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Nonpoint Source Control Plan for the Lake Ripley Priority Lake Project

The Wisconsin Nonpoint Source Water Pollution Abatement Program

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This Plan Was Cooperatively Prepared By:

The Wisconsin Department of Natural Resources
Wisconsin Department of Agriculture, Trade and Consumer Protection
and
Lake Ripley Management District
Jefferson County Land Conservation Department

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Watershed Plan Credits

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Table of Contents

List of Tables

List of Maps

List of Appendices

SUMMARY
Lake Ripley Priority Lake Plan

Introduction

The Lake Ripley Priority Lake Project plan assesses the nonpoint sources of pollution in the Lake Ripley Watershed and guides the implementation of nonpoint source control measures. These control measures are needed to meet specific water resource objectives for Lake Ripley and its tributary. The primary objective of the project is to reduce nonpoint source pollution to the lake.

A watershed management plan was prepared by the Wisconsin Department of Natural Resources (DNR), the Department of Agriculture, Trade, and Consumer Protection (DATCP), the Lake Ripley Management District, and the Jefferson County Land Conservation Department. The DNR selected the Lake Ripley Priority Lake Project through the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1992. It joined approximately 67 similar watershed projects statewide in which nonpoint source control measures are being planned and implemented. The Nonpoint Source Water Pollution Abatement Program was created in 1978 by the Wisconsin State Legislature. The program provides financial and technical assistance to landowners and local governments to reduce nonpoint source pollution.

The project is administered on the state level by the DNR and DATCP. The Lake Ripley Management District and the Jefferson County Land Conservation Department will administer the project on the local level with assistance from the University of Wisconsin–Extension.

General Watershed Characteristics

The Lake Ripley Watershed drains 8 square miles of land in Jefferson County in southern Wisconsin. The Lake Ripley Watershed drains to Koshkonong Creek, and is part of the Lower Rock River Basin. The entire watershed is within the Town of Oakland; however, Lake Ripley is often identified with the nearby Village of Cambridge. There are approximately 650 residences within the watershed boundaries, although the population fluctuates seasonally and from week to weekend.

Land Use

Approximately 70% of the land area in the watershed is agricultural; 15% is residential and open urban land, and 15% is wetland, woodland, and open water. Land in the eastern two-thirds of the watershed is generally flat, low rolling terrain with wetlands intermixed. The majority of wetlands have been drained for agricultural use. The western third of the watershed surrounds Lake Ripley itself. Most of the shoreline is developed with summer cottages and year-round homes.

Under natural conditions, a large portion of the agricultural area would be too wet to farm. Utilizing a series of ditches and drain tiles, these areas have become exceptional sod and mint farms. The watershed also contains several gravel mines.

Water Quality

Lake Ripley

Lake Ripley is the major surface water feature in the watershed. It is a 418-acre marl lake with a maximum depth of 44 feet (13.2 meters). It is a drainage lake with one inlet on the southeast corner of the lake and one outlet on the northwest corner. Since it is less than a two hour drive from Madison, Milwaukee and Chicago, the lake is an important recreational resource to the area, and is heavily used by boaters, swimmers, and anglers.

The water quality of Lake Ripley has deteriorated since humans settled in the area in the mid-1800s. Clearing land for agriculture increased the loading of sediment and nutrients to the lake, resulting in an increase in algae and a decrease in water clarity. This decline continued until the 1960s when erosion rates slowed and the water quality began to improve. However, the erosion rate increased again in the 1970s, most likely from increased residential development. Even though agricultural activity in the watershed historically contributed most of the sediment and nutrients to the lake, it appears that development is contributing a significant share of phosphorus. Water quality records indicate that the present water quality of the lake is worse now than at any other time in the last 250 years. The Trophic State Index of the lake, a measure of the biological condition of the lake, hovers around 50, which is borderline mesotrophic/eutrophic. This means the lake suffers from excessive nutrients. Nuisance algae blooms and excessive weed growth, particularly Eurasian milfoil, are common occurrences in Lake Ripley.

Tributary Inlet

The tributary inlet to Lake Ripley passes through a small wetland area in the eastern portion of the watershed. While in 1907 the tributary inlet had a defined channel length of 2.5 miles, the defined channel length in 1993 had grown to 4.25 miles. This change is entirely the result of the formation of agricultural ditches. The increased stream channel has resulted in decreased infiltration to groundwater, increased surface water runoff, and increased sediment and nutrient loads to the lake.

Wetlands

Wetlands have been a significant part of Lake Ripley's history. Mapping efforts between 1903-08 show about 1,500 acres of wetlands in the watershed. These wetlands provided valuable fish and wildlife habitat, hydrologic control, and the ability in improve water quality to the lake. Today, there are about 385 acres classified as functioning or partially functioning wetlands. The reduction in wetland acreage is the result of agricultural tillage, drain modification and development. Similarly, a reduction in wetland function has also occurred.

Groundwater

Groundwater may contribute as much as 30% of the water supply to the lake. An assessment of groundwater quality was completed by sampling 33 private wells for nitrate analysis and triazine screening. Nitrate concentrations (measured as nitrate-nitrogen) ranged from 0-33 milligrams per liter (mg/L); 15% percent had nitrate levels over the enforcement standard (health advisory level) of 10 (mg/L), and 45% percent had nitrate levels between 2 mg/L and 10 mg/L, the preventative action limit. No pattern of groundwater contamination was linked to specific sources.

Well sampling for triazine showed that no samples collected had triazine levels over 3.0 micrograms per liter (µg/L), which is the enforcement standard for atrazine plus its breakdown components, called metabolites. Triazines are a family of herbicides which include atrazine and its metabolites which when present in groundwater indicates groundwater contamination. 42% of the samples collected had triazine levels between 0.1 and 3.0 µg/L. The preventative action limit for atriazine is 0.3 µg/L.

Sources of Water Pollution

The Lake Ripley Management District collected data on all agricultural lands, barnyards, ditches, the lake shoreline, existing urban areas, and construction sites in the watershed. These data were used to estimate the pollutant potentials of these nonpoint sources. In the Lake Ripley Watershed, about 75% percent of the sediment reaching the lake originates from agricultural ditches. However, since soil eroding from ditches is comprised mostly of subsoils, rather than topsoil, it does not contribute significantly to phosphorus loading to the lake. Approximately 7% of the total sediment load from the watershed to the lake is contributed from direct shoreline erosion. About 1% of the total sediment load is from existing urban areas, and 13% is from construction sites. Although barnyards in the watershed were inventoried, none was found to be a significant source of phosphorus loading to the lake.

Pollutant Reduction Goals

The goals of the Lake Ripley Priority Lake Project are based on achieving realistic biological and recreational uses in the lake and its tributary stream. Pollutant load reductions are developed according to activities needed to achieve the water quality objectives. The following is a summary of reductions to be targeted for the entire watershed

Sediment Goal: Reduce overall sediment delivered by 50%. To meet this goal, the following can be achieved, assuming that 75% of the landowners who are eligible for cost-sharing will participate:

- 38% percent reduction in sediment from agricultural uplands delivered to a receiving waterbody;
- 75% percent reduction in ditch erosion delivered to the lake's tributary;
- 55% percent reduction in shoreline sediment delivered to the lake.
- 50% reduction in construction site erosion from new development and remodeling of existing sites;
- 50% reduction in sediment from existing urban areas.

Phosphorus Goal: Reduce overall phosphorus load by 30% percent. Assuming the sediment reduction goals are achieved, the phosphorus goal will also be met.

Other Significant Goals: In addition, this plan identifies goals that will result in improvement in the overall quality of the Lake Ripley:

- Maintain Trophic State Index below 50

- Protect lake sensitive areas

- Prevent further wetland loss or disturbance; protect wetland acres east of the lake and tributary riparian buffer areas; increase total number of wetland acres through restoration measures

- Preserve undeveloped shoreline areas as water quality buffers and wildlife refuges; enhance developed shoreline areas by planting native vegetation to serve as buffers

- Reestablish native aquatic plant communities, where feasible

- Protect the Lake Ripley largemouth bass fishery, aquatic diversity and endangered resources within the lake and watershed

- Protect groundwater resources; maintain groundwater contribution to the hydrologic budget by not changing groundwater infiltration areas.

Table S-1 summarizes the sources of pollution and pollutant reduction goals for the watershed.

Table S-1. Sources of Pollutants and Reduction Goals

Sources	Sediment Delivered (Tons/Yr)	Sediment Reduction Goal (Tons/Yr) (%)	Phosphorus Delivered (Lbs/Yr)	Phosphorus Reduction Goal (Lbs/Yr) (%)
Ditches	2,654	1981 (75%)	N/A	N/A
Construction Sites	450	225 (50%)	N/A	N/A
Shoreline	252	137 (55%)	N/A	N/A
Cropland	146	55 (38%)	865	489 (44%)
Existing Urban	30	15 (50%)	227	113 (50%)
Animal Lots	N/A	N/A	15	N/A
Total	3,532	2,413	1,107	602

N/A = pounds of phosphorus or tons of sediment from these sources is not available

Management Actions

The watershed plan prescribes best management practices (BMPs)--actions or structures that are needed to control nonpoint pollution sources to the levels described above. State funding is available to help offset the expense of installing these practices and implementing the local nonpoint source control plan. Cost-share rates vary from 50% to 70% of the total cost of the practice.

All Category I sources of nonpoint pollutants must be controlled if a landowner wishes to participate in any aspect of the program. Category I represents the level of pollution control needed to achieve the water quality goals in the watershed. Nonpoint sources in Category II contribute less of the pollutant load than those in Category I. They are included in cost-sharing eligibility to further insure that water quality goals are met. Controlling sources in this category is not mandatory for a landowner to be funded for controlling other sources.

The Lake Ripley Management District and Jefferson County will contact all landowners who are eligible to receive cost-share funds during the project's implementationand will assist landowners in applying BMPs. Practices range from alterations in farm management (such as changes in crop rotations, or shaping and seeding agricultural ditches) to engineered structures (such as diversions or sediment basins), and are tailored to specific landowner situations. Participation in the program is voluntary.

The following is a brief description of nonpoint pollutant sources, project eligibility criteria, and BMP design targets for the project.

Agricultural Lands

All agricultural lands contributing sediment to the tributary or lake at a rate greater than the tolerable soil loss, or "T" will be classified as Category I for cost sharing and must be brought down to T. This involves an estimated 60 acres of cropland. Category II will include all lands contributing sediment to the tributary or lake at a delivery rate greater than 0.4 tons/acre/year. A 38% reduction in sediment erosion is the goal for agricultural lands.

Agricultural Ditches

Project participants with identified sites with a lateral recession rate of greater than 0.5 feet per year will be Category I. Those with lateral recession rates of between 0.1 and 0.5 feet per year, will be Category II. Overall, approximately 1,981 tons of sediment from ditches are eligible for control in the Lake Ripley Priority Lake Project Watershed. A 75% reduction in sediment erosion is the goal for agricultural ditches.

Shoreline

Category I sites are those with severe shoreline erosions--a lateral recession rate exceeding 0.5 feet per year with massive washouts and slumps. Category II sites are those with moderate erosion, or having a lateral recession rate between 0.1 and 0.5 feet per year with many exposed roots, fallen vegetation and cave-ins. A 55% reduction in sediment erosion is the goal for the lake shoreline. Bioengineering using coconut fiber rolls will be the preferred method of controlling shoreline erosion in this watershed.

Urban Areas

Reductions in sediment and nutrient loading from urban sources will be accomplished through various non-structural practices. These include changes in landowner practices such as burning of leaves in waterways, timing and application of lawn fertilizers, and routing of stormwater runoff. It is recommended that the Town of Oakland develop and enforce an ordinance to restrict burning of yard waste in grassed waterways and areas adjacent to the lake.

Construction Site Erosion

Reductions in sediment and nutrient loading from construction sites will be accomplished by utilizing relatively low cost best management practices. These include proper use of silt fences, installation of gravel drives, and clean up of sediment tracking at the end of the day. Most important is the enforcement of the existing construction site erosion control ordinance in the Town of Oakland.

Sensitive Areas

Jefferson County staff will also focus on preserving and enhancing the existing wetlands and sensitive areas within the watershed boundary. These areas are critical to filtering sediment and nutrients which would otherwise end up in receiving waterbodies. They also provide essential habitat for fish and wildlife.

Funds Needed for Cost Sharing, Staffing, and Educational Activities

Grants will be awarded to the Lake Ripley Management District and the Jefferson County Land Conservation Department by the DNR for cost sharing, staff support and educational activities. Table S-2 includes estimates of the financial assistance needed to implement needed nonpoint source controls in the Lake Ripley Priority Lake Project, assuming a 75 percent participation rate of eligible landowners.

Table S-2.Cost Estimates for the Lake Ripley Priority Lake Project

Eligible Activity	State Share	Local Share
Cost Sharing	$321,863	$141,863
Easements	150,000	-
Jefferson County Staffing	352,000	-
Educational Activities	22,240	-
Other Direct (travel, supplies, etc.)	97,600	-
Engineering Assistance	87,000	-
Subtotal	$1,030,703	$141,863
	TOTAL - $1,172,566	

Project Implementation

Project implementation is scheduled to begin in February, 1995. Ordinarily, the first three years of implementation is the period for participants to sign cost-share agreements followed by a five-year period for practice installation. While an eligible landowner or operator has three years to determine whether to participate in the program, the installation of BMPs can begin as soon as a landowner has signed a cost-share agreement with the Lake Ripley Management District.

Information and Education

An information and education program will be conducted throughout the project period with the Lake District having overall responsibility for the program. University of Wisconsin–Extension staff in the county and the region will provide assistance. This program will be most intensive during the first three years of the project as landowners and local governments sign up for state cost sharing for pollution control. The program includes:

- A media campaign to inform the public about nonpoint source pollution and activities the public can do to reduce this type of pollution.

- More intensive educational activities, such as meetings, workshops, tours, and demonstration projects for landowners and local government officials who must adopt new pollution control techniques.

- Water quality newsletters that will inform farmers, local government officials, community groups, and concerned citizens about watershed activities, implementation processes, and pollution control methods.

- Educational activities and service projects to inform youth about water resource issues and help them develop a conservation ethic.

Project Evaluation

The project will be evaluated annually to determine project staff accomplishments and pollutant load reductions resulting from BMPs installed. The local project manager is responsible for reporting activities to the DNR. The evaluation strategy for the project involves the collection and reporting of information so that progress may be tracked in three areas: administrative, pollutant reduction levels, and water resources.

At the present time, detailed evaluations of the tributary or the lake are not planned. However, Lake Ripley will continue to be monitored through the DNR's Long-Term Trends Monitoring and Self-Help Lake Monitoring Programs.

Further Information

If you want more information about the Lake Ripley Priority Lake Project, or a copy of the watershed plan, please contact:

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CHAPTER ONE
Introduction, Purpose and Legal status

Wisconsin Nonpoint Source Water Pollution Abatement Program

The Wisconsin State Legislature created the Wisconsin Nonpoint Source Water Pollution Abatement Program (NPS) in 1978. The goal of the NPS Program is to improve and protect the water quality of streams, lakes, wetlands, and groundwater by reducing pollutants from urban and rural nonpoint sources. The 8-square-mile Lake Ripley Watershed, located in Jefferson County, was designated a "priority watershed" in October, 1992. The primary objective of this project is to reduce nonpoint source pollution loads to Lake Ripley and to enhance and protect the water quality of the wetlands, wildlife areas and tributary in the Lake Ripley Watershed.

Nonpoint sources of pollution include eroding agricultural lands, streambanks, roadsides and developing urban areas, field application of manure, fertilizers and pesticides. Pollutants from nonpoint sources are carried to the surface water or groundwater through the action of rainfall runoff, snowmelt, and infiltration.

The following is an overview of the NPS Program:

- The DNR and DATCP administer the program which focuses on critical hydrologic units called priority watersheds. The program is implemented through priority watershed projects for which a plan is prepared.

- Local units of government implement the watershed project. Water quality improvement is achieved through voluntary implementation of nonpoint source controls (best management practices or BMPs) and adoption of ordinances. Landowners, land renters, counties, cities, villages, towns, metropolitan sewage districts, sanitary districts, lake districts, and regional planning commissions are eligible to participate.

- Technical assistance is provided to aid in the design of BMPs. State level cost-share assistance is available to help offset the cost of installing these practices.

- Informational and educational activities are employed to encourage participation.

- The DNR and DATCP review the progress of the counties and other implementing units of government, and provide assistance throughout the eight-year project. The DNR monitors

improvements in water quality resulting from control of nonpoint sources of pollution in the watershed.

Priority Watershed Project Planning and Implementation Phases

Planning Phase

The Lake Ripley Priority Lake Project is somewhat unique in that it is the first project managed at the local level by a lake district, rather than a county government agency. This decision was made based on the small size of the watershed and the project's focus on the lake and its only tributary. Since the lake district has had experience with grants with the DNR, it was decided that the lake district would be best suited to manage the project through a district employee.

The planning phase of the project began in 1993 and included the following information-gathering and evaluation steps:

I. Determine the conditions and uses of lakes, wetlands, sensitive areas, and tributaries to Lake Ripley.

II. Inventory types of land uses and severity of nonpoint sources impacting these areas.

III. Determine levels of nonpoint source pollution control and measures necessary to improve and/or protect water quality.

IV. Prepare and gain approval for a priority watershed plan documenting the above evaluations, implementation procedures and costs.

Implementation Phase

The implementation phase begins following review of the priority watershed plan by a public information hearing and approval by the DNR, the DATCP, and local units of government. Public review during plan development occurred primarily through the Lake Ripley Management District Board and associated working teams.

During the implementation phase:

- The DNR enters into local assistance agreements with the Lake Ripley Management District and Jefferson County with implementation responsibilities identified in the plan. These agreements provide funds necessary to maintain the resources and staff required for plan implementation.

- In the rural portions of the watershed, the Lake Ripley Management District with support from the Jefferson County LCD will contact eligible landowners to determine their interest in voluntarily installing BMPs identified in the plan.

In the urban portions of the watershed, the Lake Ripley Management District or its designee will contact landowners and local units of government, specifically Oakland Township, to discuss actions to implement plan recommendations.

- For rural practices, the landowner and the lake district sign cost-share agreements outlining the practices, costs, cost-share amounts and a schedule for installation of BMPs. All practices are scheduled for installation up to five years from the date the agreement is signed. The DNR and Lake Ripley District sign similar agreements for urban practices.

Legal Status of the Nonpoint Source Control Plan

The Lake Ripley Priority Lake Plan was prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program described in Section 144.25 of the Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code. It was prepared under the cooperative efforts of the DNR, DATCP, the Lake Ripley Management District, Jefferson County and local units of government and the Lake Ripley Citizen Advisory Committee.

This watershed plan is the basis for the DNR to enter into cost-share and local assistance grants and is used as a guide to implement measures to achieve desired water quality conditions. In the event that a discrepancy occurs between this plan and the statutes or the administrative rules, or if the statutes or rules change during implementation, the statutes and rules will supersede the plan.

This plan is subject to the amendment process under N.R. 120.08(4) for substantive changes. The Department of Natural Resources will make the determination with the local sponsors if a proposed change will require a formal plan amendment.

Relationship of the Nonpoint Source Control Plan to the Integrated Resource Management Strategy

The DNR has designed and implemented a new approach to natural resource management in the basin, an approach called "integrated resource management." The DNR uses the nonpoint source control program as the foundation for coordinating other departmental environmental quality (solid waste, wastewater, water regulation and zoning, water resources management, water supply) and resource management (fisheries, forest management, parks and recreation, wildlife and endangered resources management) efforts.

This nonpoint source pollution priority lake plan meets the requirements of Section 144.25 of the Wisconsin Statutes. This statute requires the DNR to develop "an integrated resource management strategy to protect or enhance fish and wildlife habitat, aesthetics, and other natural resources" for priority watersheds.

Plan Organization

The remainder of this plan is divided into nine chapters. The contents of each chapter are described below:

Chapter Two. "Watershed Characteristics" is an overview of the cultural and natural resource features pertinent to planning and implementation efforts for the priority watershed project.

Chapter Three. "Water Resource Conditions, Nonpoint Sources and Water Resource Objectives" characterizes the existing and potential biological and recreational uses of surface waters. The results of the nonpoint source inventories and evaluations and water resource objectives are discussed.

Chapter Four. "Nonpoint Source Pollution Control Strategy" identifies the level of urban and rural nonpoint source control needed to meet the water resource objectives and identifies the decision criteria and the nonpoint sources eligible for funding under the priority watershed project.

Chapter Five. "Detailed Program for Implementation" describes the means in which the local units of government administer the project, estimates a local assistance and management practice cost-share budget, and identifies technical and financial assistance available to Lake Ripley Management District throughout the project.

Chapter Six. "Information and Education Program" describes techniques and activities for increasing awareness and understanding of water resources in the watershed, principles of nonpoint source pollution, best management practices, and the priority watershed project in general.

Chapter Seven. "Integrated Resource Management Program" presents the strategy for involving DNR resource management programs (fisheries management, wildlife, etc.) in the nonpoint source pollution abatement efforts in the Lake Ripley Watershed.

Chapter Eight. "Project Tracking" discusses the means for assessing the amount of nonpoint source control gained through installation of best management practices.

Chapter Nine. "Water Quality Monitoring and Evaluation" presents a strategy and a schedule for monitoring streams and lakes to determine the water quality impacts of implementing nonpoint source controls.

CHAPTER TWO
General Watershed Characteristics

Location

The Lake Ripley Watershed is an 8-square mile drainage basin located approximately 21 miles east of Madison in Jefferson County, Wisconsin. The outlet from the lake drains into Koshkonong Creek within the Lower Rock River Basin (Map 1).

The following is a brief overview of the watershed's cultural and natural resource features important to planning and developing a long-term nonpoint source control effort.

Cultural Features

Civil Divisions

The Lake Ripley Watershed lies entirely within Jefferson County. The watershed is located in far western Jefferson County almost adjacent to the Dane and Jefferson County border. Although it is located solely within the Town of Oakland, Lake Ripley is often identified with the Village of Cambridge, which is located on the west side of Lake Ripley.

Population Size and Distribution

The majority of people living in the Lake Ripley Watershed are concentrated around the lake itself. There are approximately 650 residences located around Lake Ripley, although population densities fluctuate dramatically between seasons and from week to weekend. Because Lake Ripley is less than two hours drive from many highly populated cities, it has historically been a favorite recreational area and place to live. Development over the last few years suggests a trend toward year-round residences.

Land Uses

Table 2-1 summarizes existing land-uses in the Lake Ripley watershed. The rural portion of the watershed comprises approximately 5.6 square miles or 77% of the watershed. Land uses consist of agricultural (63%), woodland (7%), and wetlands (8%). There are no large dairy/cattle farms in the watershed. Jefferson County has observed a trend away from beef and dairy toward cash crop type operations.

Table 2-1. Land Uses Within the Lake Ripley Watershed

Land Use Category		Acres	Percent of Total
Urban	Residential	416	8
	Recreational	19	<1
	Miscellaneous	23	<1
	Open/Undeveloped	259	5
	Subtotal	**717**	**14**
Agricultural	Cropland	2678	53
	Grassland	368	7
	Pasture	110	2
	Subtotal	**3156**	**62**
Other	Woodland	350	7
	Wetland[1]	564	8
	Surface Water	418	8
	Subtotal	**1332**	**23**
	TOTAL	**5026**	**100**

Source: U.S Soil Conservation Service
[1] Source: DNR

Urban land uses currently cover almost 15% of the watershed. Low and medium density residential development is the predominant land use covering about 60% of the urban area. Those areas are concentrated on the north/northeast side of Lake Ripley. At the time of the inventory, 1993, open areas comprised approximately 40% of the urban land use area. Since that time at least half of the areas have had some sort of residential development project started or proposed.

Special Land Uses

Specialty Crops

Under natural conditions, a large portion of the agricultural area would be too wet to farm. Through a series of ditches and drain tiles, these areas have become exceptional sod and mint farms.

MAP 1

Gravel Mining

Glacial drumlins spot the rural landscape and serve as a source for past and future gravel mining operations. There are plans to open two mines within the next several years in the Lake Ripley watershed.

Sanitary Sewer Service

As noted in the "Soils" section, land around Lake Ripley is at or near the water table and susceptible to groundwater contamination. The primary concern at that time was groundwater contamination since everyone was on private wells. The secondary concern at that time was pollution to Lake Ripley. Concerns of malfunctioning individual home septic systems around Lake Ripley were expressed in the early 1970's. A sanitary sewer service was installed around the majority of Lake Ripley and connected to the Cambridge wastewater treatment plant. The sewer was installed in three phases between 1981-84. During that time the old septic systems were pumped out and abandoned. Wastewater generated by the remainder of the watershed residents is disposed of through private on-site systems. Any new developments are required to connect to the municipal sewer system.

Water Supply Service

Water supplies used in the Lake Ripley Watershed are obtained solely through groundwater (private wells). The Cambrian sandstone aquifer that overlies Precambrian crystalline rock, not normally classed as an aquifer, is the most important aquifer in Jefferson County. It underlies the entire county and consists of several geologic units. Properly constructed wells can yield 1,000 gallons/minute.

Drainage Districts

There are three drainage districts in the Lake Ripely Watershed Project. Two of the districts are now in residential or otherwise non-agricultural land and the ditches have not been maintained recently. These two districts are south of the east bay of Lake Ripley and outlet directly into the lake. The third drainage district is approximately 2 miles east of Lake Ripley and is greater than 90% underground drain tile. The tile outlets into a well maintained drainage ditch. These drainage districts are not contributing sediment to Lake Ripley. The other ditches in the watershed project are contributing significant amounts of sediment and are being addressed as described above.

Natural Resources Features

Topography

The relief in the Lake Ripley Watershed is largely controlled by glacial features. Lake Ripley itself is a kettle-formed lake. Lake Ripley is part of a large outwash plain that stretches from south of Lake Ripley to just north of Lake Mills. This area displays all the features associated with a stream-built, or melt-water, terrace. Water apparently trapped by the kettle moraine to the east and the terminal moraine to the south formed large areas of shallow lakes that long since have drained away, resulting in large areas that are low and nearly flat (Glocker, 1979). Extensive ditch systems and tiles used to drain cropland.

