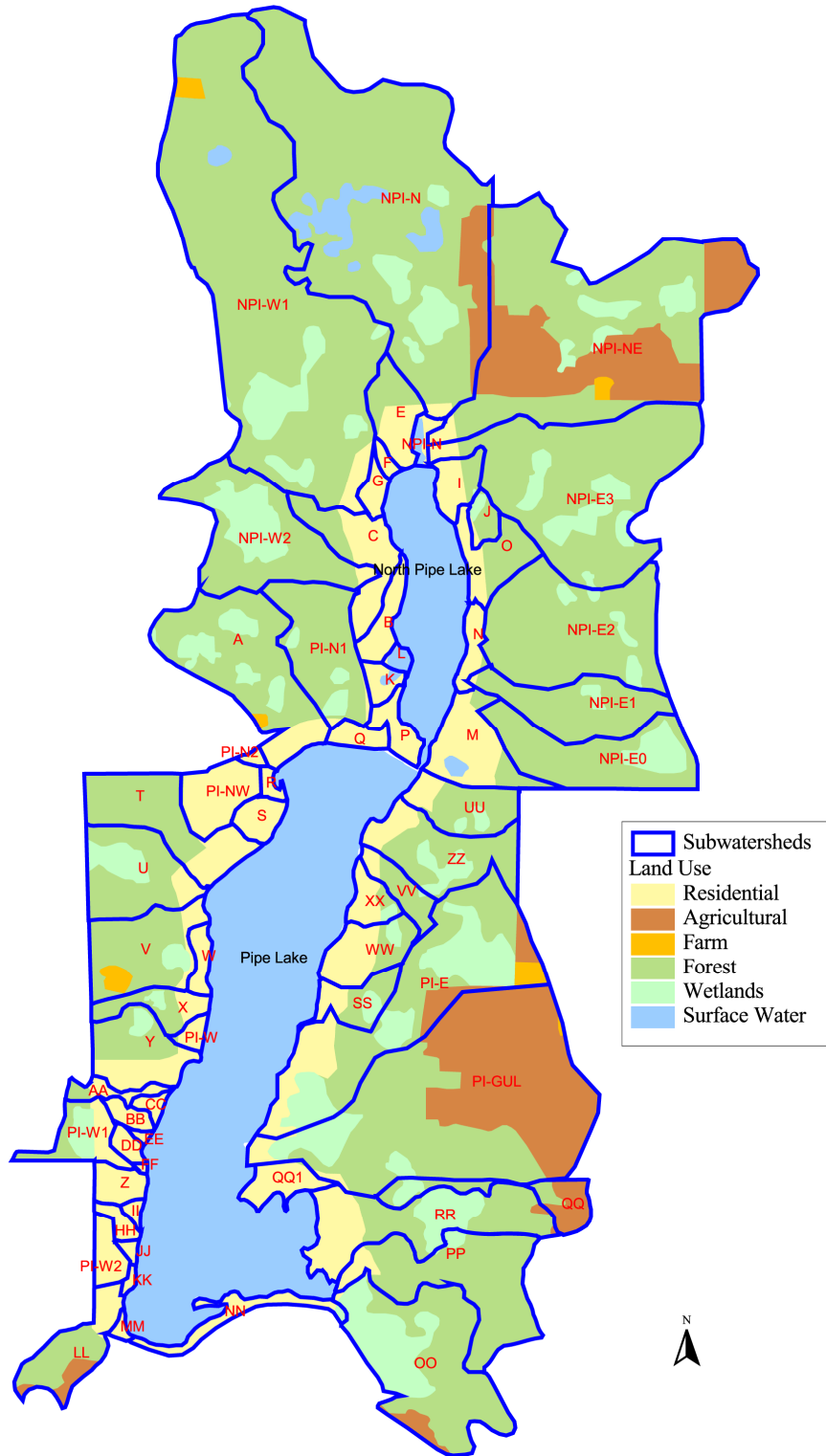


5-Year Lake Protection Action Plan Pipe and North Pipe Lakes

February 2, 2009



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Why Adopt a Lake Protection Action Plan?

