting is delayed. In most cases this would only occur in the late fall, generally after September 15th depending upon the location.

Table 4. Seeding Rates for Cover Crop	
Cereal Rye	0.5 – 1.0 lbs./ 1000 ft.²
Winter Wheat	0.5 – 1.0 lbs./ 1000 ft.²

[8] Oats are annuals that will temporarily stabilize an area and then be killed by a hard frost. Canada wild rye and side oats grama are short-lived native perennial grasses.

Runoff Control

Runoff from impervious surfaces and roof gutter downspouts should be directed to maximize infiltration. Runoff should be maintained in sheet flow (not channels) to the greatest extent possible. In soils where adequate infiltration cannot be achieved, outletting through a tile may be an option.

Fire Prevention

Areas with sandy soils are prone to forest fires. Conifer trees are especially susceptible to fire. To reduce fire danger, avoid planting conifers close to structures in those sandy areas of the state. Fire hazard is lower if conifers are planted on the waterward rather than the landward side of the house. Contact your local Department of Natural Resources Forest Ranger for information about fire-prone areas.

Cost of Buffer Preparation

Costs for completing a shoreland habitat project vary greatly. Planting shrubs or trees as bare-root stock greatly saves on the cost. Costs are kept to a minimum when landowners do the work themselves. If contractors are used, costs generally increase, but an experienced contractor may save money in the long run because the project may be more successful. Costs increase as the design shifts from "natural recovery" to "accelerated recovery." Seeding is generally cheaper than planting seedlings. However, seed takes longer to establish and there may be poor germination and seedling survival and excessive weed growth. Larger more established stock increases the price of the restoration. Balance budget constraints with concerns regarding timeliness and appearance.

Plant and Seed Sources

The DNR, counties, lake associations, and conservation groups sponsor shrub and tree sales annually in the spring. Statewide lists of native plant and seed sources are available from both the University of Wisconsin Extension (UWEX)[http://clean-water.uwex.edu/pubs/native/index.html] and the WDNR [http://www.DNR.state.wi.us/org/land/er/invasive/info/nurseries.htm]. Lists of sources of plants and seeds may also be available from your local government office.

Viewing and Access Corridor Design

Viewing corridors that are oriented somewhat obliquely to the shoreline, or are curved, are preferable to those that are perpendicular to the shoreline. This reduces the visual impact of human activities in the shoreland area. Corridor dimensions shall be determined by applicable county standards and ordinances; however, the maximum width of the viewing and access corridor shall be 30 feet.

Steps for Accelerated Recovery

Proper site preparation is one of the most important steps in establishing a native plant landscape. Reducing competition on the site by first removing the existing non-native vegetation is especially important. Turf grasses can quickly out-compete newly planted native plants if left in place.

Sometimes removing existing vegetation is not necessary, and it is possible to plant among existing scattered native plants or to leave zones of vegetation intact. The moist zone near the water's edge often consists mostly of native plants because turf grasses are flooded out. Seeds and underground stems may quickly revegetate the area if allowed to grow. Selected native flowers, grasses, and shrubs can usually be planted among existing native vegetation to fill in bare spots or to add color and variety. Plant flowers and grasses in a manner that will allow them to spread over the entire area. Stands of invasive plants like reed canary grass or purple loosestrife should be removed from wet areas.

Site Preparation

Removing Undesirable Vegetation

Techniques to remove existing vegetation by smothering and/or applying herbicide are described below.

Smothering – Use Black Plastic

Black plastic spread over vegetation eliminates light and creates heat that kills existing plants. This method is suitable for almost any site. In areas with high exposure to wind, extra care must be taken to anchor the plastic in place.