Climate and Precipitation

The frequency, duration, and amount of precipitation influences surface and groundwater quality and quantity, soil moisture content, runoff characteristics, and the physical condition of surface waters. The climate in Jefferson County is continental. It is characterized by the marked changes in weather common to the latitude and the interior of a large land mass. There can be a tendency of extremes in all of the climatic elements. The county lies about 50 miles southeast of the "tension zone" boundary between the severe and moderate temperature continental climatic zones. Changes from season to season can often be abrupt.
Precipitation is normally adequate for farming, but some degree of soil moisture deficiency usually occurs in July and August. Most of the summer precipitation falls as showers that vary in length and intensity (Glocker, 1979).

Soils

The most common soil associations occurring in the Lake Ripley Watershed are Houghton-Adrian, and Fox-Casco-Matherton. The erosion potential of these soils is based on their texture, structure, organic matter content, permeability, slope, and the position on the landscape.

Houghton-Adrian soils are found in the depressions of old glacial lake basins and stream valleys. They are very poorly drained and nearly level. Typically, the organic layer is black to very brown, about 51-inches thick.

If adequately drained, these soils have a fair to good potential for corn and specialty crops. Wetness is such a severe limitation and is so difficult to overcome that the potential for residential or similar development is slim.

Fox-Casco-Matherton soils are found on outwash plains and terraces. Casco soils tend to be well drained and gently sloping to very steep. Matherton soils are somewhat poorly drained and are nearly level to gently sloping. Typically the surface layer is dark grayish brown silt loam about 10 inches thick.

These soils have fair to good potential for the commonly grown farm crops. They have fair to good potential for residential and other urban uses. As a result of the permeability of the underlying sand and gravel, pollution of ground water is a hazard if the soils are used for waste disposal.

There are several other minor soils present in all of the major soil associations. For more information, refer to the Soil Survey of Jefferson County, prepared by the former U.S Soil Conservation Service (Glocker, 1979).

Surface Water Resources

Watershed

The Lake Ripley Watershed can be broken down into two distinct areas. The eastern two-thirds of the watershed is generally flat, low rolling terrain with wetlands intermixed. A majority of the wetlands have been drained for agricultural use. The Western one-third of the watershed surrounds Lake Ripley. Most of the lake's shoreline is developed with summer cottages and year round homes. Developmental pressure around Lake Ripley has intensified over the last few years; summer cottages are being remodeled into year round homes and multi-family subdivisions are being built. There are a few wetland sensitive areas remaining in the southeast portion of the lake. All of the remaining shoreline areas are currently in danger of being lost through residential developmental pressures.

Lake Ripley

Lake Ripley is the major surface water feature in this watershed. The lake is located in the southwest portion of Jefferson County and drains approximately 8-square miles of mostly farm land. It is a 418-acre marl lake with a maximum depth of 44 feet (13.2 meters). Lake Ripley is considered a drainage lake--a lake fed by streams, groundwater, precipitation, and runoff and drained by a stream. Lake Ripley has a single inlet located in the southeast corner of the lake and a single outlet located on the northwest side. Computer lake models show that at times groundwater can contribute up to 30% of Lake Ripley's water supply.

Lake Ripley is an important recreational resource shared by residents and tourists. As with many lakes throughout the state, Lake Ripley experienced an infestation of Eurasian water milfoil which peaked in 1989. Nonpoint source pollution runoff increased sediment and nutrients entering Lake Ripley. This created an environment which is more favorable to tolerant weedy species at the expense of native aquatic plant species. At its peak, water milfoil covered almost 40% of Lake Ripley. Over the last few years the Lake Ripley Management District, in conjunction with the WDNR, has implemented an intensive weed harvesting program to control the milfoil problem, but the milfoil seems to have receeded on its own.

Tributary Inlet

The tributary inlet for Lake Ripley is located in the southeast corner of Lake Ripley. Prior to draining to Lake Ripley, the tributary enters a small wetland area in the eastern portion of the watershed. Historically, there was only a small meandering stream inlet. Most of the watershed to the east of the lake has been ditched and tiled to create more farmland. The associated soils were very suitable for corn and specialty crops such as sod.

In 1907, the tributary inlet had a defined channel length of approximately 2.5 miles (1907 Topographical Map). An inventory conducted in 1993 by Lake Ripley staff found approximately 4.25 miles of defined stream channel. The increase was entirely due to the formation of agricultural ditches.

The increase in stream length and tiles resulted in an increase of surface water runoff, sedimentation, and nutrient transport. Surface water runoff resulted in a reduction of water infiltrating into the groundwater. Water that originally was filtered by soil and ultimately replenished the groundwater supply now ran off of fields, carrying with it sediment and nutrients into the wetlands and Lake Ripley. The increased volume of water created a more defined channel through the wetlands. This resulted in a reduction of the ecological functional capabilities associated with healthy wetlands.

Wetlands

Wetlands are valuable natural resources. They provide wildlife habitat, fish spawning and rearing areas, recreation, storage of runoff, control hydrologic fluctuations and filter out pollutants. Wetlands in the Lake Ripley watershed begin at the tributary inlet and span east across the watershed.

A wetland and sensitive area inventory was conducted to identify existing and modified or converted wetlands for the purpose of protection from degradation or potential restoration. The focus of the inventory was on wetlands that are or have been degraded through drainage, grazing, cropping, or other activities causing water storage loss, build up of sediments, and drainage to vegetation.

In 1903-08, the United States Geological Survey mapped approximately 1,500 acres of wetlands within the watershed that had already experienced significant agricultural land clearing and drainage alterations. In 1975, the Soil Conservation Service delineated 1,364 acres as wetlands, or 29% of the total watershed. Out of the total 1,364 acres, 979 acres (72%) had been agriculturally modified to some degree. In 1986, WDNR mapped 540 acres as functioning or partly functioning wetlands. The inventories indicate an approximate (60%) wetland reduction due to the cumulative effects of agricultural tillage, drainage modification, and development (Marshall, 1994). A corresponding reduction in wetland function has been observed through appraisal monitoring. Chapter Three has more information about wetland conditions. Guidelines for wetland restoration, which will be a component of this project, are outlined in Chapter Four.

Groundwater Resources

Groundwater is the main source of drinking water in the Lake Ripley Priority Watershed. Groundwater is stored underground in pore spaces and cracks in soil and rock layers. Soil and rock layers which hold groundwater are called aquifers. In an aquifer, all the pore spaces and cracks are filled or saturated with groundwater. A well is simply a pipe through which groundwater is pumped from an aquifer to the land surface.

Since 1936, the State of Wisconsin has required well drillers to document well construction and rock and soil layers encountered during well installation. These Driller Construction Reports can be used to determine the geology of the watershed as well as aquifers used for drinking water in the area.

The geology of the Lake Ripley watershed consists, from the surface down, of unconsolidated glacial sediments, Ordovician age sandstone and dolomite layers overlying Cambrian age sandstone and crystalline bedrock of Precambrian age. The Precambrian age (4.5 billion to 570 million years ago) bedrock consist mostly of quartzite. The Cambrian age (570-500 million years ago) sandstone is identified in geologic logs from the area as Trempealeau formation. The Trempealeau formation is a very fine to medium grained sandstone with interbedded dolomite and siltstone. The Ordovician age (500-440 million years ago) Prairie du Chien dolomite and St. Peter sandstone overlie the Cambrian sandstones (Glocker, 1979).

Most private wells draw drinking water from the uppermost glacial sand and gravel, limestone and sandstone aquifers. Depth to the bedrock surface varies as does the thickness of the glacial sediments. Glacial sand and gravel wells vary in depth from 40 to 181 feet below the surface. Well yields range from 0.5 to 40 gallons per minute per foot of drawdown. Wells drilled in the limestone aquifer vary in depth between 88 to 228 feet below the ground surface. Well yields range from 0.4 to 20 gallons per minute per foot of drawdown. Wells drilled in the sandstone aquifer vary in depth between 40 to 343 feet below the surface. Well yields range from 0.4 to 60 gallons per minute per foot of drawdown.

A water table map based on information obtained from Driller Construction reports was constructed using 1,174 water elevation points. In the area surrounding Lake Ripley, the groundwater gradient (or slope) is fairly flat. Regional groundwater flow is from east to west toward the Rock River and Lake Koshkonong (Kenter and Madison, 1989).

Endangered and Threatened Resources

Rare species are tracked by Wisconsin's Natural Heritage Inventory of the Bureau of Endangered Resources. Species tracked by the inventory include those that are listed by the U.S. Fish and Wildlife Service or by the State of Wisconsin. The Bureau of Endangered Resources provided a list of rare species previously found within the Lake Ripley watershed. All of the species are sensitive to impacts of nonpoint source pollution and loss of habitat. The following classifications apply the rare species found within the Lake Ripley watershed. Information was provided by the DNR in 1994.

Wisconsin Endangered Species: Any species whose continued existence as a viable component of this state's wild animals or wild plants is determined by the Department of Natural Resources to be in jeopardy on the basis of scientific evidence. "Endangered" species found in the Lake Ripley Watershed include the giant carrion beetle (*Nicrophorus americanus*).

Wisconsin Threatened Species: Any species which appears likely, within the foreseeable future, to become endangered on the basis of scientific evidence. "Threatened" species found in the Lake Ripley Watershed include the pugnose shiner (*Notropis anogenus*) and the blandings turtle (*Emydoidea blanding*)

Wisconsin Special Concern Species: Any species about which some problem of abundance or distribution is suspected in Wisconsin, but not yet proven. The purpose of this category is to focus attention on certain species **before** they become endangered or threatened. "Special Concern" Species found in the Lake Ripley Watershed include the least darter (*Etheostoma microperca*), the lake chubsucker (*Erimyzon sucetta*), and the cuckoo flower (*Cardamine prantensis*).

The blandings turtle is under consideration for inclusion on the "Federal Endangered Species" list and the giant carrion beetle is already on both the State and "Federal Endangered Species" lists. The blandings turtle and the cuckoo flower are directly affected by wetland habitat loss and human encroachment into these areas. In 1994, we also identified the bullfrog (*Raga catesbeiana*) and the black tern (*Chlidonias niger*) within the Lake Ripley riparian wetlands. Neither of these had been previously identified in the watershed.

It should be noted that the DNR's endangered resource files are continuously updated from ongoing field work. There may be other records of rare species and natural communities which are in the process of being added to the database and so are not in the lists above.

Sensitive Areas

Sensitive areas are sites that contain high quality examples of natural communities. Sensitive areas are designated to protect water quality, high value native aquatic plants, and shoreline susceptible to erosion. The following natural areas have been identified in the Lake Ripley Priority Watershed.

Waterlily beds - for fisheries habitat/spawning
Bulrush Stands - for shoreline protection and forage fish habitat
Wetland Habitat - for wildlife and water quality protection

In 1989 and 1991, an aquatic plant survey was conducted on Lake Ripley to identify resident species of aquatic plants, their distribution and densities throughout the lake. From the information gained in this survey, an aquatic plant management plan was developed and sensitive areas were designated (Marshall and Swick, 1993). The aquatic management plan emphasizes three things: proper management of aquatic plants to control exotic weedy species, enhancement of valuable native species, and protection of identified critical areas.

The findings from the aquatic management plan were supported in the 1994 Lake Ripley water resources appraisal (Marshall et. al., 1994). The shoreline erosion inventory indicated that less than 25% of Lake Ripley's shoreline remains undeveloped. The identified sensitive critical sites are found in those areas. Tamarack forest is found on the east end of Lake Ripley. Tamarack are uncommon in the southern part of Wisconsin.

The sensitive shoreline areas in Lake Ripley also serve as an important habitat for the lake's fishery. A recent DNR fish survey found the highest "catch per unit effort" (CPUE) in the sensitive shoreline areas around transects 1, 2, 3, 13, 14 (Map 2). The area around transect 3 was twice the CPUE than any lake in the County. Lake Ripley also had the highest average CPUE for any lake in Jefferson County (Marshall, 1994). Vegetation was sighted as a key element providing cover, spawning sites, and structure. Water lilies in the bays and their rhizomes provide critical firm substrate for bass nests. The extremely high catch rate around transect 3 indicates excellent habitat for bass and maximum lengths indicates usage by spawning adults. Preservation of these sensitive areas are vital to the fishery of Lake Ripley.

Archaeological Sites

Coordination with State and Federal Historic Preservation Laws

Projects using state and federal funding, assistance, licenses and permits are required by law to consider the effects of their actions on archaeological and historical sites, and historical structures. The watershed project is a joint cooperative effort between federal, state, and county agencies as well as the private landowners who volunteer to participate in the program. As a result, the federal Historic Preservation Act of 1966, as amended, and the State Historic Preservation Statute, s. 44.40, Wis. Stats., have been blended to produce a cultural resource management program which is both compatible to preserving cultural sites and implementing the watershed project.

Map 2 Lake Ripley Sensitive Areas

CHAPTER III
Water Resources Conditions,Nonpoint Sources and Water Resources Objectives

This chapter discusses the type and extent of rural and urban nonpoint pollution sources in the Lake Ripley Priority Lake Watershed and identifies their observed impacts on lakes and streams. It also sets forth water quality improvement objectives for Lake Ripley and its tributary. These objectives determine the level of nonpoint source pollution control recommended by the plan and become the basis for the pollution control strategy presented in Chapter IV, "Nonpoint Source Control Needs."

The chapter is divided by ecological resources. Each section includes: watershed overview which presents the results of the land resources inventory and the water resources appraisal, impacts of each pollutant source for each associated resource, and the water resources objectives and pollution reduction goals to be achieved through the nonpoint source program.

Runoff from farm fields carries sediment, nutrients, pesticides and bacteria. Runoff from construction sites and other urban areas carries sediment, nutrients, metals, grease, oil, bacteria and assorted debris. Consequently, the lakes and streams become turbid, dissolved oxygen levels fall, and aquatic habitat deteriorates.

Lake Ripley

To appraise the water quality conditions of Lake Ripley, the Water Appraisal Monitoring Team reviewed water quality information from WDNR file reports and data, Lake Ripley Planning Grant data, Long Term Trends data (1986-1993) and monitoring conducted in 1993 and 1994. Appraisal monitoring activities included gauging rainfall in the watershed, monitoring the lake inlet and outlet, lake sampling, fish shocking, wetlands inventory, and assessing shoreline erosion.

General water quality conditions have not significantly limited recreation in most years; however, intensive development near the lake and widespread agricultural land uses pose serious threats to the lake. These threats are clearly significant based on paleoecological studies and long term trends monitoring data (1986-93).

Assessment of lake sediments indicate much better lake water quality prior to watershed development and wetland drainage. A paleoecological study indicates that the Lake Ripley's water quality began to degrade soon after the onset of European settlement in the mid-1800s. Land clearance for agriculture increased the erosion of sediment and nutrients to the lake. This caused an increase in the phytoplankton community and a steady decline in the lake's water clarity. Watershed erosion rates continued to increase until around 1950. Although the lake's

water quality was continually declining in the early part of the twentieth century, water quality was not significantly degraded until about 1930. The cause of the degradation was mostly a result of agricultural activity. Evidence of the poor water quality include the presence of significant blue-green algae populations and the increase of the diatom, *A. ambigua.* During the 1960's, erosion in the watershed significantly declined and the lake water quality began to improve. The diatom *S. medius* declined as a result of reduced animal waste runoff and the size of the algal community declined including blue-green algae. Beginning around 1970, the nutrient runoff to the lake again increased, most likely from housing developments, and the lake's water quality again declined. Phosphorus and nitrogen levels in the sediments increased and the size of the phytoplankton community increased, including blue-green algae populations.

Even though agricultural activity in the watershed historically contributed most of the sediment and nutrients to the lake, it appears that development around the lake is contributing a significant share of phosphorus. The sediment core indicates that the present water quality of the lake is worse today than at any other time in the last 250 years.

Lake Ripley was classified using a standard measurement of its biological condition called the trophic state index (TSI). The TSI is an indicator of the degree of eutrophication or nutrient enrichment of a lake and is based on measurements of water clarity, chlorophyll concentration, and total phosphorus concentration.

The trophic state of Lake Ripley for Secchi depth, chlorophyll and phosphorus hovers around 50. This is considerably lower water quality when compared to an undisturbed northern marl lake, which has an average TSI of about 40. A TSI above 53 indicates a decrease in water clarity, probably no dissolved oxygen in the bottom of the lake during the summer, warm-water fisheries only, blue-green algae concentrations likely in the upper range during the summer, and excessive plant growth.

All of the above conditions have existed at some time on Lake Ripley over the last few years, particularly excessive weed and algae growth. These conditions suggest that nutrient and sediment degradation may impair some lake uses such as swimming and fishing. However, it is difficult or impossible to classify a lake with respect to use impairment as is done with streams because of the variety of recreational uses and public perceptions.

Upland Resources, Conditions, & Nonpoint Sources of Pollution

Agricultural

Agricultural nonpoint sources include cropland erosion, drain tile contributions, eroding ditches, winter spread manure and to a small degree animal lots. Collectively, these sources pose a

serious threat to water quality, contributing to the degradation of Lake Ripley, wildlife sensitive areas, wetlands, and tributary reaches in the watershed. These areas are principal sources of sediment and nutrients flowing into the lakes. Agricultural nonpoint source pollution was identified and assessed where agricultural rural land uses occur. These sources are discussed below.

Cropland Sediment and Phosphorus Delivery

Sediment adversely affects lakes, wetlands, and streams in many ways. It degrades habitat for wildlife, fish, and aquatic invertebrates which are important in the food chain. High sediment concentrations abrade fish gills making fish more susceptible to disease, fill in pools, reduce hunting ability, and degrade fish spawning habitat. Suspended sediment also causes temperature and photosynthetic activity fluctuations that can deplete the oxygen in tributaries or lake.

Sediment and phosphorus delivery rates were determined for the 3,711 acres of rural land (3,156 acres of agricultural fields) that were inventoried. About 146 tons of eroded soil and 865 pounds of phosphorus are washed into the ditches and Lake Ripley annually from cropland sources.

Approximately 5 percent of the total sediment and 85 percent of the total phosphorus affecting Lake Ripley and its tributary come from eroding cropland and tiled drains. Most of it originates on cropland with low rates of soil erosion. For example, more than half of the sediment delivered to surface waters from rural lands originates from croplands that are eroding at less than the tolerable level of erosion.

Manure Runoff and Phosphorus Delivery

Manure contains several components that adversely affect water quality and aquatic life. Manure entering a stream or lake decays, resulting in depletion of dissolved oxygen necessary for fish and aquatic life to survive. A byproduct of manure is ammonia. High concentrations of ammonia are toxic to fish and other aquatic life. The nutrients in manure, including nitrogen and phosphorus, also promote nuisance algae and weed growth in lakes and streams. Finally, the bacteria found in livestock manure is harmful to animals and humans that drink or come in contact with the water. Potential sources of manure in the Lake Ripley watershed are runoff from barnyards and runoff from manure improperly spread on fields located close to streams or on steep slopes.

The Lake Ripley watershed has 8 livestock/dairy operations and 3 horse farms. The barnyards associated with these operations are not large sources of phosphorus and other water-borne contaminants. Of the 8 barnyards inventoried, only 3 drain to a ditched channel. Two of those barnyards are currently idle. Runoff from the remaining barnyards flows to internally drained areas overlain by deep soils.

The current agricultural trend in the upland portion of the watershed is shifting from dairy and beef to cash cropping. This was reflected in the 1993 barnyard inventory; all of the dairy and beef operations are fairly small and are not a significant threat to either surface or groundwater quality. An estimated 15 pounds, or 1 percent of the total phosphorus entering Lake Ripley can

be attributed to barnyards. One operation is located near a ditched channel. Best management practices could limit cattle access and pasture runoff into this ditch.

There are two idle barnyard operations that are within one-quarter mile of the tributary to Lake Ripley. In the event that these barnyards resume operation or other operations expand, the barnyards will be reinventoried and classified using available models.

Streambank and Agricultural Ditch Erosion

Historically the upland portion of the watershed consisted primarily of wetlands with a small defined stream approximately 2.5 miles long. This stream meandered slowly through the wetland area. The area above this stream was eventually ditched and tiled. The agricultural area now consists of 4.25 miles of connected drainage ditches. Tile drainage and ditches have made cash cropping possible in the majority of the upland portion of the watershed.
Drainage modifications such as ditching and channelizing of streams and wetlands has immediate and long-term detrimental effects on water chemistry, stream base flows, temperature, and fish and wildlife habitat. Channelized streams tend to have uniform velocities and substrates that are unsuitable for many forms of aquatic life, particularly during dry seasons and low flows when insufficient water depths limit aquatic habitat. The soils associated with the ditches are highly prone to erosion and require regular maintenance. Sediment eroding from the ditch banks have since reduced the functional values of the adjoining wetlands and Lake Ripley.

The 4.25 miles of interconnected ditches in the watershed were surveyed during the 1993 inventory. Erosion was recorded for approximately 45,000 feet or 100 percent of the ditched channels in the watershed. The meandering stream flowing through the wetland was not included as part of the inventory because this area is considered a sediment depositional area as opposed to a sediment eroding area. The extent of ditchbank erosion is significant. About 2,654 tons or 75% of the total sediment contribution to wetland sedimentation and Lake Ripley are associated with the ditch system (Table 3-1).

Table 3-1. Ditch Erosion Inventory Results in the Lake Ripley Watershed

Stream Segment(s)	Feet of Ditchbank Degraded[1]	Sediment Released (Tons/Yr.)
Upstream of Hwy 18 (Sections 1&2)	16,200	536
Hwy 18 to wetlands (Section 3)	13,800	1412
Between Hwy 18 and Hwy A (Sections 4&5)	7,200	414
Hwy 18 to main ditch (Section 6)	7,400	292
TOTALS	44,600	2,654

[1] Both sides of the ditch

Source: LRMD & DNR

Only one site showed evidence of cattle access to the stream. Pasturing of farm animals along streams results in trampled banks and wider, shallower streams which provide fewer pools for fish to feed and find cover. Loss of streambank vegetation also increases water temperature and reduces in-stream woody cover used by most fish species.

Occasionally, excessive streambank vegetation causes a loss of riparian habitat. Stream obstructions can block or redirect the flow and de-stabilize the banks, and monospecific stands of weedy vegetation that are characteristic of these areas are generally unsuitable for desired species of wildlife. In many areas the lower bank area is heavily shaded and bare. The lower bank area is then very susceptible to erosion.

Shoreline Erosion

A shoreline inventory was conducted to evaluate the shoreline (sediment) erosion impact to Lake Ripley. Sediment erosion reduces lake water quality as well as wildlife habitat. Sediment erosion reduces water quality and wildlife habitat by:

- Reducing water clarity. Reduced water clarity decreases the ability of resident sight feeding species of fish to eat. Reduced water clarity also decreases photosynthetic activity of aquatic plants. This reduces the amount of available dissolved oxygen to aquatic organisms.

- Physically harming fish. Suspended solids abrade fish gills making the fish more susceptible to disease.

- Increasing water temperature. Warmer water cannot hold as much dissolved oxygen as cold water. Warmer water will also increase the metabolic activity of aquatic organisms. Both factors lead to increased stress on aquatic organisms.

- Degrading habitats for aquatic organisms and animals needing terrestrial/aquatic interaction for survival.

- Reducing water quality by carrying with it nutrients and pollutants. Nutrients promote algae and weed growth, and pesticides harm aquatic life found in Lake Ripley.

- Decreasing the aesthetic and monetary values of associated properties.

The shoreline inventory included the entire shoreline surrounding Lake Ripley. The field data collection was conducted during the summer, 1993 by the Lake Ripley Management District staff using the streambank and shoreline erosion inventory procedure developed by the former Soil Conservation Service. This inventory breaks the erosion rates into three categories: high, moderate, and low.

The total distance surveyed was 28,800 feet (5.45 miles) or 100 percent of the shoreline area. An estimated 70% of the shoreline is experiencing slight erosion, 4% is eroding at a moderate rate, and 26% is eroding at a high rate (Table 3-2). The total amount of annual sediment loading to Lake Ripley is 252 tons/year. This is about 8 percent of the total tons of sediment entering Lake Ripley each year.

Table 3-2. Shoreline Erosion Inventory Results for Lake Ripley

Erosion Type	Length (Ft.)	Erosion (Tons/Yr.)
Low	19,829	70
Moderate	7,644	128
High	1,325	55
Total	28,798	253

Past shoreline stabilization methods varied. Most landowners have used rock rip-rap, concrete, railroad ties, and steel walls. Some developed areas maintain a natural shoreline. Some areas are exhibiting severe rates of erosion. This is caused by a combination of two factors: boat wake and ice damage. Throughout the summer, boat wake and natural waves erode the lower portion of the shoreline. This weakens the shoreline which is then susceptible to ice and storm damage.

Sensitive/Wildlife Shoreline

As part of the shoreline inventory, remaining sensitive areas that should be protected were identified. These sensitive wildlife areas are becoming increasingly important for fish spawning, serve as a wildlife refuge, and are essential for the protection of native rare species. As development continues around Lake Ripley, the few remaining wildlife areas are at risk. The riparian shoreline areas filter out nutrients and pollutants, support diverse communities of emersed plants, tamarack, floating-leaf plants and submersed aquatic plants. In spite of the losses over the years, high quality wildlife areas still exist in the two southern bays of the lake.

The inventory identified the shoreline uses for the 100 percent of Lake Ripley's shoreline (Table 3-3). Today, 5,900 feet (20%) of Lake Ripley's shoreline supports wildlife/sensitive area communities. Protection of these sensitive areas is critical to the overall protection of Lake Ripley.

