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BIG GREEN LAKE
WATERSHED PROTECTION STRATEGY

Prepared By:

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– Green Lake County Land Conservation Department
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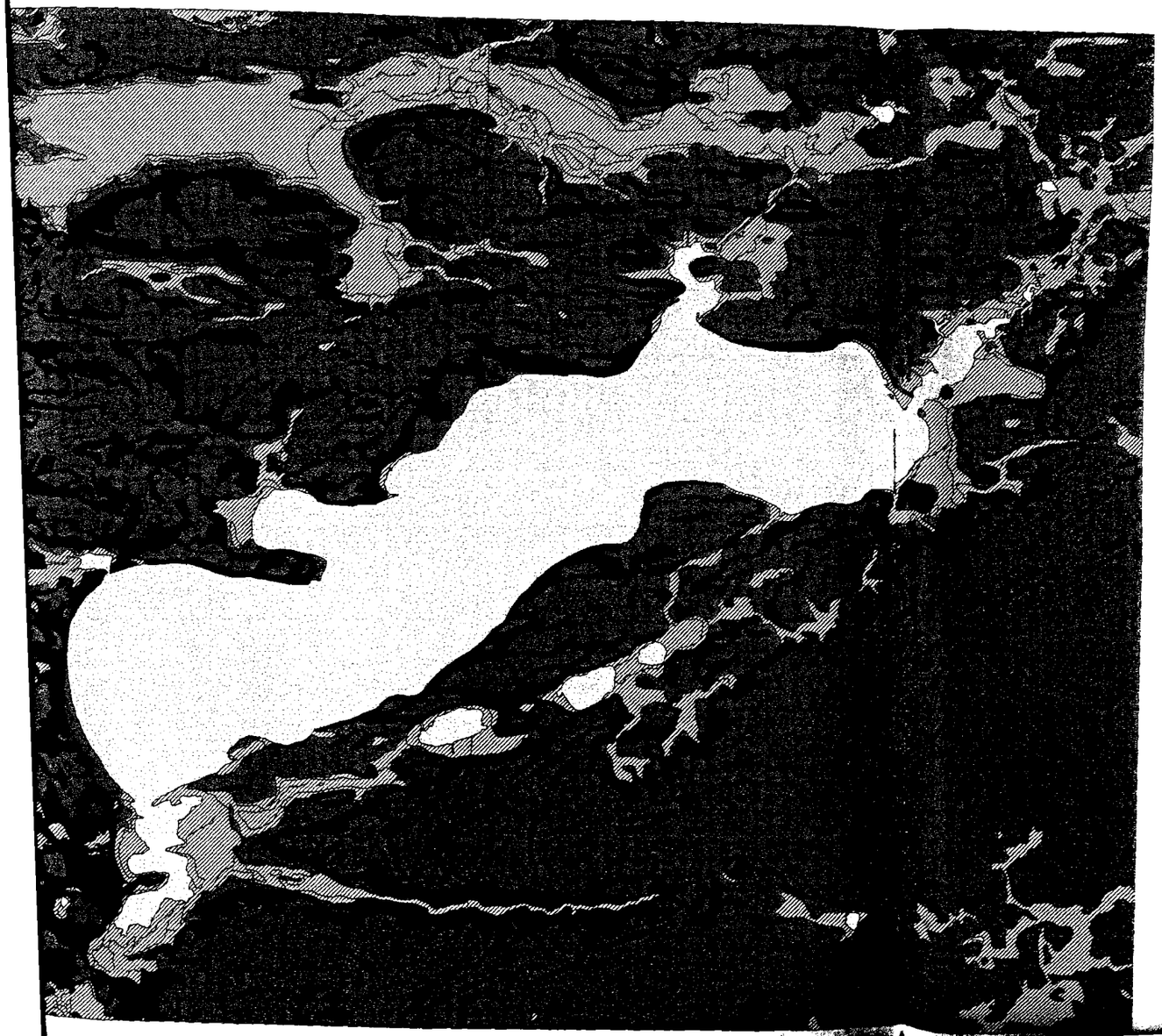
Project No. 1959700-263-530

GREEN LAKE COUNTY

BIG GREEN LAKE

POTENTIAL ENVIRONMENTALLY SENSITIVE AREAS*



LEGEND

HYDRIC SOILS

SLOPE > 6%

WATER

N

W E

S

PRODUCED BY:
GREEN LAKE COUNTY
LAND CONSERVATION DEPART
JUNE 17, 1997

*AS DETERMINED BY SOIL TYPE ON

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CHAPTER 1

EXECUTIVE SUMMARY

On October 12, 1994 the Green Lake Sanitary District Board met and established a mission statement for the district's nonpoint source control program. The mission statement established by the board is as follows:

"Maintain present water quality of Big Green Lake and strive to ultimately improve the water quality of the lake."

The purpose of this report is to lay out a watershed protection strategy for Big Green Lake in Green Lake County to meet the above mission statement. Since 1981, the Green Lake Sanitary District has set aside funds for watershed protection. The district currently budgets $25,000 annually, with $12,500 allocated for installation of nonpoint source control practices, and $12,500 for land acquisition. The purpose of this report is direct the use of the Sanitary District's funds and staff resources in the future. The report includes the following four sections:

1. A Best Management Practice Strategy - to identify priorities for use of the Sanitary District's nonpoint source control funds.
2. Land Protection Strategy - to establish a strategy for identifying environmentally sensitive lands that should be protected.
3. Storm water and Erosion Control Regulations - to control runoff from new development.
4. Information and Education Strategy - to identify needed educational issues and educational opportunities.

The following is a summary of the report findings and recommendations by section.

A BEST MANAGEMENT PRACTICE STRATEGY

The Big Green Lake Watershed Project was one of the first group of four priority watersheds designated by the Wisconsin Department of Natural Resources (WDNR) in 1980. As part of the project, best management practices to control nonpoint source pollution runoff were installed from 1985 through 1992. However, while the project was very successful in many areas (such as control of barnyard runoff), problems still exist in the Big Green Lake Watershed.

As stated above, the Sanitary District is concerned about the water quality of Big Green Lake and sets aside approximately $12,500 per year to cost share the installation of nonpoint source practices. To facilitate the District's nonpoint source control efforts the following recommendations are made:

Recommendation No. 1 - Re-open the Green Lake Priority Watershed Project. It is recommended that the Wisconsin Department of Natural Resources re-open the Big Green Lake Watershed Project for a period of five years to allow additional work in Fond du Lac County and to allow new practices now available to be installed.

Recommendation No. 2 - Update the Nonpoint Source Inventory for the Big Green Lake Watershed. The original nonpoint source inventory of the Big Green Lake watershed was conducted in 1980 and is currently 16 years old. It is recommended that funds be secured from the WDNR to contract with the Green Lake County Land Conservation Department to conduct an updated inventory of the Big Green Lake watershed, including areas in both Green Lake and Fond du Lac Counties.

Recommendation No. 3 - Conduct a Trophic State Analysis of Big Green Lake to Determine Appropriate Levels of Needed Protection. As part of the priority watershed project, no calculations were conducted to determine the level of nonpoint source control that was needed to protect the quality of Big Green Lake. It is uncertain that the levels of soil loss reduction achieved were enough to protect the quality of the lake. It is recommended that the Green Lake Sanitary District sponsor a study to determine the safe carrying capacity of the lake. The trophic state study could be sponsored through a WDNR Lake Planning Grant. It is recommended that trophic state analysis be conducted in fall of 1997.

Recommendation No. 4 - The Green Lake Sanitary District Establish a More Proactive Program of Targeting Their Limited Nonpoint Source Funds. Historically, projects sponsored by the district have been ones that approached the sanitary district for funding. It is recommended that the Green Lake Sanitary District take on a more proactive role by setting aside a portion of their annual nonpoint source budget for targeted problem areas. The district should contract with the Green Lake County Land Conservation Department (LCD) to make active contacts with critical land owners in both Green Lake and Fond du Lac Counties. Under this effort, the Green Lake County LCD should work closely with the Fond du Lac LCD to identify critical sites in Fond du Lac County.

Until an updated inventory of the watershed is completed, information from the priority watershed project should be used to identify critical sites and priorities. Priorities identified by the priority watershed project evaluation include:

- Upland soil erosion in the Silver Creek Subwatershed.
- Gully erosion in the direct drainage area of the lake.
- Expanded feedlot operations.

RECOMMENDATION NO. 5 - ESTABLISHMENT OF A PRIORITY RANKING SYSTEM FOR NONPOINT SOURCE FUNDED PROJECTS. Historically, requests for funds from the Sanitary District's nonpoint source fund have not exceeded the available resources and use of a priority system for ranking projects based on merit has not been necessary. However, if the Sanitary District takes on a more proactive approach to target problem areas as recommended above, then funds may become limited. If requests for funds exceed the available resources, then the use of a priority ranking system is recommended. A proposed priority ranking system is outlined in Chapter 3 of the full report.

LAND PROTECTION STRATEGY

Green Lake County and the watershed of Big Green Lake is blessed with an abundance of natural resources and unique glacial features. The rolling hills, steep ravines, forests, stream corridors, and extensive wetlands all add to the quality of life of the area. However, when these environmental features are disturbed, the result is loss of important fish and wildlife habitat, loss of aesthetic value, and the potential for increases in nonpoint source pollution.

Environmentally sensitive features that should be protected in the Big Green Lake Watershed include:

- Lakes
- Shorelands
- Wetlands
- Woodlands
- Steep Slopes
- Existing Park and Open Space Sites
- Historic Sites
- Natural and Scientific Areas
- Rivers and Streams
- Flood plains
- Wet, Poorly Drained and Organic Soils
- Wildlife Habitat
- Prairies
- Potential Parks
- Scenic Viewpoints

Many of the above features are currently being mapped by Green Lake County Land Conservation Department as part of the development of a geographical information system (GIS).

It is recommended that the above environmental corridor maps be used for targeting where the sanitary districts funds for land acquisition should be focused. Chapter 4 of the full report outlines the legal process and regulation for land acquisition by Sanitary District. Outside funding sources for land acquisition and protection include:

STATE GRANTS

Urban Green Space
Local Park Aids
County Conservation Aids
Nonpoint Source Pollution Abatement Program Grants
Managed Forest Law
Stewardship Fund

FEDERAL GRANTS

Conservation Reserve Program (CRP)
Water Reserve Program (WRP)
Farmland Protection Program
Wildlife Incentive Program
Forestry Incentive Program (FIP)
Stewardship Incentive Program (SIP)

In addition to purchase of publicly held easements, environmentally sensitive features can also be protected by land use regulations. **It is recommended that Green Lake Sanitary District go on record supporting adoption of environmental corridor regulations by Green Lake and Fond du Lac Counties and the Cities of Green Lake and Ripon, and establish a policy to not allow public sewers into mapped environmental corridors thereby discouraging their development.**

STORMWATER AND EROSION CONTROL REGULATIONS

Construction site erosion can be a serious source of sediment delivered to a lake. Erosion from construction sites can range from 20 to 200 tons per acre per year. A single acre of construction can contribute 50 times more sediment that an acre of typical agricultural land. To protect Big Green Lake, it is important that construction site erosion be controlled.

Stormwater runoff is the excess rain water that does not seep into the ground during and after a storm. As land is developed into urban land uses, the surface of the land is covered with a higher percentage of impervious surfaces such as roofs, driveways, parking lots and streets. As the landscape becomes more developed, the amount of rain water that becomes runoff increases. Increased runoff can cause downstream flooding, erosion problems, and carry pollutants into local lakes. The problems caused by excessive runoff can be controlled by the installation of stormwater control practices such as grass waterways, infiltration trenches, or detention ponds. Through the use of a stormwater management ordinance, local units of government can require developers to adequately plan for the control of increased runoff.

