State of Wisconsin
Department of Natural Resources

Lake Management Grant Application

Form 8700-283 (R 12/11)

Notice: Use of this form is required by the DNR for any application filed pursuant to ch. NR 190 or 191, Wis. Adm. Code. Personal information (PI data) collected on this form, including such data as your name, address, phone number, etc., will be used for management and enforcement of DNR programs, and is not intended to be used for any other purpose. Information will be made accessible to requesters under Wisconsin's Open Records laws (s. 19.32-19.39, Wis. Stats.) and requirements.

Section I: Application Type

☒ **Lake Management Planning Grant**

Check one:

☒ Large-scale planning grant

☐ Small-scale planning grant

Check one:

☐ Lake education

☐ Organizational development

☐ Other study or assessment, or multiple-purpose project

☐ **Lake Management Protection Grant**

Check one:

☐ Wetland restoration

☐ Ordinance development

☐ Lake improvement

☐ Lake classification

☐ Land or easement acquisition

Legislative District Numbers	
Senate	Assembly
10	28

To determine your legislative district, go to http://165.189.139.210/WAML//
Type in complete address, next screen shows information.

Section II: Applicant Information

Applicant: Polk County Land and Water Resources Department

Lake Name: Lotus Lake | Size in Acres: 237.00

Project County/Township/Section/Range: Polk County/Town of Osceola/T33N, R18W, Sec 15/16/21/22

Type of Eligible Applicant

☒ County ☐ Tribe ☐ Other Governmental Unit
☐ City ☐ Sanitary District ☐ Non Profit Conservation Organization
☐ Village ☐ Lake District
☐ Town ☐ Lake Association ☐ School Districts (Planning)

Authorized Representative Named by Resolution	Project Contact Name
Tim Ritten	Katelin Holm and Jeremy Williamson
Authorized Representative Title	**Project Contact Title**
Director	I&E Coordinator/Water Quality Specialist/AIS Coordinator
Address	**Address**
100 Polk County Plaza--Ste 100	100 Polk County Plaza--Ste 120
City / State / ZIP Code	**City / State / ZIP Code**
Balsam Lake / / 54810	Balsam Lake / WI / 54810
Daytime Phone (area code) / Evening Phone (area code)	**Daytime Phone (area code) / Evening Phone (area code)**
(715) 485-8699 /	(715) 485-8699 /
E-mail Address	**E-Mail Address**
timr@co.polk.wi.us	katelin.holm@co.polk.wi.us

Mail Check to: (if different from applicant)

Name and Title	Address
Organization	City / State / ZIP Code

For DNR Use Only

Application Type	Date Received	Date Reviewed (LC)	Lake Coordinator Approval / Date
Waterbody ID#	Adequate Public Access ☐ Yes ☐ No	Environmental Grants Specialist Approval / Date	
Eligible Project ☐ Yes ☐ No	Eligible Applicant ☐ Yes ☐ No	Project Priority Rank	
Prior Grant Award(s) ☐ Yes ☐ No	Fiscal Year(s)	Amount Received To Date $	Project Awarded ☐ Yes ☐ No

Section III: Project Information

Project Title	Proposed Ending Date
Determining impacts of carp removal on Lotus lake water quality and biological indicators Phase 1	12/31/17

Other Management Units Around Lake	Letter of Support	Other Management Units Around Lake	Letter of Support
1. Lotus Lake Association	☒	4.	☐
2. Polk County Parks Department	☒	5.	☐
3. St. Croix Tribal Environmental Department	☒	6.	☐

Section IV: Lake Access

Number of Public Vehicle Trailer Parking Spaces Available at Public Access Sites: 3

Number of Public Access Sites on Lake Including Boat Launches and Walk-ins: 1

Section V: Cost Estimate and Grant Request

Section V must be completed or application will be returned. Details in support of Section V are welcome.	**Project Costs** Column 1 Cash Costs	Column 2 Donated Value	*DNR Use Only*
1. Salaries, wages and employee benefits	19,485.78	1,536.00	
2. Consulting services			
3. Purchased services--printing and mailing	525.00		
4. Other purchased services (specify):			
5. Plant material			
6. Supplies (specify) Preservative (cash), GPS (donated)	40.00	300.00	
7. Depreciation on equipment			
8. Hourly equipment use charges		1,800.00	
9. State Lab of Hygiene (SLOH) Costs	9,757.71		
10. Non-SLOH Lab Costs	1,440.00		
11. Land or easement acquisition value			
12. Associated acquisition costs			
13. Other (specify) mileage		633.60	
14. **Subtotals** (sum each column)	31,248.49	4,269.60	
15. **Total Project Cost Estimate** (sum of **column 1 plus** sum of **column 2**)	35,518.09		
16. **State Share Requested** (calculate based on State share listed below)	23,797.12		

Subject to the following maximum grant amounts:

- Large-scale lake planning projects--up to $25, 000 - 67% State share
- Small-scale lake planning projects--up to $3,000 - 67% State share
- Lake classification and regulation or ordinance development projects--up to $50,000 - 75% State share
- Lake protection projects (other than lake classification and regulation or ordinance development projects)--up to $200,000 - 75% State share

Use of Federal funding as match: (check box below if applicable)

☐ We are using or planning to apply for Federal funds to be used as match.

If known, indicate source of funding:

Section VI: Attachments (check all that are included)

A. For all applicants:

- [x] 1. Authorizing resolution
- [x] 2. Letters of support
- [x] 3. Map of project location and boundaries
- [x] 4. Lake map with public access sites identified (per Section IV of this application and page 33 of the guidelines)
- [x] 5. Itemized breakdown of expenses
- [x] 6. For projects that entail sending samples to the State Laboratory of Hygiene (SLOH) only: a completed SLOH Projected Cost Form
- [x] 7. Project scope/description:
  - [x] a. Description of project area
  - [x] b. Description of problem to be addressed by project
  - [x] c. Discussion of project goals and objectives
  - [x] d. Description of methods and activities
  - [x] e. Description of project products or deliverables
  - [x] f. Description of data to be collected, if applicable
  - [x] g. Description of existing and proposed partnerships
  - [x] h. Discussion of role of project in planning and/or management of lake
  - [x] i. Timetable for implementation of key activities
  - [x] j. Plan for sharing project results
  - [x] k. Other information in support of project not described above

B. For applicants that are Lake Management Organizations (LMOs) or Non-profit Conservation Organizations (NCOs):

- [ ] 1. For first time applicant LMOs only: A completed Form 8700-226 (Lake Association Organizational Application)
- [ ] 2. For first time applicant NCOs only: Copy of IRS 501(c)(3) determination letter and copies of your Articles of Incorporation and Bylaws
- [ ] 3. List of national and/or statewide organizations with which you are affiliated
- [ ] 4. List of board members' names, including municipality and county of residence. Designate officers
- [ ] 5. Documentation of current financial status
- [ ] 6. For land or easement acquisition projects: Detailed description of your organization's land management experience
- [ ] 7. Brochures, newsletters, annual reports or other information about your organization

C. Wetland Restoration Projects:

- [ ] 1. Deed, easement, or land control agreement
- [ ] 2. Preliminary engineering plans
- [ ] 3. Water regulatory permits
- [ ] 4. Map of project location and boundaries

D. Ordinance Development Projects:

- [ ] 1. Inventory of applicable existing ordinances
- [ ] 2. Description of resources each jurisdiction allocates to enforcement
- [ ] 3. Preliminary surveys

E. Lake Improvement Projects:

- [ ] 1. Engineering and design plans
- [ ] 2. Water regulatory permits
- [ ] 3. Map of project location and boundaries

Section VI: Attachments, continued

F. Land or easement acquisition projects:

- ☐ 1. DNR Form 1800-1 (Environmental Hazards Assessment Form)
- ☐ 2. Legal description of the property
- ☐ 3. Project location boundary map
- ☐ 4. Property or easement appraisal (if not previously submitted to the Department)
- ☐ 5. If escrow closing, the title insurance commitment
- ☐ 6. Evidence of compliance with Uniform Relocation Act requirements, if applicable
- ☐ 7. Agricultural Impact Statement, if applicable
- ☐ 8. Status of acquisition negotiations, including expected time frame for closing
- ☐ 9. A land management plan
  - ☐ a. Full description of property and conditions
  - ☐ b. Description of current and proposed uses of property and adjoining properties
  - ☐ c. Management requirements for property
  - ☐ d. If roads, piers or grading are proposed, a topographic survey with feature locations, and design cross sections

Section VII: Certification

I certify that information in this application and all its attachments are true and correct and in conformity with applicable Wis. Statutes.

Print/Type Name of Authorized Representative	Title of Authorized Representative
Tim Ritten	Director
Signature of Authorized Representative	Date Signed
Tim Ritten	7-30-13

Will be approved at August 20th County Board Meeting.
Approved copy will be emailed August 21st

Resolution No. _____
Resolution to Authorize Participation in Wisconsin Department of Natural Resources—
Lotus Lake Planning Grant Program, Phases 1 & 2.