Table 3-3. Shoreline Erosion Inventory Results for Lake Ripley

Shoreline Use	Length (ft.)	Percent
Developed	16,305	57
Privately Owned/Undeveloped	6,593	23
Sensitive/Wildlife	5,900	20
Total	28,798	100

Groundwater

Drinking Water Supply

In 1989, a report detailing the groundwater quality of selected townships in Jefferson County was completed from staff at the Wisconsin Geological and Natural History Survey. The objective of the study was to assess the quality of groundwater in selected areas within the county with an emphasis on determining the nitrate concentration in domestic wells. The Lake Ripley watershed, located in Oakland Township, was included in the study. Elevated levels of nitrates and chlorides found in well samples collected as part of this study indicated that groundwater is being affected by land-use activities (Kenter and Madison, 1989).

As part of the Lake Ripley Priority Lake Project well samples were analyzed for nitrate (measured as nitrate-nitrogen) and the presence of pesticides using a triazine scan method. This study sampled 33 wells throughout the Lake Ripley watershed.

Nitrate-Nitrogen

Nitrate levels ranged from "not detected" to 33.2 parts per million (ppm). One part per million is equivalent to one drop of water in a ten gallon tank. The ground water quality enforcement standard is 10 ppm as defined in chapter NR 140, Wis Administrative Code. Five well water samples exceeded this water quality enforcement standard (Table 3-4).

Table 3-4. Nitrate Sample Results - Lake Ripley Watershed

	<2 ppm	2 -10 ppm	>10 ppm	Total Wells Sampled
Number of Wells	13 (39%)	15 (45%)	5 (15%)	33

The health standard concentrations for Nitrate-Nitrogen are as follows:

- (<2 ppm) This level is below the 10 mg/L state and federal drinking water quality standard for nitrate-nitrogen and should not pose a threat.

- (2-10 ppm) This level is elevated, but is below the 10 mg/L state and federal drinking water quality standard for nitrate-nitrogen. It is recommended that the well water be regularly tested if an infant six months of age or younger would be consuming the water.

- (>10 ppm) This level is above the 10 mg/L state and federal drinking water quality standard for nitrate-nitrogen. An alternative source of water containing less than 10 mg/l nitrate-nitrogen should be used for infants six months of age and younger.

Triazine

Triazine concentrations in the Lake Ripley watershed survey ranged from "not detected" to 0.6 parts per billion (ppb) (Table 3-5). One ppb is equivalent to one drop of water in a 10,000 gallon swimming pool. No samples exceeded the groundwater quality enforcement standard of 3 ppb. No source of contamination is indicated by the results.

Table 3-5. Triazine Scan Breakdown

	Below Detect	0.1 - 3.0 ppb	> 3.0 ppb	Total Number
Number of Wells	19 (58%)	14 (42%)	0	33

The health advisory concentrations for atrazine as compared to the *triazine scan* concentrations are as follows:

- (<0.1 ppb) The well water was below detection level and is below the drinking water advisory level. As far as atrazine is concerned, the water is safe to drink and use for other household purposes.

- (0.1-3.0 ppb) The water is safe to drink and use for other household purposes. If the result is near 3.0 ppb health standard, it is recommend that the well water be tested again soon, or at least annually.

- (>3.0 ppb) Do not use the water for drinking or as the primary ingredient in foods (eg. soups, beverages, gravy, baby formula). You may continue to bathe, wash foods, dishes and clothing or water your lawn with the water. Additional testing of the water is recommended. If additional sampling verifies these test results, some modifications in the drinking water supply system should be made.

Hydrologic Budget Supply

Groundwater contributes significantly to the lake's hydrologic budget and is critical for reducing the watershed impacts. This fact was initially brought to light when citizens became concerned about groundwater contamination via failing septic systems.

Because groundwater is so important to Lake Ripley's ecology, the potential effects of drained agricultural farmland and future residential development need to be examined. Both increase overland flow and decrease groundwater replenishment. This could ultimately change the hydrologic contributions to Lake Ripley. Additionally, because groundwater is filtered through sediments prior to entering Lake Ripley, reduced flow may decrease the contribution of clean water to the lake and potentially reduce its water quality. Increased groundwater flow will dilute the negative impacts of watershed nutrient loading to the lake. Some land-use activities may reduce groundwater infiltration and the overall contribution of groundwater to the lake, such as construction of impervious surfaces, increased domestic and commercial use of groundwater supplies, and wetland drainage.

Groundwater Quality Problems

There are no sites at Lake Ripley listed in WDNR's "Inventory of Sites or Facilities Which May Cause or Threaten to Cause Environmental Pollution" published in December of 1991. Sites listed as Waste Disposal Sites are from the DNR's "Registry of Waste Disposal Sites in Wisconsin" (1993) which lists known solid and hazardous waste disposal sites. The list includes both active, inactive and abandoned sites. Inclusion on the list does not mean that environmental pollution has occurred, is occurring or will occur in the future. The only site on the list which is close to the project area is the Village of Cambridge which was licensed in 1970.

Sites listed are currently in some phase of investigation or cleanup and are on the "List of Active Leaking Underground Storage Tanks (LUST)" (April 13, 1992). No LUST sites are listed for the project area.

The "Spills Summary Report" (1995), include spills reported to the DNR only. Location of the spills are approximate in most cases. Two sites are listed close to the project area; a 200 gallon motor oil spill on highway 12 - 150 yards east of Ripley Road which has been cleaned up and 3 gallon PCB spill occurred on highway 12 near the Lake Ripley Country Club for which no action was taken.

Wetlands

Historically, the watershed contained extensive wetlands but most have been drained for agriculture and development. Today, only 540 acres of the original approximately 1,500 acre wetland area remain in the entire watershed. Diverse wetlands have survived on the south and east ends of the lake even though over 70% of the shoreline has been developed.

Reconstruction of Lake Ripley's water quality history through paleoecological assessment demonstrated the importance of wetlands to the lake. The ability of wetlands to improve water quality, provide hydrologic control, and provide valuable fish and wildlife habitat has been widely documented. Lake Ripley's existing wetlands provide all of these functional values to some degree. Although roughly two-thirds of the original wetland area have been drained, the remaining wetlands should be protected as valuable sensitive ecological systems.

Appreciation for the value of wetland systems is not new to the area. In 1951, a proposal was submitted to the Wisconsin Conservation Department for the protection of 574 acres east of Lake Ripley. The resource appraisal was prepared in response to requests of local farmers to drain the system. The wetland was described in the resource appraisal as follows: "It contributes to the production of pheasants, ducks, other marsh and songbirds, muskrats, fox, coon, and deer. It is a relic of ages in which our nation was in a state of continually increasing wealth of natural resources, and as such we value it."

In 1903-08, the United States Geological Survey mapped approximately 1,500 acres of wetlands within a watershed which had already experienced significant agricultural land clearing. In 1975, the Soil Conservation Service (SCS) delineated 1,364 acres as wetlands, or 29% of the total watershed. Out of the total 1,364 acres, 979 acres (72%) had been agriculturally modified to some degree. In 1986, WDNR mapped 540 acres as functioning or partly functioning wetlands. The inventories indicate a greater than 60% wetland reduction due to the cumulative effects of agricultural tillage, drainage and development. Table 3-6 describes the Wetland Inventory Summary.

A wetland inventory was conducted in the Lake Ripley Watershed to identify existing wetland areas and wetland areas that have been altered by agriculture and urban development. Historical and existing wetland areas were delineated from Soil Conservation Service inventory maps (1975), WDNR wetland inventory maps (1986) and United States Geological Survey maps from

1903. Existing functional wetlands areas were determined from the 1986 wetlands inventory maps.

The majority of wetlands found in the Lake Ripley Watershed surround the only tributary to the lake. These and other wetlands have been classified by SCS as *wetland, farmed wetland, cropped wetland,* and *prior converted wetland.* Wetland areas defined by State Statutes include "areas where the water is at, near, or above the land surface long enough to be capable of supporting aquatic or hydrophytic vegetation, and has soils indicative of wet conditions."

Table 3-6. 1993 Wetland Inventory - Lake Ripley Priority Lake Project

	Acres				
	Wetlands	**Prior Converted**	**Farmed Wetlands**	**Cropped Converted**	**Total Potential Wetlands**
USGS (1908)	1500				1500
SCS (1975)	385	792	174	13	1364
DNR (1986)	540				540

The ecological functions of wetlands located east of Hwy A have been substantially reduced as a result of upland agricultural modifications (tiles, ditching and plowing). The flow regime through much of the wetland area has been altered by a small low gradient stream. Wetlands, with minimal defined channels and greater sheet flow, will more effectively retain sediment and protect downstream water quality. Most of the upland acres in the Lake Ripley watershed have been ditched or tiled to increase water drainage from the cropland, and in effect, contributed to the channeled flow through the wetlands. Siltation from adjacent farmed wetlands and sloughing from ditched channels have filled-in many areas and reduced wetland functions.

Sedimentation of wetland areas reduces its capacity to regulate hydrologic variability, and reduces the quality of water entering Lake Ripley. Nutrients and pollutants cannot be filtered out, and wildlife habitat in sensitive areas is impaired.

Stream monitoring data indicates that the remaining wetlands may become overloaded with sediment and nutrients from agricultural activities. In 1993, the inlet frequently became anaerobic during the summer months. The impact of low oxygen conditions reduced fish and aquatic invertebrate habitat and increased phosphorus loading to the lake. To improve wildlife and fish habitat and reduce nutrient loading to the lake, wetland rehabilitation should be considered. Wetland reclamation and protection are eligible practices for cost-sharing under the Nonpoint Source Water Pollution Abatement Program and the Lake Management Program.

All of the land west of Hwy A has been zoned residential. This area has been under extreme developmental pressure in recent years as large subdivisions are either under construction or being planned. Development can reduce wetland areas by intentional filling or from soil erosion. Historically, wetlands were consciously drained to enhance housing development around the lake. For instance, in 1949, the U.S. Army Corps of Engineers constructed a pumping station to drain wetlands on the north side of the lake. Today, wetlands are destroyed both intentionally or indirectly by common building practices. The standard method of scraping an entire building site clear of top soil and vegetation has caused severe erosion in some cases. Without installing and maintaining construction erosion control measures, severe erosion from building sites can have a major impact on wetlands and lake water quality.

In spite of wetland losses over the years, high quality wetlands still exist along the southern end of the lake. These wetlands support diverse communities of emersed plants, including tamarck, floating-leaf plants and submersed aquatic plants. The riparian wetlands filter nutrients, provide spawning habitat for largemouth bass and northern pike, and are essential for the protection of rare species (see Endangered Resources Section). Today, only 27% of Lake Ripley's shoreline supports riparian wetland communities. Protection of these sensitive areas is a critical element in the overall lake protection effort.

Urban Nonpoint Sources

Urban runoff carries a variety of pollutants to surface water. Some pollutants are specific to urban runoff while others are also found in runoff from agricultural areas. Pollutants found primarily in urban runoff include heavy metals (lead, copper, zinc, cadmium and chromium) and a large number of toxic organic chemicals (PCBs, aromatic hydrocarbons, esters and many others). Other substances in urban runoff that are also found in runoff from rural areas include sediment, nutrients, bacteria and other pathogens, and pesticides. In effect, urban runoff produces water with temperatures and chemical characteristics which limit animal life and recreational uses.

Over 90% of the residences in the Lake Ripley watershed are located within a quarter mile band around the lake. The high density of people around Lake Ripley concentrates the amount of urban nonpoint source pollutants associated with stormwater runoff. The purpose of the urban nonpoint source inventory and analysis was to identify the causes (and related nonpoint sources) that are critical constraints to achieving water quality goals and those that are only minor contributors. The urban nonpoint sources described below include runoff from existing urban areas, construction sites, and post-construction urban areas.

Storm Water

Storm water in the Lake Ripley watershed is most commonly conveyed to the tributary and lake through a combination of storm ditch laterals, roadside ditches, and grassed swales. Most storm water is transported rapidly with no "pretreatment" or slight filtering before it enters Lake Ripley. Grassed ditches generally reduce runoff volume because of infiltration, and sod vegetation serves to remove some pollutants from runoff before it flows into Lake Ripley.

The types and amounts of pollutants transported by storm water runoff depend on the way that pollutant-bearing surfaces are connected to the storm drainage system. For example, low density residential areas around Lake Ripley provide more lawn area than high density residential areas. High density residential areas have more rooftop, street, and parking lot surfaces. Lawns can be significant sources of fertilizers and pesticides. Rooftop areas are significant sources of zinc and atmospheric pollutants. Their connection to the storm drainage system may be direct or indirect, depending on the use of downspouts, grassed areas, or ditches. Streets are sources of significant amounts of lead, cadmium, sediment, and other pollutants, depending on their condition and the amount of traffic.

The Lake Ripley watershed was surveyed identifying current storm water drainage patterns. Storm water runoff is drained into Lake Ripley via grass swales, ditches and culverts. Residential dwellings are highly concentrated around Lake Ripley and impact the quality of Lake Ripley in three ways:

- The large amount of impermeable surfaces (roof and road) has increased surface water overland flow. Overland flow carries with it nutrients from burned leaves, gardens, and lawns, and pollutants from roofs and roadways.

- More surface flow decreases the amount of water recharging the groundwater supply. Lake models indicate that groundwater serves as a significant source of the total water budget entering Lake Ripley. A change in the groundwater supply could affect lake levels.

- Groundwater has been shown to contribute up to 30% of the total water budget to Lake Ripley. Groundwater is filtered as it percolates through the soil and is therefore considered cleaner than surface water. A reduction in the groundwater supply to Lake Ripley is essentially a reduction in clean water recharge. A reduction in clean water recharge could reduce the water quality of Lake Ripley.

Use of best management practices to reduce storm water will be a priority in the implementation of this plan. At this time, local authorities do not require installation of storm water management practices through ordinances or policies. Analysis of storm water management techniques shows that certain best management practices (BMPs) can significantly reduce sediment and other pollutant loadings to lakes and streams.

Another area of concern is that of lawn care chemicals. The potential for lawn care chemicals to be carried by runoff from shoreline areas and nearby drainageways to Lake Ripley is a concern. Fertilizer residues can enrich the lakes with nutrients and promote algae growth. Use of low-phosphorus or no-phosphorus fertilizers is recommended for lawn areas. Also, using the grass drainageways for seasonal burning of leaves and twigs adds to the nutrient enrichment to Lake Ripley. Burning in the ditches causes two problems. The nutrients in the ashes are readily transported to Lake Ripley, and the bare areas are susceptible to sediment erosion until they become stabilized again.

Urban Land Uses

High density residential and mobile home parks are the largest sources of sediment, lead, and zinc on a per acre basis. This is a direct reflection of the large amount of roads and roof area found in those areas. Medium density residential areas are also important contributors of those types of nonpoint source pollution. Residential areas, particularly in the lakeshore areas, are important where the improper use and disposal of pesticides, fertilizers, wood preservatives, and boat and automotive maintenance may occur. Urban land uses and associated nonpoint sources of pollutants are shown in Table 3-7.

Table 3-7. Pollution Generated from Urban Land Uses in the Lake Ripley Watershed.

Land Use	Total Acres	Sediment (tons)	P (lbs./yr)	Lead (lbs./yr)	Zinc (lbs./yr)
High Density Residential	43	9	43	30	34
Medium Density Res.	202	19	101	41	41
Low Density Res.	122	<1	5	5	1
Suburban Residential	28	<1	1	1	<1
Mobile Home Park	20	2	10	4	4
Miscellaneous/Cem.	23	3	7	8	15
Park	19	<1	<1	0	<1
Open Space Undeveloped	333	<1	10	0	2
Total	790	34	178	89	97

Source: LRMD & DNR

Construction Site Erosion and Sedimentation

Construction site erosion and sedimentation is a major water quality concern throughout the Lake Ripley watershed. The close proximity of construction sites to ditches, swales, or other areas draining toward Lake Ripley may result in a large load of sediment being delivered to the lake or tributary. It can destroy aquatic habitat by covering up the lake bottom and reducing water clarity. Moreover, any water quality improvements that result from implementation of nonpoint source control practices in downstream areas and around the lake can be negated by upland construction erosion.

An analysis of construction site erosion in the Lake Ripley watershed was conducted using land use inventory data provided by Jefferson County Zoning Administration. From 1989 to 1993, new home building and remodeling of old cottages more than doubled around Lake Ripley. On-going development in the watershed area indicates that this trend will continue if not increase in the future. About 17 new homes were built each year on average between 1989-93. Two large multi-family developments began in the spring of 1994. Approximately 65 future homes are associated with those two projects alone.

Although new family dwellings are on the rise, the majority of the construction occurring around Lake Ripley is converting old summer cottages into year round residencies. A lot of excavation

may be associated with those projects. Municipal and utility excavations are difficult to track, making it difficult to get an accurate measurement of the potential impacts to Lake Ripley associated with construction site erosion. Erosion rates are underestimated here. Construction site erosion estimates were only calculated for one and two family dwellings and remodeling of old homes. The soil erosion rate during construction can be 10 to 100 times greater than the rate of erosion from agriculture. On some construction sites, erosion rates can exceed 75 tons per acre per year (DNR, 1993). Average annual sediment loading to Lake Ripley and adjoining wetlands from one and two-family construction site erosion for 1989 to 1993 conditions was determined by multiplying the amount of land planned for development by an average of 30 tons per acre per year. A one-half acre average was used for new one and two-family dwellings and a one-quarter acre average was used for additions and remodeling of existing dwellings. This rate of erosion assumes the current level of on-site erosion and sediment control and is based on observed land development patterns. It is estimated that between 1989 and 1993, construction erosion may have contributed about 450 tons per year of sediment in the watershed, or about 13 percent of total from nonpoint sources.

Enforcing state and local ordinances can be an effective means of reducing construction site erosion and its adverse water quality impacts. In 1986, the DNR and the League of Wisconsin Municipalities cooperatively developed a model ordinance for the control of construction site erosion (WDNR, 1987). It contains provisions for planning, designing, installing and maintaining erosion control practices. It also contains guidance for administering and enforcing the ordinance.

The Township of Oakland has adopted an ordinance for controlling construction site erosion and sedimentation under the Universal Dwelling Code (UDC). In addition, developers are governed by state regulations set forth by the Department of Industry, Labor and Human Relations (DILHR) for erosion control on sites with one and two family dwellings. Compliance with ordinance requirements has been inconsistent, and routine enforcement has been relatively ineffective. Some of the potential impediments to effective erosion control include:

- Developers sometimes perceive erosion control as an add-on cost and not a built-in cost of construction.

- DNR handbook standards are not always practicable. For example, sedimentation basin designs consume large areas where vacant land is scarce.

- Reviewers of erosion control plans and site inspectors are reluctant to exercise full enforcement authority or their authority is limited.

- Unnecessary grading and excavation is commonplace.

- Soil is routinely tracked onto roads because preventative measures are expensive and not a high priority for builders.

- Improperly installed silt fences and straw bales are ineffective in controlling fine clay sediments.

- Courts are lenient on violators of the erosion control ordinance.

- The threat of law suits and litigation is usually what influences developers to take action to control erosion and sedimentation.

- Funds for hiring adequate inspection staff are generally not available.

- There is often confusion about who is responsible for installing erosion control practices.

- Local erosion control ordinances need revision.

- Some erosion control practices are cost prohibitive.

The construction site erosion and sedimentation control strategy (Chapter IV) & information and education strategy (Chapter VI) address the majority of the elements listed above.

The Uniform Dwelling code (UDC) has been adopted by the Town of Oakland which is the governing body for the entire Lake Ripley Watershed. As of December 1, 1992, the UDC adopted erosion control standards for new one and two family dwelling construction sites. Although a construction erosion control standard code is in place, enforcement of the code has been limited due to personnel and financial constraints.

Construction site erosion control throughout the watershed is critical to achieving sediment reduction goals. Fortunately, controlling sediment runoff from construction sites can be accomplished using relatively low-cost, effective best management practices. It is recommended that the Town of Oakland use the Wisconsin Construction Site Handbook (DNR Publication WR-222-89) as a reference manual for any development that occurs throughout the Lake Ripley Watershed. Without adequate enforcement of construction erosion control standards, construction site erosion will continue to be a significant source of sediment to Lake Ripley.

Water Resources Pollution Reduction Goals and Objectives

The goals and objectives of this plan focus on achieving realistic biological and recreational uses in Lake Ripley and tributary streams. They provide the basis for prescribing nonpoint source pollution control best management practices and the criteria by which water quality improvements will be evaluated when the project is completed.

The water resource goals and objectives for Lake Ripley and its tributary focus on providing environmental conditions which allow the watershed resources to fully achieve their potential biological uses. In many cases other cultural factors that limit the quality of these water

resources, such as point sources, channelization, dams, or limited public access, will also need to be addressed to see the full benefits of nonpoint source controls.

Water resources goals and objectives are presented below. The objectives will be met in a manner consistent with the protection of existing fish and wetlands, and wildlife habitat. In addition, opportunities will be sought to achieve nonpoint source pollution reduction goals in ways that enhance currently degraded fish and wildlife habitat, such as through the use of restored wetlands and shoreline buffers.

Project Goals and Objectives

At present, the recreational value of the lake is only marginally impaired by water quality problems. However, fish and wildlife habitat is partially impaired by degraded water quality. Therefore, the water resource goals and objectives for Lake Ripley also call for improvements in fish and wildlife habitat which will, to some degree, improve recreational values.

The Water Resources Appraisal Team identified preliminary water resources objectives, based on achieving realistic water quality improvements. Based on the information collected for the water quality appraisal, nonpoint sources of pollution contribute to excessive nutrient loading and, to a lesser extent, degradation of water clarity associated with turbidity. In addition, internal phosphorus loading appears to contribute to water quality problems in the lake. Water quality modeling, paleolimnological studies and other lake assessment data support the project objectives.

The pollutant reduction goals for Lake Ripley were selected by weighing the desire to achieve water resources objectives against the feasibility of implementing aggressive and expensive management actions in the watershed. The overall goals are presented in Table 3-8.

The goals of the project are:

- Reduce sediment by 50%. This reduction is needed to improve the water quality of the tributary, the wetland and Lake Ripley.

- Reduce phosphorus loading to the lake by 30%. This reduction will result in reduced excessive aquatic algae growth and will provide adequate water clarity in the lakes.

- Maintain Trophic State Index (TSI) below 50. This will result when phosphorus inputs decrease.

- Protect lake sensitive areas.

- Prevent further wetland loss or disturbance.

- Protect wetland areas east of the lake and tributary riparian buffer areas.

- Increase total number of wetland acres through restoration measures.

- Preserve undeveloped shoreline areas as water quality buffers and wildlife refuges.

- Enhance developed shoreline areas by planting native vegetation to serve as buffers.

- Reestablish native aquatic plant communities, where feasible.

- Protect the Lake Ripley largemouth bass fishery, aquatic diversity and endangered resources within the lake and watershed.

- Protect groundwater resources.

- Maintain groundwater contribution to the hydrologic budget by maintaining infiltration areas.

Table 3-8. Sediment and Phosphorus Reduction Goals for the Lake Ripley

Sources	Sediment Delivered (tons)	Sediment Reduction Goal	Sediment Reduced (tons)	Percent of Total	Phosphorus Delivered (Lbs.)	Pounds of P reduced
Cropland	146	38%	55	2%	865	489
Animal Lots	--	--	--	--	15	-
Existing Urban	34	50%	17	<1%	227	113
Construction Sites	450	50%	225	9%	N/A	N/A
Ditches	2654	75%	1981	82%	N/A	N/A
Shoreline	252	55%	137	6%	N/A	N/A
TOTAL	3537	50%	2413	100%	1107	

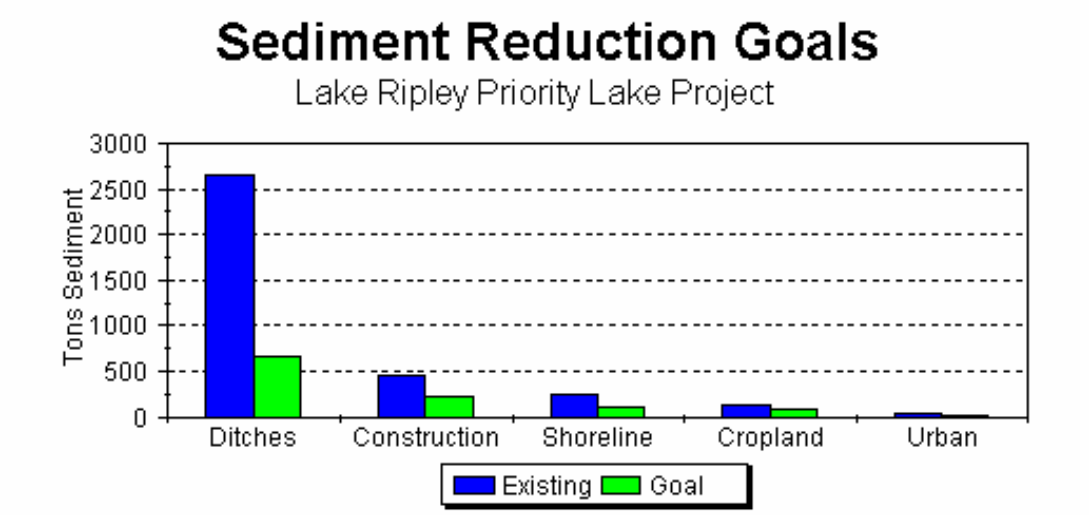

Figure 3-1. Sediment Reduction Goals for Lake Ripley

CHAPTER FOUR
Nonpoint Source Control Needs

Introduction

This chapter describes the management actions developed to meet the pollution reduction goals established during the water resource appraisal process. Table 3-8 outlined a summary of the identified pollutant reduction goals. The criteria used to determine the eligibility of each pollutant source for cost-share funding through the nonpoint source program are described in this chapter.

Management Categories

Nonpoint source control needs are addressed by assigning "management categories" to each major nonpoint source pollution site (barnyards, manure spreading, upland fields, streambank and shoreline erosion or streambank habitat degradation sites). Management categories define which nonpoint sources are eligible for financial and technical assistance under the priority watershed project. Categories are based on the amount of pollution generated by a source, and the feasibility of controlling the source. Management category eligibility criteria are expressed in terms of **tons of sediment** delivered to surface waters and lateral recession rates from eroding uplands, streambanks, and shorelines, **pounds of phosphorus** delivered to surface waters, and cattle access to tributary. A definition of each management category is given below. Following this are the criteria used to define the management categories for each pollutant source.

