A

APPENDIX A

Public Participation Materials

Presentation Outline

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

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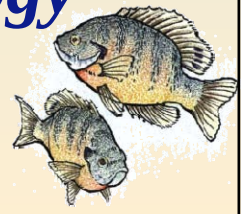
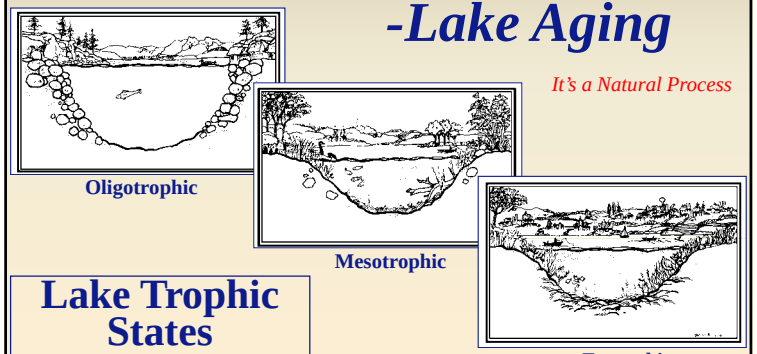
Introduction to Lake Ecology



General Lake Ecology

Eutrophication -Lake Aging

It's a Natural Process



Lake Trophic States

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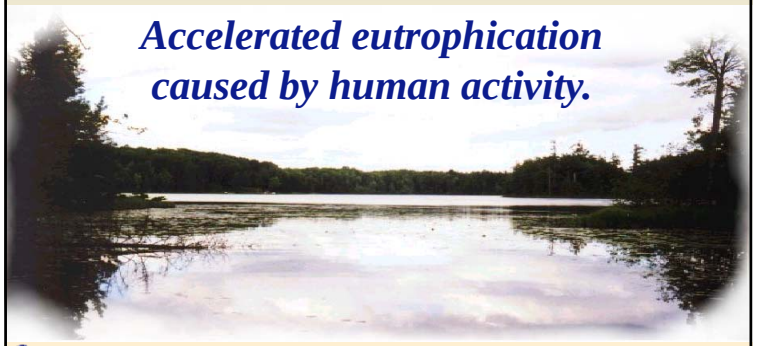
General Lake Ecology

Cultural Eutrophication

Accelerated eutrophication caused by human activity.



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General Lake Ecology

Phosphorus

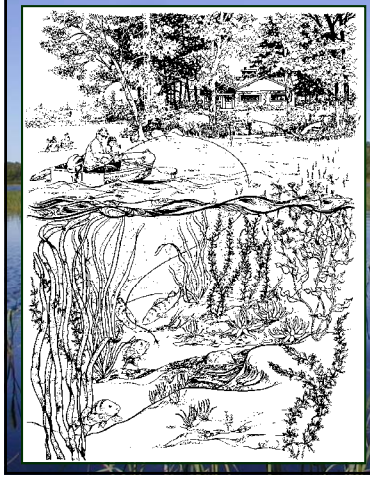
- *Limiting Nutrient*
- *Controls Plant Abundance (Productivity)*
  - *Algae*
  - *Macrophytes*

General Lake Ecology

Aquatic Plants (macrophytes)

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

Native Aquatic Plants



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

General Lake Ecology

Non-native Aquatic Plants

Curly-leaf Pondweed

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General Lake Ecology

Non-native Aquatic Plants

Eurasian Water Milfoil

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General Lake Ecology

Consequences of Exotics

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

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Current Project

Study and Plan Goals

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

A goal without a plan is just a wish.

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Current Project

Study Components

- Public Participation
- Watershed Modeling
- Water Quality
- Aquatic Vegetation
  - Curly-leaf Survey
  - Comprehensive Survey *P-I Completed (WDNR)*
  - Eurasian Water Milfoil
- Plan Development

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Current Project

Your Participation is Important to the Success of this Project

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Kathan Lake Planning Committee

- What is the *Planning Committee*?
  - Focus Group
  - Steering Committee
- Who should be on the *Planning Committee*?
  - 6-10 People
  - Cross-section
    - Age
    - Property Ownership
    - Perceptions & Interests
- What is expected of *Planning Committee* members?
  - Stakeholder Survey Mailing
  - 2-3 Meetings (1.5-3 hours each)

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Current Project

Planning Process

Planning Committee Meetings

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

↓

Implementation Plan

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Thank You

Tim Hoyman **thoyman@onterra-eco.com**

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

Wisconsin Lakes Partnership

UW Extension

Wisconsin Dept. of Natural Resources

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Presentation Outline

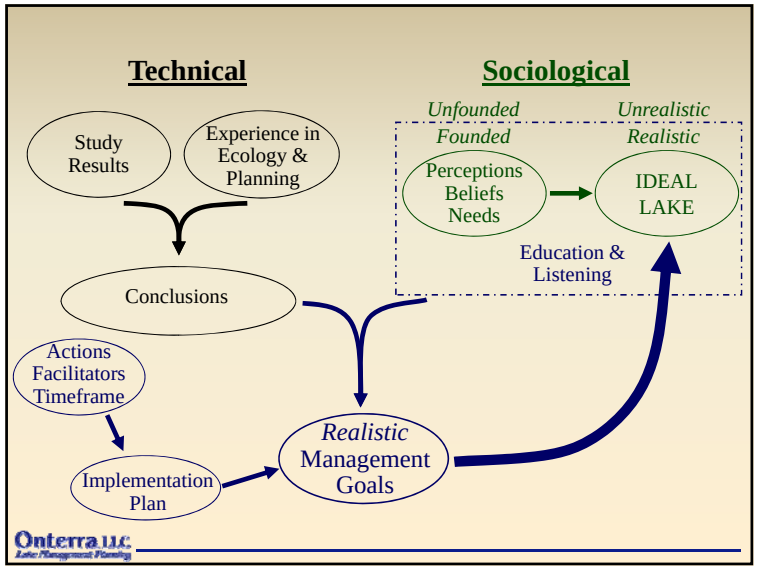
- Lake Management Planning Project Overview
- Study Results
  - Water Quality
  - Watershed
  - Aquatic Plants
  - Miscellaneous Findings
- "Big Picture"
- Goals and Actions Discussion

Study and Plan Goals

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

The Planning Process

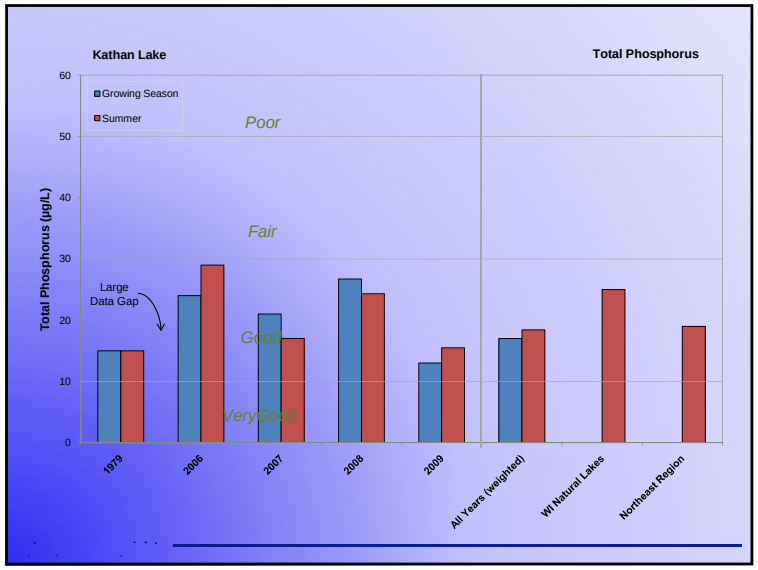
…it's not as easy as you may think.

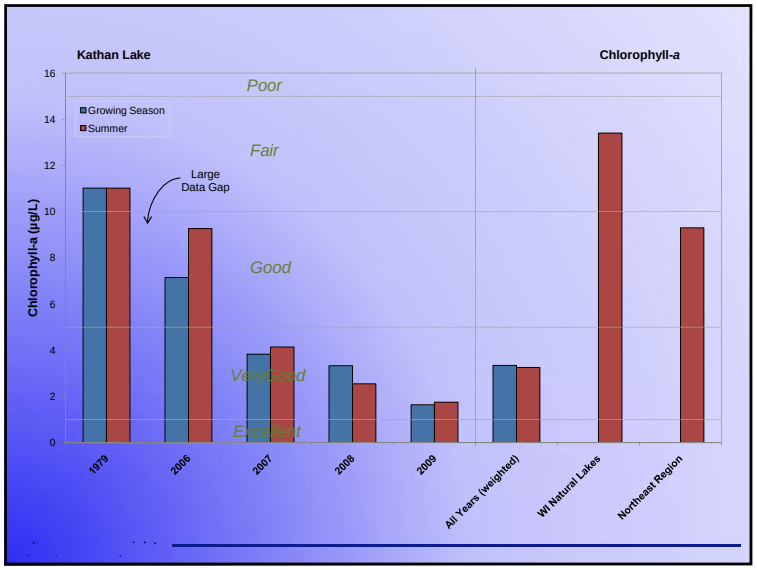

Technical
Sociological
Study Results
Experience in Ecology & Planning
Unfounded
Founded
Unrealistic
Realistic
Perceptions Beliefs Needs
IDEAL LAKE
Education & Listening
Conclusions
Actions Facilitators Timeframe
Implementation Plan
Realistic Management Goals
Onterra LLC

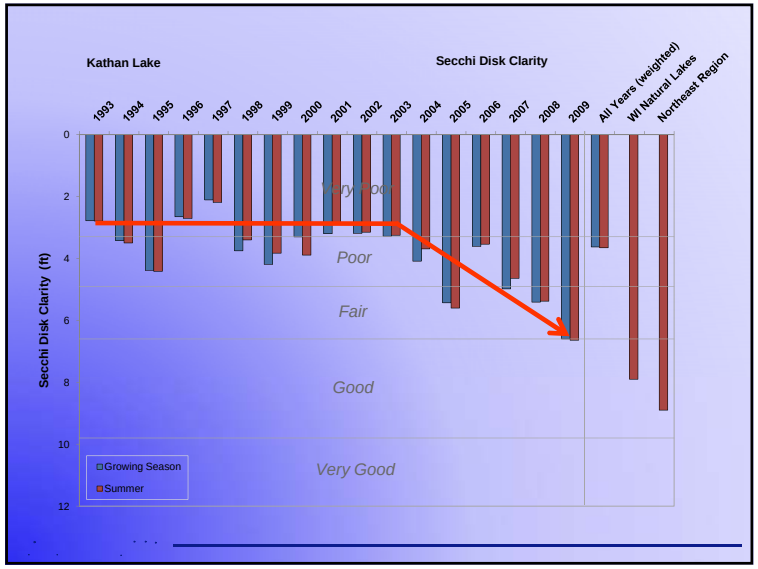

Water Quality

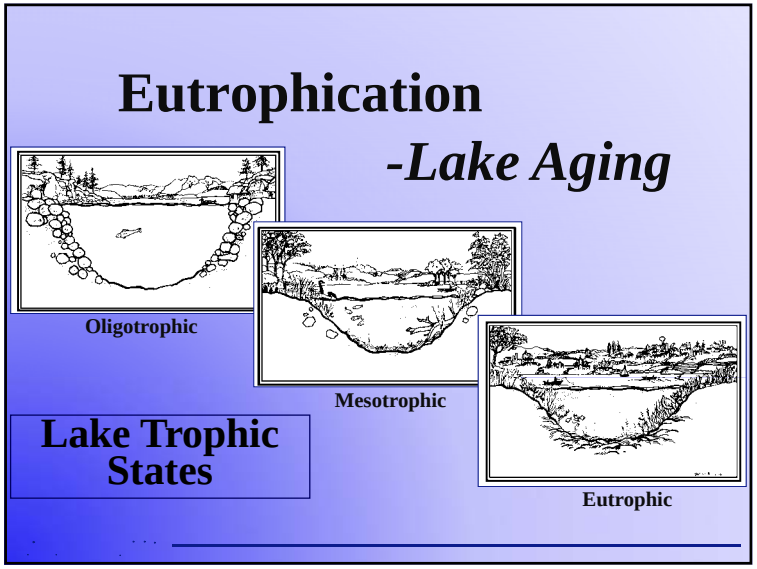

Lillie Mason Regions
Northwest
Kathan Lake
Northeast
Southwest
Central
Southeast

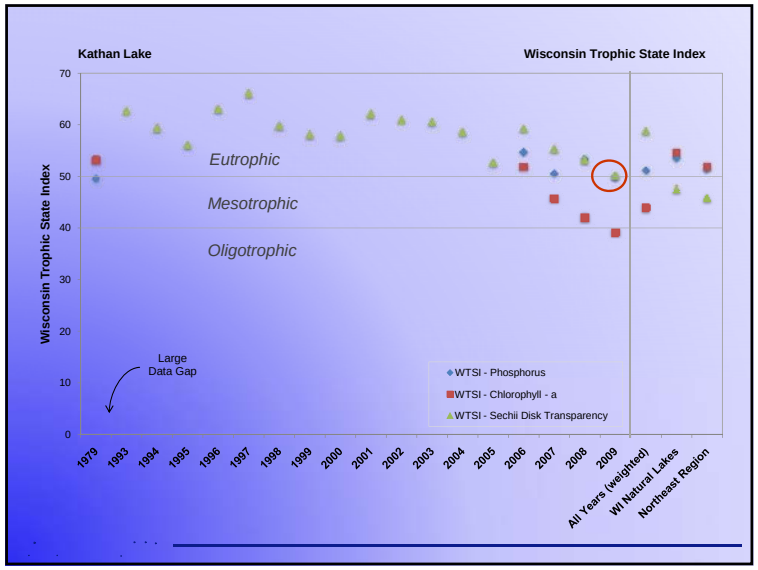

Water Quality
Phosphorus (Limiting Plant Nutrient)
Chlorophyll-a (Algal Abundance)
Water Clarity (Secchi Disk)


Kathan Lake
Total Phosphorus
Growing Season
Summer
Poor
Fair
Good
VeryGood
Large
Data Gap
Total Phosphorus (µg/L)
0
10
20
30
40
50
60
1979
2006
2007
2008
2009
All Years (weighted)
WI Natural Lakes
Northeast Region


Kathan Lake
Chlorophyll-a
Poor
Growing Season
Summer
Fair
Large
Data Gap
Good
VeryGood
Excellent
Chlorophyll-a (µg/L)
0
2
4
6
8
10
12
14
16
1979
2006
2007
2008
2009
All Years (weighted)
WI Natural Lakes
Northeast Region

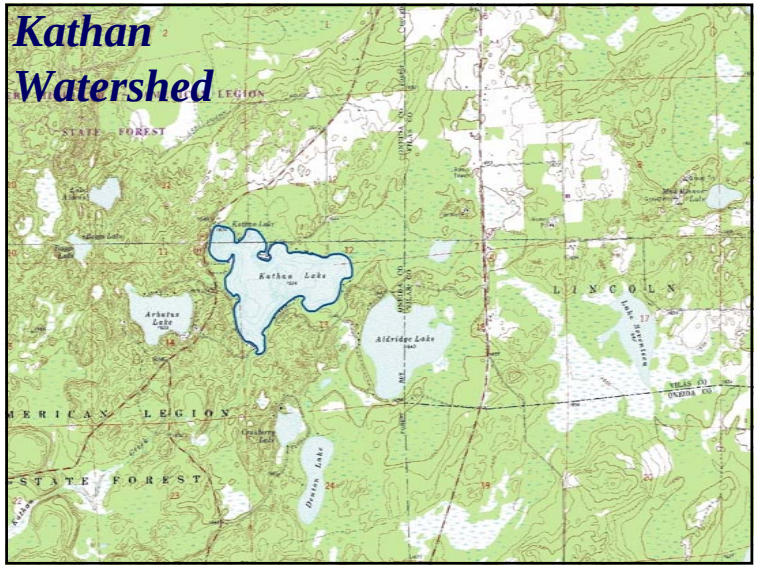

Kathan Lake
Secchi Disk Clarity
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
All Years (weighted)
WI Natural Lakes
Northeast Region
Very Poor
Poor
Fair
Good
Very Good
Growing Season
Summer
Secchi Disk Clarity (ft)
0
2
4
6
8
10
12

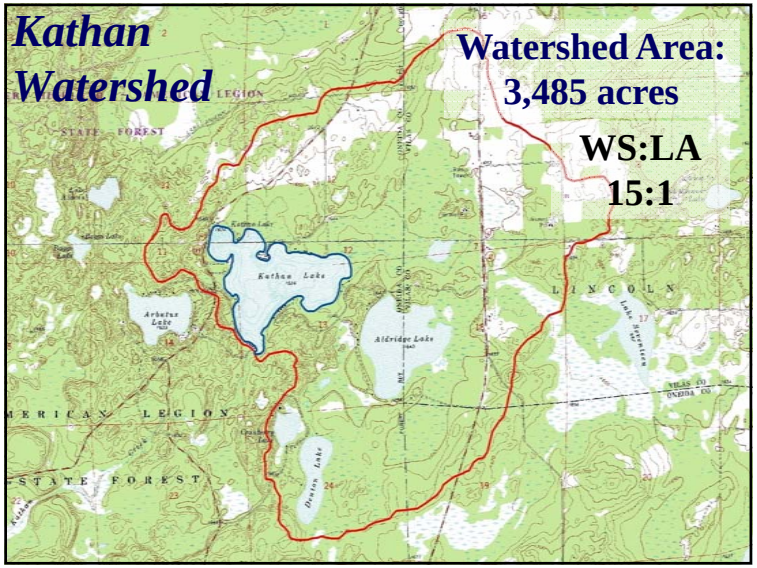

Eutrophication
-Lake Aging
Oligotrophic
Mesotrophic
Eutrophic
Lake Trophic States