1. You will need
    a. 3.5 mil or thicker black plastic to adequately cover the area, plus extra to overlap sheets at least 6 inches.
    b. 4 inch or longer, 11 gauge or heavier U-shaped metal staples (enough to space 1 foot apart where plastic overlaps and at the edges).
    c. Heavy objects like logs, cement blocks, boards, or tires to hold the plastic in place.
2. Prepare the site by mowing, weed whacking, or trimming vegetation to be removed.
3. If soil is dry, water thoroughly. This will increase the weed killing effectiveness.
4. Lay down the plastic. Overlap the plastic at least 6 inches if using more than one piece. Staple in place at one-foot intervals as it is laid down.

5. Place heavy objects over plastic. All seams and edges must be firmly anchored to exclude light. Edges can also be buried in a shallow trench to help hold them in place.
6. Leave the plastic in place for 4-6 weeks during spring or summer. Make certain there is no sign of living vegetation before removing it.
7. Remove plastic, but leave dead vegetation in place. If using plant mulch over the dead vegetation, plant directly through the mulch.

Applying Herbicide

A glyphosate herbicide like *Roundup*® is recommended. Avoid drift of herbicide to water. If herbicide is to be applied in or over the water, an aquatic glyphosate formulation such as *Rodeo*® must be used, and a Department of Natural Resources permit is required. *Always follow label instructions carefully.*

Timing of herbicide applications is crucial. Do not apply when rain is forecast in the next 24 hours. Do not apply on windy days, since vegetation you wish to preserve may be damaged by herbicide drift. Vegetation must be actively growing for glyphosate herbicides to be effective. To encourage growth, mow grass and allow it to regrow several inches. Air temperature must be between 50 and 75 degrees Fahrenheit for cool season plants like quack grass and brome grass to be actively growing, and therefore effectively killed by the herbicide.

Be certain that vegetation is dead before planting. If turf is still green or yellow-green after 7 – 10 days, a repeated herbicide application is recommended.

Soil Amendments

In most cases soil amendments are **not** required to plant native plants. Adding black dirt or manure can be detrimental to lakeshore plantings. These soil amendments will favor weed growth, and the native plants may grow more quickly and be less sturdy.

Planting Techniques

Seedlings

Fertilizer use is recommended where mulches are used because they demand nitrogen as they decompose. Fertilizer should never be broadcast due to the potential for runoff into the lake. Instead, apply a very small amount of slow release *phosphorous free* fertilizer in each planting hole. Phosphorus levels are adequate in most soils, and phosphorus can increase algae growth in the lake. Phosphorus is the middle number of the three given on the fertilizer bag.

Application amounts will vary depending on nutrient concentration. For a 6-0-6 NPK ratio, use one teaspoon of organic fertilizer per grass or wildflower plant and ¼ cup per shrub or tree. Up to one cup can be added to larger shrub or tree planting holes.

Dead vegetation left in place after smothering or an herbicide application does not need to be removed. Leave the dead material to serve as a mulch to capture moisture, reduce weed growth,

and add organic material to the soil. Plant seedlings directly through the dead material. Roots must be buried in soil and not in the thatch of dead lawn, where the plant would quickly dry out and die.

Plants Installation

1. ***Lay mulch down prior to planting.*** Spread 2 to 3 inches of straw, wood chips, leaves, or pine needles to conserve moisture and reduce weed growth. Avoid using field hay because it generally contains weed seeds. Do not use marsh hay, which is reed canary grass, and is an invasive species.
2. ***Be ready to water.*** Watering plant plugs is critical to their success. Be ready with hoses and sprinklers before planting. Water seedlings immediately after they are planted.
3. ***Dig holes for plants***. A bulb planter or bulb auger drill bit attached to an electric drill will work well to speed up planting. Be sure the holes for the plants penetrate the dead grass.
4. ***Fertilize.*** A small amount of slow release, phosphorus-free fertilizer is recommended. The second number on the fertilizer label represents phosphorus. To fertilize, place a small amount in each plant hole. Excess fertilizer will encourage weed growth.
5. ***Place live plants in the ground soon after they are brought to the site.*** To store plants for a few days before planting, keep them in an area with partial sun such as on the east side of a building or under a deciduous tree. Do not leave them in a dark area for long periods; this will weaken plants. Water to keep packs moist once or twice a day.
6. ***Plant in the cool hours of the day.*** Plants will have a greater survival rate if planted on a cool day or during the morning or evening hours. To plant, separate the mulch, dig a hole, sprinkle organic fertilizer, place the plug in the hole, press the soil gently around the plug, and replace the mulch, being careful to keep mulch 1/2" from stem of plants.
7. ***Water.*** Water immediately after planting. Plan to water at least daily for the first few weeks or until plants are well established. If plants wilt or droop, a repeated watering may be necessary during the day. Once plants are established, water only if prolonged dry periods occur.