The criteria used to define these management categories must be confirmed at the time that the county staff visit a site. A source may change management categories depending on the conditions found at the time of the site visit. A management category may be revised up to the point that a landowner signs a cost-share agreement. Any sources, created by a landowner, requiring controls after the signing of a cost-share agreement must be controlled at the landowners expense for a period of ten years.

Management Category I: Nonpoint sources included in this category contribute a significant amount of the pollutants impacting surface waters. A reduction in their pollutant load is essential for achieving the water quality objectives in the watershed project.

Nonpoint sources in Category I are eligible for funding and/or technical assistance under the priority watershed project. As a condition of funding, all sources in Management Category I must be controlled if a landowner wishes to participate in any aspect of the watershed project.

Management Category II: Nonpoint sources in this category collectively contribute less of the pollutant load than those in Management Category I. These nonpoint sources are identified and included in cost-sharing eligibility to further insure that water quality objectives for pollutant controls are met. Nonpoint sources in this category are eligible for funding and/or technical assistance under the priority watershed project. Controlling sources in this category is not mandatory for a landowner to be funded for controlling other sources.

Management Category III: Nonpoint sources of pollution in this category do not contribute a significant amount of the pollutants impacting surface waters and are not eligible for funding and/or technical assistance under the priority watershed project. Other Departmental programs (e.g. wildlife and fisheries management) can, if warranted, assist county project staff to control these sources as implementation of the integrated resource management plan for this watershed. Other federal programs may also be applicable to these lands.

Phosphorus Management Goal

The Lake Ripley Priority Lake Project has an overall phosphorus reduction goal of 30 percent. Since phosphorus is adsorbed onto soil particles, the phosphorus reduction goal will be achieved through reducing sediment contributions from cropland and urban areas. However, since high levels of phosphorus are not associated with subsoils, a high level of phosphorus control is not expected to be achieved through control of ditch erosion, construction site erosion or shoreline erosion. Additional phosphorus reduction may be achieved though the harvesting and removal of lake weeds.

Criteria for Eligibility and Management Category Designation

Cropland

Cropland erosion represents 4 percent (146 tons) of the total sediment load to Lake Ripley. A 38 percent reduction in sediment from eroding fields is targeted for agricultural lands. This includes all cropland that is above the tolerable soil loss and have a sediment delivery rate greater than 4.0 tons/acre/year.

Assuming 75% of the eligible landowners participate, a 44% reduction in phosphorus can be achieved. This was calculated by using a phosphorus to sediment ratio best suited for the soils in this area.

Category I includes all of the cropland that have soil erosion rates above the tolerable level (or "T"). Tolerable erosion levels have been determined for all of the states soils and which allow for the maintenance of long term soil productivity. This category will address an estimated 78 acres of cropland or 60 tons of the sediment load to Lake Ripley.

An additional 13 tons of the sediment load will be addressed through Category II. Category II includes those landowners with fields maintaining a sediment delivery rate above >0.4 tons/acre/year. Table 4-1 is a summary of the cropland that falls into each of the three categories of eligibility.

Table 4-1. Cropland Eligibility in the Lake Ripley Priority Lake Project

Management Category	Eligibility Criteria		Soil/Loss (tons/acre/year)	Acres	Percent Total Cropland Erosion
	Soil Loss	Sediment Delivery			
I	Above T		60	78	41%
II		Greater than 0.4	13	30	9%
III	Below T	less than 0.4	73	108	50%

Source: LRMD/Jefferson Cty LCD

Animal Lot Runoff

Currently there are no barnyards that pose a significant threat to the water quality of Lake Ripley and associated wetlands. In the event that a new operator starts up or an existing barnyard operation is expanded, an updated management classification will be developed by the Project Manager through a on-site visit.

There are a total of three active livestock/dairy operations and three active horse farms in the watershed. All of the barnyards are classified as "Category III." The following criteria will be used in the event a barnyard operation expands or starts up.

Category I:Operations that produce over 40 pounds of phosphorus per year.

Category II:Operations that produce between 10-40 pounds of phosphorus per year.

Category III: Operations that produce less than 10 pounds per year.

If a landowner receives cost sharing for animal lot runoff (Waste Management System, SCS Standard 312), he or she is required to develop a nutrient management plan (SCS Std. 590) for that operation. Operations eligible for Waste Management Systems are also eligible for cost-sharing of nutrient management practices, specifically the development of both nutrient management (SCS Std. 590) and pest management (SCS Std. 595) plans, soil testing and crop scouting. If the Waste Management System does not include waste collection, handling, or storage, it may be exempt from the nutrient management plan requirement.

Nutrient Management

Prevention of groundwater pollution through nutrient and pest management is more effective than treating degraded waters after the damage has occurred. Farmers can also benefit from nutrient and pest management plans by taking nutrients credits for legumes and landspred manure and reducing applications of commercial nutrients. Manure spreading runoff and pesticide use is addressed through two Soil Conservation Service (SCS) standards: Nutrient Management Standard 590 and Pest Management Standard 595.

Under a WDNR Priority Watershed Nutrient Management Pilot Program grant (September, 1994 through June, 1995), all of the producers in the Lake Ripley watershed were eligible to receive funds to develop a nutrient management plan for their cropland. All of the farmers located in the Lake Ripley Watershed were contacted in the fall of 1994. Eligibility criteria were that the farmer must have a contiguous farming operation having land within the borders of the Lake Ripley priority lake watershed. This project is strictly voluntary and will have no landowner costs or obligations associated with it.

The nutrient management plans were prepared by crop consultants to meet SCS 590 nutrient recommendations. These plans were submitted to and approved by the Jefferson County Land Conservation Department or its designee. Records were kept showing progress towards reducing the use of fertilizer and pesticides.

Consultants were reimbursed upon the completion of the plan at the at a rate of $6/acre of cropland. All plans were completed before June, 1995.

Other nutrient and pesticide best management practices will be available for cost-sharing through the Lake Ripley Priority Lake Project. These BMPs include: soil and manure testing, crop scouting, and spill control basins for pesticide handling. A cost-share rate of 50% is given for all nutrient and pesticide management practices except for 70% on spill control basins.

Manure Storage

Eligibility for a grant for manure storage practices will be based on the Nutrient Management Plan, developed in compliance with NRCS standard 590. A manure storage facility will be considered Category I if the farm operator receives cost-sharing for any item other than those funded under the NPM Educational Program. Storage will not be required unless the 590 plans show a need. There is no Category II for manure storage.

An operation is eligible if the nutrient management plan demonstrates that manure cannot be feasibly managed during periods of snow covered, frozen and saturated conditions without the installation of storage practices. The nutrient management plan must also demonstrate that proper utilization of the manure can be achieved following adoption of the intended storage practice.

The eligibility for storage facilities will be based on the least cost system that will satisfy the Std. 590 specifications. These options may include manure stacks (in accordance with Std. 312), short term storage (capacity for 30 to 100 days production in accordance with Std. 313), and long term storage (capacity for up to 210 days production in accordance with Std. 313 or 425).

Landowners receiving cost-sharing funds for storage practices or nutrient management are required to adopt a nutrient management plan (Std.590). Additionally, manure removed from cost-shared storage facilities designed to hold greater than 6 months, shall not be spread on frozen, snow covered, or saturated ground (as stated in NR 120).

Agricultural Ditches

The streams entering Lake Ripley are essentially agricultural ditches. Historically there was a small indistinct stream meandering through the wetlands. Now over 4.25 miles of ditches drain into those wetlands.

Ditch banks contribute 75% percent (2,654 tons/year) of the overall sediment deposited in the wetlands and delivered to Lake Ripley. Sediment deposited in wetlands has reduced the functional ability to filter out pollutants and sediment as well as regulating hydrologic variability. Sediment delivered to Lake Ripley reduces aquatic habitat and water clarity. Excess nutrients carried by sediment can increase the incidence of algal blooms.

Category I: Ditches that have a lateral recession rate of greater than 0.5 feet/year. District staff will evaluate site accessibility/feasibility on Category I sites. Ditched areas that allow for livestock access are also considered Category I.

Category II: Ditches that have moderate lateral recession rates of between 0.1 and 0.5 feet per year.

Category III: Ditches that have less a lateral recession rate less than 0.1 feet/year. Category III ditches are not eligible for cost sharing through the Lake Ripley Priority Lake Project.

Assuming a 75% participation rate of all eligible landowners, the goal is to control 75% of the sediment entering the tributary from the ditches. Table 4-2 shows the streambank eligibility criteria.

Table 4-2. Streambank Eligibility Criteria for the Lake Ripley Priority Lake

Management Category	Lateral Recession Rate	Length	Tons
I	Greater than 0.5 ft./year	13,800	1,412
II	Greater than 0.1 ft./yr but less than 0.5 ft/yr	27,900	1,230
III	Less than 0 .1 ft./year	3,200	12

Sources: LRMD, Jefferson County LCD, DNR and DATCP

Shoreline Erosion

In the fall of 1993, the entire shoreline of the Lake Ripley was inventoried. Shoreline erosion on Lake Ripley contributes 7 percent (252 tons) of the overall sediment delivered in the watershed. Although shoreline erosion contributes only 7 percent of the total sediment contribution, 100 percent enters Lake Ripley and is deposited in the littoral area. Littoral zones serve as critical areas for spawning and providing nearshore habitat. As more of the shoreline area becomes developed, preservation and restoration of these small niches will become increasingly important.

The goal is to reduce shoreline erosion by 55%. The most serious shoreline erosion problems are concentrated on only 30% of the total shoreline. The preferred best management practice for shoreline erosion control is bioengineering, an alternative to rock riprap. Bioengineering methods are less costly, easier to install, and less destructive of the littoral zone.

The shoreline erosion concerns on Lake Ripley were broken down as follows:

Slight (<.1 feet/year) - There is bare bank, but lateral recession of the bank is not obvious. Difficult to measure over one or two years.

Moderate (0.1-.5 feet/year) - Active eroding banks. There are many exposed roots, fallen vegetation and cave-ins. Sometimes changes in cultural features can be noted such as fence posts and trees leaning, cracked concrete, and miss alignment of railroad ties.

Severe (0>.5 feet/year) - Severe bank erosion is characterized by having massive washouts and slumps in addition to the characteristics of moderate erosion.

Table 4-3 presents the criteria that will be used to identify sites eligible to receive cost sharing.

Table 4-3. Shoreline Erosion Eligibility Criteria for the Lake Ripley Priority Lake Project

Management Category	Erosion Level	Shoreline Length (ft.)	Soil Loss (Tons/yr)	Percent Total (Tons/yr)
I	Severe	1,325	55	22%
II	Moderate	7,644	127	50%
III	Slight	19,829	70	28%

Gully Erosion

Gully erosion has not been identified as a significant problem in this watershed, therefore a field inventory of gully erosion was not done. Any significant gullies identified during implementation will be evaluated to determine if they are critical sources of sediment and therefore eligible for cost sharing. Gullies identified through this process will be category II for eligibility.

Wetland Restoration

As outlined in Chapter 3, the importance of the wetlands to Lake Ripley has been extensively documented. Total wetland acres has been reduced by two thirds as a result of agricultural ditching/draining. The preservation of the remaining acres is critical to the long-term ecological health of Lake Ripley and surrounding area.

All inventoried wetlands, as defined by SCS will be Category II (eligible) for restoration if the sites meet the criteria on the following pages. The project goal is to preserve existing wetlands and restore wetlands when possible.

Wetland restoration is an eligible best management practice for the purpose of controlling nonpoint sources of pollution. Secondary benefits of wetland restoration are enhancement of fish and wildlife habitat.

Wetland restoration includes: the plugging or breaking up of existing tile drainage systems, the plugging of open channel drainage systems, other methods of restoring the pre-development water levels of an altered wetland, and the fencing of wetlands to exclude livestock.

Wetland restoration is an eligible practice when applied to any of the following:

1 Cultivated hydric soils with tile or open channel drainage systems discharging to a stream or tributary. Wetland restoration will reduce the amount of nutrients and pesticides draining from the altered wetland to a water resource either by establishing permanent vegetation or altering the drainage system.

2 Pastured wetlands riparian to streams, or tributaries. Eliminating livestock grazing within wetlands will reduce the organic and sediment loading to the wetland and adjacent water resource, and reduce the direct damage to the wetland from the livestock. Livestock exclusion by fencing will control the pollutants and restore the wetland.

3 Prior converted wetlands downslope or upslope from fields identified as Management Category I upland sediment sources through the WINHUSLE model. Restoration of wetlands in these situations will do one of two things: 1) create a wetland filter which reduces the pollutants from an upslope field(s) to a water resource; or 2) reduces the volume and/or velocity of water flowing from an up-slope wetland to a down-slope critical field. Two eligibility conditions must be met to use wetland restoration in this situation:

- All upland fields draining to the wetland must be controlled to a soil loss rate that is less than or equal to the soils "T" value.

- Wetland restoration costs must be the **least-cost** practice to reach sediment reduction goals.

In addition to the criteria described above, landowners must control all "Management Category I" sources (through a cost share agreement) to be eligible for an easement through the watershed project.

Land Easements

Nonpoint source program funds may be used to purchase land easements in order to support specified best management practices. These practices, all of which involve the establishment of permanent vegetative cover, include:

- Shoreline Buffers

- Critical Area Stabilization

- Wetland Restoration

Although easements are not considered a best management practice, they can help achieve desired levels of nonpoint source pollution control in specific conditions. Easements are used to support best management practices, enhance landowner cooperation and more accurately compensate landowners for loss or altered usage of property. The benefits of using easements in conjunction with a management practice are that riparian easements can provide fish and wildlife

habitat along with the pollutant reduction function. Easements are generally perpetual, so the protection is longer term than a management practice by itself. An easement may allow for limited public access (depending on the situation). However, the primary justification of an easement must be for water quality improvement.

Within the watershed, easements should be considered in the following situations:

1. To exclude livestock from grazed wetlands or along eroding stream banks within the watershed. Easements are strongly recommended whenever:
   - there is any grazing of wetlands;
   - livestock density is so great that areas of unvegetated soil are within 60 feet of streams or intermittent streams;
   - more than 100 feet of stream bank are severely trampled and eroding;
   - channel erosion is exacerbated by livestock grazing such that unvegetated stream banks are two feet more in height;

2. When elimination of row cropping and the establishment of permanent vegetative cover will stabilize a critical area. Easements are strongly recommended whenever row cropping occurs within 60 feet or less of streams or intermittent streams, and wetlands.

3. To support eligible wetland preservation and wetland restoration projects.

In addition to the criteria described above, participating landowners must control all "Management Category I" sources (through a cost-share agreement) to be eligible for an easement through the watershed project.

Gravel Mining Operations

At this time there are two proposed gravel mining operations in the Lake Ripley Priority Lake Watershed. The lifespan of each mine is estimated to be ten years. In the past there have been little surface water quality problems associated with gravel mining operations in Jefferson County. The primary concern is solids associated with discharge water used for washing stone. There are two dewatering basins planned to contain the water prior to discharge. Due to the permeability, the wash water tends to filter into the groundwater before it drains leaving the sediment load in the basin. Routine inspection will occur by the district and county staff to see if the sedimentation basins are working correctly. In the event that the dewatering basins are found to be working inadequately, an alternative system will be developed by Lake District staff, or Jefferson County personnel.

Gravel mining operations are required to be restored on an incremental time-line. As each phase is completed, restoration is required which includes appropriate slopes and vegetation planting (native species). A new phase does not begin until the previous restoration phase has been approved.

Conservation Reserve Program (CRP)

The federal conservation reserve program compensates landowners for not growing crops on highly erodible cropland and planting permanent vegetative cover, such as a protective cover of grass or trees. This program provides annual payments to landowners based on the number of acres of eligible land entered into a ten year contract with the federal government.

Currently, there are 330 acres of cropland in the conservation reserve program in the Lake Ripley watershed. This is approximately ten percent of the total amount of cropland located in the watershed. The majority of those acres are located adjacent to valuable wetlands.

Continued funding for this program is currently under review. If funding for this program were to be cut, much of these highly erodible lands will return to agricultural production. Therefore, it is important that other potential options be explored to maintain vegetative cover on these acres, prior to any program funding reduction. Pheasants Forever, a private wildlife group, will cost-share wildlife cover.

Urban Nonpoint Source Control Needs

Urban Nonpoint Sources

As discussed in Chapter Three, the principal water quality problems derived from urban land uses result from high loading of sediment, nutrient, bacteria, heavy metals and other toxic materials from existing urban areas and construction sites. These sources must be addressed to meet the pollutant reduction goals for the Lake Ripley watershed.

Management Alternatives for Established & Planned Urban Areas

Urban Best Management Practices

Four general classes of management practices are used as erosion control practices to reduce the adverse impacts of runoff from urban areas. These classes include: source reduction practices, infiltration practices, wet detention practices, and streambanks, or in this watershed, ditchbank erosion control. In the Lake Ripley watershed, two other practices are also recommended for improving water quality from uban sources: yard waste management and construction site erosion control.

Source Reduction Practices: These practices are meant to reduce the generation of urban pollutants as close to the source as possible. At a minimum, pollutants are controlled prior to being washed from urban surfaces by rainfall and snowmelt.

Source controls are generally non-structural, relying instead on changes in lifestyle by urban residents. Reducing the amount of automobile traffic is an example of a source control, as automobiles are the source of many urban pollutants. Current policies requiring removal of lead from gasoline and asbestos from automobile brake linings are also examples of source controls. Other source controls that should be used as part of the Lake Ripley Priority Lake Project include, but are not limited to:

- Reduce the use of galvanized roof materials and gutters, a primary source of zinc in urban runoff.

- Remove pet wastes immediately from lawns and streets to reduce bacterial contamination of urban runoff.

- Control the timing and reduce the amount and type of fertilizer and pesticide applications in urban areas.

- Dispose of automobile waste fluids such as radiator water and engine oil appropriately, keeping them out of the storm sewer system.

- Remove leaves and dirt from street and parking lot surfaces through municipal sweeping and leaf collection.

- Control land use through zoning, which, in part, considers on-site suitability for storm water management practices to meet water quality, habitat, and flood prevention objectives.

- Control construction site erosion.

- Minimize use of street de-icing compounds.

- Reduce the amount of motorized traffic.

- Reduce the areal extent of parking lots.

- Encourage urban developments to take place on lands within urban service area boundaries.

Source controls that prevent the discharge of pollutants, such as the removal of lead from gasoline are the most effective. However, these controls often cannot be initiated at the local level but rather are regional or national initiatives. Citizen action that leads to this type of control is an important component of any long-range urban strategy to reduce nonpoint pollution.

Source controls that rely on better housekeeping practices, such as pet waste control programs, oil recycling, and responsible use of lawn and garden products can be initiated locally. These types of controls are inexpensive and important for any program to reduce urban nonpoint pollution. Information and education efforts presented in Chapter VI are critical in supporting these "grass roots" approaches to solving urban water quality problems.

Infiltration Practices: Reducing pollutant transport to surface waters involves reducing the amount of urban storm water reaching the tributary and lake, primarily from impervious surfaces. This is accomplished by increasing the infiltration of storm water into the soil and ground layers. Storm water infiltration on a suitable site can effectively reduce nonpoint pollution. In addition, infiltration can help stabilize the hydrology of small urban streams by replenishing groundwater, much of which is ultimately discharged to surface water. Infiltration practices can be used with wet detention facilities to augment pollutant removal effectiveness or reduce pond size.

Practices that promote on-site infiltration include porous pavements, redirecting roof downspouts to grassy areas, and directing runoff waters to infiltration trenches. These practices are generally most applicable to small source areas such as rooftops and parking lots. Grassed swale drainage systems can also be used to reduce infiltrate runoff. Finally, infiltration basins can be located at the end of drainage outlets serving larger drainage areas.

Not all sites are appropriate for the use of infiltration practices. A minimum separation distance of three feet between the bottom of the infiltration device and the groundwater or bedrock is generally required. Heavy or poorly drained soils limit the effectiveness or practical use of infiltration devices. Slopes may limit the use of grassed swales in residential areas. Most importantly, precautions must be taken when infiltrating urban storm water to prevent groundwater contamination. Runoff from residential rooftops and driveways, rooftops in institutional, commercial, and non-manufacturing industrial areas can generally be infiltrated with little risk of groundwater contamination.

Runoff from parking lots in institutional areas, commercial areas and separate employee or visitor parking lots in non-manufacturing industrial areas can be routed through infiltration devices but require some type of pretreatment. Infiltration devices in these areas should be monitored to assure that groundwater contamination is not occurring. Highly contaminated runoff, such as that from commercial and industrial storage and loading areas should not be routed through infiltration practices.

Wet Detention Practices: Wet detention ponds effectively control particulate pollutants and can be designed to control peak flow discharges. Consequently, the wet ponds can be employed to serve many needs, including removal of pollutants, control of peak flooding and/or storm water flows that may be causing streambank erosion and streambed scour. These ponds have limited effectiveness in controlling pollutants dissolved in storm water, and cannot effectively reduce the total storm water volume or enhance stream base flows. Wet ponds can be situated near a small source area such as a parking lot, but they are more commonly used to control runoff from larger areas with a combination of uses.

Ditch Bank Erosion Control Practices: Erosion control practices used along ditch banks are similar to those used to control unstable streambanks in rural areas. Generally, these practices include seeding and shaping for areas with minor erosion problems. Rapidly eroding sites, extensive areas of erosion, or areas with steep or high banks may require more stable materials. These include bioengineering (carefully engineered use of vegetation) rock riprap, gabions, or other structural practices with the ability to withstand higher stream flows.

Yard Waste Burning Ordinance: The Lake Ripley watershed is not only blessed with a beautiful lake but by hardwood forests as well. Every year a large amount of yard waste must be disposed of. The most common way to dispose of leaves, brush, and branches in the Lake Ripley area is by burning. It is commonplace to burn yard waste in the grassed waterways that flow into Lake Ripley, or in areas adjacent to the lake. Ashes are washed into Lake Ripley by rain and spring snow melt. The ashes add to the nutrient budget entering Lake Ripley. Excessive nutrients cause the summer algal blooms and nuisance weed growth in the lake.

The annual input of nutrients from leaf burning to Lake Ripley can easily be avoided if burning of yard waste is restricted. The Town of Oakland has developed and enforces an ordinance to restrict burning of yard waste in grassed waterways, ditches or swales, or in areas adjacent to the lake.

Construction Erosion Control

Construction site erosion control throughout most of the watershed is critical to achieving sediment reduction goals. It is expected that the rate of construction, remodeling and additions will increase over past rates. Without adequate control, construction site erosion will remain the second greatest source of sediment in the watershed. The goal is to reduce erosion from construction sites by 55%.

The Uniform Dwelling code (UDC) has been adopted by the Town of Oakland. The Town of Oakland is the governing body for the entire Lake Ripley Watershed. As of December 1, 1992, the UDC adopted erosion control standards for new one and two family dwelling construction sites. Although a construction erosion control standard code is in place, enforcement of the code has been limited due to personnel and fiscal constraints.

Remodeling and additions to existing homes are very common throughout the watershed. Under UDC, erosion control ordinances are not required for remodeling or additions to homes built prior to 1980. The inventory shows that remodeling and additions to existing homes accounts for over 40% of the sedimentation associated with construction erosion. It is recommended that the Town of Oakland include homes built prior to 1980 under the current UDC erosion control guidelines.

Construction site erosion control throughout the watershed is critical to achieving sediment reduction goals. Fortunately, controlling sediment runoff from construction sites can be accomplished using relatively low-cost, effective best management practices. It is recommended that the Town of Oakland use the Wisconsin Construction Site Handbook (DNR Publication WR-222-93) as a reference manual for any development that occurs throughout the Lake Ripley Watershed. Without adequate enforcement of construction erosion control standards, construction site erosion will continue to be a significant source of sediment to Lake Ripley.

Management Alternatives for Planned Development

The long-term management goal for the watershed is to achieve a high level of pollution control for planned urban development. Planned development includes all land in which known changes will take place over the next 20 years. Planned development should not increase runoff and associated pollutant loadings to the lake.

There are several mechanisms to control runoff created from increased impervious surfaces such as rooftops, driveways, and roads. Wet detention ponds will trap all sediment particles 20 microns or larger in size. Infiltration should be considered as an alternative to wet detention where conditions are suitable for providing an equivalent level of control. In particular, grassed swale drainage systems in planned residential areas should be investigated to both control pollutants and decrease the size of wet detention facilities needed for additional pollution control. Infiltration basins or trenches may be used in conjunction with wet detention to provide groundwater recharge and base flow enhancement.

Storm water management ordinances with provisions for controlling both pollutants and flows from new development are needed. Storm water plans for areas where development is expected to occur are needed to assure that land is set aside for practices that are needed to meet the flow and pollutant load reductions specified in the ordinances. Assistance available through the nonpoint source program to control urban storm water quality and quantity in planned urban areas is presented in Chapter V.

Urban Phosphorus Reduction

Reductions in urban phosphorus loading will be accomplished through various information and education activities. These will encourage composting, no burning of leaves in waterways, proper fertilization of lawns, and regular use of best management practices during construction. The information and education strategy for the Lake Ripley watershed is outlined in Chapter 6.

In-Lake Restoration

In-lake restoration activities are eligible for cost-share dollars. This includes nutrient inactivation to reduce internal cycling of phosphorus from bottom sediments. An evaluation of internal recycling of nutrients would have to take place before any in-lake restoration activities might occur. Nutrient inactivation practices should be conducted only after significant reductions in rural and urban practices are achieved.

Mechanical weed harvesting of Eurasian watermilfoil has been incorporated in to the management strategy of Lake Ripley for a number of years. Weed harvesting rates ranged from 200 tons/year at its peak to a low of 0 tons/year (Marshall, 1992). The average concentration of phosphorus to weed mass has been estimated to be 3.4 pounds/ton. Weed harvesting has been an effective means of reducing phosphorus in the past and will continue to be in the future. A record will be kept over the course of the year to track phosphorus load reductions

CHAPTER FIVE
Implementation Program

Introduction

This chapter identifies the means for implementing the management actions for controlling nonpoint source pollution control described in the Lake Ripley Watershed. The success of this priority watershed project depends an aggressive implementation commitment by the Lake Ripley Management District, Town of Oakland, and Jefferson County, as well as the watershed residents, businesses, and developers.