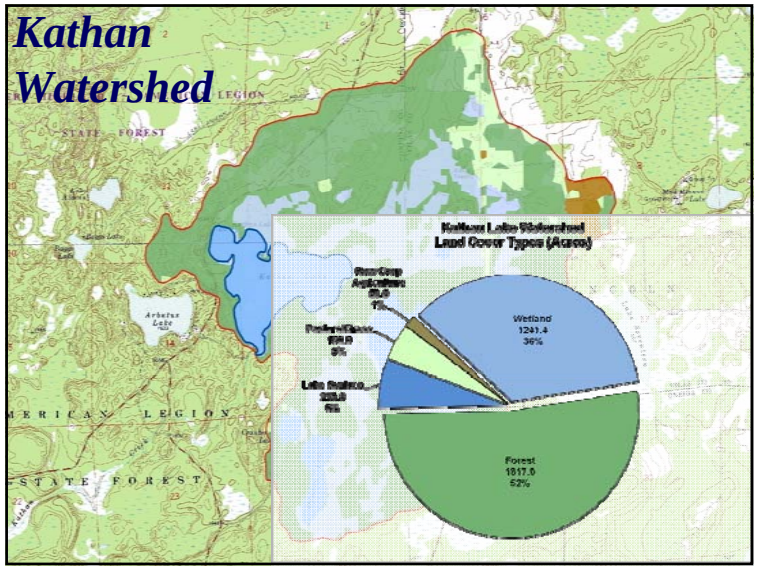


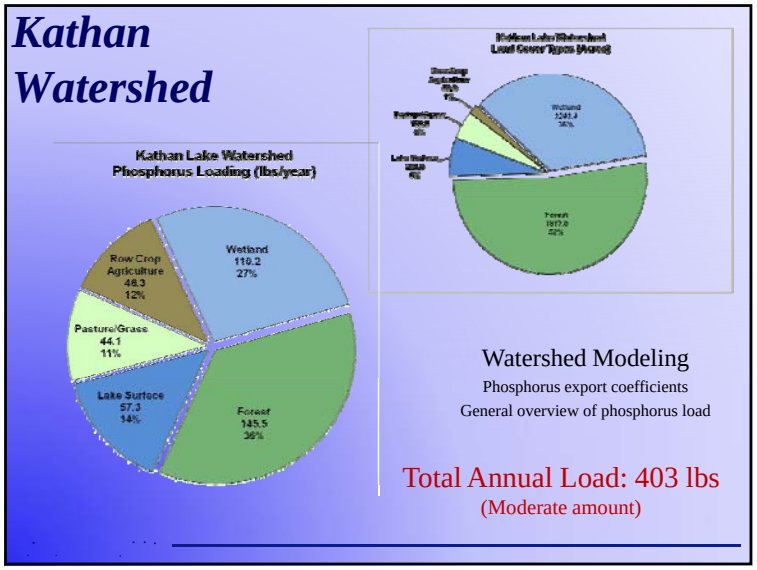
Additional Water Quality Results

- Dissolved Oxygen and Temperature Profiles
  - Lake does not stratify during the summer
  - Stratification occurs during winter
    - DO less than 2 mg/l found in lower half of lake (likely not an issue for fish)
- Limiting Nutrient
  - Nitrogen:Phosphorus = 25:1 (Phosphorus limited)
- Alkalinity (buffer capacity)
  - 18 ppm $CaCO_3$ – May 2008
  - Low sensitivity to acid rain

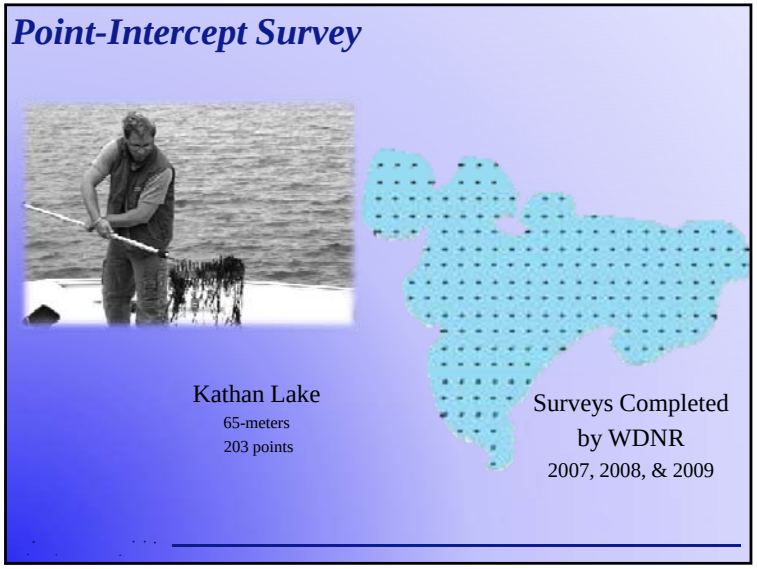





Kathan
Watershed
Land Cover Types (Acres)
Wetland
1241.4
36%
Forest
1817.0
52%


Kathan
Watershed
Kathan Lake Watershed
Phosphorus Loading (lbs/year)
Row Crop
Agriculture
46.3
12%
Wetland
110.2
27%
Pasture/Grass
44.1
11%
Lake Surface
57.3
14%
Forest
145.5
36%
Watershed Modeling
Phosphorus export coefficients
General overview of phosphorus load
Total Annual Load: 403 lbs
(Moderate amount)


Aquatic Plants


Point-Intercept Survey
Kathan Lake
65-meters
203 points
Surveys Completed
by WDNR
2007, 2008, & 2009

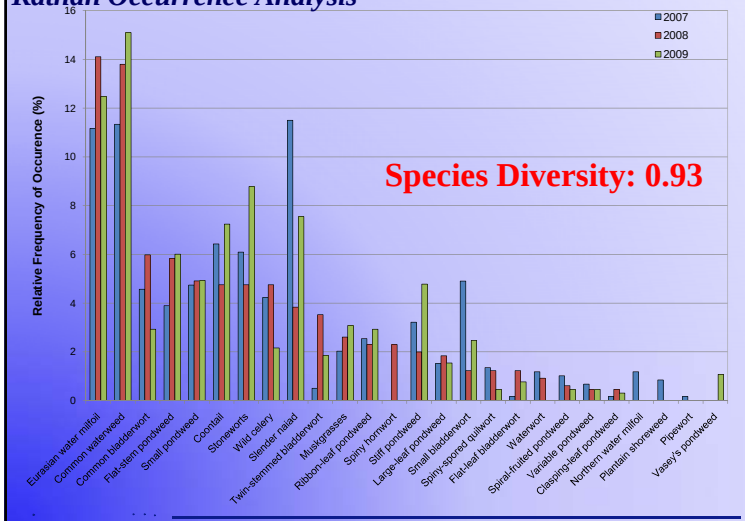
Species List

- 46 Total Species
  - 1 non-native
  - 3 special concern
  - Wild rice

Life Form	Scientific Name	Common Name	Coefficient of Conservatism	2007	2008	2009
Emergent	Carex sp.	Unknown sedge	N/A	I	I	I
	Carex lasiocarpa	Wooly-furit sedge	9		O	
	Dulichium arundinaceum	Three-way sedge	9	I	X	X
	Eleocharis erythropoda	Bald spike-rush	3		X	
	Eleocharis palustris	Creeping spikerush	6	X	X	X
	Equisetum fluviatile	Water horsetail	7	X	X	X
	Sagittaria latifolia	Common arrowhead	3		O	X
	Sagittaria rigida	Stiff arrowhead	8		O	
	Schoenoplectus tabernaemontani	Softstem bulrush	4		O	
	Schoenoplectus subterminalis	Water bulrush	9		X	X
	Typha sp.	Cattail species	1	X	X	X
	Zizania palustris	Northern wild rice	8		O	I
FF	Lemna minor	Lesser duckweed	5		X	X
FL	Brasenia schreberi	Watershield	7	X	X	X
	Nuphar variegata	Spatterdock	6	X	X	X
	Nymphaea odorata	White water lily	6	X	X	X
FL/E	Sparganium americanum	Eastern bur-reed	8			X
	Sparganium angustifolium	Narrow-leaf bur-reed	9		O	
	Sparganium fluctuans	Floating-leaf bur-reed	10		O	X
Submergent	Ceratophyllum demersum	Coontail	3	X	X	X
	Ceratophyllum echinatum	Spiny hornwort	10		X	
	Chara sp.	Muskgrasses	7	X	X	X
	Elatine minima	Waterwort	9	X	X	X
	Elodea canadensis	Common waterweed	3	X	X	X
	Eriocaulon aquaticum	Pipewort	9	X	X	X
	Isoetes echinospora	Spiny-spored quillwort	8	X	X	X
	Littorella uniflora	Plantain shoreweed	10	X	I	
	Myriophyllum sibiricum	Northern water milfoil	7	X		
	Myriophyllum spicatum	Eurasian water milfoil	Exotic	X	X	X
	Najas flexilis	Slender naiad	6	X	X	X
	Nitella sp.	Stoneworts	7	X	X	X
	Potamogeton amplifolius	Large-leaf pondweed	7	X	X	X
	Potamogeton epihydrus	Ribbon-leaf pondweed	8	X	X	X
	Potamogeton gramineus	Variable pondweed	7	X	X	X
	Potamogeton pusillus	Small pondweed	7	X	X	X
	Potamogeton richardsonii	Clasping-leaf pondweed	5	X	X	X
	Potamogeton spirillus	Spiral-fruited pondweed	8	X	X	X
	Potamogeton strictifolius	Stiff pondweed	8	X	X	X
	Potamogeton vaseyi	Vasey's pondweed	10		O	X
	Potamogeton zosteriformis	Flat-stem pondweed	6	X	X	X
	Utricularia geminiscapa	Twin-stemmed bladderwort	9	X	X	X
	Utricularia intermedia	Flat-leaf bladderwort	9	X	X	X
	Utricularia minor	Small bladderwort	10	X	X	
	Utricularia vulgaris	Common bladderwort	7	X	X	X
	Vallisneria americana	Wild celery	6	X	X	X
S/E	Eleocharis acicularis	Needle spikerush	5	I	X	X
	Juncus pelocarpus	Brown-fruited rush	8	X	X	X

FF = Free-floating, FL = Floating leaf, FL/E = Floating leaf/emergent, S/E = Submergent/Emergent
X = Present, I = Incidental, O = Additional species located by Onterra during 2008 surveys

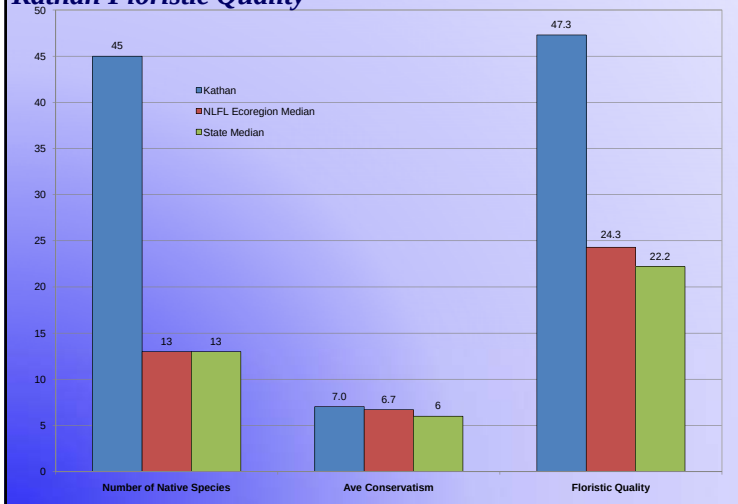
Kathan Occurrence Analysis



Aquatic Plants

Wisconsin Ecoregions

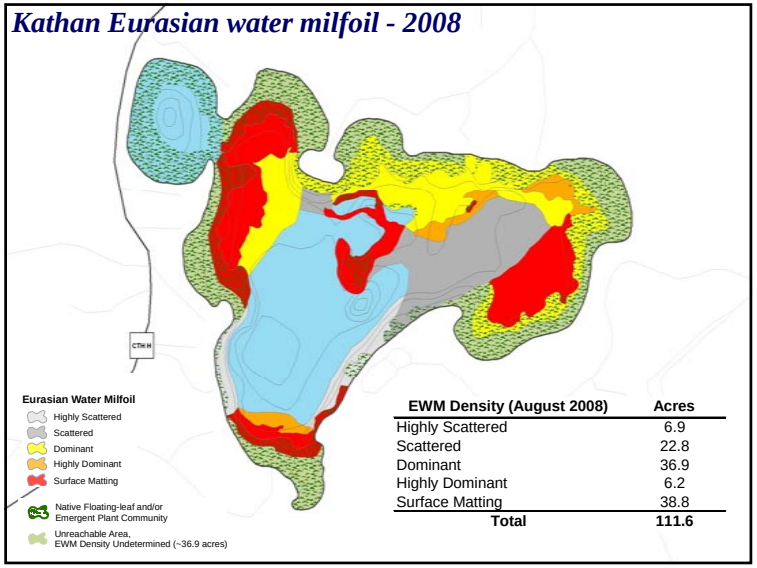
Kathan Floristic Quality



Aquatic Plant Community Mapping

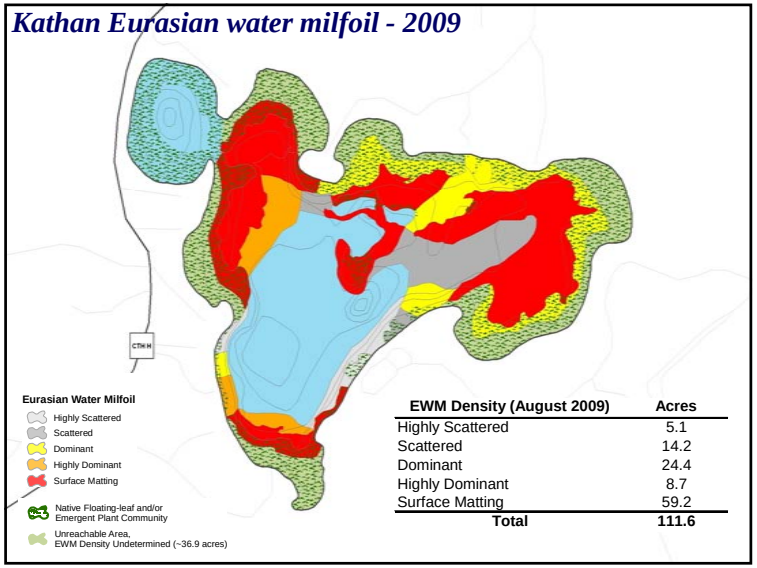
- Mapped Communities
  - Floating-leaf
  - Emergent
- Important Indicators
  - Vulnerable to ecosystem changes
    - Loss of species
    - Expansion or recession

Kathan Eurasian water milfoil - 2008



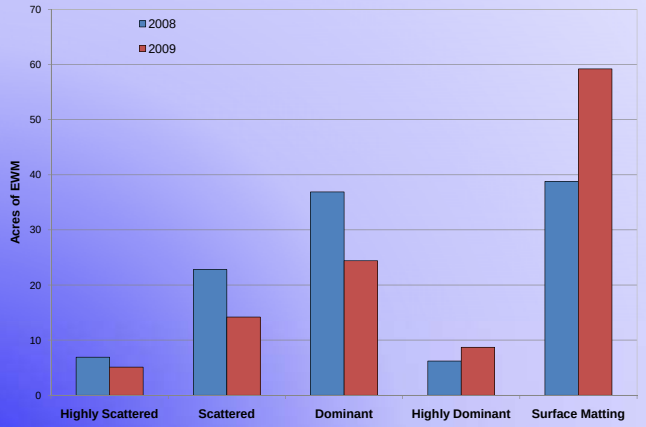
EWM Density (August 2008)	Acres
Highly Scattered	6.9
Scattered	22.8
Dominant	36.9
Highly Dominant	6.2
Surface Matting	38.8
Total	**111.6**

Kathan Eurasian water milfoil - 2009



EWM Density (August 2009)	Acres
Highly Scattered	5.1
Scattered	14.2
Dominant	24.4
Highly Dominant	8.7
Surface Matting	59.2
Total	**111.6**

Kathan Eurasian water milfoil



Additional Results

- *Dreissena* mussel monitoring
  - No veligers found
- Fisheries Data Summary
  - Compilation complete
  - Not much information available other than limited stocking data
- Stakeholder Survey
  - Tabulation completed (Thanks Larry!)
  - Charts and comments compiled

Conclusions

- Water quality is *good*
  - Long-term trend analysis indicates water quality has improved over the past few years (clarity and chl-*a*).
- Overall watershed is in good condition.
  - Land cover exports minimal phosphorus.
  - Changes in watershed would show little improvement in lake water quality.
  - Largest, *controllable* contributor is likely shoreland properties.

Conclusions

- Aquatic plant community
  - Based upon standard analysis native community is of high quality
  - Disturbance caused by EWM will likely decrease the quality of the community over time.
  - *All* residence are concerned about EWM and other plants.
  - EWM control on Kathan Lake will be difficult
    - Financially & ecologically

Thank You

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

Wisconsin Lakes Partnership

UWEX Extension

WISCONSIN DEPT. OF NATURAL RESOURCES

B

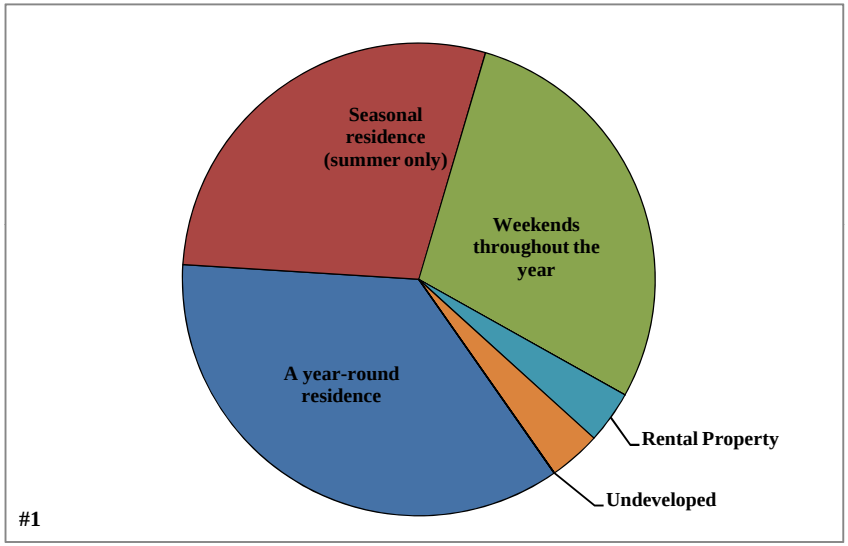
APPENDIX B

Stakeholder Survey Response Charts and Comments

Returned Surveys	27
Sent Surveys	35
Response Rate (%)	77.1

#1 What type of property do you own on Kathan Lake?