TO THE HONORABLE MEMBERS OF THE POLK COUNTY BOARD OF SUPERVISORS:

Ladies and Gentlemen:

NOW THEREFORE BE IT RESOLVED that the Board of Supervisors of Polk County authorizes to request grant funding and assistance available from the Wisconsin Department of Natural Resources under the Lake Management Planning Grant Program for a two phase Lotus Lake Planning Grant.

NOW THEREFORE BE IT RESOLVED that the Board of Supervisors of Polk County hereby authorizes the Director of the Polk County Land and Water Resources Department to act as grant administrator on behalf of Polk County to:

- Submit an application to the State of Wisconsin for financial aid for lake planning purposes for Lotus Lake;
- Sign documents;
- Take necessary action to undertake, direct, and complete an approved lake planning grant; and
- Submit reimbursement claims along with necessary supporting documentation within six months of project completion date.

BE IT FURTHER RESOLVED that the Polk County Board of Supervisors affirms that Polk County will meet the obligations under the lake planning grant including timely publication of the results and meet the financial obligations under this grant including the prompt payment of our 33% commitment to the project costs.

Funding Amount and Source:	Not Applicable
Date Finance Committee Advised:	Not Applicable
Finance Committee Recommendation:	Not Applicable
Effective Date:	Upon Passage

Submitted and Sponsored By:	

Review by County Administrator:	Review By Corporation Counsel
☐ Recommended ☐ Not Recommended ☐ Reviewed Only _____ Dana Frey, County Administrator	☐ Approved as to Form ☐ Recommended ☐ Not Recommended ☐ Reviewed Only _____

	Jeffrey B. Fuge, Corporation Counsel

County Board Action
At its regular business meeting on August 20, 2013, the Polk County Board of Supervisors adopted the above-entitled resolution, Resolution No. ____-13: Resolution To Authorize Participation in Wisconsin Department of Natural Resources—Lotus Lake Planning Grant Program, Phases 1 & 2, by a simple majority vote of ___in favor and ___ against. _____ Dated:_____ William Johnson, IV, County Board Chairperson Attest:_____ Dated:_____ Carole Wondra, Polk County

July 23, 2013

Mr. Alex Smith
810 West Maple Street
Spooner, WI 54801

Dear Mr. Smith,

As President of the Lotus Lake Association, I would like to tell you of the excitement that our association has for the possible improvements that could be made to our water clarity and vegetation growth in our lake via the efforts that could be put forth with the approval of the application for the DNR grant. Some years back our lake was considered to be one of the best game fishing lakes in the area. Now the health of the lakes has been diminished most certainly by the large population of carp that has encroached Lotus, Horse and Cedar Lakes.

In the past 10 years an employee from LWRD has attended many of our association meetings to offer valuable information as to the current and deteriorating effects of lakeshore runoff, loss of the lake's vegetation and carp issues. Our lake association will put our efforts into continuing with the weekly secchi depth testing, purple loosestrife eradicating, financing the weekly testing of the beach water facilitated by the Polk County Health Department, continuing with our active participation in PCALR and offering inspections of boats entering our lake at the public boat landing. We will be instrumental in the planning of a shoreline restoration information meeting for those living on the lake and also will extend our invitation to those living in the outlying areas. In-kind assistance will be offered with lake level and precipitation monitoring, a sociological survey, shoreline inventory, generating interest in shoreline restoration, and participation in meetings to develop a lake management plan. We will support any and all requests made by LWRD and the DNR.

Please consider the approval of the LWRD's request for this DNR grant.

Thank you,

Cheryl Miller

Cheryl Miller, President
Lotus Lake Association, Inc.
863 207th Street
Dresser, WI 54009
715-755-2257
cherylmiller@centurytel.net

Parks, Forestry, Buildings & Solid Waste Department

100 Polk County Plaza, Ste 10, Balsam Lake, WI 54810
Phone (715) 485-9294 ***Fax (715) 485-9110***

Debbie Peterson, Department Director
Butch Korsan, Maintenance Technician
Tina Riley, Office Manager
Jeremy Koslowski, Forester/Parks Assistant
Mike Voltz, Recycling Center Foreman
Mike Schleusner, GAM Maintenance

Polk County, Wisconsin

July 22nd, 2013

Alex Smith
WDNR
810 W. Maple St.
Spooner, WI 54801

Dear Mr. Smith,

The Polk County Parks Department fully supports the Polk County Land and Water Resources Department in their application for a large scale Lake Planning Grant to determine the impacts of carp removal on water quality and biological indicators and to develop a Lake Management Plan for Lotus Lake.

Lotus Lake is an important resource used by the citizens of Polk County for recreation and enjoyment of natural beauty. The Parks Department maintains the Lotus Lake boat landing and County Park on the north side of the lake and the Stowers Seven Lake State Trail on the east and south sides of the lake.

The Polk County Parks Department is committed to the success of this study and will contribute $6,000 over the three year timeframe of this project. Additionally, outside of this grant application, the Parks Department will pay for total phosphorus and chlorophyll a sampling in both August and September 2013.

Sincerely,

Debbie Peterson

Debbie Peterson, Director
Parks, Buildings and Solid Waste

St. Croix Chippewa Indians of Wisconsin

24663 Angeline Avenue • Webster, WI 54893 • (715) 349-2195 • Fax (715) 349-5768

July 29, 2013

Alex Smith
Lakes Biologist
Barron, Polk, Rusk, Sawyer Counties
Bureau of Water Quality
Wisconsin Department of Natural Resources
810 W. Maple St.
Spooner, WI 54801

Dear Mr. Smith,

The St. Croix Tribal Environmental/Natural Resources Department has drafted this letter in support of the Polk County Land and Water Resources Department's proposal to complete monitoring and data collection with respect to water quality, macrophytes, and shoreline habitat on Lotus Lake (WBIC 2616900), Polk County.

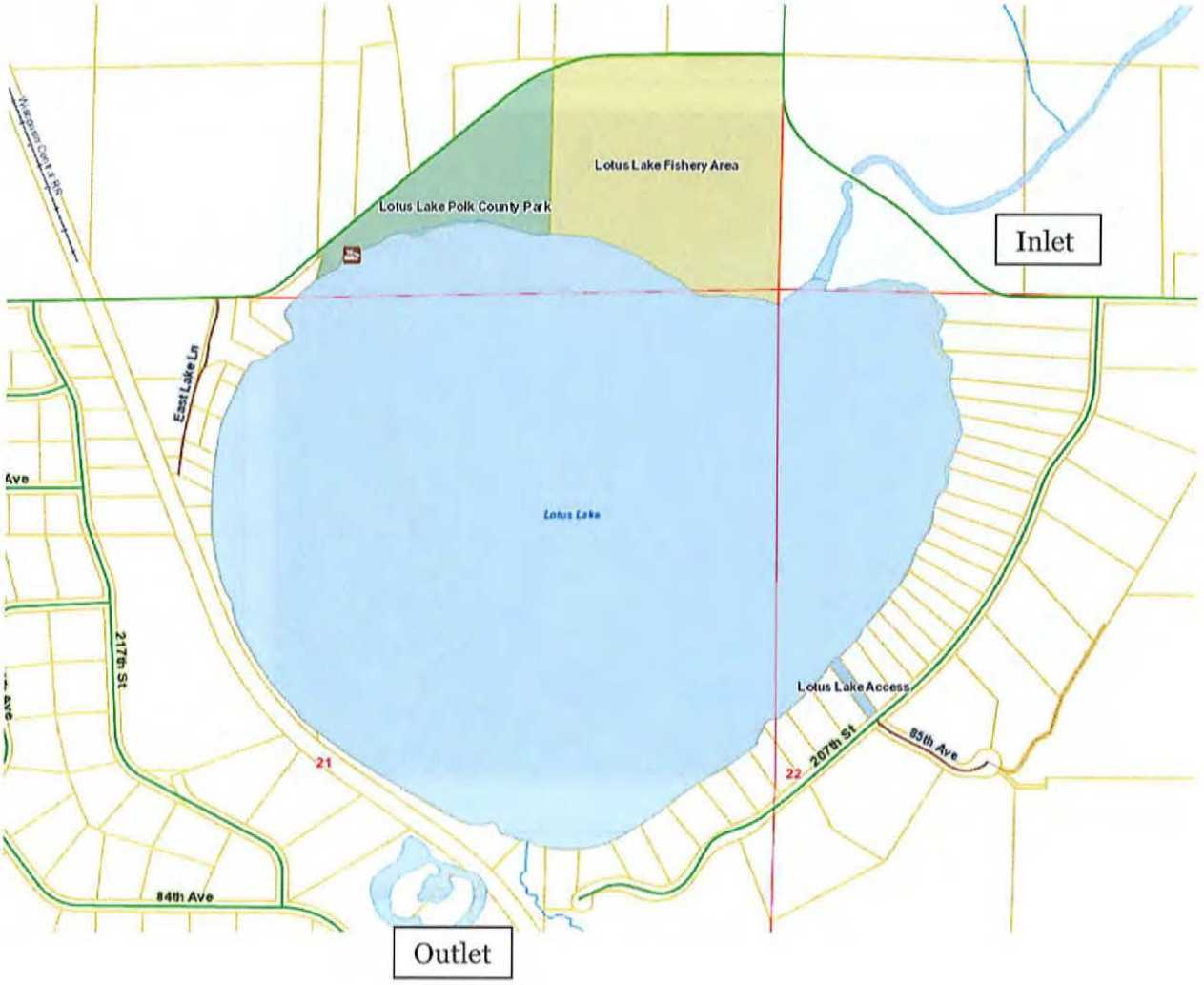
The St. Croix Tribal Environmental/Natural Resources Department has been consulting with the Polk County Land and Water Resources Department about a project such as this and is actively working with the Wisconsin Department of Natural Resources Barron Fisheries Staff on completing a population and biomass estimate on Lotus Lake for common carp. All three entities hope to complete a common carp removal in fall/winter of 2013/2014 with the goal of improving habitat and water quality.