More specifically this chapter identifies:

- The agencies and units of government responsible for carrying out the identified tasks;
- The best management practices (BMPs) necessary to control pollutants on the identified critical sites;
- The cost-share budget;
- The cost containment policies;
- The cost-share agreement reimbursement procedures including administrative procedures for carrying out the project;
- Staffing needs including total hours per year and number of staff to be hired;
- Schedules for implementing the project;
- The involvement of other programs;
- The project budget including the expense for cost-sharing; and staffing for technical assistance, administration, and the information and education program.

Rural Implementation Program

Project Participants: Roles and Responsibilities

Landowners and Land Operators: Owners and operators of public and private lands are important participants in the priority watershed program. They will adopt BMPs which reduce nonpoint sources of water pollution and protect and enhance fish, wildlife and other resources. Land owners and land operators in the Lake Ripley Watershed eligible for cost-share assistance through the priority watershed program include individuals, Jefferson County, Lake Ripley Management District, Town of Oakland, other governmental units described in NR 120.02(22), corporations, and the State of Wisconsin.

The Lake Ripley Management District (in conjunction with the Jefferson County Land Conservation Committee (LCC)) will act for the County Board and will be responsible contractually and financially to the State of Wisconsin for management of the project in areas with rural land uses. The Lake District and County LCC will coordinate the activities of all other agencies involved with the rural portion of the project.

The specific responsibilities for the county and/or the lake district are defined in the Wisconsin Administrative Rules, NR 120.05, and are summarized below:

a. Identify in writing a person to represent the district and county during implementation of the project.

b. Contact all owners or operators of lands identified as significant nonpoint sources (Category I) within one year of signing the nonpoint source grant agreement. The District's strategy for contacting landowners is included in this chapter.

c. Develop farm conservation plans consistent with the needs of the project.

d. Enter into nonpoint source cost-share agreements with eligible landowners and enforce the terms and conditions of cost-share agreements as defined in s. NR 120.13, Wisconsin Administrative Code.

e. For lands the county, town or lake district owns or operates, to enter into cost-share agreements with DNR to correct identified nonpoint sources and fulfill their obligations as a cost-share recipient.

f. Design best management practices and verify proper practice installation.

g. Reimburse cost share recipients for the eligible costs of installing BMPs at the rates consistent with administrative rules and those established in this plan.

h.Prepare and submit annual work plans for activities necessary to implement the project. The project manager shall submit a workload analysis and grant application to the Department of Agriculture, Trade and Consumer Protection (DATCP) as required in AG 166.50.

i.Prepare and submit to the Department of Natural Resources (DNR) and the Department of Agriculture, Trade and Consumer Protection (DATCP) the annual resource management report required under s. NR 120.25(1) to monitor project implementation by tracking changes in the nonpoint source inventory, and quantifying pollutant load reductions which result from installing BMPs.

j.Participate in the annual watershed project review meeting.

k.Conduct the information and education activities identified in this plan for which they are responsible.

Department of Natural Resources: The role of the Department of Natural Resources (DNR) is identified in s. 144.25 Stats. and NR 120, Wis. Adm. Code. The Department has been statutorily assigned the overall administrative responsibility for the Wisconsin Nonpoint Source Pollution Abatement Program. The Department's role is summarized below.

Project Administration. Project administration includes working with the county and lake district to ensure that work commitments required during the 8-year project implementation phase can be met. The DNR will participate in the annual work planning process with the county.

The Department reviews cost-share agreements signed by the lake district and the participating landowners for installing BMPs. The DNR provides guidance when questions arise concerning the conformance of proposed activities with the statutes, administrative rules, and the watershed plan.

Financial Support. Financial support for implementation of the priority watershed project is provided to the county and lake district in two ways: a local assistance grant agreement (with the county), and a nonpoint source grant agreement (with the lake district). These agreements are described later in this chapter. The DNR may also enter into cost-share agreements directly with local or state units of government for the control of pollution sources on land the governments own or operate.

Project Evaluation. The DNR has responsibility for priority watershed project monitoring and evaluation activities. These efforts determine if changes in water quality occur as best management practices and other pollution controls are installed or implemented. The water quality evaluation and monitoring strategy for the Lake Ripley Priority Lake Project is included in Chapter 8. The DNR documents the results of monitoring and evaluation activities in interim and final priority watershed project reports.

Technical Assistance. The DNR provides technical assistance to the county and the lake district on the design and application of best management practices. This assistance is primarily for urban areas.

Other Responsibilities. These include:

1. The regional nonpoint source coordinator to arrange for DNR staff to assist local staff with site reviews to determine the impacts of nonpoint sources on wetlands and/or groundwater quality.

2. Assisting local staff to integrate wildlife and fish management concerns into selection and design of BMPs.

Department of Agriculture, Trade and Consumer Protection: The role of the Department of Agriculture, Trade and Consumer Protection (DATCP) is identified in s. 144.25, Stats., Ch. 92 stats., and NR 120. In summary, the DATCP will:

1. Manage a training program for the staff involved with project implementation.

2. Cooperate with the University of Wisconsin - Extension to act as a clearinghouse for information related to agricultural best management practices, sustainable agriculture, and nutrient and pest management.

3. Assist the local staff in carrying out the information and education activities or tasks described in this plan.

4. Assist local staff in identifying watershed participants subject to federal or state conservation compliance programs.

5. Assist local staff to complete annual workload analyses and grant applications for work conducted under the priority watershed project.

6. Participate in the annual project review meetings.

7. If the need arises, assist in developing technical standards for agricultural BMPs, and provide technical assistance to local staff concerning application of these practices.

8. Assist local staff to evaluate the site specific practicality of implementing rural best management practices.

9. Provide technical and engineering assistance to counties for agricultural BMPs.

Other Agencies: The Lake Ripley Priority Lake Project will receive assistance from the agencies listed below.

Natural Resources Conservation Service (NRSC). This agency, formally called the Soil Conservation Service (SCS) works through the local staff to provide technical assistance for planning and installing conservation practices. The local NRCS personnel will work with the lake district and county staff to provide assistance with technical work when requested by the Land Conservation Committee and if NRCS staff time is available. Personnel from the appropriate NRCS technical center will provide staff training and engineering assistance for best management practices. Efforts will be made by DATCP to assist NRCS to coordinate the Lake Ripley Priority Lake Project with the conservation compliance and other conservation provisions of the 1985 and subsequent Federal Farm Bills.

University of Wisconsin Extension (UWEX). County and Area Extension agents will provide support in developing and conducting a public information and education program aimed at increasing voluntary participation in the project. This will include assistance to carry out the information and education activities identified in this plan.

Farm Service Agency (FSA). Formally called the Agricultural Stabilization and Conservation Service (ASCS), the Farm Service Agency administers most of the federal programs aimed at the stabilization of the prices paid producers for agricultural products and administers federal funds for rural soil and water and other resource conservation activities. The Agricultural Conservation Program (ACP) which is administered by FSA will, to the extent possible, be coordinated with the Lake Ripley Priority Watershed Project. In addition other conservation incentives such as the Conservation Reserve Program (CRP) will be used whenever possible to control critical nonpoint sources of pollution.

Agricultural Best Management Practices (BMPs)

BMPs Eligible For Cost-Sharing And Their Rates: Best management practices are those practices identified in NR 120 which are determined in this watershed plan to be the most effective controls of the nonpoint sources of pollution. The practices eligible for cost-sharing and the cost share rates for each BMP are listed in Tables 5.1 and 5.2. Other BMPs are eligible for cost-sharing under NR 120.

Design and installation of all BMPs must meet the conditions listed in NR 120. Generally these practices use specific standard specifications included in the NRCS Field Office Technical Guide. In some cases additional specifications may apply. The applicable specifications for each BMP can be found in NR 120.14. The Department may approve interim best management practices and alternative design criteria based on the provisions of NR 120.15 where necessary to meet the water resource objectives. Regarding interim agricultural BMPs, this approval is developed in consultation with DATCP.

If the installation of BMPs destroys significant wildlife habitat, NR 120 requires that habitat will be recreated to replace the habitat lost. The DNR District Private Lands Wildlife Specialist or a designee will assist the LCD in determining the significance of wildlife habitat and the methods used to recreate the habitat. Every effort shall be made during the planning, design, and installation of BMPs to prevent or minimize the loss of existing wildlife habitat.

Table 5-1. State Cost-Share Rates for Best Management Practices[1]

BEST MANAGEMENT PRACTICE	STATE COST SHARE RATE
Contour farming	50%[1]
Contour and field stripcropping	50%[1]
High residue management systems	50%
Field Diversions/Terraces	70%
Grassed Waterways	70%
Critical Area Stabilization	70% [2]
Shoreline Buffers	70% [2]
Wetland Restoration	70% [2]
Shoreline and Streambank Stabilization	70% [2]
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Nutrient/Pesticide Management	50%[3]
Lake Sediment Treatment	70%

[1]Table 5-2 shows BMPs cost shared at a flat rate.

[2]Easements may be entered into with landowners identified in the watershed plan in conjunction with these BMPs. See Chapter 4 for an explanation of where easements may apply.

[3]Spill control basins have a state cost share rate of 70%.

[4]The maximum cost-share rate for land acquisition, storm sewer rerouting, and removal of structures necessary to install structural urban best management practices is 50% .

Table 5-2. Practices Using a Flat Rate for State Cost-Share Funding

BEST MANAGEMENT PRACTICE	FLAT RATE
Contour Cropping	$ 9.00/ac [1]
Contour Strip-cropping	$ 13.50/ac [1]
Field Strip-cropping	$7.50/ac
High Residue Management	$ 18.50/ac [2]
Cropland Protection Cover	$ 25.00/ac [3]

[1]Wildlife habitat restoration components of this practice are cost-shared at 70%.

[2]Cost-shared per acre per year for no more than 6 years for high residue management systems

[3]Per acre per year for up to 3 years for green manure

Source: WDNR

Following is a brief description of some of the most commonly used BMPs included in Table 5-1 and 5-2. A more detailed description of these practices can be found in NR 120.14.

- **Contour Farming** - The farming of sloped land so that all operations from seed bed preparation to harvest are done on the contour.

- **Contour Stripcropping** - Growing crops in a systematic arrangement of strips or bands, on the contour, in alternate strips of close grown crops, such as grasses or legumes, and row crops. All operations from seed bed preparation to harvest are done on the contour.

- **Reduced Tillage** - A system which leaves substantial amounts of crop residue on the soil surface after crops are planted. The minimum amount of ground cover after planting shall be at least 30%. It is utilized in two situations: one for continuous (at least 3 consecutive years) row crops, the other for short crop rotations (no more than 2 years corn and small grains and hay) or for the establishment of forages and small grains.

- **Critical Area Stabilization** - The planting of suitable vegetation on critical nonpoint source sites and other treatment necessary to stabilize a specific location.

- **Grassed Waterways** - A natural or constructed channel shaped, graded and established with suitable cover as needed to prevent erosion by runoff waters.

- **Grade Stabilization Structure** - A structure used to reduce the grade in a channel to protect the channel from erosion or to prevent the formation or advance of gullies.

- **Shoreline and Ditchbank Stabilization** - The stabilization and protection of ditch and lake banks against erosion and the protection of fish habitat and water quality from livestock access. This practice includes rip-rap, shaping and seeding, stream crossings, and fish habitat structures.

- **Terraces** - A system of ridges and channels with suitable spacing and constructed on the contour with a suitable grade to prevent erosion in the channel.

- **Field Diversions** - A channel constructed across the slope with a supporting ridge on the lower side that diverts water to a safe outlet.

- **Agricultural Sediment Basins** - A structure designed to reduce the transport of sediment eroded from critical agricultural fields and other pollutants to surface waters and wetlands.

- **Shoreline Buffers** - A permanently vegetated area immediately adjacent to lakes, streams, channels and wetlands designed and constructed to manage critical nonpoint sources or to filter pollutants from nonpoint sources.

- **Wetland Restoration** - The construction of berms or destruction of the function of tile lines or drainage ditches to create conditions suitable for wetland vegetation.

- **Nutrient Management** - The management and crediting of nutrients for the application of manure and commercial fertilizers, and crediting for nutrients from legumes. Management includes the rate, method and timing of the application of all sources of nutrients to minimize the amount of nutrients entering surface or groundwater. This practice includes manure nutrient testing, routine soil testing, and residual nitrogen soil testing.

- **Structural Urban Best management Practices** - Source area measures, transport system and end-of-pipe measures designed to control stormwater runoff rates, volumes, and discharge quality. The practices include, but are not limited to infiltration trenches, porous pavement, oil water separators, sediment chambers, sand filtration units, grassed swales, infiltration basins and detention/retention basin.

- **Easements** - Although not considered to be Best Management Practices, easements are useful legal tools and their applicability is defined in Chapter 4, Management Actions. Details for such arrangements will be worked out between DNR and the counties during implementation phase.

Interim Best Management Practices

Under some circumstances, practices may be recommended that are not included in the list above. Administrative Rule NR 120.15 provides for alternative practices where necessary to meet water resources objectives outlined in the plan. The DNR shall identify in the nonpoint

source grant agreement the design criteria and standards and specifications where appropriate, cost share conditions, and cost share rates for each interim best management practice.

BMPs Not Cost-Shared: BMPs not cost-shared, but which shall be included on the cost share agreement if necessary to control the nonpoint sources, are listed in NR 120.17. Several examples are included below.

- That portion of a practice to be funded through other programs.
- Practices previously installed and necessary to support cost-shared practices.
- Changes in crop rotations and other activities normally and routinely used in growing crops or which have installation costs that can be passed on to potential consumers.
- Changes in location of unconfined manure stacks involving no capital cost.
- Manure spreading management.
- Other activities the DNR, the county, and lake district determine are necessary to achieve the objectives of the watershed project.

Activities and Sources of Pollution Not Eligible For Cost Share Assistance: Priority watershed cost-share funds cannot be used to control sources of pollution and land management activities specifically listed in NR 120.17(2). The following is a partial list of ineligible activities most often inquired about for cost-sharing in rural areas.

- Operation and maintenance of cost-shared BMPs,
- Actions which have drainage of land or clearing of land as the primary objective,
- Practices already installed,with the exception of repairs to the practices which were rendered ineffective due to circumstances beyond the control of the landowner,
- Activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) Program or covered in other ways by Chapter 147 of Wis. Stats. (including livestock operations with more than 1,000 animal units, or livestock operations issued a notice of discharge under ch. NR 243),
- Septic system controls or maintenance,
- Dredging activities,
- Silvicultural activities,
- Bulk storage of fertilizers and pesticides,
- Activities and structures intended primarily for flood control,
- Practices required to control sources which were adequately controlled at the time the cost-share agreement was signed, with the exception of those that occur beyond the control of the landowner,
- Other practices or activities determined by DNR not to meet the objectives of the program.

Cost-Share Budget

Costs of Installing BMPs: The quantity and type of management practices that are required to meet the water quality objectives of this project are listed in Table 5-3. The capital cost of installing the BMPs are listed in this table assuming landowner participation rates of 75%. Also included are the units of measurement and cost per unit for the various BMPs.

The capital cost of installing the Best Management Practices is approximately $618,300 assuming 100% participation. State funds necessary to cost-share this level of control would be about $429,150. The local share provided by landowners and other cost-share recipients would be about $189,150. At a 75% level of participation, the state funds needed to cover capital installation would be about $321,863. The local share would then be $141,863.

Easement Costs: Chapter 4 identifies where nonpoint source program funds can be used to purchase easements. The estimated cost of purchasing easements on eligible lands in Jefferson County is shown in Table 5-3. At 100% participation, the estimated purchase price of easements on eligible lands would be $200,000. At 75% participation, the cost would be $150,000. The easement costs would be paid for entirely by the state. However, it is very difficult to determine landowner response to easements as a management tool.

Table 5-3. Cost-Share Budget Needs for Rural Management Practices in the Lake Ripley Watershed

Best Management Practice	Number	Cost/Unit	Total Cost (1) 100% Participation	75% Participation	
				State Share	Local Share
Cropland NPS Control					
Change in Crop Rotation	30 ac	NA (2)	0	0	0
Contour Cropping	25 ac	NA (2)	0	0	0
Contour Strip Cropping	25 ac	$12	300	225	(3)
Reduced Tillage (4)	80 ac	$45	3,600	2,700	(3)
Reduced Tillage (5)	20 ac	$15	300	225	(3)
Critical Area Stabilization	40 ac	$1,000	40,000	21,000	9,000
Field Diversions & Terraces	16,000 ft	$4	64,000	33,600	14,400
Nutrient Management (6)	1,600 ac	$6	9,600	3,600	3,600
Nutrient and Pest Mgmt. (6)	1,500 ac	$10	15,000	5,625	5,625
Shoreline Buffers	50 ac	$200	10,000	5,250	2,250
Wetland Restoration	3 ea	$2,000	6,000	3,150	1,350
Streambank Erosion Control					
Shape and Seeding	41,700 ft	$5	208,500	109,463	46,913
Lakeshore Rock Rip-Rap	2,000 ft	$40	80,000	42,000	18,000
Lakeshore Bio Rip-Rap	7,000 ft	$25	175,000	91,875	39,375
Crossing/Watering Ramp	1	$6,000	6,000	3,150	1,350
Subtotal:			$618,300	$321,863	$141,863
Easements	200	$1,000	200,000	150,000	0
TOTALS			$818,300	$471,863	$141,863

(1) Total cost to control identified critical pollution sources
(2) NA means that cost share funds are not available for this practice
(3) Local share consists of labor and any additional equipment costs, also see flat rates
(4) Reduced tillage on greater than three years continuous row crops
(5) Reduced tillage, including no-till, on rotations including hay
(6) Nutrient and Pest Management is cost shared per acre over a three year period. Therefore, number of acres shown represents three times the eligible acres.

Source: DNR; DATCP, and and the Lake Ripley Management District

Cost Containment

Cost Containment Procedures: Chapter NR 120 requires that cost containment procedures be identified in this plan.

Cost-share payments will be based on actual installation costs. If actual installation costs exceed the amount of cost-sharing determined by the bidding, range of costs, and average cost methods the amount paid the grantee may be increased with the approval of the Lake Ripley Management District. Appropriate documentation regarding the need for changes will be submitted to DNR.

Bids, Average Costs, and Flat Rates: If applicable, a bidding procedure will be developed and forwarded to the DATCP and DNR for approval. If these procedures change, they are subject to approval by DATCP and DNR.

Average costs have been determined through experience in the County. The average cost list will be reviewed periodically and appropriate changes made. If changes are made, the list will be forwarded to the DNR and the DATCP for final approval before the changes are used for calculating cost share agreements and payments.

BMPs using flat rates are shown in Table 5-2. The rates shown are the state's share of the practice installation costs.

Cost-Share Agreement Reimbursement Procedures

Nonpoint Source Grant Agreement and Administration

General Information: The Nonpoint Source Grant Agreement is the means for transmitting funds from the DNR (through the Nonpoint Source Program) to the Lake Ripley Management District for use in funding the state's share of cost share agreements. Cost share agreements are the means to transmit funds from the county to the landowners. The Nonpoint Source (NPS) Grant Agreement will be amended annually to provide funding needed for cost sharing for the year. The funds obligated under cost share agreements must never exceed the total funds in the NPS Grant Agreement.

Fiscal Management Procedures, Reporting Requirements: The lake district and the county are required by NR 120 to maintain a financial management system that accurately tracks the disbursement of all funds used for the Lake Ripley Priority Lake Project. The records of all watershed transactions must be retained for 3 years after the date of final project settlement. A more detailed description of the fiscal management procedures can be found in NR 120.25 and NR 120.26.

Cost Share Agreement and Administration

Purpose and Responsibilities: Consistent with s. 281.65, Stats. and NR 120, Wis. Adm. Code, cost-share funding is available to landowners for a percent of the costs of installing BMPs to meet the project objectives. Landowners have three years after formal approval of the watershed plan to enter into cost-share agreements (CSA). Practices included on cost-share agreements must be installed within the schedule agreed to on the cost-share agreement. Unless otherwise approved, the schedule of installing BMPs will be within 5 years of signing of the cost-share agreement. Practices must be maintained for a minimum of ten years from the date of installing the final practice included in the cost-share agreement.

The cost-share agreement is a legal contract between the landowner and the Lake Ripley Management District. The agreement includes the name and other information about the landowner and grant recipient, conditions of the agreement, the practices involved and their location, the quantities and units of measurement involved, the estimated total cost, the cost share rate and amount, the timetable for installation, and number of years the practice must be maintained. The agreements also identify and provide information on practices not cost-shared through the nonpoint program but that are essential to controlling pollution sources (such as crop rotations). These items will be completely listed in the conservation plan and the conservation plan is tied to the CSA via addendum 2 of the CSA. Once it is signed by both parties, they are legally bound to carry out the provisions in it.

If land ownership changes, the cost-share agreement remains with the property and the new owner is legally bound to carry out the provisions. NR 120.13(9) and (10) has more information on changes of land ownership and the recording of cost-share agreements.

Local, state, or federal permits may be needed prior to installation of some BMPs. The areas most likely to need permits are zoned wetlands and the shoreline areas of lakes and streams. These permits are needed whether the activity is a part of the watershed project or not. Landowners should consult with the Jefferson County Planning and Zoning Department, the lake district, or the Land Conservation Department offices to determine if any permits are required. The landowner is responsible for acquiring the needed permits prior to installation of practices.

The cost-share agreement binds the cooperating agencies to provide the technical assistance needed for the planning, design, and verification of the practices on the agreement, and to provide the cost-share portion of the practice costs.

The Lake District will be responsible for enforcing compliance of cost-share agreements to which they are a party. Where DNR serves as a party to an agreement with a unit of government, the DNR will take responsibility for monitoring compliance. The responsible party will insure that BMPs installed through the program are maintained in accordance with the operation and maintenance plan for the practice for the appropriate length of time. The Lake Ripley Management District will check for compliance with practice maintenance provisions once every three years after the last practice has been installed. The lake district must check maintenance at

its own expense after the Nonpoint Source Agreement has lapsed, unless state funding for this activity becomes available at any time during the implementation or monitoring phase of this project.

Landowner Contact Strategy: The following procedure will be used to make landowner contacts.

- During the first three months of the implementation period, all landowners or operators with eligible nonpoint sources will receive from the lake district a mailing explaining the project and how they can become involved.

- After the initial landowner mailings, staff will make personal contacts with all landowners that have been identified as having critical nonpoint sources of pollution (Management Category I). These contacts will occur within the cost-share sign-up period.

- The project will continue to make contacts with eligible (Management Category I and II) landowners and operators until they have made a definite decision regarding participation in the program.

- The staff will contact all eligible landowners (as explained above) not signing cost-share agreements by personal letter six months prior to the end of the cost-share sign-up period.

Procedure for Developing a Cost Share Agreement: Eligibility for cost-sharing is verified following a site visit, using the criteria described in Chapter 4.

The development of farm conservation plans will be the primary method used to develop cost-share agreements. These plans are specific to a particular landowner and are a comprehensive approach to the abatement of the nonpoint sources of pollution, and the conservation of soil and other resources. The farm plan takes into consideration the sustainability of the agricultural resources and the management decisions of the owner or operator.

The cost share agreement specifies the items listed in the farm conservation plan that are necessary to reduce the nonpoint sources of pollution. The conservation plan and cost share agreement will document existing management which must be maintained to protect water quality.

The following procedure will be used by the lake district for developing and administering agreements. Below are the steps from the initial landowner contact through the completion of BMP maintenance.

- Landowner and staff meet to discuss the watershed project, NPS control practice needs, and coordination with conservation compliance provisions if applicable.

- Landowner agrees to participate with the watershed project.

- A farm conservation plan is prepared by Jefferson County LCD if applicable.

- The landowner agrees with the plan, a Cost Share Agreement is prepared and both documents are signed by the landowner and the lake district. A copy of the Cost Share Agreement (CSA) is sent to the DNR South Central Region and a copy given to the landowner. The CSA will be recorded by the county with the County Register of Deeds.

- Practices are designed by the lake district, the county, or their designee, and a copy of the design is provided to the landowner.

- Landowner obtains the necessary bids or other information required in the cost containment policy.

- Amendments to the CSA are made if necessary.

- The project staff oversee practice installation.

- The project staff verifies the installation.

- The landowner submits paid bills and proof of payment (canceled checks or receipts marked paid) to the lake district.

- The Lake District Board or their designated representative and if required, county committees or boards, approve cost-share payments to landowners.

- Checks are issued by the lake district to the respective landowners and project ledgers are updated.

- The lake district records the check amount, number, and date.

- DNR reimburses the lake district for expended cost-share funds.

Identifying Wildlife and Fishery Needs: The Lake Ripley project staff will consult with DNR's South Central Region wildlife management and fisheries management staff to optimize the wildlife and fish management benefits of nonpoint source control BMPs. Specifically, the county staff will contact DNR staff if in the county's opinion: Fence rows, rock piles, wetlands, or other wildlife habitat components will be adversely affected by installation of agricultural BMPs.

The DNR staff will assist the project staff at the lake district's request by:

- Identifying streambank protection practices that benefit fish and wildlife.

- Identifying wildlife habitat components that could be incorporated into vegetative filter strips along streams or in upland areas.

- Reviewing placement of agricultural sediment basins to assure that negative impacts on stream fish and aquatic life do not occur and recommending wildlife habitat components.

- Providing technical assistance when the installation of BMPs will require the removal of obstructions or other wildlife habitat by proposing measures to minimize impact on wildlife habitat.

- Assisting to resolve questions concerning effects of agricultural nonpoint source BMPs on wetlands.

Submittal to the Department of Natural Resources: Cost-share agreements do not need prior approval from DNR, except in the following instances:

- where cost-share funds are to be used for practices on land owned or controlled by the county or other public lands.