	Total	*%*
A year-round residence	10	*35.7*
Seasonal residence (summer only)	8	*28.6*
Weekends throughout the year	8	*28.6*
Resort	0	*0.0*
Rental Property	1	*3.6*
Undeveloped	1	*3.6*
Other	0	*0.0*
	28	*100.0*

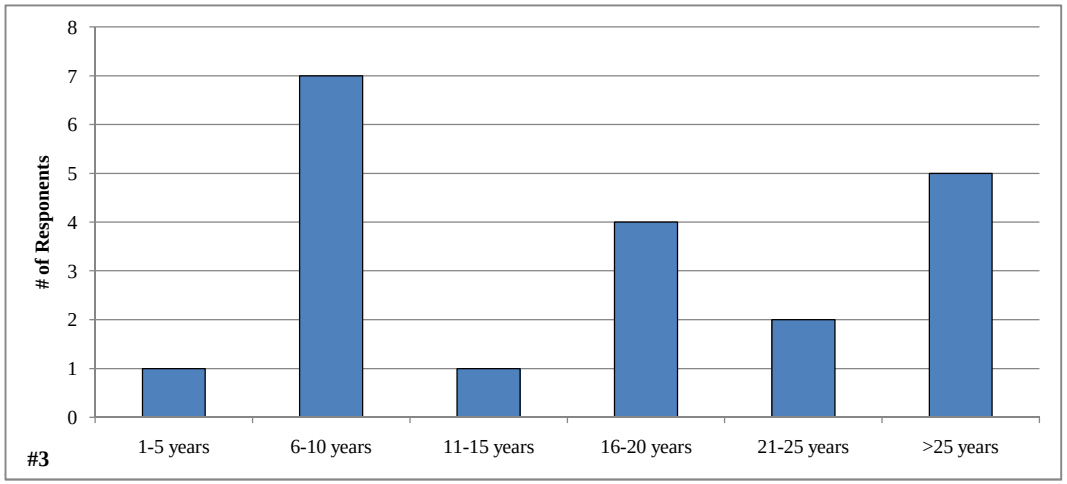


#2 If you are not a year-round resident, how many days each year is your property used by you or others?

Answered Question	16
Average	65.9
Standard deviation	49.3

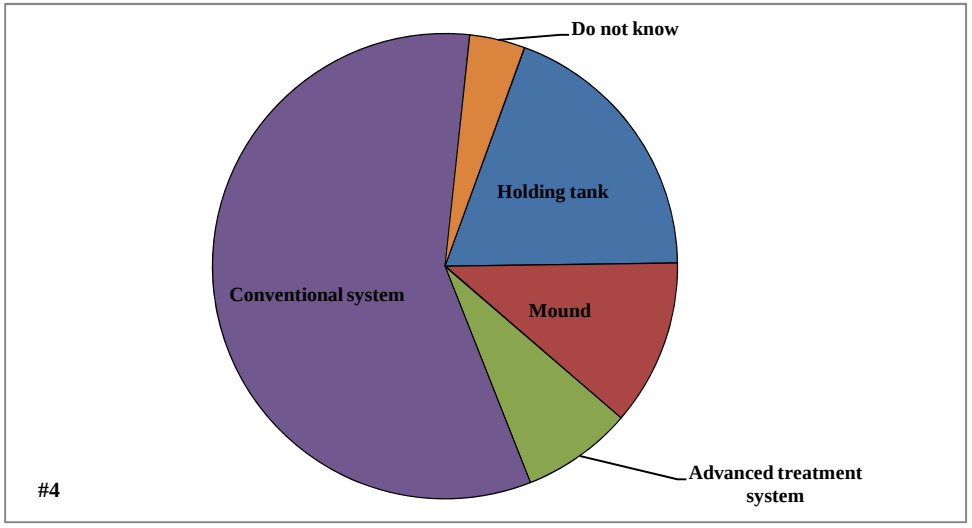
#3 How many years have you owned property on Kathan Lake?

	Total	%
1-5 years	1	*5.0*
6-10 years	7	*35.0*
11-15 years	1	*5.0*
16-20 years	4	*20.0*
21-25 years	2	*10.0*
>25 years	5	*25.0*
	20	*100.0*



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

	Total	%
Holding tank	5	*19.2*
Mound	3	*11.5*
Advanced treatment system	2	*7.7*
Conventional system	15	*57.7*
Municipal Sewer	0	*0.0*
Do not know	1	*3.8*
	26	*100.0*

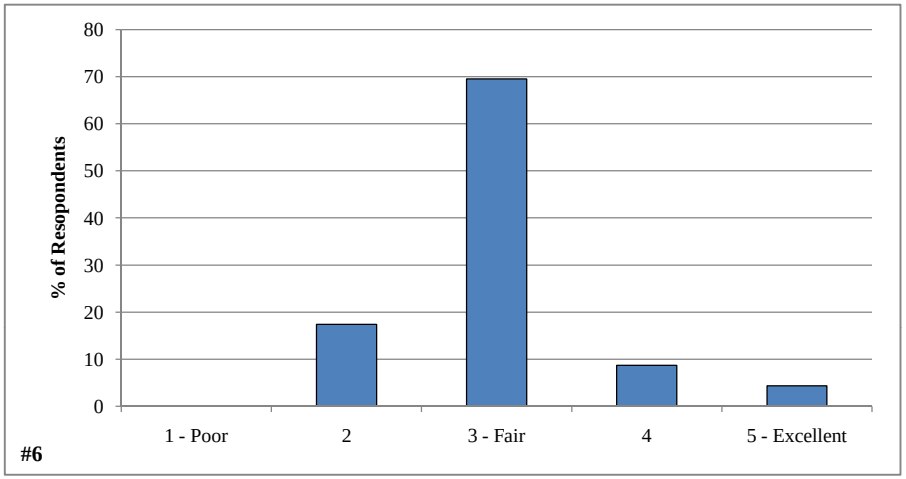


#5 Have you fished on Kathan Lake in the past 3 years?

	Total	%
Yes	24	*88.9*
No	3	*11.1*
	27	*100.0*

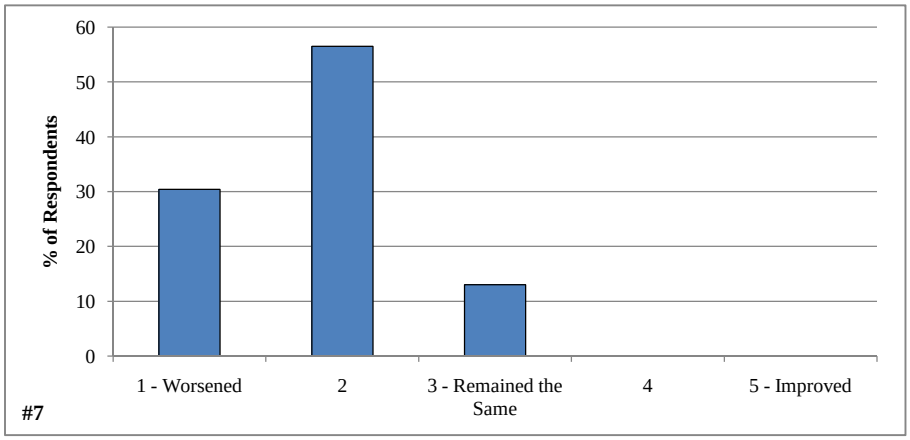
#6 How would you describe the current quality of fishing on Kathan Lake?

	Total	%
1 - Poor	0	*0.0*
2	4	*17.4*
3 - Fair	16	*69.6*
4	2	*8.7*
5 - Excellent	1	*4.3*
	23	*100.0*



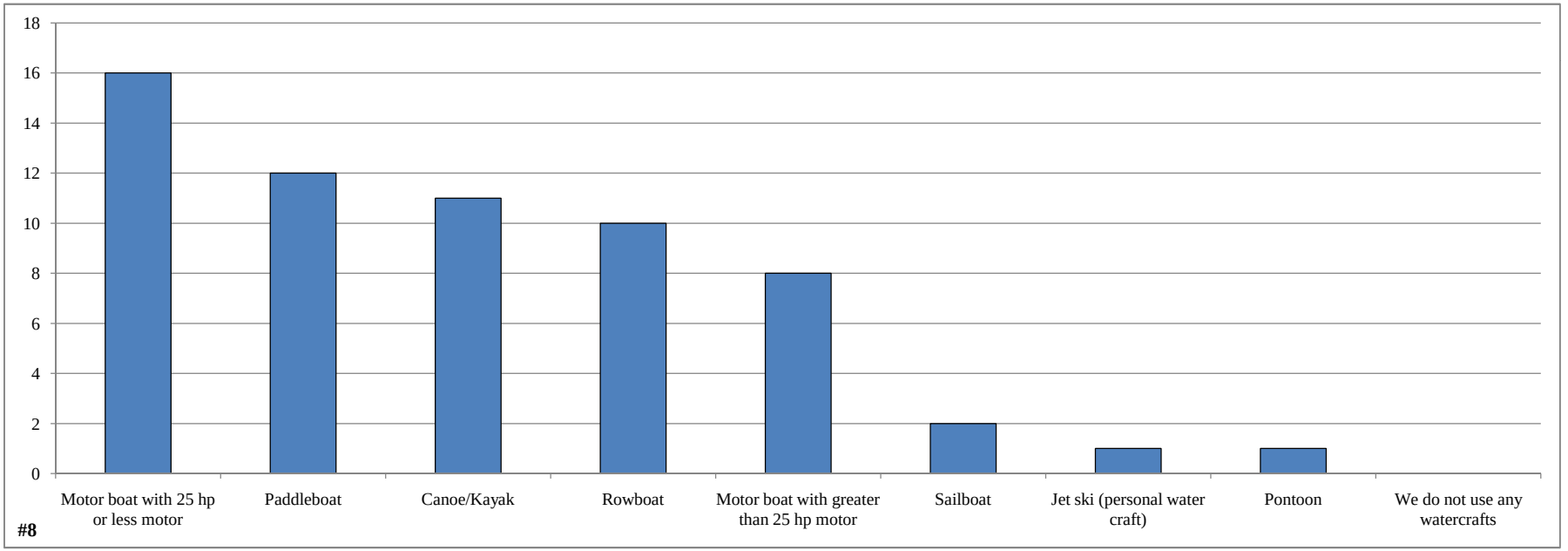
#7 How has the quality of fishing changed on Kathan Lake since you obtained your property?

	Total	%
1 - Worsened	7	*30.4*
2	13	*56.5*
3 - Remained the Same	3	*13.0*
4	0	*0.0*
5 - Improved	0	*0.0*
	23	*100.0*



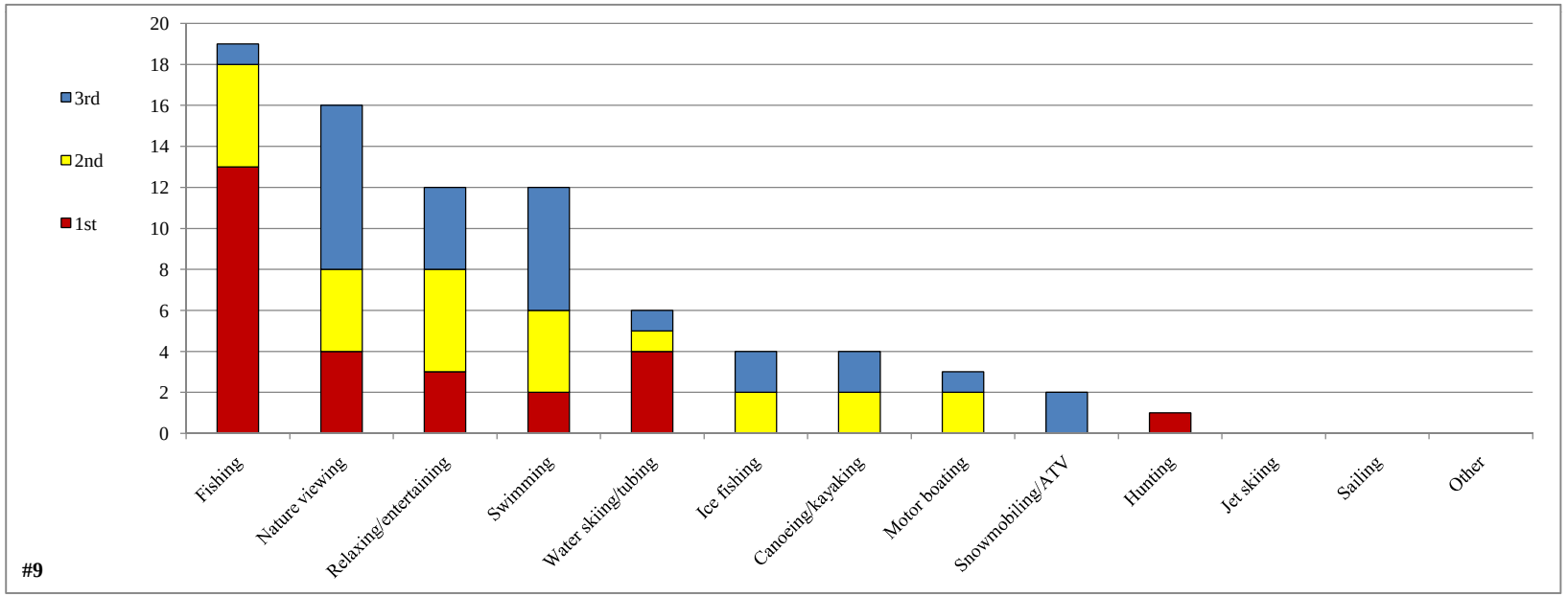
#8 What types of watercraft do you or others that use your property, currently use on the lake?

	Total
Motor boat with 25 hp or less motor	16
Paddleboat	12
Canoe/Kayak	11
Rowboat	10
Motor boat with greater than 25 hp motor	8
Sailboat	2
Jet ski (personal water craft)	1
Pontoon	1
We do not use any watercrafts	0
	61



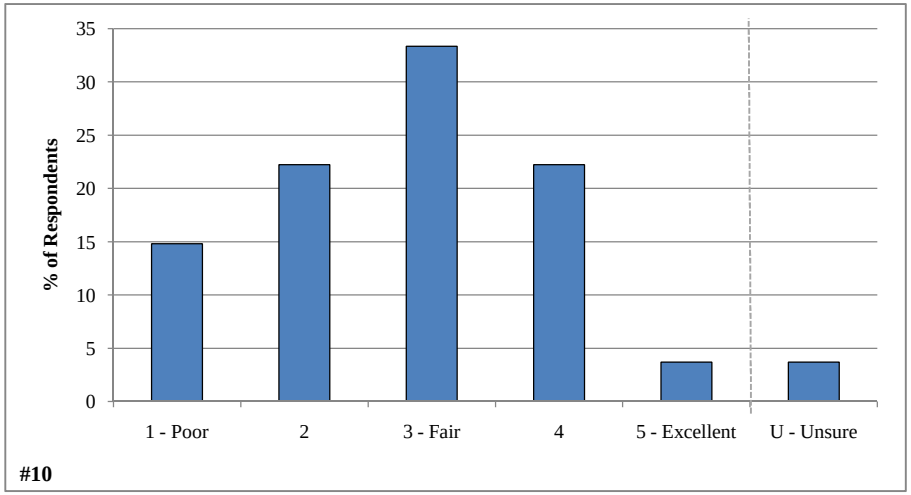
#9 Please rank the activities below that are the most important or enjoyable to you on Kathan Lake?

	1st	2nd	3rd	*% ranked*
Fishing	13	5	1	*23.5*
Nature viewing	4	4	8	*19.8*
Relaxing/entertaining	3	5	4	*14.8*
Swimming	2	4	6	*14.8*
Water skiing/tubing	4	1	1	*7.4*
Ice fishing	0	2	2	*4.9*
Canoeing/kayaking	0	2	2	*4.9*
Motor boating	0	2	1	*3.7*
Snowmobiling/ATV	0	0	2	*2.5*
Hunting	1	0	0	*1.2*
Jet skiing	0	0	0	*0.0*
Sailing	0	0	0	*0.0*
Other	0	0	0	*0.0*
	27	25	27	*97.5*



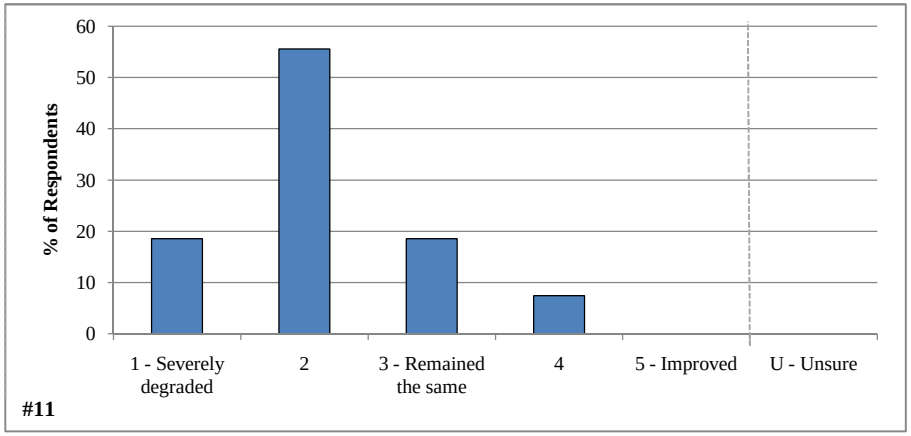
#10 How would you describe the current water quality of Kathan Lake?

	Total	%
1 - Poor	4	*14.8*
2	6	*22.2*
3 - Fair	9	*33.3*
4	6	*22.2*
5 - Excellent	1	*3.7*
U - Unsure	1	*3.7*
	27	*100.0*



#11 How has the water quality changed in Kathan Lake since you obtained your property?

	Total	%
1 - Severely degraded	5	*18.5*
2	15	*55.6*
3 - Remained the same	5	*18.5*
4	2	*7.4*
5 - Improved	0	*0.0*
U - Unsure	0	*0.0*
	27	*100.0*



#12 Before having read the statement above, had you ever heard of aquatic invasive species?