It is recommended that the Green Lake Sanitary District, by resolution, go on record endorsing the adoption of a stormwater and erosion control ordinance in both Green Lake and Fond du Lac Counties. The resolution should be adopted at the January, 1997 meeting of the Sanitary District Board. A letter should be prepared to each County Board, and the Cities of Green Lake and Ripon, requesting their adoption of the model ordinance prepared as part of this report. The strategy is to first try and get the Counties to adopt the ordinance for all of the incorporated areas. If the County Boards are reluctant to adopt the ordinance then the strategy will focus on township adoption under Wisconsin Statute 62.234.

The Big Green Lake watershed has 12 units of government that have authority to adopt stormwater and erosion ordinances under Wisconsin Statutes. The units of government include the following:

1. Green Lake County
2. Fond du Lac County
3. City of Green Lake
4. City of Ripon
5. Town of Brooklyn (Green Lake County)
6. Town of Green Lake (Green Lake County)
7. Town of Princeton (Green Lake County)
8. Town of Marquette (Green Lake County)
9. Town of Metomen (Fond du Lac County)
10. Town of Ripon (Fond du Lac County)
11. Town of Rosendale (Fond du Lac County)
12. Town of Springvale (Fond du Lac County)

Prior to adoption of a stormwater and erosion control ordinance, it will be important to develop local support for the measure. The first step in developing public support is public education. **It is recommended that the Green Lake County Land Conservation Department take the lead role in the needed education effort.**

need lead person

In addition to public support for stormwater and erosion control ordinances by the local municipalities, It is recommended that the Green Lake Sanitary District adopt an erosion rule prohibiting properties with construction site erosion problems from connecting to the public sanitary sewer system.

#4

INFORMATION AND EDUCATION STRATEGY

An I & E program to educate local residents as to what they can do to prevent and reduce stormwater pollution problems is important to the protection of Big Green Lake. Issues that need to be addressed by the I & E program to meet the water quality goals of this plan include:

1. Lawn Care
   - Fertilizer use
   - Proper disposal of grass clippings
2. Proper disposal of pet waste
3. Reduction of dumping of waste in storm sewers and local drainage ways
4. Prevention of shoreline erosion
5. Protection of important fish and wildlife habitat areas
6. Lake use issues
7. Weed harvesting
8. Construction site erosion control
9. Lake ecology

Target groups for public education include the following:

- Local elected officials
- Civic leaders
- Farmers
- Company's that sell lawn care products and services
- Lakeshore residents
- The general public

Information and Educational Program Recommendations For the Next Five Years

RECOMMENDATION NO. 1 - The Green Lake Sanitary District should prepare an annual summary report outlining the current status of the water quality of Big Green Lake. This report should be published once per year as a special edition of the Sanitary District's newsletter. The first edition should be prepared for the summer of 1997.

RECOMMENDATION NO. 2 - The Green Lake Sanitary District should work with local newspapers to carry articles on Big Green Lake water quality issues. Once per year the administer of the District should meet with the editor(s) of the Green Lake Reporter, Princeton Times Republic, Ripon Commonwealth, and Markesan newspaper to discuss potential articles and to maintain a working network.

RECOMMENDATION NO. 3 - Once per year the Green lake Sanitary District should sponsor a tour of the Big Green Lake area to show local leaders examples of progress being made in watershed management. The tour should be sponsored in cooperation with the Green Lake County Land Conservation Department and demonstrate how the Sanitary District has used its grant program to make positive changes.

RECOMMENDATION NO. 4 - The Green Lake Sanitary District should sponsor an annual stewardship award to the landowner or organization that contributed to the protection of Big Green Lake. The award will be used to foster local pride and recognition for the efforts of local citizens and encourage other to participate in the protection of the lake.

RECOMMENDATION NO. 5 - The Cities of Green Lake and Ripon should sponsor a storm sewer stenciling program to encourage people not to dump waste into local storm drains.

RECOMMENDATION NO. 6 - The Green Lake Sanitary District should establish a telephone hotline to answer frequent questions by the public. The hotline would be used to reduce staff time answering frequent public calls regarding issues such as weed harvesting.

CHAPTER 2

INTRODUCTION

The purpose of this report is to layout a watershed protection strategy for Big Green Lake in Green Lake County. Since 1981, the Green Lake Sanitary District (GLSD) has set aside funds for watershed protection. The district currently budgets $25,000 annually, with $12,500 allocated for installation of nonpoint source control practices and $12,500 for land acquisition The purpose of this report is direct the use of the Sanitary District's funds in the future. The report includes the following four sections:

1. Best Management Practice Strategy - to identify priorities for use of the Sanitary District's nonpoint source control funds.
2. Land Protection Strategy - to establish a strategy for identifying environmentally sensitive lands that should be protected.
3. Stormwater and Erosion Control Regulations - to control runoff from new development.
4. Information and Education Strategy - to needed educational issues and educational opportunities.

The purpose of this report is not to provide a comprehensive summary of existing water quality information that is located in other documents.

MISSION STATEMENT

On October 12, 1994, the Green Lake Sanitary District Board met to establish a mission statement and goals and objectives for the district's nonpoint source control program. The mission statement established by the board is as follows:

"Maintain present water quality of Big Green Lake and strive to ultimately improve the water quality of the lake."

GOALS & OBJECTIVES

To meet the above mission statement, the following goals and objectives were established by the sanitary district board:

Public Awareness

A. Information & Education
   1) Raise public awareness
   2) In-school education

Substantially Reduce Agricultural Pollution

A. Cost Sharing Best Management Practices
B. Reinstate Big Green Lake into Priority Watershed
   1) Designate critical sites

Protect Sensitive Areas

A. Watershed Activities

1) Acquire land & easements

(a) Purchase or acquire easement on Rohde Land

2) Take care of more streams and Ravines

3) Reinstate Big Green Lake into priority watershed

(a) Designate critical sites

B. Lake Activities

1) Institute carp removal

2) Restore wetlands

3) Protect intake sensitive areas (aquatic plants)

4) Continue AQWEED

Pollution Prevention

A. Regulations

1) Regulate construction sites

2) Urban storm water run-off

3) Enforce critical sites and NR 243 regulations

4) Regulate grading

5) Regulate power boating in wetlands

6) Pier regulations

Evaluate Program Effectiveness

A. Monitoring

1) Monitor lake water quality and evaluate monitoring

2) Continued monitoring of BMP's (GLSD cost-shared)

3) Zebra mussel monitoring

4) Phosphate/suspended solids/toxic monitoring

5) Geese

PRIORITY & OBJECTIVES OF GREEN LAKE SANITARY DISTRICT NONPOINT PROGRAM

To meet the above goals and objectives, the Sanitary District Board established the following priorities:

1. Purchase or acquire easement on Rohde Land
2. Continued cost sharing of BMP's
3. Control of run-off
4. Take care of more streams
5. Regulate construction sites
6. Work more closely with Green Lake County in zoning matters
7. Reinstate Big Green Lake into priority watershed
    a) Designate critical sites
8. Enforce critical sites and NR 243 regulations
9. Monitor lake water quality and evaluate monitoring
10. Urban storm water run-off
11. Raise public awareness
12. Institute carp removal at east end
13. Town and county assistance
14. Restore wetlands

15. Regulate grading
16. Form partnerships
17. Continued monitoring of BMP's (GLSD cost-shared)
18. Protect intake sensitive areas (aquatic plants)
19. Regulate power boating in wetlands
20. Zebra mussel monitoring
21. Continue AQWEED
22. Stream watch program and intake monitoring
23. Phosphate monitoring/toxic monitoring
24. Budget with lake and watershed $$
25. Identify financial assistance
26. Geese
27. Pier regulations

CHAPTER 3

BEST MANAGEMENT PRACTICE STRATEGY

INTRODUCTION

The Green Lake Sanitary District has operated a grant program to cost share the installation of conservation practices by local landowners to protect the quality of Big Green Lake. The Sanitary District has budgeted $25,000 annually the last couple years for nonpoint source pollution control ($12,500) and land acquisition ($12,500). Appendix A of this report outlines projects funded by the Green Lake Sanitary District from 1981 through 1995. In the fourteen years of the program, $251,121.40 have been awarded as cost share grants by the Sanitary District.

The purpose of this chapter is to outline a standardized application process for administration of the Sanitary District's Nonpoint Source Grant Program. The chapter will provide an overview of the lake and watershed area, the types of nonpoint source problems being experienced, and the existing grant program, and will recommend program changes to improve the efficiency of the program. The report will include identification of a standardized application process, a list of eligible management practices, criteria for project ranking, a landowner targeting strategy, and a model cost share agreement.

OVERVIEW OF LAKE AND WATERSHED AREA

Lake Size and Features. Big Green Lake is located in the central portion of Wisconsin roughly 75 miles northwest of Milwaukee. With a maximum depth of 229 feet, it is the deepest inland lake not only in Wisconsin, but the entire Midwest.

The lake is situated in a large pre-glacial valley formed by the action of a pre-glacial river. The Cary Glacier scoured this valley. Deposited material from the glacier succeeded in damming a glacial river causing it to flood the scoured valley and overflow into the present day Puchyan-Fox drainage system.

The lake covers 7,325 acres and has a mean depth of 101 feet. It is 7.3 miles long and 2 miles wide. The shoreline extends for 21.2 miles, of which approximately 2.5 miles are accessible to the public. Circulation in the lake is dimictic with spring and fall "turnovers," and is classified as mesotrophic. The hydraulic residence time, or the time it takes to change the entire lake volume of water, is approximately 21 years.

The lake is one of the finest resources in the State of Wisconsin and the Wisconsin Department of Natural Resources (WDNR) has classified it as an "outstanding water resource." It offers a diversity of recreational activities that include boating, water skiing, diving, sailing, swimming, fishing, and hunting.

Watershed Area. The watershed covers approximately 100 square miles and its land use is mainly agricultural. Ninety nine percent of the land is in private ownership. The cities of Green Lake and Ripon are the only incorporated areas in the watershed. Silver Creek is the main tributary entering Big Green Lake from the east, but eight smaller streams drain into the lake. The outlet from Big Green Lake is the Puchyan River which eventually drains into the Fox River and then into Lake Michigan via Green Bay. A dam constructed on the lake outlet maintains the water level about five feet higher than the natural lake basin.

There are eight subwatersheds that drain into Big Green Lake (Figure 3-1). Three of the subwatersheds drain into the inlet area often referred to as the County Park Marsh. They include Spring Creek, Roy Creek, and Wurchs Creek. Cumulatively, they drain 13.6 square miles of the watershed (14%) and account for 40% of the annual discharge into Big Green Lake.

In 1980, Big Green Lake was selected as one of first four "priority watersheds" for participation in the Wisconsin Nonpoint Source Pollution Abatement Program. During the 10-year project, many best management practices (BMPs) were installed throughout the watershed. These practices included: barnyard runoff systems; strip cropping; terracing sloped lands; grassed and diversion waterways; and conservation tillage.

Soils and Topography. Surface relief in the county is the result of glaciation. Topographic features include ground moraines in which low hills and kettles are interspaced with old glacial lake beds and drainage ways. Bedrock escarpments and sand dunes give some diversity to this pattern. The soils formed mainly in materials that were laid down during or shortly after glaciation.

Green Lake County can be divided into three physiographic areas by surface features. There is the high plain or plateau in the southeastern part of the county. This plain extends north to Big Green Lake and a smaller segment is north of the lake. The plain surface is generally level. The soils formed in windblown silts and glacial till. This segment encompasses some of the best farmland in the county; however, these soils are also subject to erosion. Surface crusting often prohibits the development of small seeded plants.

Underlying the high plateau at shallow depth are two kinds of bedrock. The upper layer is dolomite and the lower layer is sandstone. Escarpments and outcrops of bedrock are scattered throughout the county.

The second physiographic area is in the northwestern part of the county which forms part of the central sand plain of Wisconsin. It is a low, level and gently sloping region of sandy soils and marshland. The portions of these sandy soils that are moderately to well drained are partial to blowing. The soils in the lower areas are often ponded.

The third physiographic area consists of rolling hills and valleys caused almost entirely by glacial deposition. Wet soils are interwoven throughout this region. If cultivated, the loamy soils that formed in glacial till are subject to erosion. Most of the soils in the low areas are poorly drained.