- for agreements or amendments where the cost-share amount for all practices for a landowner exceeds $50,000 in state funds.

- for grade stabilization structures and agricultural sediment basins with embankment heights between 15 and 25 feet and impoundment capacities of 15 to 50 acre feet.

- for streambanks to be controlled using riprap or other materials with banks over 6 feet high, according to NR 120.14. If applications are similar to each other in content, they will be reviewed to determine if future applications need be subject to this approval procedure.

- for animal lot relocation.

- for roofs over barnyards or manure storage facilities.

Local Assistance Grant Agreement Administration

General Information: The Local Assistance Grant Agreement (LAGA) is a grant from the DNR to the Lake Ripley Management District) for staff and support costs. Consistent with NR 120, these funds from the LAGA are for staff to implement the project and conduct information and education activities. Other items such as travel, training, and certain office supplies are also supported by the LAGA. Further clarification of eligible costs supported by this grant is given in NR 120.21(4) and (6).

Grant Agreement Application Procedures: An annual review of the Local Assistance Grant Agreement is conducted through the development of an annual workload analysis by the lake district. This workload analysis estimates the work needed to be accomplished each year. The workload analysis is provided to DATCP and DNR for review and clarification. Along with the workload analysis, a grant application form is sent. Funds needed to complete the agreed upon annual workload are amended to the local assistance grant agreement.

Fiscal Management Procedures, Reporting Requirements: The Lake Ripley Management District is required by NR 120 to maintain a financial management system that accurately tracks the disbursement of all funds used for the Lake Ripley Watershed Project. The records of all watershed transactions must be retained for 3 years after the date of final project settlement. A more detailed description of the fiscal management procedures can be found in NR 120.25 and NR 120.26. NR 120 requires quarterly reports to DATCP from the county in accordance with s. Ag. 166.40(4) accounting for staff time, expenditures, and accomplishments regarding activities funded through the watershed project.

Staffing Needs

Budget and Staffing Needs

This section estimates the funding and staffing required to provide technical assistance for the rural portion of this project.

Staff Needs: Table 5-4 lists the total estimated staff needed to implement the project. Figures are provided for 75% level of participation. A total of about 13,370 staff hours are required to implement this plan at a 75% landowner participation rate. This includes 4,770 staff hours to carry out the information and education program.

Currently, one position is being funded for the Lake Ripley Priority Lake Project. The county and agencies will determine the need for additional staff based on the annual workload analysis. The county will assess the number and type of staff required for the final five years of the project based on the actual landowner participation following the three year cost-share sign-up period.

Staffing Costs: The estimated cost for staff at the 75% participation rate (see Table 5-5) is approximately $352,000. These costs will be paid by the state through the Local Assistance Grant Agreement.

Table 5-4.Estimated County LCD Staff Needs for Project Implementation

Activity	Project Years When Work Will Be Done	Jefferson COUNTY	
		75% Landowner Participation (Staff Hours)	50% Landowner Participation (Staff Hours)
Project and Financial Management	1-8	2,000	2,000
Information and Education Program	1-8	4,770	4,770
Pre-Contact Office Inventory; Landowner Contracts and Progress Tracking	1-3	800	500
Conservation Planning and Cost-Share Agreement Development	1-3	800	600
Plan Revisions and Monitoring	1-8	800	500
Practice Design and Installation	1-8		
Upland Sediment Control		800	500
Animal Waste Management		800	500
Ditchbank Erosion Control		1,600	1,000
Easements			
Training	1-8	1,000	1,000
Total LCD Workload:		13,370	11,370
Estimated Staff Required for Years 1-3:		1.1 per year	1.0 per year
Hours		2,370 per year	2,015 per year
Estimated Staff Required for Years 4-8:		0.8 per year	0.7 per year
Hours		1,601 per year	1,362 per year

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade and Consumer Protection and the Lake Ripley Management District.

Table 5-5.Lake Ripley District/Jefferson County Grant Disbursement Schedule at 75 percent Landowner Participation

Item	Local Share	State Share
Cost-Share Funds: Practices	$141,863	$321,863
Cost-Share Funds: Easements	0	150,000
Local Assistance Staff Support	0	352,000
Information/Education: Direct	0	22,241
Other Direct: (travel, supplies, etc.)	0	97,600
Engineering Assistance	0	87,000
Totals	$141,863	$1,030,704

Source:Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade and Consumer Protection, Lake Ripley Management District and the Jefferson County Land Conservation Department

Schedules

Grant Disbursement and Project Management Schedule

Implementation may begin upon approval of this watershed plan by the Lake Ripley Management District Board, and the Wisconsin Department of Natural Resources. The priority watershed project implementation period lasts eight years. It includes an initial three year period for contacting eligible landowners and signing cost-share agreements. Practices on any cost-share agreement must be installed within five years of signing the CSA.

Under extenuating circumstances, the initial period for entering into cost-share agreements can be extended by DNR for a limited period of time if it will result in a significant increase in nonpoint source control. Limited extensions for the installation period for practices on individual cost-share agreements must also be approved by DNR and DATCP.

The disbursement of the grants (Local Assistance and Nonpoint Source) to the Lake Ripley Management District and Jefferson County will be based on an annual workload analysis and grant application process.

Total Project Cost: The total state funding required to meet the rural nonpoint source pollution control needs at a 75% level of landowner participation is presented Table 5-5. This figure

includes the capital cost of practices, staff support, and easement costs presented above. The estimated cost to the state is $1,030,703 and the estimated cost to landowners and others is $141,863.

This cost estimate is based on projections developed by the agency planners, Lake Ripley Management District staff, and Land Conservation staff. Historically, the actual expenditures for projects are less than the estimated costs. The factors affecting expenditures for this watershed project include: the time it takes to plan the project; the length of time the project is under implementation; the amount of cost sharing that is actually expended; the number of staff working on the project; the amount of support costs; and the time local assistance is necessary.

Involvement of Other Programs

Coordination With State and Federal Conservation Compliance Programs

The Lake Ripley Priority Watershed Project will be coordinated with the conservation compliance features of the Wisconsin Farmland Preservation Program (FPP) administered by DATCP, and the Federal Farm Bill (FFB) administered by the Natural Resources Conservation Service. DATCP will assist the LCD and the NRCS offices to identify landowners within the watershed that are subject to the compliance provisions of FPP and FFB. Conservation Farm Plans were completed for all landowners in FSA on December 31, 1989. FPP conservation plans were completed by Jefferson County. There are 15 FPP plans and 21 Farm Bill plans within the watershed project.

Implementation and amendment of these conservation plans will be necessary during the implementation phase of the watershed project. Watershed project staff will inform FPP and NRCS staff of changes in plans resulting from management decisions and the installation of needed BMPs for nonpoint source pollution abatement. This comprehensive approach to farm planning will facilitate consideration of the various goals and objectives for all the programs in which the landowner participates.

Some eroding uplands in management categories 1 and 2 may need control, in addition to that required for meeting sediment delivery targets, in order to meet soil erosion program goals established through other state and federal programs. Where this occurs, technical and financial assistance from the Nonpoint Source Program can be used to support practice design and installation on these critical lands. This assistance applies only where the additional control needed to meet soil erosion goals can be achieved using low cost practices.

CHAPTER SIX
Information and Education Program

This chapter describes an information and education (I & E) strategy designed to support implementation of the water quality recommendations made in this plan. The strategy identifies goals, targets audiences, recommends activities to meet these needs, and estimates funding needs.

Background

Urbanization Pressure

Residents of the Lake Ripley watershed have recognized the value of their lake and are highly motivated to take action to improve and protect their lake. Through the existance of the lake district, they have received lake planning grants, developed an aquatic management plan, and become a priority lake project. Lake Ripley provides an aesthetic living environment with easy access to boating, fishing, and wildlife habitat. Implementation of the information and education plan will improve Lake Ripley and protect residents' investment in a high quality environment.

Over the last five years, year-round residential development around the lake has more than doubled. Most of this new development has occurred within one-quarter mile of Lake Ripley. The majority of the developed area in the Lake Ripley watershed is located adjacent to the lake.

Due to the high concentration of people living around Lake Ripley and an increasing trend toward establishing year round residences, information and educational activities will stress the importance of responsible stewardship of Lake Ripley. Many of the residences are seasonal; therefore, many activities have been timed to meet their seasonal schedule.

Agricultural Lands

Most of the farmland is located in the eastern two-thirds of the watershed. This area has been extensively ditched and tiled to drain wetland areas for cropland. Cash grains and sod are the predominant crops grown in the watershed.

Audience

The primary audience for the I & E program are landowners in the watershed who have been classified as eligible for project participation. Secondary audiences are priority watershed landowners who are not eligible for project participation, suppliers of services to the priority watershed, interest groups, and the general public including the lake district board, nonresident lake users, residents of small towns and villages, rural nonagriculture landowners, developers and builders, lake and riverbank residents, teachers and youth.

Goals

The goals of the information and education program are:

- to protect and improve water quality by maximizing landowner participation in the Lake Ripley Watershed Project
- to develop a citizenry that is knowledgeable about the problem of nonpoint source pollution and the project
- to reduce landowners' contribution to surface and ground water pollution through changes in daily activities.

Objectives of the Program

To achieve the goal of cleaner water, the information and education program strategy must support implementation of the solutions recommended in the plan. Specifically, the strategy must help build:

- Increased awareness, understanding and appreciation of the water resources of the Lake Ripley watershed and its benefits to the Cambridge area.

- Increased understanding of the principles of water pollution, especially nonpoint source (NPS) water pollution as experienced in the Lake Ripley Watershed and knowledge of how NPS impacts people and the natural environment.

- Increased awareness, knowledge and ability to implement Best Management Practices (BMPs) being promoted through the Lake Ripley Watershed Project, including awareness and knowledge of how these practices can lead to cleaner water and improved land management.

- Increased awareness and knowledge of habitat concerns and ecosystem sustainability within the Lake Ripley Watershed and willingness to participate in programs that improve fish and wildlife habitat.

- Increased awareness and understanding of the purpose, operation and benefits of the Lake Ripley Priority Lake Project.

- Increased sense of civic responsibility towards protecting and improving water resources.

Delivery Team

The local project manager will take the lead responsibility for the delivery of the information and education program, with county staff proving assistance on projects involving BMPs and agriculturally related I&E activities. The University of Wisconsin–Cooperative Extension (UWEX), the Department of Natural Resources (DNR) and the Department of Agriculture (DATCP) will provide supportive assistance.

Activities

One-on-One Meetings/Home Practices Inventory

Description: To help both the project manager when s/he talks to lake residents and county staff when they meet with agricultural landowners, a binder of information will be developed. The binder will contain before and after pictures of BMPs, other materials about specific best management practices, press releases, and other useful information for landowners. This packet will be developed by the project manager with assistance from UWEX and the DNR NPS implementation coordinator.

The most important approach to be taken to educate landowners will be one-on-one meetings between project staff and landowners.

Urban residents: The project manager will complete a survey called the "Lake Resident Home Practices Inventory." This inventory takes about one hour of direct time with each resident. This is valuable educational opportunity will also provide the watershed project with information on the daily activities of the residents are doing and what might change to protect and improve Lake Ripley's water quality.

Rural residents: The rural landowners will be contacted individually by the local project manager.

Contractors, building inspectors and developers: Since construction erosion is a major contributor of soil to the lake, the project manager will work individually with the building inspector and others involved with construction to help meet the watershed project's sediment goals.

Evaluation: District and County staff will annually evaluate the usefulness of the packet and make changes and updates as needed. Evaluation of the one-on-one contacts will be in the numbers of cost-share agreements signed, and other changes in people's behaviors.

Cost: 3 packets at $30 each for a total of $90.

Nutrient Management Planning

Description: Through a special grant, land owners will have the opportunity to have their soil tested and a nutrient management plan developed for their land. Local co-ops and crop consultants provided the service at no cost to the landowners in 1995. The development of a nutrient management plan will ensure the proper utilization of manure and fertilizer to meet the needs of the crops without causing water quality problems.

Evaluation: Evaluation of nutrient management will be based on the number of nutrient management plans developed and implemented and by the amount of nutrient credits taken for manure or legumes that had not been taken in the past.

Newsletters

Description: Newsletters will be a major component of the Lake Ripley I & E program. A research survey conducted by the Lake Ripley Management District indicated that newsletters are the most effective way for the district to communicate with its members (LRMD, 1992). During the sign-up period, newsletters will focus on building an awareness and knowledge of the problem of nonpoint source pollution and of promoting the purpose, operation and benefits of the project and of the Best Management Practices (BMP).

Newsletters will be sent to all landowners in the watershed from an existing mailing list of over 600 people. In addition, newsletters will be made available to other residents and nonresident lake users at other locations in or near the watershed. During the implementation period of the project, newsletters will emphasize the operation and maintenance of BMPs, the water quality improvements realized through BMP installation and overall watershed progress. Three to four newsletters per year will be sent out during project sign-up. After project sign-up and until project end, two newsletters per year will be distributed. Newsletters will be the responsibility of the Lake Ripley Management District in cooperation with UWEX.

Evaluation: Evaluation will be based on research being done through UWEX publications on the value of specific types of newsletters. In addition, the Lake Ripley Management District Board, in lieu of a Citizen Advisory Committee, will be asked to evaluate the effectiveness and usefulness of the newsletters annually in order to make improvements and suggestions for future issues.

Cost: $4,400 postage; $150 photographic supplies.

News Releases/Articles

Description: News releases and articles will be sent to local newspapers. Paid announcements will be included in the local shopping guide.

A research survey conducted by the Lake Ripley Management District indicated that articles in local newspapers are the second most effective way for the district to communicate with its members.

Topics of news releases will include:

a. Description of the water resources and impact of nonpoint source pollution in the watershed.
b. Current status of watershed project progress.
c. Success stories of improved water quality.
d. Invitations to project tours, lake fairs and meetings.
e. Pollution awareness and benefits of BMP installation.
6. Seasonal articles.

The news releases will be the responsibility of the Lake Ripley Management District. Two releases per year during project sign-up and one release per year during implementation will be scheduled. Announcements of upcoming events will be placed in the local newspapers as necessary.

Evaluation: No formal evaluation is planned, but informal evaluation will include questions on tour or workshop evaluations concerning where people heard about events.

Cost: $400, cost for paid advertising in local shopping guide.

Local Cable Programming

Description: Watershed events will be videotaped and provided to the local access cable channel. The local channel has been very receptive to showing these programs; several programs a week have been provided by the Lake Ripley Watershed Program including the "It All Adds Up" video series. Lake Ripley Management District will take the lead responsibility for this activity.

Evaluation: No formal evaluation planned.

Cost: No cost

Citizen Advisory Committee

Description: A separate Citizen Advisory Committee was formed and regularly met during the planning phase of the project. During implementation, the responsibilities of this group will assumed by the Lake Ripley Management District Board of Directors which meets monthly throughout the year. The Board, or a designated subcommittee, will help develop and implement educational activities including promotional items, lake fairs and workshops.

Evaluation: At the end of the sign-up period, and again at the end of the implementation phase, a random sample of the Lake District Board of Directors will be called and asked questions concerning their involvement with the program, change in their understanding of the program and methods for improving citizen involvement in watershed activities.

Cost: Funds for awareness activities: $900.

Public Informational Meetings

Description: Public meetings will be held during each year of project sign-up, as a regular part of the Lake Management District's monthly meeting. This will provide an opportunity to answer any questions. Participating landowners may share their experiences to help convince other landowners to participate by signing cost-share agreements and encouraging other residents to adopt appropriate behaviors to reduce or prevent NPS pollution in the watershed. Topics that will be covered at these meetings will be:

- The explanation of nonpoint source pollution and detailed explanations of BMPs needed to reduce pollution problems.
- Program overview, including project sign-up, practice design & installation, and payment procedure.
- Goals and objectives of the watershed plan.
- Administrative rules for the watershed project, including eligibility and cost sharing.

At the end of the sign-up period, a meeting will be held in conjunction with an appreciation dinner to honor all those who signed cost share agreements and those who demonstrated positive actions towards water quality but did not qualify for cost sharing practices. This meeting will provide an opportunity to thank participants and to provide a status update and report of project success.

Evaluation: Evaluation will be based on attendance and the number of contacts these generate for county staff.

Cost: Six public meetings, as part of Lake District meetings. One public meeting in conjunction with meal: $1,500.

Workshops

Description: During each year of sign-up at least one workshop will be held. One of the workshops that will be repeated at least every other year will be a residential home and yard care workshop to educate home owners, especially lake residents, about the problems and solutions to NPS water pollution. Home owners will learn the best methods of reducing pollution from their homes including fertilizer and pesticide use, water infiltration practices, composting, septic system maintenance, and home hazardous waste reduction. Those who complete the workshop will receive a certificate and a small plastic sign for display in their yard that identifies them as supporting clean water. In addition to the workshop, the project manager, in cooperation with UWEX, will develop informational handouts to help residents take positive actions for water quality. Example include a list of local suppliers of low phosphate fertilizer, how to choose a lawn care company, or information on how to get soil tested. The materials developed will be based on the Lake Residents Home Practices Inventory and feedback from the Lake District Board.

Other workshops will be developed on topics such as responsible boating, shoreline stabilization, wetlands and ditch shaping and seeding.

Evaluation: Each workshop will be evaluated with a questionnaire using both Likert-like scales of 1-5 with 5 being high and short answer evaluation questions.

Cost: Eight workshops at $200 each for a total of $1,600.

Lake Fairs

Description: Based on the suggestions of the CAC, and its success in 1994, a Lake Ripley Lake Fair will be held at least twice during signup and implementation periods. Other lake fairs could be held at nearby lakes and advertised through the Lake Ripley Priority Watershed Project. The lake fair will focus on impacts of activities on water quality and positive actions that people can take to protect and improve local water quality. The 1994 lake fair included pontoon boat tours, displays and children's activities. An annual caretaker award will be presented at the Lake Fair or at the Annual meeting,

Evaluation: Evaluation will be based on a questionnaire sent to volunteers and by the numbers of participants. Participants will be asked to fill out a short questionnaire at the end of the fair.

Cost: 4 Lake Fairs at $1,375 each, total $5,500; Lake Caretaker Award, $50/year, total $500

Demonstration Tours

Description: Two demonstration sites for shoreland stabilization were selected and completed in 1994. Two formal, well-publicized tours were held for these sites. The tours allowed landowners to observe BMPs first hand and have their questions answered by watershed project staff. Meeting landowners who have installed these BMPs will encourage those attending the tour to implement similar practices. Shoreline stabilization workshops will continue building on this knowledge base.

If another demonstration site is selected to show shaping and seeding of ditches, other tours, field days, fact sheets and workshops will be held.

Evaluation: A questionnaire will be distributed to every participant at the end of the tour or workshop. It will include short answer knowledge questions and questions on quality of activities which use a Likert-like rating of 1-5 with 5 being high. After the completion of each tour, staff will do a self-evaluation to discuss how to improve the next tour or modify the program.

Cost: Four field days/tours at $100 each for a total of $400.

Demonstration Fact Sheet

Description: A fact sheet will be prepared for the demonstration sites. It will include before and after photos, provide a project explanation, outline the costs, and estimate the cost sharing breakdown. This will be done when the practice is completed and the necessary information is available. The fact sheet will be developed by the Lake Ripley Management District with assistance from UWEX.

Evaluation: No formal separate evaluation planned.

Cost: Covered by UWEX printing budget.

Lake Fact Sheet

Description: A fact sheet will be developed for Lake Ripley. This will include ecological, historical environmental information, NPS impacts, sources and solutions, especially in relation to individual responsibility.

Evaluation: No separate evaluation planned.

Cost: Covered by UWEX printing budget.

Project Display

Description: A display was developed during the planning phase of the project. It will be updated as the project moves through sign-up and implementation. This display can be used in banks, schools and libraries. It highlights area nonpoint source pollution problems and solutions.

A special display explaining the deep sediment core will also be developed.

Evaluation: No separate evaluation planned.

Cost: $200 for deep sediment core interpretation, plus part of photography budget for updated pictures.

Presentation

Description: A presentation on nonpoint source pollution and the project will be created using local slides. The presentation will be used at meetings and talks given to the project's targeted audiences. The slide presentation will be completed by the Lake Ripley Management District. Either county or UWEX staff will provide a construction erosion presentation to county and town boards as requested. Other presentations on specific topics will also be made as requested.

Evaluation: Presentations will be evaluated as part of tour and meeting evaluations.

Cost: Photographic costs included in general photography budget ($1,000 total for all uses over project life).

Cooperator Signs

Description: Each landowner who signs a cost-share agreement will receive a sign with the Lake Ripley logo and the inscription " Clean Water Cooperator." These will be available in two sizes: 2 foot x 2 foot sign for agricultural landowners, and 1 foot x 1 foot for lake property owners. In addition, any person living in the watershed who demonstrates a willingness to improve water quality through personal actions may receive the smaller sign.

Evaluation: Evaluation will be based on the interest of landowners in displaying signs.

Cost: 10 large signs at $15 each for a total of $150; 200 small signs at $2.50 each for a total of $500

Watershed Signs

Description: Water quality information signs will be erected and placed at one location in the watershed. These signs will have a seasonal message such as "Keep Lake Ripley Blue: Compost leaves or burn away from ditches;" " Keep Lake Ripley Blue: It's time to test your soil before fertilizing," etc. The lake district board will help determine message and sign location.

Cost: Four interchangeable signs: $400 each, total $1,600

Clean Water Demonstration Site

One visible landowner will be selected who is already doing an outstanding job of home and yard maintenance for clean water. The Priority Watershed Project will fund other activities if necessary, such a compost bins or porous pavement. A sign will be posted along with a holder for a home owners fact sheet.

Cost: Sign plus yard care materials such as compost bin, $300

Youth Education and Wisconsin Water Action Volunteers

Description: Project staff will identify and work with at least one local youth group, school class or conservation group to participate in the Wisconsin Water Action Volunteers (WAV), and/or with the UWEX Adopt-a-Lake Program. As appropriate to the group they will monitor the stream/lake, participate in stream walks and/or work on habitat improvement. Project staff will also continue to work with the Cambridge High School on the on-going school monitoring program begun during the planning phase of the project. Staff will also act as a resource to local schools and youth groups providing information on the project, nonpoint source pollution and groundwater education.

Evaluation: Students or groups involved in extensive activities with the watershed project will be asked to evaluate their involvement. Teachers will be asked to fill in an evaluation form after the completion of any program involving more than one class period.

Cost: $400 for miscellaneous monitoring equipment and educational materials

Yard Waste Composting Facility

The project manager will investigate the feasibility of developing a yard waste collection facility. If this becomes a reality, appropriate signs and information sheets will be developed.

Evaluation: Evaluation would be based on the development and use of the facility.

Wildlife Habitat

Description: The project manager will investigate the feasibility of re-establishing native aquatic plant species in one location by the lake. This site will serve as a demonstration for others on the lake who may wish to increase species diversity. Landowners will increase their level of understanding of complex aquatic ecosystems and the benefits of native plants on their shoreline. Signs will be developed if needed.

Evaluation: Evaluation will be based on the numbers of people taking fact sheets and the number of people reestablishing native species on their shoreline

Cost: $1,000 for seed and plant stock.

Boating Impacts

Description: In conjunction with the DNR, the project manager will continue to investigate the potential re-suspension of nutrients into the water column by boating traffic. New releases, articles, etc. will be the primary means to inform the public.

Evaluation: None planned.

Costs: Covered by the DNR - Bureau of Research

Watershed Project Evaluation

Since the education component of the watershed project is complex and pervasive, many items cannot be evaluated on their own. We suggest using the following criteria to evaluate the effectiveness of the I&E strategies.

- Number of Cost Share Agreements signed.
- Improved practices around lakes and homes.
- Improved farm practices without a cost share agreement.
- Improved urban practices without cost share agreement.

In order to obtain information on changes in practices without cost share agreements, the Lake Ripley Priority Watershed Project will survey residents using the "Lake Residents Home Practices Inventory." This survey will occur during early 1995. Following completion of the project, a second smaller random survey will be done, and results compared.

Cost: For survey administered by county staff, $2,000 for both pre- and post- survey plus cost of any materials identified as an educational need based on survey results.

Summary of Previously Completed I & E Tasks

Several items of the I & E strategy have been completed prior to the implementation stage of the project. They are:

- Project brochure explaining the project; its goals, timetable, etc.
- Newsletters
- Bookmark for distribution to school groups, library
- Construction erosion seminar
- Public informational meetings to shoreline associations
- One-on-one contacts
- Bioengineering shoreline protection demonstration
- Distribution of shirts, and other promotional items
- Lake Ripley Lake Fair
- Information Packets for CAC members
- Watershed Display

A summary of the information and education budget and staff needs is presented in Table 6.1.

Table 6-1. Information and Education Budget and Staff Needs

Activity	Total Number	Total Direct Costs	Required Staff Hours	
			Years 1-3	Years 4-8
One-on-One, staff binders	3	$90	500	500
Newsletters	22	4550	540	600
News Releases	11	400	48	40
Cable Access Channel	16	0	36	40
Public Meetings	7	1,500	160	90
Citizen Advisory Committee		900	80	40
Demonstration Tours	4	400	40	40
Workshops	8	1,600	240	240
Lake Fairs	4	5,500	200	200
Demonstration Fact Sheet	2	0	60	0
Clean Water Demonstration Site	1	300	40	20
Lake Fact Sheet	1	0	40	0
Project Display	1	200	80	30
Presentation	1	0	80	40
Cooperator Signs	215	650	30	15
Watershed Signs	4	1,600	120	0
Photography		1,000	24	0
Youth Activities		400	140	50
Survey	2	2,000	140	100
Yard Waste Composting Fac.*		150		
Wildlife Habitat	1	1,000	80	48
	Totals	$22,240	2,678	2,093

*Activities and cost depends on whether or not facility is developed.

CHAPTER SEVEN
Integrated Resource Management Program

Introduction

The purpose of this chapter is to define the principles and guidelines for assuring that the watershed project is coordinated with other resource management programs, organizations, and activities. Each of these activities is described below.

