Deer Lake Management Plan: Evaluation and Update

FINAL PROJECT REPORT
DNR Lake Planning Grant 744-01

Project Scope/Description

The project area includes Deer Lake and it surrounding watersheds. Deer Lake is an 812-acre lake in Polk County. Its watersheds, primarily on the north side of the lake, total almost 5800 acres.

The Deer Lake Conservancy worked for several years to aggressively implement recommendations from planning grant studies sponsored by the Deer Lake Association in the early 1990s. A timeline for the projects is shown below. This planning grant project assessed their effectiveness, and made recommendations for future work.

	92	93	94	95	96	97	98	99	00	01	02	03
Planning Grant Studies												
Incorporation												
501(c)(3) Tax Exempt Status												
W2 Basin Constructed												
W2 Prairie Planting												
W3 Sediment Basins												
W3 30 Acre Purchase												
W3 Tire Removal												
W3 Wetland Restorations												
W4 35 Acre Purchase												
W4 5 Acre Purchase												
W4 DNR Easement												
W3 Polk County Easement												
W3 Prairie Planting/Burn												
W4 Prairie Planting/Burn												
W4 Gravel Pit Restoration												
W1 Wetland Restoration												
W1 Monitoring												
Trail System												
Educational Program												
W1 Wetland Recs.												
W6 Flagstad Farm Purchase												
W6 Prairie Planting												

W1 – W6 refer to Watersheds 1 through Watershed 6: the Conservancy project areas.

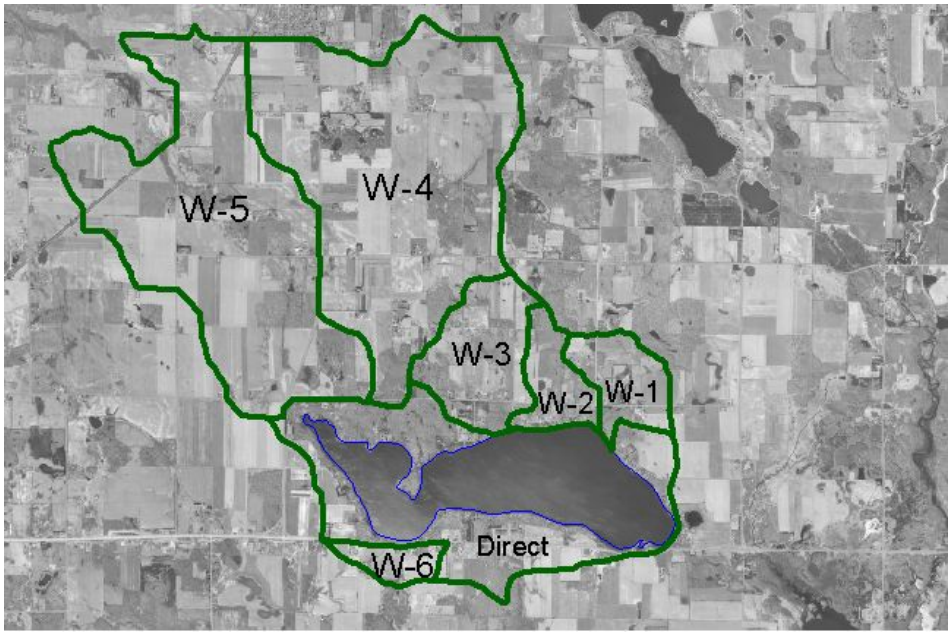
Project Accomplishments

Conservation Practices Assessment

The 1993 and 1995 planning grant studies recommended increasing stormwater retention, slowing stormwater flow, and stabilizing streambanks in the watershed. With the help of many partnering agencies, the Conservancy comprehensively implemented these recommendations from 1997 to 2003.

Flow and grab sample monitoring and modeling were used to evaluate the effectiveness of the installed conservation practices. Runoff flows regularly and was monitored only in watershed 1 and watershed 4. Polk County Land and Water Resources staff and Conservancy volunteers took grab samples from watershed 1 through watershed 7. Although many samples were taken, data was not comprehensive. Several storm events were missed because of the need to ship samples to the State Lab of Hygiene only Monday through Wednesday. Flow and sampling results are summarized and included as an attachment. Sampling data were used to corroborate modeling results.