For many centuries prior to about 150 years ago, the Pipe Lakes and their shorelands changed slowly and only slightly. Natural forces, like wind and rain, caused all the changes back then. Changes at the Pipe Lakes sped up and became more pronounced after European immigrants appeared on the scene in the later 19th century. The first major change by humans was logging, followed by farming, and more recently by building around the lakes' entire shores. Today, this modification of the land continues along the shores and in the outer-watershed. These changes have provided many economic and lifestyle benefits - roads, utilities, jobs, recreation opportunities, etc.

Strong evidence is evolving, however, that some of our activities around lakes contribute to loss of lake clarity, nature's beauty, and wildlife. Most of the structures we build increase the amount of water that flows to the lakes because less of the rain and snowmelt can soak into the ground. This increased flow to the lakes brings more nutrients and sediments to the lakes. Clearing and leveling of the land around our buildings and along the shores also contribute to increased nutrient and sediment flow to the lakes when a rain event occurs because the land loses some of its absorbing capability. Increased wave action from motorized watercraft can re-suspend sediments along the shore. Overloading the land with fertilizer adds still more nutrients to the lakes when runoff occurs. Excess nutrients, such as phosphorus, and suspended sediments in the lakes decrease clarity. Building, clearing, and leveling removes habitat for wildlife and often provides opportunity sites where invasive species can begin to thrive. The loss of water quality, natural beauty, and wildlife tends to go on for decades before it becomes generally bothersome. Reversing this loss can take even longer and may not even be possible. Preventing these losses is usually much easier than trying to reverse them.

The District surveyed the property owners in 2008 to determine their level of interest and concern about protecting or enhancing the lakes' and their watershed. A majority of 64 percent of the respondents supported implementing an action plan to protect the lakes for the future. Strongest interest was for actions to avoid invasive species, to protect water quality, to protect wildlife habitat, and to protect nature's beauty. These actions will make the lakes more enjoyable while enhancing property owner's investments. As a result, a 5-Year Lake Protection Action Plan to correct or compensate for the losses mentioned above is proposed in this document. This Lake Protection Action Plan consists of a series of practical measures to preserve the quality of both lakes while improving the clarity of North Pipe Lake. This Plan is to be funded and implemented through a joint effort of property owners, government agencies, and non-profit groups.

This Lake Protection Action Plan does not stand alone. Through a monitoring program started in 1998, 3 planning grants, several additional studies, and numerous citizen interactions, the lake community has evolved a strategic plan for management of the lakes for the next 10 years. The District Board of Commissioners adopted a Communication Action Plan in January, 2008 to increase the effectiveness of Lake District communications with all key constituencies. [See Appendix 2 for historical

document references.] This Lake Protection Action Plan document completes the third planning grant and compliments the earlier planning by describing the main action steps the District intends to take over the next 5 years to manage the long-term quality of the lakes.

Description of the Lakes

The Pipe Lakes consist of 296-acre Pipe Lake and 66-acre North Pipe Lake in the Upper Apple River Watershed in Polk County, Wisconsin. North Pipe Lake collects surface water run-off from the northern region of the lakes' watershed. North Pipe Lake has an outlet which flows to Pipe Lake. Pipe Lake's watershed is 2070 acres which includes North Pipe Lake's watershed of 1106 acres. Both Lakes have most of their shoreline developed with private cabins and homes. Both lakes' watersheds remain largely forested with a smaller portion in agriculture. The only known invasive species present in the lakes or on their shoreland are Reed Canary Grass and the Chinese Mystery Snail.

Pipe Lake is designated an Outstanding Water Resource by the State of Wisconsin. The Pipe Lake shoreland varies from undisturbed forest to urban-type lawns to bare-soil banks. Its May-September Secchi clarity depth averages about 16 feet. This lake has a watershed land to lake area ratio of 7 to 1. This relatively small ratio helps maintain Pipe Lake's clarity. Furthermore, because more than half of the run-off from Pipe Lake's watershed land first flows through North Pipe Lake, nutrient absorption in North Pipe Lake reduces nutrient flow to Pipe Lake. This absorption is likely a significant contributor to Pipe Lake's historical exceptional clarity.

