Lake Management / Wetlands Restoration Grant Application

The Lake Koshkonong/Mud Lake Wetland Restoration Project

SUBMITTED BY

ROCK KOSHKONONG LAKE DISTRICT

May 1, 2012

The Lake Koshkonong/Mud Lake Wetland Restoration Project
Lake Management / Wetlands Restoration Grant Application

APPLICATION

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
11	33

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: Rock-Koshkonong Lake District

Lake Name: Lake Koshkonong

Size in Acres: 10,460.00

Project County/Township/Section/Range: Jefferson County, T05, R13, Section 13

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
Brian Christianson	Rob Montgomery
Authorized Representative Title	**Project Contact Title**
Chairman	Project Manager
Address	**Address**
374 E. Samuelsen Dr.	119 S. Main St.
City / State / ZIP Code	**City / State / ZIP Code**
Edgerton	Cottage Grove, WI 53527
Daytime Phone (area code)	**Daytime Phone (area code)**
(608) 884-9444	(608) 839-4422
Evening Phone (area code)	**Evening Phone (area code)**
(608) 347-4002	(608) 225-0682
E-mail Address	**E-Mail Address**
bkg@cpgmidwest.com	rob@ma-rs.org

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	Environmental Grants Specialist Approval / Date	
	☐ Yes ☐ No		
Eligible Project	**Eligible Applicant**	**Project Priority Rank**	
☐ Yes ☐ No	☐ Yes ☐ No		
Prior Grant Award(s)	**Fiscal Year(s)**	**Amount Received To Date**	**Project Awarded**
☐ Yes ☐ No		$	☐ Yes ☐ No

Section III: Project Information

Project Title	Proposed Ending Date
The Lake Koshkonong/Mud Lake Wetland Restoration Project	05/31/12

Other Management Units Around Lake	Letter of Support	Other Management Units Around Lake	Letter of Support
1. Twin Island Gun Club, Inc.	☒	4.	☐
2.	☐	5.	☐
3.	☐	6.	☐

Section IV: Lake Access

Number of Public Vehicle Trailer Parking Spaces Available at Public Access Sites: 55

Number of Public Access Sites on Lake Including Boat Launches and Walk-ins: 8

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			
2. Consulting services	49,000.00		
3. Purchased services--printing and mailing			
4. Other purchased services (specify): Breakwater, Material placement., Restoration	170,600.00		
5. Plant material			
6. Supplies (specify)			
7. Depreciation on equipment			
8. Hourly equipment use charges			
9. State Lab of Hygiene (SLOH) Costs			
10. Non-SLOH Lab Costs			
11. Land or easement acquisition value			
12. Associated acquisition costs			
13. Other (specify)			
14. **Subtotals** (sum each column)	219,600.00		
15. **Total Project Cost Estimate** (sum of **column 1 plus** sum of **column 2**)	219,600.00		
16. **State Share Requested** (calculate based on State share listed below)	100,000.00		

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
- [ ] 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
- [ ] 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
- [x] 2. Preliminary engineering plans
- [x] 3. Water regulatory permits
- [x] 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 As
- ☐ 2. Legal description of the property
- ☐ 3. Project location boundary map
- ☐ 4. Property or easement appraisal (if not previou s y submitted to the Department)
- ☐ 5. If escrow closing, the title insurance commitment
- ☐ 6. Evidence of compliance with Uniform Relocat on Act requirements, if applicable
- ☐ 7. Agricultural Impact Statement, if applicable
- ☐ 8. Status of acquisition negotiations, including e: pected time frame for closing
- ☐ 9. A land management plan
  - ☐ a. Full description of property and conditions
  - ☐ b. Description of current and proposed u: es of property and adjoining prc
  - ☐ c. Management requirements for property
  - ☐ a topographic survey with feature locations, and design cross sections

hments are true and correct and in conformity with applicable Wis. Statutes.

	itle of Authorized Representative
an Christianson	Chairman
ature of uthorized	Date Signed -30-12

1. AUTHORIZING RESOLUTION

1. Letter of Commitment from Rock-Koshkonong Lake District Chairmain

Note: The electors of the Rock Koshkonong Lake District authorized the District to pursue this project and the district's annual meeting in August 2011. An official Authorizing Resolution by the District Board of Trustees will be presented at the monthly board meeting on May 10, 2012 and will be submitted subsequently.

Rock-Koshkonong Lake District

RKLD.org

Brian Christianson
Edgerton
Chairman

Steve Proud
Ft. Atkinson
Commissioner

Ray Lunder
Milton
Treasurer

Jim Bowers
Edgerton
Commissioner

Ed Sandner
Fort Atkinson
Secretary

Sup. Andy Walton
Town of Fulton
Appointee

Sup. Mary Mawhinney
Rock County
Appointee

April 30, 2012

Ms. Sue Graham
Wisconsin Department of Natural Resources
3911 Fish hatchery Rd
Fitchburg, WI 53711

Re: Grant application for funding
Lake Koshkonong/Mud Lake shoreline protection and wetland restoration project

This letter confirms the intent of the Rock Koshkonong Lake District to complete a project on the eastern shoreline of Lake Koshkonong that will protect the wetlands surrounding Mud Lake from erosive damage, restore a portion of the shoreline that is currently failing, and restore wetland areas that were historically lost to erosion within Lake Koshkonong.

The District has been conducting a joint project with the U.S. Army Corps of Engineers under the Planning Assistance to States program, which is also included participation of the Wisconsin Department of Natural Resources. The Planning Assistance to States project has the objective of defining and evaluating a variety of projects to improve Lake Koshkonong. The Mud Lake shoreline protection project was identified early in that process, and was discussed in a series of public meetings in 2010 and 2011. The electors of the Rock Koshkonong Lake District authorized the District to pursue construction of this project at the district's annual meeting in August 2011. We are in the final public notice period for the U.S. Army Corps of Engineers permit to authorize this project, and the DNR permit is pending.

gomery Associates: Resource Solutions, LLC to prepare and
Grant application for this project to the Wisconsin DNR, as part of
esign and direction for this project.

th state rules for the program, may perform force account work,
financial obligations under the grant, if awarded.

Please contact me with any questions.

Sincerely,

Brian Christianson

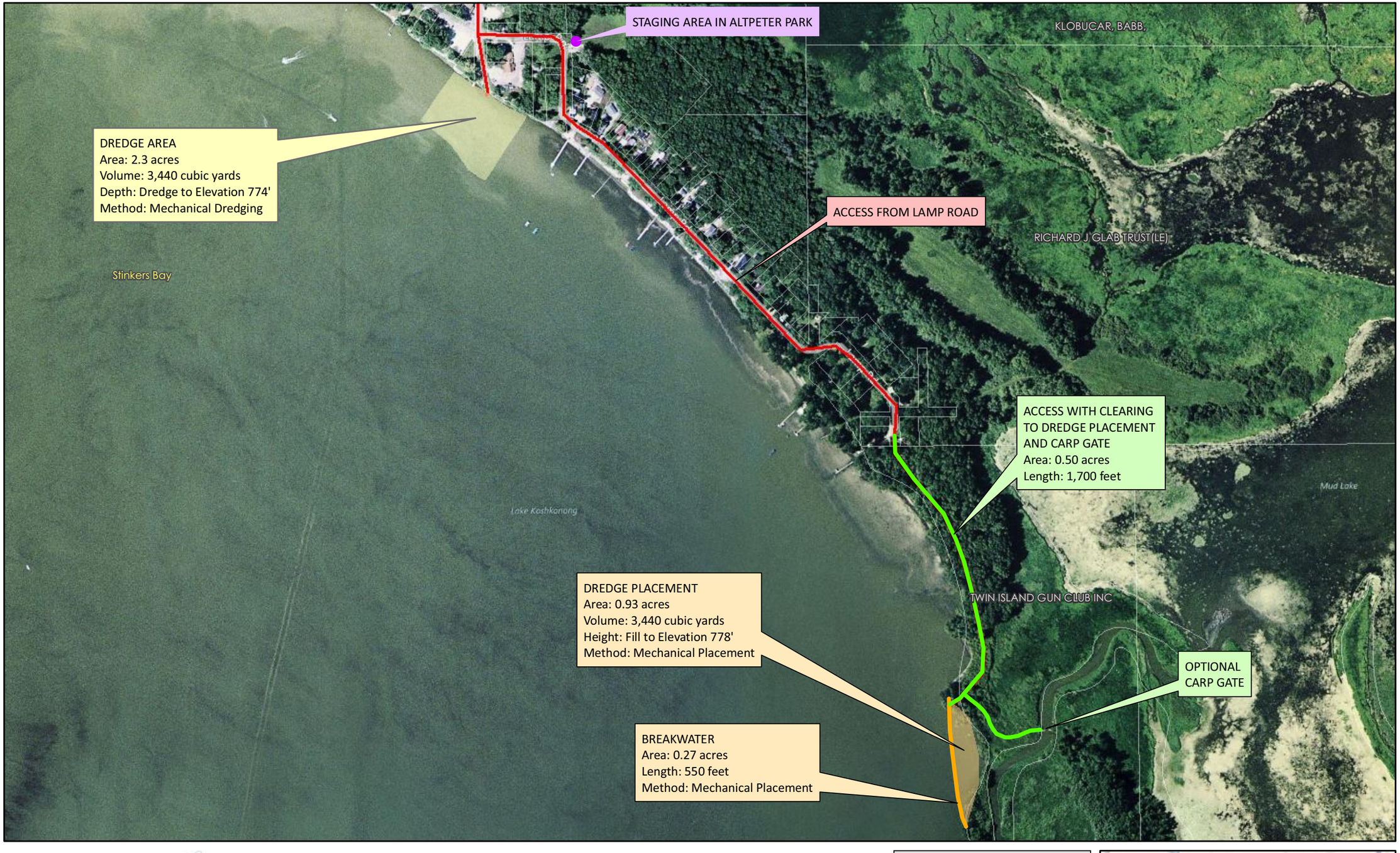
Chairman
608-884-9444

CC: RKLD BOARD of Commissioners

2. LETTERS OF SUPPORT

NOTE: Letter from the adjacent property owner and one of main land owners of Mud Lake will be forthcoming in the coming days.