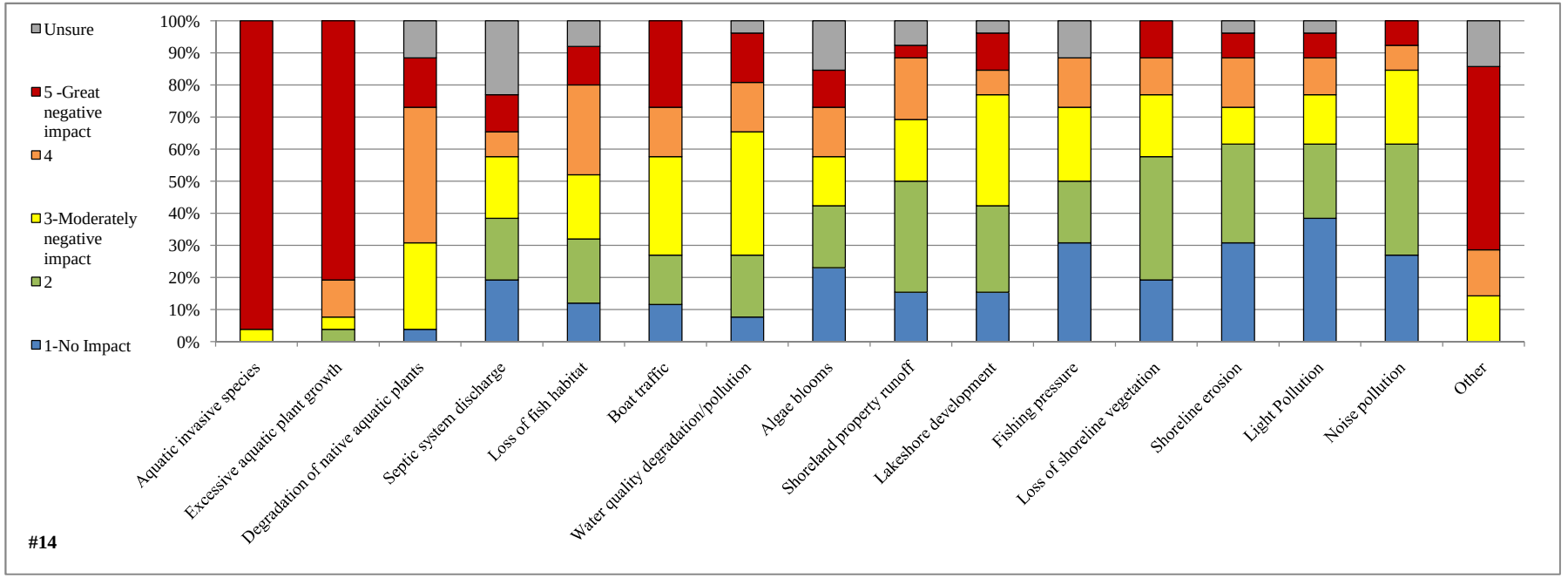
	Total	%
Yes	27	*100.0*
No	0	*0.0*
	27	*100.0*

#13 Are you aware of aquatic invasive species in your lake?

	Total	%
Yes	25	*92.6*
No	2	*7.4*
	27	*100.0*

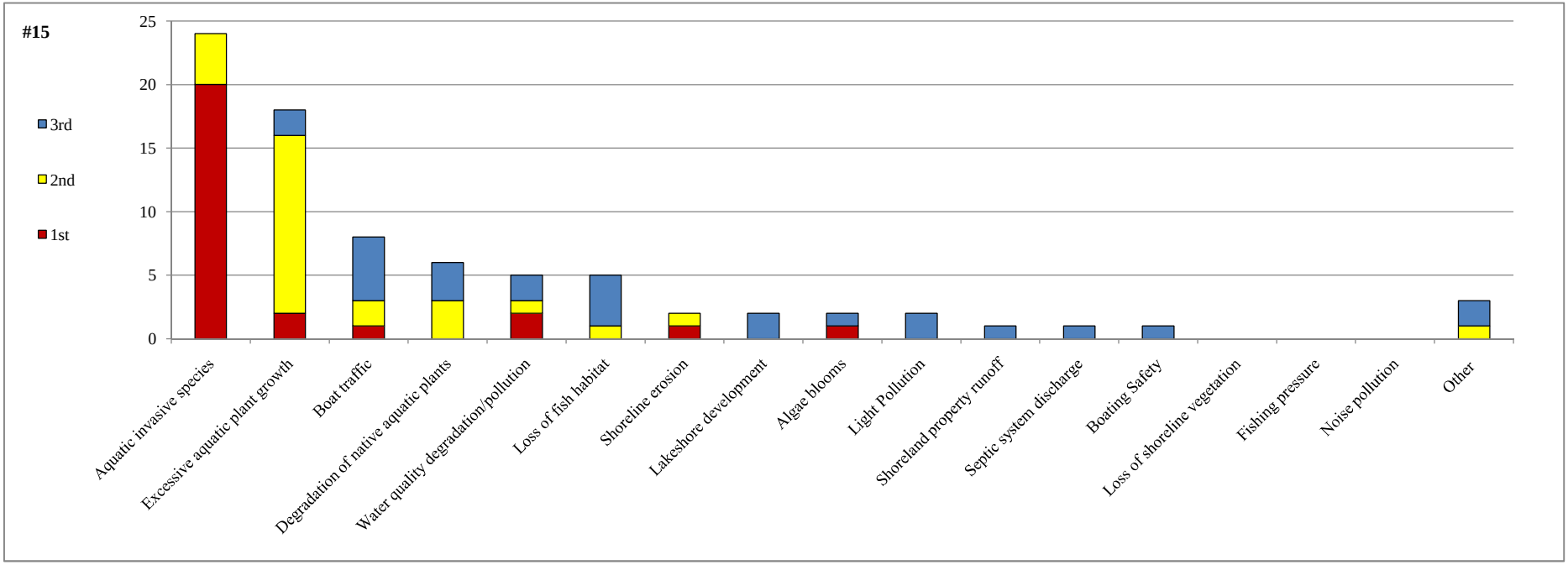
#14 To what level do you believe each the following factors are negatively impacting Kathan Lake?

	1-No Impact	2	3-Moderately negative impact	4	5 -Great negative impact	Unsure	*Total*	*Average*
Aquatic invasive species	0	0	1	0	25	0	*26*	*4.9*
Excessive aquatic plant growth	0	1	1	3	21	0	*26*	*4.7*
Degradation of native aquatic plants	1	0	7	11	4	3	*23*	*4.0*
Septic system discharge	5	5	5	2	3	6	*20*	*3.4*
Loss of fish habitat	3	5	5	7	3	2	*23*	*3.3*
Boat traffic	3	4	8	4	7	0	*26*	*3.3*
Water quality degradation/pollution	2	5	10	4	4	1	*25*	*3.2*
Algae blooms	6	5	4	4	3	4	*22*	*3.2*
Shoreland property runoff	4	9	5	5	1	2	*24*	*2.8*
Lakeshore development	4	7	9	2	3	1	*25*	*2.8*
Fishing pressure	8	5	6	4	0	3	*23*	*2.7*
Loss of shoreline vegetation	5	10	5	3	3	0	*26*	*2.6*
Shoreline erosion	8	8	3	4	2	1	*25*	*2.5*
Light Pollution	10	6	4	3	2	1	*25*	*2.4*
Noise pollution	7	9	6	2	2	0	*26*	*2.3*
Other	0	0	1	1	4	1	*6*	*4.7*



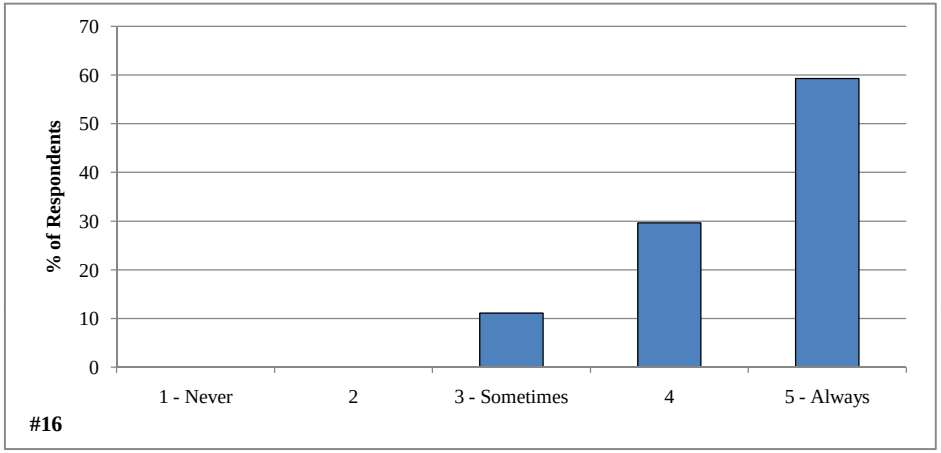
#15 From the list below, please rank your top three concerns regarding Kathan Lake?

	1st	2nd	3rd	*% Ranked*
Aquatic invasive species	20	4	0	*88.9*
Excessive aquatic plant growth	2	14	2	*66.7*
Boat traffic	1	2	5	*29.6*
Degradation of native aquatic plants	0	3	3	*22.2*
Water quality degradation/pollution	2	1	2	*18.5*
Loss of fish habitat	0	1	4	*18.5*
Shoreline erosion	1	1	0	*7.4*
Lakeshore development	0	0	2	*7.4*
Algae blooms	1	0	1	*7.4*
Light Pollution	0	0	2	*7.4*
Shoreland property runoff	0	0	1	*3.7*
Septic system discharge	0	0	1	*3.7*
Boating Safety	0	0	1	*3.7*
Loss of shoreline vegetation	0	0	0	*0.0*
Fishing pressure	0	0	0	*0.0*
Noise pollution	0	0	0	*0.0*
Other	0	1	2	*11.1*
	27	27	26	*296.3*



#16 How often does aquatic plant growth impact your enjoyment of Kathan Lake?

	Total	%
1 - Never	0	*0.0*
2	0	*0.0*
3 - Sometimes	3	*11.1*
4	8	*29.6*
5 - Always	16	*59.3*
	27	*100.0*

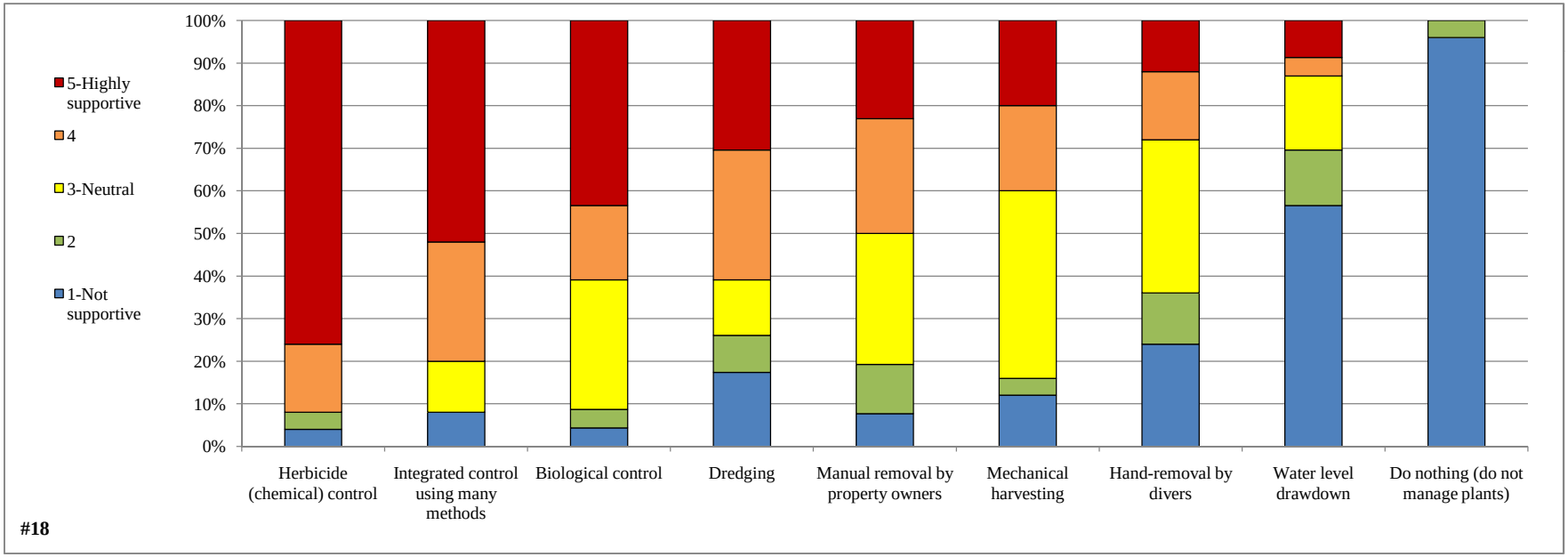


#17 Considering your answer to the question above, do you believe aquatic plant control is needed on Kathan Lake?

	Total	%
Yes	27	*100.0*
No	0	*0.0*
Unsure	0	*0.0*
	27	*100.0*

#18 What is your level of support for the responsible use of the following techniques on Kathan Lake?

	1-Not supportive	2	3-Neutral	4	5-Highly supportive	*Total*	*Average*
Herbicide (chemical) control	1	1	0	4	19	*25*	*4.7*
Integrated control using many methods	2	0	3	7	13	*25*	*4.3*
Biological control	1	1	7	4	10	*23*	*4.2*
Dredging	4	2	3	7	7	*23*	*3.8*
Manual removal by property owners	2	3	8	7	6	*26*	*3.6*
Mechanical harvesting	3	1	11	5	5	*25*	*3.5*
Hand-removal by divers	6	3	9	4	3	*25*	*3.0*
Water level drawdown	13	3	4	1	2	*23*	*2.4*
Do nothing (do not manage plants)	24	1	0	0	0	*25*	*1.4*



#19 Before receiving this mailing, have you ever heard of the Kathan Lake Association, Inc?

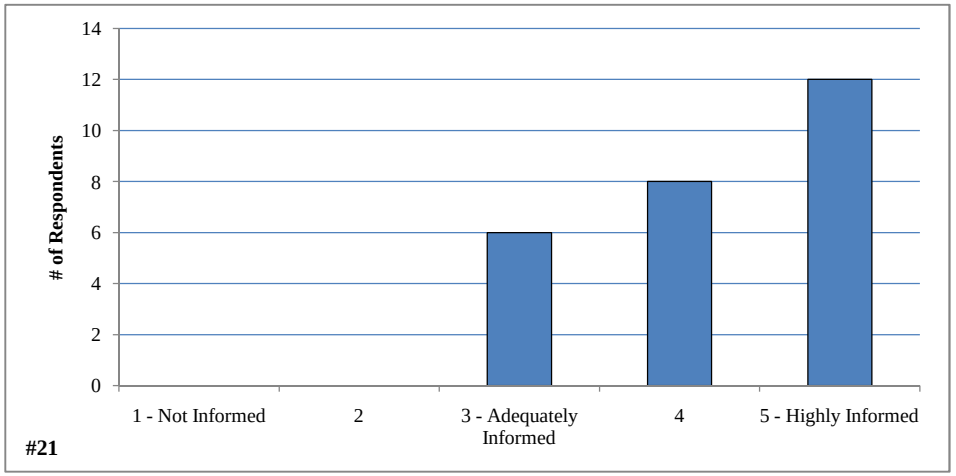
	Total	%
Yes	26	*96.3*
No	1	*3.7*
	27	*100.0*

#20 Are you currently a member of the Kathan Lake Association, Inc?

	Total	%
Yes	23	*85.2*
No	4	*14.8*
	27	*100.0*

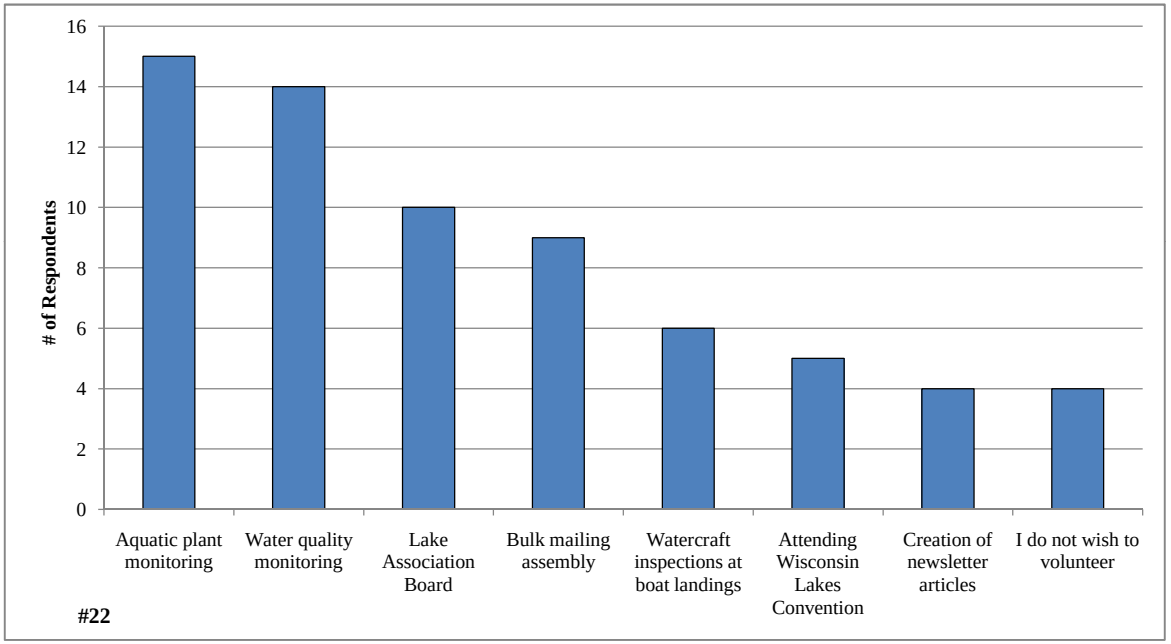
#21 Do you believe the Kathan Lake Association Inc. has kept you adequately informed regarding issues with Kathan Lake and its management?

