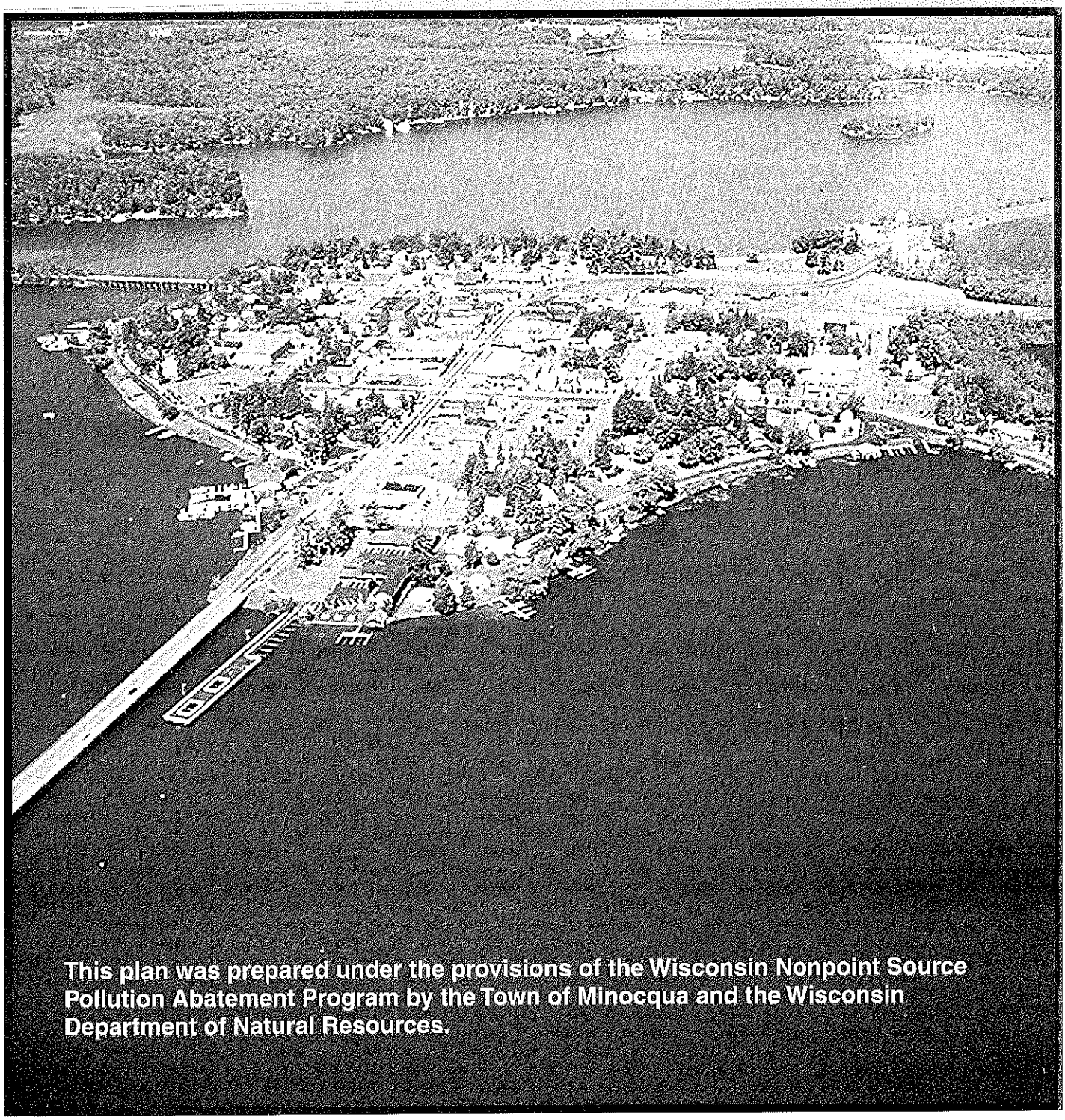
Minocqua - Woodruff Priority Lakes

Ofc. of the Secretary

AD/5

Project Plan



This plan was prepared under the provisions of the Wisconsin Nonpoint Source Pollution Abatement Program by the Town of Minocqua and the Wisconsin Department of Natural Resources.

Watershed Plan Organization Information

Natural Resources Board

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Neal W. Schneider, Secretary
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Wisconsin Department of Natural Resources

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Susan L. Sylvester, Administrator, Division for Environmental Quality
Paulette Harder, Director, Bureau of Watershed Management
Rebecca Wallace, Chief, Runoff Management Section

Minocqua - Woodruff
Priority Lakes Project Plan

The Wisconsin Nonpoint Source Water Pollution Abatement Program

Plan Approved
October 1994

Plan Cooperatively Prepared By:

Wisconsin Department of Natural Resources
Towns of Minocqua and Woodruff

Publication WT-477-96

For copies of this document please contact:

Department of Natural Resources
Bureau of Watershed Management
Runoff Management Section
P.O. Box 7921
Madison, Wisconsin 53707

The Department of Natural Resources acknowledges the Environmental Protection Agency's Region V office for their involvement in the partial funding of this activity through Section 319 of the Water Quality Act.

Watershed Plan Credits

Author

Tom Blake, Northern Region, Wisconsin Department of Natural Resources (DNR)

Principal Contributors

Paul Garrison, Bureau of Integrated Science Services, Wisconsin DNR
Jeff Prey, Bureau of Watershed Management, Wisconsin DNR
Jim Vennie, Bureau of Watershed Management, Wisconsin DNR
Tom Woodall, Project Manager, Town of Minocqua
Bob Young, Northern Region, Wisconsin DNR

Maps

DNR Geographic Services Section

Cover Photo

Department of Natural Resources

Additional Contributors

The author and principal contributors would like to acknowledge the valuable contributions of the following people:

Dave Coon, Wisconsin Valley Improvement Company
Bob Korth, University of Wisconsin Extension, Stevens Point
Butch Welch, Director of Public Works, Town of Minocqua

Minocqua - Woodruff Priority Lakes Project Citizens Advisory Committee

Don Gauger
Larry Greschner
George Grundy
Al Hanley
James Kilbane
Robert Wendt

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

WISCONSIN
DEPT. OF NATURAL RESOURCES

George E. Meyer
Secretary

101 South Webster Street
Box 7921
Madison, Wisconsin 53707
TELEPHONE 608-266-2621
TELEFAX 608-267-3579
TDD 608-267-6897

July 6, 1995

Mr. William Korrer, Jr., Chairman
Town of Minocqua
P.O. Box 168
Minocqua, Wisconsin 54548

Mr. Larry Greschner
Town of Woodruff
P.O. Box 560
Woodruff, Wisconsin 54568

Gentlemen:

I am pleased to approve the Minocqua-Woodruff Priority Lakes Project Plan prepared through the Wisconsin Nonpoint Source Pollution Abatement Program. This plan meets the intent and conditions of s. 144.25, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. The plan went before the land and Water Conservation Board on October 4, 1994, and was unanimously approved at that time. I am also approving this plan as an amendment to the Upper Wisconsin River Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Town staff who participated in preparing this plan. We look forward to assisting the Towns of Minocqua and Woodruff in the implementation of the Minocqua-Woodruff Priority Lakes Project Plan.

Sincerely,

GEM

George E. Meyer
Secretary

GEM:TB:ck
cc: Alan Tracy, DATCP, P.O. Box 8911, Madison, WI 53708-8911
Jim Bradley, LWCB, 657 Granite Way, Sun Prairie, WI 53590
Martha Crunk, Town of Minocqua, Box 168, Minocqua, WI 54548
Lynn Hess, DATCP, P.O. Box 8911, Madison, WI 53708-8911
Larry Maltbey, Rhinelander
Tom Blake, Rhinelander
Cindy Hoffland, CA/8

"Minocqua the Island City"

TOWN OF MINOCQUA
POST OFFICE BOX 168
MINOCQUA, WISCONSIN 54548-0168
(715) 356-5296

August 18, 1994

Mr. George E. Meyer, Secretary
Department of Natural Resources
P. O. Box 7921
Madison, WI. 53707

Dear Mr. Meyer:

The Town of Minocqua Board of Supervisors has reviewed the Minocqua/Woodruff Priority Watershed Implementation Plan and approves of the goals and objectives as well as the procedures for implementing the Project.

This approval was endorsed unanimously at the regular Board meeting on August 16, 1994.

Sincerely
Don Gauger
Mr. Donald Gauger
Chairman
Town of Minocqua

cc: Mr. Tom Blake
Dept of Nat. Resources
P. O. Box 818
Rhinelander, WI. 54501

Mr. Tom Woodall
Priority Lake Project
P. O. Box 168
Minocqua, WI. 54548

Town of Woodruff
WOODRUFF, WISCONSIN 54568

August 17, 1994

Department of Natural Resources
Mr. George E. Meyer, Sec.
P.O. Box 7921
Madison, WI 53707

Dear Mr. Meyer:

The Woodruff Town Board Supervisor's have reviewed the Minocqua/Woodruff Priority Watershed Implementation Plan and approves of the goals and objectives as well as the procedures for implementing the Project.

This approval was endorsed unanimously at the Woodruff Regular Town Board Meeting on August 10, 1994.

If you have any questions, please feel free to contact me at the Woodruff Town Office, 1/715/356/9421.

Sincerely,

Larry E. Greschner
Woodruff Town Chairman
P.O. Box 560
Woodruff, WI 54568
LEG/mjv

cc: Mr. Tom Blake
Dept. of Nat. Resources
P.O. Box 818
Rhinelander, WI 54501

Mr. Tom Woodall
Priority Lake Project
P.O. Box 168
Woodruff, WI 54568

ONEIDA COUNTY BOARD OF SUPERVISORS
Court House
P. O. Box 400
RHINELANDER, WISCONSIN 54501

August 22, 1994

Mr. George E. Meyer, Secretary
Department of Natural Resources
P.O. Box 7921
Madison, WI 53707

Dear Mr. Meyer:

The Oneida County Board of Supervisors has reviewed the Minocqua/Woodruff Priority Watershed Implementation Plan and approves of the goals and objectives as well as the procedures for implementing the Project.

This approval was endorsed unanimously at the regular Board meeting on August 16, 1994.

Sincerely,

William E Korrer Jr

Mr. William E. Korrer, Jr., Chairman
Oneida County Board of Supervisors

cc: Mr. Tom Blake, Department of Natural Resources
Mr. Tom Woodall, Priority Lake Project

Telephone 715-369-616

LAND CONSERVATION
VILAS COUNTY
3375 Airport Road
RHINELANDER, WISCONSIN 54501

September 2, 1994

Mr. Tom Blake,
Nonpoint Source Coordinator
Department of Natural Resources
P.O. Box 818
Rhinelander, WI 54501

RE: Minocqua/Woodruff Priority Lakes Project Plan

Dear Mr. Blake:

Thank you for the opportunity to respond to the Minocqua/Woodruff Priority Lake Plan. We understand there is a small portion of state-owned land in Vilas County that is included in this plan.

Vilas County does support the plan; however, because of the small area involved (approximately 40 acres), the Vilas County Land Conservation Committee doesn't feel it is necessary to sign off on the plan.

If you have any questions or concerns, please contact me.

Sincerely,

Joseph Wisniewski

Joe Wisniewski
Chairman

JW/NH:pm

cc: Nancy Hollands, County Conservationist

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Summary

Introduction

This project summary provides an overview of the information contained in the Minocqua - Woodruff Priority Lakes Project Plan. The project plan offers watershed management recommendations and financial support through DNR to achieve lake water quality objectives.

Water quality degradation of area lakes has occurred since the area was first settled in the 1890' s. The last two decades have seen an increase in nonpoint source pollution . This includes:

- Construction Site Erosion
- Urban Stormwater Runoff
- Impacts from Lakeside Development

Minocqua and Kawaguesaga Lakes are showing signs of degradation from phosphorus inputs. Water quality is declining through increased populations of algae and aquatic plants, especially apparent in the bays around the lake. This project plan is being implemented to slow the process of lake aging by reducing the entry of phosphorus, sediment and heavy metals.

The Nonpoint Source program is administered by DNR to provide land owners and local governments solutions to protecting our water resources from the effects of nonpoint source pollution.

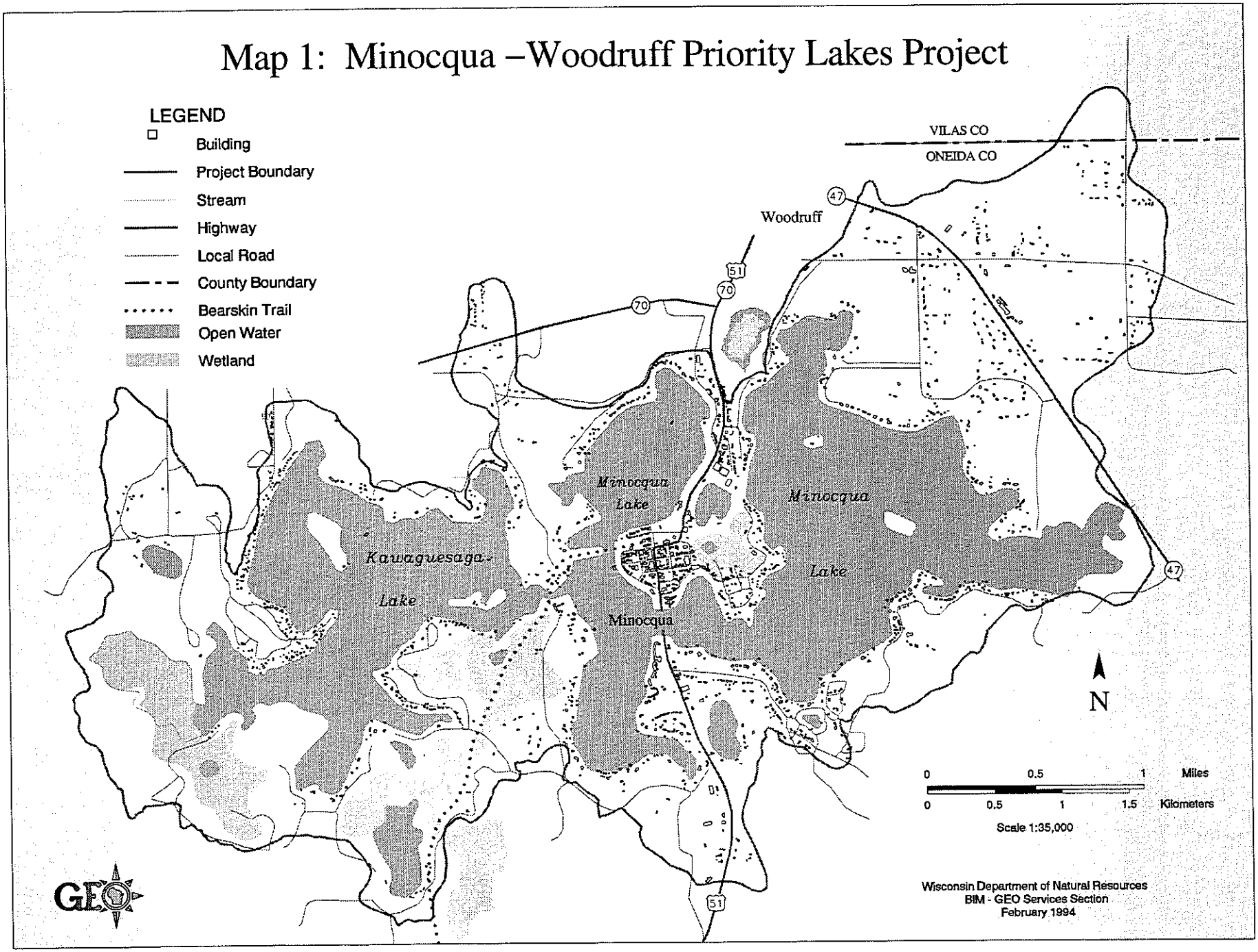
Watershed Characteristics

The watershed drainage area is approximately 72 square miles. Many high quality lakes are located here. The project area is approximately 10 square miles within the Towns of Minocqua and Woodruff (Map 1). Land use is comprised of woodlands, wetlands, urban, lakeshore and off water development. Much of this area is sandy soil except for wetland areas. There are no streams within the project area. Within the watershed the majority of nonpoint source pollution originates within the project area. Approximately 47% of the project area residents receive water and sanitary sewer service.

Water Resources

The project watershed consists of five named lakes and two unnamed lakes. Minocqua and Kawaguesaga lakes are the two largest lakes and most influenced by nonpoint source pollution. These lakes receive drainage from eight other lakes through the Tomahawk and Minocqua

Map 1: Minocqua –Woodruff Priority Lakes Project



Thoroughfares. This chain of lakes is controlled by a dam at the outlet of Kawaguesaga Lake, which is the headwaters for the Tomahawk River.

Minocqua and Kawaguesaga lake have been identified by DNR as high quality lakes. High quality resource values include water quality, a trophy fishery (muskellunge and walleye), cold- water fishery (cisco), and quality multi-use recreation.

Overall groundwater quality is good based on a limited well sampling study conducted in 1991.