North Pipe Lake has an average May-September Secchi clarity of 7.4 feet. It is mildly eutrophic and enjoys a mostly forested watershed. In the summer, the near-shore area still has an aesthetic feel of being within a forest because building structures are mostly set back at least 75 feet and native plant removal has been limited to only a few parcels. With a land to lake ratio of almost 17 to 1, North Pipe Lake is susceptible to degradation by nutrient loads from surface run-off from its outer-watershed.

Guiding Factors

- ◆ The information assembled to date indicates that phosphorus in surface runoff is the dominant controller of lake clarity for both lakes. Zooplankton grazing of algae may help maintain Pipe Lake's clarity. North Pipe Lake has significant internal phosphorus recycling from the sediments. However, the phosphorus delivered to the top waters from the bottom waters of the lake during spring turnover is believed to be small relative to phosphorus from surface runoff. Recycling during the growing season does not usually dominate the clarity level because of strong temperature stratification. This summer stratification helps keep phosphorus, released from the sediments, in the bottom waters of the lake where algae cannot grow.
- ◆ Residential land surrounding the lakes plus the agriculture land make up 25% of the watershed area. Through conservation practices, these lands have the most potential for decreasing the phosphorus load to the lakes. The other 75% of the Pipe Lakes watershed is forested with wetlands. In this forested area, stabilization

of some of the stream banks have potential to decrease phosphorus and sediment delivered to the lakes.

- ◆ Because the 2 lakes differ markedly in characteristics, optimal management actions will not always be the same for both lakes. For example, North Pipe Lake may be affected more by unnatural waves from motorized watercraft because of its narrower width and smaller area. Another example is that Pipe Lake may be more sensitive to phosphorus runoff from the shoreland because its area is a larger percent of the effective watershed. Pipe Lake also has a greater percent of shoreline needing natural protection.
- ◆ Phosphorus loading from northeast sub-watersheds of North Pipe Lake seems excessive. Management recommendations to date are inadequate to tell what specific actions to take.
- ◆ Only a few undeveloped lots remain on either lake. Maintaining habitat for fish and other wildlife near the shore over the long-term is an important concern to the community. In order to minimize negative effects on the lakes from further development, the District intends to develop working relationships with Johnstown Township and Polk County in planning and zoning for the future.
- ◆ The aquatic plant diversity is far above average in both lakes. No invasive species are known to exist in and on the shores of the Pipe Lakes, except for Reed canary grass and the Chinese Mystery Snail.
- ◆ To make visible progress in protecting or enhancing the lakes by implementing this Plan, financial support from the DNR and volunteer participation are vital. Additional funding partners are also important to the Plan's success. [See Plan Expense Estimates at the end of this report]
- ◆ Most of the estimated expenses in this Plan are based on the recent planning grant study by Cedar Corporation. The emphasis of Cedar Corporation's study was northeast of North Pipe Lake, east central of Pipe Lake, and the shoreland as observed from the lakes.

Plan Objectives

This Action Plan summarizes projects for the next 5 years to:

- ◆ Protect water quality of Pipe Lake. Reduce the phosphorus load to North Pipe Lake by 15 percent.
- ◆ Enhance wildlife habitat around and in Pipe Lake. Protect wildlife habitat around and in North Pipe Lake.
- ◆ Prevent entrenchment of invasive species.

Planned Management Actions

1. Lake Protection Education

To be effective, lake protection needs active participation by the lake organization, by the individuals that use the lake, and by other governmental units. A key

strategic direction identified in the District's 10-Year Strategic Plan is to educate, motivate and sustain support from shoreland owners, visitors, community leaders, and public officials. This 5-Year Lake Protection Action Plan will include the following educational components:

- ◆ Mailings of educational materials to District members and local officials
- ◆ Small group guidance meetings led by District leaders and lake management professionals
- ◆ Reports to local government units - town, county, regional

2. Monitoring Studies

Volunteers will perform all monitoring studies proposed. The District will attempt to have 3 trained volunteers for each monitoring function.

a. Lake Clarity Characteristics

Clarity monitoring will consist of Secchi disk measurements every 2 weeks from May through October 15th at the deep-hole location for each lake.