Green Lake County has large acreage suitable for farming. Level Plano soils in the southeastern part of the county are well suited to intensive crop production. These lands respond well to high levels of management (i.e. heavy fertilizer, BMPs, etc.). Kidder soils are more prevalent in the rolling sections of the county. Kidder soils are limited in their response to levels of management because they are not as deep and hold less water than Plano soils.

Many soils within the county are well suited for non-farm uses such as homes with private sewage systems; however, it should be noted that with Knowles, Ripon and Ritchey soils, which (in some cases) form over dolomite, pollution becomes a hazard because natural fissures and crevices in the bedrock permit a rapid downward movement of unfiltered effluent.

Groundwater Resources. Most of Green Lake County is in the southern part of the Fox-Wolf River Basin. This basin includes all or substantial parts of 18 counties in east central and northeastern Wisconsin. Groundwater in Green Lake County generally moves in a southeastward direction. This water movement is caused by the slope of the underlying crystalline rock surface which generally dips southeastward at about 15 to 20 feet per mile. In Green Lake County, glacial drift aquifers are the main source of ground water discharge to streams. These aquifers are recharged by rainfall averaging 30 inches per year.

Land Use. The vast majority of the Big Green Lake Watershed is in agriculture land use. The primary residential and urban areas include the City of Ripon (population 7,500) and the City of Green Lake (population 1,000). The drainage basin of Big Green Lake does include suburban residential development.

Lakes and rivers make up approximately 5% of Green Lake County with wetlands taking up another 15% of the County. Forest represents 5-10% of the County with the remaining majority of land used for agriculture. Green Lake County is approximately 354 square miles in size.

Units of Government. The Big Green Lake Watershed includes portions of two counties, two cities and ten townships. The units of government in the watershed are listed below:

Green Lake County	Fond du Lac County
1. City of Green Lake	1. City of Ripon
2. Town of Brooklyn	2. Town of Metomen
3. Town of Green Lake	3 Town of Ripon
4. Town of Princeton	4. Town of Rosendale
5. Town of Marquette	5. Town of Springvale

OVERVIEW OF NONPOINT SOURCE PROBLEMS IN THE BIG GREEN LAKE WATERSHED

Summary of WDNR's 1988 Interim Evaluation

Big Green Lake has experienced nonpoint source problems dating back to the 1800s. In the 1800s, large tracks of forest were logged and converted to farmland. Many lowland wetland areas were drained and also converted to agricultural land. Since European settlement, Big Green Lake has been receiving increased polluted runoff in the form of soil, nutrients, and pesticides from the 100 square mile watershed. The end result of the increased runoff has been eutrophication of the shallow areas of the lake and loss of fish and wildlife habitat in the near shore zones and tributary streams.

In 1977, Donahue and Associates, Inc. prepared a phosphorus budget for Big Green Lake. The results are outlined in Table 3-1.

Table 3-1
Annual Phosphorus Inputs to Big Green Lake

Source	Phosphorus Loading (lbs/yr)	Percent of Total
Groundwater	220	1%
Waterfowl	730	3%
Urban Lands	1,020	4%
Direct Precipitation	1,450	6%
Livestock Operations	2,151	9%
Other	3,680	16%
Agricultural and Forest	13,480	59%
Total	**22,731**	**100%**

Source: Donahue and Associates, Inc. (1978)

From the above analysis, we can see that runoff from agricultural and forested areas contribute the bulk of phosphorus from the watershed into Big Green Lake.

In 1980, the Big Green Lake Watershed was designated as one of the first priority watersheds by the Wisconsin Nonpoint Source Pollution Abatement Program. As a priority watershed, highly erodible lands and livestock feedlots were eligible for cost share grants to install conservation practices. In 1980, the Green Lake and Fond du Lac County Soil and Water Conservation Districts (SWCD) and the Soil Conservation Service (SCS) conducted an inventory to identify critical sources of nonpoint source pollution. The findings of the inventory are summarized in the report titled Big Green Lake Priority Watershed Plan (WDNR, 1981). As part of the inventory, 47 sites with critical soil loss and 60 livestock feedlots were identified for potential land management in Green Lake and Fond du Lac Counties. Table 3-2 outlines the management practices recommended by subwatershed.

The large number of contour strip cropping, terraces, critical area stabilization, and rock lined chutes that were recommended illustrates the impact of the steep topography on water quality. The direct drainage area to the lake, White Creek, Hill Creek, and Roy Creek subwatersheds are areas that were targeted for practices on steep slopes. Animal waste runoff controls were recommended for 25 farms, and animal waste storage facilities were recommended for 12 farms.

During the 10-year period of the priority watershed project, management practices were installed on several farm areas. Table 3-3 summarizes the levels of soil loss and phosphorus runoff control achieved as of March 31, 1988 (WDNR, 1988). As can be seen, 18% of the upland erosion was controlled. The goal of the watershed plan was a 44% percent reduction in soil loss. The greatest reductions were achieved in the Darkin Creek, direct to lake, Hill Creek, Roy Creek, Spring Creek, and Wurchs Creek subwatersheds where greater than 90% of the target was met. The Marsh and Silver Creek subwatersheds achieved low soil loss reductions.

It should be noted that the soil loss reduction goals in the priority watershed plan were based on soil productivity maintenance and not water quality of Big Green Lake or its tributaries. The goal was set based on the "Tolerance" or "T" factor for the soil. The tolerance factor is the rate at which soil will regenerate itself and maintain a safe level of productivity. For the Big Green Lake Watershed Project, a "T" value of 4 tons of soil loss per acre was used. No calculations of the safe loading rates for sediment or phosphorus were conducted to identify appropriate protection levels for Big Green Lake. Therefore, it is uncertain that the levels of soil loss reduction are enough to protect the quality of the lake.

Soil loss in the priority watershed project was measured by the Universal Soil Loss Equation (USLE). The USLE is a measure of soil disturbance on a field, and does not represent actual sediment delivered to a lake. As disturbed soil moves down a slope, a portion of the material is deposited at the bottom of the slope and in catchment areas and does not all make it to the water courses. Figure 3-2 illustrates the relationship between watershed area and percent of sediment delivered (Roehl, 1962). Table 3-4 summarizes the potential soil delivery for each of the Big Green Lake subwatersheds.

Of the remaining potential 153,490 tons of soil loss per year in the watershed, approximately 30,869 tons reach the lake per year. Approximately 33% of the sediment delivered to the lake comes from Silver Creek. Through the use of a more detailed watershed modeling effort, specific fields delivering the greatest amount of sediment could be identified.

From Table 3-2, we can see that gully erosion has been controlled by only 17%, indicating that this is still a significant source of sediment delivery to the lake. It is estimated that as of March 31, 1988, 7,006 tons of soil loss is still occurring from gully erosion.

Barnyard runoff control appears to be a successful component of the priority watershed project. Thirty-six barnyards were controlled of the 111 in the watershed. However, while the number controlled was only 32% of the total, a 75% reduction in phosphorus export was achieved from this nutrient source (WDNR, 1988). Based on the numbers in the WDNR's interim evaluation report, problem barnyards still exist in the Darkin Creek, Hill Creek, Silver Creek and Wurchs Creek subwatersheds.

Results of WDNR's 1991 Evaluation Monitoring

In 1991, the WDNR conducted an evaluation of the quality of the tributary streams to Big Green Lake. The quality of the streams is an indication of the potential impacts from nonpoint source pollution. The results of the sampling for stream habitat rating and Hilsenhoff Biotic Index are summarized in Table 3-5.

As can be seen in Table 3-5, all of the evaluated streams had sections rated as poor for both the stream habitat index and Hilsenhoff biotic index, indicating that nonpoint source pollution is still a problem in the Big Green Lake Watershed. Unfortunately, Silver Creek, the largest tributary in the watershed, was not evaluated in the WDNR study.

Table 3-5
Habitat Assessment for Big Green Lake Watershed

Stream	Stream Habitat Rating	Hilsenhoff Biotic Index
White Creek	166 (fair)	5.91 (fair)
Section 1	185 (poor)	5.06 (fair)
Section 2	149 (fair)	6.77 (poor)
Section 3	185 (poor)	NA
Section 4	146 (fair)	NA
Hill Creek	167 (fair)	6.37 (fair)
Section 1	165 (fair)	6.77 (poor)
Section 2	157 (fair)	6.32 (fair)
Section 3	201 (poor)	6.04 (fair)
Section 4 &5	133 (fair)	NA
Section 6	156 (fair)	NA
Spring Creek	180 (poor)	NA
Section 1	195 (poor)	NA
Section 2	165 (fair)	NA
Roy Creek	177 (poor)	NA
Wurches Creek	201 (poor)	NA
Silver Creek	NA	NA
Darkin Creek	NA	NA

Source: WDNR, 1992
NA = Not Analyzed

Monitoring of lake water quality for total phosphorus, chlorophyll a, and secchi disc transparency indicates that Big Green Lake has good to very good water clarity in the center of the lake (WDNR, 1991). However, bacterial sampling at local beaches, expansion of the littoral zone, and changes in the near shore aquatic plant community indicate that nonpoint source pollution is having a negative impact on the quality of the lake.

BEST MANAGEMENT PRACTICE TARGETING STRATEGY.

The Big Green Lake Watershed Project helped reduce sediment and nutrient inputs to Big Green Lake. As of March 1988, 33,722 tons/year of upland soil and 1,412 tons/year of gully erosion were controlled. Thirty-six barnyard management systems were installed. However, while the project was very successful in many areas (such as control of barnyard runoff), problems still exist in the Big Green Lake Watershed. The Green Lake Sanitary District has set aside a fund for cost sharing the correction of the remaining runoff problems; however, the funds are limited. The following are a series of recommendations for future management of nonpoint source pollution in the Big Green Lake Watershed.

Recommendation No. 1 - Re-open the Green Lake Priority Watershed Project

The Big Green Lake Watershed Project was one of the first group of four priority watersheds designated by the Wisconsin Department of Natural Resources. At the time, the program was new and had little recognition by the public or farm community. At the beginning of the project, both Green Lake and Fond du Lac Counties had limited staff to implement the project. Through the help of the Green Lake Sanitary District, two full time staff were added to the Green Lake County Land Conservation Department's staff to implement the project in both Green Lake and Fond du Lac Counties. Levels of participation in the program were hampered by early start up problems of the priority watershed program.

During the early days of the priority watershed program, several management practices currently in place were not available to landowners and managers in the Big Green Lake Watershed. Key tools that were not available in the early 1980s were grants for urban stormwater planning, wetland restoration, nutrient and pesticide management, and shoreline and streambank conservation easements.

It is recommended that the Wisconsin Department of Natural Resources re-open the Big Green Lake Watershed Project for a period of five years to allow additional work in Fond du Lac County and to allow new practices now available to be installed. The Green Lake Sanitary District should contact both the Green Lake and Fond du Lac County Land Conservation Committees to request their support for re-opening the watershed project. Letters of support should also be obtained from each of the ten townships and two cities in the watershed for extension of the project. The support material should be packaged and submitted to WDNR in the summer of 1997.

Recommendation No. 2 - Update the Nonpoint Source Inventory for the Big Green Lake Watershed

The original nonpoint source inventory of the Big Green Lake Watershed was conducted in 1980 and is currently 16 years old. As part of the 1980 inventory, not all of the drainage area was inventoried. To better target the limited resources of Green Lake Sanitary District's grant program, an updated inventory of significant problems is needed.

Today, new technologies such as Green Lake County's Geographical Information System (GIS) based Land Information System (LIS) can be used to conduct calculations of soil loss for each field and property. It is recommended that the inventory of the Big Green Lake Watershed in Green Lake County be updated using the County's GIS. Through analysis of layers such as topography, soils, land cover, land use, and parcel ownership, identification of critical erosion sites can be identified. Once the system is established, it can be easily updated as management practices are implemented or land use changes occur. The GIS program can be used as an accounting system to track progress towards the lake protection goals.