3. MAP OF PROJECT LOCATION AND BOUNDARIES



RKLD
Rock-Koshkonong Lake District

Access from Main Road
Clearing
Dredging
Breakwater
Fill

Main Map Projection: Wisconsin State Plane South | Locator Map Not to Scale

DRAWN BY	CHECKED BY
DYL	JMH

MONTGOMERY ASSOCIATES:
RESOURCE SOLUTIONS, LLC
119 South Main Street | Cottage Grove, WI 53527
(608) 839-4422 | www.ma-rs.org

EXPERIMENTAL PROJECT
OVERVIEW MAP
Lake Koshkonong Restoration
Jefferson County, WI

N
W E
S

0 100 200 400 Feet
SCALE
1 inch = 400 feet

PROJECT NO.	DATE
1453	Feb 10, 2012

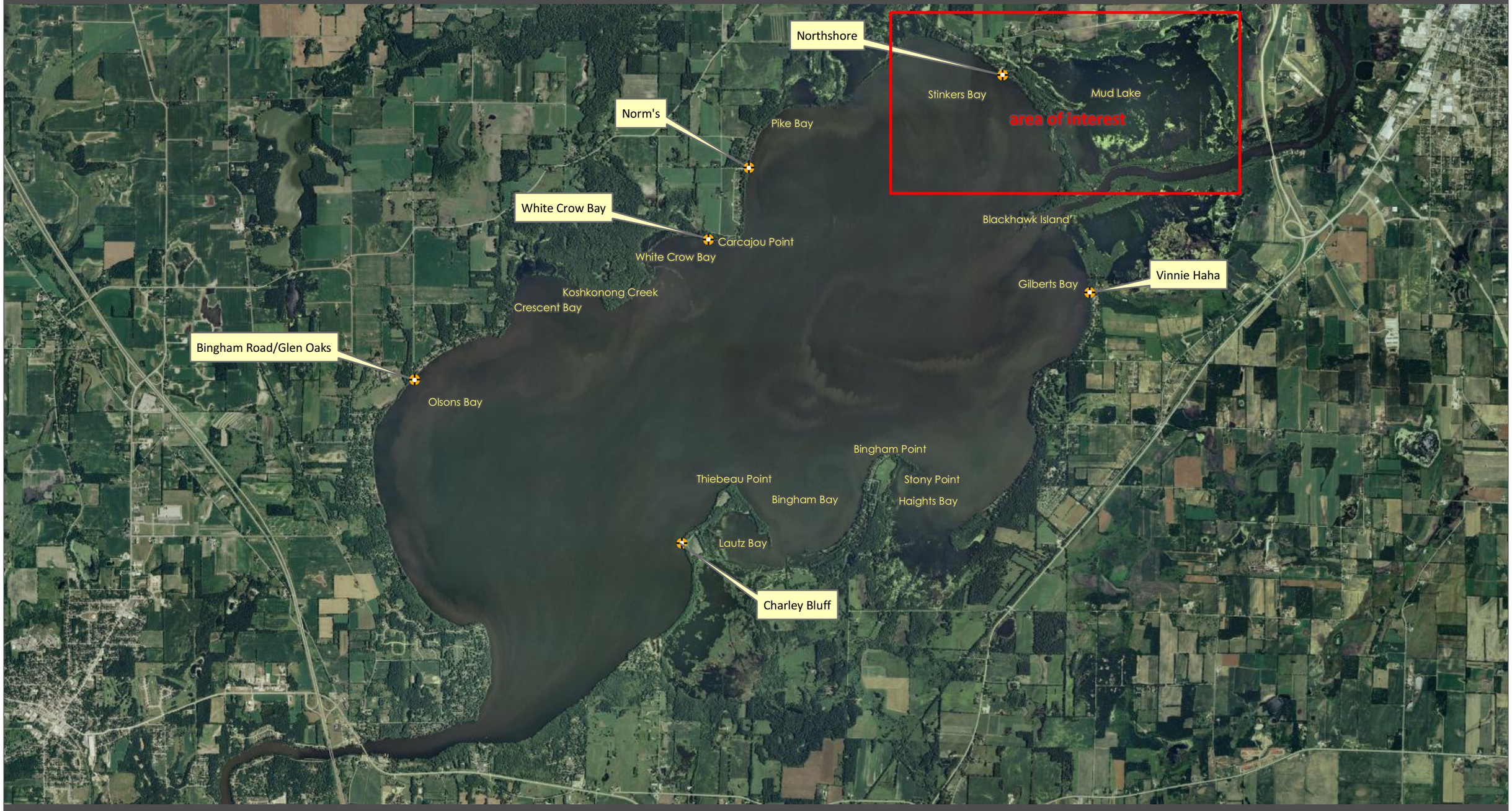
SHEET NO.

FIGURE A

4. LAKE MAP WITH PUBLIC ACCESS SITES IDENTIFIED

April 30, 2012

Lake Koshkonong Public Access | Dane, Rock and Jefferson Counties, WI



N

1 inch = 4,000 feet

0 4,000 Feet

5. ITEMIZED BREAKDOWN OF EXPENSES

Lake Koshkonong Lake Restoration
April 30, 2012 Estimate
Rock Koshkonong Lake District

Opinion of Probable Costs

LAKE KOSHKONONG/MUD LAKE WETLAND RESTORATION PROJECT

OPTION NO.	ITEM DESCRIPTION	ESTIMATED QUANTITY	UNIT	UNIT PRICE	TOTAL
1	CONSTRUCTION COSTS				
1a	Mobilization/Site Preparation/Access	1	LS	$ 60,000.00	$60,000
1d	Breakwater Material and Installation	550	Feet	$ 78.00	$42,900
1e	Dredging (Material Source for Wetland Creation) - NOT INCLUDED IN WETLAND GRAND APPLICATION	3,440	CY	$ 10.00	$34,400
1f	Material hauling and placement	3,440	CY	$ 8.00	$27,600
1g	Restoration	1	Acres	$ 10,000.00	$10,000
1h	Carp Gate	1	LS	$ 30,000.00	$30,000
Total for CONSTRUCTION COSTS					$205,000
2	CONSULTING SERVICES				
2a	Final Design and Construction Documents	1	LS	$ 15,000.00	$15,000
2b	Bid Support and Project Management Services	1	LS	$ 6,000.00	$6,000
2c	Construction Observation	1	LS	$ 10,000.00	$10,000
2d	Restoration Monitoring and Maintenance Services	1	LS	$ 18,000.00	$18,000
2e	Archeological Observation Services	1	LS	$ 3,000.00	$3,000
Total for Mechanical Dredging with Carp Gate, Temporary Access					$49,000

6. SLOH PROJECTED COST FORM

NOTE: No SLOH costs are anticipated as part of this project.

The Lake Koshkonong/Mud Lake Wetland Restoration Project

Lake Management / Wetlands Restoration Grant Application

7. Project Scope / Description

PROJECT SETTING

Lake Koshkonong is a large (over 10,000 –acres), shallow lake in Rock, Dane, and Jefferson Counties. It provides recreation through fishing, hunting, and boating, and is home to a wide variety of fish and wildlife. Adjacent wetlands are spawning grounds to local fish populations and are homes to various hunting clubs as well as the DNR managed Koshkonong Wildlife Area. However, residents who live on Lake Koshkonong and visitors to the lake are challenged with navigational access issues, an eroding shoreline, and water quality problems. The Rock Koshkonong Lake District (RKLD), along with the Wisconsin Department of Natural Resources (WDNR) and the US Army Corps of Engineers (USACE) have been working together to create a suite of options to strive toward addressing issues associated with Lake Koshkonong. As part of that process, funded by the US Army Corps of Engineers Planning Assistance to States program, the Wisconsin Department of Natural Resources (WDNR) and the USACE are in the process of completing a wide-ranging analysis of the various restoration options for the Lake and the surrounding environment.