In addition to Secchi depth, the following measurements and sampling at the deep-hole locations for each lake are planned:

Surface and bottom total phosphorus once a month May-September and during spring and fall overturn every 3 years

Surface chlorophyll once a month June-August

Dissolved oxygen profile at the same time phosphorus is sampled

Temperature profile at the same time phosphorus is sampled

b. Major Stream Sampling

Grab samples during approximately 5 runoff events from the following intermittent streams will be analyzed for total phosphorus: NPI-W1, NPI-N, NPI-NE, NPI-E3, NPI-E2, and PI-GUL.

c. Enhanced Stream Monitoring

The total phosphorus concentration in the North Pipe Lake stream NPI-NE has been much higher than other streams that drain to the Pipe Lakes. To help determine the source of this high phosphorus load and if a retention structure would be beneficial, the flow rate, total phosphorus, soluble reactive phosphorus, nitrogen, and suspended solids will periodically be measured in this stream, its tributaries, and reference streams over the next 2 years. This enhanced monitoring will seek to answer the following questions and will be coordinated with the engineering study mentioned later in section 5d to investigate viability of a retention basin in this area.

What % of the nutrients in NPI-NE comes from the north side of 230th Avenue? What are the major sources of the phosphorus load north of 230th Avenue in the NPI-NE sub-watershed?

How much larger is the phosphorus load delivered to the lake by NPI-NE than by the other main streams draining to North Pipe Lake?

Will large-scale projects such as swales, dry ponds or wet ponds be effective in reducing nutrients in the NPI-NE stream?

If the above enhanced monitoring is successful, a similar study may be employed for PI-GUL, the main agriculture sub-watershed for Pipe Lake.

3. Shoreland

Development tends to decrease the natural habitat near the shore, habitat that is important for survival of many wildlife species. Development around Pipe Lake has been roughly estimated to have increased the phosphorus delivered to the lake by more than 15%. About a third of Pipe Lake's near-shoreland is unprotected with natural vegetation while ten percent of North Pipe's near-shoreland is unprotected. Pipe Lake would benefit the most from restoring land near the shoreline with natural vegetation. Both lakes would benefit from reducing run-off from upland areas.

Nearly half of the respondents in a 2008 survey of property owners indicated they would like to investigate installation of a water quality protection landscape practice on their property. As a result the District would like to create an incentive program to encourage implementation of these practices. The program would offer nearly free design services on landscaping for water quality. Cost sharing incentives would be offered for materials and labor to restore natural areas or install compensation practices to reduce runoff. The targeted outcome of the incentive program will be to increase the protected shoreland from about 67% to 80% on Pipe Lake.

The incentive program will consist of 4 categories. Three categories are described below. The 4th category (tree-falls) is described under In-Lake Projects in the next section.

a. Technical Assistance.

Up to \$350 provided to each of 75 property owners if they pay the first \$25. The \$25 payment would be refunded if the owner participates in one of the other project categories. Technical assistance will be by professionals who can demonstrate qualifications in landscaping for water quality to the District. Technical assistance will be allowed anywhere in the shoreland or littoral zone.

b. Installation and Materials within the 35-ft Buffer Area

Owners pay 25% of project expenses up to \$3000 and 100% for all project expenses above \$3000. The maximum funding by the District (with help from a protection grant) will, therefore, be \$2250. The District hopes to fund at least 10 buffer restoration projects. The technical assistance in category (a) above will not be included in calculating project expenses. Within the 35-ft buffer area, DNR funding will require a perpetual conservation covenant.

c. Installation and Materials behind the 35-ft Buffer Area

Owners pay 50% of project expenses up to \$3000 and 100% for all project expenses above \$3000. The maximum funding by the District (with help from a protection grant) will, therefore, be \$1500. The District hopes to fund at least 25 of these upland projects. The technical assistance in category (a) above is not included in calculating project expenses. Behind the 35-ft buffer area, a 10-year agreement to remain in place will be required and administered by either the District or the County.

4. In-Lake Projects

In-lake projects will focus on protecting the near-shore zone of the lakes. Protecting habitat in this littoral zone through the projects below and through decreasing sediment flow to the lakes by buffer strips mentioned earlier are critical to maintaining a healthy wildlife community.

a. Invasive Species

The District started a 5-year aquatic invasive species grant in 2008 which pays 75% of the cost to provide 200 hours of boat landing education and watercraft inspection under the DNR Clean Boats, Clean Water program. The District intends to continue this program under this Lake Protection Plan.