It is recommended that funds be secured from the WDNR to contract with the Green Lake County Land Conservation Department to conduct an updated inventory of the Big Green Lake Watershed, including areas in both Green Lake and Fond du Lac Counties. Potential funding sources include Local Planning Aids, the Lake Protection Grant Program, and the Priority Watershed Program. Grant applications should be prepared for submittal in calendar year 1997, with an anticipated project starting date in 1998.

Recommendation No. 3 - Conduct a Trophic State Analysis of Big Green Lake to Determine Appropriate Levels of Needed Protection

As stated previously, targets for upland erosion control as part of the priority watershed project were based not on water quality of Big Green Lake, but protection of soil productivity. As part of the priority watershed project, no calculations were conducted to determine the level of nonpoint source control that was needed to protect the quality of Big Green Lake. It is uncertain that the levels of soil loss reduction achieved were enough to protect the quality of the lake. It is recommended that the Green Lake Sanitary District sponsor a study to determine the safe carrying capacity of the lake. The safe carrying capacity is the level of sediment and nutrient inputs to the lake that will not cause a degradation to water quality. These safe loading numbers would be used to help target the needed levels of watershed controls, and could be used to determine the maximum level of watershed development that the lake can handle before showing signs of degradation.

In addition to evaluating the impacts of nonpoint source pollution, the trophic state study should also evaluate the impact of the Ripon Wastewater Treatment Plant. Under Wisconsin Administrative Code NR 217, the treatment plant is required to meet a 1 mg/l phosphorus standard. However, this level may not be enough to protect Big Green Lake. Under Wisconsin Administrative Code NR 102.06, the WDNR can impose stricter phosphorus standards where "*...such limitations will result in an improvement in water quality, or preserve the quality of surface waters where long-term discharges may result in impaired water quality.*"

The trophic state study could be sponsored through a WDNR Lake Planning Grant. It is recommended that trophic state analysis be conducted in fall of 1997.

Recommendation No. 4 - The Green Lake Sanitary District Establish a More Proactive Program of Targeting Their Limited Nonpoint Source Funds

While the priority watershed program was successful in reducing sediment and nutrient inputs to Big Green Lake, several problems areas still exist. Currently, the Sanitary District has set aside $12,500 per year to fund the installation of nonpoint source practices. From 1981 through 1995, the district awarded $251,121 in grants. Appendix A outlines the history of grants awarded by the sanitary district. Historically, projects sponsored by the district have been ones that have approached the sanitary district for funding. Under this approach, only a portion of the problem sites are being controlled. Many of chronic problems areas are not being addressed. Therefore, it is recommended that the Green Lake Sanitary District set aside a portion of their annual nonpoint source budget for targeted problem areas and that the district take on a more proactive approach by contracting with the Green Lake County Land Conservation Department (LCD) to make active contacts with critical land owners in both Green Lake and Fond du Lac Counties. Under this effort, the Green Lake County LCD should work closely with the Fond du Lac LCD to identify critical sites in Fond du Lac County. Until an updated inventory of the watershed can be conducted, information from the priority watershed project should be used to identify critical sites and priorities.

As outlined in Table 3-3, as of March 1988 only 18% of the upland soil erosion was controlled by the priority watershed project. The greatest soil loss reductions were achieved in the Darkin Creek, direct to lake, Hill Creek, Roy Creek, Spring Creek, and Wurchs Creek Subwatersheds, where greater than 90% of the fields eroding above 4-tons/year were controlled. The Marsh and Silver Creek subwatersheds achieved low soil loss reductions and still contain fields with high erosion rates. Silver Creek accounts for 33%, or 10,182 tons/year, of the soil delivered to Big Green Lake. It is recommended that Silver Creek be a target area for funding of upland soil control.

Gully erosion is still a major problem in the Big Green Lake Watershed. Of the 8,472 tons/year of soil loss from gully erosion, only 1,412 tons/year (or 17%) were controlled as of March 1988. Table 3-6 outlines the remaining gully erosion by subwatershed. As can be seen, 63% of the remaining gully erosion still exists in the direct drainage area of the lake. The direct drainage subwatershed should be a target area for gully erosion control.

Barnyard runoff control was a successful component of the priority watershed project. It was estimated that 75% of the phosphorus from this source was controlled as of March, 1988. Some problem barnyards, however, may still exist. Dairy farming is a volatile industry today. Some farms have decreased herd size, while others are expanding. Some farms identified in 1980 as a problem may not be raising livestock any more. To target the remaining problem barnyards in the Big Green Lake Watershed, an update of the barnyard inventory would be needed.

RECOMMENDATION NO. 5 - ESTABLISHMENT OF A PRIORITY RANKING SYSTEM FOR NONPOINT SOURCE FUNDED PROJECTS

Currently, the Green Lake Sanitary District has set aside $12,500 per year to fund the installation of nonpoint source practices. As stated above, past projects sponsored by the district have been ones that approached the sanitary district for funding. Many of these projects have been forwarded to the district at the recommendation of the Green Lake County Land Conservation Department. Historically, requests for funds have not exceeded the available resources and use of a priority system for ranking projects based on merit has not been necessary. However, if the Sanitary District takes on a more proactive approach to target problem sites as recommended above, then funds may become short. If requests for funds exceed the available resources, the use of a priority ranking system is recommended. The following priority system is based on a model established by the state priority watershed program in Wisconsin Administrative Code NR 121.

Eligible Management Practice and Criteria for Project Ranking

SECTION 1.01 PURPOSE

In order to provide a fair and consistent distribution of nonpoint source water pollution abatement project grants, the Green Lake District adopts the provisions of Wisconsin Administrative Code NR 120. The Green Lake District will participate in the selection of nonpoint projects by action of the District Commissioners. District resources are directed at projects selected on the following policies (Wisconsin Administrative Code NR 120.01 (1)(a)(b)(c):

A. Grants shall be made for the implementation of best management practices (BMP's) on the basis of the expected water quality benefits accruing to the public and secondarily on the basis of financial hardship.

B. Priority watershed plan development, land management needs determination, and practice design and implementation shall involve local agencies.

C. Project locations and practice eligibility shall be coordinated with related federal programs to bring about the maximum utilization of federal cost-sharing moneys and technical assistance.

SECTION 1.02 DEFINITIONS

D. "Best management practices" (BMP) means a practice that has been determined to be the most cost effective, practicable means of preventing or reducing soil erosion or pollution from agricultural nonpoint sources.

E. "Conservation agreement" means an agreement by the Green Lake District to provide cost sharing to a land owner or land user to comply with identified soil and water resource management objective.

F. "Conservation tillage" means the preparation of land surfaces for planting using methods that leave a rough land surface covered with vegetative residues from a previous crop. This provides a significant degree of resistance to soil erosion and surface water runoff or wind erosion. It also means the planting of crop seeds in a narrow slot or strip of tilled soil, so as to maintain residue cover.

G. "Contour farming" means plowing, preparing, planting and cultivating sloping land on the contour, including following established grades of terraces or diversions.

H. "Critical area stabilization" means the planting of suitable vegetation on highly erodible areas such as steep slopes, gullies and roadsides, so as to reduce soil erosion or pollution from agricultural nonpoint sources.

I. "Cropland" means land used for the growing and harvesting of grains, legumes, grasses, fruits or vegetables.

J. "Diversions" means structures installed to divert excess surface runoff water to areas where it can be used, transported or discharged without causing excess soil erosion.

K. "Grade stabilization structures" means structures used to stabilize the grade in a channel, so as to protect the channel from erosion or to prevent the formation or advance of gullies.

L. "Landowner" means any person over 18 years of age and any partnership, firm or corporation that holds title to land lying within the Big Green Lake Watershed.

M. "Land user" means any person who uses land as an operator, lessor, or renter.

N. "Nonpoint source pollution" is pollution that enters a water body from diffuse origins on the watershed and does not result from discernible, confined, or discrete conveyances.

O. "Soil and water conservation plan" means written record of agricultural management decisions and conservation practices to be implemented.

P. "Streambank and shoreline protection" means using vegetation or structures to stabilize and protect banks of streams, lakes or excavated channels against scour and erosion.

Q. "Strip-cropping" means the growing of crops in a systematic strip arrangement with strips of grass, legumes or other close growing crops being alternated with strips of clean tilled crops or fallow, all of which are established on the contour so as to reduce water or wind erosion.

R. "Terrace system" means a system of ridges and channels constructed on the contour with suitable spacing to significantly reduce erosion grades.

S. "Waste storage facility" means a concrete, steel or otherwise fabricated structure or an excavated earthen impoundment used for storage of animal waste.

T. "Waterway" means a natural or constructed watercourse or outlet that is covered with a suitable vegetative cover to prevent erosion by runoff waters.

U. "Settling basin" is pond or basin that manages stormwater runoff through temporary storage allowing suspended loads to settle.

V. "Special projects" means projects other than those listed above that the Sanitary District determines reduce nonpoint source pollution, improve aquatic habitat, or protect the water quality of Big Green Lake.

SECTION 1.03 PRIORITY RANKING.

The District will consult with the Green Lake County Land Conservation Committee (LCC) to determine a priority ranking of all eligible projects. The projects selected for cost-sharing will be based on a priority rank derived from consideration of the following criteria:

W. Water quality benefits to Big Green Lake and its tributaries that can be realized by implementation of the project;

X. Location with respect to the municipal area of the Green Lake Sanitary District;

Y. Location with respect to the priority management area designated by the LCC in the priority watershed plan.

SECTION 1.04 ELIGIBLE APPLICANTS.

All land owners or land users are eligible for cost share assistance for the installation of BMP's within the Big Green Lake Watershed. The District may determine that a land owner is not eligible for cost-sharing for any of the following:

Z. The land owner initiated the discharge of pollutants for the purpose of obtaining a cost share grant.

AA. The discharge of pollutants could be prevented by approving management practices at nominal costs.

AB. The discharge of pollutants could have been prevented by complying with a previously agreed upon soil and water conservation plan.

AC. The cost sharing grant will achieve no predictable water quality benefits to the Big Green Lake Watershed. The District shall consult with the county conservation department regarding the water quality benefits associated with the grant.

AD. The land owner has received a Wisconsin Pollution Discharge Elimination system permit from the WDNR under Sec. 147.02, Stats.

AE. The term of the conservation agreement expires. The eligibility for conservation assistance may be extended if the District and land owner mutually agree.

SECTION 1.04 ELIGIBLE PROJECTS.

Only those projects that are determined as the most cost effective conservation practice shall be funded. The District shall consult the county land conservation department to determine the cost effectiveness of a proposed project. Cost-share eligible BMP's include the following:

- Conservation tillage
- Grassed waterways
- Manure storage facilities
- Barnyard runoff control
- Terraces
- Contour strip cropping
- Stream & shoreline stabilization
- Fencing for livestock exclusion
- Grade control structures
- Critical area stabilization
- Shoreline protection
- Settling basins
- Special projects

It is possible that some practices may be "custom" plans that do not fit the established definition for a particular practice. Cost-share payments for such projects should be made after review and approval by the Sanitary District Commission. The Green Lake Sanitary District will make a final determination on the eligibility for cost-sharing, and assign a maximum cost-sharing rate.

SECTION 1.04 MAXIMUM GRANT RATES AND PAYMENTS

Cost Share Grants

The amount paid to a land owner or land user under a conservation agreement shall be based on the cost of the proposed project as determined by the land conservation department. The cost sharing rate for the design and construction of the BMP shall equal the percentages specified as follows:

BMPs AND MAXIMUM COST-SHARE RATES

Practice	GLSD Cost-sharing	Maximum Cost-share Allowable
Conservation tillage	20%	$500
Grassed waterways	20%	$2,500
Manure storage facilities	20%	$5,000
Barnyard runoff control	20%	$5,000
Terraces	20%	$2,500
Contour strip cropping	20%	$500
Stream & shoreline stabilization	20%	$1,000
Fencing for livestock exclusion	20%	$2,500
Grade control structures	20%	$5,000
Critical area stabilization	20%	$500
Shoreline protection	20%	$500
Settling basins	20%	$2,500
Special projects	90%[1]	$5,000

[1]Cost-share rate is flexible up to 90% at the discretion of the Green Lake Sanitary District. District funds may be used to match county cost-sharing funds or other funding sources.