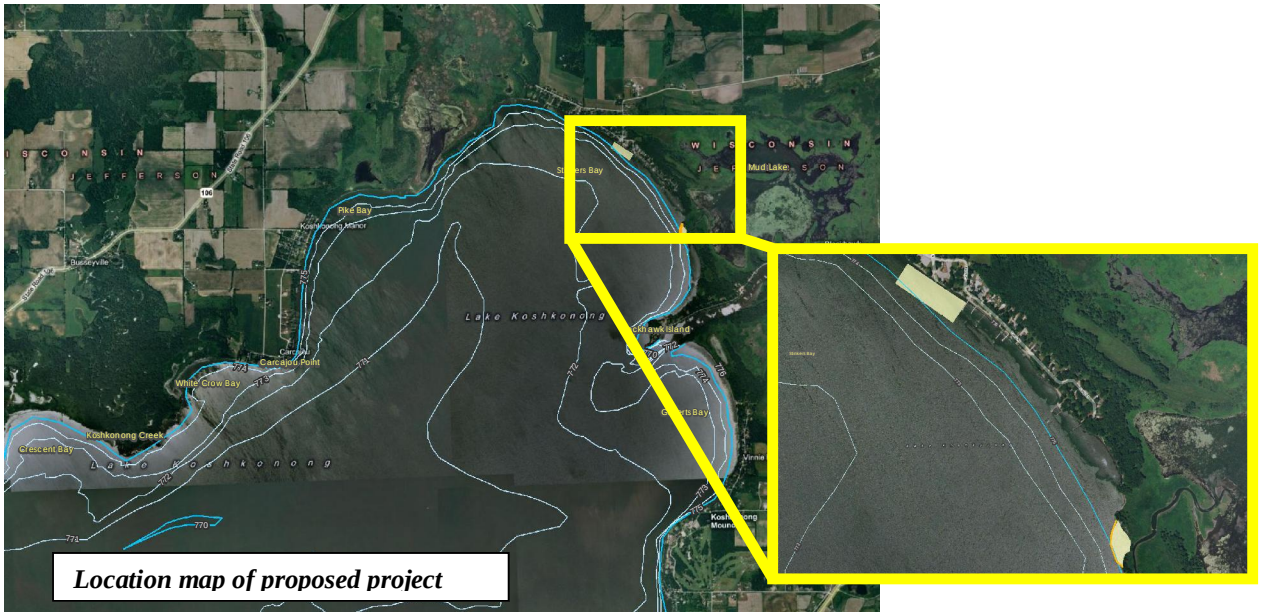
PROJECT PURPOSE AND PROJECT TEAM

Since many of these projects would require significant investment, the project team has determined that the best course of actions is to begin the lake restoration process with a smaller-scale experimental or demonstration project to learn how effective lake restoration techniques actually are. The Mud Lake Wetland Restoration Project is one such experimental project. The main goal of this project is to protect Mud Lake, a high quality wetland, currently at risk of becoming physically connected to Lake Koshkonong which would destroy adjacent wetlands and negatively impact the water quality of Mud Lake. In addition, this small scale experimental project would provide information that can assist RKLD in assessing options and provide the general public with a true test of 1) the viability of near-shore shallow dredging and how long, and to what extent the dredging will be effective, and 2) how best to protect shorelines from continued erosion, especially in high energy areas of this large open lake.

The project team includes Montgomery Associates: Resource Solutions, a water resources engineering firm which will oversee the final engineering and project oversight for the duration of the project; and Eco-Resource Consulting, an ecological consulting firm that will oversee the ecological restoration and monitoring of this project. The Great Lakes Archaeological Research Center, Inc. will provide a field archaeologist to address permit requirements.

7. Project Scope / Description

DESCRIPTION OF PROJECT AREA



Location map of proposed project

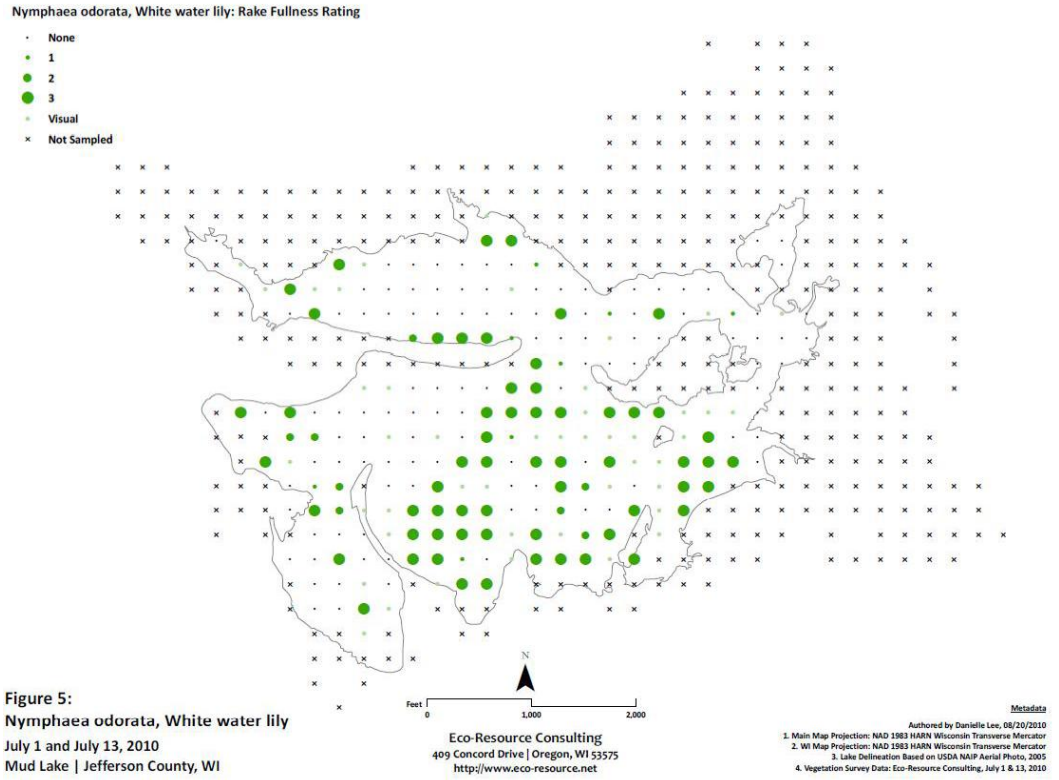
Mud Lake is over 900-acre shallow marsh wetland rich in native species and provides a necessary nursery for variety of fish. It accounts for approximately 1/3rd of wetlands around Lake Koshkonong. Wood ducks and other avian species use the wetland for resting, foraging and nesting. The loss of this wetland would be a significant loss to the lake's ecosystem. Wave erosion is now threatening the embankment separating Mud Lake from Lake Koshkonong.

Mud Lake

7. Project Scope / Description

In July 2010, RKLD authorized the first aquatic vegetation survey in Mud Lake since RKLD was formed in 1999 and possibly the first point-intercept transect method survey ever in Mud Lake (See report attached). The survey concluded that Mud Lake has relatively diverse aquatic vegetation, a modest number of species, a moderate to high coefficient of conservatism and an above average floristic quality index for southern Wisconsin. Plant species found include coontail, sago pondweed, bladderwort, white waterlily, marsh milkweed, various arrowhead and bulrush species along with some wild-rice and duckweed.

For the first time on record, the Mud Lake wetland complex was surveyed using point-intercept methods that resulted in 228 sites sampled with 226 containing aquatic plants. The maximum depth of plant growth relative to the water stage was 5.8 feet. All 228 sites were at or less than the maximum depth of rooted plants. The frequency of occurrence of sites shallower than maximum depth of plants was 99% meaning that almost all of the sites sampled contained aquatic macrophytes and that depth of water was not a limiting factor in plant growth. The calculated Simpson Diversity Index is 0.75 with a value of 1.00 being an optimal measure of plant diversity. The average number of species per site including native species was 2.84. The species richness is a total number of species sampled or observed (includes visuals) and for Mud Lake is 18. The calculated Mean C is 4.6 and the Floristic Quality Index (FQI) is 14.5.



Example of the results of the point-intercept vegetation survey showing the presence of White Water Lily.

7. Project Scope / Description

The data indicate that Mud Lake is a relatively diverse aquatic ecosystem that has a modest number of species but that they have a moderate to high coefficient of conservatism and above average FQI for southern Wisconsin. Mud Lake is an important resource in and of its own right, but especially since Lake Koshkonong proper has a relatively low amount of ecological habitat. Mud Lake is an important resource as it relates to Lake Koshkonong because it has a relatively high density of native plants and provides a substantial spawning and rearing habitat that is particularly absent in the lake.