	Total	%
1 - Not Informed	0	*0.0*
2	0	*0.0*
3 - Adequately Informed	6	*23.1*
4	8	*30.8*
5 - Highly Informed	12	*46.2*
	26	*100.0*



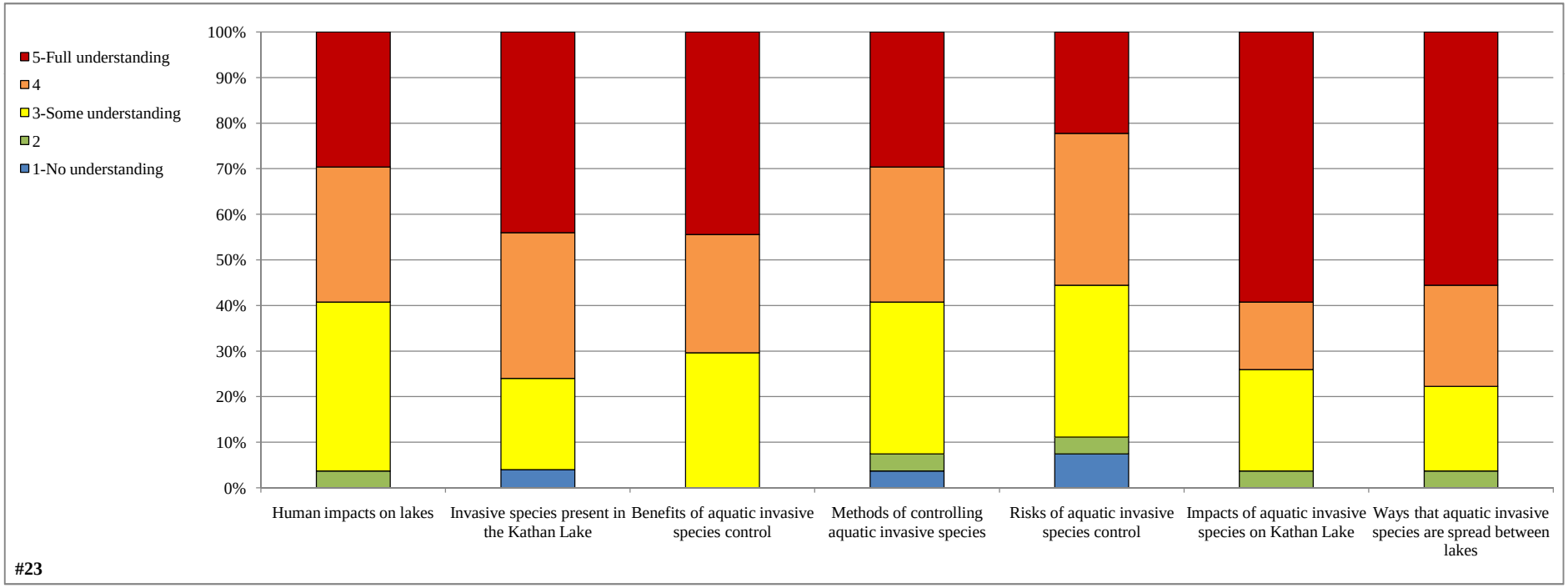
#22 Please circle the activities you would be willing to participate in if called upon.

	Total
Aquatic plant monitoring	15
Water quality monitoring	14
Lake Association Board	10
Bulk mailing assembly	9
Watercraft inspections at boat landings	6
Attending Wisconsin Lakes Convention	5
Creation of newsletter articles	4
I do not wish to volunteer	4
	67



#23 Please describe your level of understanding of each of the following lake management issues.

	1-No understanding	2	3-Some understanding	4	5-Full understanding	*Total*	*Average*
Human impacts on lakes	0	1	10	8	8	*27*	*4.3*
Invasive species present in the Kathan Lake	1	0	5	8	11	*25*	*4.3*
Benefits of aquatic invasive species control	0	0	8	7	12	*27*	*4.1*
Methods of controlling aquatic invasive species	1	1	9	8	8	*27*	*3.9*
Risks of aquatic invasive species control	2	1	9	9	6	*27*	*3.8*
Impacts of aquatic invasive species on Kathan Lake	0	1	6	4	16	*27*	*0.4*
Ways that aquatic invasive species are spread between lakes	0	1	5	6	15	*27*	*0.1*



Stakeholder Survey Comments

I personally would not mind our fees going up to see something done about our water problems and our time fixing it.

Our family comes up during the winter season due to snowmobiling. We aren't aware of Kathan Lake weed problem; however we have this problem in Long Lake, IL. The land owners are on their own, most people treated it with BID chem. And it's been working, and washing boats if from another lake. Prevention is key.

We are in the process of fixing our Kathan Lake property and are looking forward to the lake process.

We wish to remain closely informed of all actions, meeting minutes and concerns regarding our lake when they occur. Thank you.

The property owner has a DNR lake monitor for water quality the past 18 years. The recorded results show very little change in clarity of Kathan Lake. The bottom quality of the lake seems to have a bearing on the growth of AIS. Our consultant maybe able to shed some light on this factor. If an aerator is installed in the lake, make sure a safety fence around the open water is there for the association's liability coverage.

We have owned property on Kathan Lake for 16 years and enjoy every aspect of the area. I have concerns about the milfoil, but do not have enough knowledge on the numerous methods of control and its short and long term effects.

I have been enjoying Kathan Lake since 1949 and have been a property owner since 1991. I have spent most of my summers vacationing on the lake. Since being a property owner we have spent year round time, almost every month, on the lake. In my opinion, with the milfoil problem, the lake is not as enjoyable as it use to be. Fishing, swimming, boating and canoeing areas are limited now. Also, with people using large motors on our small lake, the water quality is poor. It is stirred up a lot of the time, esp. summer. We use to enjoy swimming in Lake Kathan, but not much anymore. The large motors bring up the sediment from the bottom of the lake and the lake remains cloudy, when it use to be clear. Also, the large motors chew up and distribute the milfoil faster.

My dad and his dad started coming her to Kathan Lake in the early 1950's. So I've seen the lake go from a great fishing lake with lots of muskies to a lake with only a few. The weeds have taken over the bay in the back of the island is totally chocked out and the rest of the lake will be next. Back 30 years ago we had one ski boat and now we have 6 ski boats. The lake has an average depth o f 6 feet maybe! What are these people thinking? They go out skiing and the water turns muddy to murky. They turn up the bottom and also chop up the milfoil and spread it all over the lake. That's a lot of the reason its spreading like it is. If the association is going to spend time and money needed to fight the milfoil, then this needs to stop. If these people care as much as they say they do, then they should be willing to stop digging up the lake. I think that a no motor ban until the milfoil is cleared up is highly needed. Otherwise you could spend all the money in

the world and the milfoil will never go away. The other thing is cleaning out the inlet creek is going to do nothing, all your doing is draining a swamp. Aldridge creek dries up every June and remains dry until spring. Then the only thing cleaning out the outlet creek does is lower the lake level. Which isn't helping the milfoil spreading either. I care greatly about this lake, but I'm sick and tired of watching people destroy my lake for me!

All of our efforts will be for naught if big boat traffic is not controlled. Our lake is not deep enough to support large boats. The big boats have rototilled the lake over and over, making the water mucky and spreading the milfoil!! Maybe we should ban all motors at least until we solve the milfoil problem.

Thank you for all your time, effort and expense you are putting into Kathan Lake a beautiful, healthy, little "fishing and relaxing" lake.

Part of this problem must include if possible monitoring water level. i.e. spillway on south end of lake& keeping traffic out of AIS sites. This is especially crucial to owners on the east side of lake.

The lake is rapidly being overtaken by milfoil. Some form of management must be implemented soon.

Kathan's fish populations and vegetation have always been cyclical. Current conditions are poor and AIS may change normal cycles negatively.

As Eagle River spreads toward Kathan Lake and off lake development increases the area is transforming to a more suburban density and "feel" versus the rural middle of the nowhere conditions of 30-40 years ago. We can try to limit the impacts of this transition through the association.

Doing a good job so far. Definitely need to proceed with the treatment as quickly as possible.

Question Specific Comments

#1g Seasonal, winter
#1g Other warm seasons
#1g Uses 8 months of year round home

#4 None

#14p A lot of iron in the lake water which stains my boat hull
#14p Motor size HP
#14p Low water level
#14p Large motor boats
#14p Removal of dams inlet & outlet, ski boat traffic
#14p Boat traffic through AIS

#15q Low lake water level
#15q Low water level
#15q Large motor boats
#15q Large motor boats

C

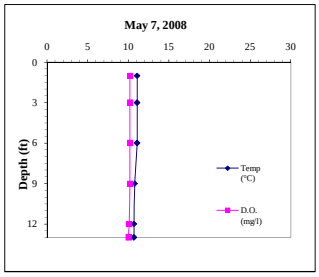
APPENDIX C

Water Quality Data

Kathan

Date: 05-07-08 **Max Depth (ft):** 15.3
Time: 12:20 PM, **KLS Depth (ft):** 3.0
Weather: 100 % Clouds, Windy, 45ºF **KLS Depth (ft):** 13.0
Ent: BTB **Verf:** **Secchi Depth (ft):** 2.4

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	11.1	10.2	7.0	69
3.0	11.1	10.2	7.0	68
6.0	11.1	10.2	7.0	69
9.0	10.8	10.2	7.0	69
12.0	10.7	10.1	6.9	69
13.0	10.7	10.0	6.9	69



Parameter	KLS	KLB
Total P (µg/L)	41.000	62.000
Dissolved P (µg/L)	2.000	2.000
Chl a (µg/L)	8.06	NA
TKN (µg/L	620.00	610.00
NO3+NO2-N (µg/L)	ND	ND
NH3-N (µg/L)	ND	ND
Total N (µg/L)	620.00	610.00
Lab Cond. (µS/cm)	72	72
Lab pH	7.09	7.12
Alkal (mg/l CaCO3)	17	17
Total Susp Sol (mg/l)	3	4
Calcium (mg/l)	5.5	NA

Data Collected by BTB and SNK (Onterra)

Kathan

Date: 05-20-08 **Max Depth (ft):** NA
Time: NA **KLS Depth (ft):** NA
Weather: NA **KLB Depth (ft):** NA
Ent: BTB **Verf:** **Secchi Depth (ft):** 3.5

Data collected by James Hughes (Kathan CLMN)

Kathan

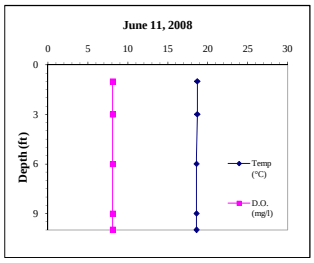
Date: 06-03-08 **Max Depth (ft):** NA
Time: NA **KLS Depth (ft):** NA
Weather: NA **KLB Depth (ft):** NA
Ent: BTB **Verf:** **Secchi Depth (ft):** 4.5

Data collected by James Hughes (Kathan CLMN)

Kathan

Date: 06-11-08 **Max Depth (ft):** 11.8
Time: 12:50 **KLS Depth (ft):** 3.0
Weather: Partly Sunny, 55ºF, Windy **KLS Depth (ft):** 10.0
Ent: BTB **Verf:** **Secchi Depth (ft):** 5.0

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	18.7	8.1	7.1	71
3.0	18.7	8.1	7.2	71
6.0	18.6	8.1	7.1	71
9.0	18.6	8.1	7.1	71
10.0	18.6	8.1	7.1	71



Parameter	KLS	KLB
Total P (µg/L)	29.000	48.000
Dissolved P (µg/L)	NA	NA
Chl a (µg/L)	1.68	NA
TKN (µg/L	700.00	NA
NO3+NO2-N (µg/L)	ND	NA
NH3-N (µg/L)	17.000	NA
Total N (µg/L)	700.00	NA
Lab Cond. (µS/cm)	NA	NA
Lab pH	7.20	7.10
Alkal (mg/l CaCO3)	NA	NA
Total Susp Sol (mg/l)	ND	NA
Calcium (mg/l)	NA	NA

Data collected by BTB and SNK (Onterra)

Kathan

Date: 06-18-08
Time: NA
Weather: NA
Ent: BTB **Verf:**

Max Depth (ft): NA
KLS Depth (ft): NA
KLB Depth (ft): NA
Secchi Depth (ft): 4.0

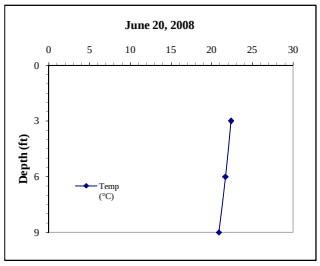
Data collected by James Hughes (Kathan CLMN)

Kathan

Date: 06-20-08
Time: NA
Weather: NA
Ent: BTB **Verf:**

Max Depth (ft): 9.0
KLS Depth (ft): 3.0
KLS Depth (ft): 9.0
Secchi Depth (ft): 6.5

Depth (ft)	Temp (°C)	Temp (°F)
3.0	22.4	67.8
6.0	21.7	66.7
9.0	20.9	65.4



Parameter	KLS	KLB
Total P (µg/L)	24.000	NA
Dissolved P (µg/L)	NA	NA
Chl a (µg/L)	3.18	NA
TKN (µg/L	NA	NA
NO3+NO2-N (µg/L)	NA	NA
NH3-N (µg/L)	NA	NA
Total N (µg/L)	NA	NA
Lab Cond. (µS/cm)	NA	NA
Lab pH	NA	NA
Alkal (mg/l CaCO3)	NA	NA
Total Susp Sol (mg/l)	NA	NA
Calcium (mg/l)	NA	NA

Data collected by Denis Boehm (Kathan Lake CLMN)

Kathan

Date: 07-01-08
Time: NA
Weather: NA
Ent: BTB **Verf:**

Max Depth (ft): NA
KLS Depth (ft): NA
KLB Depth (ft): NA
Secchi Depth (ft): 4.5

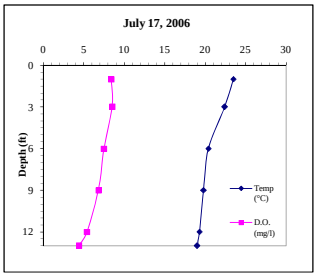
Data collected by James Hughes (Kathan CLMN)

Kathan

Date: 07-17-08
Time: 12:15
Weather: hazy, 83 F, calm
Ent: BTB **Verf:**

Max Depth (ft): 14.8
KLS Depth (ft): 3.0
KLB Depth (ft): 13.0
Secchi Depth (ft): 5.5

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	23.5	8.4	7.6	72
3.0	22.4	8.5	7.6	72
6.0	20.4	7.5	7	73
9.0	19.8	6.8	6.7	72
12.0	19.3	5.4	6.5	73
13.0	19.0	4.4	6.5	75



Parameter	KLS	KLB
Total P (µg/L)	31.000	30.000
Dissolved P (µg/L)	6.000	5.000
Chl a (µg/L)	1.07	NA
TKN (µg/L	670.00	670.00
NO3+NO2-N (µg/L)	ND	ND
NH3-N (µg/L)	ND	48.000
Total N (µg/L)	670.00	670.00
Lab Cond. (µS/cm)	74	75
Lab pH	7.60	6.50
Alkal (mg/l CaCO3)	18	18
Total Susp Sol (mg/l)	ND	4
Calcium (mg/l)	NA	NA

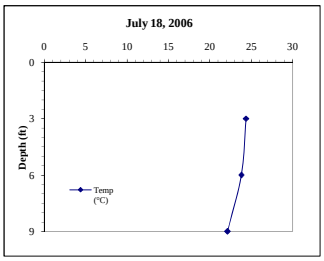
Data Collected by BTB and SNK (Onterra)

Kathan

Date: 07-18-08
Time: NA
Weather: NA
Ent: BTB **Verf:**

Max Depth (ft): 9.0
KLS Depth (ft): 3.0
KLB Depth (ft): 9.0
Secchi Depth (ft): 5.5

Depth (ft)	Temp (°C)	Temp (°F)
3.0	24.4	71.0
6.0	23.8	70.1
9.0	22.1	67.4



Parameter	KLS	KLB
Total P (µg/L)	21.000	NA
Dissolved P (µg/L)	NA	NA
Chl a (µg/L)	4.18	NA
TKN (µg/L	NA	NA
NO3+NO2-N (µg/L)	NA	NA
NH3-N (µg/L)	NA	NA
Total N (µg/L)	NA	NA
Lab Cond. (µS/cm)	NA	NA
Lab pH	NA	NA
Alkal (mg/l CaCO3)	NA	NA
Total Susp Sol (mg/l)	NA	NA
Calcium (mg/l)	NA	NA

Data collected by Denis Boehm (Kathan Lake CLMN)

Kathan

Date: 07-21-08
Time: NA
Weather: NA
Ent: BTB **Verf:**

Max Depth (ft): NA
KLS Depth (ft): NA
KLB Depth (ft): NA
Secchi Depth (ft): 5.0

Data collected by James Hughes (Kathan CLMN)

Kathan

Date: 08-05-08
Time: NA
Weather: NA
Ent: BTB **Verf:**

Max Depth (ft): NA
KLS Depth (ft): NA
KLB Depth (ft): NA
Secchi Depth (ft): 5.5

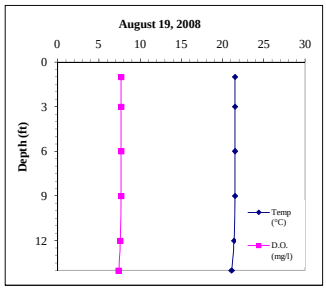
Data collected by James Hughes (Kathan CLMN)

Kathan

Date: 08-19-08
Time: 9:00
Weather: 100% clouds, windy, 50F
Ent: BTB **Verf:**

Max Depth (ft): 15.1
KLS Depth (ft): 3.0
KLB Depth (ft): 14.0
Secchi Depth (ft): 6.4

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	21.5	7.7	7.3	75.0
3.0	21.5	7.7	7.3	75.0
6.0	21.5	7.7	7.3	75.0
9.0	21.5	7.7	7.3	75.0
12.0	21.4	7.6	7.2	75.0
14.0	21.1	7.4	7.2	75.0



Parameter	KLS	KLB
Total P (µg/L)	25.00	17.00
Dissolved P (µg/L)	2.000	NA
Chl a (µg/L)	2.56	NA
TKN (µg/L	440.00	NA
NO3+NO2-N (µg/L)	ND	NA
NH3-N (µg/L)	ND	NA
Total N (µg/L)	440.00	NA
Lab Cond. (µS/cm)	NA	NA
Lab pH	7.30	7.20
Alkal (mg/l CaCO3)	NA	NA
Total Susp Sol (mg/l)	3	NA
Calcium (mg/l)	NA	NA