Payment

The Sanitary District will issue payments after the project is installed subsequent to final approval of the District Commission. A cost-share grant award shall be made by check directly to the qualified property owner. After the installation of the practice, the landowner must submit all project costs to the designated management agency (DMA), the Green Lake County Land Conservation Department.

Grant funds for approved projects shall be awarded to applicants (after project completion) upon the receipt by the District Administration of:

1. A final invoice for eligible costs submitted by the owner's contractor.

2. A statement by the Green Lake County Conservationist that the BMP has been inspected and is properly installed.

If the owner's contractor submits a final statement indicating that payment has been completed, the District shall issue a check to the owner. In the event that payment has not been completed, the District shall issue a check jointly to the owner and to the owner's contractor.

SECTION 1.05 NONPOINT ABATEMENT AGREEMENTS

The Green Lake Sanitary District shall enter into a written conservation agreement with every land owner whom the District provides conservation funds to for implementation of soil and water resource management projects. The land conservation agreements shall be recorded at the office of the Register of Deeds within 30 days after the conservation easement is signed. Each agreement shall include:

A. The name and address of the applicant and legal description of the land where the project will be implemented. If the applicant is a land user, other than the land owner, the agreement shall include the name of the land owner and be signed by the land owner.

B. The specific best management practice(s) to be implemented.

C. The estimated cost of implementing the project and the percentage of the cost to be paid by the Green Lake Sanitary District.

D. Time deadline for implementing the project.

E. A plan for operating and maintaining the project.

F. A method for certifying that the best management practice(s) has been implemented and maintained.

G. A procedure by which the agreement may be amended.

H. A statement that the agreement runs with the land and will apply to any subsequent land owner or land user, if title to the land is transferred.

By signing a conservation agreement the recipient agrees to:

I. Maintain the funded best management practice for its normal expected life. If the recipient fails to maintain the BMP, the agreement shall require the recipient to repay to the Green Lake Sanitary District all cost sharing funds received under the agreement. Repayment is not required if a structure is rendered ineffective due to circumstance beyond the control of the land owner.

J. Undertake land management practices that comply with a soil and water conservation plan. The plan shall be developed in cooperation with the land owner or land user and must be approved by the county land conservation committee. If the recipient fails to maintain compliance with an approved soil and water plan, the agreement shall require the recipient to repay the Green Lake Sanitary District all conservation funds received under the agreement.

CHAPTER 4

LAND PROTECTION STRATEGY

INTRODUCTION

The purpose of this chapter is to outline a strategy for land protection using land purchases and conservation easements. The strategy will address protection of existing environmentally sensitive areas and restoration of areas that have been disturbed. The work product will include a strategy for mapping sensitive resources such as wetlands, steep slopes, erodible soils, eroding streambanks, fish and wildlife habitat, and groundwater recharge areas. An evaluation of potential funding sources will be conducted. Potential funding programs will be evaluated. An implementation strategy on land acquisition—including appraisals, offers, acceptable uses of the land, and contract negotiation procedures—will be included. A model easement agreement will be prepared.

NEED FOR PROTECTION OF ENVIRONMENTALLY SENSITIVE AREAS

Green Lake County and the watershed of Big Green Lake is blessed with an abundance of natural resources and unique glacial features. The rolling hills, steep ravines, forests, stream corridors, and extensive wetlands all add to the quality of life of the area. However, when these environmental features are disturbed, the result is loss of important fish and wildlife habitat, loss of aesthetic value, and the potential for increases in nonpoint source pollution. It is said that "a lake is a reflection of its watershed." The quality of the environmental features in the watershed is directly related to the quality of the lake environment. To protect the quality of Big Green Lake, it is important that we protect the quality of the environmental features in the watershed.

ENVIRONMENTALLY SENSITIVE AREAS AND CORRIDORS THAT SHOULD BE PROTECTED IN THE BIG GREEN LAKE WATERSHED

The concept of protecting environmentally sensitive areas was first introduced in Wisconsin by Whitnall. The concept of environmental corridors was re-articulated in Wisconsin in 1962 in a State Department of Resource Development report entitled Recreation in Wisconsin. The Southeastern Wisconsin Regional Planning Commission (SEWRPC) further refined the concept into their regional planning process. In an article entitled Refining the Delineation of Environmental Corridors in Southeastern Wisconsin (SEWRPC, 1981), SEWRPC outlined their concept of defining environmentally sensitive areas. The SEWRPC concept recognizes the value of linear tracts (or corridors) of environmentally sensitive land. The following definitions are based on the work by SEWRPC.

Environmentally sensitive areas fall into the following categories:

- Lakes
- Shorelands
- Wetlands
- Woodlands
- Steep Slopes
- Existing Park and Open Space Sites
- Historic Sites
- Natural and Scientific Areas
- Rivers and Streams
- Flood plains
- Wet, Poorly Drained and Organic Soils
- Wildlife Habitat
- Prairies
- Potential Parks
- Scenic Viewpoints

Lakes: Lakes are defined as either major or minor lakes. Major lakes are those 50 acres and over in size, and minor lakes are those less than 50 acres. Lakes are important features in that they provide many recreational opportunities.

Rivers and Streams: Rivers and streams fall into two categories—perennial, which carry flow year round; and intermittent, which only carry flow part of the year. Rivers and streams are defined as those that are shown on 7.5-minute quadrangle topographic maps published by the U. S. Geological Survey.

Rivers and streams are important to the quality of Big Green Lake in two ways. First, they provide spawning habitat for several important fish and fish food organisms. Forage fish and game fish—such as northern pike—use both perennial and intermittent streams to spawn and live out their early life stages. Secondly, streams act as the mechanism for delivery of eroded sediment and pollutants off the landscape. In fact, highly eroding streambanks can be a significant source of sediment to a lake.

Shorelands: Shorelands are buffer areas along lakes and streams. The shoreland zone is defined as a zone 75 feet wide along lakes and streams. The shoreline is important in that it can act as a filter area to trap pollutants from adjacent land uses. The quality of the vegetation in the shoreland zone plays an important role in the filtering capacity of the buffer.

Flood plains: Flood plains are those lands that are inundated by water during large storms. Flood plains are defined based on the recurrence interval of the storm that causes the flood. Typical flood plain designations include the 10-year, 100-year and 500-year flood plains. For the mapping of environmentally sensitive areas, the 100-year flood plain is used. Flood plain maps for mapped areas of Green Lake County are available from the Federal Emergency Management Agency, WDNR or Green Lake County. Flood plains provide important filter areas for stormwater. In a study in North Carolina, it was found that when streams over top their banks and inundate the flood plain, they can loose as much as 90% of their sediment load into the riparian vegetation.

Wetlands: Wetlands are defined as areas with hydric soils (such as peats, mucks or other organic soils) and by the growth of hydrophytes (such as sedges, cattails, red osier dogwood, and tamarack). Wetlands in Green Lake County have been mapped by the WDNR as part of the Wisconsin Wetland Inventory. Wetlands can act as filters for contaminated runoff and may be recharge areas for the local groundwater system.

Wet, Poorly Drained and Organic Soils: Wet, poorly drained and organic soils are a key components of the development of wetlands. These soils also make bad substrates for urban development (roads and buildings), but provide opportunities for open space development. The wet, poorly drained and organic soils can be mapped from the Green Lake County soils maps prepared by the Natural Resources Conservation Service (NRCS).

Woodlands: Woodlands are defined as those upland areas one acre or more in size, having 17 or more deciduous trees per acre, each measuring at least four inches in diameter at breast height, and having at least 50 percent canopy cover. Woodlands provide a vegetative cover that protects the land from erosion and provides important habitat for wildlife.

Wildlife Habitat: Wildlife habitat is defined as those areas devoted to natural open uses which are of a size and have a vegetative cover capable of supporting a high and balanced diversity of wildlife. Such areas have vegetation that provides nesting opportunities, travel routes, concealment, and weather impact modification for a variety of wildlife species. Wildlife habitat can be inventoried into three categories—high, medium, and low.

High value wildlife habitat contains a diversity of wildlife, has adequate size to meet all of the habitat requirements of the species of concern (including territorial and vegetative composition requirements), and is generally located in proximity to other wildlife habitat areas. Medium value wildlife habitat areas generally lack one of the three criteria for a high +14Xvalue area; however, retain good plant and animal diversity. Low value wildlife habitat areas are remnant in nature in that they lack two or more of the above high value criteria but are located close to a high or medium value area.

Steep Slopes: Steep slopes are defined as slopes of 12 percent or greater. Slopes greater than 12 percent are considered unsuitable for urban development and, if farmed, require special conservation practices. Disturbances of steep slopes can lead to excess soil erosion. Steep slopes can be mapped from the 7.5-minute quadrangle topographic maps published by the U. S. Geological Survey.

Prairies: Prairies are defined as open, treeless areas which are dominated by native grasses. Prairies once covered large areas of southern Wisconsin. Because of the lack of trees in these areas, they were easily farmed. Native grasses have been found to be very drought tolerant and provide exceptional land cover to prevent erosion. The few remnant prairies in Green Lake County provide an important seed source for restoration of new prairie areas on disturbed soils. Prairies of significance have been mapped by the Wisconsin Scientific Areas Preservation Council.

Existing Park and Open Space Sites: Existing park and open space sites include any state, county or local park.

Potential Parks: A potential park site is one that has been identified in a local Park and Open Space Plan.

Historic Sites: Historic sites are classified into three categories—structures, archaeological features, and other cultural features. Historic structures include architecturally or historically significant homes, churches, inns, government buildings, mills, schools and museums. Archaeological features consist of areas occupied or utilized by human beings for a sufficient length of time to be associated with early American Indian settlements. Other cultural features include sites of early European settlements or sites that are closely related to such settlements and include, for example, old plank roads and cemeteries.

Scenic Views: Scenic views are defined as vantage points from which a diversity of natural features can be observed. Three basic criteria are applied to identify viewpoints: 1) the variety of features viewed should exist harmoniously in nature or rural landscape, 2) there should be one dominant or interesting feature—such as a river or lake—which serves as a focal point of the scenic area, and 3) the viewpoint should permit an observation area from which the variety of natural features can be seen. Scenic viewpoints can be identified from 1 inch = 2000 feet scale U.S. Geological Survey 7.5-minute quadrangle maps. Areas with relief greater than 30 feet and a slope of at least 12 percent or more can be identified. Areas of steep slopes having a ridge of a least 200 feet in length and a view of at least three natural resource features—including surface waters, wetlands, woodland, agricultural lands, or other significant geological feature— within approximately one-half mile of the ridge, can be identified as potential scenic viewpoints.

Natural and Scientific Areas: Natural areas are defined by the Wisconsin Scientific Areas Preservation Council as tracts of land or water so little modified by human being activities or sufficiently recovered from the effects of such activities that they contain intact plant and animal communities believed to be representative of the pre-settlement landscape. Scientific areas are those natural areas, geological sites or archeological sites identified as being of at least statewide significance and which have been designated by the WDNR's Scientific Areas Preservation Council. State scientific areas have been designated into three categories—natural areas of statewide or greater significance, natural areas of countywide or regional significance, or natural areas of local significance.

SEWRPC has delineated environmental corridors into three categories depending on size. Primary environmental corridors occupy an area of at least 400 acres and have a minimum length of two miles and a minimum width of 200 feet. Secondary environmental corridors occupy an area of at least 100 acres and have a minimum length of one mile. Isolated high value natural areas are at least five acres in size.

STRATEGY FOR MAPPING ENVIRONMENTALLY SENSITIVE RESOURCES

Mapping of environmentally sensitive areas is an extensive and time consuming process. The mapping process is well suited to the use of geographical information systems (GIS). Green Lake County is in the process of developing a land information system based on the software program ArcCADD. The project is being funded by a Wisconsin Lake Protection Grant, Land Information Board Grant and local county funds. The project, which started in 1995, will consist of digitizing the U. S. Geological Survey 7.5-minute quadrangle topographic maps, NRCS soils maps, local zoning, land use, parcel ownership and tax key information, and the Wisconsin Wetland Inventory. This information can be used as the basis for conduction of an inventory of environmental corridors.