Mud Lake is the most important spawning and nursery for Lake Koshkonong fishes. This high quality shallow marsh contains the greatest diversity of aquatic plants and is currently protected and isolated for the lake by a small channel in North Shore Bay. Recent observations indicate that young-of-the-year and juvenile pan- and gamefish species and critical habitat is present in Mud Lake. Few other Lake Koshkonong bays or backwater areas contain the diversity or populations of pan- and gamefish as Mud Lake. Despite a commercial carp fishery in Lake Koshkonong, which harvests 1 to 2 million pounds of carp per year, rough fish populations remain high. Rough fish are detrimental to the sport fishery and other aquatic resources since they browse on and dislodge rooted aquatic vegetation and increase the turbidity of the water keeping sediments and pollutants in suspension. Mud Lake is also a breeding ground for carp and two attempts have been made to try to restrict carp access to the wetland complex with the construction of various carp exclusionary structures that have subsequently gotten damaged. Also significant is the presence of less common species of birds, which are sought out by bird watchers from throughout the state and surrounding areas. Examples of these species are large flocks of American White Pelicans, State threatened or endangered Forster's and black terns, waterfowl and shorebirds which have been observed in Mud Lake.

DESCRIPTION OF PROBLEMS TO BE ADDRESSED BY PROJECT

At present, Wisconsin has lost 47% of its original ten million acres of wetlands. Many of the remaining 5.3 million acres are in the northern third of the state (Wisconsin DNR 1990). In some southern Wisconsin counties, the amount of wetland loss is well over 75%. Wisconsin's losses are reflective of the national status of wetlands; it is estimated that one-half of the nation's original 221 million acres of wetlands have been lost (Feierabend 1992). The wetlands of Lake Koshkonong are riverine/lake fringe wetlands associated with several navigable bodies of water: Lake Koshkonong, the Rock River and several tributary streams. While these wetlands are not threatened by development, they continue to be threatened by wind and wave induced erosion, and high water levels. In addition, turbid water and lack of sheltered areas inhibit submergent and emergent plant growth, which contributes to continuing wetland losses. A review of aerial photography in the late 1980s by the WDNR found that approximately 52 acres of bank line had disappeared between 1950 and 1963. Further review discovered an additional loss of approximately 270 acres between 1963 and 1975.

The Mud Lake wetland complex is separated from Lake Koshkonong by only a thin shoreline which is currently being threatened by erosion from wind-wave and ice action. The project site has a direct hydraulic connection to Mud Lake and once breached, the physical connection to

7. Project Scope / Description

Lake Koshkonong will have significant water quality impacts to Mud Lake and a potential for large scale migration of carp, nutrients, sediment, and additional harm from wave action when the shoreline breaches. If the health of Mud Lake wetland complex is compromised, the wetland's ability to provide continued water quality benefits to Lake Koshkonong will certainly be reduced by at least 10%. This experimental project will help reinforce the existing embankment and create wetlands that were once lost, not to farming, but through erosion and provide a hydrologic restoration to the wetland shoreline by re-creating it. The newly re-created wetland would then be protected from future erosion with the creation of a breakwater along the shoreline. The wetland complex will be protected, providing continued water quality benefits for other habitat areas being managed for public benefit, such as Lake Koshkonong, the Rock River and other adjacent wetlands.

Photographs of the thin shoreline and break in protection separating Mud Lake from Lake Koshkonong.

Additional component of this project is the rebuilding of a carp exclusion gate in the channel to Mud Lake to keep roughfish from entering this area during spawning season while allowing navigation through a floating gate section. Two previous carp gates have been installed in the channel that have failed or proved short-term remedy. RKLD proposes to remove the two old gate structures and rebuild a new barrier with floating or swinging gate section with riprap protection up- and downstream of the barrier to protect it from erosion and maintain current channel geomorphology.

7. Project Scope / Description

Photograph of carp gat on September 9, 2010. The concrete block structure is in disrepair.

PROJECT GOALS AND OBJECTIVES

The goal of this project is to protect the water quality and ecological integrity of Mud Lake, a wetland complex adjacent to Lake Koshkonong. There are three main objectives that are proposed:

1. Protect the eroding wetland shoreline that could breach, which will be accomplished by creation of wetland areas with shoreline protection lakeward of the existing protected wetland area at the location of the shoreline erosion breaches shown in the above photographs;
2. Re-create shoreline wetland that has been lost to erosion in historic time creating a diverse wetland community
3. Replace carp gate in channel to Mud Lake to keep spawning carp out and allowing game- and pan-fish to Lake Koshkonong.

The wetland created will include emergent/wet meadow wetland community along the shore of the lake, and lakeward to the armored barrier. The following goals have been in the forefront in developing the wetland re-vegetation and restoration plan:

Floristic Diversity
The wetland area that will be created along the lake will replace the currently low quality shallow water lake bed containing sparse sago pondweed (Stuckenia pectinata). The goal for the wetland creation will be an emergent/wet meadow plant community.

7. Project Scope / Description

Wildlife Habitat
Wildlife habitat will be enhanced by the creation of a diverse wetland plant community that will be desirable by a wide variety of lake-dependent wildlife, bird and invertebrate species.

Fisheries Habitat
The fisheries habitat in the lake will be enhanced by the wetland plantings along the banks and the submergent and emergent plantings in the lake itself. Aquatic plants will also provide habitat for many species in the lake.

Aesthetics/ Education
The wetland will provide increased habitat for native vegetation and wildlife thereby providing additional observation opportunities for those visiting the site. Those who take pleasure in natural ecosystems and ecological restoration will appreciate the aesthetics provided by the wetland creation. This project will also provide educational and research possibilities for evaluation of its success for both the public and private sector.

METHOD AND ACTIVITIES

The project entails using dredged material from Lake Koshkonong to reinforce the physical barrier between Mud Lake and Lake Koshkonong. The dredged material will be placed behind a containment breakwater to build up and reinforce the thin shoreline separating Mud Lake and Lake Koshkonong and create additional wetland habitat. Access to the site is located at the end of Lamp Road through existing wetland area. Disturbance will be minimized with construction sequencing (wintertime construction) or placement of temporary stabilizing materials (timbermats). The placed material will be restored with wetland forbs, grasses and sedges. Monitoring of the restoration of the dredge placement site and establishment of wetland vegetation will provide valuable information in determining which shoreline protection techniques will work best in areas prone to intense wind-wave and ice action.

The project components include:

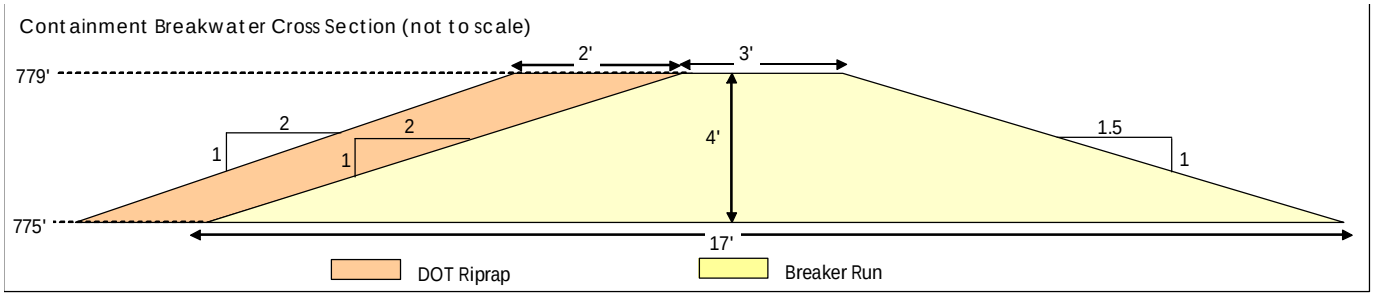
1. **Development of Construction Access**
   Access possibilities vary from utilizing frozen ground conditions, access via the frozen lakebed, to placement of stabilizing materials such as geotextiles with a rock surface or timber mats. All temporary materials placed in access locations will be removed at the end of the construction project and disturbed areas will be restored to their pre-construction state. Access specifics include:
   - Area: 0.5 acres
   - Length: 1,700 feet
   - Location: from the end of Lamp Road to the dredge placement site and carp gate

7. Project Scope / Description

2. Installation of a Containment Breakwater

Experience on Lake Koshkonong has shown that unprotected natural wetland shorelines will erode. Small breakwater projects in other parts of Lake Koshkonong have shown promise for expanding wetland shoreline vegetation behind the breakwater. Specifics include:

- Area: 0.27 acres
- Length: 550 feet
- Height: 4 feet, from approximately elevation 775' to elevation 779'
- Base Width: 21.5 feet
- Top Width: 7.5 feet
- Typical Cross Section: Breaker run core with 2 feet of heavy DOT riprap facing.