Sources of Water Pollution

The Minocqua - Woodruff area is a winter and summer tourist mecca. Area water resources receive heavy use, which is predicted to increase in the future. Nonpoint source pollution originates from many sources within the urban and developed lakeshore areas. Nutrients, sediment, oxygen demanding substances, road salt and heavy metals such as lead and zinc enter the lakes from overland flow during rainfall or snow melt periods. Minocqua Lake receives these pollutants directly from a network of storm sewers in the urbanized area, known locally as the "Island". Much of this area is impervious from concrete and asphalt which provides little infiltration of rain or snow. There are no agricultural operations within the project area.

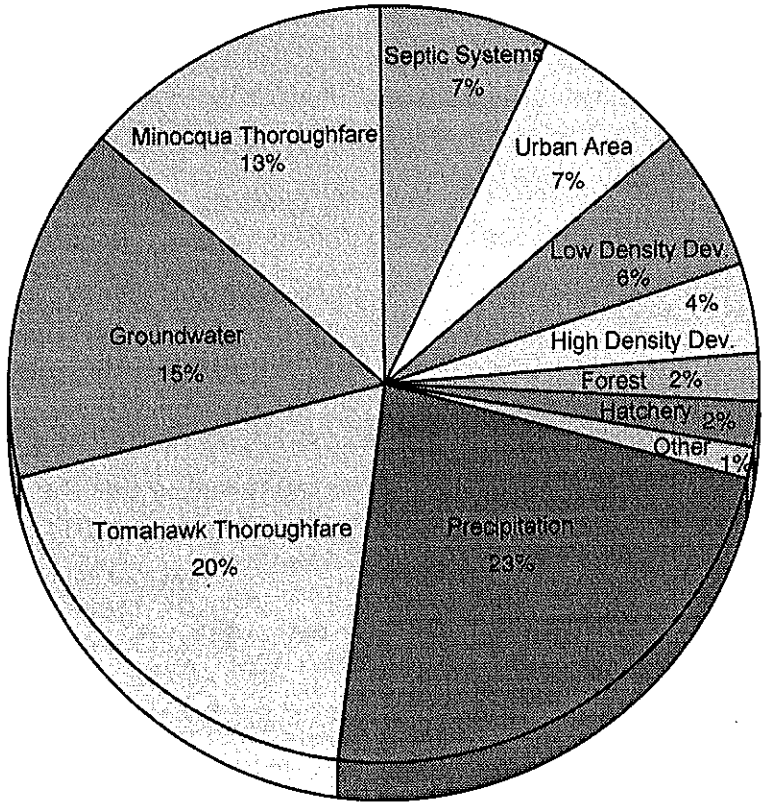
Estimates of phosphorus quantities from all major sources was completed using a water quality model. This information is used to target project management efforts. Figures 1 and 2 provide estimates of the amounts and sources of phosphorus which entered Minocqua and Kawaguesaga Lakes during 1991.

Project Objectives

Minocqua and Kawaguesaga Lakes have changed over the last 100 years and are showing signs of ecosystem degradation. This change is due primarily to human development within the watershed. Lake coring results on Minocqua Lake reveal an acceleration in lake sedimentation, and indicate water quality is now degrading at a rapid rate relative to the last 100 years. Aquatic plant surveys conducted by DNR in 1989 and 1993 show an increase in the diversity and density of rooted aquatic plants within Minocqua Lake (Johnson, 1993) this occurring over only a four year period.Lake water quality models reveal approximately 24 percent of the phosphorous to Minocqua Lake and an estimated 16 percent of the phosphorous to Kawaguesaga Lake are from nonpoint sources and septic systems.

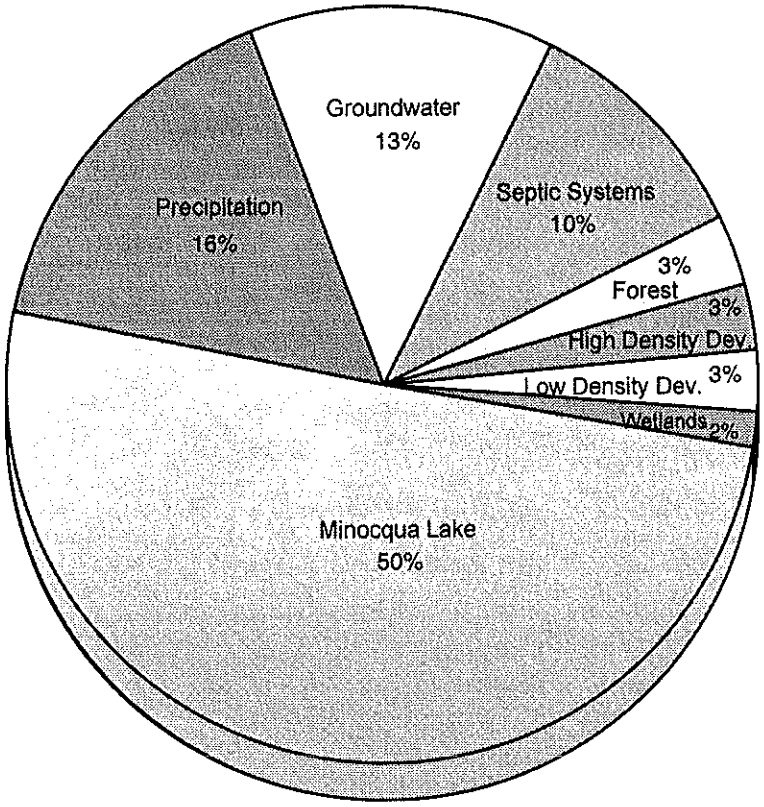
The objectives for this project are intended to maintain the lakes existing high quality resource

Figure 3-1 Sources of Phosphorus to Minocqua Lake



Source	Loading kg/yr
Precipitation	475
TomahawkThoroughfare	396
Groundwater	317
Minocqua Thoroughfare	277
Septic Systems	152
Urban Area	139
High Density Dev.	127
Low Density Dev.	79
Forest	42
Hatchery	40
Other	28

Figure 3-2 Sources of Phosphorus to Kawaguesaga Lake



Source	Loading kg/yr
Minocqua Lake	767
Precipitation	244
Groundwater	200
Septic Systems	157
Forest	46
High Density Dev.	43
Low Density Dev.	40
Wetlands	23

Based on Dillon & Rigler, 1974
Source: DNR, 1991

values through local implementation of water quality protection measures. This plan recommends the following objectives for pollution control during the project implementation period:

MINOCQUA LAKE

Safeguard water quality and aquatic habitat against further degradation.

POLLUTION REDUCTION GOALS

* Decrease phosphorous inputs from nonpoint source pollution and septic system discharges by 10 percent.

* Lower the quantity of heavy metals reaching the lake from nonpoint source pollution by 10 percent.

* Reduce lake sedimentation from nonpoint source pollution.

KAWAGUESAGA and other lakes within the watershed

Safeguard water quality and aquatic habitat against further degradation.

POLLUTION REDUCTION GOALS

* Decrease phosphorous inputs from nonpoint source pollution and septic system discharges by 10 percent.

* Reduce lake sedimentation from nonpoint source pollution.

A ten percent reduction was selected as a realistic goal for this watershed. Much of the existing nonpoint source phosphorus originates from many small sources, and significant reductions will most likely occur from information and educational efforts. Septic systems though not eligible through this program for financial assistance, will receive attention through the Towns educational program conducted as part of this project.

Recommended Management Actions

The project plan recommends a course of action for the Town of Minocqua in order to protect area lakes. Four approaches have been identified which, when implemented together should maintain existing water quality of all project lakes.

Pollutant Source Controls: Reduce pollution at the source. Examples include leaf collection, street sweeping and reducing the use of road salt, pesticides and fertilizers.

Reduce Runoff Volume and Treat Stormwater Pollutants: To accomplish this a variety of best management practices are suited, such as the use of grass swales instead of curb and gutter, oil/grit separators for stormwater runoff and stormwater infiltration under certain conditions.

Reroute Stormwater Discharges: Eliminating the discharge of stormwater into the lake brings great water quality benefits to the lake. The use of wetlands for stormwater discharge sites may be less harmful to the environment than discharging directly to a lake. The project plan has identified local stormwater management planning as a key component for reaching project goals.

Regulations for Pollution Prevention: Local ordinances can provide the legal framework for ensuring suitable management practices to control nonpoint source pollution. Ordinances can regulate new development to ensure surface and groundwater resources are protected from excessive stormwater runoff. This recommendation has been identified in the Town of Minocqua's Comprehensive Plan (1991).

The Department of Natural Resources will assist the Town of Minocqua during the extent of the project. Financial and technical aid is provided.

Information and Education Program

Local project staff will conduct an information and education effort throughout project implementation. The information and education program is very important to project success. Water quality improvements are most likely to result from local residents and tourists assuming part responsibility for the care of area lakes. This will be accomplished with the following activities:

- Quarterly Newsletter
- Public Service Announcements

- Newspaper Advertising
- Highway Signage
- Project Informational Display
- Construction Erosion, Stormwater and Septic System Informational Sessions
- School Presentations

Project Funding

The Department of Natural Resources will award grants to the Town of Minocqua for cost sharing, staff support and the educational program. Table 1 includes estimates of the financial assistance needed to implement nonpoint source pollution controls assuming 8 years of full implementation.

Table 1: Estimated Costs for Implementing the Minocqua-Woodruff Priority Lake Project (1)

Activity	Total Cost	State Share
Staff and Staff Support (2)	$224,000	$223,000
Basic Program Elements		
Information and Education (3)	42,400	42,400
Fall Leaf Collection (4)	---	---
Specific Program Elements		
Stormwater Management Planning (5)	20,000	20,000
Engineering Feasibility Studies for Existing Urban Area...	20,000	20,000
Design and Engineering for Structural BMP's (6)	75,000	50,000
Staff for Administering Stormwater Management Ordinance (7)	40,000	7,500
Parking Lot Sweeping (4)	---	---
Best Management Practices Demonstrations (8)	50,000	105,000
Totals	$571,400	$467,900

(1) Assumes 8 years of full implementation.
(2) Assumes additional staff of one part time position.
(3) Assumes $5,300 per year.
(4) Cost estimate not available. State support is limited to 5 years.
(5) Includes administrative and financing strategy development.
(6) Includes non-reimbursable engineering costs for future development in currently undeveloped areas.
(7) Assumes 8 years of additional staff or contracted services and a 50% shortfall in the local budget. Staff support is limited to 3 years.
(8) Assumes $50,000 for each demonstration at 70% cost sharing.

Project Evaluation

Project evaluation involves the collection, analysis and reporting of information in three major areas:

1. **Administrative** - The Town will produce an annual report on implementation of project activities. This report will include progress in attaining pollutant source controls such as a fall leaf collection, ordinance development, stormwater management, and information and education activities. This effort is intended to evaluate the effort of local project staff and keep the project on track.

2. **Pollutant Reduction Levels** - Reductions in nonpoint source pollutant loadings which result from the installation of Best Management Practices will be determined through computer modelling by the DNR. Site specific data will be collected by local project staff. Though not a direct measurement of water quality, this data will provide actual pollutant reductions to the lakes. These include sediment, phosphorus and the heavy metals copper, lead , cadmium and zinc.

3. **Water Resources** - Water quality monitoring will provide information to determine if the project objectives, to safeguard water quality and aquatic habitat, have been achieved. This is an important yet difficult task. Typically, intensive monitoring and financial resources over an extended period are necessary in order to adequately determine a water quality trend. This plan does recommend continued lake monitoring in order to assist local units of government, state lake managers, and local lake associations in future management decisions. Water quality monitoring will be conducted by Department of Natural Resources staff and citizen volunteers at two locations on Minocqua Lake.

Long Term Trend Lake Monitoring

The DNR will monitor one site as part of the on-going long term trend monitoring program. Minocqua Lake is one of fifty lakes from around the state which receive quarterly monitoring by DNR to assess the biological, chemical and physical water quality trends over an extended period.

Volunteer Lake Monitoring Program

Volunteer monitoring programs are DNR sponsored and enable local citizens the opportunity to be involved first hand in lake monitoring efforts. A local volunteer

will monitor water quality at two sites on Minocqua Lake. Water clarity and water chemistry sampling data being performed by these individuals is made available to DNR to complement the Departments efforts. Rooted aquatic plants will be surveyed lake wide over an indefinite period by a volunteer through a DNR sponsored program to detect a declining, sustaining, or increasing population of lake plants. Lastly, a zebra mussel monitoring program sponsored by the University of Wisconsin Sea Grant Institute, began in 1994, enlists a local volunteer to periodically monitor Minocqua Lake near a public boat landing for zebra mussel infestation.

If this lake protection project is successful, algae production should not increase significantly from levels currently being measured, despite an increase in land development. Local stormwater management planning is essential to reach project objectives.

Chapter One

Introduction, Purpose and Legal Status

Introduction

The Minocqua Chain of Lakes, a series of six interconnected navigable lakes, is an important water resource in the Lakeland Area of Oneida County. These lakes are very popular for numerous recreational pursuits. Water quality and the fishery are exceptional. Maintaining the quality of Minocqua-Woodruff Area lakes is key to sustaining the highly successful tourist based economy.

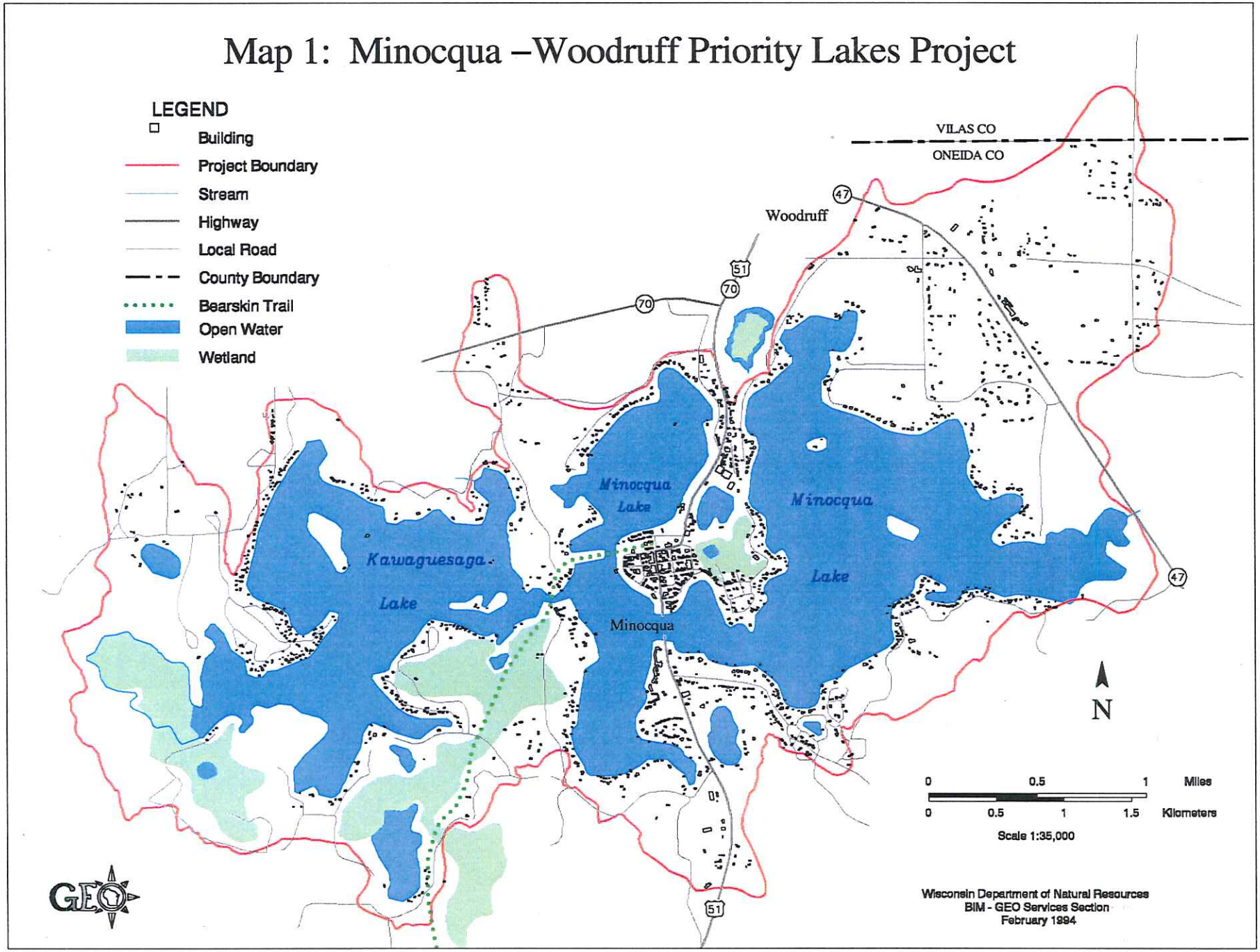
The long-term management of these lakes is a concern of local and state government. The Town of Minocqua in its Comprehensive Plan and the Department of Natural Resources in a 1991 Water Quality Management Plan identified the need to protect water quality of Minocqua and Kawaguesaga Lakes. In response to this need the Town of Minocqua in cooperation with the Town of Woodruff, accepted an offer in late 1990 from the Department to begin a Priority Lake Project through the Wisconsin Nonpoint Source Pollution Abatement Program.