A GIS program is well suited to the mapping of environmental corridors. The GIS software allows the user to set up formulas that allow the program to analyze data between the GIS layers. The following are examples of environmental features that can be identified from the county's land information data base:

Environmental Feature	GIS Source
Lakes	USGS topographic maps
Rivers and Streams	USGS topographic maps
Shorelands	USGS topographic maps and County Shoreland Zoning maps
Flood plains	County Flood plain Zoning maps
Wetlands	Wisconsin Wetland Inventory and County Shoreland Wetland Zoning maps
Wet, Poorly Drained and Organic Soils	NRCS Soils Inventory
Woodlands	County Land use map
Wildlife Habitat	Wisconsin Wetland Inventory, County Land use map, and USGS topographic maps
Steep Slopes	NRCS Soils Inventory
Prairies	NRCS Soils Inventory
Existing Park and Open Space Sites	County Land use map
Potential Parks	Local Park and Open Space Plans
Historic Sites	State Historical Society maps
Scenic Viewpoints	USGS topographic maps
Natural and Scientific Areas	Scientific Areas Preservation Council maps

As stated above, Green Lake County is in the process of preparing a county wide environmental corridor map. The project is due for completion in 1997. However, it should be noted that preparation of the environmental corridor maps is only the start of the process. Environmental corridors can be protected through the use of local land use regulations. To be used for regulation, the corridor maps need to be adopted by the county and local municipalities into local regulations. Development of environmental corridor regulations at the local level can be a time consuming and very political process. Development of such regulations will require the input from various interested parties. **It is recommended that Green Lake Sanitary District go on record supporting adoption of environmental corridor regulations by Green Lake and Fond du Lac Counties and the Cities of Green Lake and Ripon.**

Once regulations are in place, the mapping process is not over. The maps are only a planning tool to show the approximate boundary of the corridor. Where site specific decisions need to be made, the environmental corridor will need to be field verified. Maps will also need to be updated on a periodic basis as land use conditions change. Dedicated staff and funding will be required to implement an environmental corridor protection program.

Regulations are not the only way to protect environmentally sensitive areas. Land purchases and easements provide other tools to protect important natural resources. The Green Lake Sanitary District has set aside $12,500 per year for land acquisition. **It is recommended that the above environmental corridor maps be used for targeting where the sanitary districts funds should be focused.**

The following section discusses how land can be protected by the District through purchase and easements.

SANITARY DISTRICT'S LAND PROTECTION STRATEGY

The District's land protection strategy aims to protect Green Lake's water quality and ecosystem through voluntary purchases of environmentally sensitive areas. In some cases, the District will seek to purchase land outright. In other cases, the district may not require all of the interest in the property. For example, a "less than fee" interest like a conservation easement may be sufficient where the District seeks to establish buffer areas along watercourses.

A conservation easement is an interest in property imposing limitations or obligations to protect natural resources.[1] A landowner who conveys a conservation easement agrees to the imposition of specific restrictions on his or her property in order to protect the public interest in natural resources on the property. For example, an agricultural open space conservation easement might prohibit the construction of nonagricultural buildings or structures on a parcel of agricultural land and further require that agriculture on the parcel be conducted in accordance with soil and water conservation practices. A historic preservation easement would typically prohibit alterations to the exterior appearance of a building having recognized architectural qualities. These restrictions would apply in addition to zoning or other regulations in effect and would be enforceable by the easement holder. Typically, conservation easements "run with the land" binding the current owner and all future owners of the property.

A conservation easement is transferred in a real estate transaction in which the landowner grants the conservation easement to a "holder". Under Wisconsin law, local governments authorized to hold interests in real property and some private charitable organizations are qualified to "hold" conservation easements.[2] The Wisconsin Statutes clearly authorize town sanitary districts to acquire land and conservation easements by gift or purchase.[3] Conservation easements can also be established by acquisition of land and later transfer of the property with a conservation easement "reserved" by the seller.

All conservation easement transactions require that a deed of conservation easement be executed by all landowners, accepted by the holder, and recorded in the office of the County Register of Deeds .[4]

1 Section 700.40, Wis. Stats., the Uniform Conservation Easement Act, provides a clear framework for conservation easement creation and enforcement.

2 Section 700.40(1)(b)(1), Wis. Stats.

3 Section 60.77(5), Wis. Stats., authorizes the Sanitary District Commission to acquire real property. Section 60.782(2)(d), Wis. Stats., specifically authorizes "lake sanitary districts" like the Green Lake Sanitary District to acquire property to improve water quality, support stream bank protection and provide for parks, public access, fish and wildlife habitat, woodlands, wetlands, trails and other open space purposes.

4 Section 700.40(2), Wis. Stats.

Conservation easements acquired under Wisconsin law are protected against a variety of judicial challenges to their validity. These include challenges based on common law theories which have historically frustrated the durability of such easements.[5] Conservation easements may be granted for a specified term of years or in perpetuity.[6] In recent years, there has been a significant increase in the use of "conservation easements" as a component of community planning. This increase is a result of several factors.

First, the Internal Revenue Code was amended in the early 1980's to provide a federal income tax deduction for donations of certain qualifying conservation easements.[7] A corresponding income tax benefit is provided under Wisconsin income tax law.

Second, many areas of the country have chosen to use voluntary purchases of development rights to complement zoning and other regulatory land use controls. Unlike police power regulations, these techniques rely on voluntary restrictions reflected in enforceable recorded agreements with landowners. As result, they have not encountered the degree of public opposition that sometimes attends regulatory approaches to secure open space.

A major advantage of this approach is flexibility. The exact restrictions under a conservation easement can be tailored to a particular situation. For example, a conservation easement could prohibit any buildings, or could authorize specific types of buildings in particular locations on the affected parcel.

Disturbance of natural vegetation could be barred on one portion of a parcel, while agriculture could be permitted on another area.

Conservation easements have been used for a wide range of conservation purposes, including water quality protection. The acquisition of conservation easements could protect environmentally sensitive areas in the Big Green Lake Watershed without unduly burdening land owners.

The District could purchase conservation easements and/or encourage voluntary contributions of these interests. The District has established a Lake and Watershed Protection Fund for the acquisition of wetlands, highly erodible lands or other lands which contribute significantly to the protection or improvement of the water quality of Big Green Lake, its watershed or ecosystem.

There is some potential to leverage these District funds with State of Wisconsin grant funds and private donations. Partnerships with private citizens and other government units are a key component of the District's strategy for land protection.

[5] Section 700.40(2), Wis. Stats.

[6] Under Section 700.40(2)(c), Wis. Stats., a conservation easement is unlimited in duration unless the conservation easement otherwise provides.

[7] P.L. 96-541.

The State of Wisconsin's program of land conservation acquisition was consolidated and expanded in the Warren Knowles and Gaylord Nelson Stewardship Fund adopted in 1989.[8] The Stewardship Fund legislation authorizes state general obligation bonds of approximately $25 million in each fiscal year and authorizes acquisition and development activities in a dozen different conservation categories ranging from Urban Green Space to Streambank Protection.

Under the program, the appropriations for three of these categories are available exclusively for Department of Natural Resources acquisition of designated state project areas. These include state parks, state forests, state wildlife areas and other project sites.

Municipalities, including the District, are eligible to receive cost sharing funds under two major Stewardship categories: local park aids and urban green space.[9] Under these programs, local units of government can receive up to fifty percent of acquisition and development costs for qualifying projects.

A significant change in the state's strategy for land acquisition was adopted as the nonprofit conservation organization (NCO) provision of the Stewardship Fund Act.[10]

The nonprofit conservation organization law authorizes the Department of Natural Resources to distribute funds appropriated under several of the Stewardship Fund categories to qualifying private sector organizations. In order to participate, nonprofit organizations need to meet standards for corporate organizational form and federal tax-exempt status. Such organizations must be organized for purposes which include the acquisition of property for conservation.[11]

The Department of Natural Resources is not required to provide any portion of any appropriation to nonprofit conservation organizations, although it may appropriate as much as 100% of the funds available in some Stewardship Fund categories as nonprofit organization grants. The program authorizes grants to NCOs in an amount not exceeding 50% of the cost of acquisition.

Under state rules for the nonprofit conservation organization grants, the organizations are required to apply to the state to insure the qualification of (i) their organizational status, (ii) the project they propose for acquisition, and (iii) each transaction to purchase an individual parcel of land. The nonprofit organizations are also required to enter into an agreement as a condition of the grant which insures the use of the property for the conservation purpose for which it is funded under the Stewardship Fund Program. The organization must specifically agree to grant the state a reversionary interest in the property which automatically transfers title of the property to the state in the event that the NCO fails to comply with the proposed uses and management of the property or if the organization violates prohibitions against unpermitted transfer.

[8] 1989 Wisconsin Act 31.
[9] Sections 23.09(19) and (20), Wis. Stats.
[10] Section 23.096, Wis. Stats.
[11] Section 23.096(1)(a), Wis. Stats.

There are several program categories under the Stewardship Fund which have available resources for cost sharing grants to NCOs which could be used as part of the Big Green Lake land protection program. The Green Lake Association and the Green Lake Conservancy qualify for these grants.

A cooperative effort involving the District and one or more nonprofit conservation organizations would enhance access to these State funds. For example, the Green Lake Conservancy could obtain a Stewardship Program grant covering 50 percent of the acquisition cost of a parcel of environmentally sensitive land or a stream bank easement. The District could contribute all or a part of the local matching cost through an agreement with the Conservancy. [12] In some cases, it may be most appropriate for the District to be the ultimate owner of the property with responsibility for management.

The Department of Natural Resources also administers a Lake Management Grant Program. [13] Under that program, local units of government (including the Village) and nonprofit organizations qualified under the Stewardship Program may obtain matching grants for the purchase of land or conservation easements to protect lake water quality. These grants are limited to $200,000 per project. Although the annual appropriation for these grants is currently $1.35 million dollars, there is a fund balance from unexpended appropriations in prior years.

Whether a conservation easement is donated or purchased, a determination of its value must be made. The valuation of conservation easement interests is not a wholly perfected science, although substantial improvements in appraisal techniques have been made in the last decade. An important element of the valuation problem is the dearth of comparable property sales involving lands subject to easement restrictions. There is general agreement that the valuation of an easement should be based on the difference in land values before and after the imposition of the easement restrictions. In other words, the value of the property subject to the easement restrictions is subtracted from its market value prior to the easement grant. The difference is the value of the easement. This manner of valuation is used by state and federal government agencies including the Internal Revenue Service. [14]

> For example: Suppose that a 40 acre parcel of farmland which can be subdivided into 5 acre residential lots has a market value of $200,000. If the parcel were subject to a conservation easement, limiting its use to agricultural and open space purposes and prohibiting subdivision and construction of residential buildings, its value would be more consistent with its agricultural value, say $2500 per acre or $100,000. The value of the conservation easement would be $200,000 less $100,000 or $100,000.

[12] Section 60.782(2)(c), Wis. Stats., specifically authorizes a lake sanitary District to appropriate money for the conservation of natural resources or for payment to a bona fide nonprofit organization for the conservation of natural resources or beneficial to the district.

[13] Section 144.254, Wis. Stats.

[14] Rev. Rul. 73-399, 1973-2 CUM. BUL. 68.

There are substantial tax benefits available to donors of conservation easements that meet the certain standards. [15]

What follows is a general discussion of some of the key tax consequences of conservation easements.