Seed Installation

1. ***Rake or till only enough to expose soil for planting seed***, no more than 1–2 inches deep.
2. ***Select seed.*** Refer to Table 1 for seeding densities. Greater amounts of seed will result in denser growth and better chances for success. Include 1 ounce of Canada wild rye per 1,000 square feet if desired. This seed will germinate readily to indicate areas where seeding is successful and help to hold the soil in place. Canada wild rye is a short-lived native perennial grass.
3. ***Mix seeds with slightly moist sand or sawdust.*** Fill an ice cream pail or similar one gallon bucket 2/3 full with moist, but not wet, sand or sawdust. Add up to 4 ounces of seed and mix well. The seeds will adhere to the sand or sawdust, so they can be spread more thinly and evenly.
4. ***Broadcast the seed/sand mixture.*** Use half of the seed/sand mixture to cover the entire area. Sow the remaining half while walking perpendicular to the line of the first pass to assure good

seed distribution. The sand or sawdust will make it easier to see places that have not been seeded.

5. ***Press seed in by tamping down the soil*** with a rake or lightly raking the seeds in. The site may be rolled with a water-filled roller to insure good soil/seed contact. Do not roll when soil is wet, this will compact the soil, decrease levels of oxygen in the soil, and reduce seed germination.
6. ***Mulch lightly*** with 1/2 inch of weed free straw. Soil must be visible between the straw stems, or the mulch is too thick to allow seedlings to grow. If mulch is used on steep slopes, hold it in place with jute or biodegradable net. A biodegradable erosion control blanket up to ½ inch thick may be used as an alternative to mulch.
7. ***Water.*** Water immediately following seeding. Watering seeds and small seedlings after sprouting is critical for sandy soils. Plan to water daily, preferably in the morning, for the first few weeks or until plants are well established. Check to see that soil is moist beneath the mulch. Very sandy sites may require watering more than once daily for the first few weeks. Once plants are established, water only if prolonged dry periods occur.

   Note: Watering *may* not be necessary for spring plantings in areas with loamy or clay soils as long as regular (weekly) rainfall of ½ inch or more occurs.

Shrubs and Trees

1. ***Keep bare-root stock moist and cool before planting.*** Dormant bare-root shrubs can be ordered in fall or winter for delivery in the spring. Plant bare-root stock as soon as it arrives if possible. If necessary, store bare-root stock close to 34 degrees Fahrenheit, to avoid breaking dormancy. Keep tree roots moist by periodically sprinkling with water. Do not soak roots in water because this will deprive them of oxygen.

2. ***Dig the hole deeply enough*** so that the roots won't curl or bunch up. The trees and shrubs should be planted about one-half inch deeper than they were in the nursery. Paler colored bark and a slight swelling on the stem show where the old soil line was. Bare rootstock may need to be root pruned. For more information about bare rootstock refer to WDNR website [http://www.DNR.state.wi.us/org/land/forestry/nursery/generalinfo/plantingprocs.htm#seedling] and contact your local forester.

3. ***Pack soil firmly around the roots.*** Air pockets left around the roots will dry them out. Press soil around the roots with your foot, but do not stomp on them.

4. ***Water regularly*** to keep soil moist but not saturated.