Lotus Lake is a historically date regulated wild rice lake and anecdotal information points to Lotus Lake supporting robust wild rice stands in the past. The St. CRoix TRibal Environmental/Natural Resources Department would be very much interested in restoring Lotus Lake's water quality and wild rice resources.

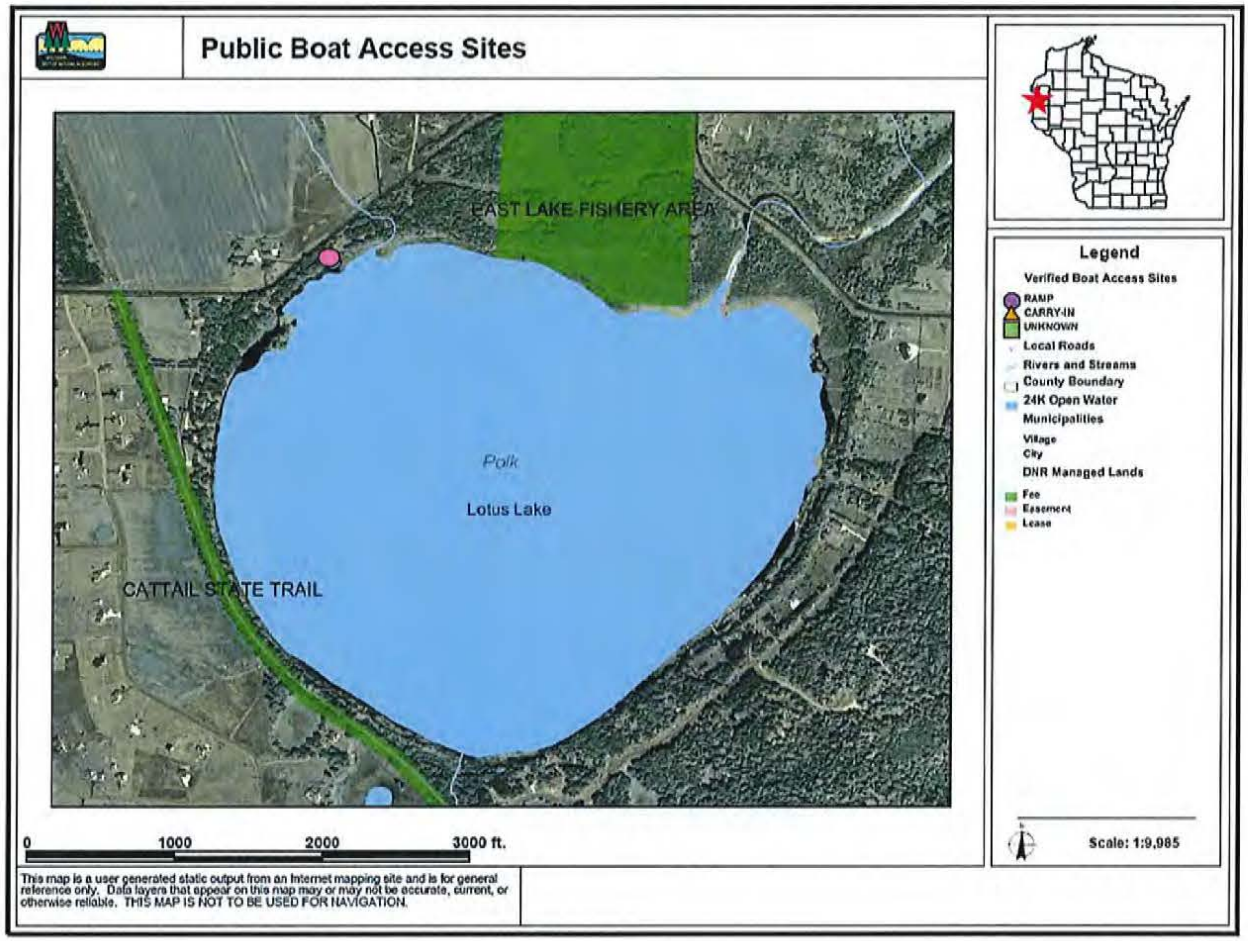
Sincerely,

Anthony Havranek
Land and Water Resources Manager
St. Croix Tribal Environmental Department

Map of Project Locations and Boundaries



Lake Map with Public Access Sites Identified



Itemized Breakdown of Expenses

Phase 1

Jeremy Williamson = $27.97, Katelin Holm = $31.37, average when time evenly divided = $29.67

Salaries, wages, and employee benefits, cash costs

	Samples	Years	Hours	Staff	Staff cost	Subtotal
Water quality sampling	12	3	8	2	$29.67	$17,089.92
Lake level monitoring		3	5	2	$29.67	$890.10
Sociological survey		1	48	1	$31.37	$ 1,505.76
						$19,485.78

Salaries, wages, and employee benefits, donated value

	Hours	Rate	Subtotal
Lake level monitoring	120	$12.00	$1,440.00
Review sociological survey	8	$12.00	$96.00
			$1,536.00

Purchased services

Shipping algae	$75.00
Shipping chemistry	$350.00
Sociological survey postage	$100.00
	$525.00

Supplies

Preservative	$40.00
GPS	$300.00
	$340.00

Hourly equipment use charges

	# trips	Cost	Subtotal
Boat rental DONATED	36	$50.00	$1,800.00

SLOH Lab Costs

	Years	Samples	Lab costs	Subtotal
Algae	3	3	$153.00	$1,377.00
Chemistry (in lake/trib)				$8,380.71
				$9,757.71

Non-SLOH lab costs

	Years	Samples	Lab costs	Subtotal
Zooplankton	3	3	$160.00	$1,440.00

Other mileage and fuel

Mileage sampling	$633.60

TOTAL	$35,518.09
67%	$23,797.12
33%	$ 11,720.97

Itemized Breakdown of Expenses

Phase 2

Jeremy Williamson = $27.97, Katelin Holm = $31.37, average when time evenly divided = $29.67

Salaries, wages, and employee benefits, cash costs

	Events	Years	Hours	Staff	Staff cost	Subtotal
Point intecept surveys/vouchers	2	3	45	2	$29.67	$16,021.80
Shoreline inventory/mapping		1	60	2	$29.67	$3,560.40
Shoreline rest wksp			15	2	$29.67	$890.10
Shoreline rest review/design (5)			50	2	$29.67	$2,967.00
Watershed deliniation Staff 1			40	1	$27.97	$1,118.80
Landuse scenario modeling Staff 1			40	1	$27.97	$1,118.80
Data analysis			40	2	$29.67	$2,373.60
Report generation Staff 1			50	1	$27.97	$1,398.50
Report generation Staff 2			120	1	$31.37	$3,764.40
LMP Development Mtgs			60	1	$29.67	$1,780.20
						$34,993.60

Salaries, wages, and employee benefits, donated value

	Hours	Rate	Subtotal
LMP Development Mtgs	60	$12	$720.00
Shoreline restoration	24	$12	$288.00
Shoreline inventory	24	$12	$288.00
			$1,296.00

Supplies

PI vouchers (paper, glue, etc)	$70.00

Hourly equipment use charges

	# trips	Cost	Subtotal
Boat rental DONATED	15	$50.00	$750.00

Other mileage and fuel

Mileage PI survey, inventory, mtg	$193.60

TOTAL	$37,303.20
67%	$24,993.14
33%	$ 12,310.06

LAKE/RIVER PLANNING GRANTS PROJECTED LAB COSTS First Year FY 2013

Lake Name: Lotus
Waterbody ID#: 2616900
County: Polk
Applicant Name: Polk County Land and Water Resources Department
Will the Lab be doing filtation for dissolved parameters? (Y/N) N
Will field tests be recorded on the Lab Slip? N