The grant mentioned above also pays 75% of the cost for professional underwater surveillance near the official boat landing and at a location along the south side of Pipe Lake where watercraft loading and unloading occasionally takes place.

The District will devise an action plan for periodic whole-lake surveillance and how to respond should invasive species be found in or near the lakes.

b. Tree-falls

Woody habitat in the water along the shore is known to be important for maintaining a healthy environment for fish and wildlife. Eleven property owners in the 2008 survey indicated interest in tree-falls in the water along their shore to provide wildlife habitat. Installation of tree-falls will be encouraged through the following incentive program:

Owners pay 25% of project expenses up to \$2000 and 100% for all project expenses above \$2000. The maximum funding by the District (with help from a protection grant) will, therefore, be \$1500. The District hopes to fund at least 4 tree-fall projects. The technical assistance in category (3a) above will not be included in calculating project expenses. A 10-year agreement to remain in place will be required and administered by either the District or the County.

c. Critical Habitat Areas

The previously designated sensitive areas (See Document History in the Appendix) will be reviewed with the DNR to assess if protective actions are needed.

d. Aquatic Plant Survey

Plans are to complete an aquatic plant survey according to Wisconsin DNR guidelines in 2012.

5. Outer-Watershed

Planning grant work in 2007 by Cedar Corporation on the outer-watershed focused in the area northeast of North Pipe Lake and east-central of Pipe Lake. This focus was the result of earlier observations that the intermittent streams in those areas average higher phosphorus concentrations than the other streams draining the watershed. Most projects proposed below are recommendations for these areas. In other parts of the outer-watershed, areas of concern will be monitored during the 5 year period of this Plan. Improvement in these other areas will be arranged in the following years unless a critical problem is discovered.

a. Road Construction and Maintenance

To minimize sediment in run-off associated with both public and private roads, the District plans to promote repair of culvert installations that show erosion is occurring or have potential to occur. Optional cost sharing will be encouraged for private roads.

(1) Recommendations for Sub-watershed Focus Areas

East culvert outlet protection repair on 230th Avenue (North Pipe NPI-NE)
Culvert replacement on 20th Street (North Pipe NPI-NE)
Monitor ditches along private road regraded in 2008. Repair erosion as needed.(Pipe PI-GUL)

(2) Other watershed areas

The District will inspect all culverts draining to the lakes and arrange for any critically needed repairs.

b. Stream Bank Stabilization

The District will contact the Polk County Land and Water Resources Department for guidance in the following stream bank restoration areas.

(1) Recommendations for Sub-watershed Focus Areas

Upstream and downstream from 20th Street (North Pipe NPI-NE)
At the outlet side of culvert in 20th Street (North Pipe NPI-NE)
Monitor swale constructed in 2008. Repair erosion as needed. (Pipe PI-GUL)
Up and downstream from logging road (Pipe PI-GUL)

(2) Other watershed areas

Monitor NPI-E3. If a critical problem exists, implement corrective actions.
Inspect any other stream of concern and determine action to take.

c. Farm Management Practices

The agricultural areas of the watershed are located mainly in sub-watersheds NPI-NE and PI-GUL. Based on average landuse export coefficients, about 25% of North Pipe Lake's phosphorus load comes from areas designated as agricultural. About 15 % of Pipe Lake's phosphorus load comes from its agricultural area. The District plans to work with the agricultural land owners to encourage practices that minimize nutrients from agriculture activities from entering the lakes. This effort will consist of developing a "working together" relationship with the land owners and utilizing governmental support from sources such as Polk County, the State of Wisconsin, and Federal Agencies.

d. Phosphorus Retention Projects

Projects recommended by Cedar Corp in the 2007 planning grant report for the next 10 years included working with the agriculture land owners on farm plans, acquiring easements for critical areas, correcting culvert problems, repairing stream bank erosion, and encouraging shoreland runoff reduction. These efforts are very important and are largely included in this 5-Year Plan. However, the District has concluded that these projects alone are unlikely to accomplish the objectives stated earlier. Although Cedar Corp recommended waiting at least 10 years to consider a retention structure, by including such a structure northeast of North Pipe Lake, good potential exists to accomplish the objectives of this 5-Year Plan.