The Minocqua-Woodruff Priority Lakes Project is the first project under this program which targets a high quality water resource for watershed management. The lands surrounding Minocqua and Kawaguesaga Lakes include high density lake development and a highly urbanized area drained by stormsewers. It is this area that contributes the greatest amount of nonpoint source pollution and is delineated as the priority lake project area (Map 1). Five smaller lakes are also located within the immediate drainage area and are included in the project. These lakes are not a part of the Minocqua system of lakes. The Minocqua Chain outlets to the Tomahawk River which drains to the Willow Reservoir and finally to the Wisconsin River.

Nonpoint Source Water Pollution Abatement Program

The Nonpoint Source Water Pollution Abatement Program was created in 1978 by the Wisconsin Legislature. The programs goal is to improve and protect the water quality of lakes, streams, wetlands and groundwater by reducing pollutants from urban and rural nonpoint sources. The program is administered by the Department of Natural Resources (DNR) and the Department of Agriculture, Trade and Consumer Protection.

Map 1: Minocqua –Woodruff Priority Lakes Project



Nonpoint source pollution includes: stormwater from streets, parking lots, construction sites, eroding shorelines, and lawn chemical use. Pollutants from nonpoint sources are carried to surface or groundwater through the action of rainfall runoff and snow melt.

The following is an overview of the program:

- The program focuses on hydrologic units called watersheds. If the watershed drains to a lake the program is often implemented as a priority lake project.

- A priority lake project plan is prepared cooperatively by the DNR, the Department of Agriculture, Trade and Consumer Protection (as pertinent) and local units of government with input from a local citizen's advisory committee. The priority lake plan assesses nonpoint sources and identifies Best Management Practices necessary to meet water resource objectives. The plan guides voluntary implementation of nonpoint source controls in an effort to achieve water quality objectives.

- Informational and educational activities are offered to encourage participation.

- Projects are implemented by local units of government such as counties and towns.

- State cost share assistance is available to help offset the costs for the design and installation of Best Management Practices (BMPs) for the most significant nonpoint sources.

- Structural BMPs may be installed anytime within the Nonpoint Source Grant period.

- The DNR reviews the progress of local units of government and provides assistance throughout the life of the project.

- Water quality is monitored often by the DNR to assess water resource improvements from control of pollution from nonpoint sources.

Purpose of the Project Plan

This Priority Lake Plan was developed to guide the implementation of best management practices and educational and informational efforts to control nonpoint sources of water pollution to meet the water resource objectives for lakes in the Minocqua-Woodruff project.

This plan is divided into eight chapters as described below:

Chapter 1. Introduction, Purpose and Legal Status provides a brief introduction of the projects intent.

Chapter 2. Description of the Project Watershed is an overview of the natural resource features pertinent to planning and implementation efforts for this project.

Chapter 3. Water Resource Conditions, Objectives and Nonpoint Source Pollution identifies the water quality or water resource problems and objectives for the Minocqua-Woodruff Priority Lakes Project. A pollutant control level is identified which is necessary for achieving the water resource objectives.

Chapter 4. Recommended Management Actions describes the best management practices and other nonpoint source control needs identified in Chapter 3.

Chapter 5. Local Governments Implementation Program outlines a strategy for assisting landowners and businesses to institute or install best management practices to control nonpoint sources. Included are local assistance and management practice budgets, an information and education program, and overall project administration.

Chapter 6. Other Water Resource Activities describes a strategy for involving other DNR resource management programs in the nonpoint source pollution abatement efforts of this project.

Chapter 7. Progress Assessments discusses the means for assessing the degree of nonpoint source control obtained through best management practices and an administrative review component.

Chapter 8. Water Resource Evaluation Monitoring outlines lake monitoring procedures which may be used for assessing water quality changes throughout implementation of the project.

Legal Status of the Project Plan

The Minocqua-Woodruff Priority lakes 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, the Towns of Minocqua and Woodruff and the Project Advisory Committee.

This plan is the basis for the DNR to enter into cost sharing 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.

Chapter Two

Description of the Project Watershed

Location

The project watershed is located virtually in its entirety within the Towns of Minocqua and Woodruff, Oneida County. A small parcel of the project area is located on state property in Vilas County in the Town of Arbor Vitae. The project area is approximately 10.2 square miles in size. The project lakes receive drainage from a much larger watershed system of approximately 72 square miles. Eight lakes drain into Minocqua Lake via the Minocqua and Tomahawk Thoroughfares. These lakes are not included in the project area. The majority of nonpoint source pollution occurs within the project watershed and is a more manageable size in terms of planning, then the entire watershed. Therefore the other lakes were not included in the project area. The system outlet is the dam on Kawaguesaga Lake which is the headwaters of the Tomahawk River.

Land Resources

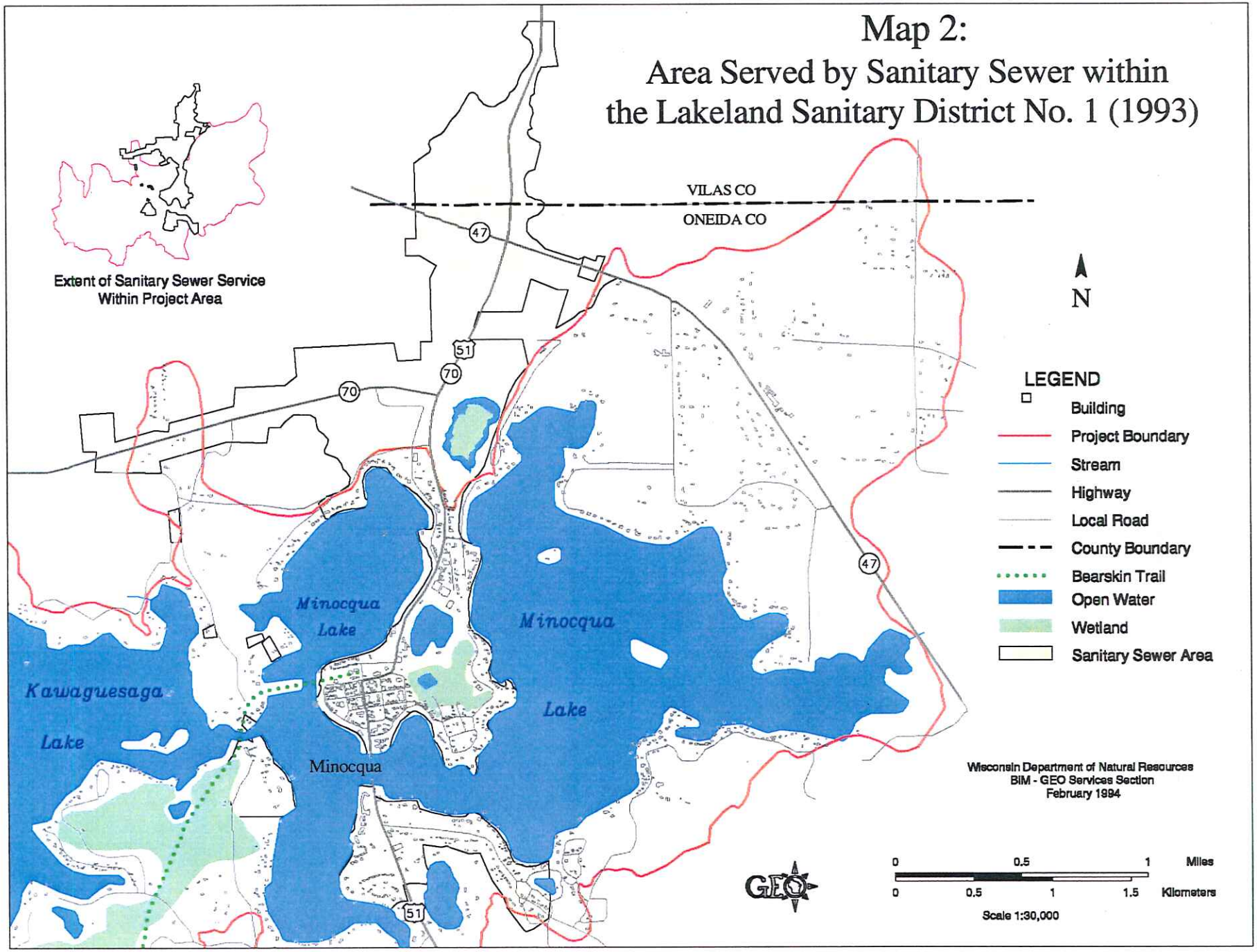
Land use is comprised of year-round, vacation or second homes, forested lands and commercial development (motels/resorts, shopping areas, restaurants, etc.). The area lakes have made the Minocqua-Woodruff area a highly popular retirement and recreational area. Many residents are seasonal.

The urban area located primarily along State Highway 51 is best characterized as a tourist oriented commercial center. The non-urban area of the watershed is primarily lake side and off water homes, resorts, forested land and wetlands. The lands along the far eastern side of the project boundary are part of the Northern Highland-American Legion State Forest. The Bearskin Hiking Trail, a former railroad line, runs for the most part north to south through the watershed.

The Minocqua-Woodruff area has experienced a steady growth rate for the last decade (Minocqua Comprehensive Plan, 1991) and consistently leads Oneida County in building construction activity. Sanitary sewer service is provided by the Lakeland Sanitary District No. 1 to all of the "island" and other areas to the north, south and west (Map 2).

The area served by sanitary sewer will continue to expand. The wastewater treatment plant is

Map 2:
Area Served by Sanitary Sewer within the Lakeland Sanitary District No. 1 (1993)



located outside of the watershed and discharges treated effluent to the Tomahawk River.

The area topography can be described as pitted outwash with mostly hilly terrain. Both flat and steep slopes are found within the area.

Common soil types are loamy sands and sands on the uplands, and muck or peat soils in the wetland areas. The sandy soils are conducive to infiltration of rain water and melting snow, when the soil is not frozen. Large areas of wetlands are adjacent to Kawaguesaga Lake. Smaller wetland areas are located on Baker and Minocqua Lakes. Scattered throughout the watershed are areas, usually small in size, that are closed depressions. These internally drained areas receive surface runoff but do not have an outlet.

Water Resources

The project watershed consists of five named lakes and two unnamed lakes. Table 2-1 contains information on each of the lakes. There are no streams in the project area.

Table 2-1: Minocqua-Woodruff Project - Lake Information

Lake	Maximum Depth (feet)	Mean Depth (feet)	Size (acres)	Type of Lake
Minocqua	60	22	1,357*	Drainage
Kawaguesaga	44	17	670*	Drainage
Baker	9	--	42	Spring
Clawson	22	--	21	Seepage
Jerome	19	--	3.3*	Drainage
Unnamed Lake 14-03	16	--	2.2	Seepage
Unnamed Lake 17-4	10	--	13.2	Seepage

* Acreage at full pool.

Minocqua and Kawaguesaga lakes are part of the Minocqua Chain of Lakes. The water level on lakes Minocqua, Kawaguesaga and Jerome is controlled by the dam at the outlet of Kawaguesaga Lake. Baker and Jerome lakes have outlet streams to Kawaguesaga and

Minocqua respectively. Clawson Lake is a seepage lake with neither an inlet or outlet. Lake 14-3 located at the center of the "island" is a seepage lake completely encircled by wetlands, and lake 17-4 drains to a wetland adjacent to Kawaguesaga Lake. Public boat landings are available only on Minocqua Lake giving access to Kawaguesaga, Jerome and Baker Lakes via waterways. Clawson Lake and the unnamed lakes currently have no public access.

Water levels have been manipulated on the Chain of Lakes since the 1890's when the dam was operated for transporting logs to downstream sawmills. The Wisconsin Valley Improvement Company (WVIC) acquired the Minocqua Dam in 1907 and changed operation of the dam to achieve a more uniform downstream river flow. WVIC is a private corporation organized under the laws of Wisconsin. The dam is not used for hydro-electric power generation. Currently the Minocqua "Reservoir" is operated to store runoff during the spring period and generally reaches full pool level by the end of May. The lakes remain relatively stable until the winter drawdown period. The winter drawdown maximum is 2.33 feet below the full lake elevation. The maximum summer drawdown is 1.0 feet. The Federal Energy Regulatory Commission is in the process of reviewing the WVIC dam relicensing application which proposes little change in the current water level operations of the reservoir.

The Department of Natural Resources has identified Minocqua and Kawaguesaga Lakes as high quality lakes. High quality resource values include water quality, a cold-water fishery (cisco), trophy fishery (muskellunge and walleye) and high quality multi-use recreation.

The great majority of the urbanized area, which is concentrated on the "island" and areas north and south along Highway 51, are impervious lands. Polluted runoff from vast areas of rooftop, asphalt and concrete is discharged to Minocqua Lake via an in-ground storm sewer network. High density lake development generates additional pollutants and further impacts the lake resource. The other lakes receive stormwater by surface runoff only. Long-term water quality is being threatened by runoff from nonpoint source pollution. Chapter 3 presents a more detailed discussion of the local water resources.

Groundwater

The source of drinking water for all watershed residents is groundwater. Wells in the area draw water from a sand and gravel aquifer. An aquifer is a water bearing geologic formation. Water in this aquifer is recharged locally by precipitation and seepage into the soil and underlying glacial deposits. Overall groundwater quality is very good. Chapter 3 provides additional information on groundwater quality.

Municipal sewer and water service is supplied and operated by the Lakeland Sanitary District No. 1. The sanitary district supplies sewer and water services to approximately 53% of the watershed residents. Two wells now serve customers of the sanitary district. The wells are located in the southeast portion of the "island". Groundwater and soil near the wells are currently being treated to remove a dry cleaning solvent which spilled onto the ground and seeped into groundwater. Groundwater is pumped to the surface and aerated over a step cascade to evaporate the solvent. This water is then discharged into Minocqua Lake. This clean up project is very close to restoring the aquifer.

Endangered and Threatened Species

The Department of Natural Resources maintains a record of Endangered, Threatened and Special Concern plant and animal species concerns in the State of Wisconsin, as defined below:

Endangered:	Any species in danger of being extirpated in Wisconsin.
Threatened:	Any species likely to become endangered in Wisconsin.
Special Concern:	Any species which may be experiencing abundance or distribution problems in Wisconsin and needs further study to determine its' status. This category is to focus attention on certain species before they become threatened or endangered.

Within the Minocqua-Woodruff Priority Lakes Watershed, the following species have been sited and given special designation:

Wisconsin Endangered Species:

- Canadian Lynx

Wisconsin Threatened Species:

- Bald Eagle
- Osprey

Wisconsin Special Concern Species:

- Lake Herring (Cisco)

It should be recognized that other endangered, threatened, or special concern status species

may be present within the watershed, either permanently or for a temporary time.

The cisco as a Special Concern Species requires special observation to identify conditions that might cause a decline or factors that could help to ensure their survival. The greatest threat to the cisco population in inland lakes is the enrichment of the water. During summer this condition results in the depletion of oxygen in the lower stratum (hypolimnion) and forces the cisco into the upper strata, where temperatures are unfavorable for survival (Becker 1983).

Natural Areas

High quality natural communities can be designated as State Natural Areas by the DNR and the Natural Area Preservation Council. These special areas have escaped most, if not entirely, exploitation and are devoted to scientific research and preservation of their natural values. They are not intended for intensive recreational uses like picnicking or camping.

At the southwest end of Kawaguesaga Lake is located the Finnerud Pine Forest, an old growth, northern, dry mesic forest Natural Area. This 120-acre parcel features an old growth, red pine stand more then 140 years old, with many trees in the two-foot diameter size class. A 36-acre open bog is also part of this property. This property is immediately adjacent to Kawaguesaga Lake. Permission for access must be obtained from the property manager.

Chapter Three

Water Resource Conditions, Objectives and Nonpoint Source Pollution

Introduction

The lakes in northern Wisconsin were formed during the last glacial period about 11,000 years ago. Each lakes inherent natural characteristics are greatly influenced by geologic features and soil characteristics. As time progresses however, a lake undergoes an "aging process" which slowly alters the lake ecosystem. This process is directed by the numerous inputs to the lake which are both natural and manmade or cultural in origin. Sediment and nutrients, primarily phosphorus, are the key inputs which influence the future water quality of these lakes.

Sediment and phosphorus originate from natural and manmade sources. The manmade sources include a mix of nonpoint and point source pollution. Point sources within the Minocqua-Woodruff Project area include two contaminated groundwater treatment system discharges into Minocqua Lake. A DNR operated fish hatchery also discharges into Minocqua Lake on a seasonal basis. Nonpoint source pollution as described previously, runs off the land and into surface or groundwater. Nonpoint source pollution will continue to increase as more watershed development occurs through time. How this development occurs and what measures are taken to minimize future and present runoff into the lakes and groundwater will directly affect the future quality of the Lakeland area water resources.

Surface Water

Minocqua and Kawaguesaga Lakes have good water quality and support a diverse warm-water fishery and a lake herring (Cisco) cold-water fishery. Minocqua and Kawaguesaga lakes have a very large watershed (73 square miles), typical of drainage lakes. These lakes are classified as mesotrophic. The lakes in this category are quite productive and experience occasional algal blooms and oxygen deficient hypolimnions (bottom water) during the summer. These lakes are very popular and are utilized year round for a wide array of recreational activities.