5. ***Mulch*** a two-foot diameter circle around each plant 2 to 3 inches deep with wood chips, straw, or leaves. This will reduce competition with other plants. Keep this area free of other growth by weed whacking or hand-pulling weeds for the first couple of years. Avoid mulching where there are steep slopes. In this case, reduce competition by weed whacking.

Transplanting Trees and Shrubs

It is best to transplant when trees and shrubs are dormant in the early spring or late fall. Identify and label trees and shrubs when leaves are on the plant. Obtain permission from the landowner before removing plant material. Dig up as much of the root as possible. Replace the duff layer of leaves and stems to reduce erosion at the site. Only dig up trees and shrubs if they are part of a large stand or if the seedlings are numerous. If the tree or shrub is uncommon or rare, do not move it. Only remove a small percentage of any one type of plant. Leave behind a large enough population to allow further reproduction of the native population.

Site Care and Maintenance

The most ideal maintenance is to simply leave the site alone. Do not fertilize, do not mow, do not rake, do not "clean up" fallen limbs or trees. Allow native vegetation to regrow.

In accelerated recovery areas, some initial maintenance may be required. Pulling invasive weeds around native shrubs, trees, and groundcovers the first year or two eliminates competition and will help to give them a good start. Maintenance over the long-term must be in accordance with the local shoreland ordinance requirements.

The duff layer, made up of fallen leaves and pine needles, should be left intact. This layer covers the soil, thereby conserving moisture, preventing erosion, and allowing water to infiltrate into the soil.

Year One

Watering

Regular watering in the first two months of a spring or summer planting is one of the most important factors for success. Without supplemental watering, roots may not reach the soil moisture they need. Watering at least 30 minutes each day allows vigorous root growth for plants to become quickly established. Timers to turn water on and off automatically are available from hardware and garden supply stores.

Where drainage is poor, water only in the morning, not at night when evaporation is reduced. Fungal diseases that start with excess moisture can kill young seedlings. Use lake water if feasible, since this water often is warmer and more nutrient-rich than well water. Pumping water from the lake is allowed in Wisconsin as long as no type of structure is left in the lake.

Protection Against Deer Browsing

Whitetail deer and other animals may damage plantings, especially trees and shrubs. Protect against damage by physical or chemical means. Surround newly planted trees and shrubs with 4 – 6 foot high, galvanized mesh fence supported with wooden stakes or fence posts, or cover plants with bird netting. Landscape products available to spray on plants deter browsing through strong tastes or odors. Red pepper spray is an example. Use of these products may need to be varied as deer become accustomed to their taste or smell. Protection against deer browsing is particularly important if deer are fed on the site or nearby. Deer feeding should be discouraged near restoration areas. For more information about deer damage refer to Craven et. al and the following Web site: [http://www1.uwex.edu/ces/pubs/pdf/G3083.PDF].

Weeding Planted Areas

Pull weeds out as early as possible being careful to not disturb the native plants. Be especially diligent in areas where non-native invasive species like purple loosestrife, mullein, lamb's quarter, quack grass, reed canary grass or bluegrass are known to be present.

Weeding Seeded Areas

It can be difficult to tell weeds from the native plants in a seeded area. Sprouting a small sample of the native seeds in a plant tray will assist with their identification. Cut off flowering heads of weeds before they go to seed. Perennial natives will eventually out-compete annual weeds that sprout from seed.

Another alternative is to repeatedly trim weedy vegetation to 6 to 8 inches with a weed-whacker. Remove clippings immediately if they cover the native seedlings. This will discourage weed growth, remove shade, and allow native seedlings to grow.

Fertilizing And Applying Insecticides

Fertilizers and insecticides should be avoided. Applying fertilizers may encourage weed growth. If native plants are selected appropriately, supplemental fertilization should not be required. Also avoid applying insecticides since so many are non-specific and can harm or even kill non-target species.