During this 5-Year Plan, nutrient retention structures will be pursued for North Pipe Lake. Modeling calculations estimate that a retention basin for the NPI-NE sub-watershed could reduce the phosphorus load to North Pipe Lake by 15-20%. A retention basin for North Pipe Lake will benefit Pipe Lake because North Pipe Lake's outflow is into Pipe Lake. Total phosphorus concentrations measured in grab samples from the NPI-NE stream over the last 8 years averaged more than 400 ug/l, higher than for any of the other 7 main intermittent streams flowing to the lakes. The District's second planning grant report by Blue Water Science recommends watershed work if the flow-weighted mean concentration exceeds 150 ug/l. Searching for the main sources for the high phosphorus concentrations will be an important part of the first years of this Plan. See also section 2c where plans are described to better understand the nutrient load from sub-watershed NPI-NE. A potential location for a retention basin has been identified northeast of the eastern culvert which drains across 230th Avenue. Based on preliminary investigations with the Polk County Land and Water Resources Department, an engineering study will be necessary to more completely establish the viability of constructing a retention structure in this location. This study would include soil permeability analyses, survey work to establish sub-watershed boundaries, tributary stream sampling to help identify the nature and sources of nutrients in surface runoff, and, if needed, finding alternate locations to install nutrient retention practices.

Cedar Corp also recommended long-term consideration of a nutrient retention structure for the PI-GUL sub-watershed, east of Pipe Lake. A nutrient retention

structure for this area has not been included in this Plan because lake data and modeling analysis have not shown potential for noticeable lake quality improvement and because the land owner introduced in 2008 many of the Cedar Corp recommendations for the PI-GUL sub-watershed. The logging road, which has functioned to slow runoff during a major runoff event by damming up a natural pond area before flowing through culverts in the logging road, was stabilized. This project added a 3rd culvert and a low-slope overflow region. Although this is not an ideal solution, it should help preserve the nutrient and sediment retention capability of the wetland downstream and provide a measure of nutrient retention in the pond. The owner also introduced swales prior to the PI-GUL channel to slow the runoff velocity in these areas. These modifications to the PI-GUL sub-watershed will be monitored, and repaired as needed, as vegetation re-establishes.

Plan Expense Estimates

Estimated expenses for the projects described above are summarized below. These expenses are based on project estimates in the recent planning grant report, on historical monitoring expenses, recent contractor estimates, and on the Wisconsin DNR protection grant program requirements. The Total Plan Expense table includes all projects in this Plan. The Protection Grant Expense table includes only items proposed for funding from a DNR Protection grant. For example, the Protection Grant Expense table does not include expenses currently funded by the aquatic invasive species grant, by the Citizens Lake Monitoring Network, or by the District for routine lake/stream sample analyses. A scenario for project timing and payments is provided in the Appendix.

5-Yr Total Plan Expense Summary	
Project Type	Expense Range (dollars)
Education	3000 - 4000
Outer-watershed	120000 - 139000
Shoreland	102000 - 119000
In-Lake	25000 - 29000
Monitoring	13000 - 15000
Total for all projects	263000 - 306000
Amount from grants	192000 - 223000
Donated value	14000 - 16000
District responsibility	57000 - 67000

5-Yr Protection Grant Expense Summary	
Project Type	Expense Range (dollars)
Education	3000 - 4000
Outer-watershed	120000 - 139000
Shoreland	102000 - 119000
In-Lake	15000 - 17000
Monitoring	6000 - 7000
Total for all projects	246000 - 286000
Amount from grant	185000 - 200000
Donated value	11000 - 12000
District responsibility	51000 - 59000

Further Lake Protection Planning Considerations

A few aspects important to lake protection are not directly included in this Plan because they need further investigation before taking action. These are mentioned below to indicate that the District recognizes their importance for long-term lake health, and may need to be addressed as action steps during the 5-year period of this Plan and beyond.

1. The Rest of the Outer-watershed

The focus in the outer-watershed in this Plan is the same as in the 2007 planning grant work by Cedar Corp. The 2007 grant work investigated only the sub-watersheds northeast of North Pipe Lake and east-central of Pipe Lake because they have been contributing a larger portion of phosphorus to the lakes than the other sub-watersheds for the lakes. Protection work investigation is likely to be needed in the future in the other sub-watersheds also.