Fisheries

Watershed best management practices (BMPs), such as streambank & shoreline protection, buffer strips, and easements, should be implemented in such a way that will enhance fishery habitat management goals. The fishery manager should be consulted for input in the design of each shoreline, wetland, sensitive area, and protection project.

Wetland Restoration

There are many potentially restorable wetlands in this watershed, specifically in the floodplain areas along the main tributary. The general guidelines for wetland restoration, easement acquisition, and shoreline buffers to protect existing wetlands should be followed (see Chapter 5). Wetlands that are important wildlife habitats will be identified by the U.S. Fish and Wildlife Service in consultation with the Department of Natural Resources (DNR) private lands manager. Shoreline buffer easements may be acquired adjacent to these wetlands to better protect them from sedimentation and other nonpoint sources of pollution.

These wetlands (existing and restorable) were identified in the wetlands inventory conducted by the Lake Ripley Management District, Jefferson County Land Conservation Department, Wisconsin DNR, and U.S. Natural Resources Conservation Service In addition to the normal priority watershed funding, additional cost-sharing may be available to provide for a 100 percent payment for the restoration practices. This additional funding may be available through the DNR district private lands manager, and/or the U.S. Fish and Wildlife Service. Eligibility for this additional funding would be determined by the DNR's private lands manager or the regional nonpoint source coordinator.

Riparian Zones

Where possible, riparian zones along tributary ditches and wetlands should be protected from livestock grazing and trampling with fencing. These can be acquired through easements so that they receive lasting protection.

Stewardship

The streambank protection program under stewardship is an important additional means of protecting water quality. Under this program, the DNR could obtain an easement on both sides of the stream (generally 66 feet wide on each side). If needed, the DNR will financially support the fencing of the stream to protect it from livestock access.

Streams eligible in the watershed:

- Main tributary inlet
- Ditch channels draining into inlet channel.

Additional streams can be nominated when the nomination period is reopened.

Endangered Resources Area Sites, Threatened and Special Concern Species

Endangered, threatened, and special concern species are listed in Chapter 2 of the plan. To the best extent possible, every effort should be made to protect these species. If specific information is needed, contact the DNR Bureau of Endangered Resources.

Cultural Resources

Procedures for coordination with state and federal historic preservation laws can be obtained from the DNR Nonpoint Source Coordinator. The known archaeological sites within the Lake Ripley Watershed will be identified and given special consideration when structural best management practices are being considered. Streambank or shoreline shaping and riprapping are likely practices that may impact archaeological sites.

The Lake Ripley Priority Lake Project will be coordinated with the conservation compliance features of the Wisconsin Farmland Preservation Program (FPP) administered by DATCP, and the Federal Farm Bill (FSA) administered by the Natural Resources Conservation Service and the Farm Service Agency.

Lake Management District

The Lake Ripley Management District is the local unit of government that was formed to protect and rehabilitate Lake Ripley established under Ch. 33 of Wisconsin State Statutes. Lake District staff will attend board meetings, public meetings, and provide fact sheets & educational materials to targeted watershed landowners. As a local unit of government, Lake Ripley Management District may apply for local assistance grants and Nonpoint Source grants (see Chapter 5).

Coordination With Shoreline Associations

There are a large number of Shoreline Associations around Lake Ripley. These associations are organized in varying degrees. Over the years they have proven effective in promoting protection, improvements, and safety on Lake Ripley. One goal of this plan is to fully integrate the various Shoreline Associations on special projects, lake fairs, and events that inform and educate the public about lake and nonpoint source pollution issues. Shoreline Associations are eligible for nonpoint source program local assistance grants funds if they meet the following criteria:

- They must be incorporated under Chapter 181 Wisconsin Statutes.

- They must specify in the articles of incorporation or by-laws that they support the protection or improvement of inland lakes for the benefit of the general public and demonstrate this by their past actions.

- They do not limit or deny the right of any member or class of members to vote as provided under Chapter 181.16(1), Wisconsin Statutes.

- They have been in existence for at least one year, have at least 25 members, and require annual membership fees of not less than $10 nor more than $25.

Coordination with WDNR Resources Programs

Long Term Trends: The Lake Ripley is one of 50 lakes selected by the DNR to be monitored through the Long Term Trends Monitoring Program. Data has been collected five times a year on Lake Ripley since 1986. Parameters monitored for this program include: water quality, phytoplankton, zooplankton, fisheries, macrophyte, benthic, and watershed surveys. The monitoring schedule is included in Chapter 8. The program will monitor any changes in the parameters over time.

Self Help Monitoring: Lake Ripley has been a participant in the Self-Help Monitoring Program for many years. Local volunteers take secchi disc (water clarity) and other readings and the DNR provides computer data storage and annual reports.

WAV: Lake Ripley has also participated in the Wisconsin Action Volunteers (WAV) program, where school groups and other youth select activities to better understand a stream. Area youth will continue to participate in these activities as interests and leaders change over time.

State Lake Planning and Lake Protection Grant Programs

Lake Ripley Management District has received two Lake Planning Grants:

- A grant to take a sediment core from the lake bottom which characterized lake and watershed trends over the last 100 years. This grant was received in December, 1991.

- A grant which will examine fish population densities and species diversity. The project will look at past stocking of the lake, compare current conditions to estimates and recommend fishery management efforts. This grant was received in 1993.

Lake Planning Grant funds are available at a 75% cost share rate for up to $10,000 per two-year period and $30,000 for the life of the program. Lake Protection Grant funds, a separate grant program, are limited to $100,000 for property purchases, wetland restorations, and regulation development, and program funds must be matched with an equal share by the local government.

The Lake Ripley District has also utilized other grant programs to help purchase a weed cutter and upgrade a public boat launch.

Coordination with Other Organizations and Activities

In addition to those activities and organizations listed above, others such as the Town of Oakland, Town of Oakland Conservation Club, Conservation Corps, local schools, and local activities should be integrated within the watershed project to more effectively achieve water resources objectives of this plan.

CHAPTER EIGHT
Project and Water Resource Evaluation

Introduction

This chapter briefly summarizes the plan for monitoring the progress and evaluating the effectiveness of the Lake Ripley Priority Lake Project. The evaluation strategy includes these components:

- Administrative review.
- Pollution reduction evaluation.
- Water resource evaluation monitoring.

Information on these components will be collected by the Lake Ripley Management District, Jefferson County Land Conservation Department (LCD), Department Natural Resources (DNR) and reported on a regular basis to DNR & DATCP. Additional information on the numbers and types of practices on cost-share agreements, funds encumbered on cost-share agreements, and funds expended will be provided by the DNR's Bureau of Community Financial Assistance. The water resource evaluation monitoring follows guidance established by DNR's Bureau of Water Resources management to select and monitor specific sites in the watershed to monitor resource changes.

A final report will be prepared for the Lake Ripley Priority Lake Project within 18 months of the end of the grant period. This report will include information on landowner participation, project management, grant management, technical assistance and other topics. Its purpose is to evaluate progress, provide documentation on attainment of water quality and pollutant load reduction objectives, evaluate BMP effectiveness, and provide recommendations which target key areas needing improvement in the NPS Program.

Administrative Review

The first component, the administrative review, will focus on the progress of Lake Ripley Management District & Jefferson County LCD in implementing the project. The project will be evaluated with respect to accomplishments, financial expenditures, and staff time spent on project activities.

Accomplishment Reporting: The Lake Ripley Management District and Jefferson County LCD will use a NRCS computer system, FOCS, or Field Offices Computing System to collect data for administrative accomplishments, and will provide the information to the DNR and the DATCP for program evaluation to meet the accomplishment reporting requirements.

Accomplishment data are summarized in the Annual Accomplishment Report prepared by DATCP and DNR, and are also discussed in an annual watershed review meeting. The County and Lake District will provide the following data to the DNR and the DATCP as requested:

- Number of personal contacts made with landowners
- Completed information and education activities
- Number of farm conservation plans prepared for the project
- Number of cost-share agreements signed
- Number of farm conservation plan and cost-share agreement status reviews completed
- Number of farms and acres of cropland checked for proper maintenance of BMPs

Financial Expenditures: Lake Ripley Management District will provide the following financial data to the DNR and the DATCP on a quarterly basis:

- Number of landowner cost-share agreements signed
- Amount of money encumbered in cost-share agreements
- Number of landowner reimbursement payments made for the installation of best management practices (BMPs), and the amount of money paid
- Staff travel expenditures
- Information and education expenditures
- Expenditures for equipment, materials, and supplies
- Expenditures for professional services and staff support costs
- Total project expenditures for the LCD staff
- Amount of money paid for installation of BMPs, and money encumbered in cost-share agreements

The Lake Ripley Management District and Jefferson County LCD will also provide both agencies with the following financial data on an annual basis:

- Staff training expenditures
- Interest money earned and expended
- Total county LCD budget and expenditures on the project

Time Spent On Project Activities: The Lake Ripley Management District and other participating units of government will provide time summaries to both departments for the following activities on a quarterly basis:

- Project and fiscal management
- Clerical assistance
- Pre-design and conservation planning activities
- Technical assistance: practice design, installation, cost-share agreement status review and monitoring
- Educational activities

- Training activities
- Leave time

Evaluation Of Pollutant Load Reduction

The purpose of the second evaluation component, pollutant load reduction, is to estimate reductions in the amount of nonpoint source pollutants as a result of installing BMPs. Key sources were identified for estimating changes in pollutant loads that reach surface waters in the Lake Ripley Priority Lake Watershed: upland sediment, runoff from barnyards and fields spread with manure, streambank/shoreline erosion, and urban stormwater runoff.

Upland Sediment Sources

Lake Ripley Management District and Jefferson County LCD staff will use the WINHUSLE (Wisconsin Nonpoint Source) model to estimate sediment reductions due to changes in cropping practices. The counties will use FOCS to provide data for the WINHUSLE model on a quarterly basis, as described above.

Barnyard Runoff

Lake Ripley Management District and Jefferson County staff will use the BARNY (Modified ARS) model to estimate phosphorus reductions due to the installation of barnyard control practices. The county will report the information to the DNR through FOCS.

Ditchbanks/Shoreline

Lake Ripley staff will calculate changes in ditchbank sediment in terms of tons of sediment and length of eroding sites using the original method provided by the DNR. A tally will be kept of landowners contacted, the amount of ditchbank sediment being generated at the time of contact, and changes in erosion levels estimated after installing BMPs.

Construction Site Erosion

Local units of government participating in the urban implementation program will report annually to the DNR on the number of construction sites served by adequate erosion control practices, number of construction sites receiving appropriate permits, and any amendments to construction site erosion control ordinances that affect sediment loads associated with these sources.

Existing & Planned Urban Areas

Local units of government will report annually to the DNR on any activities that may result in changes in pollutant loadings to Lake Ripley. Such activities include acres of existing (1994) and new (post-1994) urban land by land use served by new stormwater BMP's, new urban lands by land use not served by storm water BMP's, and other information requested by the DNR concerning BMP characteristics.

Water Resource Evaluation Monitoring

Limited funds and the intensive staffing needed to properly evaluate water quality changes prohibits monitoring each watershed individually. Instead, two types of evaluation monitoring are being conducted on a state-wide basis: Master Monitoring Sites and Signs of Success.
The goal of the evaluation monitoring activities is to determine the progress the Nonpoint Source Program is making towards improving the quality of Wisconsin's water resources.
Evaluation monitoring activities were developed to answer five questions about the water resource objectives and the pollution reduction goals:

1) Do the types and levels of best management practices recommended in the watershed plans achieve the water resource objectives?

2) Do the types and levels of best management practices recommended in the watershed plans achieve the pollutant reduction goals?

3) Does any level of practice installation below 100 percent achieve the water resource objectives or the pollutant reduction goals?

4) Do we need to adjust the pollutant load reduction goals to achieve the water resource objectives?

5) Can we use simple environmental indicators in many of the watershed projects to provide some early evidence that the practices might achieve the water resource objectives and pollutant reduction goals?

A team of experts from state and federal agencies, and the University of Wisconsin was formed to develop and direct the evaluation monitoring activities at the Master Monitoring and Signs of Success sites.

Whole Stream Monitoring Sites

Criteria were developed to select and monitor twelve streams around the state. The stream sites represent the five major types of fishery found in agricultural and urban parts of priority watersheds, and they also represent three of the five ecoregions in the state. The five fishery types are: high gradient cold water sport fishery, high gradient warm water sport fishery, high gradient warm water forage fishery, low gradient warm water forage fishery, and low gradient cold water sport fishery. A stormsewer outfall is also being monitored. The three ecoregion types represented are the Southeastern Wisconsin till plains, the Driftless area, and the North Central Hardwood Forest.

All but one of the stream sites drains a small area (about ten square miles or less). The schedule involves two years of monitoring before any best management practices are installed, five years of monitoring during the practice installation phase, 2 years of monitoring during the response period, and two years of monitoring during the post-practice installation phase, for a total of eleven years of monitoring.

State-of-the-art chemical and physical monitoring is being done at all the stream sites. State-of-the-art biological monitoring will be done at eight of the twelve streams. Results of the monitoring will be used to determine how well the best management practices achieve the pollution reduction goals and objectives. Improving the fish community is the most important water resource objective for all the streams.

A total of about $5,000,000 would be needed for the stream monitoring, if the work is carried out over a period of eleven years. The success of the evaluation monitoring activities depends on the installation of all the best management practices at the Master Monitoring Sites.

Signs of Success

Signs of success is short-term monitoring designed to provide some early evidence that better land management does make a difference. One sight is being sought for each watershed project. Signs of Success will focus on one practice such as barnyard runoff controls, manure storage, or streambank fencing that is expected to have an early effect on the adjacent stream.
Monitoring will take place over a two-year period--the year before and the year after a practice is installed. Expected positive improvements will be on those sites where degraded habitat has occurred. Habitat sampling and photographs will be used to indicate the benefit of the practice. Limited chemical monitoring and fish sampling will be done at some sites.

The cost of the Signs of Success program $100,000 statewide per year if fully implemented. The results of the Signs of Success monitoring will be featured in educational materials such as local newsletters and newspapers and the statewide newsletter "Fields and Streets."

Lake Ripley - Long-Term Trends Monitoring

Lake Ripley will continue to be monitored by lake management specialists as part of the DNR Long-Term Trends Monitoring Program. The lake will be monitored five times a year for physical, chemical, and biological parameters. (Table 8-1).

Monitoring of Lake Ripley will continue as described in the appraisal monitoring plan and report. Trophic State Index (TSI) calculations based on secchi disc, chlorophyll, and total phosphorus recordings will be used to evaluate changes in lake water quality.

Table 8-1. Lake Monitoring Sampling Schedule for Lake Ripley

Parameter	Spring Turn-over	Mid June	Mid July	Mid August	February	Remarks
Complete Water Chemistry	X					Two depths: 1 ft. above the water surface and 2 ft. above the lake bottom.
Total Phosphorus	X*	X**	X**	X**	X*	* = 2 depths: 1 ft. below water surface and 2 ft. above the lake bottom. ** = Third additional depth at top of hypolimnion.
Water Temperature Dissolved oxygen pH and specific conductance	X	X	X	X	X	Profile: 1 ft. below water surface and proceed to lake bottom using 3-6 ft. intervals, depending on existing cond-itions and/or total lake depth. pH and conductance dependent on meter availability.
Chlorophyll a	X	X	X	X	X	One depth: 1 ft. below water surface and at depth of observed metalimnion oxygen maxima.
Secchi disk depth	X	X	X	X		Minimum frequency; weekly by local volunteer if possible
Lake water level	X	X	X	X		Minimum frequency; weekly by local volunteer if possible
Fish survey						Netting during spawning season, boom shocking after Sept. 1. Electrofishing every other year.
Fish Contaminants						Occasional monitoring for PCBs and other contaminants
Macrophyte			X or	X		Survey every third year (general abundance and location by species)
Phytoplankton	X	X	X	X	X	Water collected at 1 ft. depth (identification and general abundance).
Zooplankton	X	X	X	X	X	One vertical tow with plankton net (identification and general abundance).

Water chemistry sampling includes NO_2-N+; No_3-N; NH_3-N; KJN-N; Cl; Org. N; Diss. P; Ca; Mg, Na, K, pH, SO_4; tot alk; Fe; Mn; color; turbidity; total diss. solids, volatile solids; and suspended solids.

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APPENDIX A
Watershed Planning Methods

This chapter describes the steps and procedures used to prepare this plan. These are:

- Evaluating water quality and aquatic habitat.
- Assessing pollution sources.
- Establishing water resource objectives.
- Establishing pollution reduction goals.
- Developing a nonpoint source control strategy.
- Involving the public and local units of government.

Evaluating Water Quality and Aquatic Habitat

The DNR is responsible for: designating the biological and recreational uses that surface waters can support under proper management; prescribing the water quality required to sustain these designated uses; and indicating the methods to implement, achieve and maintain those conditions.

The DNR's former Madison Area Office and Southern District Water Resources Management staff conducted investigations of the existing quality and natural resource conditions for Lake Ripley and its tributary in 1993 and 1994. Their purpose was to evaluate water quality problems and establish a basis for setting water resources management objectives. Detailed assessment results are documented in water resource appraisal reports.

Data Collection

The following is a summary of the elements comprising the water quality and aquatic habitat investigation.

Tributary Monitoring

The Lake Ripley inlet and outlet were sampled routinely as part of the water resources appraisal. Three STORET stations were established along the inlet stream and one at the outlet. Flows and/or water levels were measured at each site, along with the water chemistry. Macroinvertebrate samples were collected in April, 1993.

Lake Sampling

Lake Ripley has been monitored five times a year since 1986 under the DNR's Long-Term Trends monitoring program (see sampling schedule, Chapter 8). The appraisal monitoring for the NPS evaluation was a continuation of this monitoring. It included sampling the deep water basin bi-monthly during the 1993 open water season.

Water Quality Modeling

Computer modeling was used on Lake Ripley to assess existing water quality and its potential for improvement. The modeling method used was the Wisconsin Lake Model Spreadsheet (WILMS) Version 1.01 (Panuska and Wilson, 1994). WILMS is a lake modeling spreadsheet that contains 10 empirical lake response models coupled with a watershed loading and a lake response module.

Sediment Sampling

Through a lake planning grant, two types os sediment analysis was conducted: pAleolimnology and littoral zone sediment sampling. A sediment core was extracted from the deepest portion of the lake and analysed in 1-2 cm increments for nutrients, organic matter, algae and algae pigments, and zooplankton. Second, shallow water sediments were sampled and analyzed for nitrogen and phosphorus which can be mobilized by Eurasian watermilfoil or resuspended by mechanical disturbances such as dredging or motorboating.

Shoreline Erosion Inventory

The entire shoreline of Lake Ripley was inventoried for erosion conditions. Bank height, width and lateral recession rates were measured or estimated

Wetlands Inventory

Historical and existing wetland maps were used to estimate how many wetlands have been altered by agriculture and urban development. Historical maps were from 1903 (USGS) and current maps were from 1975 (SCS) and 1986 (DNR).

Data Interpretation

Data collected using the above methods were analyzed and used to set the water quality goals for Lake Ripley, its tributary, and the uplands draining to the lake.

Tributary Monitoring

Monitoring indicated that 1100 kg of phosphorus entered the lake from the tributary. This number is considered high due to the unusually high precipitation conditions in 1993. From June to September, when 72% of the load was delivered, the tributary experienced anoxic to near anoxic conditions. The abundance of a specific algae type in the tributary indicated very poor water quality in the tributary. Groundwater contributes about 45% of the annual flow to the lake.

Macroinvertebrate sampling results placed the tributary in the fair to poor water quality category.

Lake Monitoring

All data collected on Lake Ripley between 1986 and 1993 were statistically analyzed for trends, but none were recognized. The trophic state index (TSI) for the lake was also calculated. The TSI has fluctuated around 50 (meso-eutrophic). Slight improvements were seen in drought years, and slight decreases were seen in years of high precipitation.

Lake Modeling

The Reckow model (1979 natural lake model) within the WILMS suite was the model that best fit the conditions at Lake Ripley. The model predicted an in-lake phosphorus concentration of 21 ug/L. The model predicted that a 30% reduction of phosphorus to the lake would result in an in-lake phosphorus concentration of 15 ug/L. This corresponds to a trophic state index of around 50.

Sediment Sampling

The deep sediment core taken in Lake Ripley captured the lake's history for 120-150 years, the same time period when the lake experienced the consequences of human impacts. The rate at which sediment was deposited in the lake is comparable to land clearing activities in the watershed. The sedimentation rate at present is 17 times greater than it was prior to 1850. Erosion rates from the watershed have decreased at present compared with the 1970s. Phosphorus and nitrogen accumulation rates increased with settlement. Despite the change in land use from agriculture to homesite development, phosphorus accumulation rates are higher now than any other time in the last 250 years.

Nutrient levels in the shallow cores are high enough to sustain a Eurasian watermilfoil nuisance.

Groundwater

Groundwater quality standards for substances of public health concern and public welfare concern are contained in Chapter NR 140 Wisconsin Administrative Code. The enforcement standards (ES) and preventative action limits (PAL) are defined in Chapter Two. If well samples results exceeded the nitrate (NO_3) + nitrite (NO_2) ES, owners were sent a notice warning them that infants under six months and pregnant women should not drink the well water. At nitrate (NO_3) + nitrite (NO_2) levels greater than 40 mg/L, owners are eligible to apply for well compensation funds from the Bureau of Water Supply.

Assessing Pollution Sources

The purpose of the pollution source assessment is to identify the rural and urban sources and quantities of pollutants impacting surface waters. Rural and urban pollutant sources assessed for this watershed are discussed below.

Rural Nonpoint Sources

Excessive quantities of sediment, nutrients, oxygen demanding substances, pesticides and bacteria are pollutants carried in runoff draining agricultural areas. These pollutants degrade surface water quality thereby restricting recreational and biological uses. The principal rural nonpoint sources evaluated in preparing this plan include:

- Barnyards and livestock area runoff
- Eroding uplands delivering sediment to surface waters
- Eroding, slumping, or trampled streambanks or lakeshore
- Areas contributing runoff of winterspread livestock manure
- Gullies

The Lake Ripley Management District staff conducted inventories during 1993-4. The DNR in cooperation with the DATCP and the Lake District staff completed the data analyses. Inventory and evaluation procedures are summarized below.

Barnyard and Livestock Area Runoff

The Lake District staff mapped the locations of 8 barnyards in the watershed on 1"=400' scale aerial photographs. A field survey of each barnyard was conducted to collect information needed to determine its pollution potential.

The barnyard data was used in the "BARNY" Model (Baun, 1992), a modification of the animal lot runoff model, which the U.S. Department of Agriculture, Agricultural Research Service developed. Information about the mass loading of total phosphorus annually was generated to evaluate the

relative pollution potential of each barnyard. The livestock operations were ranked according to their potential to impact surface and/or groundwater quality.

Upland Erosion and Sediment Delivery

The Lake District staff conducted the inventory on about 8 square miles, or 100 percent of the watershed, using existing data and field investigations. Cropland, pastures, grasslands, woodlands and other open (non-urban) land uses were investigated. Existing data sources included site specific farm conservation plans, 1"=400' scale aerial photographs, and U.S. Geological Survey 1"=2,000' scale quadrangle maps. The information obtained for each parcel included size, soil type and erodibility, slope percent and length, land cover, crop rotation, present management, overland flow distance and destination, channel type and receiving water.

Upland erosion and sediment delivery was determined using the Wisconsin Nonpoint Source (WINHUSLE) Model (Baun, 1992). The WINHUSLE model calculates the average annual quantity of eroded soil reaching surface waters from each farm field. The determination is made based on a "typical" year of precipitation. Estimated sediment delivery was used to assess the relative pollution potential of each farm field in the watershed.

Streambank Erosion

The Lake District staff and the DNR conducted field surveys on about 4.25 miles of ditches draining to Lake Ripley. The method used is a modification of the streambank erosion analysis included in Phase II of the Land Inventory Monitoring process used by the U.S. Department of Agriculture, Soil Conservation Service. At locations where erosion was occurring, the following information was recorded:

- Length of trampled or eroding bank.
- Vertical height.
- Estimated annual rate of recession.
- Adjacent land uses.
- Potential management measures.

The amount of sediment lost annually was calculated for each erosion site. In addition, areas adjacent to streams impacted by livestock, but which were not necessarily eroding at a high rate, were also noted.

Urban Nonpoint Sources

Nationwide investigations confirm that urban runoff can have a significant adverse impact on receiving waters. The result is that urban areas and activities can upset several important components of a stream including stream flow, habitat, water quality, bottom sediment quality, and stream biology.

Principal urban nonpoint sources of pollution evaluated in preparing this plan include:

- Existing urban land uses.

- New urban development, including the potential for construction site erosion as well as increased pollutant loading from the newly established urban surfaces.

- Eroding streambanks.

Stormwater pollutant concentrations, runoff volumes, and pollutant yields vary according to the urban land use (residential, commercial, industrial) and development characteristics (intensity of the development, stormwater conveyance system). The inventory of existing and planned urban areas was designed to quantify the urban land use and development characteristics for existing and planned urban development. This information was used to estimate the existing and future urban pollutant loads.

Existing Urban Areas: All of the existing urban land was analyzed for its contributing sediment and nutrient loads to the lake using a SLAMM spreadsheet. Further analysis included examining trends in constuction site activities.

Other Pollution Sources

Additional sources of surface water pollution beyond those discussed in this plan are degrading water quality in the watershed. These pollution sources have the potential of overshadowing improvements in water quality that might otherwise occur as a result of the priority watershed program.

The DNR conducted an inventory and evaluation of these other pollution sources. Inventory results and recommendations for alleviating the water quality impacts of these other pollution sources are documented in Chapter Two of this plan.

Establishing Water Resource Objectives and Pollution Reduction Goals

Water resource goals and objectives were established for the lake and its tributary in the watershed. These objectives identify how the project is anticipated to change the quality of the aquatic environment for recreational and biological uses. Factors considered in establishing water resource objectives include: existing water quality and aquatic habitat; factors or pollutants that may be preventing the surface water from reaching its full potential of supporting biological and recreational uses; and the practicality of reducing pollutants.