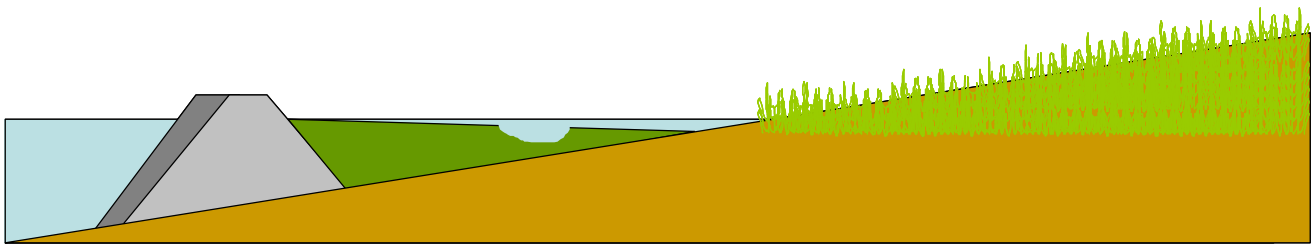


Containment Breakwater Design – Cross-Section

3. Wetland Area Creation

The material used to create the wetland areas behind the breakwater will be dredged at the end of a public boat launch (funded separately from this project). Dredge placement site is also in close proximity to the dredging site, which reduces temporary impacts during construction. Parameters of the wetland creation are:

- Area: 0.93 acres (the actual wetland creation is a little less than 1-acre but the Mud Lake wetland complex which this project will help protect is larger than 5-acres).
- Height: Fill to elevation 778' (~3-4 feet of fill in a ~550 by 120 foot area)
- Method: Mechanical Placement
- Erosion and Sediment Control: Containment Breakwater, Polymer



Schematic figure showing the wetland area creation behind the breakwater

7. Project Scope / Description

4. Restoration

The shoreland zone (landward from the riprap) will be seeded and planted with wetland forbs, grasses and sedges. No trees or shrubs will be planted and the species list includes low growth sedges, forbs and grasses so the riparian viewshed will not be impacted. A Class I Type B erosion control mat consisting of wood excelsior will also be placed in the shoreland zone during restoration.

Sediment Stabilization Wetland Mix:

Common Name	Scientific Name	Seeding Rate in oz./acre
Rice cutgrass	Leersia oryzoides	2
Fowl mannagrass	Glyceria striata	2
Woolgrass	Scirpus cyperinus	1
Fox sedge	Carex vulpinoidea	2
Joe-pye weed	Eupatorium maculatum	2
Blue vervain	Verbena hastata	2
Sneezeweed	Helenium autumnale	1
Marsh milkweed	Asclepias incarnata	2
Spotted touch-me-not	Impatiens capensis	2
* Canada wild rye	Elymus canadensis	24
* Side-oats grama	Bouteloua curtpendula	24

** Denotes native cover crop*

5. Carp Gate Installation

The proposed carp exclusion gate in the channel to Mud Lake will keep rough fish from entering this area during spawning season while allowing navigation through a floating gate section. RKLD proposes to remove two old gate structures and rebuild a new barrier with floating or swinging gate section with riprap protection up- and downstream of the barrier to protect it from erosion and maintain current channel geomorphology.

- Area: 0.13 acres (~1,000 square feet from gate installation and 0.10 acres of temporary disturbance from construction access)
- Location: Within the small channel connecting Mud Lake and Lake Koshkonong.

7. Project Scope / Description

DATA TO BE COLLECTED

A monitoring plan for the newly created wetland habitat area has been developed for the project for a minimum of three years. Quantitative observation and inventory of vegetation establishment in the newly created wetland habitat areas will take place twice per year so that modifications can be made accordingly to correct hydrology or to remove undesirable plant species. An annual monitoring report will be created and submitted to WDNR and USACE. The following data will be collected:

1. A vegetation map will describe the vegetation types observed during monitoring events. The established transect locations will be shown on the map. Dominant species within the project area will be identified. Representative photographs of the vegetation will be submitted.
2. An inventory of the total number of adventive and total native taxa will be established in each quadrat. The native mean C value, native FQA, and native mean wetness coefficient will be calculated in each transect.
3. The total number of taxa and native taxa will be inventoried for the entire realignment area. The native mean C, native FQA and native wetness coefficient will be calculated.
4. The native mean C value for each quadrat will be compared to the native mean C value for the entire transect as well as the entire site. If the native mean C value for any individual quadrat is significantly lower that the native mean C value for the transect, or the entire site, then corrective actions would be recommended for those areas.
5. The relative frequency (RFS) and relative coverage (RCS) will be calculated for each species.
6. Observations of other restoration features, such as hydrology or wildlife, will be noted during field sampling and reported.
7. The performance standards outlined in the USACOE document titled “Informational Notice Mitigation Guidelines and Requirements”, dated April 30, 1998 will be used to determine the success of the re-vegetation within the restored areas. ERC proposes that a performance standard of 50% cover for the first year, 65% cover for the second year; and 80% native plant coverage with less than 20% invasive plant coverage at the end of three years be used to evaluate success of the project.

In addition to observing the vegetative establishment in the new habitat areas, at the end of the monitoring period, a point-intercept survey of Mud Lake will be repeated to evaluate the condition in Mud Lake to verify the project goals have been met.

7. Project Scope / Description

EXISTING AND PROPOSED PARTNERSHIPS

Current partners include the Rock-Koshkonong Lake District as project sponsor, the Wisconsin Department of Natural Resources and the US Army Corps of Engineers which comprise of the Lake Koshkonong restoration and management plan team. Other partners include the shoreline property owner, the Twin Island Gun Club, Inc.

As this project moves forward, continued efforts to build a broad support for this project will includes involving the Lake Koshkonong Wetland Association, the adjacent property owners and users of Mud Lake, as well as other state interest groups such as the Wisconsin Waterfowl Association, the Wisconsin Wetland Association and Wisconsin Lakes.

DISCUSSION OF ROLE OF PROJECT IN PLANNING AND/OR MANAGEMENT OF LAKE

This project is the first step in the implementation of a large suite of restoration activities that the RKLD, along with the WDNR and the USACE have been working to put together in the last few years. Since many of these projects would require significant investment, the project team has determined that the best course of actions is to begin the lake restoration process with a smaller-scale, experimental project to learn how effective lake restoration techniques actually are. The Mud Lake Wetland Restoration Project is the first such experimental project. The results of this project will guide the implementation plan for the planned restoration activities for years to come and could proof to be a model wetland protection/shoreland restoration approach for other wetland areas on Lake Koshkonong, including the WDNR owned Koshkonong Wildlife Area, south of Mud Lake.

TIMETABLE

Construction will begin in late 2012 and will be completed within 6 months of starting construction.

Task	Estimated / Actual Completion Date
Permits received	May 2012
Final Engineering	June – August 2012
Assembling support and contract agreements	September - November 2012
Construction begins	December 2012
Construction completed	February 2013
Restoration	May 2013
Monitoring	May 2013 through September 2016

7. Project Scope / Description

PLAN FOR SHARING PROJECT RESULTS

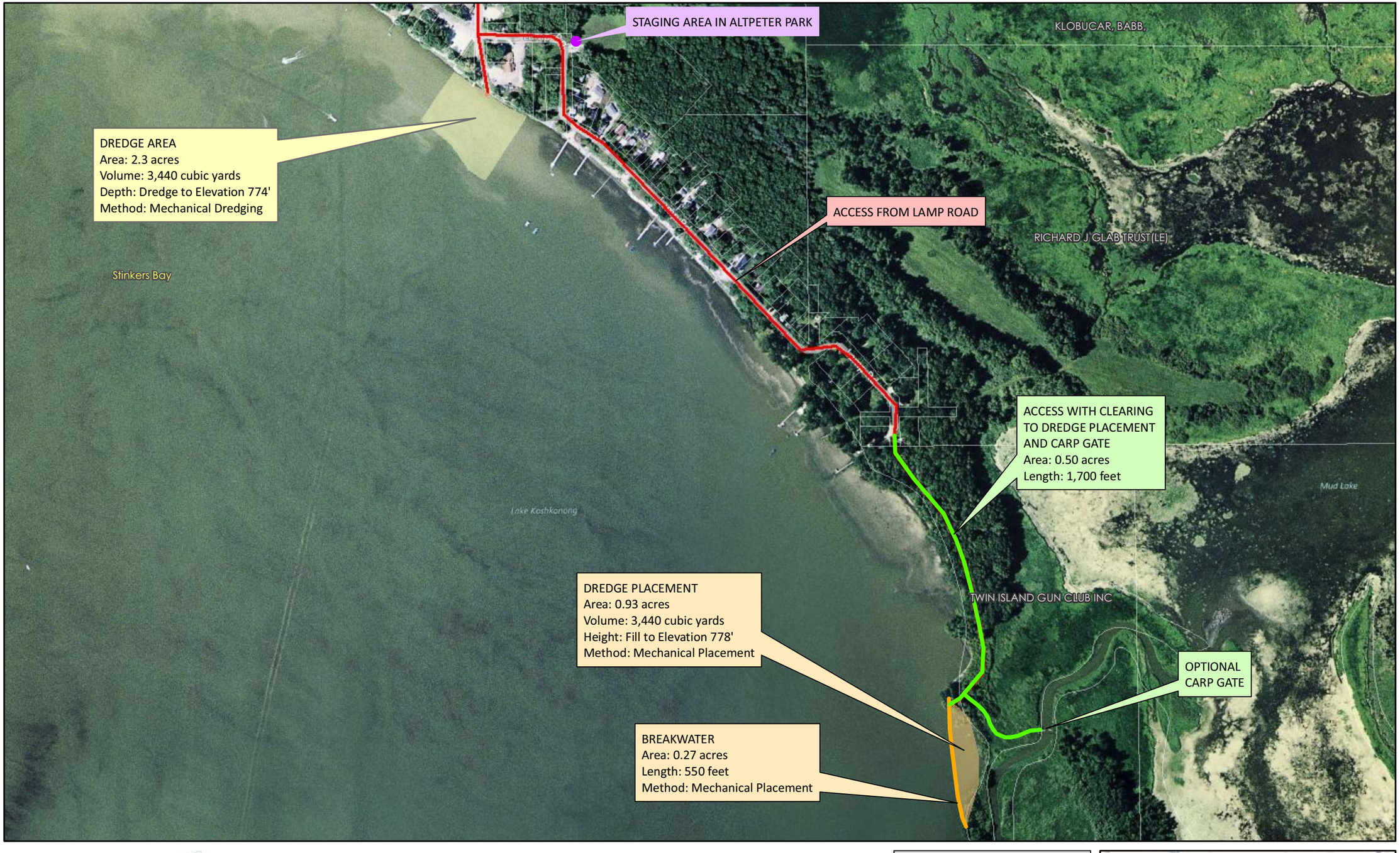
The Rock-Koshkonong Lake District is working closely with the WDNR and USACE to develop a comprehensive plan for the restoration of the lake. This experimental project is a key in finding sustainable methods for implementing some of the planned activities. As such, this project will be closely monitored to document what is successful and what failed for future construction activities. The following methods will be used to share the results among interested stakeholders and general public:

1. Project completion report will be compiled for RKLD, USACE and the WDNR. This will include a description of the construction methods used, what worked and what in the original plan was modified as well as a description of restoration activities. This report will be used as a learning tool to evaluate the best construction methods for future restoration activities on Lake Koshkonong.
2. Presentation on the construction project at the next RKLD annual membership meeting.
3. Educational campaign to teach lake users how to use the newly installed carp gate will be implemented in 2013.
4. Annual monitoring report will be compiled and distributed to WDNR, USACE, RKLD and adjacent property owners.
5. Monitoring results will be presented at the RKLD annual membership meeting.

C1. DEED, EASEMENT, OR LAND CONTROL AGREEMENT

NOTE: Forthcoming.

C2. PRELIMINARY ENGINEERING PLANS



RKLD
Rock-Koshkonong Lake District

Access from Main Road
Clearing
Dredging
Breakwater
Fill

Main Map Projection: Wisconsin State Plane South | Locator Map Not to Scale

DRAWN BY	CHECKED BY
DYL	JMH

MONTGOMERY ASSOCIATES:
RESOURCE SOLUTIONS, LLC
119 South Main Street | Cottage Grove, WI 53527
(608) 839-4422 | www.ma-rs.org

EXPERIMENTAL PROJECT
OVERVIEW MAP
Lake Koshkonong Restoration
Jefferson County, WI

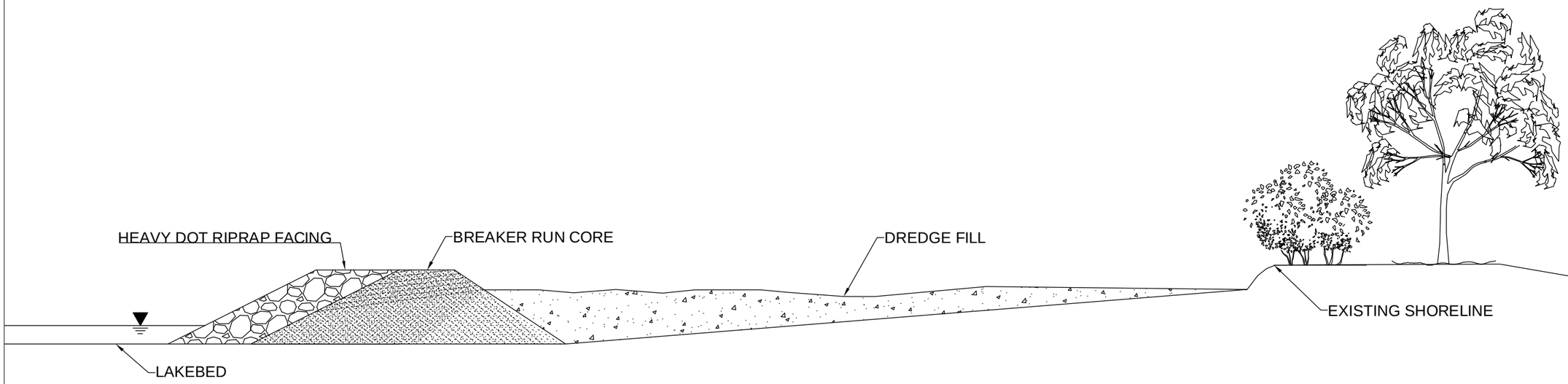
N
W E
S

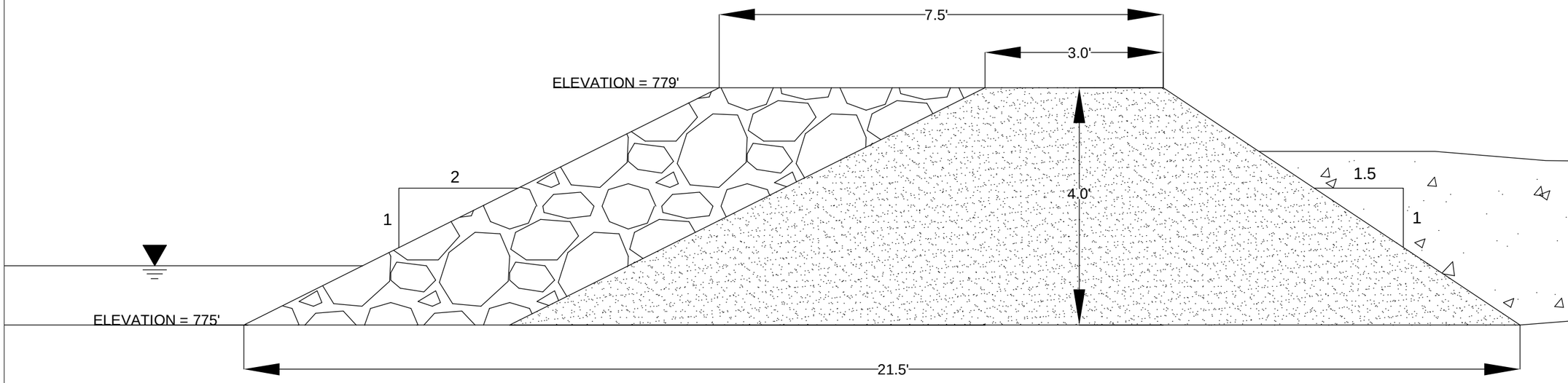
0 100 200 400 Feet
SCALE
1 inch = 400 feet

PROJECT NO.	DATE
1453	Feb 10, 2012

SHEET NO.

FIGURE A





DRAWN BY	CHECKED BY
DYL	JMH

NO.	REVISION / ISSUE	DATE

MONTGOMERY ASSOCIATES:
RESOURCE SOLUTIONS, LLC
119 SOUTH MAIN STREET
COTTAGE GROVE, WI 53527
www.ma-rs.org | (608) 839-4422

CONTAINMENT BREAKWATER
DETAILED CROSS SECTION

EXPERIMENTAL PROJECT
LAKE KOSHKONONG
JEFFERSON COUNTY, WI

ROCK KOSHKONONG LAKE DISTRICT

IF THIS BAR DOES NOT MEASURE 1"
THEN DRAWING IS NOT TO SCALE
0 ½ 1

SCALE
N.T.S.

PROJECT NO.	DATE
1453	05/26/11

SHEET NO.
1/1

P:\1453 RKLD - Lake Koshkonong planning 2009\Drawings\2011-05-26 Experimental Project Cross Section.dwg

C3. WATER REGULATORY PERMITS

NOTE:

1. **US Army Corps of Engineers have completed the public notice period (see attached) and are in the process of issuing the permit in the next days.**
2. **Wisconsin DNR will be issuing the water regulatory permits in the next few weeks.**

US Army Corps of Engineers
St Paul District

APPLICANT: Rock Koshkonong Lake District

Public Notice

ISSUED: 28, March 2012
EXPIRES: 26, April 2012

REFER TO: 2011-00258-SLM

SECTION: 404 - Clean Water Act
SECTION: 10 - Rivers and Harbor Act

1. APPLICATION FOR Department of the Army Permits under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act to conduct dredging, place structures, and discharge dredged or fill material in Lake Koshkonong and adjacent wetlands.

2. SPECIFIC INFORMATION

APPLICANT'S ADDRESS: Rock Koshkonong Lake District
374 E. Samuelsen Drive
Edgerton, WI 53534

PROJECT LOCATION: Sections 11 and 13, T. 5N., R. 13E., Town of Sumner, Jefferson County, Wisconsin.