Land use within the project watershed is dominated by forest and wetlands. Low density residential and, too a lesser extent, high density residential and urban lands are also present.

The urban area is confined to Minocqua Lake. The shorelines are for the most part, nearly all developed. New development occurs primarily on off-water parcels. This development, in many cases, can further degrade water quality without stormwater management planning.

Intensive studies of Minocqua and Kawaguesaga Lakes were conducted as a part of this project. Baker and Jerome Lakes were also surveyed for water quality information. Clawson and the unnamed lakes were not included. These lakes are seepage lakes and do not currently have public access. All these lakes have good overall water quality.

Land use types were inventoried using air photos and topographic maps for use in a water quality predictive model. The model was used in conjunction with the water quality monitoring data in order to estimate the quantity and sources of phosphorus entering Minocqua and Kawaguesaga Lakes. Phosphorus is a nutrient which stimulates the growth of algae and aquatic plants. Additional phosphorous will promote the growth of aquatic plants and algae which leads to habitat and water quality degradation.

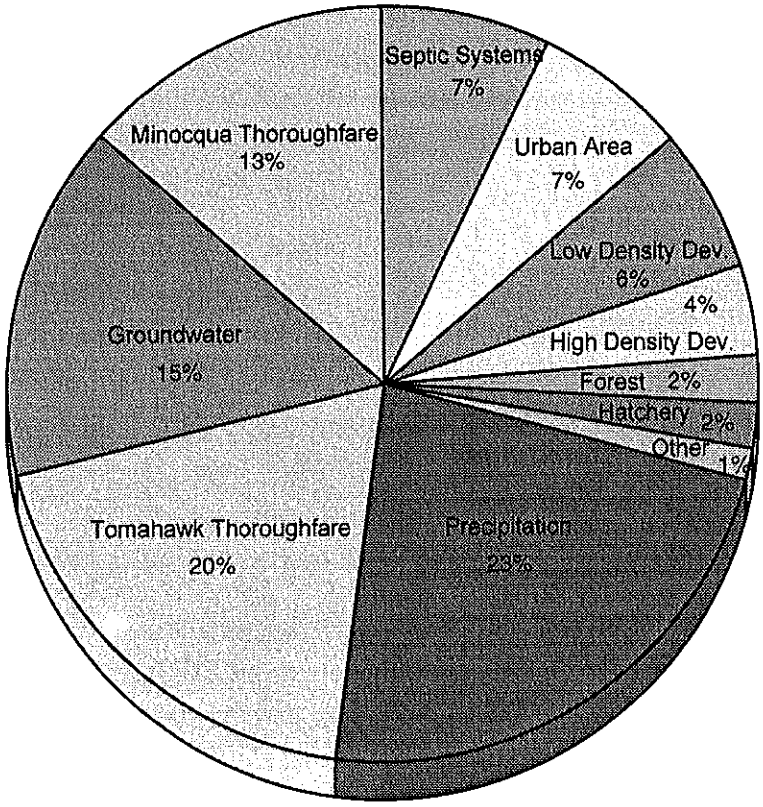
Water Quality Lake Model

A lake water quality model (Dillon and Rigler, 1974) was used to calculate the phosphorus loading from existing land use within the watershed. An annual phosphorus loading estimate (1991 data) to Minocqua and Kawaguesaga Lakes is presented in Figures 3-1 and 3-2. These data reflect natural sources of phosphorus and sources brought on through land use development. Specifically, low and high density development, urban areas and septic systems contribute phosphorus brought on by mans activity. Within the project area these three sources contribute approximately 24% of the phosphorus to Minocqua Lake and 16% of Kawaguesaga's annual phosphorus load. The remaining phosphorus for the most part is naturally occurring, the largest source being precipitation. Nonpoint source pollution outside of the project area is not a significant source of phosphorous. The Minocqua and Tomahawk Thoroughfare phosphorous estimates include all land use types including developed areas. Phosphorus loading from undeveloped lands however is minimal, with much of the watershed in State ownership.

Lakes draining to the Minocqua Thoroughfare, which include Big and Little Arbor Vitae, Carrol, and Madeline Lakes are naturally quite fertile. The Department of Natural Resources fish hatchery and rearing ponds, a regulated point source discharge, contributes approximately 2% of the phosphorus to Minocqua Lake.

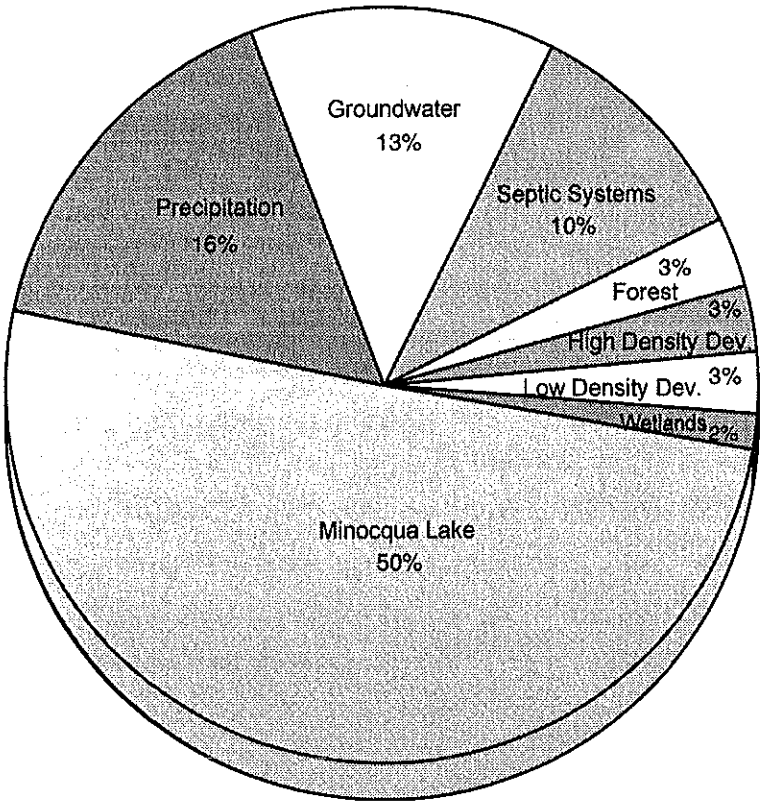
Minocqua and Kawaguesaga Lakes, being irregular in shape, have differing water quality

Figure 3-1 Sources of Phosphorus to Minocqua Lake



Source	Loading kg/yr
Precipitation	475
TomahawkThoroughfare	396
Groundwater	317
Minocqua Thoroughfare	277
Septic Systems	152
Urban Area	139
High Density Dev.	127
Low Density Dev.	79
Forest	42
Hatchery	40
Other	28

Figure 3-2 Sources of Phosphorus to Kawaguesaga Lake



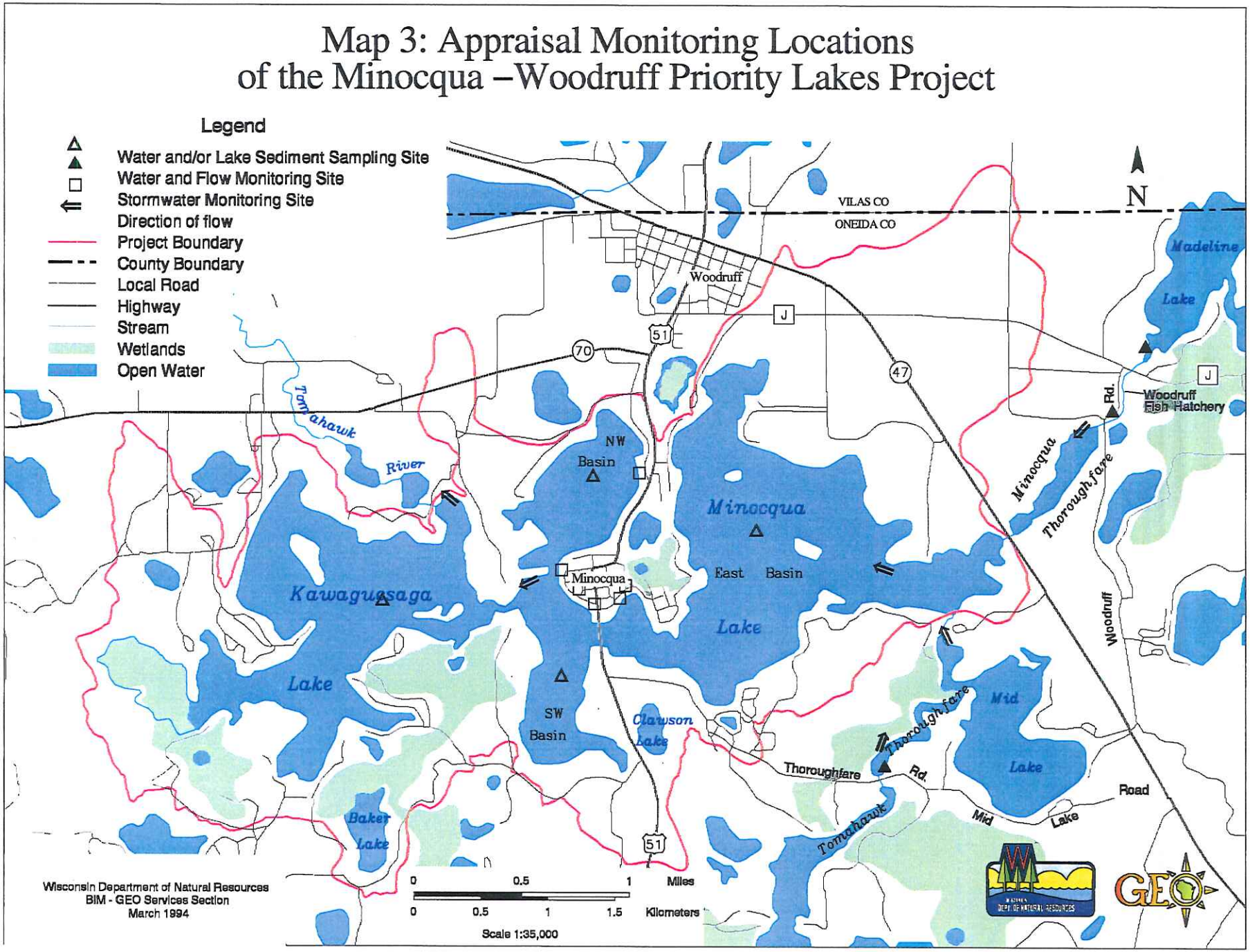
Source	Loading kg/yr
Minocqua Lake	767
Precipitation	244
Groundwater	200
Septic Systems	157
Forest	46
High Density Dev.	43
Low Density Dev.	40
Wetlands	23

Based on Dillon & Rigler, 1974
Source: DNR, 1991

characteristics within the bays or basins of each lake. Water quality monitoring was completed at three sites in Minocqua Lake and at one site in Kawaguesaga Lake. Map 3 shows the monitoring site locations, which are the deepest areas within each lake basin. Water quality was determined through chlorophyll-a values (an indicator of algae populations), phosphorus concentrations and water transparency. These measurements were used to calculate a water quality index for each lake basin. The highest water quality was measured in the east basin of Minocqua Lake (less eutrophic). The northwest basin was slightly lower in water quality than the southwest basin. Kawaguesaga Lake, in general, had the lowest water quality.

The northwest basin of Minocqua Lake receives the highest percentage of phosphorus originating from nonpoint source pollution (32%). The basin shoreline is highly developed and receives drainage from very urbanized landuse. Sewage was discharged into an adjacent bay for approximately 35 years. The degree to which this discharge has affected the lake is unknown. Wastewater effluents contain phosphorus and the northwest basin is presumably now higher in phosphorus than if no wastewater was discharged. The retention or flushing rate for the northwest basin is about 3.5 years. Flushing rates are the average length of time water remains within a lake or basin. Rapid water exchange rates allow nutrients to be flushed out of the basin or lake quickly. The northwest basin has the longest flushing rate relative to the other basins. Phosphorus is retained within this basin for a longer period than the other basins. This results in an increase in the growth of algae and aquatic plants. Efforts to minimize nonpoint source pollution and septic system effects will have a greater impact within this basin than other basins. However, water quality will be very slow to improve and take many years, even decades. Phosphorus enrichment will continue from phosphorus stored within the basin sediments.

Map 3: Appraisal Monitoring Locations of the Minocqua –Woodruff Priority Lakes Project



Urban Nonpoint Source Pollution Model

An urban stormwater computer model was used by DNR to estimate the quantity of sediment, phosphorous and certain heavy metals which drain the urban area and discharge into Minocqua Lake. For planning purposes the urban area was delineated as shown in Map 4. A large amount of this surface area is impervious to rainfall and is drained via a stormsewer system. The urban area is more populated than other parts of the project area and also receives a greater level of motor vehicle traffic.

Approximately 14 stormsewer outfall pipes are located within the project's urban area and discharge into Minocqua Lake. The commercial area contributes the greatest quantity of pollutants in total and per acre within the urban area (Table 3-1). Commercial areas are very impervious, receive high motor vehicle use and, in general, accumulate more debris than non-commercial areas. Motor vehicles in particular are the source for a wide array of pollutants contained in urban stormwater runoff. These pollutants include: metals and hydrocarbon compounds from exhaust emissions, crankcase oil, gasoline, coolants, and hydraulic fluids; particles worn from break shoes, clutch linings and tires; rust and dirt; and the abrasion of asphalt surfacing.

Urban stormwater drainage was sampled at six locations in 1991 as part of the study for the project. The concentration of metals found in the samples were typical of urban stormwater, and are toxic to many forms of aquatic life. If more land is paved through future development, a corresponding increase in the level of pollutants draining to the lake is very likely to occur. A stormwater management program can minimize the toxic effects from stormwater runoff as described in Chapter 4.

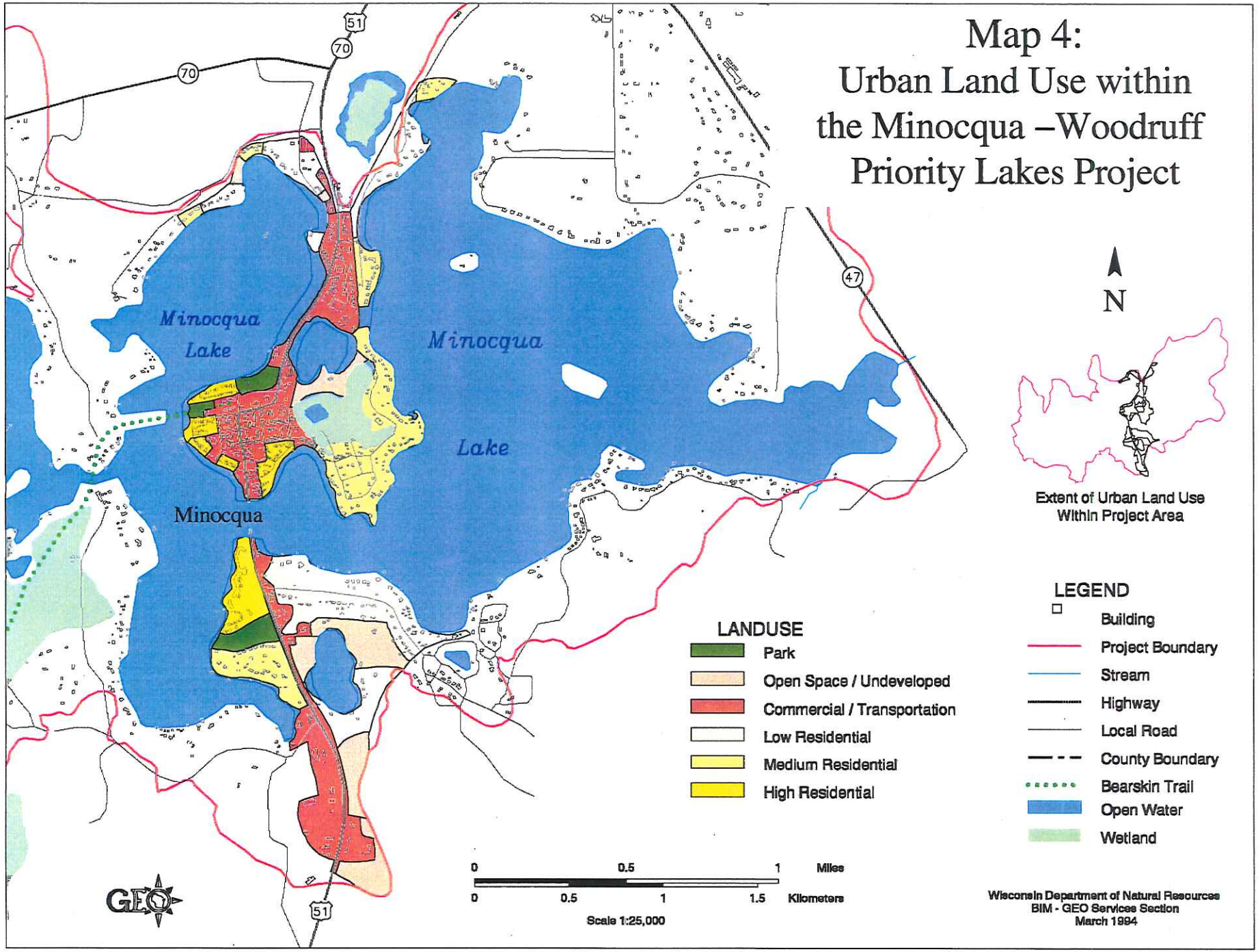

Map 4:
Urban Land Use within the Minocqua –Woodruff Priority Lakes Project
Minocqua Lake
Minocqua Lake
Minocqua
51
70
70
47
N
Extent of Urban Land Use Within Project Area
LANDUSE
Park
Open Space / Undeveloped
Commercial / Transportation
Low Residential
Medium Residential
High Residential
LEGEND
Building
Project Boundary
Stream
Highway
Local Road
County Boundary
Bearskin Trail
Open Water
Wetland
0 0.5 1 Miles
0 0.5 1 1.5 Kilometers
Scale 1:25,000
GEO
Wisconsin Department of Natural Resources
BIM - GEO Services Section
March 1994

Table 3-1: 1991 Urban Land Use and Associated Pollutant Loads*

	Area		Pollutant				
Land Use	Acres	%	Phosphorus (lbs)	Sediment** (tons)	Lead (lbs)	Copper (lbs)	Zinc (lbs)
Commercial	142	30	184	59	65	27	179
Residential	258	54	90	17	10	5	36
Open Space	61	13	1	<1	<1	<1	<1
Parks	17	3	<1	<1	<1	<1	<1
Totals	478	10	275	76	75	32	215

* For planning purposes, urban land use includes those lands served by the Lakeland Sanitary District including the drainage areas to Clawson Lake.