Data collected by BTB (Onterra)

Kathan

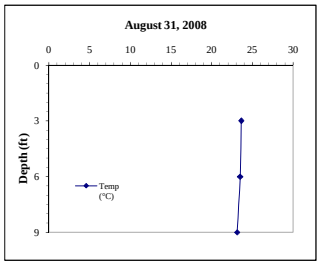
Date: 08-21-08 **Max Depth (ft):** NA
Time: NA **KLS Depth (ft):** NA
Weather: NA **KLB Depth (ft):** NA
Ent: BTB **Verf:** **Secchi Depth (ft):** 5.5

Data collected by James Hughes (Kathan CLMN)

Kathan

Date: 08-31-08 **Max Depth (ft):** 9.0
Time: NA **KLS Depth (ft):** 3.0
Weather: NA **KLB Depth (ft):** 9.0
Ent: BTB **Verf:** **Secchi Depth (ft):** 6.5

Depth (ft)	Temp (°C)	Temp (°F)
3.0	23.6	69.8
6.0	23.5	69.6
9.0	23.1	69.0



Parameter	KLS	KLB
Total P (µg/L)	16.000	NA
Dissolved P (µg/L)	NA	NA
Chl a (µg/L)	2.60	NA
TKN (µg/L	NA	NA
NO3+NO2-N (µg/L)	NA	NA
NH3-N (µg/L)	NA	NA
Total N (µg/L)	NA	NA
Lab Cond. (µS/cm)	NA	NA
Lab pH	NA	NA
Alkal (mg/l CaCO3)	NA	NA
Total Susp Sol (mg/l)	NA	NA
Calcium (mg/l)	NA	NA

Data collected by Denis Boehm (Kathan Lake CLMN)

Kathan

Date: 09-20-08 **Max Depth (ft):** NA
Time: NA **KLS Depth (ft):** NA
Weather: NA **KLB Depth (ft):** NA
Ent: BTB **Verf:** **Secchi Depth (ft):** 7.5

Data collected by James Hughes (Kathan CLMN)

Kathan

Date: 10-02-08 **Max Depth (ft):** NA
Time: NA **KLS Depth (ft):** NA
Weather: NA **KLB Depth (ft):** NA
Ent: BTB **Verf:** **Secchi Depth (ft):** 7.3

Data collected by James Hughes (Kathan CLMN)

Kathan

Date: 10-21-08 **Max Depth (ft):** NA
Time: NA **KLS Depth (ft):** NA
Weather: NA **KLB Depth (ft):** NA
Ent: BTB **Verf:** **Secchi Depth (ft):** 6.8

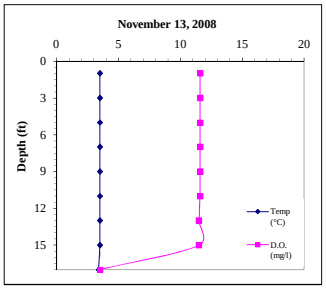
Data collected by James Hughes (Kathan CLMN)

Kathan

Date: 11-13-08
Time: 11:30
Weather: 100% clouds
Ent: BTB **Verf:**

Max Depth (ft): 18.0
KLS Depth (ft): 3.0
KLB Depth (ft): 17.0
Secchi Depth (ft): 8.8

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	3.5	11.6	5.9	73.0
3.0	3.5	11.6	5.5	73.0
5.0	3.5	11.6	5.1	73.0
7.0	3.5	11.6	5.0	73.0
9.0	3.5	11.6	5.0	73.0
11.0	3.5	11.6	5.0	73.0
13.0	3.5	11.5	5.1	73.0
15.0	3.5	11.5	5.1	73.0
17.0	3.4	3.5	4.0	73.0



Parameter	KLS	KLB
Total P (µg/L)	20.000	NA
Dissolved P (µg/L)	NA	NA
Chl a (µg/L)	NA	NA
TKN (µg/L	NA	NA
NO3+NO2-N (µg/L)	NA	NA
NH3-N (µg/L)	NA	NA
Total N (µg/L)	NA	NA
Lab Cond. (µS/cm)	73	NA
Lab pH	5.90	NA
Alkal (mg/l CaCO3)	NA	NA
Total Susp Sol (mg/l)	ND	NA
Calcium (mg/l)	NA	NA

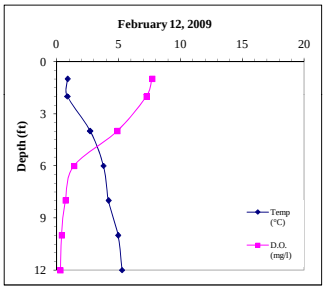
Data collected by EJH (Onterra)

Kathan

Date: 02-12-09
Time: 1:00
Weather: 100% clouds, 31°F, windy
Ent: BTB **Verf:**

Max Depth (ft): 14.0
KLS Depth (ft): 3.0
KLB Depth (ft): 12.0
Secchi Depth (ft): 6.6

Depth (ft)	Temp (°C)	D.O. (mg/l)	pH	Sp. Cond (µS/cm)
1.0	0.9	7.7	7.5	109.0
2.0	0.9	7.3	7.1	106.0
4.0	2.7	4.9	6.8	100.0
6.0	3.8	1.4	6.5	101.0
8.0	4.2	0.7	6.1	133.0
10.0	5.0	0.4	6.1	203.0
12.0	5.3	0.3	6.4	228.0



Parameter	KLS	KLB
Total P (µg/L)	22.000	71.000
Dissolved P (µg/L)	5.000	7.000
Chl a (µg/L)	NA	NA
TKN (µg/L	430.00	1250.00
NO3+NO2-N (µg/L)	ND	ND
NH3-N (µg/L)	75.000	562.000
Total N (µg/L)	430.00	1250.00
Lab Cond. (µS/cm)	NA	NA
Lab pH	NA	NA
Alkal (mg/l CaCO3)	NA	NA
Total Susp Sol (mg/l)	4	22
Calcium (mg/l)	NA	NA

Data collected by: EJH and SNK (Onterra)
Ice: 1.6 ft

Water Quality Data

2008/2009	Surface		Bottom	
Parameter	Count	Mean	Count	Mean
Secchi Depth (feet)	15	5.4	NA	NA
Total P (µg/L)	9	30.9	5	45.6
Dissolved P (µg/L)	4	4.3	3	4.7
Chl a (µg/L)	7	3.3	NA	NA
TKN (µg/L	5	736.0	3	843.3
NO3+NO2-N (µg/L)	5	ND	5	ND
NH3-N (µg/L)	5	289.5	5	305.0
Total N (µg/L)	5	736.0	3	843.3
Lab Cond. (µS/cm)	3	73.0	2	73.5
Lab pH	5	7.0	4	7.0
Alkal (mg/l CaCO3)	2	17.5	2	17.7
Total Susp Sol (mg/l)	3	9.2	3	10.0
Calcium (µg/L)	1	5.5	NA	NA

Wisconsin Trophic State Index (WTSI)

Year	TP	Chla	SD
1979	49.21	52.76	
1993			62.34
1994			59.07
1995			55.70
1996			62.76
1997			65.83
1998			59.49
1999			57.77
2000			57.54
2001			61.78
2002			60.59
2003			60.14
2004			58.31
2005			52.29
2006	54.35	51.46	58.90
2007	50.19	45.42	55.00
2008	52.98	41.79	52.87
2009	49.47	38.96	49.83
All Years (weighted)	50.81	43.62	58.44
WI Natural Lakes	53.19	54.23	47.33
Northeast Region	51.05	51.49	45.61

Morphological / Geographical Data

Parameter	Value
Acreage	189
Volume (acre-feet)	1417.5
Perimeter (miles)	3.63
Shoreland Development	
Maximum Depth (feet)	15
County	Oneida County
WBIC	1598300
Lillie Mason Region(1983)	Northeast Region
Nichols Ecoregion(1999)	NLFF

Watershed Data

WiLMS Class	Acreage	kg/yr	lbs/yr
Forest			
Open Water			
Pasture/Grass			
Row Crops			
Urban - Rural Residential			
Wetland			

Watershed to Lake Area

	Secchi (feet)				Chlorophyll a (µg/L)				Phosphorus (µg/L)				Phosphorus (µg/L)			
	Growing Season		Summer		Growing Season		Summer		Growing Season				Spring Turnover		Fall Turnover	
Year	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean	Count	Mean
1979					1	11.02	1	11.02	1	15	1	15				
1993	9	2.78	7	2.79												
1994	9	3.42	4	3.5												
1995	11	4.39	6	4.42												
1996	10	2.65	6	2.71												
1997	9	2.11	4	2.19												
1998	10	3.75	5	3.4												
1999	13	4.19	6	3.83												
2000	14	3.3	7	3.89												
2001	10	3.2	5	2.9												
2002	9	3.19	5	3.15												
2003	10	3.28	6	3.25												
2004	8	4.09	4	3.69												
2005	10	5.43	5	5.6												
2006	12	3.61	6	3.54	2	7.15	1	9.27	2	24	1	29				
2007	14	4.98	7	4.64	3	3.83	2	4.14	4	21	2	17				
2008	18	5.41	13	5.38	7	3.33	6	2.55	7	26.71	6	24.33				
2009	10	6.6	5	6.64	3	1.64	2	1.75	3	13	2	15.5	**1**	**41**		
All Years (weighted)		3.6		3.7		3.3		3.3		17.0		18.4				
WI Natural Lakes				7.9				13.4				25				
Northeast Region				8.9				9.3				19.0				

Summer 2008 N: 603
Summer 2008 P: 24

Summer 2008 N:P 25 :1

D

APPENDIX D

Watershed Analysis WiLMS Results

Date: 3/8/2010 Scenario: Kathan Current

Lake Id: Kathan
Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 3270.3 acre
Total Unit Runoff: 12.2 in.
Annual Runoff Volume: 3324.8 acre-ft
Lake Surface Area <As>: 215 acre
Lake Volume <V>: 1073.6 acre-ft
Lake Mean Depth <z>: 5.0 ft
Precipitation - Evaporation: 5.8 in.
Hydraulic Loading: 3428.7 acre-ft/year
Areal Water Load <qs>: 15.9 ft/year
Lake Flushing Rate <p>: 3.19 1/year
Water Residence Time: 0.31 year
Observed spring overturn total phosphorus (SPO): 41 mg/m^3
Observed growing season mean phosphorus (GSM): 26.67 mg/m^3
% NPS Change: 0%
% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	Loading (kg/ha-year)				Loading (kg/year)		
Row Crop AG	51	0.50	1.00	3.00	11.3	10	21	62
Mixed AG	0.0	0.30	0.80	1.40	0.0	0	0	0
Pasture/Grass	160.9	0.10	0.30	0.50	10.7	7	20	33
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0
Rural Res (>1 Ac)	0.0	0.05	0.10	0.25	0.0	0	0	0
Wetlands	1241.4	0.10	0.10	0.10	27.5	50	50	50
Forest	1817.0	0.05	0.09	0.18	36.2	37	66	132
Lake Surface	215.0	0.10	0.30	1.00	14.3	9	26	87

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)	248.1	402.8	802.7	100.0
Total Loading (kg)	112.5	182.7	364.1	100.0
Areal Loading (lb/ac-year)	1.15	1.87	3.73	0.0
Areal Loading (mg/m^2-year)	129.34	209.98	418.46	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)	228.9	345.2	610.8	100.0
Total NPS Loading (kg)	103.8	156.6	277.1	100.0

Phosphorus Prediction and Uncertainty Analysis Module

Date: 3/8/2010 Scenario: Kathan Current
Observed spring overturn total phosphorus (SPO): 41.0 mg/m^3
Observed growing season mean phosphorus (GSM): 26.7 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	19	30	60	3	11
Canfield-Bachmann, 1981 Natural Lake	19	29	52	2	7
Canfield-Bachmann, 1981 Artificial Lake	18	26	44	-1	-4
Rechow, 1979 General	7	12	24	-15	-56
Rechow, 1977 Anoxic	22	37	73	10	37
Rechow, 1977 water load<50m/year	17	27	54	0	0
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	18	29	58	-12	-29
Vollenweider, 1982 Combined OECD	16	24	42	-10	-30
Dillon-Rigler-Kirchner	8	12	25	-29	-71
Vollenweider, 1982 Shallow Lake/Res.	12	19	35	-15	-44
Larsen-Mercier, 1976	17	28	55	-13	-32
Nurnberg, 1984 Oxic	9	15	30	-12	-45

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	19	51	FIT	0	GSM
Canfield-Bachmann, 1981 Natural Lake	9	84	FIT	1	GSM
Canfield-Bachmann, 1981 Artificial Lake	8	75	FIT	1	GSM
Rechow, 1979 General	7	21	FIT	0	GSM
Rechow, 1977 Anoxic	24	62	FIT	0	GSM
Rechow, 1977 water load<50m/year	17	47	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	16	54	FIT	0	SPO
Vollenweider, 1982 Combined OECD	12	44	FIT	0	ANN
Dillon-Rigler-Kirchner	8	21	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	10	35	FIT	0	ANN
Larsen-Mercier, 1976	19	46	P Pin	0	SPO
Nurnberg, 1984 Oxic	8	27	FIT	0	ANN

Water and Nutrient Outflow Module

Date: 3/8/2010 Scenario: Kathan Current
Average Annual Surface Total Phosphorus: 26.67mg/m^3
Annual Discharge: 3.43E+003 AF => 4.23E+006 m^3
Annual Outflow Loading: 237.9 LB => 107.9 kg

Date: 3/8/2010 Scenario: Kathan minus agriculture

Lake Id: Kathan2
Watershed Id: 0

Hydrologic and Morphometric Data

Tributary Drainage Area: 3270.3 acre
Total Unit Runoff: 12.2 in.
Annual Runoff Volume: 3324.8 acre-ft
Lake Surface Area <As>: 215 acre
Lake Volume <V>: 1073.6 acre-ft
Lake Mean Depth <z>: 5.0 ft
Precipitation - Evaporation: 5.8 in.
Hydraulic Loading: 3428.7 acre-ft/year
Areal Water Load <qs>: 15.9 ft/year
Lake Flushing Rate <p>: 3.19 1/year
Water Residence Time: 0.31 year
Observed spring overturn total phosphorus (SPO): 41 mg/m^3
Observed growing season mean phosphorus (GSM): 26.67 mg/m^3
% NPS Change: 0%
% PS Change: 0%

NON-POINT SOURCE DATA

Land Use	Acre	Low	Most Likely	High	Loading %	Low	Most Likely	High
	(ac)	Loading (kg/ha-year)				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	160.9	0.10	0.30	0.50	11.9	7	20	33
HD Urban (1/8 Ac)	0.0	1.00	1.50	2.00	0.0	0	0	0
MD Urban (1/4 Ac)	0.0	0.30	0.50	0.80	0.0	0	0	0
Rural Res (>1 Ac)	0.0	0.05	0.10	0.25	0.0	0	0	0
Wetlands	1241.4	0.10	0.10	0.10	30.6	50	50	50
Forest	1868	0.05	0.09	0.18	41.5	38	68	136
Lake Surface	215.0	0.10	0.30	1.00	15.9	9	26	87

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)	227.6	361.4	674.4	100.0
Total Loading (kg)	103.3	163.9	305.9	100.0
Areal Loading (lb/ac-year)	1.06	1.68	3.14	0.0
Areal Loading (mg/m^2-year)	118.67	188.39	351.56	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)	208.4	303.8	482.5	100.0
Total NPS Loading (kg)	94.6	137.8	218.9	100.0

Phosphorus Prediction and Uncertainty Analysis Module

Date: 3/8/2010 Scenario: Kathan minus agriculture
Observed spring overturn total phosphorus (SPO): 41.0 mg/m^3
Observed growing season mean phosphorus (GSM): 26.7 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	17	28	52	1	4
Canfield-Bachmann, 1981 Natural Lake	18	27	45	0	0
Canfield-Bachmann, 1981 Artificial Lake	17	24	38	-3	-11
Rechow, 1979 General	7	11	20	-16	-60
Rechow, 1977 Anoxic	21	33	61	6	22
Rechow, 1977 water load<50m/year	15	24	45	-3	-11
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	16	26	49	-15	-37
Vollenweider, 1982 Combined OECD	15	22	36	-12	-35
Dillon-Rigler-Kirchner	7	11	21	-30	-73
Vollenweider, 1982 Shallow Lake/Res.	11	17	30	-17	-50
Larsen-Mercier, 1976	16	25	46	-16	-39
Nurnberg, 1984 Oxic	8	13	25	-14	-52

Lake Phosphorus Model	Confidence Lower Bound	Confidence Upper Bound	Parameter Fit?	Back Calculation (kg/year)	Model Type
Walker, 1987 Reservoir	18	46	FIT	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	7	18	FIT	0	GSM
Rechow, 1977 Anoxic	22	53	FIT	0	GSM
Rechow, 1977 water load<50m/year	15	40	FIT	0	GSM
Rechow, 1977 water load>50m/year	N/A	N/A	N/A	N/A	N/A
Walker, 1977 General	14	47	FIT	0	SPO
Vollenweider, 1982 Combined OECD	12	39	FIT	0	ANN
Dillon-Rigler-Kirchner	7	18	FIT	0	SPO
Vollenweider, 1982 Shallow Lake/Res.	9	31	FIT	0	ANN
Larsen-Mercier, 1976	17	40	P Pin	0	SPO
Nurnberg, 1984 Oxic	7	23	FIT	0	ANN