DESCRIPTION OF PROJECT: Lake Koshkonong is a shallow 10,595-acre lake in Rock, Dane, and Jefferson counties in Wisconsin. Currently there are challenges with navigational access, an eroding shoreline and water quality problems. Multiple approaches and ideas are being considered to address an underlying need for managing and conserving natural resources on Lake Koshkonong while continuing to provide quality public recreation experiences for present and future generations. In order to generate reasonable alternatives for a larger, comprehensive management plan for Lake Koshkonong, a smaller scale, experimental project is proposed. The experimental project includes dredging 2.3 acres of the Lake Koshkonong lakebed at the public North Shore boat ramp in Stinkers Bay, in order to provide navigation access to lake residents and visitors. Dredging in this location also would allow access to monitor the rate at which new sediment accumulates in the dredged area. The dredged material will be used 1 mile away to reinforce the physical barrier between Mud Lake and Lake Koshkonong. Mud Lake is a high quality wetland that is in danger of becoming part of Lake Koshkonong due to the erosion of a thin area of shoreline that is currently protecting the Mud Lake wetland complex. Dredged material will be discharged in a 0.93 acre lakebed area behind a containment breakwater to build up and reinforce the thin area of shoreline separating Mud Lake from Lake Koshkonong. The containment breakwater would consist of 0.27 acres of fill material in the form of heavy DOT riprap, geotextile fabric, and breaker run stone core. This lakebed area will be seeded with a wetland seed mix, converting lakebed to wetland to create additional emergent/wet meadow wetland habitat, which will be maintained and monitored for a minimum of three years.

The proposed construction access route currently consists of an existing two-track roadway that extends approximately 1,700 feet south of the terminus of Lamp Road. Removal of approximately 10 trees will be required for sufficient access and include green ash, sandbar willow, and silver maple. Other species along the route include narrow-leaved cattail, smartweed, river bulrush, phragmites, reed canary grass and red osier dogwood. Removal of

woody vegetation is proposed within the access drive footprint, which will be approximately 12 feet wide. Vegetation cleared will be moved to an upland location for disposal. There will be no tree grubbing. The area is proposed to be reseeded with Canada wild rye in areas with less than 70% existing vegetation. In addition, an existing carp gate that is in disrepair and may be replaced. Placement of a new carp gate in a small channel that connects Mud Lake and Lake Koshkonong would impact 0.13 acres of the channel. The purpose is of the carp gates is to study the effectiveness of these structures on Lake Koshkonong. Placement of the carp gates may reduce the pathways for carp to enter Mud Lake.

The staging area for the project is in upland and is located at Altpeter Park, near the boat landing (see Figure A).

The proposed project objectives are to:

1. Determine how quickly dredged areas will fill;
2. Determine what type of sediment deposits in those dredged areas;
3. Determine the most effective way of dredging and placing sediment;
4. Determine if ice will affect the breakwater;
5. Determine the cost of maintenance for breakwaters;
6. Determine success of aquatic and emergent plant community restoration in the dredge placement areas; Determine if the diversities of structures, rock, sediments, and plants improve the biotic use of the near shore lake area;
7. Determine if carp gates allow boats in and out and still exclude carp.

QUANTITY, TYPE, AND AREA OF FILL:

The impacted aquatic resources are as follows:

1. Dredging – 2.3 acres of lakebed – Lake Koshkonong.
2. Discharge of dredged material – 0.93 acres of aquatic bed/open water.
3. Temporary construction access – approximately 0.5 acres in wetlands.
4. Discharge of fill material for containment breakwater – 0.27 acres of aquatic bed /open water.
5. Carp gate – 0.13 acres (1,000 square feet from the gate installation and 0.10 acres of temporary disturbance from construction access) located in a channel connecting Lake Koshkonong with the Mud Lake wetland complex.

SOURCE OF FILL MATERIAL: The applicant would use an existing commercial source for the fill material and also lakebed material.

SURROUNDING LAND USE: The land use surrounding the experimental project is wetland, lake use, commercial and residential properties.

DESCRIPTION OF STRUCTURE: Containment breakwater; the area of aquatic resource impact is proposed to be 0.27 acres. The length of the breakwater will be 550 LF. The height will be 4 feet from approximately elevation 775' to elevation 779'. The base width is proposed to be 21.5 feet and the top with will be 7.5 feet. The typical cross section will be breaker run core with 2 feet of heavy DOT riprap facing. Geotextile material will be placed underneath.

ALTERNATIVES CONSIDERED: Several alternatives are being considered including a no action alternative. Action alternatives being considered involve several variations in structure design, and variations in the degree and extent of dredging and filling. Maps showing alternatives being considered are attached.

THE FOLLOWING POTENTIALLY TOXIC MATERIALS COULD BE USED AT THE PROJECT SITE: Fuel, hydraulic fluid, lubricants, coolant and other fluids commonly used by construction equipment would be expected to be present for construction of the project.

THE FOLLOWING PRECAUTIONS TO PROTECT WATER QUALITY HAVE BEEN DESCRIBED BY THE APPLICANT: Application states erosion control and stormwater management plan approval would be required by appropriate agencies for this project. Turbidity barriers will be utilized at the dredge location to minimize the impact of suspended sediment. The dredge spoil disposal area has been designed to retain sediment so additional sediment control is not currently proposed.

MITIGATION: The applicant is not proposing compensatory mitigation as the project is designed to result in a net gain in aquatic resource function and value. The project is providing wetland/shoreline protection and degraded wetland restoration.

3. REPLIES/COMMENTS: Interested parties are invited to submit to this office written facts, arguments, or objections within 30 days of the date of this notice. These statements should bear upon the suitability of the location and the adequacy of the project and should, if appropriate, suggest any changes believed to be desirable. Comments received may be forwarded to the applicant.

Replies may be addressed to Regulatory Branch, Corps of Engineers, 20711 Watertown Road, Suite F, Waukesha, Wisconsin 53186.

Or, IF YOU HAVE QUESTIONS ABOUT THE PROJECT, call Stacy Marshall at the Waukesha office of the Corps, telephone number (262) 717-9540.

To receive Public Notices by e-mail, go to the St. Paul District web page at http://www.mvp.usace.army.mil/regulatory/ and sign up by clicking on

Email Notification of Public Notices

on the left side of the web site under Notices.

4. FEDERALLY-LISTED THREATENED OR ENDANGERED WILDLIFE OR PLANTS OR THEIR CRITICAL HABITAT. The project area is within the known or historic range of the following Federally-listed threatened (T) and endangered (E) species:

Species	Habitat
Whooping Crane – non-essential experimental population	Open wetlands/lakeshores
Eastern prairie fringed orchid	Wet grasslands

The United States Fish and Wildlife Service (USFWS) indicated that due to the project location, no federally-listed, proposed, or candidate species would be expected within the project area. No critical habitat is present. Further, they state that this precludes the need for further action on this project as required by the 1973 ESA, as amended. Any comments the USFWS may have concerning Federally-listed threatened or endangered wildlife or plants or their critical habitat would be considered in our final assessment of the described work.

5. JURISDICTION.

This application is being reviewed in accordance with the practices for documenting Corps jurisdiction under Sections 9 & 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act identified in Regulatory Guidance Letter 07-01. We have made an Approved Jurisdictional Determination that the aquatic resources that would be impacted by the proposed project are regulated by the Corps of Engineers under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899.

6. STATE SECTION 401 WATER QUALITY CERTIFICATION.

This Public Notice has been sent to the WDNR and is considered by the District Engineer to constitute valid notification to that agency for water quality certification. A permit will not be granted until the Wisconsin Department of Natural Resources has issued Section 401 certification.

7. HISTORICAL/ARCHAEOLOGICAL.

This public notice is being sent to the National Park Service, the State Archaeologist, the State Historic Preservation Officer, and interested tribal governments to determine any potential impacts to cultural resources as a result of the proposed work. Phase I archaeological investigations have been conducted within the proposed project area. No archaeological sites, cultural materials, or historic properties were identified as a result of the archaeological survey within any of the project areas. Initial consultation has occurred, and will be ongoing to ensure any potential impacts to resources are addressed in the permitting process. The Corps will consider affects to any resources pursuant Section 106 of the National Historic Preservation Act and in consultation with interested tribal governments and the States Historic Preservation Office.

Any unknown archaeological, scientific, or historical data could be lost or destroyed by the work described in the permit application. In the event that and historical or archaeological materials are encountered during the course of the project, all construction in the area of the discovery should be halted and appropriate coordination would occur.

8. PUBLIC HEARING REQUESTS.

Any person may request, in writing, within the comment period specified in this notice, that a public hearing be held to consider this application. Requests for public hearings shall state, in detail, the reasons for holding a public hearing. A request may be denied if substantive reasons for holding a hearing are not provided or if there is otherwise no valid interest to be served.