WISCONSIN PROPERTY TAX

Wisconsin property taxes are generally levied on the fair market value of land. The Wisconsin real property assessment statutes specifically require that the assessor consider the effect on the value of the property of a conservation easement under Sec. 700.40, Wis. Stats. Therefore, to the extent that such a conservation easement reduces the market value of property, the property tax burden on the owner is reduced to reflect that reduction. This can be a significant factor for an owner of land used for agricultural or open space purposes, where the actual market value of the land might otherwise reflect its value for commercial or residential development. It is a natural consequence of this that the property burden within a jurisdiction is shifted to other taxable parcels. Unlike publicly owned land, however, land subject to a conservation easement does remain on the property tax rolls at its use value.

FEDERAL AND WISCONSIN INCOME TAX

A donation of a conservation easement is deductible from federal income tax if it qualifies under specific Internal Revenue Code provisions and related Treasury Regulations. Generally speaking, these provisions require that the conservation easement be granted in perpetuity and exclusively for one of four recognized conservation purposes.

The Internal Revenue Code provides for the deductibility of a gift of a "qualified real property interest," to a "qualified organization," "exclusively for conservation purposes".

A "qualified real property interest" is defined to include "a restriction (granted in perpetuity) on the use which may be made of the real property". A conservation easement under Wisconsin law qualifies under this section.

"Qualified conservation organizations" include governmental units and certain tax-exempt charities. The Green Lake Sanitary District meets that requirement and could therefore receive donations of tax-deductible conservation easements. In order for a non-governmental recipient of a conservation easement donation to qualify it must be a "publicly supported charity". I understand that the Green Lake Conservancy qualifies as a recipient of tax-deductible conservation easement contributions.

The final requirement for a deductible easement donation is that the conservation easement be granted exclusively for conservation purposes. The Code recognizes the following four conservation purposes:

1. The preservation of land areas for outdoor recreation by, or the education of, the general public,
2. The protection of a relatively natural habitat of fish, wildlife, or plants, or similar ecosystem,
3. The preservation of open space (including farmland and forest land),
4. The preservation of an historically important land area or a certified historic structure.

[15] Some donated conservation easements qualify for federal and state income tax incentives. All conservation easements (whether purchased or donated) result in reduced property and estate taxes. The extent of these benefits vary widely, depending on the situation of the taxpayer and the effect on the value of the property resulting from the particular restrictions incorporated in the conservation easement.

Conservation easement donated for water quality purposes may be deducible under either item 2 or 3 above.

Because it is the most generally applicable conservation purpose, Congress made open space easements subject to additional standards for deductibility. These requirements are detailed in federal Treasury Regulations. Among other requirements, open space easements must yield a "significant public benefit" and qualify as being for open space preservation which is either:

(A) for the scenic enjoyment of the general public, or;

(B) pursuant to a clearly delineated federal, state, or local governmental conservation policy.

The scenic enjoyment requirement is met by either physical access of the general public or "visual access," such as the view of a scenic shoreland area from a public road or waterway.

Grants of open space easements on lands without public scenic values qualify for deduction if made pursuant to a clearly delineated governmental conservation policy. In order to support the deductibility of donated open space easements under that provision, the District should consider adoption of a plan which identifies specific areas for open space conservation.

All deductible open-space easements must yield a significant public benefit. Among the factors identified in the Treasury Regulations for determining the significance of public benefits provided by a conservation easement are the "uniqueness" of the property, the intensity of nearby development, and the consistency of the proposed easement use with public conservation programs for "water supply protection, water quality maintenance and enhancement, flood prevention and control, [and] shoreline protection" and with private conservation programs in the area.

All such charitable donations (including conservation easements and gifts of cash, securities or other assets) are subject to limitations. Generally, an individual taxpayer may deduct charitable contributions up to one-third to one-half of adjusted gross income annually. Excess contributions may be "carried forward" for up to five additional tax years.

Wisconsin income tax law generally follows federal law. Therefore, a conservation easement donation meeting the federal standards described above, would also qualify for a state income tax deduction.

FEDERAL ESTATE TAX

Federal estate tax is payable on estates exceeding $600,000. Because a conservation easement reduces the value of property, it can also reduce the taxes payable on a decedent's estate. These savings are proportional to the reduction in the value of a taxable asset resulting from the conservation easement.

OVERVIEW OF POTENTIAL FUNDING SOURCES FOR LAND ACQUISITION AND PROTECTION.

STATE GRANTS

1. **Urban Green Space** - This state grant program provides 50% matching grants to cities to provide open natural space in urban development. The Urban Green Space Program is allocated $750,000 statewide per year. The Cities of Green Lake and Ripon could be eligible for this program.

2. **Local Park Aids** - This state program provides 50% matching grants for the development of public outdoor recreational facilities. Local Park Aids are allocated $2,500,000 statewide per year.

3. **County Conservation Aids** - This state program provides 50% matching grants for implementation of fish and wildlife management projects.

4. **Nonpoint Source Pollution Abatement Program Grants** - This program provides cost share grants for the installation of nonpoint source pollution abatement practices. Conservation easements are an eligible practice under this program.

5. **Managed Forest Law** - This program provides property tax incentives to landowners who maintain their land in forest. Only areas 10 acres or larger are eligible for the program. Eighty percent of the land must produce merchantable timber.

6. **Stewardship Fund** - This program is made up of 11 sections. The sections include:

Program	Eligible
General Land Acquisition	WDNR
State Recreation Property Development	WDNR
Local Park Aids	local governments
Lower Wisconsin River Acquisition	WDNR
Natural Areas Acquisition	WDNR
Streambank Easements	WDNR, local governments, and Nonprofit Conservation Organizations
Wildlife Habitat Restoration and Fisheries	WDNR
Trails	WDNR
Urban Green Space	local governments, and Nonprofit Conservation Organizations
Natural Areas Match Grant	WDNR
Ice Age Trail	WDNR

FEDERAL GRANTS

1. **Conservation Reserve Program (CRP)** - This program pays a rental fee to local farmers to place highly erodible land into grass, trees, or other long term cover. In 1996, $80 per acre was being paid in Green Lake County for CRP rentals.

2. **Water Reserve Program (WRP)** - This program provides funds to acquire easements on wetland areas. The cost share rates depend on the length of the easement. The program provides 75 to 100 percent cost sharing for permanent easements, 50 to 75 percent for 30 year easements, and 50 to 75 percent for restoration cost share agreements.

3. **Farmland Protection Program** - This program provides funds for the purchase of conservation easements on land which farmers want to preserve in agriculture. This program can help protect farms in urbanizing areas.

4. **Wildlife Incentive Program** - This program helps farmers improve wildlife habitat on private lands. The program provides cost share grants for developing habitat for upland wildlife, wetland wildlife, endangered species, fisheries, and other wildlife.

5. **Forestry Incentive Program (FIP)** - This program provides cost sharing for forestry practices. Tree planting, site preparation and timber stand improvements are examples of eligible practices under this program.

6. **Stewardship Incentive Program (SIP)** - This program provides cost sharing for forestry and land management practices. Forestry management, tree planting, fish habitat improvement, recreational development, and wildlife plantings are examples of eligible practices under this program.

CHAPTER 5

STORMWATER AND EROSION CONTROL REGULATIONS

INTRODUCTION

Construction site erosion can be a serious source of sediment delivered to a lake. Erosion from construction sites can range from 20 to 200 tons per acre per year. A typical problem agricultural field may be eroding at 8 to 10 tons of soil loss per acre per year. Construction sites are also a major problem because they have higher delivery mechanisms. Delivery ratios for sediment from a construction site can range from 50 to 100% of the soil disturbed. On agricultural fields, delivery ratios are typically 10 to 30% depending on the drainage area. A single acre of construction can contribute 50 times more sediment that an acre of typical agricultural land. To protect Big Green Lake, it is important that construction site erosion be controlled.

Stormwater runoff is the excess rain water that does not seep into the ground during and after a storm. As land is developed into urban land uses, the surface of the land is covered with a higher percentage of impervious surfaces such as roofs, driveways, parking lots and streets. As the landscape becomes more developed, the amount of rain water that becomes runoff increases. Increased runoff can cause downstream flooding, erosion problems, and carry pollutants into local lakes. The problems caused by excessive runoff can be controlled by the installation of stormwater control practices such as grass waterways, infiltration trenches, or detention ponds. Through the use of a stormwater management ordinance, local units of government can require developers to adequately plan for the control of increased runoff.

The purpose of this chapter is to provide a model stormwater and construction site erosion control ordinance for use by local communities and Green Lake and Fond du Lac Counties. A strategy to develop public and political support for ordinance adoption is outlined.

NEED FOR STORMWATER AND CONSTRUCTION SITE EROSION CONTROL ORDINANCES

Stormwater

Often the Green Lake County Land Conservation Department is called by a landowner complaining about water management problems with their property. When the department investigates these sites, they generally find the following condition:

1) No thought was given to assess major storm events and their impacts on the affected properties.

Most landowners view water management from the standpoint of "once it's off my property, there's no problem." This is, of course, a very human attitude but unfortunately most of us do live downstream and can realize the negative impact. Situations causing the problems are usually land use changes such as the following:

1) Creation of more impervious areas which lead to more runoff (i.e.: expansion of homes, paving driveways, patios, parking areas, etc.).
2) Diverting or redirecting of water from a low velocity overland flow to a rapid channelized water transport method.
3) Landowners building in flood prone areas.

Why is this problem a concern to the residents of the Green Lake Sanitary District?

1) Potential devaluation of property. Anytime that moderate rainfall events create a stormwater problem, landowners will have a desire to move elsewhere.
2) Non-point source pollution to county lakes, rivers and streams. As water quality declines, so does the perceived value and enjoyment of the waterfront property.
3) Lastly, the actual instances where the flooding waters cause property damage.

Green Lake County has obtained a grant through the WDNR Lake Protection Program to analyze and assess the impact of land use trends and impact on issues like stormwater management. It is already a forgone conclusion that an ordinance is needed; but, the major issue will focus on funding of the implementation and enforcement of the ordinance. It is the intention of the preparers of this report and the Green Lake County Lake Protection Grant project to hopefully implement the ideas and recommendations from both reports into reasonable and workable solutions. It should be the goal of these reports to achieve the real intent of these ordinances and policies—"protection of the water resources."

Erosion Control

As outlined above, construction sites can be a serious source of sediment and nutrients to a lake. The Green Lake area is experiencing steady growth. Installation of the sanitary sewer system has opened up opportunities to develop properties that were not suited for on-site disposal systems. Many seasonal homes are being converted to year-round residents. As new development and redevelopment takes place, the potential for damage to the lake from construction activities increases. With proper erosion control, construction activities can take place without risk to the lake. One way to assure that erosion practices are used is to mandate their use through state regulations or local ordinances.

Soil erosion from construction sites in Green Lake County is often ignored. The reason for the ignorance is simply that we are creatures of habit. It is the natural assumption by home builders in our county that the last item of business when building a home is the landscaping of the area surrounding the home. Rarely will a builder landscape the majority of the property first and then build the home. A common solution to construction erosion is the placement of two bales of straw just above the road culvert receiving the runoff water.

The Green Lake County Land Conservation Department (LCD) has worked with landowners in the past regarding a situation where a golf course planned a nine-hole course expansion. The LCD recommended hiring an engineering firm to design construction site erosion control. In this instance, the golf course paid close to $10,000 for the plan preparation. Major soil erosion occurred due to the golf course builder not following the plan that had been prepared by the engineering firm. The LCD was then caught in a situation of trying to correct the situation by explaining to the golf course builder how to properly install the best management practices along with maintaining them. If the county would have had stop work order provisions, the situation would have been corrected quickly.

Green Lake County does not have a Construction Site, Erosion Ordinance; therefore, the majority of municipalities have no regulation of construction site erosion. The State of Wisconsin regulates construction site erosion on single-family homes, duplexes and commercial buildings through the state Uniform Dwelling Code (UDC). The code is enforced by the local building inspector where the building code is adopted. The City of Berlin is the only municipality that falls under (UDC). The three major lakes in the county—Big Green Lake, Little Green Lake and Lake Puckaway—have no UDC requirement and, in turn, means very little proper erosion control for construction areas.