Historical Water Quality - Paleolimnology

Lake sediments can provide much information about the water quality of a lake. Laboratory investigations of certain aquatic life found preserved within the sediment can reveal much about the lakes past. During 1991, undisturbed lake sediment cores were obtained from each of the deep basins within Minocqua Lake and one core from Kawaguesaga Lake (Map 4). Estimates of microscopic plant (algae) and animal (zooplankton) populations were determined for each core. The sediment layers were dated and when paired with population data, historical water quality is then reconstructed.

The lake sediment coring work determined there has been considerable changes in the three basins of Minocqua Lake within the last century (Garrison and Hurley, 1991). Data gathered indicates that the water quality of all three basins of Minocqua Lake have progressively declined since the coming of the railroad across the lake in 1887. The coming of the railroad spurred tremendous growth. Loggers, homesteaders and tourists poured into the area. Photographs of the town from this era reveal vast area of bare ground, dirt roads, and many fill areas on the shore of the lake for bridge and other types of construction. Lake sedimentation began to increase at a very rapid rate. The Woodruff Fish Hatchery began operations in 1906 which began discharging hatchery wastewater into the Minocqua Thoroughfare. The affects of this discharge to lake water quality are not known. It should be noted that the construction of the dam on the Tomahawk River in 1889 raised the lake level almost 1 meter.

Lake Sedimentation

As part of this project, three basins in Minocqua Lake were also studied to measure the rate of lake sedimentation. Lake sediment cores reveal a chronology of lake degradation since the 1890's (Figure 3-3). Around the 1920's the sediment accumulation rate stabilized. The rate remained relatively unchanged until the 1960's. About 1970 the sediment accumulation rate increased in all the basins with an increase in home construction throughout the watershed. The east.basin has been less effected because of its' large size and longer distance from much of the sediment source.

Nutrients & Diatom Studies

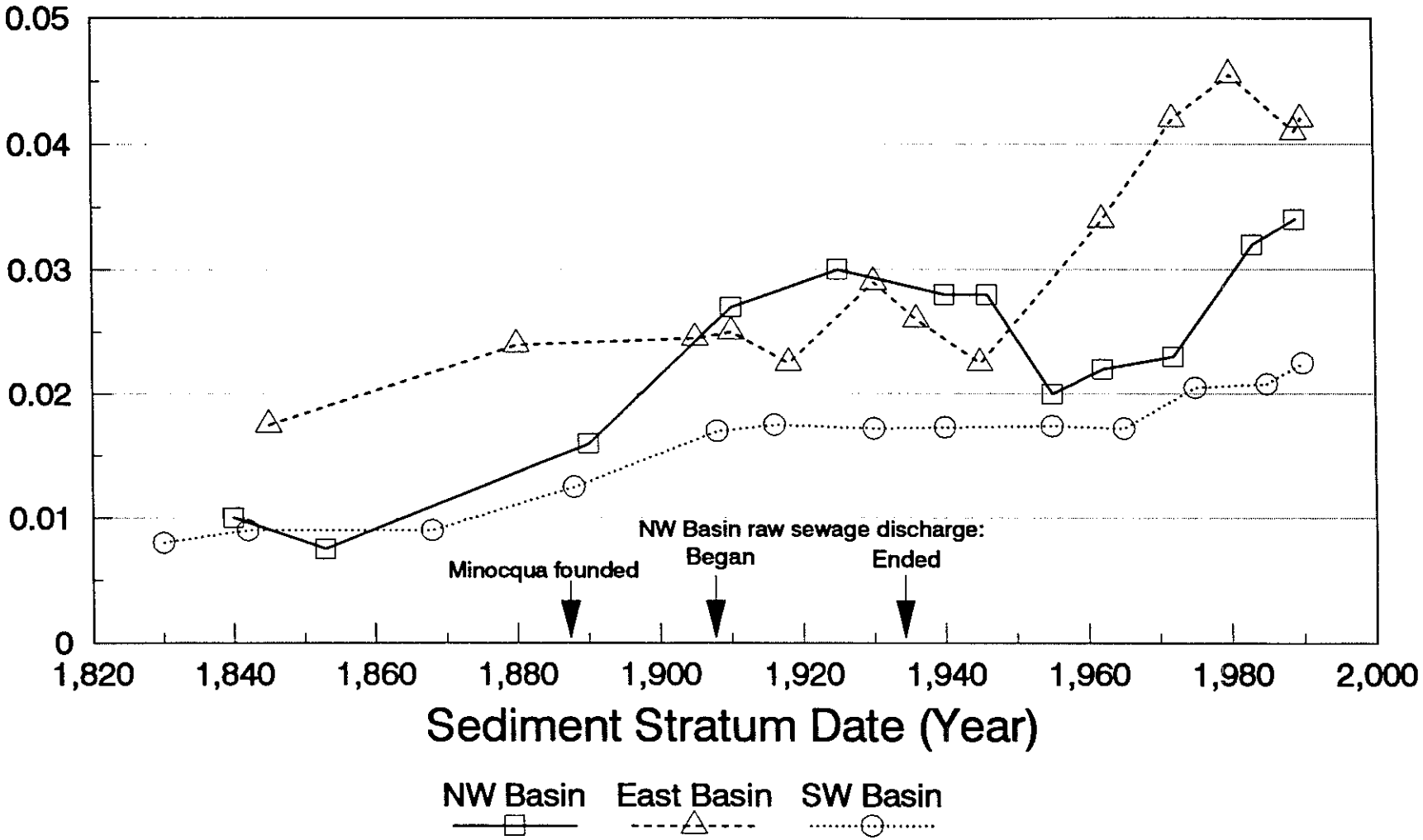
As the watershed was developed over the last 100 years the level of lake nutrients increased due to uncontrolled runoff and the discharge of sewage. The northwest basin received untreated sewage from the Minocqua community from 1907 to 1935. A treatment plant was constructed in 1936 and continued discharging treated sewage into the basin until 1964 when a modern treatment facility was built and began discharging to the Tomahawk River. The increase in nutrients brought change to the aquatic ecosystem. Diatoms are a type of algae which remain preserved in lake sediments. The type or species of diatoms which dominate a particular layer of lake sediment are an indicator of water quality during the time a particular layer of sediment was formed. In all three cores the dominant pre-development species of diatom (Aulacosira ambigua), an indicator of good water quality, has declined over the last century. The abundance of diatom species which are indicative of increasing lake nutrients (Fragilaria crotonenesis and Tabellaria flocculosa) have increased over the same time period. This information is very meaningful because it indicates a progressive, although relatively slow, decline in water quality since 1890 with an acceleration of the degradation since about 1975.

The southwest basin has degraded much more rapidly than the other basins. Water quality in the main basin, in general, has been more stable until the last 5 years. Changes in the diatom community appear to indicate that water quality is degrading at a faster rate in recent years then any other time in history. This correlates with the recent increase in sedimentation rates.

Groundwater Conditions

Within the Minocqua-Woodruff area, groundwater is the source of drinking water for private well owners and those served by the towns municipal water supply. A sand and gravel water-table aquifer is the source of water for the great majority of area wells. This aquifer is relatively

FIGURE 3-3 Lake Minocqua Sediment Core Data *



* From Garrison(1993)

shallow and the overlying glacial deposits are highly permeable. Various pollutants are therefore, capable of being readily transported through the sand and gravel deposits into the water supply.

A well water monitoring program conducted in July 1991 analyzed groundwater from 23 private water supply wells within the project area. Results of this study suggest overall good quality groundwater in the Minocqua-Woodruff area. Outlined below are selected results from the monitoring study.

Coliform Bacteria

Thirteen percent of the samples tested positive for the presence of coliform bacteria. However, because these samples were obtained by homeowners themselves, some samples may have become contaminated as a result of sampling technique. Coliform bacteria should not be present in groundwater. When coliform bacteria are found in groundwater it indicates that wastes may be contaminating the water and disease causing organisms may have entered groundwater. Septic system drain field effluent and surface runoff near poorly constructed wells are probable sources of bacterial contamination.

Nitrate

Low concentrations of nitrate are a natural chemical component of groundwater. However, nitrate becomes a health concern for pregnant woman (the fetus) if consuming water above the drinking water standard.

Sampling results revealed 9% or 2 well water samples were elevated above naturally occurring or background levels. Within the project area nitrates from human activity enter groundwater primarily from lawn fertilization and septic system drain fields. One well water sample exceeded the drinking water standard.

Chlorides

Northern Wisconsin groundwater is naturally low in chlorides. Chloride concentrations above naturally occurring levels were found in 26 percent of the wells sampled. Chloride is not toxic, however, it leaches readily through most soils in the Minocqua-Woodruff area. Elevated levels point to groundwater contamination from a variety of sources. The probable origins of chloride contamination are septic systems, road salt, fertilizer or other wastes.

Phosphorus

Groundwater sampling of home water supplies revealed concentrations of dissolved or reactive phosphorus at variable concentrations. Groundwater phosphorus levels in glacial outwash deposits are naturally variable and are difficult to interpret in terms of surface water impacts without more detailed monitoring. The source of natural groundwater phosphorus is normally leached from soil organic matter, and from glacial deposits which contain phosphorus in contact with groundwater. Elevated phosphorus levels are not a health concern, but may indicate a contamination source.

Groundwater phosphorus is a significant source of the phosphorus entering Minocqua and Kawaguesaga Lakes. See tables 3-1 & 3-2. The majority of the groundwater phosphorus is from natural sources. However, septic systems, most lawn fertilizers, and other wastes contribute to groundwater phosphorus in sandy soils (Ellis and Childs, 1973). The great majority of soils in use as septic system drain fields within the Minocqua-Woodruff area are characterized as inadequate for septic tank effluent disposal (Boelter, 1993). Sandy soil serves as a poor filter for phosphorus and many other contaminants.

Groundwater Protection

Accidental spills or leaks from commercial and industrial sources which can contaminate groundwater will always occur. Chapter 2 mentions a very serious groundwater contamination incident which occurred in Minocqua, that almost eliminated the towns only remaining viable municipal well. Minimizing the risk of spills and leaks can greatly reduce further contamination incidents of goundwater and surface water. Chapter 4 briefly describes how the towns can protect their existing and future well fields from threats due to spills and leaks.

Wetlands

Wetlands are a significant land use type representing approximately 15% (one square mile) of the project area. Many of these wetlands drain into Baker and Kawaguesaga Lakes. The largest area of wetlands on Minocqua Lake are located near the inlet of the Minocqua thoroughfare. These wetland areas are typically large areas of black spruce, tamarack, or floating bogs. Numerous small isolated wetlands are also scattered throughout the entire region.

Wetlands serve many important functions. They provide wildlife habitat, can reduce stormwater impacts to adjoining lakes, and provide groundwater recharge. Located near the center of the

Minocqua "island" is a wetland area of approximately 21 acres which is not riparian to Minocqua Lake. A small seepage lake of nearly 2 acres is found within the wetland. Little is known about this small lake. The wetland consists of open areas of emergent vegetation and a wooded fringe of mostly black spruce. Storm sewers currently discharge on the south and western edge of the wetland. Chapter 4 contains a recommendation to further consider the use of this wetland as a stormwater discharge site as opportunities become available for the re-routing of existing storm sewers or as new sewers are designed. Wetland protection standards, Wisconsin Administrative Code NR103, should be adhered too with any proposed wetland discharge.

Water Resources Objectives

Minocqua and Kawaguesaga Lakes have changed over the last 100 years and are showing signs of ecosystem degradation. This change is due primarily to human development within the watershed. Lake coring results on Minocqua Lake reveal an acceleration in lake sedimentation. Aquatic plant surveys conducted by DNR in 1989 and 1993 show an increase in the diversity and density of rooted aquatic plants within Minocqua Lake (Johnson, 1993).

Lake water quality models reveal approximately 24 percent of the phosphorous to Minocqua Lake and an estimated 16 percent of the phosphorous to Kawaguesaga Lake are from nonpoint sources and septic systems. Algal studies of lake sediment cores indicate water quality is now degrading at a rapid rate relative to the last 100 years.

In order to maintain high water quality this plan recommends the following objectives for pollution control during the project implementation period:

Water Resource Objectives

MINOCQUA LAKE

Safeguard water quality and aquatic habitat against further degradation.

* Reduce lake sedimentation from nonpoint source pollution.

* Decrease phosphorous inputs from nonpoint source pollution and septic system discharges by 10 percent.

* Lower the quantity of heavy metals reaching the lake from nonpoint source pollution by 10 percent.

KAWAGUESAGA and other watershed lakes

Safeguard water quality and aquatic habitat against further degradation.

* Reduce lake sedimentation from nonpoint source pollution.

* Decrease phosphorous inputs from nonpoint source pollution and septic system discharges by 10 percent.

The future of these lakes was well stated nearly three decades ago in an Oneida County water resources inventory publication and is still true today.

A lake-dimpled and stream-threaded landscape clad in forests is Oneida County's real heritage. It provides the raw materials for the county's second largest industry-recreation. Inherently these water assets are of high quality, born in the finest watersheds nature can provide, but they are fragile and must be intelligently managed.

The fishery and game resource has habitat needs, and to destroy essential habitat is equivalent to killing the resource. Waters have delicate ecosystems which can be thrown out of balance by a slug of pollution or enrichment. Imbalances are measured in winterkill, dense weed beds and smelly waters--and some are so subtle they are never measured.

Fitting the harsh angular world of man into the gentle curving lines of nature is the challenge of the future. There will be more men but no more lakes and streams. Respect for the lakes and streams should be the order of the day. Respect can be manifested through adequate land use controls and pollution abatement. Oneida County has been first in land use controls before, it can be first again.

Lloyd M. Andrews and C. W. Threinen,
DNR Fish Biologists 1966

Chapter Four

Recommended Management Actions

Introduction

This chapter identifies the nonpoint source pollution control actions which are necessary to achieve the water resource objectives presented in Chapter 3. Nonpoint source pollution controls, rely in part, on structural means to reduce pollution, such as a stormwater infiltration system. In addition an aggressive and comprehensive information and education program is critical in order to foster among residents and non-residents an individual responsibility for protecting the water quality of area lakes. Chapter 5 describes a public education program to accomplish this objective.

Individuals, local government, and area businesses should assume an increasing responsibility for protecting water quality of area lakes. The Minocqua Comprehensive Plan has identified a number of specific water quality goals which are necessary to protect the regions water resources. The actions identified within this nonpoint source control plan will build upon the Town's comprehensive plan and offer financial support, as allowed by rule, to attain mutual water quality goals and objectives. It is important to note that water quality factors other than those related to nonpoint source pollutants, also affect the water quality of a lake. These include groundwater, precipitation, and background or natural runoff which are largely uncontrollable but contribute to the long-term water quality of all lakes.

Management Strategy

Four general approaches for nonpoint source pollution management are recommended for implementation within the Minocqua-Woodruff Lakes project watershed and involve:

- Pollutant Source Controls;
- Controls for Reducing Runoff Volume and Stormwater Treatment;
- Rerouting Stormwater Discharges; and

- Local Regulatory Considerations for Pollution Prevention.

Each of these approaches are described in detail below:

Pollutant Source Controls

Reducing the quantity of pollutants at, or near, their point of origin minimizes the contact of runoff and pollution before entering the water resource. Source controls generally involve non-structural measures and rely on individual and local government participation. Individuals need to be made aware of how they contribute to the problem and how they can prevent polluted runoff.