9. PUBLIC INTEREST REVIEW.

The decision whether to issue a permit will be based on an evaluation of the probable impact, including cumulative impacts, of the proposed activity on the public interest. That decision will reflect the national concern for both protection and utilization of important resources. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal will be considered, including the cumulative effects. Among those are conservation, economics, aesthetics, general environmental concerns, wetlands, cultural values, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production and, in general, the needs and welfare of the people. Environmental and other documents will be available for review in the Corps Waukesha Field Office.

The Corps is soliciting comments from the public; Federal, State, and local agencies and officials; Indian tribes; and other interested parties in order to consider and evaluate the impacts of this proposed activity. Any comments received will be considered by the Corps to determine whether to issue, modify, condition, or deny a permit for this proposal. To make this decision, comments are used to assess impacts on endangered species, historic properties, water quality, general environmental effects, and the other public interest factors listed above. Comments are used in the preparation of an Environmental Assessment and/or an Environmental Impact Statement pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

Todd Vesperman

Todd Vesperman,
Chief, SE Section

Enclosures

NOTICE TO EDITORS: This public notice is provided as background information and is not a request or contract for publication.

C4. MAP OF PROJECT LOCATION AND BOUNDARIES

NOTE: See 3 of C1 of this grant application.

The Lake Koshkonong/Mud Lake Wetland Restoration Project
Lake Management / Wetlands Restoration Grant Application

ATTACHMENTS

Mud Lake Aquatic Vegetation Survey
Summary Report
July 2010

Prepared for:

Rock-Koshkonong Lake District
374 E Samuelsen Drive
Edgerton, WI 53534

Prepared by:

Eco-Resource Consulting, LLC
409 Concord Drive
Oregon, WI 53575

INTRODUCTION

The Rock-Koshkonong Lake District (RKLD) has entered into a cooperative agreement with the U.S. Army Corps of Engineers and the Wisconsin Department of Natural Resources in the Planning Assistance to States program (PAS). As part of the PAS project and on behalf of RKLD, Eco-Resource Consulting (ERC), has conducted a baseline aquatic vegetation survey of the Mud Lake water resource adjacent to Lake Koshkonong, Jefferson County, Wisconsin. The purpose of the survey was to collect scientific data on this water resource for the planning process of the PAS and a Comprehensive Lake Management Plan and Environmental Assessment.

FIELD DATA COLLECTION

The Mud Lake aquatic vegetation survey was conducted by ERC staff on July 1 and 13, 2010. On July 1, 2010 the water level was 779.44 mean sea level (msl) and on July 13, 2010 the water level was 778.00 msl. Normal summer operating order maximum is 776.33 msl with a target level of 776.20 msl.

This means that the aquatic vegetation survey was conducted with water levels 1.8 to 3.2 feet above the normal summer levels allowing greater access to this shallow water area. This aquatic vegetation survey is the first conducted since RKLD was formed in 1999 and possibly the first point-intercept or transects method survey ever in Mud Lake.

ERC staff Steve Hjort and Stan Nichols conducted the survey using an 18 foot square-stern canoe with an electric trolling motor, paddles and a push pole. The canoe was launched on the north side of Blackhawk Island and navigated to Mud Lake via the access channel. ERC staff observed the carp gate in disrepair along the access channel. It appears that the majority of the concrete blocks are still in place with one or two tipped over and still visible under the water.

July 1, 2010

The first day of the aquatic vegetation survey was clear, with light northwesterly winds and about 76^{o} F for a high temperature. The water clarity in the Lake Koshkonong was less than two feet and green in color. In Mud Lake, the water clarity increased dramatically. When ERC staff reached about 100 yards into Mud Lake heading to the west the water clarity was very good with crystal clear conditions to the maximum depth of over six feet. Bottom sediments were visible at all locations throughout the survey. The bottom substrate was predominantly muck with isolated areas of sand. ERC staff started in the southern one-half of the lake and worked north (from smallest GPS point numbers to highest), completing 118 sample points in approximately 8 hours.

Numerous fish species were observed in the clear water including many minnow, pan- and game-fish species. Many of these fish were young of the year or two year old indicating nursery habitat was present. Panfish species such as bluegill and yellow perch were observed in loose schools of 10 to 50 individuals throughout the shallow lake. Large carp were also observed, usually in small groups of 2-5 fish or individuals loafing in the shallow water weedbeds. Very few large predator species were observed, however one impressive largemouth bass was seen first missing, then recovering to eat a frog that was knocked off of a lily pad. The complete fish species list is included in the following pages.

Numerous birds were also observed and some were still nesting including black terns. The tern eggs were mottled brown in color and lay atop bog fragments. One hatchling was observed atop a bog fragment. A small flock of white pelicans were roosting or loafing on the lake but it was not determined if they were actively nesting or protecting broods. No young pelicans were seen. A flock of 25 or more sandhill cranes were using an area in the north-central portion of Mud Lake and took flight when the canoe came close to their resting place Various other waterfowl including swans were observed but at a distance so that positive identification was not determined except for Canada geese.

July 13, 2010

The second day of the survey was clear with light westerly winds and air temperatures around 80^{o}F in the afternoon. The water level was down by about one foot from July 1st but access was still very good. The water was very clear with some algae bloom by midday due to warm water and air temperatures. The second visit allowed the ERC staff to complete the PI survey. One purple loosestrife plant was observed beginning to flower near the access channel and ERC removed the plant. Other non-native species observed were narrow-leaved cattail (*Typha angustifolia) and* giant reed *(Phragmites australis).*

Similar observations were made on this second field day on Mud Lake with respect to wildlife and fish species.

Statistical Analysis

Field data were analyzed using Wisconsin Floristic Quality Assessment software (WDNR, 2010). The data indicate that 228 sites were sampled with 226 containing aquatic macrophytes. The maximum depth of plant growth relative to the water stage was 5.8 feet. All 228 sites were at or less than the maximum depth of rooted plants. The frequency of occurrence of sites shallower than maximum depth of plants was 99% meaning that almost all of the sites sampled contained aquatic macrophytes and that depth of water was not a limiting factor in plant growth.

By far the most common and dominant species in Mud Lake were *Ceratophyllum demersum* (frequency 93%, relative frequency 32%), *Lemna minor* (frequency 79%, relative frequency 28%), *Stuckenia pectinata* (frequency 65%, relative frequency 22%), and *Nymphea odorata* (frequency 34%, relative frequency 12%) in Table 1. Filamentous algae was also found at 73% of the sampling points.

The calculated Simpson Diversity Index is 0.75 with a value of 1.00 being an optimal measure of plant diversity. The average number of species per site including native species was 2.84. The species richness is a total number of species sampled or observed (includes visuals) and for Mud Lake is 18. The calculated Mean C is 4.6 and the FQI is 14.5.

The data indicate that Mud Lake is a relatively diverse aquatic ecosystem that has a modest number of species but that they have a moderate to high coefficient of conservatism and above average FQI for southern Wisconsin.

The following lists were complied of all species observed during the Mud Lake Aquatic Vegetation Survey on July 1 and 13, 2010.

Plant species list

Coontail (*Ceratophyllum demersum*)
Sago pondweed (*Stuckenia pectinata*)
Bladderwort (*Utricularia vulgaris*)
White waterlily (*Nymphea odorata*)
Yellow waterlily (*Nuphar variegata*)
Marsh milkweed *(Asclepias incarnata*)
*Common reed (*Phragmites australis*)
*Narrow-leaved cattail (*Typha angustifolia*)
Broad-leaved cattail (*Typha latifolia*)
Sessile-fruited arrowhead *(Sagittaria rigida*)
Common arrowhead (*Sagittaria latifolia*)
Water smartweed (*Polygonum natans*)
* Purple loosestrife *(Lythrum salicaria*)
Soft-stem bulrush (*Scirpus validus*)
River bulrush (*Scirpus fluviatilis*)
Wild-rice (*Zizania aquatica*)
Least spikerush *(Eleocharis acicularis*)
Duckweed *(Lemna minor*)

* indicates non-native species

Fish species list

Common Carp (*Cyprinus carpio*)
Northern pike (*Esox lucius*)
Bluegill (*Lepomis macrochirus*)
Largemouth bass (*Micropterus salmoides*)
Crappie *(Pomoxis nigromaculatus*)
Sheepshead (*Aplodinotus grunniens*)
Perch (*Perca flavescens*)
Yellow bullhead *(Ameiurus natalis*)
Channel catfish *(Ictalurus punctatus*)

Other Wildlife

Black tern (*Chlidonias niger*)
White pelican (*Pelecanus erythrorhynchos*)
Sandhill crane (*Grus canadensis*)
Swan (*Cygnus sp*.)
Dragonfly (*Anisoptera*)
Damselfly (*Zygoptera*)
Snapping turtle (*Chelydra serpentina*)
Canada goose (Branta canadensis)

TABLES

Literature Cited

Hauxwell, J., S. Knight, K. Wagner, A. Mikulyuk, M. Nault, M. Porzky and S. Chase. 2010. Recommended baseline monitoring of aquatic plants in Wisconsin: sampling design, field and laboratory procedures, data entry and analysis, and applications. Wisconsin Department of Natural Resources Bureau of Science Services, PUB-SS-1068 2010. Madison, Wisconsin