JEO Consulting Group completed the report, *Qualitative and quantitative analysis of identified Deer Lake Tributaries* in March 2003. This report explains modeling methodologies, summarizes modeling results, and recommends ongoing conservation practice work. It examines phosphorus and sediment loading from each watershed in 1996 and in 2000 following implementation of conservation practices.



Deer Lake Watersheds

Progress Toward Phosphorus Reduction Goals

The Deer Lake Conservancy is well on its way to achieving an ambitious phosphorus reduction goal. The Balsam Branch Priority Watershed Plan established a total phosphorus goal of 36%, and predicted that this would result in summer phosphorus concentrations of 19 micrograms per liter. The plan established a watershed loading reduction objective for Deer Lake of 22%. This objective has been greatly exceeded. From 1996 to 2000, the estimated annual watershed phosphorus loading to Deer Lake decreased by 51%.

Balsam Branch Priority Watershed Objective (1995)
Reduce phosphorus in watershed runoff by 22 percent.

Conservancy Result (2000)
51% reduction of watershed phosphorus loading
Reached over two times the reduction objective!

The Conservancy adopted the Balsam Branch Priority Watershed goal of reducing total phosphorus (from all sources, not just watershed sources) by 36%. Using the Barr Engineering estimate of watershed loading making up 55% of total phosphorus load, an overall reduction of 28% was attained by 2000. This is over three-quarters of the way to the Conservancy phosphorus reduction goal.

Conservancy Phosphorus Reduction Goal (1994)
Reduce total phosphorus loading by 36 percent.
Maintain and improve water clarity in Deer Lake

Conservancy Result (2000)
28% reduction in total phosphorus
Over 3/4 of the way to the goal!

Components of Total Phosphorus Load 1994

Watershed loading:	55%
Internal loading:	26%
Drain fields:	3%
Atmosphere:	16%

*1995 Planning Grant Report. Barr Engineering

Conservation Practice Recommendations

The JEO report includes recommendations for conservation practice implementation by watershed. Several of the recommendations are underway or are being investigated. The Conservancy Board of Directors will use the recommendations to develop a new conservation practice implementation plan.

Watershed Practice Recommendations

Watershed #1
Divert water from the pond north of 140th directly to the lake
Increase vegetative filtering ability below barnyard
Add riser pipe to control flow of pond outlet

Watershed #4
Construct sediment basins and wetland restorations.

Watershed #6
Plant crop fields to native prairie
Construct sediment basin or create wetland basins

Direct Drainage
Restore buffers of shoreline vegetation

Watershed #1

Watershed #1 pond with barnyard and drainage to the lake shown

The outflow of the Watershed #1 pond on the northeast side of Deer Lake is a significant contributor of phosphorus to the lake. Drainage from a barnyard and cropfields to the east of the pond contains high concentrations of phosphorus and high fecal coliform counts. The pond was dredged under a DNR Lake Management Grant in the Fall of 1999.

The Conservancy hired consultant, Dick Osgood, to further investigate treatment options for the pond. The current proposal under consideration is to apply alum, allow the water and alum particles with phosphorus to settle, and release treated water to the existing outflow to Deer Lake. Control of the inflow and outflow of the pond will be pursued for effective settling and control of phosphorus. Department of Natural Resource permits are required for control of pond outflow and for alum application.

Diversion of water from another wetland pond directly to the north of the main pond was considered but not pursued. Relatively high concentrations of phosphorus were found in the north pond in the summer of 2003 making it undesirable to directly divert this water to the lake.

Watershed #4

Purple prairie clover and little bluestem on Watershed #4 restored prairie.

Opportunities for wetland restoration and sediment basin construction will be investigated. As a starting point, the Conservancy will contact landowners of potentially drained wetlands identified during the Balsam Branch Priority Watershed planning process. Cost sharing is available for wetland restoration from the watershed program through 2005.