E

APPENDIX E

2007-2009 Aquatic Plant Survey Data

Point Number	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock	Rope (R); Pole (P); Visual (V)	Notes	Myriophyllum spicatum	Potamogeton crispus	Najas flexilis	Elodea canadensis	Brasenia schreberi	Ceratophyllum demersum	Nitella sp.	Utricularia minor	Potamogeton pusillus	Nymphaea odorata	Utricularia vulgaris	Vallisneria americana	Potamogeton zosteriformis	Potamogeton strictifolius	Potamogeton epihydrus	Nuphar variegata	Chara sp.	Equisetum fluviatile	Potamogeton amplifolius	Isoetes echinospora	Eleocharis palustris	Thick (Emergent) Floating Sparg ??	Elatine minima	Myriophyllum sibiricum	Thin Floating Sparganium sp.	Potamogeton spirillus	Littorella uniflora	Juncus pelocarpus	Potamogeton gramineus	Utricularia geminiscapa	Eriocaulon aquaticum	Typha latifolia	Potamogeton richardsonii	Sagittaria latifolia	Utricularia intermedia	UNK TL Pondweed ??	Sparganium sp.	Med Floating Sparg. ??
1				nonnavigable (plants)					v					v																											
2	7	m	p						v	1				2			v																					1		
3	4	m	p						2	1		1		2																										
4				nonnavigable (plants)					v					v																											
5				nonnavigable (plants)					v					v																										v		
6	2	m	p					1		3		1		3			1									v														
7	9	m	p																																					
8	9	m	p																																					
9	4	m	p						2	1		1		2	1																									
10				nonnavigable (plants)										v																									v		
11				nonnavigable (plants)										v																											
12	9	m	p																																				
13	8	m	p																																				
14	6	m	p							2		1					3																						
15				nonnavigable (plants)					v					v																											
16				nonnavigable (plants)					v					v																											
17				nonnavigable (plants)					v					v																											
18				nonnavigable (plants)																		v																		
19				nonnavigable (plants)																		v																		
20	1	m	p						1						1										1										v				
21	1	s	p						1												1	2													1				
22	2	m	p						2						1							1	1		2														
23	4	m	p					1	2	1				2	1														1										
24	4	m	p					2	2	2											1		1						1										
25	2	m	p					3	2	2			1	v									1			1													
26	2	m	p					1	v	1		1		1	1						1	2	1					1											
27	5	m	p		1			1		3				v																									
28	4	m	p					1	2	2				2	1	1	1																							
29	6	m	p		1			1						v		2																							
30	6	m	p		2			1																															
31	7	m	p		2		1																															
32	5	m	p		1			2	2	2					1	2																							
33				nonnavigable (plants)																		v																v		
34	1	m	p				1		1											v		1			1													
35	9	m	p																																				
36	9	m	p																																				
37	8	m	p				1				1																											
38	6	m	p		1		1				1								1																			
39	3	m	p				1		1							1				2	1				v				1									
40				nonnavigable (plants)										v																										
41				nonnavigable (plants)																																				
42	6	m	p		2			1		1			1		1																								
43	6	m	p		2		1			1		1	1																										
44	7	m	p		2				1																														
45	7	m	p		2		1	1																														
46	7	m	p		v		2						1															1										
47	8	m	p				2	1																														
48	8	m	p				2				1																											
49	8	m	p				1																															
50	9	m	p																																			
51	11	m	p																																			
52	11	m	p																																			
53	9	m	p				1				1		1																									
54	8	m	p				1				1																											
55	6	m	p		2												1																					
56	2	m	p		1			1		1			1	1	2								v			2			1										v
57				nonnavigable (plants)					v					v																										
58	4	m	p		1			2	2	1		1					1																					
59	5	m	p		2			2				1	1		2		1		2																			
60	6	m	p		2								2								1																	
61	7	m	p		1		2						2																									
62	7	m	p		1		1	1																														
63	7	m	p				2												2																			
64	8	m	p				1																															
65	9	m	p				2																															
66	9	m	p				2																															
67	10	m	p				1																															
68	11	m	p																																			
69	10	m	p																																			
70	10	m	p																																			
71	7	m	p				2				1																											
72	6	m	p														2																				2		
73	1	s	p						v											v		v		v	1	v	1				1							
74				nonnavigable (plants, shallow)					v																															
75	3	m	p				1		2	1		1		1													1				1					1			
76	2	m	p					1	2	2		1	1		1												1				1							
77	2	s	p					1	2	1	1			v	2	1									1													
78	2	s	p				1											1						1	1	v	1				1							
79	7	m	p				2				1	1	1																									
80	8	m	p		1		2																															
81	8	m	p				1																															
82	9	m	p				1																															

Point Number	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock	Rope (R); Pole (P); Visual (V)	Notes	Myriophyllum spicatum	Potamogeton crispus	Najas flexilis	Elodea canadensis	Brasenia schreberi	Ceratophyllum demersum	Nitella sp.	Utricularia minor	Potamogeton pusillus	Nymphaea odorata	Utricularia vulgaris	Vallisneria americana	Potamogeton zosteriformis	Potamogeton strictifolius	Potamogeton epihydrus	Nuphar variegata	Chara sp.	Equisetum fluviatile	Potamogeton amplifolius	Isoetes echinospora	Eleocharis palustris	Thick (Emergent) Floating Sparg ??	Elatine minima	Myriophyllum sibiricum	Thin Floating Sparganium sp.	Potamogeton spirillus	Littorella uniflora	Juncus pelocarpus	Potamogeton gramineus	Utricularia geminiscapa	Eriocaulon aquaticum	Typha latifolia	Potamogeton richardsonii	Sagittaria latifolia	Utricularia intermedia	UNK TL Pondweed ??	Sparganium sp.	Med Floating Sparg. ??
83	8	m	p																																						
84	8	m	p																																						
85	9	m	p																																						
86	9	m	p																																						
87	9	m	p				1																																	
88	8	m	p				1																																	
89	7	m	p		2						1																														
90	4	m	p		v		1	1	2	1					2		1		1	1								1													
91	3	m	p				1	1	2	1	1	1		1	2								1						1				1								
92				nonnavigable (plants)					v																																	
93				nonnavigable (plants)					v					v						v																						
94	6	m	p				1	1			1							2																							
95	9	m	p																																						
96	8	m	p				2																																	
97	8	m	p								1																														
98	8	m	p				2				1																														
99	8	m	p				1				1								1																						
100	8	m	p				1				1																														
101	8	m	p		v						1		1						v																						
102	8	m	p				1		1		1																														
103	5	m	p				1									1	1									2														
104				nonnavigable (plants, shallow)					v																																	
105	1	s	p						2			1		v	1					v		1		v	v	v	v														
106	1	s	p		1		1		1							v			v					1								1		v						
107	8	r	p		1																										1									
108	5	m	p		2			1									1	1	1																					
109	2	m	p		1			1								1					2		1	1										1						
110	9	m	p																																						
111	9	m	p																																						
112	8	m	p				1				1																														
113	5	s	p				2	1								1																								
114	1	s	p													1								1									2								
115				nonnavigable (shallow, plants)					v					v						v																					
116				nonnavigable (shallow, plants)																																						
117	2	r	p						1							1								1				1												
118	1	m	p				1									1								1				1			1	1								
119	8	m	p				2	1			1	1																	1		1									
120	8	m	p				1				1																		1											
121	6	m	p		1		1	1		1	1				2		1		2	1								1		1			1							
122	12	s	p																																						
123	11	m	p																																						
124	6	s	p				2												1																					
125				nonnavigable (shallow, plants)										v						v																					
126	2	m	p		1			1	2			1									2	v																		
127	6	m	p		2			2				2	2					1																						
128	6	m	p		v										1			1																						
129	3	s	p		2			2			1					2							2																	
130	4	s	p		2		1	1								2	1						2																	
131	8	m	p				2				1																													
132	9	m	p				1	1					1																		1									
133	8	s	p				2														1																			
134	1	s	p																			v		1								v							
135	2	s	p													1							2	1			1													
136	7	m	p		1		1	1			1	1	1						1																					
137	5	s	p		1			2			1					2	1	1																						
138	7	m	p		1		2																																	
139	8	m	p					1																																
140	8	m	p		1		1				1	1	1																											
141				shallow																																					
142				terrestrial																																					
143	5	s	p		2			1						v																									
144	7	m	p		2								1					2																						
145	6	m	p		2		1	1		1		1						1																						
146	7	m	p		1		1																																	
147	7	m	p								1																													
148	7	m	p				1				1		1				v																						
149	4	r	p					1								1					2																			
150	2	s	p				1	1								1		1												1			1							
151	6	s	p		2		1	1			1																													
152	7	m	p		1		2																																	
153	8	m	p				1																																	
154	5	r	p		v		1	1																																
155	2	s	p													1		1	1								1				1									
156	3	m	p		2			1								2				v																				
157	7	m	p		2		1				1	1	1					1																						
158	7	m	p								1																													
159	7	m	p		1		1						1																											
160	1	s	p																					v	1		1				1	1							
161	3	m	p		1				1	1		2		1	1																									
162				nonnavigable (shallow, plants)										v						v																					
163	3	m	p		1			2	2						1	2	2																		1					
164	6	m	p		2		1	1					1					2																						

Point Number	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock	Rope (R); Pole (P); Visual (V)	Notes	Myriophyllum spicatum	Potamogeton crispus	Najas flexilis	Elodea canadensis	Brasenia schreberi	Ceratophyllum demersum	Nitella sp.	Utricularia minor	Potamogeton pusillus	Nymphaea odorata	Utricularia vulgaris	Vallisneria americana	Potamogeton zosteriformis	Potamogeton strictifolius	Potamogeton epihydrus	Nuphar variegata	Chara sp.	Equisetum fluviatile	Potamogeton amplifolius	Isoetes echinospora	Eleocharis palustris	Thick (Emergent) Floating Sparg ??	Elatine minima	Myriophyllum sibiricum	Thin Floating Sparganium sp.	Potamogeton spirillus	Littorella uniflora	Juncus pelocarpus	Potamogeton gramineus	Utricularia geminiscapa	Eriocaulon aquaticum	Typha latifolia	Potamogeton richardsonii	Sagittaria latifolia	Utricularia intermedia	UNK TL Pondweed ??	Sparganium sp.	Med Floating Sparg. ??
165	7	m	p								1																														
166	7	m	p																																						
167	6	m	p		1			1		1			1																												
168	5	m	p		2			2		1					2				1																						
169	5	m	p					2		3		1																													
170				nonnavigable (shallow, plants)					v					v						v																						
171				nonnavigable (shallow, plants)																	v																					
172	6	m	p		1					1	1							1																							
173	6	m	p				1	1		1	1		1																												
174	7	m	p		2																																			
175	6	m	p		2			1			1		1				1																							
176	6	m	p		1			1			1							1	1		1																			
177	5	m	p		1			3					1		1																										
178				nonnavigable (shallow, plants)					v					v						v																						
179	3	m	p		1			1	2					3	1	1											1														
180	6	m	p		1			1		1			2				1	1																							
181	6	m	p		1													1																							
182	5	m	p		2		1	1					1				1																								
183	5	m	p		2			1							1	2		1		1																					
184	5	m	p		2			2									1		v	1																					
185	4	m	p					3	v			1			2				2		1																				
186	4	m	p					1		1					1											2															
187	5	m	p		1			1							1		2																								
188	5	m	p		2		1							v					1																						
189	4	m	p		2		1	1				1	1			1			1																						
190	4	m	p		2			1		1							1																								
191	5	m	p		2			1	2	1							1	1																							
192	3	m	p					2	1	1		1			1					1	1							1													
193	3	m	p		1			2	2	2		2																												
194	3	m	p		1			1	2			1					1										1														
195	3	m	p		1			1	2	1		1		1				1																							
196	2	m	p					1	1	2							1					2																			
197	3	m	p		1				2	1		1				2						1																			
198	2	s	p													1																1									
199				nonnavigable (shallow, plants)					v					v						v																						
200				nonnavigable (shallow, plants)					v					v						v																						
201				nonnavigable (shallow, plants)					v					v						v																						
202				nonnavigable (shallow, plants)					v					v						v																						
203				nonnavigable (shallow, plants)					v					v						v																						

Point Number	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock	Rope (R); Pole (P); Visual (V)	Notes	Myriophyllum spicatum	Potamogeton crispus	Elodea canadensis	Brasenia schreberi	Utricularia vulgaris	Potamogeton zosteriformis	Potamogeton pusillus	Nymphaea odorata	Vallisneria americana	Ceratophyllum demersum	Nitella sp.	Najas flexilis	Utricularia geminiscapa	Chara sp.	Ceratophyllum echinatum	Potamogeton epihydrus	Potamogeton strictifolius	Potamogeton amplifolius	Equisetum fluviatile	Isoetes echinospora	Utricularia intermedia	Eleocharis acicularis	Utricularia minor	Eleocharis palustris	thick floating-leaved Sparganium sp.	Juncus pelocarpus	Elatine minima	thin floating leaved Sparganium sp.	Nuphar variegata	Potamogeton spirillus	Potamogeton gramineus	Potamogeton richardsonii	Emergent Sparganium sp.	Dulichium arundinaceum	Lemna minor	Sagittaria sp.	Scirpus sp.	Eleocharis erythropoda	Carex sp.	Eriocaulon aquaticum	Schoenoplectus subterminalis	Typha latifolia
1				NONNAVIGABLE (PLANTS)								V																																			
2	4	M	P				1	2		1		2		2			1										1																				
3	1	M	P					1				V					1								2	1	1													V							
4				NONNAVIGABLE (PLANTS)																																												
5				NONNAVIGABLE (PLANTS)				V				V																																				
6	5	M	P				1		1	1		2		1											1																						
7	9	M	P																																												
8	9	M	P																																											
9	3	M	P		1			3	1			2		1											1																					
10				NONNAVIGABLE (PLANTS)				V				V																																				
11				NONNAVIGABLE (PLANTS)																																												
12	8	M	P				1																																							
13	8	M	P																																											
14	6	M	P						1	2				3			1								1																					
15				NONNAVIGABLE (PLANTS)								V																																				
16	2	M	P				1	2				3					1				1					3	2												V							
17				NONNAVIGABLE (PLANTS)				V				V																																				
18	3	M	P		1		1	2						2			1					1			1																				
19	3	M	P				2		1	1		3		2																						V										
20	1	S	P					2	2				1		1		1	1					V			1		1		1			1												
21				NONNAVIGABLE (PLANTS)																																											
22	5	M	P		1		1	2	2				1									1																							
23	4	M	P		1		2	2	1					2																			1												
24	4	M	P				2		1	1				2				2				1																							
25	2	M	P				1	2	2		1	2					1	1	1		1				V		1		1			1			1									
26	2	S	P				1	1										1				1	3																					
27	5	M	P		2		1							2				2																											
28	4	M	P		2		2	2			1		2	2															1															
29	7	M	P		2		1																																					
30	6	M	P		3																																							
31	6	M	P		3							V																								V								
32	6	M	P		2		2							1																														
33	1	S	P		1			1															1																					
34	1	S	P					V			1												1	1							1													
35	8	M	P																																										
36	9	M	P																																									
37	8	M	P								1		1																															
38	7	M	P		2					1																																	
39	3	M	P		1		2	2	1	1			1					1						V					2														
40				NONNAVIGABLE (PLANTS)				V				V																																			
41	1	S	P		1		1	2	1		1						1	1					3		1		1																
42	6	M	P		2		2			1	1			1																														
43	6	M	P		3		1			1																																	
44	7	M	P		3																																						
45	7	M	P		2		1				1																																
46	7	M	P		2					1																																	
47	8	M	P							1	1					1																												
48	8	M	P		1																																						
49	9	M	P				1								1																												
50	9	M	P																																								
51	11	M	P																																								
52	11	M	P																																								
53	9	M	P																																								
54	8	M	P				1			1	1				1																												
55	6	M	P		2					1																											2							
56	3	M	P		1		2	2		1		V		1			1					2						1															
57				NONNAVIGABLE (PLANTS)				V				V																																			
58	4	M	P		1		1	1			1	3		2	1		1										1																
59	6	M	P		2		1					V		1							1																							
60	7	M	P		1		1		2		1																																	
61	7	M	P		2					1	1				1	1	1																											
62	7	M	P		2					1																																	
63	7	M	P		1															1																							
64	8	M	P		1		1				1																																
65	8	M	P												1																												
66	9	M	P								1					1					1														1								
67	9	M	P																																								
68	10	M	P																																								
69	10	M	P																																								
70	9	M	P																																								
71	8	M	P																																								
72	6	M	P		2		1			1				1																													
73	1	S	P				1	1				V							1				1	1				2			1										V		
74				NONNAVIGABLE (PLANTS)				V				V																																		
75				NONNAVIGABLE (PLANTS)				V				V																																		
76	3	M	P				1	1	2			V		2														1	1	1			1											
77	1	S	P					2				V											V					2								V			V				
78	1	S	P																																							1		
79	8	M	P								1				1																												
80	8	M	P								2																																
81	9	M	P																																							
82	9	M	P												1																												
83	8	M	P				1			2					1																												
84	9	M	P												1	1																												
85	9	M	P												1																												
86	9	M	P																	1																							
87	9	M	P								1					1																												
88	8	M	P								1				1																												
89	7	M	P		2		1			2																																	
90	4	M	P				2	2	2						1				1																									
91	2	M	P				1	2	1			2		1	1		1																											