Vegetative Cover

At the end of the growing season, allow all dead vegetation to remain in place. It becomes a valuable seed source for next year's growth, provides food and cover for wildlife, and will help to cover the soil and slow spring runoff. The grass seed and dried flower heads add another level of appeal to the native landscape in the winter months.

Year Two

Watering

Water only during periods of severe drought.

Weeding

Thoroughly weed early in the summer. After this initial weeding, check for and remove weeds at least once a month.

Year Three and Beyond

No watering or weeding should be necessary except for extreme drought conditions or stubborn invasive weed problems. Leave vegetation in place in the fall and through the winter months. Approval from the zoning or land conservation office is required for extensive weed removal in the shoreland zone.

Prairie and savanna areas may be trimmed or burned only under an approved management plan. Additional permits or approval may be necessary before trimming or burning. Trim groundcover

in prairie areas no more than once every three to five years. Groundcover should be cut no less than 6-8 inches high. Cut vegetation in the late winter when the ground is still frozen, or in late spring, when the ground is dry enough to walk on without damaging new growth. Leave all dead plant clippings on-site. They will add to the shoreland soil structure. A controlled burn may be appropriate only in prairie and savanna areas. A burn should not be attempted until the prairie or savanna is well established – usually after five or more years. To determine if a controlled burn is appropriate evaluate the site for safety considerations; threats to structures, shrubs, and trees; and weed species present. In addition to any required permits, Department of Natural Resources broadcast burning permits are required in intensive fire zones.

Except in prairie areas that are identified in an approved management plan, any native trees, shrubs, and groundcover in the restoration area shall be left undisturbed. Trees and shrubs are intended to move in to create multiple layers of canopy cover. Tree thinning or removal of dead or diseased trees requires approval of the appropriate administering agency.

Vehicles shall be excluded from the buffer except for limited use in the viewing/access corridor. Docks and boatlifts shall be stored outside the buffer or in the viewing/access corridor.

Resources

References for Plant Selection

Please note that counties may have approved or recommended plant lists.

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SHORELAND HABITAT

(Acres)
CODE 643A (Interim)

Natural Resources Conservation Service
Conservation Practice Standard

I. Definition

Area adjacent to a waterbody or watercourse in a non-agricultural setting that is vegetated with a *diverse*[1] mixture of native species that can include grasses, grass-like species, forbs, shrubs, and trees.

II. Purposes

A. Provide habitat (food, shelter, nesting sites, over-winter cover) for aquatic and terrestrial fauna.

B. Enhance *littoral zone* (shallow water) habitat function for a broad range of vertebrate and invertebrate species by providing shade and cover with overhanging vegetation, and promoting natural recovery of emergent species.

C. Provide a source of detritus (decomposing organic matter) and large woody cover for aquatic organisms.

D. Provide shade to lower water temperatures and facilitate higher dissolved oxygen concentrations to improve habitat for aquatic organisms.

E. Promote shoreland corridors for aquatic and terrestrial flora and fauna.

F. Increase the presence and diversity of native plant and animal species in shoreland areas.

G. Reduce the environmental and visual impact of human activities in the near-shore area.

H. Improve water quality by reducing the amount of sediment and other pollutants, such as pesticides and nutrients in surface runoff.

I. Enhance bank stability by limiting intensive use, and reducing wave impact.

III. Conditions Where Practice Applies

This practice applies, but is not limited to, areas of shoreland development where it is desired to enhance or restore native mixed vegetation for the improvement of fish and wildlife habitat, water quality and bank stability.

Where the primary purpose is to control sediment to environmentally sensitive areas, refer to the Natural Resources Conservation Service (NRCS) Field Office Technical Guide Section IV (FOTG), Standard 393, Filter Strip.

Where the primary purpose is to control bank erosion, refer to NRCS FOTG Standard 580, Streambank and Shoreline Protection to be used in conjunction with this standard.