Nonpoint pollution reduction goals are estimates of the level of nonpoint source control needed to meet the water quality and recreational use objectives identified in this plan. Pollution reduction goals and water resource objectives are established together since they are integrally related.

The nonpoint source pollution reduction goals in this plan specifically target the control of sediment and phosphorus in rural areas and the control of sediment, and phosphorus in urban areas. Importantly, reducing the quantity of these substances reaching surface waters decreases the amount of other substances such as pesticides and bacteria which degrade water quality.

Chapter Four of this plan identifies additional ongoing program efforts available to address many related issues in the watershed. Coordination with those efforts will go beyond the scope of the priority watershed program to help improve the area's natural resources.

Developing a Nonpoint Source Management Strategy

The final step in the planning process is the development of a strategy for achieving the nonpoint source pollution reduction goals identified in the plan. Several items are addressed in developing the management strategy including:

- Significant nonpoint pollution sources.

- Effective management practices and guidelines for use of state cost-share funds for practice installation.

- Responsibilities, estimated workloads and work schedules for local implementing agencies, and guidelines for use of state funds to support local implementation activities.

- Estimated cost of installing practices and supporting staff at the local level.

- Information and education needs.

- Project evaluation needs.

Identification of critical nonpoint sources eligible for cost share and technical assistance under the Nonpoint Source Water Pollution Abatement (NPS) Program were determined by:

- Evaluating pollutant loading for each nonpoint source in each subwatershed.

- Determining the relative importance of controlling each source (barnyards, urban runoff, cropland erosion, etc.) to achieving the water resource objectives.

- Developing criteria to determine which sources need to be controlled.

- Applying the criteria to determine eligibility for participation in the priority watershed project.

This evaluation was carried out on a watershed basis for the all nonpoint sources. The result is a site specific ranking of nonpoint sources and a determination of assistance to be made available through the nonpoint source program for the control of NPS pollution, financial and technical.

Involving the Public and Local Units of Government

The Lake District, UWEX and DNR convened an advisory subcommittee to assist in preparing this watershed plan. The advisory committee contains representatives from the town of Oakland, Jefferson County, the lakeshore, and other interested citizens. This committee primarily provided guidance during the planning process and reviewed plan chapters. The activities of the Citizen Advisory Committee will be assumed by the Lake District Board of Directors in the future.

A technical work group was convened to help with developing all aspects of the plan—the water resource, agricultural resouces, urban resources and information and education. Th group reviewed land and water resource assessment information, assisted in developing water resource objectives and pollution reduction goals and assisted in developing the pollution control strategy.

APPENDIX B
Glossary

ACUTE TOXICITY:
Any poisonous effect produced by a single short-term exposure to a chemical that results in a rapid onset of severe symptoms.

ADVANCED WASTEWATER TREATMENT:
The highest level of wastewater treatment for municipal treatment systems. It requires removal of all but 10 parts per million of suspended solids and biological oxygen and/or 50 percent of the total nitrogen. Advanced wastewater treatment is also known as "tertiary treatment."

AGRICULTURAL CONSERVATION PROGRAM (ACP):
A federal cost-sharing program to help landowners install measures to conserve soil and water resources. ACP is administered by the USDA ASCS through county ACP committees.

ALGAE:
A group of microscopic, photosynthetic water plants. Algae give off oxygen during the day as a product of photosynthesis and consume oxygen during the night as a result of respiration. Therefore, algae effect the oxygen content of water. Nutrient-enriched water increases algae growth.

AMMONIA:
A form of nitrogen (NH_3) found in human and animal wastes. Ammonia can be toxic to aquatic life.

ANAEROBIC:
Without oxygen.

AREA OF CONCERN:
Areas of the Great Lakes identified by the International Joint Commission (IJC) as having serious water pollution problems.

AREAWIDE WATER QUALITY MANAGEMENT PLANS (208 PLANS):
A plan to document water quality conditions in a drainage basin and make recommendations to protect and improve basin water quality. Each basin in Wisconsin must have a plan prepared for it, according to section 208 of the Clean Water Act.

ANTIDEGRADATION:
A policy stating that water quality will not be lowered below background levels unless justified by economic and social development considerations. Wisconsin's antidegradation policy is currently being revised to make it more specific and meet EPA guidelines.

AVAILABILITY:
The degree to which toxic substances or other pollutants are present in sediments or elsewhere in the ecosystem and are available to affect or be taken up by organisms. Some pollutants may be "bound up" or unavailable because they are attached to clay particles or are buried by sediment. Oxygen content, pH, temperature and other conditions in the water can affect availability.

BACTERIA:
Single-cell, microscopic organisms. Some can cause disease, but others are important in organic waste stabilization.

BASIN PLAN:
See "Areawide Water Quality Management Plan".

BENTHIC ORGANISMS (BENTHOS):
Organisms living in or on the bottom of a lake or stream.

BEST MANAGEMENT PRACTICE (BMP):
The most effective, practical measures to control nonpoint sources of pollutants that runoff from land surfaces.

BIOACCUMULATION:
The uptake and retention of substances by an organism from its surrounding medium and food. As chemicals move through the food chain, they tend to increase in concentration in organisms at the upper end of the food chain such as predator fish, or in people or birds that eat these fish.

BIOASSAY STUDY:
A test for pollutant toxicity. Tanks of fish or other organisms are exposed to varying doses of treatment plant effluent. Lethal doses of pollutants in the effluent are then determined.

BIOCHEMICAL OXYGEN DEMAND (BOD):
A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. BOD_5 is the biochemical oxygen demand measured in a five day test. The greater the degree of pollution, the higher the BOD_5.

BIODEGRADABLE:
Waste that can be broken down by bacteria into basic elements. Most organic wastes such as food remains and paper are biodegradable.

BIOTA:
All living organisms that exist in an area.

BUFFER STRIPS:
Strips of grass or other erosion-resisting vegetation between disturbed areas and a stream or lake.

BULKHEAD LINES:

Legally established lines that indicate how far into a stream or lake an adjacent property owner has the right to fill. Many of these lines were established many years ago and allow substantial filling of the bed of the river and bay. Other environmental laws may limit filling to some degree.

CARCINOGENIC:
A chemical capable of causing cancer.

CATEGORICAL LIMITS:
All point source discharges are required to provide a basic level of treatment. For municipal wastewater treatment plants this is secondary treatment (30 mg/1 effluent limits for SS and BOD). For industry the level depends on the type of industry and the level of production. More stringent effluent limits are required, if necessary, to meet water quality standards.

CHLORINATION:
The application of chlorine to wastewater to disinfect it and kill bacteria and other organisms.

CHLORORGANIC COMPOUNDS (CHLORORGANICS):
A class of chemicals that contain chlorine, carbon and hydrocarbon. This generally refers to pesticides and herbicides that can be toxic. Examples include PCB's and pesticides such as DDT and dieldrin.

CHRONIC TOXIcity:
The effects of long-term exposure of organisms to concentrations of a toxic chemical that are not lethal, but is injurious or debilitating in one or more ways. An example of the effect of chronic toxicity is reduced reproductive success.

CLEAN WATER ACT:
See "Public Law 92-500."

COMBINED SEWERS:
A wastewater collection system that carries both sanitary sewage and stormwater runoff. During dry weather, combined sewers carry only wastewater to the treatment plant. During heavy rainfall, the sewer becomes swollen with stormwater. Because the treatment plant cannot process the excess flow, untreated sewage is discharged to the plant's receiving waters, i.e., combined sewer outflow.

CONFINED DISPOSAL FACILITY (CDF):
A structure built to contain and dispose of dredged material.

CONGENERS:
Chemical compounds that have the same molecular composition, but have different molecular structures and formula. For example, the congeners of PCB have chlorine located at different spots on the molecule. These differences can cause differences in the properties and toxicity of the congeners.

CONSERVATION TILLAGE:
Planting row crops while only slightly disturbing the soil. In this way a protective layer of plant residue stays on the surface. Erosion rates decrease.

CONSUMPTION ADVISORY:
A health warning issued by DNR and WDHSS that recommends people limit the fish they eat from some rivers and lakes based on the levels of toxic contaminants found in the fish.

CONTAMINANT:
Some material that has been added to water that is not normally present. This is different from a pollutant, which suggests there is too much of the material present.

CONVENTIONAL POLLUTANT:
Refers to suspended solids, fecal coliforms, biochemical oxygen demand, and pH, as opposed to toxic pollutants

COST-EFFECTIVE:
A level of treatment or management with the greatest incremental benefit for the money spent.

CRITERIA:
See water quality standard criteria.

DDT:
A chlorinated hydrocarbon insecticide that was banned because of its persistence in the environment.

DIOXIN (2,3,7,8-tetrachlorodibenso-p-dioxin):
A chlorinated organic chemical which is highly toxic.

DISINFECTION:
A chemical or physical process that kills organism that cause disease. Chlorine is often used to disinfect wastewater.

DISSOLVED OXYGEN (DO):
Oxygen dissolved in water. Low levels of dissolved oxygen cause bad smelling water and threaten fish survival. Low levels of dissolved oxygen often result from inadequate wastewater treatment. The DNR considers 5 ppm DO necessary for fish and aquatic life.

DREDGING:
Removal of sediment from the bottom of water bodies.

ECOSYSTEM:
The interacting system of biological community and its nonliving surrounding.

EFFLUENT:
Solid, liquid or gas wastes (byproducts) that are disposed on land, in water or in air. As used in the RAP, effluent generally means wastewater discharges.

EFFLUENT LIMITS:
The DNR issues WPDES permits establishing the maximum amount of pollutant to be discharged to a receiving stream. Limits depend on the pollutant and the water quality standards that apply for the receiving waters.

EMISSION:
A direct (smokestack particles) or indirect (busy shopping center parking lot) release of any contaminant into the air.

ENVIRONMENTAL PROTECTION AGENCY (USEPA):
The federal agency responsible for enforcing federal environmental regulations. The Environmental Protection Agency delegates some of its responsibilities for water, air and solid waste pollution control to state agencies.

ENVIRONMENTAL REPAIR FUND:
A fund established by the Wisconsin Legislature to deal with abandoned landfills.

EPIDEMIOLOGY:
The study of diseases as they affect populations rather than individuals, including the distribution and incidence of a disease mortality and morbidity rated, and the relationship of climate, age, sex, race and other factors. EPA uses such data to establish national air quality standards.

EROSION:
The wearing away of the land surface by wind or water.

EUTROPHIC:
Refers to a nutrient-rich lake. Large amounts of algae and weeds characterize a eutrophic lake (see also "Oligotrophic" and "Mesotrophic").

EUTROPHICATION:
The process of nutrient enrichment of a lake loading to increased production of aquatic organisms. Eutrophication can be accelerated by human activity such as agriculture and improper waste disposal.

FACILITY PLAN:
A preliminary planning and engineering document that identifies alternative solutions to a community's wastewater treatment problems.

FECAL COLIFORM:
A group of bacteria used to indicate the presence of other bacteria that cause disease. The number of coliform is particularly important when water is used for drinking and swimming.

FISHABLE AND SWIMMABLE:

Refers to the water quality goal set for the nation's surface waters by Congress in the Clean Water Act. All waters were to meet this goal by 1984.

FLOURANTHENE:
A polyaromatic hydrocarbon (PHA) with toxic properties.

FLY ASH:
Particulates emitted from coal burning and other combustion, such as wood burning, and vented into the air from stacks, or more likely, collected by electrostatic precipitators.

FOOD CHAIN:
A sequence of organisms where each uses the next as a food source.

FURANS (2,3,7,8-tetra-chloro-dibenzpfurans):
A chlorinated organic compound which is highly toxic.

GREEN STRIPS:
See buffer strip.

GROUNDWATER:
Undergroundwater-bearing areas generally within the boundaries of a watershed, which fill internal passageways of porous geologic formations (aquifers) with water that flows in response to gravity and pressure. Often used as the source of water for communities and industries.

HABITAT:
The place or type of site where a plant or animal naturally lives and grows.

HEAVY METALS:
Metals present in municipal and industrial wastes that pose long-tern environmental hazards if not properly disposed. Heavy metals can contaminate ground and surface waters, fish and other food stuffs. The metals of most concern are: arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium and zinc (see also separate listings of these metals for their health effects).

HERBICIDE:
A type of pesticide that is specifically designed to kill plants and can also be toxic to other organisms.

HYDROCARBONS:
Any chemical of a large family of chemicals containing carbon and hydrogen in various combinations.

INCINERATOR:
A furnace designed to burn wastes.

INFLUENT:
Influent for an industry would be the river water that the plant intakes for use in its processing. Influent to a municipal treatment plant is untreated wastewater.

IN-PLACE POLLUTION:
As used in the RAP, refers to pollution from contaminated sediments. These sediments are polluted from post discharges from municipal and industrial sources.

INTERNATIONAL JOINT COMMISSION (IJC):
An agency formed by the United States and Canada to guide management of the Great Lakes and resolve border issues.

ISOROPYLBIPHENYL:
A chemical compound used as a substitute for PCB.

LANDFILL:
A conventional sanitary landfill is "a land disposal site employing an engineered method of disposing of solid wastes on land in a manner that minimizes environmental hazards by spreading solid wastes in thin layers, materials at the end of each operating day". Hazardous wastes frequently require various types of pretreatment before they are disposed of, i.e., neutralization chemical fixation encapsulation. Neutralizing and disposing of wastes should be considered a last resort. Repurifying and reusing waste materials or recycling them for another use may be less costly.

LC-1:
The concentration that results in 1% mortality of the test animal populations exposed to the contaminant.

LC_{50}:
Lethal concentration for 50% of the test population exposed to a toxicant substance.

LD_{50}:
Lethal dose for 50 percent of the test population exposed to a toxicant substance.

LEACHATE:
The contaminated liquid which seeps from a pile or cell of solid materials and which contains water, dissolved and decomposing solids. Leachate may enter the groundwater and contaminate drinking water supplies.

LOAD:
The total amount of materials or pollutants reaching a given local.

MACROPHYTE:
A rooted aquatic plant.

MASS:

The amount of material a substance contains causing it to have weight in a gravitational field.

MASS BALANCE:
A study that examines all parts of the ecosystem to determine the amount of toxic or other pollutant present, its sources, and the processes by which the chemical moves through the ecosystem.

MESOTROPHIC:
Refers to a moderately fertile nutrient level of a lake between the oligotrophic and eutrophic levels. (See also "Eutrophic" and "Oligotrohpic.")

MILLIGRAMS PER LITER (mg/1):
A measure of the concentration of substance in water. For most pollution measurement this is the equivalent of "parts per million".

MITIGATION:
The effort to lessen the damages caused, by modifying a project, providing alternatives, compensating for losses or replacing lost values.

MIXING ZONE:
The portion of a stream or lake where effluent is allowed to mix with the receiving water. The size of the area depends on the volume and flow of the discharge and receiving water. For streams the mixing zone it is one-third of the lowest flow that occurs once every 10 years for a seven day period.

NONPOINT SOURCE POLLUTION (NSP):
Pollution whose sources cannot be traced to a single point such as a municipal or industrial wastewater treatment plant discharge pipe. Nonpoint sources include eroding farmland and construction sites, urban streets, and barnyards. Pollutants from these sources reach water bodies in runoff, which can best be controlled by proper land management.

NPS:
See nonpoint source pollution.

OLIGOTROPHIC:
Refers to an unproductive and nutrient-poor lake. Such lakes typically have very clear water. (See also "Eutrophic" and "Mesotrophic.")

OUTFALL:
The mouth of a sewer, drain, or pipe where effluent from a wastewater treatment plant is discharged.

PATHOGEN:
Any infective agent capable of producing disease. It may be a virus, bacterium, protozoan, etc.

PELAGIC:
Referring to open water portion of a lake.

PESTICIDE:
Any chemical agent used to control specific organisms, such as insecticides, herbicides, fungicides, etc.

PH:
A measure of acidity or alkalinity, measured on a scale of 0 to 14 with 7 being neutral and 0 being most acid, and 14 being most alkaline.

PHENOLS:
Organic compounds that are byproducts of petroleum refining, textile, dye, and resin manufacture. High concentrations can cause taste and odor problems in fish. Higher concentration can be toxic to fish and aquatic life.

PHOSPHORUS:
A nutrient that, when reaching lakes in excess amounts, can lead to overfertile conditions and algae blooms.

PLANKTON:
Tiny plants and animals that live in water.

POINT SOURCES:
Sources of pollution that have discrete discharges, usually from a pipe or outfall.

POLLUTION:
The presence of materials or energy whose nature, location, or quantity produces undesired environmental effects.

POLYCHLORINATED BIPHENYLS(PCBs):
A group of 209 compounds, PCBs have been manufactured since 1929 for such common uses as electrical insulation and heating/cooling equipment, because they resist wear and chemical breakdown. Although banned in 1979 because of their toxicity, they have been detected on air, land and water. Recent surveys found PCBs in every section of the country, even those remote from PCB manufacturers.

POLYCHLORINATED ORGANIC COMPOUNDS:
A group of toxic chemicals which contain several chlorine atoms.

PRETREATMENT:
A partial wastewater treatment required from some industries. Pretreatment removes some types of industrial pollutants before the wastewater is discharged to a municipal wastewater treatment plant.

PRIORITY POLLUTANT:

A list of toxic chemicals identified by the federal government because of their potential impact in the environment and human health. Major dischargers are required to monitor all or some of these chemicals when their WPDES permits are reissued.

PRIORITY WATERSHED:
A drainage area about 100,000 acres in size selected to receive Wisconsin Fund money to help pay the cost of controlling nonpoint source pollution. Because money is limited, only watersheds where problems are critical, control is practical, and cooperation is likely are selected for funding.

PRODUCTIVITY:
A measure of the amount of living matter which is supported by an environment over a specific period of time. Often described in terms of algae production for a lake.

PUBLIC LAW 92-500 (CLEAN WATER ACT):
The federal law that sets national policy for improving and protecting the quality of the nation's waters. The law set a timetable for the cleanup of the nation's waters and stated that they are to be fishable and swimmable. This also required all dischargers of pollutants to obtain a permit and meet the conditions of the permit. To accomplish this pollution cleanup, billions of dollars have been made available to help communities pay the cost of building sewage treatment facilities. Amendments in the Clean Water Act were made in 1977 by passage of Public Law 95-217, and in 1987.

PUBLIC PARTICIPATION:
The active involvement of interested and affected citizens in governmental decision-making.

PUBLICLY OWNED TREATMENT WORKS (POTW):
A wastewater treatment plat owned by a city, village or other unit of government.

RAP:
See Remedial Action Plan.

RECYCLING:
The process that transforms waste materials into new products.

REMEDIAL ACTION PLAN:
A plan designed to restore beneficial uses to a Great Lakes Area of Concern.

REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RF/FS):
An investigation of problems and assessment of management options conducted as part of a superfund project.

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA):
This federal law amends the Solid Waste Disposal Act of 1965 and expands on the Resource Recovery Act of 1970 to provide a program that regulates hazardous wastes, to eliminate open dumping and to promote solid waste management programs.

RETRO-FIT:
The placement of an urban structural practice in an existing urban area, which may involve rerouting existing storm sewers and/or relocating existing buildings or other structures.

RIPARIAN:
Belonging or relating to the bank of a lake, river or stream.

RIPRAP:
Broken rock, cobbles, or boulders placed on the bank of a stream to protect it against erosion.

RULE:
Refers to Wisconsin administrative rules. See Wisconsin Administrative Code.

RUNOFF:
Water from rain, snowmelt, or irrigation that flows over the ground surface and returns to streams. Runoff can collect pollutants from air or land and carry them to receiving waters.

SECONDARY IMPACTS:
The indirect effects that an action can have on the health of the ecosystem or the economy.

SECONDARY TREATMENT:
Two-stage wastewater treatment that allows the coarse particles to settle out, as in primary treatment, followed by biological breakdowns of the remaining impurities. Secondary treatment commonly removes 90% of the impurities. Sometimes "secondary treatment" refers simply to the biological part of the treatment process.

SEDIMENT:
Soil particles suspended in and carried by water as a result of erosion.

SEICHES:
Changes in water levels due to the tipping of water in an elongated lake basin whereby water is raised in one end of the basin and lowered in the other.

SEPTIC SYSTEM:
Sewage treatment and disposal for homes not connected to sewer lines. Usually the system includes a tank and drain field. Solids settle to the bottom of the tank. Liquid percolates through the drain field.

SLUDGE:
A byproduct of wastewater treatment; waste solids suspended in water.

SOLID WASTE:
Unwanted or discharged material with insufficient liquid to be free flowing.

STANDARDS:

See water quality standards.

STORM SEWERS:
A system of sewers that collect and transport rain and snow runoff. In areas that have separated sewers, such stormwater is not mixed with sanitary sewage.

SUPERFUND:
A federal program that provides for cleanup of major hazardous landfills and land disposal areas.

SUSPENDED SOLIDS (SS):
Small particles of solid pollutants suspended in water.

SYNERGISM:
The total effect is greater than the sum of the individual effects. For example, the characteristic property of a mixture of toxicants that exhibits a greater-than-additive cumulative toxic effect.

TACs:
Technical advisory committees that assisted in the development of the Remedial Action Plan.

TERTIARY TREATMENT:
See advanced wastewater treatment.

TOP-DOWN MANAGEMENT:
A management theory that uses biomanipulation, specifically the stocking of predator species of fish to improve water quality.

TOTAL MAXIMUM DAILY LOADS:
The maximum amount of a pollutant that can be discharged into a stream without causing a violation of water quality standards.

TOXIC:
An adjective that describes a substance which is poisonous, or can kill or injure a person or plants and animals upon direct contact or long-term exposure. (Also, see toxic substance.)

TOXIC SUBSTANCE:
A chemical or mixture of chemicals which, through sufficient exposure, or ingestion, inhalation of assimilation by an organism, either directly from the environment or indirectly by ingestion through the food chain, will, on the basis of available information cause death, disease, behavioral or immunologic abnormalities, cancer, genetic mutations, or development of physiological malfunctions, including malfunctions in reproduction or physical deformations, in organisms or their offspring.

TOXICANT:
See toxic substance.

TOXICITY:
The degree of danger posed by a toxic substance to animal or plant life. Also see acute toxicity, chronic toxicity and additivity.

TOXICITY REDUCTION EVALUATION:
A requirement for a discharger that the causes of toxicity in an effluent be determined and measures taken to eliminate the toxicity. The measures may be treatment, product substitution, chemical use reduction or other actions that will achieve the desired result.

TREATMENT PLANT:
See wastewater treatment plant.

TROPHIC STATUS:
The level of growth or productivity of a lake as measured by phosphorus content, algae abundance, and depth of light penetration.

TURBIDITY:
Lack of water clarity. Turbidity is usually closely related to the amount of suspended solids in water.

UNIVERSITY OF WISCONSIN-EXTENSION (UWEX):
A special outreach, education branch of the state university system.

VARIANCE:
Government permission for a delay or exception in the application of a given law, ordinance or regulation. Also, see water quality standard variance.

VOLATILE:
Any substance that evaporates at a low temperature.

WASTELOAD ALLOCATION:
Division of the amount of waste a stream can assimilate among the various dischargers to the stream. This limits the amount (in pounds) of chemical or biological constituent discharged from a wastewater treatment plant to a water body.

WASTEWATER:
Water that has become contaminated as a byproduct of some human activity. Wastewater includes sewage, washwater and the water-borne wastes of industrial processes.

WASTE:
Unwanted materials left over from manufacturing processes, refuse from places of human habitation or animal habitation.

WASTEWATER TREATMENT PLANT:
A facility for purifying wastewater. Modern wastewater treatment plants are capable of removing 95% of organic pollutants.

WATER QUALITY AGREEMENT:
The Great Lakes Water Quality agreement was initially signed by Canada and the United States in 1972 and was subsequently revised in 1978 and 1987. It proves guidance for the management of water quality, specifically phosphorus and toxics, in the Great Lakes.

WATER QUALITY LIMITED SEGMENT:
A section of river where water quality standards will not be met if only categorical effluent standards are met.

WATER QUALITY CRITERIA:
A measure of the physical, chemical or biological characteristics of a water body necessary to protect and maintain different water uses (fish and aquatic life, swimming, etc.).

WATER QUALITY STANDARDS:
The legal basis and determination of the use of a water body and the water quality criteria, physical, chemical, or biological characteristics of a water body, that must be met to make it suitable for the specified use.

WATER QUALITY STANDARD VARIANCE:
When natural conditions of a water body preclude meeting all conditions necessary to maintain full fish and aquatic life and swimming, a variance may be granted.

WATERSHED:
The land area that drains into a lake or river.

WETLANDS:
Areas that are inundates or saturated by surface or groundwater at a frequency and duration sufficient to support a variety of vegetative or aquatic life. Wetland vegetation requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas.

WISCONSIN ADMINISTRATIVE CODE:
The set of rules written and used by state agencies to implement state statutes. Administrative codes are subject to public hearing and have the force of law.

WISCONSIN FUND:
A state program that helps pay the cost of reducing water pollution. Funding for the program comes from general revenues and bonds and is based on a percentage of the state's taxable property value. The Wisconsin Fund includes these programs:

Point Source Water Pollution Abatement Grant Program - Provides grants for 60% of the cost of constructing wastewater treatment facilities. Most of this program's money goes for treatment plant construction, but three percent of this fund is available for repair or replacement of private, on-site sewer systems.

Nonpoint Source Water Pollution Abatement Grant Program - Funds to share the cost of reducing water pollution. Nonspecified sources are available in selected priority watersheds.

Solid Waste Grant Program - Communities planning for solid waste disposal sites are eligible for grant money. $500,000 will be available each year to help with planning costs.

WISCONSIN NONPOINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM:
A state cost-share program established by the State Legislature in 1978 to help pay the costs of controlling nonpoint source pollution. Also known as the nonpoint source element of the Wisconsin Fund or the Priority Watershed Program.

WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES):
A permit system to monitor and control the point source dischargers of wastewater in Wisconsin. Dischargers are required to have a discharge permit and meet the conditions it specifies.