Point Number	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock	Rope (R); Pole (P); Visual (V)	Notes	Myriophyllum spicatum	Potamogeton crispus	Elodea canadensis	Brasenia schreberi	Utricularia vulgaris	Potamogeton zosteriformis	Potamogeton pusillus	Nymphaea odorata	Vallisneria americana	Ceratophyllum demersum	Nitella sp.	Najas flexilis	Utricularia geminiscapa	Chara sp.	Ceratophyllum echinatum	Potamogeton epihydrus	Potamogeton strictifolius	Potamogeton amplifolius	Equisetum fluviatile	Isoetes echinospora	Utricularia intermedia	Eleocharis acicularis	Utricularia minor	Eleocharis palustris	thick floating-leaved Sparganium sp.	Juncus pelocarpus	Elatine minima	thin floating leaved Sparganium sp.	Nuphar variegata	Potamogeton spirillus	Potamogeton gramineus	Potamogeton richardsonii	Emergent Sparganium sp.	Dulichium arundinaceum	Lemna minor	Sagittaria sp.	Scirpus sp.	Eleocharis erythropoda	Carex sp.	Eriocaulon aquaticum	Schoenoplectus subterminalis	Typha latifolia
92	2	M	P		1			1	1			2					1																					V									
93				NONNAVIGABLE (PLANTS)				V				V																																				
94	7	M	P		1		1		2											1		2																									
95	9	M	P																																											
96	9	M	P		1		1				2				1																														
97	8	M	P												1																														
98	8	M	P						1		2				1																				1										
99	8	M	P				1				2			1	1																				1										
100	8	M	P													1				1																									
101	8	M	P												1	1																													
102	8	M	P												1	1																													
103	5	M	P							1			1			1																													
104				NONNAVIGABLE (PLANTS)				V				V																																			
105	1	S	P		1		1	2					1	1	1		1	1								1		V			1						1		V						
106	1	S	P		2		1	2		1		2	1							1														1										
107	10	M	P																																										
108	5	S	P		3		1															2																						
109	2	S	P		1		1						1																						1									
110	9	M	P													1																													
111	9	M	P																																										
112	8	M	P						2						1	1																													
113	5	S	P				1						1								1	1																						
114	2	S	P										1										1							1															
115				NONNAVIGABLE (PLANTS)				V				V																																			
116				NONNAVIGABLE (PLANTS)				V				V																																			
117	2	S	P				1	2	1																		1																	
118	2	S	P		1								1			1												V						1										
119	8	M	P												1	1																													
120	8	M	P													1																													
121	5	M	P		2		2	2	1	1			2																															
122	12	S	P																																										
123	11	M	P																																										
124	8	S	P												1																														
125				NONNAVIGABLE (PLANTS)				V				V											V						V																	
126	1	S	P					1				V					1						1						1																
127	6	M	P		2		2																																					
128	6	M	P		2					2																																		
129	3	S	P		2		2						2				1					1																						
130	4	S	P		3		1						2									1																						
131	8	M	P		V											1																													
132	9	M	P																																										
133	6	S	P		1											1		1				1																						
134	1	S	P																				1	1							1													
135	3	R	P					1																																				
136	6	M	P		2		2		2	2	1				1																													
137	5	M	P		2		2					2			2																													
138	7	M	P		2		1			2						1																													
139	7	M	P		2				1											1																									
140	8	M	P								1																																		
141	1	S	P																					1				1		1														
142	1	S	P																				1			2														V	1	1			
143	5	M	P		3			1																													1								
144	6	M	P		1		2				1	V																																	
145	6	S	P		2		1						1																															
146	7	M	P		2		1														1																							
147	7	M	P		1											1				2																									
148	7	M	P		V											1																													
149	4	S	P		1		2	2					1					1																											
150	5	R	P		1								2									2																							
151	5	M	P		2		1						2	1																						V		1							
152	8	M	P		V																																								
153	7	M	P													1																													
154	7	M	P		2																																							
155	3	S	P		1								1					1						1		1																		
156	4	S	P		2		2						2									V													1									
157	6	M	P		2		1																																					
158	7	M	P							2																																		
159	7	M	P		V					2	1				1						1																							
160	1	S	P																					2		1									V	V	V							
161	3	M	P		V		1	2	V			3					1		1						1		1																
162				NONNAVIGABLE (PLANTS)				V				V																																		V
163	4	M	P		1		2	2	2	1			1	1																													
164	6	M	P		2		1			1																																		
165	7	M	P		1		2													2																								
166	7	M	P		1		1			V																																		
167	6	M	P		1		2			1	1				1	1		2			1																							
168	4	M	P		2		2			1			V	1	1				1	1																								
169	5	M	P				2							2			1																												
170				NONNAVIGABLE (PLANTS)				V				V																																		
171	1	S	P		1																		3	V						V													
172	6	M	P		2		2		1												2																							
173	6	M	P				2																																				
174	6	M	P		1		1		2						1	1																												
175	6	M	P		2		1						1	1																													
176	4	M	P		1		2				1								1																									
177	5	M	P		1		2																																				
178	2	M	P		1		2	3		V	1	2		1			1		1									V												V		
179	3	M	P		1		2	2		1		2	1						1																									
180	6	M	P		1		1				1			1																														
181	6	M	P		V									1		1					1																								
182	5	S	P		2					1				2																														

Point Number	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock	Rope (R); Pole (P); Visual (V)	Notes	Myriophyllum spicatum	Potamogeton crispus	Elodea canadensis	Brasenia schreberi	Utricularia vulgaris	Potamogeton zosteriformis	Potamogeton pusillus	Nymphaea odorata	Vallisneria americana	Ceratophyllum demersum	Nitella sp.	Najas flexilis	Utricularia geminiscapa	Chara sp.	Ceratophyllum echinatum	Potamogeton epihydrus	Potamogeton strictifolius	Potamogeton amplifolius	Equisetum fluviatile	Isoetes echinospora	Utricularia intermedia	Eleocharis acicularis	Utricularia minor	Eleocharis palustris	thick floating-leaved Sparganium sp.	Juncus pelocarpus	Elatine minima	thin floating leaved Sparganium sp.	Nuphar variegata	Potamogeton spirillus	Potamogeton gramineus	Potamogeton richardsonii	Emergent Sparganium sp.	Dulichium arundinaceum	Lemna minor	Sagittaria sp.	Scirpus sp.	Eleocharis erythropoda	Carex sp.	Eriocaulon aquaticum	Schoenoplectus subterminalis	Typha latifolia
183	5	M	P		2		1		2			V	2			1																														
184	5	M	P		2		2		2			V								2	1																									
185	4	M	P		V		3	V				V																																		
186	4	M	P		2		2	2	1	2			2	1					1										1																
187	5	M	P		2		1		1	1										1																									
188	5	M	P		2		1		2		1			1					1	1	1																							
189	4	M	P		2		2		1				1				1			1																									
190	4	M	P		2		2			1																																		
191	4	M	P		1						1		2		1			1		2																									
192	3	M	P		1		2	2	2	1		2					1	2	2														1	1									
193	3	S	P		1		1	2	1								1		1	1																							
194	4	S	P		1		1	2	2			2																					1										
195	3	M	P		1		2	2	1							1	1					1											1										
196	1	S	P				1	V											1				3														1						
197	3	M	P		1		2	2	2	1			1																															
198	1	S	P										1						1					1		1				1				V									
199				NONNAVIGABLE (PLANTS)								V																																	
200	3	S	P		1			2	1								2		1																									
201	3	M	P		1		2	2	2		1	2					2	1							1																		
202				NONNAVIGABLE (PLANTS)				V				V																																	
203				NONNAVIGABLE (PLANTS)				V				V																																	

Point Number	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	Notes	Myriophyllum spicatum	Potamogeton crispus	Elodea canadensis	Nitella sp.	Brasenia schreberi	Najas flexilis	Ceratophyllum demersum	Potamogeton zosteriformis	Nymphaea odorata	Potamogeton pusillus	Potamogeton strictifolius	Chara sp.	Potamogeton epihydrus	Utricularia vulgaris	Utricularia geminiscapa	Vallisneria americana	Potamogeton amplifolius	Sparganium fluctuans	Equisetum fluviatile	Eleocharis palustris	Potamogeton vaseyi	Utricularia intermedia	Isoetes echinospora	Juncus pelocarpus	Potamogeton gramineus	Nuphar variegata	Potamogeton spirillus	Lemna minor	Potamogeton richardsonii	Elatine minima	Eleocharis acicularis	Dulichium arundinaceum	Schoenoplectus subterminalis	Eriocaulon aquaticum	Typha latifolia	Sparganium americanum	Utricularia minor
1				NONNAVIGABLE (PLANTS)					V				V																												
2	4	M	P						2		1		3	1			1	1								1																1
3				NONNAVIGABLE (PLANTS)					V				V																													
4				NONNAVIGABLE (PLANTS)					V				V																													
5				NONNAVIGABLE (PLANTS)					V				V																													
6	5	M	P				1		1		2	1	3		1			1																							
7	9	M	P																																						
8	10	M	P																																						
9	5	M	P				1		2		1		2		1			1																							
10				NONNAVIGABLE (PLANTS)									V																													
11				SHALLOW					V				V																													
12	8	M	P																																					
13	8	M	P																																					
14	5	M	P				1				2	1	3		1																									
15				NONNAVIGABLE (PLANTS)									V																													
16	1	M	P		1		1		2		1		2						1							1	1										V	1			1
17				SHALLOW					V				V																													
18	2	M	P				1		2		2				1				1								V				1										1
19	2	S	P				1		2		1	1	1					1	1								1				V									1
20	1	S	P				1		2	1	1					1			1					1			V			1	1									1
21	1	S	P						1							1							V	2					V											1
22	3	S	P						1	1	1											V	V						1												
23	4	M	P		1		2		2		2	1		1	1			1				1							1												
24	4	M	P				1	1	1		2		2																												
25	3	M	P				1	1	1		1		2																												1
26	2	S	P				1		2		1		V			1		1	1				2																	1
27	6	M	P		2		1				2		V				1																							
28	4	M	P		1		2		2		2										2	V																		
29	6	M	P		2		1			1	1				1																									
30	6	M	P		2																																		
31	6	M	P		2		1		V		1	1																												
32	5	M	P		2		2		2		1										V																			
33	1	S	P				1						2									V	1	1		1						1						V		
34	1	S	P						1	1														V																
35	9	M	P					1		1				1	1																									
36	9	M	P					1		1																														
37	8	M	P		V		2	1		1				1	1																									
38	7	M	P		2																																		
39	2	S	P						V														1	2			V												
40				TERRESTRIAL																																					
41	0	M	P						1		1		V						V				2			V														V
42	6	M	P		1		2		V		2		V	1			1																							
43	6	M	P		2		2																																	
44	7	M	P		2							1					1																							
45	7	M	P		3									1																										
46	7	M	P		2																																		
47	8	M	P		V		2	1		1		1		1											1															
48	8	M	P		1		1	1		1				1											1															
49	9	M	P					1		1																														
50	9	M	P																																				
51	11	M	P		V																																		
52	11	M	P		V																																		
53	10	M	P							1																													
54	8	M	P		V		1	1																	1														
55	6	S	P		2		1					1									1																		
56	3	S	P		1		2		2		1									1	2	1																	
57	1	M	P				1		2				2					1	1																					1
58	4	M	P				1		2		2						1	1			1					1														1
59	6	M	P		2		2		V		1																													
60	6	M	P		1		1		1	1	1	1		1		1	1																							
61	7	M	P		1		1	2														V																	
62	7	M	P		2			1							1																									
63	8	M	P		V		2	1		1			1	1	1		1																							
64	8	M	P					2		1																							1							
65	8	M	P				1	2		1				1											1															
66	9	M	P		V			2		1																													
67	9	M	P					1		1										2																			
68	11	M	P																																				
69	10	M	P																																				
70	10	M	P		1			1																															
71	8	M	P		1			1		1																													
72	6	M	P		2		1				2	1																												
73	1	S	P		1				V	1													1	2			1				1								
74				NONNAVIGABLE (PLANTS)					V				V																												
75	3	M	P				1		2		1			1		1			1							V							1							1
76	3	M	P		1		1		2		2				1				1																					1

Point Number	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	Notes	Myriophyllum spicatum	Potamogeton crispus	Elodea canadensis	Nitella sp.	Brasenia schreberi	Najas flexilis	Ceratophyllum demersum	Potamogeton zosteriformis	Nymphaea odorata	Potamogeton pusillus	Potamogeton strictifolius	Chara sp.	Potamogeton epihydrus	Utricularia vulgaris	Utricularia geminiscapa	Vallisneria americana	Potamogeton amplifolius	Sparganium fluctuans	Equisetum fluviatile	Eleocharis palustris	Potamogeton vaseyi	Utricularia intermedia	Isoetes echinospora	Juncus pelocarpus	Potamogeton gramineus	Nuphar variegata	Potamogeton spirillus	Lemna minor	Potamogeton richardsonii	Elatine minima	Eleocharis acicularis	Dulichium arundinaceum	Schoenoplectus subterminalis	Eriocaulon aquaticum	Typha latifolia	Sparganium americanum	Utricularia minor
77	3	M	P		1		1		2		2							1																							
78	1	S	P																					1																	
79	8	M	P		V			1		1				1																											
80	8	M	P		V			1		1							2																							
81	9	M	P		V			1		1				1																										
82	9	M	P				1	2		1																														
83	8	M	P		V		1	2		1		1			1		1																							
84	9	M	P		V		2																																	
85	9	M	P					1		1																														
86	9	M	P					1		1				1																										
87	9	M	P		V			1		1															1															
88	8	M	P		V			1		1		2		1																										
89	7	M	P		2		1					1																												
90	4	M	P		1		2		2		1							1			1																			
91	3	S	P				1		2	1	1				1	1			1			1																		1
92	1	M	P				1		2		1		1	1		1		1	1			1																		1
93				NONNAVIGABLE (PLANTS)					V				V																												
94	5	M	P		2		1													1	3																		
95	9	M	P				2	1				1				1																								
96	9	M	P		V			1		1		1																												
97	9	M	P		2			1		1					1		2																							
98	8	M	P		V			1		1					1		2																							
99	8	M	P					2		1																														
100	9	M	P		V			2		1	1				1																									
101	8	M	P		V		1	1		1		2		1																										
102	8	M	P		V			2						1																										
103	7	M	P		V		1																																
104				SHALLOW					V				V																											
105				SHALLOW					V				V																								V			
106	1	S	P						1											V							V	V	V		V								
107	9	R	P					1		1																													
108	5	S	P		2		1		V			1									2																		
109	2	S	P		V											2																							
110	9	M	P					1				1																											
111	10	M	P					1																														
112	9	M	P					1		1				1																									
113	4	S	P				1			1					1					1	V																		
114	1	S	P																	V							V	1											
115				SHALLOW					V				V																											
116				SHALLOW					V				V																											
117	1	R	P																																	V			
118	2	S	P		1											1											1												
119	8	M	P					1		1		2		2																										
120	8	M	P		V			2							1		2																							
121	5	S	P		2		1		1		2	1																												
122	12	S	P																																				
123	12	M	P																																				
124	7	S	P							1						1									1						1									
125				NONNAVIGABLE (PLANTS)					V				V																												
126				NONNAVIGABLE (PLANTS)					V				V																												
127	6	S	P		1		2																													V			
128	6	S	P		2		1					1									2																		
129	4	S	P		2		1								1		1			1	1																		
130	4	S	P		2		1					1								1	2																		
131	8	M	P					2		1					1																								
132	9	M	P					1		1					1																								
133	6	S	P							1						1																							
134	1	S	P																				1	V			V	V									V		
135	2	R	P		V																		V																
136	7	M	P		2		2				2	2																												
137	3	R	P		2		1					1				1				1																			
138	8	M	P		1		1	2						1	1																								
139	7	M	P		V			1		1		2																												
140	8	M	P		1		2										1																							
141	1	S	P																					2															
142	1	S	P																								1	1						V	1				
143	5	S	P		2		1				1		V							1																			
144	7	S	P		2		1	2																															
145	5	S	P		2		1													1																			
146	7	M	P		2			1		1				1	1																								
147	7	M	P		V		1	2				1																											
148	7	M	P		2		2					2			1																								
149	4	R	P		2		1		V							1				1																			
150	3	R	P																	1							V							V					
151	6	M	P		2		1													1																			
152	7	M	P		2		2	1				1			1																								

Point Number	Depth (ft)	Sediment type (M=muck, S=Sand, R=Rock)	Rope (R); Pole (P); Visual (V)	Notes	Myriophyllum spicatum	Potamogeton crispus	Elodea canadensis	Nitella sp.	Brasenia schreberi	Najas flexilis	Ceratophyllum demersum	Potamogeton zosteriformis	Nymphaea odorata	Potamogeton pusillus	Potamogeton strictifolius	Chara sp.	Potamogeton epihydrus	Utricularia vulgaris	Utricularia geminiscapa	Vallisneria americana	Potamogeton amplifolius	Sparganium fluctuans	Equisetum fluviatile	Eleocharis palustris	Potamogeton vaseyi	Utricularia intermedia	Isoetes echinospora	Juncus pelocarpus	Potamogeton gramineus	Nuphar variegata	Potamogeton spirillus	Lemna minor	Potamogeton richardsonii	Elatine minima	Eleocharis acicularis	Dulichium arundinaceum	Schoenoplectus subterminalis	Eriocaulon aquaticum	Typha latifolia	Sparganium americanum	Utricularia minor
153	8	M	P				1	2				2	1		1																									
154	7	S	P		1		2	1										1																							
155	3	S	P													1				V			V				V						V							
156	4	S	P		2		1													1									2										
157	7	M	P		2		1	2				1			1																		1							
158	7	M	P		V			1		1							2																							
159	7	M	P		1			1				1		2																										
160				NONNAVIGABLE (PLANTS)					V				V																											
161				NONNAVIGABLE (PLANTS)					V				V																											
162				NONNAVIGABLE (PLANTS)					V				V																											
163	4	S	P		1		2		2		1							1	1			1																	
164	6	S	P		2		1					1																											
165	7	M	P		2		2	1						1																									
166	7	M	P		V			1		1		2																											
167	6	M	P		2		1							2	1	2																							
168	5	M	P		2		1		V		1	1				2																							
169	5	M	P		1		1				3	2					1																						
170				NONNAVIGABLE (PLANTS)					V				V																											
171	1	S	P																				1	2				V										
172	6	M	P		2		2					1						1																					
173	6	M	P		2		2																															
174	7	M	P		2		1	1		1				1	1	1																							
175	6	M	P		2		1																															
176	6	M	P		2		3							1																									
177	5	M	P		1		2																															
178				NONNAVIGABLE (PLANTS)					V				V																											
179	3	S	P				2		2	1	1	1	1					1		1																			1
180	6	M	P		2		1				2																												
181	6	M	P		2		1							1																									
182	5	M	P		2		1																															
183	5	M	P		2		1				1			1																									
184	5	M	P		2		1						V			1																							
185	4	M	P		1		1		2		1		1	1		2		1																					
186	4	M	P		1		1		2		2						1	1				1																	
187	5	M	P		2		1				1	1					1																						
188	4	M	P		2		1						V																									
189	3	M	P		2		2						V	1																									
190	4	M	P		2								V																									
191	3	M	P		1		2		1								1																					
192				NONNAVIGABLE (PLANTS)					V				V									V																	
193				NONNAVIGABLE (PLANTS)					V				V									V																	
194	5	M	P		1		1		2		1				1			1	1																				1
195	3	M	P		1		1		2		2				1			1																					
196				NONNAVIGABLE (PLANTS)																			V																	
197	3	M	P		1		1		1		1	1																						1					
198	2	S	P				1		V											V	V							V										
199				NONNAVIGABLE (PLANTS)					V				V									V																	
200				NONNAVIGABLE (PLANTS)					V				V									V																	
201				NONNAVIGABLE (PLANTS)					V				V									V																	
202				NONNAVIGABLE (PLANTS)					V				V									V																	
203				NONNAVIGABLE (PLANTS)					V				V									V																	