The Towns of Minocqua and Woodruff should work with interested members of the community in planning lake protection measures. This may involve all or some of the following:

- Improved scheduling and equipment for sweeping the streets. Sweeping the streets immediately following snow melt and during the autumn leaf fall are the most effective periods for pollutant removal. The towns should also explore an arrangement for having privately owned parking lots swept with a vacuum sweeper.

- Expanding the fall leaf collection effort to include curbside pickup if feasible. Stormwater studies reveal an increase in stormwater phosphorus during the fall season which is attributed to fallen leaves. A homeowner survey could help determine if a curbside leaf pickup program is a worthy practice.

- Home and cottage owners should avoid lake and curbside burning of leaves. Ashes are phosphorus rich and wash easily into stormsewers or the lake.

- Effective soil erosion control from all construction sites. Soil erosion control regulations administered by the DNR and the Department of Industry, Labor and Human Relations (DILHR) should be vigorously enforced to minimize lake sedimentation. Town officials and community residents should insist on the best possible erosion control methods and firm enforcement of the regulations.

- Stabilize eroding shorelines. Significant lake shore erosion should be stabilized as appropriate. Preserving aquatic habitat and visual aesthetics should be considered in all shoreline planning.

- Improved maintenance of storm sewer catch basins. Catch basins are designed to remove larger sediment particles and debris carried with stormwater runoff. Frequent removal of trapped solids allow the catch basin to act as a small sediment trap. If not maintained catch basins offer no water quality benefits. Cleaning is recommended a minimum of two times a year.

- The towns have minimized the use of road salt, by increasing the sand content, and should consider the use of alternative de-icing compounds in areas served by stormsewers and areas of high salt-use. Snow disposal areas should not drain into lakes or streams. The Wisconsin Department of Transportation should work with the Town of Minocqua to explore the best method for ensuring safe roads and minimal salt usage.

- Continue the public awareness program to inform individuals on how to minimize pollutants from entering the lakes. Examples include the proper use of pesticides and fertilizers, proper septic system operation, reducing nutrient runoff from near shore leaf burning and disposal, and limiting impervious areas. Chapter 5 describes an information and education program.

- Firefighters should continue to avoid using old structures for practice firefighting unless runoff can be controlled to avoid entering wetlands, lakes and stormsewer inlets.

- Local emergency officials should be well prepared as first responders for protecting ground and surface water resources from spill contamination. The environmentally sensitive Lakeland area must be prepared to handle many spill scenarios with capable spill contingency planning. Spill preparedness should include adequate training and equipment such as containment booms and spill adsorbents. Emergency response consultants can assist town fire fighters and Oneida County Emergency Government in spill contingency planning.

Controls for Reducing Runoff Volume and Stormwater Treatment

Nonpoint source pollutants are carried by rain and melting snow from the land into area lakes. Reducing pollutant transport involves, to a large degree, decreasing the volume of stormwater which enters the lakes. Large areas of impervious ground, as found in the urbanized downtown area, virtually eliminate any infiltration of water into the ground. Ideally, the remaining areas of

pervious ground in the urbanized area should be developed as natural areas where feasible. If structural development is planned, designs should include controls for minimizing the increase of runoff into Minocqua Lake.

Stormwater infiltration on a suitable site can effectively reduce nonpoint source pollution. Creating new areas of infiltration begins with each individual evaluating the runoff from their home or business. Not all sites are appropriate for infiltrating stormwater. A minimum separation distance of three feet between the bottom of the infiltration device and the groundwater or bedrock is generally required. Protecting groundwater quality must be planned when infiltration practices are being considered. The DNR and the U.S. Environmental Protection Agency have design standards for pretreating stormwater prior to groundwater discharge to prevent contamination and the loss of the soils infiltrative capacity. Runoff from highways, roads, and manufacturing areas should not be infiltrated. Various techniques can minimize runoff and maximize infiltration, including:

Roof Water Infiltration: Infiltrating roof stormwater can be as simple as redirecting roof downspout outlets from an impervious surface onto a grassed area. Dry wells or french drains can also be used to handle roof water infiltration. Larger volumes of stormwater, such as from large building roofs, should be handled with an infiltration trench.

Infiltration Trench/Basins and Dry Wells: Certain types of runoff may be infiltrated with engineered sand and gravel infiltration structures if site conditions are appropriate. The drainage area should not exceed 5 acres. Designs must incorporate pre-treatment, such as an oil and grit separator, sediment trap, or vegetated buffer to prevent clogging from sediment and minimizing groundwater contamination. Infiltration basins are designed for infiltrating stormwater from much larger drainage areas than an infiltration trench. Infiltration basins are typically located at stormwater outfalls. Infiltration best management practices should include monitoring groundwater to ensure water quality is not being degraded.

Alternative Surfacing: Porus asphalt pavement is an alternative to traditional asphalt which can be used, under certain site conditions for parking lots, sidewalks and roads with low-traffic volume. Information is limited on the use of this BMP in cold climate areas. The asphalt is designed to reduce stormwater runoff by allowing water to pass through the asphalt. Infiltration is achieved through a high void content in the asphalt. The underlying soil must be permeable to allow adequate drainage. Stormwater is infiltrated while many of the pollutants are filtered and retained in the pavement. To maintain infiltration within the pavement, regular cleaning is necessary to prevent fine material from clogging the surface. A vacuum cleaning,

street sweeper will best accomplish this task. Alternatives to walkways, driveways and other impervious surfaces include concrete grids, paving bricks, flagstone, and wood decking. These alternatives offer varying levels of stormwater infiltration and are often more visually appealing then concrete or asphalt.

Grass Swales: Grass swales are very wide grass lined ditches. These alternatives to curb and gutter, reduce stormwater impacts by infiltrating runoff, and to some degree the vegetation acts as a sediment filter. Grass swale drainage systems should be considered within future growth areas not only to reduce stormwater impacts but as an alternative with lower construction costs when compared to curb and gutter drainage.

Oil and Grit Separators: These below surface structures remove floatable material such as oil and grease, and reduce the flow of stormwater which allows settling of a portion of the stormwater sediment prior to discharge. Well maintained oil grit separators are capable of removing 25% of the suspended solids and trace metals in stormwater and 75% of the oil and grease. Maintenance to remove accumulated sediment is necessary and important to retain the water quality benefits of this practice. Typically these devices are capable of treating no more than a 2 acre drainage area. Other stormwater treatment systems incorporate a filtration medium such as sand/peat mixtures to further reduce the discharge of contaminants.

Detention Basins: These structures are very effective in controlling nonpoint source pollution but require relatively large land areas and preferably nonsandy soils. These siting factors will for all practical purposes make this an unlikely option within the project area.

Rerouting Stormwater Discharges

The use of wetlands for stormwater discharges in certain instances, can be less harmful to the environment then discharging to a lake. Wetlands offer natural infiltration for stormwater flows and are able to remove or treat many pollutants. Two large wetlands receive stormwater from stormsewers in the urbanized area of Minocqua. These wetlands may be preferable locations for stormwater discharges than the waters of Minocqua Lake. The Town of Minocqua should consider the economic feasibility of rerouting stormsewers, which drain into Minocqua Lake, for discharging into these wetlands. A stormwater management plan can analyze water quality, financial and other considerations for rerouting storm sewers. Chapter 5 discusses stormwater planning and stormsewer rerouting in more detail. Additionally, the Wisconsin Department of

Transportation should consider these wetlands for stormwater discharges when State Highway 51 undergoes reconstruction.

Regulations for Pollution Prevention

Develop local ordinances to help reduce the degradation of area lakes from nonpoint source pollution. Ordinances provide the legal framework for requiring suitable management practices to control nonpoint source pollution.

Stormwater Management: A stormwater management ordinance can specify performance standards, specific Best Management Practices or limit peak stormwater flow. In future years, as more land is developed, the importance of managing stormwater to protect water quality becomes increasingly important. The Minocqua Comprehensive Plan recognizes the importance of regulatory control in managing stormwater runoff. The plan states that:

"The Town of Minocqua should require major developments, defined as projects with over 20 dwelling units or 50,000 square feet of commercial space, to provide on-site stormwater detention or retention in order to prevent excessive runoff and contaminated stormwater from entering surface water bodies."

When developing an ordinance, various approaches should be explored as to when stormwater regulations should be applicable to new development. The drainage and size, receiving waters and runoff, phosphorous loading, and other factors should be considered.

Various Wisconsin communities are using stormwater management ordinances for both water quality and water quantity objectives. The Towns of Minocqua and Woodruff are fortunate for the opportunity through the Priority Lakes Project to receive grant funds in order to develop a water quality protection ordinance as part of a stormwater management plan. A comprehensive stormwater control ordinance can offer great assurance that future growth will not be significantly detrimental to water resources in the Lakeland area.

Financing ordinance administration to avoid overburdening taxpayers is recognized as a major concern in ordinance adoption. Developing financing alternatives and administrative strategies may reveal acceptable costs for enacting a stormwater management ordinance. Funding is available to the town from the DNR for developing an administrative strategy. Financial support is also available for 5 years from the DNR to eliminate budget shortfalls in administering a stormwater management program. The town should consider retaining the services of an

engineer or other professional experienced in stormwater management and design, to review new development proposals for compliance with the towns' ordinance.

Construction Site Erosion Control: Bare soil from construction sites can easily erode and enter a lake or wetland through storm sewers or direct overland runoff. Sediment from construction site erosion destroys aquatic habitat as the lake bottom becomes covered from repeated sedimentation after each rainfall. Areas of high concern are lakeside construction and off-water construction within the storm sewer drainage system.

Currently in Wisconsin, state rules are being developed by the DILHR to begin a statewide construction erosion control program which regulates the erosion of most earth disturbing activities. Included will be provisions for the submittal of soil erosion control plans and construction site inspections for usage of proper erosion control measures. The enforcement of these new rules will greatly reduce the ongoing sedimentation of Minocqua and Kawaguesaga Lakes from construction site erosion. Therefore a locally administered construction site erosion control ordinance is not required as a condition for receiving nonpoint source grant funds. However, the administration and enforcement of erosion control regulations are best suited if the responsibility is based locally. The towns of Minocqua and Woodruff can request delegation of the DILHR erosion control program by the DILHR. Practically speaking Oneida County is probably the better choice given their experience with erosion control administering the State Shoreland Zoning Ordinance. Oneida County should be requested to seek local authority from the DILHR for this important water quality program. A locally administered ordinance could also regulate erosion in those situations where the DILHR rules are not applicable, such as site grading activity where a structure is not constructed. This includes roads, golf courses, underground utility installation and other construction activity excluded in the DILHR program. Any construction site greater than 5 acres is regulated by the DNR and local delegation is not available in these situations.

Wellhead Protection: Ensuring a long term source of clean water to customers of the Lakeland Sanitary District is a critical environmental and health issue. A polluted water supply is a health hazard causing havoc in our day to day lives. Wellhead protection is a local planning mechanism to prevent groundwater pollution. The basis of wellhead protection is to eliminate potential sources of spills or leaks from seriously polluting the local water supply, as occurred in Minocqua in the 1980's. This approach to pollution prevention has been identified in the town's comprehensive plan as follows:

Protect surface and groundwater sources from contamination by dumping, accidental spillage of toxic or hazardous materials, and other forms of pollution.

Wellhead protection plans, which incorporate local zoning restrictions and an information and education program, can effectively reduce the potential for contaminating the community water supply. Department of Natural Resource staff, the University of Wisconsin Extension or a consultant are available to assist local utility and town officials in planning a wellhead protection program including potential financial and technical resources. Federal 604(b) Water Quality Planning funds are available to assist local units of government and regional planning agencies in water quality planning such as wellhead protection. These funds are administered through the DNR.

Water Conservation in Unsewered Areas: On-site wastewater treatment systems commonly known as septic systems, are assumed to be a source of groundwater and lake pollution as noted in Chapter 3. The siting and construction of on-site wastewater systems are regulated by the Oneida County Planning and Zoning Department. The proper maintenance of a septic system is largely a voluntary effort. This project will promote the proper operation and maintenance of septic systems through an education effort as described in Chapter 5.

Water conservation can reduce septic system impacts to ground and/or surface water resources. Reducing the volume of water discharged to a septic system drain field offers environmental and personal advantages:

- Septic system pathogens and chemical pollutants are less likely to leach into groundwater and contaminate area wells and/or the lake.
- Improved drain field longevity.
- Extends the life of a well and/or septic system pump.

The use of efficient or low flow plumbing fixtures for new construction is a no or low cost alternative to conventional plumbing fixtures which can reduce septic system failures. These include faucet aerators, low flow shower heads, and low flow toilets (1.5 gallon). These highly efficient plumbing fixtures drastically reduce the volume of water which enters the drainfield without any changes in user lifestyle. Reducing the cost for hot water heating is a direct financial benefit of low flow shower heads. The average size family can save 5,000 to 10,000 gallons of water per year using a low flow shower head, and 8,000 to 10,000 gallons annually

with a 1.5 gallon high efficiency toilet. This can amount to a 50% reduction in wastewater volume.

The Towns of Minocqua and Woodruff should consider requesting Oneida County to amend the building codes water conservation requirement for new construction to incorporate low flow shower heads where on-site wastewater treatment systems are present. Presently, four states have requirements which require the use of high water efficiency fixtures in new home construction.

Land Easements

Nonpoint source program funds may be used to purchase land easements in order to support the shoreline buffer Best Management Practice. This BMP involves the establishment of permanent vegetative cover. Easements can enhance landowner cooperation and to more accurately compensate landowners for loss or altered usage of property. The benefits of using easements in conjunction with a management practice are: 1) riparian easements can provide fish and wildlife habitat along with reducing runoff pollutants, and 2) easements are generally perpetual so the protection is longer term than a management practice by itself. However, the primary justification of an easement must be for water quality improvement.

Shoreline buffers which replace an area of impervious ground, within the urban area may be considered for easement eligibility. The vegetative buffer would act to filter and or infiltrate pollutants from urban runoff. The size of these buffers is dependent on the amount of drainage area served.

Cost Share Eligibility For Best Management Practices

Urban stormwater contributes an estimated 7% of the phosphorus to Minocqua Lake and the majority of the heavy metals. Reducing phosphorus from the urban portion of the watershed through the use of structural best management practices would reduce a small percentage of the phosphorus entering the lake system when one considers the phosphorus balance from all sources within the watershed (Figure 3-2). Heavy metals, sediment, oils and grease would have higher watershed removal rates since much of these pollutants originate within the urban area. It is recognized that pollutant source controls and information and education are a low cost approach to limit nonpoint source pollution. In the interest of protecting water resources, attaining the plan objectives, and the cost effective use of state program dollars, this project will offer cost-share assistance for best management practice demonstrations for controlling nonpoint

source pollution. Demonstrating viable stormwater management alternatives can effectively promote the adoption of best management alternatives within the local community. The Department will evaluate the operation and effectiveness of each practice for purposes of allowing additional best management practice cost sharing. Also, the cost and operating efficiency of each demonstration will be used in determining if additional best management practices will be cost shared. Eligible practices may include:

- Vegetative Buffers to Replace Impervious Areas
- Structural Urban Practices
- Shoreline Stabilization Using Vegetative Measures

Critical Lands

Land use types which contribute the greatest quantity of pollutants are termed critical lands. These areas offer the greatest opportunity to reduce stormwater pollutants through stormwater management. Cost sharing will be limited to critical lands. These areas include:

- Commercial/Transportation Areas
- High Density Residential
- Shoreline Areas

Forming a Local Lake Organization

Nearly 400 lake associations exist in Wisconsin today. These are usually voluntary organizations with members who own land on or near a lake. A local lake organization is an excellent way for promoting environmental stewardship of area lakes. Lake associations can help build a sense of community and create an information network for members. They may work with state and local government agencies to effect ordinances and lake management practices. Additionally, State financial assistance is available to qualifying lake organizations for planning various lake management needs. Qualified lake associations are also eligible for State funding in order to purchase property or easements and to receive matching funds for developing local regulations and ordinances where these measure will contribute to the protection of the lake ecosystem. Many lake residents in the Lakeland area have formed organized groups and received planning grants including the Mid Lake Rehabilitation District, which drains to Minocqua Lake. The Minocqua Area Lake Improvement Association was established in 1994 to maintain, protect, and improve the local lake resources. This organization will compliment the Priority Lakes' Information and Education effort (see Chapter 5) in maintaining the quality of these water resources.

Chapter Five

Local Governments Implementation Program

Introduction

This chapter provides details for implementing the management actions identified in Chapter 4 and an information and education program for addressing nonpoint source pollution of lakes within the project watershed. The success of this project depends on a strong implementation commitment by the Towns of Minocqua and Woodruff and from the watershed residents, businesses, and developers.

Implementation will involve two nonpoint source program elements, a basic element, which can begin without further study, and a specific element which entails additional nonpoint source planning and engineering studies. The two elements are implemented by local units of government.

Basic Program for Nonpoint Source Control

The basic program is the first step in the implementation process. The components of this program are:

- Develop and implement a community program of urban "housekeeping" practices which reduces nonpoint source pollution. This may include a combination of: more frequent cleaning of stormsewer catch basins, improving the schedule for fall leaf collection, and other appropriate activities and,

- Implementing the information and education program as described at the end of this chapter.