2. Recreation - Safety & Sharing of the Lakes

Because the number and size of watercraft continues to increase, promoting safe and respectful operation of recreational equipment in a manner that minimizes degradation of both the land and water is an important responsibility of the District. The District, therefore, will promote conformance to existing laws, good common sense use of this equipment where laws do not exist, and further investigation on the best next steps to take.

3. Land Conservation

In its planning grant report, Cedar Corp recommended conservation easements for potential control structures, stream corridors, wetlands, and other natural spaces. Preservation of critical watershed land for the long-term benefit to the lake community is important to the District's value as a natural recreation and residential area. The District intends to encourage private conservation easements, creation of a conservancy organization, and when necessary hold easements for critical lands.

Appendix

1. Protection Grant Estimated Payable Expense and Timing

(a scenario example)

		Payable Expense Estimate*	Expense per Year				
			1	2	3	4	5
Lake Protection Education							
	Mailing materials	500	100	100	100	100	100
	Support for small group guidance meetings	2000	500	500	500	500	
Road Construction and Maintenance							
	Culvert outlet protection on 230 th Avenue (North Pipe NPI-NE)	350	350				
	Culvert replacement on 20 th Street (North Pipe NPI-NE)	3000	3000				
Stream Bank Stabilization							
	Downstream from 230th Avenue (North Pipe NPI-NE)	5500			5500		
	At the outlet side of culvert in 20 th Street (North Pipe NPI-NE)	1700	1700				
	Upstream and downstream from logging road (Pipe PI-GUL)	5000		5000			
	Sub-watersheds not included in 2007 planning grant studies	4000		2000	2000		
Farm Management Practices							
	Provide support for improved farm management practices	500			500		
Phosphorus Retention Projects							
	Northeast of North Pipe Lake	100000	3000	3000	6000	13000	75000
	East-central of Pipe Lake	5000		2500		2500	
Shoreland Buffers							
	Technical assistance	26250	8750	8750	8750		
	Buffer zone restoration and tree-falls (materials & installation)	30000	7500	7500	7500	7500	
	Residential area practices (materials & installation)	50000	12500	12500	12500	12500	
In-Lake							
	Tree-falls	8000					
	Aquatic plant survey	6000			6000		
	Invasive species contingency plan	1000	500	500			
Monitoring Studies							
	Enhanced Stream Monitoring	5753	1918	1918	1918		
	total payable	254553	39818	44268	51268	36100	75100
	donated services	11398					
	total expense (includes value of donated services)	265951					
		* Expenses the District will pay out. Total grant expenses are larger because of donations.					

2. Documentation History

DNR Fishery Study (1989)

DNR Fishery Study (1995)

DNR Sensitive Area Study (1999)

Planning Grant 1 (2000-2002)

Planning Grant 2 (2003-2004)

Zooplankton/phytoplankton Study (2004)

DNR Fishery Study (2004-2005)

DNR North Pipe Paleolimnological Study (2004-2005)

Zooplankton/phytoplankton Study (2005)

DNR/District Understanding Updates (2006)

Historical Monitoring Summary (2006)
2005 Lake Management Program and 2006 Status (2004-2006)
Planning Grant 3 (2007-2008)
10-Year Strategic Plan (2007-2008)
Historical Documentation Review (2008)
District Communication Action Plan (2008)
2008 Property Owner Survey Results

3. Glossary

Buffer area – The last rim of shoreland with natural vegetation that can absorb run-off water before it reaches a lake. In Wisconsin, the strip of land 35-ft wide along the shore is referred to as the buffer area and is regulated differently than land farther back from the shore.

Conservation covenant – A statement in a deed that places a limitation on the use of a property. Conservation covenants are required for Wisconsin grant funding for labor and materials for the 35-foot buffer depth.

Littoral zone – That portion of a lake near the shore where aquatic plants grow.

Overturn – Mixing of a temperature stratified lake's top and bottom waters after ice-out and before freeze-up.

Shoreland – The land near the shore. In Polk County, the land within 1000 feet of the shore is considered shoreland.

Upland – The part of the shoreland farther inland than the buffer strip.