Review Period:
Application Period:

2012 2013

Test ID	Parameter	Samples/Month July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Analyses/ Fiscal Year	Price/ Analysis	Annual Cost For Parameter
	NUTRIENTS															
I530CLD	DISSOLVED REACTIVE P (ORTHO)													0	$16.67	$0.00
I520PLT	TOTAL PHOSPHORUS													0	$23.60	$0.00
I520PLD	TOTAL DISS PHOSPHORUS (AS P), (EPA 365.1)													0	$23.60	$0.00
I470DLT	TOTAL KJELDAHL NITROGEN													0	$32.99	$0.00
I460MLD	NITRATE+NITRITE (AS N), DISS (EPA 353.2)													0	$27.00	$0.00
I440NLD	AMMONIA-N, DISSOLVED													0	$25.89	$0.00
	OTHER WET CHEMISTRY															
I305ALT	AUTOMATED CONDUCTIVITY, PH & ALKALINITY													0	$22.00	$0.00
I120ALT	ALKALINITY, GRAN TECHNIQUE													0	$54.00	$0.00
I240FLT	CHLORIDE													0	$20.00	$0.00
I251UNF	CHLOROPHYLL A, FLUORESCENCE, FIELD FILTERED													0	$23.28	$0.00
I251UNL	CHLOROPHYLL A, FLUORESCENCE LAB FILTERED													0	$24.52	$0.00
I290ALT	COLOR, TRUE, PT-CO													0	$25.00	$0.00
I340IR1	HARDNESS, CALCULATION METHOD (When Metals Done)													0	$5.37	$0.00
	HARDNESS, CALCULATION METHOD (When Metals not Done)													0	$52.82	$0.00
I600ELT	SULFATE (EPA 375.2)													0	$26.00	$0.00
I650JLT	SUSPENDED SOLIDS													0	$18.80	$0.00
I640ILD	TOTAL DISSOLVED SOLIDS, 180 C													0	$17.13	$0.00
I650JLV	TOTAL VOLATILE SOLIDS													0	$10.03	$0.00
I660NLT	TURBIDITY													0	$10.00	$0.00
I720BLT	FIELD TESTS (For each labslip with Field Testing Recorded)													0	$3.00	$0.00
	TOTAL METALS															
I230IR1	CALCIUM, TOTAL RECOVERABLE, ICP	0	0	0	0	0	0	0	0	0	0	0	0	0	$13.00	$0.00
I370IR1	IRON, TOTAL RECOVERABLE, ICP													0	$13.00	$0.00
I390IR1	MAGNESIUM, TOTAL RECOVERABLE, ICP													0	$13.00	$0.00
I400IR1	MANGANESE, TOTAL RECOVERABLE, ICP													0	$13.00	$0.00
I540IR1	POTASSIUM, TOTAL RECOVERABLE, ICP													0	$13.00	$0.00
I580IR1	SODIUM, TOTAL RECOVERABLE, ICP													0	$13.00	$0.00
I322IR1	DIGESTION, TOT. RECOV. LOW LEVEL, ICP + ICP SETUP	0	0	0	0	0	0	0	0	0	0	0	0	0	$21.45	$0.00
	WATER BACTI															
B152ALT	E COLI ENZYMATIC SUBTRATE QUANTITRAY MPN													0	$37.00	$0.00
B200ALT	Fecal Coliform (MFFCC)	0	0	0	0	0	0	0	0	0	0	0	0	0	$37.00	$0.00
														Grand Total =		$0.00

Number of Inorganic Lab Slips (Machine Determined)	0	0	0	0	0	0	0	0	0	0	0	0	0	=Total Inorganic Lab Slips for Fiscal Year
Number of Bacti Lab Slips (Machine Determined)	0	0	0	0	0	0	0	0	0	0	0	0	0	=Total Bacti Lab Slips for Fiscal Year
Number of Inorganic Lab Slips (from workplans)														

LAKE/RIVER PLANNING GRANTS PROJECTED LAB COSTS Second Year FY 2014

Lake Name: Lotus
Waterbody ID#: 2616900
County: Polk
Applicant Name: Polk County Land and Water Resources Department

Review Period:
Application Period:

Will the Lab be doing filtation for dissolved parameters? (Y/N) N
Will field tests be recorded on the Lab Slip? N

	2013						2014								
	Samples/Month												Analyses/	Price/	Annual Cost
Parameter	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Fiscal Year	Analysis	For Parameter
NUTRIENTS															
DISSOLVED REACTIVE P (ORTHO)										1	3	3	7	$17.17	$120.19
TOTAL PHOSPHORUS										1	3	3	7	$24.31	$170.16
TOTAL DISS PHOSPHORUS (AS P), (EPA 365.1)													0	$24.31	$0.00
TOTAL KJELDAHL NITROGEN										1	3	3	7	$33.98	$237.86
NITRATE+NITRITE (AS N), DISS (EPA 353.2)										1	3	3	7	$27.81	$194.67
AMMONIA-N, DISSOLVED										1	3	3	7	$26.67	$186.67
OTHER WET CHEMISTRY															
AUTOMATED CONDUCTIVITY, PH & ALKALINITY													0	$22.66	$0.00
ALKALINITY, GRAN TECHNIQUE													0	$55.62	$0.00
CHLORIDE													0	$20.60	$0.00
CHLOROPHYLL A, FLUORESCENCE, FIELD FILTERED													0	$23.98	$0.00
CHLOROPHYLL A, FLUORESCENCE LAB FILTERED											1	1	2	$25.26	$50.51
COLOR, TRUE, PT-CO													0	$25.75	$0.00
HARDNESS, CALCULATION METHOD (When Metals Done)													0	$5.53	$0.00
HARDNESS, CALCULATION METHOD (When Metals not Done)													0	$54.40	$0.00
SULFATE (EPA 375.2)													0	$26.78	$0.00
SUSPENDED SOLIDS										1	3	3	7	$19.36	$135.55
TOTAL DISSOLVED SOLIDS, 180 C													0	$17.64	$0.00
TOTAL VOLATILE SOLIDS													0	$10.33	$0.00
TURBIDITY													0	$10.30	$0.00
FIELD TESTS (For each labslip with Field Testing Recorded)													0	$3.09	$0.00
TOTAL METALS															
CALCIUM, TOTAL RECOVERABLE, ICP	0	0	0	0	0	0	0	0	0	0	0	0	0	$13.39	$0.00
IRON, TOTAL RECOVERABLE, ICP													0	$13.39	$0.00
MAGNESIUM, TOTAL RECOVERABLE, ICP													0	$13.39	$0.00
MANGANESE, TOTAL RECOVERABLE, ICP													0	$13.39	$0.00
POTASSIUM, TOTAL RECOVERABLE, ICP													0	$13.39	$0.00
SODIUM, TOTAL RECOVERABLE, ICP													0	$13.39	$0.00
DIGESTION, TOT. RECOV. LOW LEVEL, ICP + ICP SETUP	0	0	0	0	0	0	0	0	0	0	0	0	0	$22.09	$0.00
WATER BACTI															
E COLI ENZYMATIC SUBTRATE QUANTITRAY MPN													0	$38.11	$0.00
Fecal Coliform (MFFCC)	0	0	0	0	0	0	0	0	0	0	0	0	0	$38.11	$0.00
													Grand Total =		$1,095.60

Number of Inorganic Lab Slips (Machine Determined)	0	0	0	0	0	0	0	0	0	1	3	3	7	=Total Inorganic Lab Slips for Fiscal Year
Number of Bacti Lab Slips (Machine Determined)	0	0	0	0	0	0	0	0	0	0	0	0	0	=Total Bacti Lab Slips for Fiscal Year
Number of Inorganic Lab Slips (from workplans)														

LAKE/RIVER PLANNING GRANTS PROJECTED LAB COSTS Thrid Year FY 2015

Lake Name: Lotus
Waterbody ID#: 2616900
County: Polk
Applicant Name: Polk County Land and Water Resources Department
Will the Lab be doing filtation for dissolved parameters? (Y/N) N
Will field tests be recorded on the Lab Slip? N

Review Period:
Application Period:

2014 2015

Parameter	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Analyses/ Fiscal Year	Price/ Analysis	Annual Cost For Parameter
NUTRIENTS	Samples/Month														
DISSOLVED REACTIVE P (ORTHO)	3	3	3	1						1	3	3	17	$17.69	$300.65
TOTAL PHOSPHORUS	3	3	3	1						1	3	3	17	$25.04	$425.63
TOTAL DISS PHOSPHORUS (AS P), (EPA 365.1)													0	$25.04	$0.00
TOTAL KJELDAHL NITROGEN	3	3	3	1						1	3	3	17	$35.00	$594.98
NITRATE+NITRITE (AS N), DISS (EPA 353.2)	3	3	3	1						1	3	3	17	$28.64	$486.95
AMMONIA-N, DISSOLVED	3	3	3	1						1	3	3	17	$27.47	$466.93
OTHER WET CHEMISTRY															
AUTOMATED CONDUCTIVITY, PH & ALKALINITY													0	$23.34	$0.00
ALKALINITY, GRAN TECHNIQUE													0	$57.29	$0.00
CHLORIDE													0	$21.22	$0.00
CHLOROPHYLL A, FLUORESCENCE, FIELD FILTERED													0	$24.70	$0.00
CHLOROPHYLL A, FLUORESCENCE LAB FILTERED	1	1	1								1	1	5	$26.01	$130.07
COLOR, TRUE, PT-CO													0	$26.52	$0.00
HARDNESS, CALCULATION METHOD (When Metals Done)													0	$5.70	$0.00
HARDNESS, CALCULATION METHOD (When Metals not Done)													0	$56.04	$0.00
SULFATE (EPA 375.2)													0	$27.58	$0.00
SUSPENDED SOLIDS	3	3	3	1						1	3	3	17	$19.94	$339.06
TOTAL DISSOLVED SOLIDS, 180 C													0	$18.17	$0.00
TOTAL VOLATILE SOLIDS													0	$10.64	$0.00
TURBIDITY													0	$10.61	$0.00
FIELD TESTS (For each labslip with Field Testing Recorded)													0	$3.18	$0.00
TOTAL METALS															
CALCIUM, TOTAL RECOVERABLE, ICP	0	0	0	0	0	0	0	0	0	0	0	0	0	$13.79	$0.00
IRON, TOTAL RECOVERABLE, ICP													0	$13.79	$0.00
MAGNESIUM, TOTAL RECOVERABLE, ICP													0	$13.79	$0.00
MANGANESE, TOTAL RECOVERABLE, ICP													0	$13.79	$0.00
POTASSIUM, TOTAL RECOVERABLE, ICP													0	$13.79	$0.00
SODIUM, TOTAL RECOVERABLE, ICP													0	$13.79	$0.00
DIGESTION, TOT. RECOV. LOW LEVEL, ICP + ICP SETUP	0	0	0	0	0	0	0	0	0	0	0	0	0	$22.78	$0.00
WATER BACTI															
E COLI ENZYMATIC SUBTRATE QUANTITRAY MPN													0	$39.25	$0.00
Fecal Coliform (MFFCC)	0	0	0	0	0	0	0	0	0	0	0	0	0	$39.25	$0.00
													Grand Total =		$2,744.28

Number of Inorganic Lab Slips (Machine Determined)	3	3	3	1	0	0	0	0	0	1	3	3	17	=Total Inorganic Lab Slips for Fiscal Year
Number of Bacti Lab Slips (Machine Determined)	0	0	0	0	0	0	0	0	0	0	0	0	0	=Total Bacti Lab Slips for Fiscal Year
Number of Inorganic Lab Slips (from workplans)														

LAKE/RIVER PLANNING GRANTS PROJECTED LAB COSTS Fourth Year FY 2016

Lake Name: Lotus
Waterbody ID#: 2616900
County: Polk
Applicant Name: Polk County Land and Water Resources Department
Will the Lab be doing filtation for dissolved parameters? (Y/N) N
Will field tests be recorded on the Lab Slip? N

Review Period:
Application Period:

Parameter	Samples/Month July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Analyses/ Year	Price/ Analysis	Annual Cost For Parameter
	2015											2016			
NUTRIENTS															
DISSOLVED REACTIVE P (ORTHO)	3	3	3	1						1	3	3	17	$18.22	$309.67
TOTAL PHOSPHORUS	3	3	3	1						1	3	3	17	$25.79	$438.40
TOTAL DISS PHOSPHORUS (AS P). (EPA 365.1)													0	$25.79	$0.00
TOTAL KJELDAHL NITROGEN	3	3	3	1						1	3	3	17	$36.05	$612.83
NITRATE+NITRITE (AS N), DISS (EPA 353.2)	3	3	3	1						1	3	3	17	$29.50	$501.56
AMMONIA-N, DISSOLVED	3	3	3	1						1	3	3	17	$28.29	$480.94
OTHER WET CHEMISTRY															
AUTOMATED CONDUCTIVITY, PH & ALKALINITY													0	$24.04	$0.00
ALKALINITY, GRAN TECHNIQUE													0	$59.01	$0.00
CHLORIDE													0	$21.85	$0.00
CHLOROPHYLL A, FLUORESCENCE, FIELD FILTERED													0	$25.44	$0.00
CHLOROPHYLL A, FLUORESCENCE LAB FILTERED	1	1	1								1	1	5	$26.79	$133.97
COLOR, TRUE, PT-CO													0	$27.32	$0.00
HARDNESS, CALCULATION METHOD (When Metals Done)													0	$5.87	$0.00
HARDNESS, CALCULATION METHOD (When Metals not Done)													0	$57.72	$0.00
SULFATE (EPA 375.2)													0	$28.41	$0.00
SUSPENDED SOLIDS	3	3	3	1						1	3	3	17	$20.54	$349.24
TOTAL DISSOLVED SOLIDS, 180 C													0	$18.72	$0.00
TOTAL VOLATILE SOLIDS													0	$10.96	$0.00
TURBIDITY													0	$10.93	$0.00
FIELD TESTS (For each labslip with Field Testing Recorded)													0	$3.28	$0.00
TOTAL METALS															
CALCIUM, TOTAL RECOVERABLE, ICP	0	0	0	0	0	0	0	0	0	0	0	0	0	$14.21	$0.00
IRON, TOTAL RECOVERABLE, ICP													0	$14.21	$0.00
MAGNESIUM, TOTAL RECOVERABLE, ICP													0	$14.21	$0.00
MANGANESE, TOTAL RECOVERABLE, ICP													0	$14.21	$0.00
POTASSIUM, TOTAL RECOVERABLE, ICP													0	$14.21	$0.00
SODIUM, TOTAL RECOVERABLE, ICP													0	$14.21	$0.00
DIGESTION, TOT. RECOV. LOW LEVEL, ICP + ICP SETUP	0	0	0	0	0	0	0	0	0	0	0	0	0	$23.44	$0.00
WATER BACTI															
E COLI ENZYMATIC SUBTRATE QUANTITRAY MPN													0	$40.43	$0.00
Fecal Coliform (MFFCC)	0	0	0	0	0	0	0	0	0	0	0	0	0	$40.43	$0.00
													Grand Total =		$2,826.61

Number of Inorganic Lab Slips (Machine Determined)	3	3	3	1	0	0	0	0	0	1	3	3	17	=Total Inorganic Lab Slips for Fiscal Year
Number of Bacti Lab Slips (Machine Determined)	0	0	0	0	0	0	0	0	0	0	0	0	0	=Total Bacti Lab Slips for Fiscal Year
Number of Inorganic Lab Slips (from workplans)														

LAKE/RIVER PLANNING GRANTS PROJECTED LAB COSTS Fifth Year FY 2017

Lake Name: Lotus
Waterbody ID#: 2616900
County: Polk
Applicant Name: Polk County Land and Water Resources Department
Will the Lab be doing filtation for dissolved parameters? (Y/N) N
Will field tests be recorded on the Lab Slip? N

Review Period:
Application Period:

2016 2017

Parameter	Samples/Month July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Analyses/ Year	Price/ Analysis	Annual Cost For Parameter
NUTRIENTS															
DISSOLVED REACTIVE P (ORTHO)	3	3	3	1									10	$18.76	$187.62
TOTAL PHOSPHORUS	3	3	3	1									10	$26.56	$265.62
TOTAL DISS PHOSPHORUS (AS P), (EPA 365.1)													0	$26.56	$0.00
TOTAL KJELDAHL NITROGEN	3	3	3	1									10	$37.13	$371.31
NITRATE+NITRITE (AS N), DISS (EPA 353.2)	3	3	3	1									10	$30.39	$303.89
AMMONIA-N, DISSOLVED	3	3	3	1									10	$29.14	$291.39
OTHER WET CHEMISTRY															
AUTOMATED CONDUCTIVITY, PH & ALKALINITY													0	$24.76	$0.00
ALKALINITY, GRAN TECHNIQUE													0	$60.78	$0.00
CHLORIDE													0	$22.51	$0.00
CHLOROPHYLL A, FLUORESCENCE, FIELD FILTERED													0	$26.20	$0.00
CHLOROPHYLL A, FLUORESCENCE LAB FILTERED	1	1	1										3	$27.60	$82.79
COLOR, TRUE, PT-CO													0	$28.14	$0.00
HARDNESS, CALCULATION METHOD (When Metals Done)													0	$6.04	$0.00
HARDNESS, CALCULATION METHOD (When Metals not Done)													0	$59.45	$0.00
SULFATE (EPA 375.2)													0	$29.26	$0.00
SUSPENDED SOLIDS	3	3	3	1									10	$21.16	$211.60
TOTAL DISSOLVED SOLIDS, 180 C													0	$19.28	$0.00
TOTAL VOLATILE SOLIDS													0	$11.29	$0.00
TURBIDITY													0	$11.26	$0.00
FIELD TESTS (For each labslip with Field Testing Recorded)													0	$3.38	$0.00
TOTAL METALS															
CALCIUM, TOTAL RECOVERABLE, ICP	0	0	0	0	0	0	0	0	0	0	0	0	0	$14.63	$0.00
IRON, TOTAL RECOVERABLE, ICP													0	$14.63	$0.00
MAGNESIUM, TOTAL RECOVERABLE, ICP													0	$14.63	$0.00
MANGANESE, TOTAL RECOVERABLE, ICP													0	$14.63	$0.00
POTASSIUM, TOTAL RECOVERABLE, ICP													0	$14.63	$0.00
SODIUM, TOTAL RECOVERABLE, ICP													0	$14.63	$0.00
DIGESTION, TOT. RECOV. LOW LEVEL, ICP + ICP SETUP	0	0	0	0	0	0	0	0	0	0	0	0	0	$24.14	$0.00
WATER BACTI															
E COLI ENZYMATIC SUBTRATE QUANTITRAY MPN													0	$41.64	$0.00
Fecal Coliform (MFFCC)	0	0	0	0	0	0	0	0	0	0	0	0	0	$41.64	$0.00
													Grand Total =		$1,714.22

Number of Inorganic Lab Slips (Machine Determined)	3	3	3	1	0	0	0	0	0	0	0	0	10	=Total Inorganic Lab Slips for Fiscal Year
Number of Bacti Lab Slips (Machine Determined)	0	0	0	0	0	0	0	0	0	0	0	0	0	=Total Bacti Lab Slips for Fiscal Year
Number of Inorganic Lab Slips (from workplans)														

LAKE/RIVER PLANNING GRANTS PROJECTED LAB COSTS Grand Total

Lake Name: Lotus Lake
Waterbody ID#: 2616900
County: Polk
Applicant Name: Polk County Land and Water Resources Department

Review Period:
Application Period:

Parameter	Analyses For Grant	Grant Cost For Parameter
NUTRIENTS		
DISSOLVED REACTIVE P (ORTHO)	51	$918.13
TOTAL PHOSPHORUS	51	$1,299.81
TOTAL DISS PHOSPHORUS (AS P), (EPA 365.1)	0	$0.00
TOTAL KJELDAHL NITROGEN	51	$1,816.98
NITRATE+NITRITE (AS N), DISS (EPA 353.2)	51	$1,487.07
AMMONIA-N, DISSOLVED	51	$1,425.94
OTHER WET CHEMISTRY		
AUTOMATED CONDUCTIVITY, PH & ALKALINITY	0	$0.00
ALKALINITY, GRAN TECHNIQUE	0	$0.00
CHLORIDE	0	$0.00
CHLOROPHYLL A, FLUORESCENCE, FIELD FILTERED	0	$0.00
CHLOROPHYLL A, FLUORESCENCE LAB FILTERED	15	$397.34
COLOR, TRUE, PT-CO	0	$0.00
HARDNESS, CALCULATION METHOD (When Metals Done)	0	$0.00
HARDNESS, CALCULATION METHOD (When Metals not Done)	0	$0.00
SULFATE (EPA 375.2)	0	$0.00
SUSPENDED SOLIDS	51	$1,035.44
TOTAL DISSOLVED SOLIDS, 180 C	0	$0.00
TOTAL VOLATILE SOLIDS	0	$0.00
TURBIDITY	0	$0.00
FIELD TESTS (For each labslip with Field Testing Recorded)	0	$0.00
TOTAL METALS		
CALCIUM, TOTAL RECOVERABLE, ICP	0	$0.00
IRON, TOTAL RECOVERABLE, ICP	0	$0.00
MAGNESIUM, TOTAL RECOVERABLE, ICP	0	$0.00
MANGANESE, TOTAL RECOVERABLE, ICP	0	$0.00
POTASSIUM, TOTAL RECOVERABLE, ICP	0	$0.00
SODIUM, TOTAL RECOVERABLE, ICP	0	$0.00
DIGESTION, TOT. RECOV. LOW LEVEL, ICP + ICP SETUP	0	$0.00
WATER BACTI		
E COLI ENZYMATIC SUBTRATE QUANTITRAY MPN	0	$0.00
Fecal Coliform (MFFCC)	0	$0.00
	Grand Total =	$8,380.71

Lotus Lake, Polk County

Large Scale Lake Management Planning Grant
August 1st, 2013

Determining impacts of carp removal on Lotus Lake water quality and biological indicators and development of Lotus Lake Management Plan

Collection of water quality and biological data: Phase 1
Collection of plant data, analysis of data, shoreline restoration, watershed modeling, and development of Lotus Lake Management Plan: Phase 2

Project Scope/Description

a. Description of project area

Lotus (East) Lake (WBIC 2616900) is located in southwestern Polk County, Wisconsin in the town of Osceola. The lake has a surface area of 237 acres and a maximum depth of 15 feet. The water clarity of Lotus Lake is very low with the lake being classified as hypereutrophic.

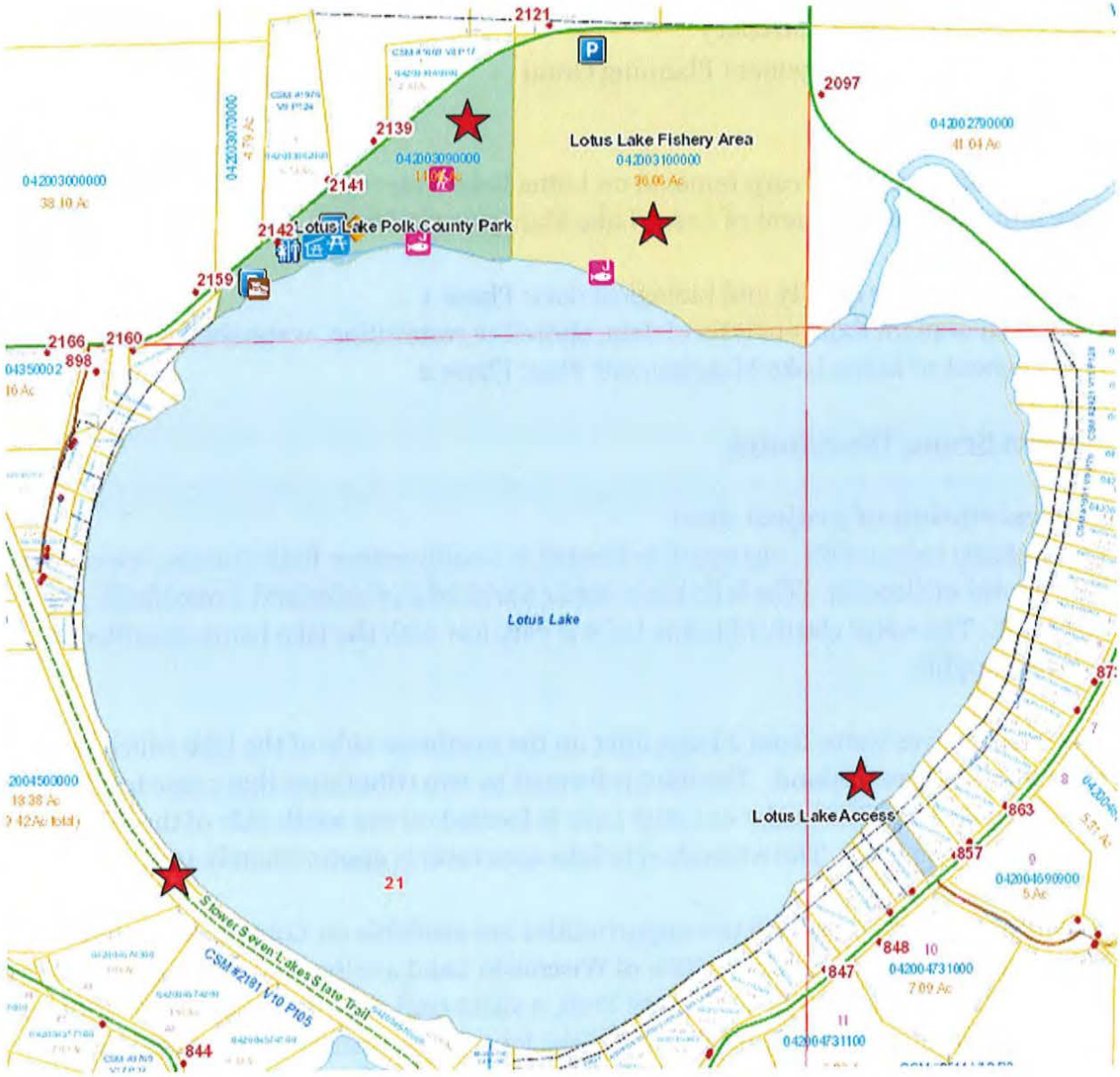
The lake receives water from a large inlet on the northeast side of the lake which drains through a six-acre wetland. The inlet is formed by two tributaries that come together further upstream. The outlet of Lotus Lake is located on the south side of the lake and drains to Horse Lake. The watershed to lake area ratio is approximately 10:1

Significant public access and use opportunities are available on Lotus Lake. A public boat landing, County Park, and State of Wisconsin Land are located on the north side of the lake; the Stowers Seven Lake State Trail, a silent trail maintained by the County, runs alongside the east and south sides of the lake; and a platted access site owned by The Town of Osceola is located on the southeast side of the lake.