The Town of Minocqua must commit to instituting the basic program within the first three years of implementation before grant funds can be used for the design and installation of nonpoint source control demonstration practices owned and operated by the town. Grant funds may also be used in those instances where the municipality acts as a grantor, passing cost share funds through to private landowners for installing runoff control measures.

Specific Program for Nonpoint Source Control

This program can begin any time following the development and initial implementation of the basic program. Elements of this program are those generally requiring detailed investigations prior to implementation.

The Specific Program may include the following components:

- Conducting engineering feasibility studies to determine the best means to implement community specific nonpoint source control best management practices for existing developed areas. Controlling pollution at the point of origin is preferable to more expensive structural practices.Source reduction activities should be considered when determining the structural practices necessary to meet pollution reduction goals. Chapter 4 contains examples of source reduction activities that should be considered.

- Designing and installing best management practice demonstrations for existing developed areas with a completed detailed engineering feasibility study.

- Develop as necessary, a Stormwater Management Plan for areas of future urban development. This plan identifies the types and locations of structural best management practices for areas of future development within the watershed.

- Developing, adopting and enforcing a comprehensive stormwater management ordinance consistent with the State "model" stormwater ordinance which is currently under preparation. The stormwater management plan should include ordinance development activities.

- Conducting detailed financing/implementation studies which determine various options to financially administer stormwater control programs. These studies should be conducted as part of the stormwater management planning process.

Program Participants - Roles and Responsibilities

The following activities are the roles and responsibilities for the Town of Minocqua as part of the basic program.

The Town of Minocqua, in cooperation with the Town of Woodruff as applicable, is responsible for local implementation of this plan. The Town of Minocqua is eligible for a nonpoint source grant. Summarized below are the specific Town of Minocqua responsibilities:

A. Identify in writing a person to represent the town during project implementation.

B. A written commitment from the town to implement the basic program. The content and scheduling of the basic or housekeeping program shall be completed within 12 months of beginning project implementation. This will be negotiated between the DNR and the Town of Minocqua.

C. Prepare and submit annual work plans for staff and activities necessary to implement the project.

D. Prepare and submit to the DNR an annual report for the purposes of monitoring project implementation activities.

E. Participate in the annual priority lake project review meeting.

The following activities are the roles and responsibilities for the Town of Minocqua as part of the specific program, where applicable.

F. Complete engineering feasibility studies to determine the best means to implement site specific nonpoint source control measures for existing urban development in high priority areas where landowners express interest in program participation. Structural best management practices will be guided by the detailed engineering feasibility reports. A commitment to implementing the feasibility report recommendations will be required as a condition for subsequent financial assistance for conducting additional engineering feasibility studies.

G. Adopt and enforce a comprehensive stormwater management ordinance for undeveloped areas consistent with the State "model" stormwater ordinance.

H. Enter into cost share agreements for designing and installing up to three eligible structural best management practices within existing urban areas with completed detailed engineering studies.

For practices installed and maintained by private individuals, the cost share agreement is between the landowner and the Town of Minocqua. In these instances the Town of Minocqua will be required to:

1. Design or contract for the design of best management practices and verify proper practice installation;

2. Request reimbursement from the DNR for practices installed by private landowners and in turn reimburse those landowners for the eligible amount of cost sharing; and
3. Monitor landowner compliance with provisions of the cost share agreement.

l. Submit information to the DNR necessary for project evaluation.

The following activities are the roles and responsibilities of the DNR as part of the basic program.

The Department has been statutorily assigned the overall administrative responsibility for the Wisconsin Nonpoint Source Water Pollution Abatement Program. This includes providing financial support for local staff and installation of management practices, assisting local units of government to integrate wildlife and fish management concerns, and conducting project evaluation activities.

The Department's role in assisting local units of government in carrying out project activities is as follows:

a. Review community programs of urban "housekeeping" practices for nonpoint source control.

b. Review and approve annual work plans for staff and activities necessary to implement the project.

c. Review and approve annual project implementation reports.

d. Participate in the annual watershed project review meeting.

e. Track changes in pollutant loads using information supplied by local units of government. This will be determined for the annual project review meeting between DNR and the Town of Minocqua.

The following activities are the role and responsibilities of DNR as part of the specific program, where applicable.

f. Assist the town in developing priorities, schedules, and requirements for specific program activities.

g. Develop a model stormwater management ordinance for use in areas of future development. Assist the towns with adoption and enforcement of stormwater management ordinances.

h. Participate in the selection of BMPs and approve practice designs. Review nonpoint source cost share agreements signed by local units of government with eligible land owners.

i. Enter into nonpoint source cost share agreements for eligible lands the local unit of government owns or operates

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

k. Approve stormwater management plans. Approval will be based upon the ability of the plan to meet pollution reduction goals.

Landowners and Land Operators

Private landowners may install BMPs on their property within critical areas. They can be important participants in the project's success. Eligible land owners can participate in the project by signing cost share agreements with the Town of Minocqua.

Best Management Practices (BMPs)

Best Management Practices are those practices which have been determined to be most effective in reducing nonpoint sources of pollution to meet water quality objectives. The application of these practices will be guided by feasibility studies and assistance provided by the DNR. Eligible practices and State cost share rates are listed in Table 5-1.

Table 5-1: State Cost Share Rates for Best Management Practices

Best Management Practice	State Cost Share Rate (1)
Shoreline Stabilization	70%
Shoreline Buffers	70% (2)
Structural Urban Practices	70% (3)
Sweeping Parking Lots and Fall Leaf Collection	50% (4)
Land Purchase & Piping to Reroute Stormwater	50%

(1) Applies only to structures for developed urban areas.
(2) Easements may be used in conjunction with this practice.
(3) Includes the design and installation of oil grit separators. Maintenance costs are the responsibility of the owner.

General specifications for structural practices are described in Chapter Three.
Land easements may be used in conjunction with certain BMPs to reduce the water quality impacts of stormwater runoff as noted in Table 5-1. The use of easements in these instances will be reviewed by the DNR on a case by case basis.

Priority lake cost share funds cannot be used to control sources of pollution and land management activities specifically excluded in NR 120. The following is a partial list of ineligible activities most often inquired about for cost sharing in urban areas:

1. The operation and maintenance of cost shared best management practices (BMPs).

2. Construction erosion control practices.

3. Structural BMPs for new urban development. New urban development is that where construction activity commences after the DNR approves this priority lake plan.

4. BMPs installed prior to signing a cost share agreement.

5. Activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) program, except those facilities regulated for stormwater discharges.

6. On-site septic systems or maintenance. The Oneida County Planning and Zoning office administers an on-site septic replacement grant program.

7. Lake dredging activities.

8. Activities and structures intended primarily for flood control.

Grant Agreements and Administration

Two grants may be provided by the DNR to the Town of Minocqua in order to implement the priority lakes project. These grants and general administrative procedures are described below.

Local Assistance Grant Agreement

The Local Assistance Grant Agreement is a grant from the DNR to local units of government to sustain project staff support and to subsidize costs of carrying out the implementation strategy. The Town of Minocqua is eligible for a Local Assistance Grant. Consistent with NR 120, these grant funds will be used for additional staff to implement the project and to conduct information and education activities. The grant also subsidizes other items such as travel, training, and certain office supplies. Further clarification of eligible costs that this grant supports are detailed in NR 120.

Activities described in the "basic" and "specific" programs are eligible for financial assistance. Certain eligible activities and the amount of state funds available are described in Table 5-2.

TABLE 5-2: Activities Eligible For State Funding

Activity	Support Rate
Stormwater Management Planning	100% (1)
Engineering Studies for Existing Urban Area	100% (2)
Design and Engineering for Structural Best Management Practices	100% (3)
Staff for Administrating Stormwater Management Ordinance	100% (4)
Sweeping Parking Lots and Fall Leaf Collection	
- Staff Related Costs	100% (5)
- Equipment Related and Other Costs	50% (5)

(1) Planning is limited to water quality in undeveloped areas. Includes stormwater management ordinance development.

(2) Funding not available for components dealing exclusively with drainage and flood management.

(3) Applies to practices in established urban areas.

(4) Limited to three years of funding additional staff or contracted services to administer and enforce ordinance if local budget falls insufficient. Level of staffing based on a work plan submitted by the local unit of government and approved by the DNR.

(5) The town may negotiate with DNR a flat fee cost-share amount per lot swept. Funding assistance is limited to vacuum sweeping once in early spring and once in the fall. Cost sharing will be on a reimbursement basis. These practices are further limited to 5 years of cost-share eligibility or until the end of the project, whichever occurs first. Eligible components for reimbursement include fuel, disposal equipment, maintenance and depreciation.

The grant application procedure begins with an annual work plan which the local unit of government develops. The work plan estimates the work to be accomplished each year. The work plan is provided to the DNR for review and clarification. Along with the work plan, 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 and reporting requirements in NR 120 requires the Town of Minocqua to maintain a financial management system that accurately tracks the disbursement of all funds

used for the project. The records of all watershed transactions must be retained for three years after the date of final project closeout. A more detailed description of the fiscal management procedures can be found in NR 120. Quarterly reports from the Town accounting for staff time, expenditures, and accomplishments regarding activities funded through the watershed project, are a required submittal. Reimbursement requests may be included with the submittal of the quarterly project reports.

Nonpoint Source Grant Agreement

The nonpoint source grant agreement is the means for transmitting funds from the DNR to local units of government to provide cost sharing for installation of best management practices. In some cases the town will act only as a grantee. In this case, the town of Minocqua will use funds obtained under the grant directly for practices the town will install, own, and operate.

The town will play an additional role as a grantor. In these situations, the town will pass the cost share funds it has received from the DNR to private landowners who have responsibility for installing, operating, and maintaining the management practices. When this occurs, the town will enter into a separate cost sharing agreement with the private landowner receiving the state funds.

The nonpoint source grant agreement can be amended to provide funding needed for eligible cost sharing. The funds obligated under cost share agreements must never exceed the total funds in the grant agreement.

Cost Share Agreements and Administration

Consistent with s. 144.25, Wisconsin Statutes and NR 120, cost share funding is available to landowners and local units of government for a percent of the costs of installing BMPs to meet the project objectives. Cost share agreements may be signed during the Nonpoint Source Grant period. These agreements are for use with private landowners.

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 five 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.

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. The cost share recipient is responsible for acquiring the needed permits prior to installation of practices.

The Town of Minocqua is responsible for enforcing compliance of cost share agreement to which they are a party. Where the 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 town will consult with the DNR's District Wildlife Management and Fisheries Management staffs to optimize any Wildlife and Fisheries Management benefits for nonpoint source control BMPs. Specifically, the DNR will be contacted if lake shore protection or wetland practices are being considered. The DNR staff will assist by identifying lake shore protection practices that benefit fish and/or wildlife.

Cost share agreements for landowners will be developed and administered by the town following the procedure outlined below:

a. Site and practice eligibility is verified using site feasibility studies completed as part of the specific program.

b. Landowners meet with the town to discuss and develop a draft cost share agreement.

c. The town, landowner, and DNR meet to discuss design procedures and alternative designs prior to design of the practice.

d. A preliminary practice design for each identified alternative is submitted to the DNR for review and comment.

e. A detailed design for the selected alternative, prepared by a registered professional engineer or other individual approved by the DNR, is submitted to the DNR for final review and written approval or disapproval.

f. Cost share agreement is signed.

g. Cost share agreement is recorded with Register of Deeds in Oneida County.

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

i. Amendments to the cost share agreement are made if necessary.

j. Installation is inspected and verified by the town or consultant.

k. Landowner submits paid bills and proof of payment (canceled checks or receipts marked paid) to the town.

l. Checks are issued by the town to the landowner, and project ledgers are updated including the check date, number, and date.

m. DNR reimburses the town for expended cost share funds.

Cost Containment

Cost share payments for Best Management Practices will be reimbursed on actual installation costs. If actual installation costs exceed the amount of cost sharing determined from cost estimates from qualified contractors, then the amount paid the grantee may be increased with the approval of the DNR. Appropriate documentation regarding the need for changes will be submitted to DNR. The cost containment procedure to be used will be a bidding procedure. The low bid must be accepted by the cost share recipient.

Estimated Budget and Staff Needs

This section discusses the estimated budget for planning and implementing best management practices recommendations and local staff support as part of the basic and specific program.

Engineering Feasibility Study

The costs presented in Table 5-3 include costs for BMP feasibility studies within the existing urban area where landowners have expressed an interest in program participation and for areas of likely future urbanization. These studies are necessary before stormwater management practices can be designed and installed to control runoff. The private sector will likely carry out

most of this study with the DNR providing 100% of the funding.

Design and Engineering For Best Management Practice Demonstrations

Upon completion of a feasibility study, the type of structural BMPs will be identified. The cost of preparing detailed BMP designs located in existing and planned urban areas are presented in Table 5-3. The private sector will prepare the BMP plans and specifications with DNR providing 100% of the funding in existing urban areas.

Installation of Best Management Practice Demonstrations

There are many factors that can affect the cost of constructing practices to control existing urban runoff. Key factors include construction, engineering and possibly land acquisition costs. The relative importance of these costs varies on a case by case basis. Retro-fitting stormwater management BMPs into the existing urban area is more costly than for developing areas. Proper planning in a developing area can assure that land is set aside and stormwater BMPs are incorporated into project designs to protect lake water quality. The costs for best management practices as shown in Table 5-3 reflect the costs for the existing urban area. Nonpoint source funds can not be used for installing structural BMPs in areas of new development.

Staff for Project Implementation

Local project implementation will likely require a part time position with the Town of Minocqua. This position is responsible for overall project coordination. The position does not involve staffing for design and engineering assistance, nor the administration of local ordinances. Support for local staff can continue for a maximum of eight years. During the annual project meeting, progress on attaining project and work plan objectives will determine the need for continued staff support.

Staff for Administering a Stormwater Management Ordinance

The costs for administering a stormwater management ordinance is supported 100% by the nonpoint source program for additional local staff or contracted services to adequately enforce the ordinance within the project area if the user fee supported program budget is deficit. State support for a stormwater management ordinance is limited to 3 years of support or until the end of the project, which ever occurs first.

Table 5-3: Estimated Costs for Implementing the Minocqua-Woodruff Priority Lake Project (1)

Activity	Total Cost	State Share
Staff and Staff Support (2)	$224,000	$223,000
Basic Program Elements		
Information and Education (3)	42,400	42,400
Fall Leaf Collection (4)	---	---
Specific Program Elements		
Stormwater Management Planning (5)	20,000	20,000
Engineering Feasibility Studies for Existing Urban Area...	20,000	20,000
Design and Engineering for Structural BMP's (6)	75,000	50,000
Staff for Administering Stormwater Management Ordinance (7)	40,000	7,500
Parking Lot Sweeping (4)	---	---
Best Management Practices Demonstrations (8)	150,000	105,000
Totals	$571,400	$467,900

(1) Assumes 8 years of full implementation.
(2) Assumes additional staff of one part time position.
(3) Assumes $5,300 per year.
(4) Cost estimate not available. State support is limited to 5 years.
(5) Includes administrative and financing strategy development.
(6) Includes non-reimbursable engineering costs for future development in currently undeveloped areas.
(7) Assumes 8 years of additional staff or contracted services and a 50% shortfall in the local budget. Staff support is limited to 3 years.
(8) Assumes $50,000 for each demonstration at 70% cost sharing.

Information and Education Program

Controlling nonpoint source pollution within the Minocqua Lakes project area is largely a matter of:

1. Educating residents and tourists about the adverse impacts of runoff and why it is

considered a source of pollution.

2. Informing the public how they can help prevent lake pollution.
3. Managing stormwater to protect water quality within areas of future development.

Local project staff will conduct an information and education effort throughout project implementation. The information and education program is very important to project success. Water quality improvements are most likely to result from local residents and tourists assuming part responsibility for the care of area lakes. Reducing the use of pesticides and phosphorus fertilizer are examples of how individuals can lower the risk of lake pollution. This will be accomplished with the following activities:

- Quarterly Newsletter
- Informational Meetings
- Public Service Announcements
- Newspaper Advertising
- Highway Signage
- Project Informational Display
- Construction & Stormwater Management Informational Sessions
- School Presentations

Table 5-4 outlines the Information and Education program and estimated costs. The information and education program will be reviewed annually and modified as necessary. Each activity is described below:

Project Newsletter

All property owners will receive newsletters to provide them with an array of nonpoint source pollution topics, announce upcoming informational meetings, and provide project updates. The UW Extension in Madison assists in the production of the quarterly newsletter.

Informational Meetings

Tourists and residents will be offered the opportunity to attend various water quality informational meetings. These meetings are intended to offer the public a more thorough understanding of topics such as:

- The benefits of establishing a lake association/district
- Options for aquatic plant management

- Septic and stormwater management (drywells, etc.)
- Lawn care and composting

Table 5-4: Information and Education Program and Estimated Costs

Audience	Activity	Cost
Residents/Tourists	Quarterly Newsletter	$2000
	Informational Meetings	600
	Informational Display	700
	Project Signage	500
	Newspaper Advertising	250
	Public Service Announcements	None
Students K-12	School Presentations	200
	Educational Materials Development	600
Key Landowners (1)	Personal Contacts	None
Building Contractors & Developers	Construction Erosion & Stormwater Management Informational Meetings	500
Total		$5350

(1) A feasibility study will identify within the existing developed area those sites where structural BMP's may be appropriate. Landowners in at these sites will receive informational visits by project staff.