IV. Federal, State, and Local Laws

Installation and maintenance of shoreland habitat shall comply with all federal, state, and local laws, rules, or regulations. The landowner is responsible for securing required permits. This standard does not contain text of any federal, state, or local laws.

V. Criteria

The Wisconsin Biology Technical Note 1: Shoreland Habitat is an important guidance document to this standard. This can be found either in the NRCS Field Office Technical Guide (FOTG) or on the NRCS website: [http://www.wi.nrcs.usda.gov/fotg/index.html]

A. Establishment

1. Shoreland habitat shall be established by planting a diverse mix of native species that are adapted to site conditions and are representative of area plant communities. Where appropriate, natural recovery techniques may be utilized rather than planting. Refer to county species lists and/or the Wisconsin Biology Technical Note 1: Shoreland Habitat, where applicable.

2. In order to restore the functional values of a shoreland habitat, vegetation shall be vigorous, diverse and structurally complex

[1] Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

and shall include herbaceous cover, a shrub layer and a tree canopy. The only exception to this requirement shall be where natural conditions in the region lack these habitat components.

3. *Invasive plants* shall not be included in any installation.

4. Invasive plants and state listed *noxious weeds* shall be *controlled* during establishment, if present.

5. Exposure of bare soils during establishment shall be kept to a minimum. Measures shall be taken to prevent erosion.

6. Phosphorus application is only permitted where soil tests indicate a deficiency. Where fertilizer application is necessary, no drift or misapplication into the water shall occur.

7. Heavy equipment shall be excluded from the shoreland habitat area, to avoid compaction of soil.

8. Weeds shall be controlled until the shoreland habitat species are established.

9. A watering schedule shall be followed until species are established.

B. The starting point for measuring minimum shoreland habitat depths for the following landscape features shall be as follows.

1. Lakes. Practice depth shall be measured from the *ordinary high water mark* (OHWM) landward perpendicular to the shoreline.

2. Perennial and intermittent streams, and springs. Practice depth shall be measured from the OHWM. Each side of the stream shall be evaluated independently.

3. Wetlands. Practice depth shall be measured from the upland-wetland interface.

4. Existing tree and shrub corridors. Existing tree and shrub corridors shall be included as part of the measured practice depth.

C. Shoreland habitat dimensions

1. Practice depth: The minimum practice depth is 35 feet. Greater practice depths provide increased benefit and are encouraged.

   a. Where the principal structure is within 50 feet of the OHWM, land within 15 feet of the structure may be excluded from the practice.

2. Practice length: The practice shall extend the entire length of the lot, except that a viewing and access corridor is allowed.

3. A viewing and access corridor may extend from the lake inland. Corridor dimensions shall be determined by applicable county standards and ordinances. The maximum viewing corridor width is 30 feet.

D. Runoff from impervious surfaces, such as rooftops and driveways, in the contributing drainage area shall be evaluated and treated to promote infiltration and sheet flow.

E. When soil disturbance is necessary due to bank or gully repair, the appropriate action shall be taken to limit the disturbance and protect and replant all disturbed areas in accordance with this standard.

F. Areas of concentrated flow shall be evaluated and treated.

G. Areas below the OHWM shall not be disturbed. This does not preclude practices intended for bank stabilization.

VI. Considerations

A. Consider using this practice to enhance the conservation of declining species.

B. Consider marking practice boundaries in an identifiable manner until established.

VII. Plans and Specifications

Plans and specifications for the shoreland habitat describe the requirements for applying the practice to achieve its intended purpose. Plans and specifications shall be prepared for each specific site where the practice will be installed. A plan includes information about the location, site preparation, vegetation establishment, and operation and maintenance requirements.

Plan specifications will include the following (see Wisconsin Biology Technical Note 1: Shoreland Habitat).