There is ample car-trailer parking at both the public landing and adjacent County Park.

Lotus Lake is located in the Town of Osceola (T33N, R18W) in sections 15, 16, 21, and 22. Species listed in the Town of Osceola (T33N, R18W) include: Trumpeter Swan (SC/M) and Bald Eagle (SC/P).[1]

[1] http://dnr.wi.gov/topic/NHI/documents/Polk_County.pdf


2121
2097
2139
2141
2142
2159
2166
2160
898
Lotus Lake Fishery Area
042003100000
Lotus Lake Polk County Park
042003000000
042002790000
Lotus Lake
Lotus Lake Access
863
857
848
847
844
21
Slower Seven Lakes State Trail
CSM #2181 V10 P105
042004731000
042004731100
042004690000

b. Description of problem to be addressed by project

The purpose of this three year study is to determine the impacts of carp removal on Lotus Lake water quality and biological indicators and to develop a Lake Management Plan for Lotus Lake.

The most recent comprehensive water quality study conducted on Lotus Lake was completed by the Polk County Land and Water Resources Department, and funded by the Wisconsin DNR through a Lake Planning Grant (LPL-113-07) in 2007. The extensive data collection suite included in this study will serve as pre-carp removal data for Lotus Lake.

Data collected for the 2007 project included:

- ✓ Water profiles at 1 meter intervals (temperature, dissolved oxygen)
- ✓ In-lake and tributary phosphorus and nitrogen
- ✓ Secchi depth
- ✓ Chlorophyll a
- ✓ TSI calculations
- ✓ Lake level and precipitation monitoring
- ✓ Lake sediment lead concentrations
- ✓ Fish tissue lead concentrations
- ✓ Algae composition
- ✓ Zooplankton composition
- ✓ Twice yearly aquatic macrophyte surveys
- ✓ Macroinvertebrates
- ✓ Terrestrial vegetation
- ✓ WiLMS modeling
- ✓ Public survey

The 2007 study characterized Lotus Lake as hypereutrophic (TSI secchi, chlorophyll, and phosphorus) and determined a maximum rooting depth of 5 feet for aquatic macrophytes. The macrophyte community of Lotus Lake is dominated by floating-leaf species, such as water lilies and the American lotus. However, the paleolimnological record shows that Lotus Lake historically had submerged aquatic vegetation. This is supported by the 1961 report Surface Water Resources of Polk County (Wisconsin Conservation Department) which notes the presence of nesting species of mallards, bluewing teal, and wood ducks on Lotus Lake. These are species which rely on the presence of a submerged aquatic macrophyte community.

The paleolimnological record shows evidence of carp in Lotus Lake as early as the 1950's, which correlates with the timeframe during which plants began to disappear from the lake. The fisheries of Lotus Lake must tolerate shallow depths (which create

warm conditions and low dissolved oxygen in the summer) and high blue green algae concentrations, which provide low food value. Carp, specifically *Cyprinus carpio*, are able to tolerate these conditions and dominate the fisheries of Lotus Lake. Carp are known to create turbidity and dislodge aquatic vegetation while searching for food. The activity of carp promotes nutrient flux from the sediment into the water column causing an extra re-suspension of sediment particles. In shallow lakes the concentration of organic and inorganic suspended solids increase markedly due to the ability of wind forces to hold sediment in suspension (Jeppesen et al., 1997). As a result, the impacts of carp induced turbidity are likely expounded in Lotus Lake due to the nature of the shallow lake system. Additionally, carp could be contributing to the remarkable increase in sediment focusing in the last decade in Lotus Lake (personal communication, Dan Engstrom).

Although management recommendations exist for Lotus Lake, they are not formatted by today's standards which include: goals, objectives, action items, responsible parties, timelines, and funding sources. A current Lake Management Plan developed by the Lotus Lake Association is a need that will be addressed by this project.

c. Discussion of project goals and objectives

In an analysis of data of 36 lakes Søndergaard et al. (2008) found that the effects of removing a large amount of the biomass of benthivorous fish resulted in changes in Secchi depth, chlorophyll a, suspended solids, total nitrogen, and total phosphorus. Modeling for this study showed that the new clear state could persist for many years and perhaps permanently (Søndergaard et al., 2008). Additionally, Hanson and Butler (1990) found that biomanipulation in Lake Christina, a large shallow lake in central Minnesota, resulted in lake-wide reductions in chlorophyll a and improvements in water transparency. This resulted in a dramatic increase in rooted, submerged macrophytes and a reduction in nutrients and suspended solids. If submerged macrophytes become abundant as a result of carp removal, they have a positive influence on lake water clarity through their action of assimilating and retaining phosphorous and reducing re-suspension. Additionally, increased water clarity leads to enhanced benthic algal production which may further reduce phosphorus release from the sediment (Søndergaard et al., 2008).

The main goals of this project are to monitor the impacts of biomanipulation in Lotus Lake and to develop a Lake Management Plan. Carp were tagged in June 2013 and carp removal is scheduled for fall 2013. Data from the 2007 study will be used as a baseline to determine impacts of removing a large biomass of benthivorous fish on physical and chemical in-lake conditions and biological communities (macrophyte, algae, and zooplankton).

The project aims to enhance the local understanding of water quality and the uses and factors which affect water quality in the lake. Data collected at the deep hole will include standard chemical and physical data (including Secchi depth and three parameter TSI). Tributary monitoring will be used to develop a nutrient budget for the lake and WiLMS will be used to generate a lake condition response model. By examining the system as a whole, best management practices to increase water quality will be characterized.

Zooplankton form a crucial link between bottom-up and top-down processes in lake ecosystems. They are voracious consumers of algae and bacteria and also a favorite food of planktivorous fish, minnows, and the fry of larger fish. As a result, zooplankton connect two of the most important features of lake management—water clarity and fisheries health. A goal of this study is to inventory zooplankton and phytoplankton community assemblages and populations as a means to develop management recommendations for aquatic life based on data collected.

The aquatic macrophyte community of Lotus Lake is dominated by floating leaf species such as water lilies and American lotus with a maximum rooting depth of only 5 feet. The paleolimnoligical record shows historic presence of submerged plants in Lotus

Lake, with plants beginning to disappear with the introduction of carp. Point intercept macrophyte surveys will be completed to determine impacts of carp removal on the aquatic macrophyte community of Lotus Lake.

This project will also enhance knowledge and understanding of the Lotus Lake Watershed conditions that are currently affecting, or have the potential to affect, the lake's ecosystem. To meet this goal the watershed boundaries will be delineated, existing land uses and acreages will be estimated, and WiLMS will be used to estimate annual pollutant loadings from the watershed. Additionally, actual loads will be partitioned by sub-watershed through tributary monitoring and modeling. Data will be used to identify surface runoff patterns and delineate environmentally sensitive areas in the Lotus Lake Watershed (forests, wetlands). Based on data collected, watershed specific best management practices will be suggested for implementation.

An additional goal of this project is to improve management of Lotus Lake. The project will complete a Lake Management Plan using data from the study, input from a series of meetings, and results from a DNR approved sociological survey. This project will provide information and education regarding management options to ensure the health of the Lotus Lake ecosystem.

Lastly, this study will result in the creation of specific shoreline restoration plans for up to 5 sites on Lotus Lake. LWRD will focus one educational workshop towards providing lakeshore owners with the tools necessary to design their own shoreline restoration plans. These plans will then be reviewed by LWRD to comply with zoning regulations and to be acceptable for lake protection grant applications.

d. Description of methods and activities

Physical and chemical data will be collected in-lake at the deep hole. Integrated samples will be collected from the water column once a month. Water samples will be analyzed at the State Lab of Hygiene for total phosphorus, soluble reactive phosphorus, nitrate/nitrite nitrogen, ammonium, total Kjeldahl nitrogen, total suspended solids, and chlorophyll a. Spring and fall turnover samples will be collected in April and October. In addition, lake profile monitoring will be conducted every two weeks. Profile monitoring will include dissolved oxygen, temperature, conductivity, and pH readings as well as Secchi depth readings. Readings will be taken at meter intervals and, if necessary, at a finer scale near the sediment interface to document the presence/absence of anoxic conditions. Three parameter TSI will be calculated.