Every time a complaint is made to the county LCD in regards to construction site erosion, the department averages four hours of staff time to handle and view the complaint—not to mention the hours involved if the landowner wishes to solve the problem and needs assistance. This burden on staff then removes available time to deal with other traditional non-point pollution projects such as cropland erosion control or animal waste management systems.

The real key to controlling construction site erosion is education of landowners and contractors. Realistically though, protection of the major lakes and others bodies of water will only be obtained by implementing an ordinance with stop work order provisions and penalties.

TARGET UNITS OF GOVERNMENT FOR ORDINANCE ADOPTION

The Big Green Lake watershed has 12 units of government that have authority to adopt stormwater and erosion ordinances under Wisconsin Statutes. The units of government include the following:

1. Green Lake County
2. Fond du Lac County
3. City of Green Lake
4. City of Ripon
5. Town of Brooklyn (Green Lake County)
6. Town of Green Lake (Green Lake County)
7. Town of Princeton (Green Lake County)
8. Town of Marquette (Green Lake County)
9. Town of Metomen (Fond du Lac County)
10. Town of Ripon (Fond du Lac County)
11. Town of Rosendale (Fond du Lac County)
12. Town of Springvale (Fond du Lac County)

Under state statutes, cities (60.627); villages (61.354); towns (62.234); and counties (59.974) have the authority to adopt local erosion control ordinances. To implement the ordinance, it is important that the local unit of government have the trained staff to do the work. The eight townships listed above have limited staffing and would unlikely have enough individual building activity to maintain staff for ordinance administration and enforcement. Currently, none of the townships have local zoning authority. All zoning is currently being administered by Green Lake County. For the unincorporated areas of the County, it would make more sense to adopt the ordinance at the county level and have it administered through the County Zoning Department and Land Conservation Department.

The City of Green Lake has the authority to adopt a stormwater and erosion control ordinance. The ordinance could be administered through the City Engineer.

The Green Lake Sanitary District does not have statutory authority to adopt a stormwater or erosion control ordinance. While the district does not have authority to adopt an ordinance, there may be things the district can do to enforce installation of erosion control practices. The Pewaukee Lake Sanitary District has successfully enforced a local rule prohibiting properties with construction site erosion problems from connecting to the public sanitary sewer system. Pewaukee's local rule has never been challenged in the courts and has been successful is controlling several chronic problem sites. **It is recommended that the Green Lake Sanitary District adopt an erosion rule similar to the Pewaukee Lake Sanitary District's in calendar year 1997.**

STRATEGY FOR ORDINANCE ADOPTION

First it is recommended that the Green Lake Sanitary District, by resolution, go on record endorsing the adoption of a stormwater and erosion control ordinance in both Green Lake and Fond du Lac Counties. The resolution should be adopted at the January, 1997 meeting of the Sanitary District Board. A letter should be prepared to each County Board, and the Cities of Green Lake and Ripon, requesting their adoption of the model ordinance prepared as part of this report. The strategy is to first try and get the Counties to adopt the ordinance for all of the incorporated areas. If the County Boards are reluctant to adopt the ordinance then the strategy will focus on township adoption under Wisconsin Statute 62.234.

Prior to adoption of a stormwater and erosion control ordinance, it will be important to develop local support for the measure. The first step in developing public support is public education. An educational program identifying the potential impacts of uncontrolled stormwater is important. The Green Lake County Land Conservation Department should prepare a summary of the building activity in the watershed. Case histories of past problems should be summarized. An overview of the economic impact of the ordinance should be developed. The economic review should balance the cost of program administration against potential damages that can be caused if the ordinance is not in place. The economic value of the local recreational industry in Green Lake County should be summarized. An informational sheet on the issue should be prepared.

Support from local interest groups will need to be solicited. Examples of groups that should be solicited for support should include the Green Lake Association, Little Green Lake Protection and Rehabilitation District, local builders association, local chamber of commerce, local resort owners, and civic organizations. Individual meetings with these groups will be required. To facilitate the discussion process, a slide presentation should be prepared.

Once public support is developed for an ordinance, an educational forum should be held with county board supervisors. A group of interested supervisors will need to be identified to sponsor the ordinance resolution. **It is recommended that the Green Lake County Land Conservation Department take the lead role in the needed education effort.**

MODEL STORMWATER MANAGEMENT AND CONSTRUCTION SITE EROSION CONTROL ORDINANCE

A model stormwater management and construction site erosion control ordinance is located in Appendix B of these report. The ordinance is based on two models developed at the state level. The stormwater portions of the ordinance are based on a draft model developed by the Wisconsin Department of Natural Resources that will be released in 1997. The erosion control sections are based on a model ordinance developed by the Wisconsin Department of Natural Resources and Wisconsin League of Municipalities. Both sections of the ordinance have been slightly modified by R. A. Smith & Associates, Inc. based on comments from a focus group in the City of Watertown.

CHAPTER 6

INFORMATION AND EDUCATION STRATEGY

INTRODUCTION

The purpose of this Chapter is to outline an implementation strategy for education regarding watershed protection for Big Green Lake. The strategy will outline methods for educating the public about water quality issues. The strategy will focus on what local residents, civic groups and local communities can do to control sources in their own backyards. The issues that the Information and Education (I & E) strategy will address will be identified in the planning process and will be tailored to the specific needs of the study area. Opportunities for coordination of the I & E efforts with local organizations such as Green Lake County, 4-H, sportsman groups, Green Lake Association, and local schools will be explored.

EDUCATIONAL ISSUES

An I & E program to educate local residents as to what they can do to prevent and reduce stormwater pollution problems is important to the protection of Big Green Lake. Issues that need to be addressed by the I & E program to meet the water quality goals of this plan include:

1. Lawn Care
    a. Reduced fertilizer use
    b. Reduced pesticide use
    c. Proper disposal of lawn clippings
    d. Proper disposal of leaves
2. Proper disposal of pet waste
3. Reduction of dumping of waste in storm sewers and local drainage ways
4. Prevention of shoreline erosion
5. Protection of important fish and wildlife habitat areas
    a. Wetlands
    b. Fish spawning and nursery areas
    c. Nesting areas
    d. Proper shoreline structures
6. Lake use issues
    a. Jet skies
7. Weed harvesting
    a. What is going on
    b. impacts on fishery

8. Construction site erosion control

9. Lake ecology

   a. What is a watershed
   b. The property owner's role in controlling nonpoint source pollution
   c. Lake monitoring

TARGET GROUPS

Target groups for public education include the following:

- Local elected officials
- Civic leaders
- Farmers
- Company's that sell lawn care products an services
- Lake shores residents
- The general public

Reaching the general public is a difficult task in recreational areas where many of the homes are seasonal. The best approach for reaching people is through traditional interest organizations that they may belong. Organizations such as the Green Lake Association and local civic groups are examples of vehicles that can be used to reach the public with educational material.

Educational Methods

Table 6-1 outlines recommended I & E activities that could be used in the Big Green Lake Watershed area.

TABLE 6-1
I & E Opportunities

I & E METHOD	ACTIVITY
Newsletters	The following organizations publish newsletters to educate residents on local issues. This newsletter should be used to disseminate information as part of this plan. Organization — Publication dates Green Lake Sanitary District — Twice per year Green Lake Association — Quarterly Green Lake County LCD — Quarterly
Articles in the local newspapers	The Green Lake community is served by the following newspapers: The Green Lake Reporter, Princeton Times Republic, and Ripon Commonwealth. The Green Lake Sanitary District and Green Lake County Land Conservation Department should work with local reporters of these newspapers to include articles on stormwater and water quality related issues.
Local cable TV	The City of Green Lake is served by Marcus Cable Company. Currently, there is no local access cable channels.
Meetings with civic groups	Meetings with the local Chamber of Commerce (294-3260), Rotary Club (Marge Bostelmann, 294-4005), Lion's Club (Jim Dorsey, 294-3369), Women's Professional Business Club (Barb Riser, 294-3063), local scout troops, 4-H, local farm coops, and other civic groups are recommended in order to explain the importance of housekeeping practices in maintaining good water quality is recommended.
Display at local events	Display educational information at local civic events such as the Lion's Club Winterfest (February), Chamber of Commerce 4th of July celebration, and Harvestfest.
Placement of educational material at public buildings	It is recommended that a display area for flyers located in the lobby of the Green Lake City Hall, County Courthouse, Big Green Lake Sanitary District, public libraries, and other public buildings to display I & E materials. I & E material on lawn care, fertilizer use, pet waste, etc., developed by the University of Wisconsin Extension and the Green Lake Land Conservation Department can be displayed for public pick up.
Tours of management practices	Tours of management practices and pollution prevention activities are recommended for local citizens and civic leaders.
Educational signs at management practice sites	Signs to explain the purpose of stormwater management, habitat protection and other water quality management facilities can educate the public on how their dollars are being spent.
Storm sewer stenciling program	To prevent the dumping of waste materials down storm drains, placement of the statement "*Dump No Waste Drains to River*" on the storm sewer inlets is recommended. This project could be conducted by a local civic or scout group. The Dane County Lakes and Watershed Comm. and the University of Wisconsin Extension has material available to conduct this activity.
Telephone hotline	The Green Lake Sanitary District in cooperation with the Green Lake County Land Conservation District and University of Wisconsin Extension should develop a telephone hotline that will allow residents to listen to pre-recorded messages about local water quality issues.

Potential Funding and Assistance Programs for Public Education

1. **Wisconsin Lake Planning Grant Program** - This grant program provides state cost share dollars for planning and education of lake related issues. The program provides grants up to $10,000 in size to cover 75 percent of the cost of planning projects. Application dates for the program are February and August of each year.

2. **Project Wild/Aquatic** - This state program provides a free collection of supplemental teaching activities for grades K-12 which focuses on the aquatic ecosystem. Subjects covered include the food chain, natural processes and human interaction. There is a teacher's workshop for this program. This program is administered by the Wisconsin Department of Natural Resources (WDNR) Bureau of Information and Education.

3. **Water Education for Teachers (WET)** - This is a collection of supplemental teaching activities for grades K-12. This program focuses on water resources management. There is a teacher's workshop for this program. This program is administered by the WDNR Bureau of Information and Education.

4. **Wetland Understanding Leading to Protection** - This is a comprehensive multi-disciplinary wetland educational program for grades 6-8. The program is administered by the WDNR Bureau of Information and Education and funded by WDNR Coastal Zone Management. No workshop is required for this unit.

Information and Educational Program Recommendations For the Next Five Years

Recommendation No. 1 - The Green Lake Sanitary District should prepare an annual summary report outlining the current status of the water quality of Big Green Lake. This report should be published once per year as a special edition of the Sanitary District's newsletter. The first edition should be prepared for the summer of 1997.

Recommendation No. 2 - The Green Lake Sanitary District should work with local newspapers to carry articles on Big Green Lake water quality issues. Once per year the administer of the District should meet with the editor(s) of the Green Lake Reporter, Princeton Times Republic, and Ripon Commonwealth to discuss potential articles and to maintain a working network.

Recommendation No. 3 - Once per year the Green Lake Sanitary District should sponsor a tour of the Big Green Lake area to show local leaders examples of progress being made in watershed management. The tour should be sponsored in cooperation with the Green Lake County Land Conservation Department and demonstrate how the Sanitary District has used its grant program to make positive changes.

Recommendation No. 4 - The Green Lake Sanitary District should sponsor an annual stewardship award to the landowner or organization that contributed to the protection of Big Green Lake. The award will be used to foster local pride and recognition for the efforts of local citizens and encourage other to participate in the protection of the lake.

Recommendation No. 5 - The Cities of Green Lake and Ripon should sponsor a storm sewer stenciling program to encourage people not to dump waste into local storm drains.

Recommendation No. 6 - The Green Lake Sanitary District should establish a telephone hotline to answer frequent questions by the public. The hotline would be used to reduce staff time answering frequent public calls regarding issues such as weed harvesting.

REFERENCES

Donahue & Associates, Inc. (1978). A Plan for the Protection of Green Lake. Sheboygan, WI

WDNR, (1981). Big Green Lake Priority Watershed Plan. Wisconsin Department of Natural Resources, Madison WI.

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