Watershed #6

Ponds and farm fields at center drain from the Flagstad Farm property to Deer Lake.

The Deer Lake Conservancy purchased the Flagstad Farm property, the major agricultural property in Watershed 6, on a land contract in August of 2002. The organization is currently raising funds in hopes of maintaining ownership to ensure that conservation practices are installed and maintained on this property. Considerable effort is also underway to encourage the Department of Transportation to move the planned four lane expansion of U.S. Highway 8 further away from the lake. DNR Lake Protection and Stewardship Grants are on hold pending DOT selection of a preferred Highway 8 corridor in the Deer Lake area.

The DNR and Conservancy planted 50 acres of farm fields to native prairie in the summer of 2003. Significant phosphorus reduction to the lake will result once this prairie is well-established. Additional reductions of phosphorus will occur by holding water in sedimentation or wetland basins.

Implementation of the recommendations for Watershed 6 and Watershed 1 are predicted to result in exceeding the Conservancy phosphorus reduction goal. A lake study is currently under way to reassess the impacts of these reductions.

Predicted Conservation Practice Results

Conservancy Goal (1994)
Reduce total phosphorus loading by 36 percent.

Flagstad Farm Prairie (2003):
P loading from watersheds reduced by 53%
Total P loading reduced by 29%

Flagstad Farm Wetlands (2005):
P loading from watersheds reduced by 59%
Total P loading reduced by 32%

Watershed 1 Wetland Treatment (2004-2005)
P loading from watersheds reduced by 69%
Total P loading reduced by 48%

Conservancy Result (2005)
38% reduction in total phosphorus

Direct Drainage

As pollutants in runoff from agricultural watersheds are reduced, the direct drainage area becomes a relatively more significant contributor of phosphorus to the lake. The primary recommendation in the direct drainage area is to restore buffers of vegetation in the shoreland area. Removing impervious surfaces, redirecting runoff water away from the lake, and encouraging infiltration will also reduce phosphorus runoff from the direct drainage area.

Buffers of vegetation help to increase infiltration and uptake nutrients in runoff water. The riparian habitat area within 35 feet of the shoreline (both in the water and on the land) is also an extremely critical habitat zone for fish, amphibians, birds and mammals. Options to encourage restoration are discussed in following sections.

Riparian Habitat Restoration Design Services

The project provided shoreline restoration consultations including on-site visits, verbal recommendations, and site designs (when requested). Recommendations for both native plantings and runoff management were provided. These services were offered at the 2002 and 2003 Deer Lake Conservancy annual meetings. A total of ten visits were completed from 2001 through 2003.

An example restoration design plan is included as attachment. This site was planted with funds available through the Balsam Branch Priority Watershed project.

Riparian Habitat Survey

The riparian habitat survey inventoried the character of the immediate lake shoreline and the composition of the shoreland buffer area back to thirty-five feet. Parcels with digital parcel information available were surveyed. This area included one hundred forty-nine parcels totaling 19,386 feet of lake shoreline in the Town of St. Croix Falls. Parcel information is not yet available in the Town of Balsam Lake.

The results reported below are compiled from estimates made while viewing the shoreline from the lake. Digital photographs made a visual record of shoreline and buffer conditions for the fall of 2003.

Table 1. Character of Immediate Shoreline

Shoreline Bank	Description	Percentage of total linear feet
RipRap	Rocked	41%
Structure	Retaining walls, boathouses, etc.	1%
Lawn	Mown grass	6%
Natural	Vegetation allowed to grow	52%

Many landowners allowed the shoreline to grow naturally even when lawn was immediately behind. This narrow band of natural vegetation can help to stabilize the bank and provide some minimal habitat benefits for fish and amphibians.