A. Dimensions of the practice to accomplish the planned purpose.

B. Site map or diagram.

C. Species selection, planting rates, location and spacing to accomplish the planned purpose.

D. Planting dates, care, and handling of the seeds or plants to ensure an acceptable rate of survival.

E. Site preparation sufficient to establish and grow selected species.

F. Identification and treatment of concentrated flow areas.

G. Operation and Maintenance Plan.

VIII. Operation and Maintenance

A. Dead or windblown trees provide cover and refuge for fish and wildlife, and should be left in place. Tree thinning or removal of dead or diseased trees requires approval by the appropriate administering agency.

B. Mowing or other removal of ground cover is prohibited in the practice area except as part of an approved maintenance plan.

C. The duff layer, made up of fallen leaves and/or pine needles, must be left intact. This layer covers the soil, thereby conserving moisture and preventing erosion.

D. State listed noxious weeds shall be controlled. Control of invasive plants is encouraged.

E. Herbicides are prohibited except as required for control of invasive plants and as approved by the appropriate administering agency. Avoid damage to shoreland habitat vegetation from herbicide application to nearby areas.

F. Fertilizers are prohibited after the establishment year, except as approved by appropriate administering agency.

G. Except for an access corridor, areas waterward of the practice shall be undisturbed.

H. Boats, docks and other equipment shall be excluded from the practice area to prevent soil compaction and damage to practice vegetation.

I. Vehicles shall be excluded except as necessary for establishment and maintenance activities.

J. Activities are prohibited in the practice area which damage or destroy the vegetation, such as piles of leaves, boards, etc.

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UW Madison herbarium website (good source of county species lists):_[http://wiscinfo.doit.wisc.edu/herbarium/Countysearch.html].

Wisconsin Manual of Control Recommendations for Ecologically Invasive Plants: [http://www.dnr.state.wi.us/org/land/er/invasive/manual_toc.htm].

X. Definitions

Control (V.A.4.) – To destroy the above-ground portion of a weed in a manner and at the proper time to prevent the development and distribution of viable seeds or other propagules and their spread from one area to another. For species that reproduce vegetatively, control includes the use of methods which help contain or reduce the vegetative spread of the weed.

Diverse (V.A.1.) – For the purposes of this standard, a mix of plants is considered diverse when it meets the minimum number of species as specified in Wisconsin Biology Technical Note 1: Shoreland Habitat, Table 1.

Invasive plants (V. A. 3.) – Having the ability to significantly displace desirable vegetation in landscapes or to reduce yield of growing crops. The Department of Natural Resources Bureau of Endangered Resources maintains a list of invasive plants. For more guidance refer to the following Web site: [http://www.dnr.state.wi.us/org/land/er/invasive/index.htm].

Littoral zone (II.B.) – The near shore area of a lake or wetland where water is shallow enough to support the growth of rooted aquatic vegetation.

Noxious weed (V. A. 4.) – "Noxious weed" means Canada thistle, leafy spurge and field bindweed (creeping jenny) and any other weed the governing body of any municipality or the county board of any county by ordinance or resolution declares to be noxious within its respective boundaries (ref. WI Statute, Chapter 66, part 66.0404). For more information refer to the following Web site: [http://www.legis.state.wi.us./rsb/stats.html].

Ordinary high water mark (V. B. 1.) – The ordinary high water mark (OHWM) is the point on the bank or shore where the water is present often enough so that the lake or streambed begins to look different from the upland. Specifically, the OHWM is the point on the bank or shore up to which the water, by its presence, wave action, or flow, leaves a distinct mark on the shore or bank. The mark may be indicated by erosion, destruction of or change in vegetation, or other easily recognizable characteristics.

The OHWM can be located through on-site studies of physical and biological conditions at the shoreline. The principal indicator is the change from water plants to land plants. In the area where the plants change, the investigator may also use indicators such as change in soil type, ridges, or other erosion marks or water stains on rocks, soils, trees, or structures. If none of these indicators are available in the immediate location, the elevation of the OHWM may be found at another spot and transferred to that site in question.