Two tributaries (inlet and outlet) will be sampled monthly throughout the growing season. Analysis of tributary samples will include nitrate + nitrite, ammonium, total Kjeldahl nitrogen, total phosphorus, soluble reactive phosphorus, and total suspended solids by the State Lab of Hygiene. Stream flow will also be measured biweekly with a Marsh McBirney.

Phytoplankton will be sampled at the deep hole with a 2-meter composite sampler. Phytoplankton will be collected three times per year in accordance with the National Park Service Inland Lake Protocol for the Great Lakes Region. Samples will be sent to the State Lab of Hygiene for identification and enumeration of the algal community.

Zooplankton will be sampled at the deep hole with a Wisconsin Net. Zooplankton samples will be collected three times per year in accordance with the National Park Service Inland Lake Protocol for the Great Lakes Region. Samples will be sent to Northland College for identification to the lowest level possible.

Point intercept aquatic macrophyte surveys will be performed on Lotus Lake two times per year to inventory and index the plant community. A spring survey will serve as early detection for curly leaf pondweed, which is not yet documented in Lotus Lake. The point-intercept method will be employed with a DNR-generated grid. Specimen will be vouchered. Data will be used to develop management recommendations for aquatic plant management.

A WDNR approved sociological survey will be distributed to riparian residents to obtain public perception on water clarity, lake use, invasive species, shoreline restoration, and lake management activities.

Lake volunteers will collect daily lake level and precipitation monitoring data. LWRD will install the staff gauge and rain gauge and provide necessary training. Lake

volunteers will record lake level throughout the growing season to track the lake's response to precipitation. Precipitation will also be documented for the growing season.

Watershed boundaries will be delineated, existing land uses and associated acreage will be mapped, and annual watershed pollutant loadings will be estimated using standard runoff coefficients using WiLMS. Environmentally sensitive areas (forests and wetlands) in the lake watershed will be delineated. Surface runoff patterns will be used to determine subwatershed boundaries.

Phosphorus load will be partitioned by subwatershed, loading reductions will be analyzed, and determinations will be used in the creation of a Lake Management Plan.

A WDNR approved shoreline inventory will take place to document shoreline health and provide information to develop a shoreline restoration and protection program for Lotus Lake.

An educational workshop on shoreline restoration/rain gardens will be offered to lakeshore and watershed residents. Review and design of 5 plans will be *offered* to interested landowners.

Institutional programs affecting lake quality will be inventoried and summarized for lake residents (i.e. County ordinances, land use planning, state regulations).

e. Description of project products or deliverables

A Comprehensive Lake Management Plan which includes:

- In-lake and tributary water quality report with comparison to previous data where it exits and management options to improve water quality
- In-lake biological report which will enhance the understanding of changes in aquatic life
- Lake level and precipitation monitoring data
- Evaluation of watershed conditions and land use including annual pollutant loading determined though modeling and actual load partitioning
- Delineation of environmentally sensitive areas (forest, wetlands)
- Lake nutrient budget
- Lake response to phosphorus reduction scenarios including internal loading
- Shoreline inventory results showing priorities for shoreline restoration
- Up to 5 shoreline restoration designs, provided interested landowners
- Sociological survey results
- Macrophyte surveys
- Goals, objectives, and actions for lake management pertaining to water quality, watershed/land use, and aquatic life
- Planning schedule for implementation of goals, objectives, and actions

f. Description of data to be collected, if applicable

- Standardized water chemistry and monitoring data for in-lake and tributary sites
- Trophic State Index (TSI) data
- Stream flow measurements and loading calculations
- Biological data (zooplankton and algae) with indices and ecological interpretation
- Point intercept macrophyte surveys
- Sociological survey
- Lake level and precipitation monitoring
- Watershed and subwatershed land use and phosphorus loading
- Nutrient budget
- Phosphorus reduction scenarios
- Shoreline inventory

g. Description of existing and proposed partnerships

Polk County Parks Department

- Over 10% of the financial project match
- Shoreline restoration design for County Park to be implemented outside this grant application

St. Croix Tribal Environmental Department

- Technical assistance

Lotus Lake Association

- In-kind assistance with lake level and precipitation monitoring, sociological survey, shoreline inventory, generating interest in shoreline restoration, and participation in meetings to develop a Lake Management Plan

Wisconsin DNR Fisheries Department

- Technical assistance

PCALR

- Communicate information through website

Polk County Land and Water Resources Department

- Administer grant
- Perform field activities
- Organize and analyze data
- Model watershed information
- Generate final report
- Present data and best management practices to lake citizenry
- Provide education material/workshops, technical support, and grant updates
- Facilitate Lake Management Plan development meetings

h. Discussion of role of project in planning and/or management of lake

The recommendations from the Lotus Lake Management Plan resulting from the 2007 Water Quality and Biological Assessment which this study will address are shown below in italics.

- *Monitoring of the biological populations of the lake, including algae, zooplankton, fish, and aquatic macrophytes.*

- *Maintain current riparian vegetation, aquatic plants, and coarse woody debris (fallen trees and logs) to preserve the water quality of Lotus Lake and provide habitat for young game fish and zooplankton.*

Additionally, this study will address Goals 1, 2, and 3 of the Polk County Land and Water Resource Management Plan (2009), adopted by the County Board and approved by the state. The results of this grant project will be used to amend/update future drafts of the LWMP.

Goal 1. Protect the water quality of our groundwater, lakes, streams, rivers, creeks, and associated ecosystems.

Goal 2: Protect shorelines, undeveloped riparian land, wetlands, grasslands, forests, farmland, and agricultural resources to perpetuate the benefits they provide: habitat and associated native wildlife communities, clean water, clean air, carbon sequestration, aesthetic beauty, and recreational opportunities.

Goal 3: Support and develop the human resources in Polk County that manage our natural resources—both LWRD and volunteer management groups.

i. Timetable for implementation of key activities

This project will be completed over a three year timeframe as a two phase project to allow for the manifestation of community changes in response to carp removal.

Phase 1

The following activities will take place each of the three years of the project:

- Physical and chemical in lake data
- Tributary data
- Phytoplankton
- Zooplankton
- Lake level and precipitation monitoring

The following activity will take place only once during the time of the project:

- Sociological survey

Phase 2

The following activities will take place each of the three years of the project:

- Point intercept macrophyte surveys
- Analysis of data

The following activities will take place only once during the time of the project:

- Shoreline inventory
- Shoreline restoration workshop
- Design of up to 5 shoreline restorations (including County Park), if interested landowners
- Watershed and subwatershed modeling (land use and nutrient loading) and associated nutrient budget
- Delineation of sensitive areas
- Summary of institutional programs affecting lake quality
- Summary of previous fish survey data

The following activities will be completed after all data has been analyzed and written into a report:

- Development of goals, objectives, and action items by committee members
- Development and finalization of Lotus Lake Management Plan

j. Plan for sharing project results

- Updates will be shared with lake residents in newsletters, emails, and the LWRD website.
- LWRD will present data and recommendations at association meetings.
- An executive summary will be given to lakeshore property owners and interested residents.
- Project partners and DNR officials will be provided with the final report.
- The final report will be posted on the LWRD website and PCALR website and a hard copy housed at the Dresser Library.
- Data will be entered into SWIMS.

k. **Other information in support of project not described above**

2013 sampling efforts (funded outside of grant application)

- August and September 2013 total phosphorus, chlorophyll a, and in-lake profile monitoring (dissolved oxygen, temperature, conductivity, pH, salinity, secchi)
- Fall 2013 point intercept macrophyte survey

References

Hanson, M., and M. Butler, 1990. Early responses of plankton and turbidity to biomanipulation in a shallow prairie lake. Hydrobiologia 200/201: 317-327.

Jeppesen, E., J. P. Jensen, M. Søndergaard, T. Lauridsen, L. J. Pedersen, and L. Jensen, 1997. Top-down control in freshwater lakes: the role of nutrient state, submerged macrophytes and water depth. Hydrobiologia 342/343: 151-164.

Sather, L.M. and Threinen, 1961. Surface water resources of Polk County. Lake and stream classification project. Wisconsin Conservation Department.

Søndergaard, M., L. Liboriussen, A. R. Pedersen, and E. Jeppesen, 2008. Lake restoration by fish removal: short- and long-term effects in 36 Danish lakes. Ecosystems 11: 1291-1305.