Table 2. Composition of Shoreland Buffer Area

Shoreland buffer area	Description	Percentage of total square feet
Landscaped or lawn		50%
Hard surface	Buildings, pavement, decks	8%
Natural	Vegetation mostly allowed to grow*	42%

*May be some trimming of woody vegetation

While a considerable percent of the shoreland buffer area remains natural, the result is well below what would be expected from county shoreland standards. If every parcel met the standard of 30 feet of

opening per 100-foot parcel, only 30% of the buffer area would be landscaped or lawn within which there may be minimal hard surfaces such as stairs. Reaching this ratio in the 35 foot buffer area would require a 50% increase in the natural buffer area. Buffer restoration projects totaling 143,000 square feet or 3.3 acres would be necessary for the shoreland area of Deer Lake in the Town of St. Croix Falls. Additional restoration would be needed in the Town of Balsam Lake.

Shoreland Buffer Restoration Projects

The Polk County Land and Water Resources Department provides funding for shoreland restoration through the Balsam Branch Priority Watershed Program. The program provided cost sharing for nine restoration projects on Deer Lake from 1999-2003. These projects cost an average of $1.23 per square foot and averaged 2771 square feet per restoration. Fifty-two projects would be needed to reach a 70% natural vegetation ratio in the 35 foot buffer area (Town of St. Croix Falls). Cost sharing (70% funding) is available through the Balsam Branch Priority Watershed through 2005.

Deer Lake residents completed native plantings without cost sharing, but these are not tracked. For example, Conservancy members received free native plants at annual meetings, and some have purchased and planted more natives. In addition, shoreland buffer mitigation was required for some building projects permitted through the Polk County Zoning Office.

Shoreland Ordinance Enforcement

Volunteers from the lake association completed a parallel effort outside of this grant project. They toured the lake with a zoning official looking for serious zoning violations. The zoning official is responsible for follow-up and enforcement. One problem with enforcing shoreline regulations is the inability to show conditions previous to when an alleged violation occurred or to place the violation in a particular time period. The digital images from this project will be useful for shoreland enforcement efforts in the future.

Exotic Species Monitoring

The Lake Association contracted with Lake Management, Inc. and Aquatic Engineering for aquatic plant management. The contracts include surveys for invasive, non-native plants such as Eurasian Water Milfoil. Eurasian Water Milfoil has not been spotted to date. Lake residents report no purple loosestrife on the lake. The Lake Management, Inc. inventories and a comprehensive aquatic plant survey in June of 2003 identified curly leaf pondweed, another exotic aquatic plant, in many locations in Deer Lake.

Communication of Results

A recent *Deer Lake Conservancy Report* featured the results of this project. The newsletter also provided members with updates about the trail systems.

This final report will be distributed to Conservancy and Lake Association board members and other interested parties.

Project recommendations reinforce the current major conservation effort underway: the Flagstad Farm acquisition and conservation practice implementation. Project information and recommendations helped to provide direction for conservation efforts and supporting information for major fundraising efforts.

Coordination of Organizational Roles

The Deer Lake Conservancy and the Deer Lake Improvement Association are currently working together to assess the in-lake nutrient and aquatic macrophyte conditions of Deer Lake with financial assistance from two DNR Lakes Planning Grants. The In-Lake Committee has representatives from both organizations for this study. The Conservancy and the Lake Association will use recommendations from the in-lake study to develop a long-term aquatic plant management program and to update the loading reduction strategy for Deer Lake.

A combined Lake Association / Conservancy annual meeting or event is under consideration for the summer of 2004. The Lake Association is represented by a position on the Conservancy board.

References

Deer Lake Planning Grant Report. Polk County, Wisconsin. Prepared for the Deer Lake Improvement Association In Cooperation with Polk County Land Conservation Department and the Wisconsin Department of Natural Resources. June 1993.

Deer Lake Planning Grant II Report. Polk County, Wisconsin. Prepared for the Deer Lake Improvement Association In Cooperation with Polk County Land Conservation Department and the Wisconsin Department of Natural Resources. January 1995.

Nonpoint Source Control Plan for the Balsam Branch Priority Watershed Project. Department of Natural Resources and Polk County Land Conservation Department. April 1995.

Qualitative and quantitative analysis of identified Deer Lake Tributaries. March 2003. JEO Consulting Group.

Water Quality Appraisal for the Balsam Branch Watershed. Department of Natural Resources. 1993.