Public Service Announcements

WMQA, a local radio station, will be asked to air messages on various local water quality topics and where to receive assistance.

Construction Erosion Workshop

An understanding of the water quality impacts from construction sediment and various erosion control methods will be the focus for a winter workshop. Building contractors, landscapers, developers, consultants, and others interested in erosion control will be invited to attend. Department of Industry, Labor and Human Relations (DILHR) staff will be asked to attend and provide regulatory information. Manufacturer Representatives of various erosion control

products will be asked to display their products.

Stormwater Management Informational Meeting

If a stormwater management ordinance is adopted locally, the town should arrange an ordinance information meeting for those effected.

School Activities

Involving youth in water quality education can have long-term benefits to the community and its water resources, both surface and groundwater. Local teachers and administration will be asked how local project staff can assist them with environmental education.

Chapter Six

Other Water Resource Activities

Various environmental issues other than nonpoint source pollution are a concern in good lake management. Unfortunately, however, numerous, worthwhile activities are not within the scope of the nonpoint source program. Listed below are opportunities which should be considered for integration into the educational effort of this Priority Lakes Project. These particular issues are highlighted because they all effect water quality and/or the aquatic ecosystem and are probably best served through informational activities.

Aquatic Plant Management Alternatives. Various methods for controlling excessive aquatic plant growth are capable of producing excellent results. Lake shore owners need to be aware of non-chemical methods and the environmental concerns of chemical treatments for aquatic plants.

Shoreline Protection Alternatives. Where feasible, shoreline erosion should be controlled using vegetation or so called, bioengineering techniques. Eroding shorelines can be stabilized using vegetative methods which are more attractive than sheet piling or wooden seawalls. A natural or vegetative shoreline creates a productive habitat for many aquatic and terrestrial species. When structural erosion is necessary, rip-rap is preferable to vertical control measures. Rip-rap is used by some fish for spawning and presents less of a barrier to creatures moving in and out of the water. Recommendations for stabilizing shorelines can be obtained from the Soil Conservation Service, County Land Conservation Department or DNR. Permits from DNR are also necessary.

Exotic Species Awareness. Undesirable exotic species (non-native) are a concern to maintaining a stable natural lake environment. Examples of exotic species that may degrade Northwoods lakes include:

Eurasian Water Milfoil. This plant is capable of "overtaking" native aquatic plants to the point of interfering with boating, skiing, swimming, and fishing. Nineteen lakes in Wisconsin are currently dominated by this exotic species.

Zebra Mussels. These fresh water mussels threaten the natural balance of the aquatic environment. They are potentially capable of altering a lakes water clarity. This in turn will likely bring a shift in the diversity and abundance of algae and aquatic plants. As the plant community is altered, certain fish species are favored and others are harmed.

Purple Loosestrife. This destructive plant species inhabits lake shorelines and wetlands. Minocqua and Kawaguesaga Lakes currently have active purple loosestrife growing in various areas. The Tomahawk thoroughfare has sizable areas where the loosestrife is growing. The loosestrife displaces native wetland plants by shading. Wildlife which utilize native vegetation for food and habitat, decline as loosestrife colonies expand.
An approach for creating exotic species awareness is publicizing the Zebra Mussel and Eurasian Milfoil water watch programs which are coordinated by the DNR Lake Management Program in Rhinelander. These volunteer programs can provide useful data which is valuable to fish management and water quality staff within the DNR.

These activities are, for the most part, limited to individual landowners and as such, are not eligible for cost share assistance. The project newsletter and public service announcements will be used to inform tourists and local residents of these threats to the lake community. Sources of technical assistance will be highlighted.

Chapter Seven

Progress Assessments

Local governments receiving a local assistance grant will administratively evaluate the project effectiveness in attaining plan objectives. The evaluation is centered on tracking their progress in implementing the basic and specific programs. A nonpoint source pollutant load reduction tracking system is maintained as well. The DNR will evaluate the project from a water resource perspective as outlined in Chapter 8.

Pollutant Load Evaluation

The local project manager will provide the following information to the DNR for use in determining an estimate of key pollutant reductions over time.

1. The acres of post 1993 new urban development by land use both served and not served by stormwater practices, and other information requested by the DNR concerning stormwater management,

2. The acres of construction site activity both served and not served by adequate erosion control measures.

Pollutant source reduction activities which reduce nonpoint source pollution should also be reported by the towns. Although the effect of source reductions on urban pollutant loadings may not be quantifiable, accomplishments should be recognized as having a positive impact on efforts to reduce nonpoint source pollution.

Administrative Evaluation

The local project manager will provide an annual report to the DNR on progress in implementing the basic program accomplishments and when applicable, specific program activities. This report will include:

1. Scheduled information and education activities

2. Any recommended changes in community housekeeping activities

3. Actual improvements in community nonpoint source housekeeping

4. The acres of post 1994 new urban development, by land use, which are both planned and not planned to include controls for nonpoint source pollution and stormwater flows.

In addition to these reports an annual project management meeting will be held with town and other agency staff to review progress reports and identify a plan of work for local project staff. These meetings will occur in February of each year.

Chapter Eight

Water Resources Evaluation Monitoring

Monitoring the progress in attaining this projects water quality objectives is an important yet difficult task. Typically intensive monitoring and financial resources over an extended period are necessary in order to adequately determine a water quality trend. This plan does recommend continued lake monitoring to assist local units of government, state lake managers, and local lake associations in future management decisions.

Water quality monitoring will be conducted by Department of Natural Resources staff and citizen volunteers at two locations in Minocqua Lake. The DNR will monitor the east basin site as part of the on-going long-term trend lake monitoring program. This is a quarterly activity which involves chemical, physical, and biological monitoring. A local volunteer will also monitor water quality at this site including water chemistry sampling. The northwest basin site will be monitored by a volunteer for water clarity and the relationship to algae production and phosphorous. The volunteer monitoring programs are DNR sponsored and enable local citizens the opportunity to be involved first hand in lake monitoring efforts. Volunteer monitoring will occur during the open water season.

Rooted aquatic plants will be surveyed lake wide over an indefinite period by a volunteer through a DNR sponsored program to detect a declining, sustaining, or increasing population of lake plants. Lastly, a program sponsored by the University of Wisconsin Sea Grant Institute will begin in 1994, a zebra mussel monitoring program which enlists a local volunteer to periodically monitor Minocqua Lake near a public boat landing for zebra mussel infestation. See Chapter 6 for a discussion of this exotic species.

The above mentioned monitoring activities will need to be in place over decades in order to properly characterize the water quality of Minocqua Lake as getting better, worse, or staying the same.

Other monitoring activities worthy of further study include septic system impacts and near shore motorized boating and the effects on lake water quality. Lake districts, local units of government, and certain lake associations may receive DNR grant funding to help investigate these or other lake monitoring efforts.

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Appendix A

Project Maps

The data presented on maps within this plan are not intended to be a substitute for physically locating utilities, boundaries, buildings, etc. The maps present a preliminary reference map showing approximate locations. A review of the original source document and field inspection should be made before any final analysis or plans are made.

Priority Watershed Projects in Wisconsin: 1996 - 1997

Year Selected-Map Number	Large-scale Priority Watershed Project	County(ies)
79-1	Galena River ♦	Grant, Lafayette
79-2	Elk Creek ♦	Trempealeau
79-3	Hay River ♦	Barron, Dunn
79-4	Lower Manitowoc River ♦	Manitowoc, Brown
79-5	Root River ♦	Racine, Milwaukee, Waukesha
80-1	Onion River ♦	Sheboygan, Ozaukee
80-2	Sixmile-Pheasant Branch Creek ♦†	Dane
80-3	Big Green Lake ♦	Green Lake, Fond du Lac
80-4	Upper Willow River ♦	Polk, St. Crox
81-1	Upper West Branch Pecatonica River ♦	Iowa, Lafayette
81-2	Lower Black River ♦	La Crosse, Trempealeau
82-1	Kewaunee River ♦	Kewaunee, Brown
82-2	Turtle Creek ♦	Walworth, Rock
83-1	Oconomowoc River ♦	Waukesha, Washington, Jefferson
83-2	Little River ♦	Oconto, Marinette
83-3	Crossman Creek/Little Baraboo River ♦	Sauk, Juneau, Richland
83-4	Lower Eau Claire River ♦	Eau Claire
84-1	Beaver Creek ♦	Trempealeau, Jackson
84-2	Upper Big Eau Pleine River	Marathon, Taylor, Clark
84-3	Sevenmile-Silver Creeks ♦	Manitowoc, Sheboygan
84-4	Upper Door Peninsula ♦	Door
84-5	East & West Branch Milwaukee River	Fond du Lac, Washington, Sheboygan, Dodge, Ozaukee
84-6	North Branch Milwaukee River	Sheboygan, Washington, Ozaukee, Fond du Lac
84-7	Milwaukee River South	Ozaukee, Milwaukee
84-8	Cedar Creek	Washington, Ozaukee
84-9	Menomonee River	Milwaukee, Waukesha, Ozaukee, Washington
85-1	Black Earth Creek	Dane
85-2	Sheboygan River	Sheboygan, Fond du Lac, Manitowoc, Calumet
85-3	Waumandee Creek	Buffalo
86-1	East River	Brown, Calumet
86-2	Yahara River - Lake Monona	Dane
86-3	Lower Grant River	Grant
89-1	Yellow River	Barron
89-2	Lake Winnebago East	Calumet, Fond du Lac
89-3	Upper Fox River (Ill.)	Waukesha
89-4	Narrows Creek - Baraboo River	Sauk
89-5	Middle Trempealeau River	Trempealeau, Buffalo
89-6	Middle Kickapoo River	Vernon, Monroe, Richland
89-7	Lower East Branch Pecatonica River	Green, Lafayette
90-1	Arrowhead River & Daggets Creek	Winnebago, Outagamie, Waupaca
90-2	Kinnickinnic River (Milwaukee Basin)	Milwaukee
90-3	Beaverdam River	Dodge, Columbia, Green Lake
90-4	Lower Big Eau Pleine River	Marathon
90-5	Upper Yellow River	Wood, Marathon, Clark
90-6	Duncan Creek	Chippewa, Eau Claire
91-1	Upper Trempealeau River	Jackson, Trempealeau
91-2	Neenah Creek	Adams, Marquette, Columbia
92-1	Balsam Branch	Polk
92-2	Red River - Little Sturgeon Bay	Door, Brown, Kewaunee
93-1	South Fork Hay River	Dunn, Polk, Barron, St. Croix
93-2	Branch River	Manitowoc, Brown
93-3	Soft Maple/Hay Creek	Rusk
93-4	Tomorrow/Waupaca River	Portage, Waupaca, Waushara
94-1	Duck Creek	Outagamie, Brown
94-2	Apple/Ashwaubenon Creeks	Outagamie, Brown
94-3	Dell Creek	Sauk, Juneau
94-4	Pensaukee River	Shawano, Oconto
94-5	Spring Brook	Langlade, Marathon
94-6	Sugar/Honey Creeks	Walworth, Racine
95-1	Pigeon River	Manitowoc, Sheboygan
95-2	Middle Peshtigo/Thunder Rivers	Marinette, Oconto
95-3	Fond du Lac River	Fond du Lac, Winnebago
95-4	Lower Rib River	Marathon
95-5	Kinnickinnic River (St. Croix Basin)	St. Croix, Pierce
95-6	Lower Little Wolf	Waupaca
95-7	Pine & Willow Rivers	Waushara, Winnebago

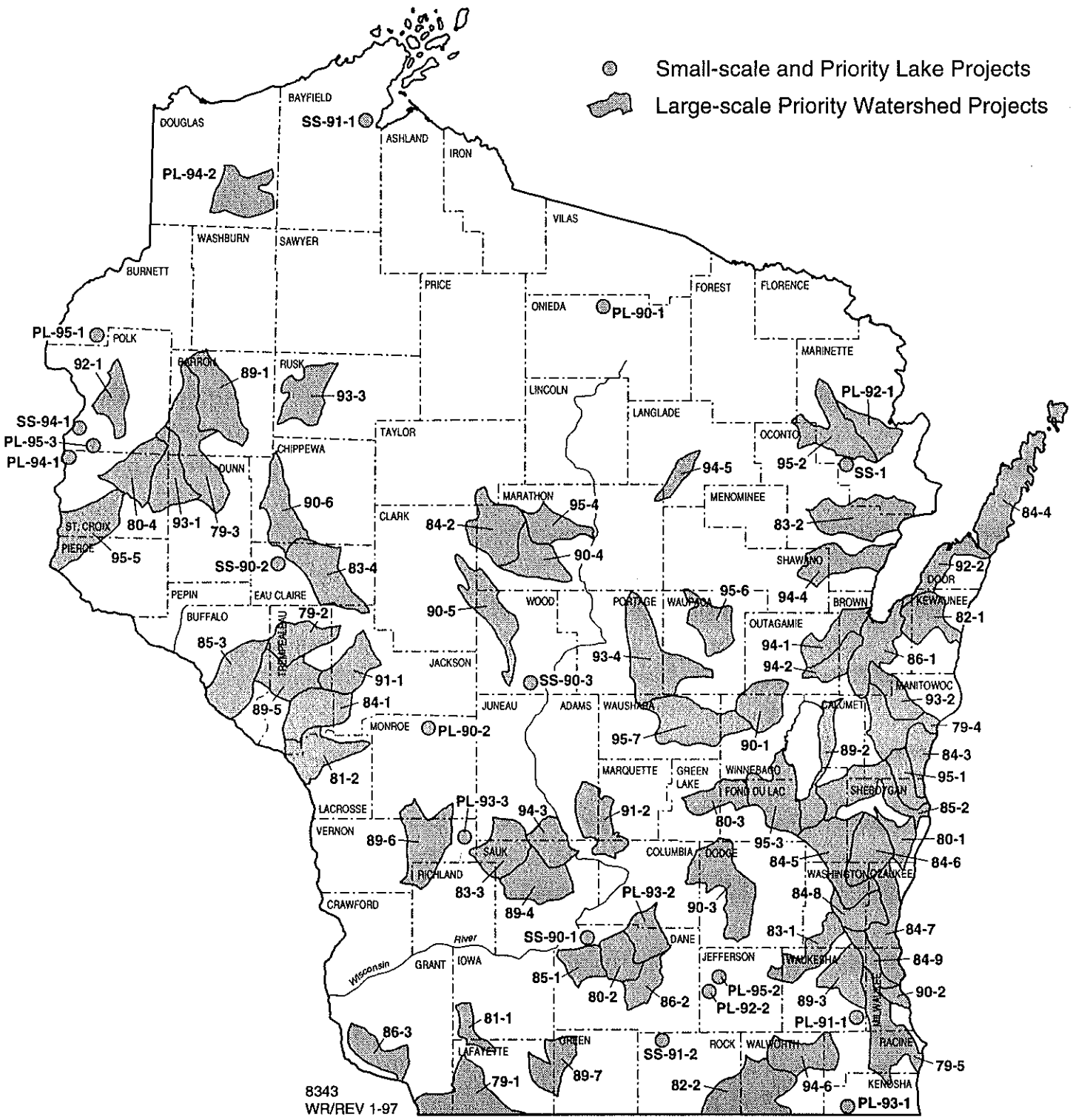
Year Selected-Map Number	Small-scale Priority Watershed Project	County(ies)
SS-1	Bass Lake ♦	Marinette
SS-90-1	Dunlap Creek	Dane
SS-90-2	Lowes Creek	Eau Claire
SS-90-3	Port Edwards - Groundwater Prototype	Wood
SS-91-1	Whittlesey Creek	Bayfield
SS-91-2	Spring Creek	Rock
SS-94-1	Osceola Creek	Polk

Year Selected-Map Number	Priority Lake Project	County(ies)
PL-90-1	Minocqua Lake	Oneida
PL-90-2	Lake Tomah	Monroe
PL-91-1	Little Muskego, Big Muskego, Wind Lakes	Waukesha, Racine, Milwaukee
PL-92-1	Lake Noquebay	Marinette
PL-92-2	Lake Ripley	Jefferson
PL-93-1	Camp/Center Lakes	Kenosha
PL-93-2	Lake Mendota	Dane, Columbia
PL-93-3	Hillsboro	Vernon
PL-94-1	St. Croix County Lakes Cluster	St. Croix
PL-94-2	Upper St. Croix/Eau Claire River	Douglas
PL-95-1	Big Wood Lake	Burnett, Polk
PL-95-2	Rock Lake	Jefferson
PL-95-3	Horse Creek	Polk, St. Croix

♦ *Project completed*

† *Sixmile-Pheasant Branch is being redone as part of the Lake Mendota project (PL-93-2).*

Priority Watershed Projects in Wisconsin
1996-1997



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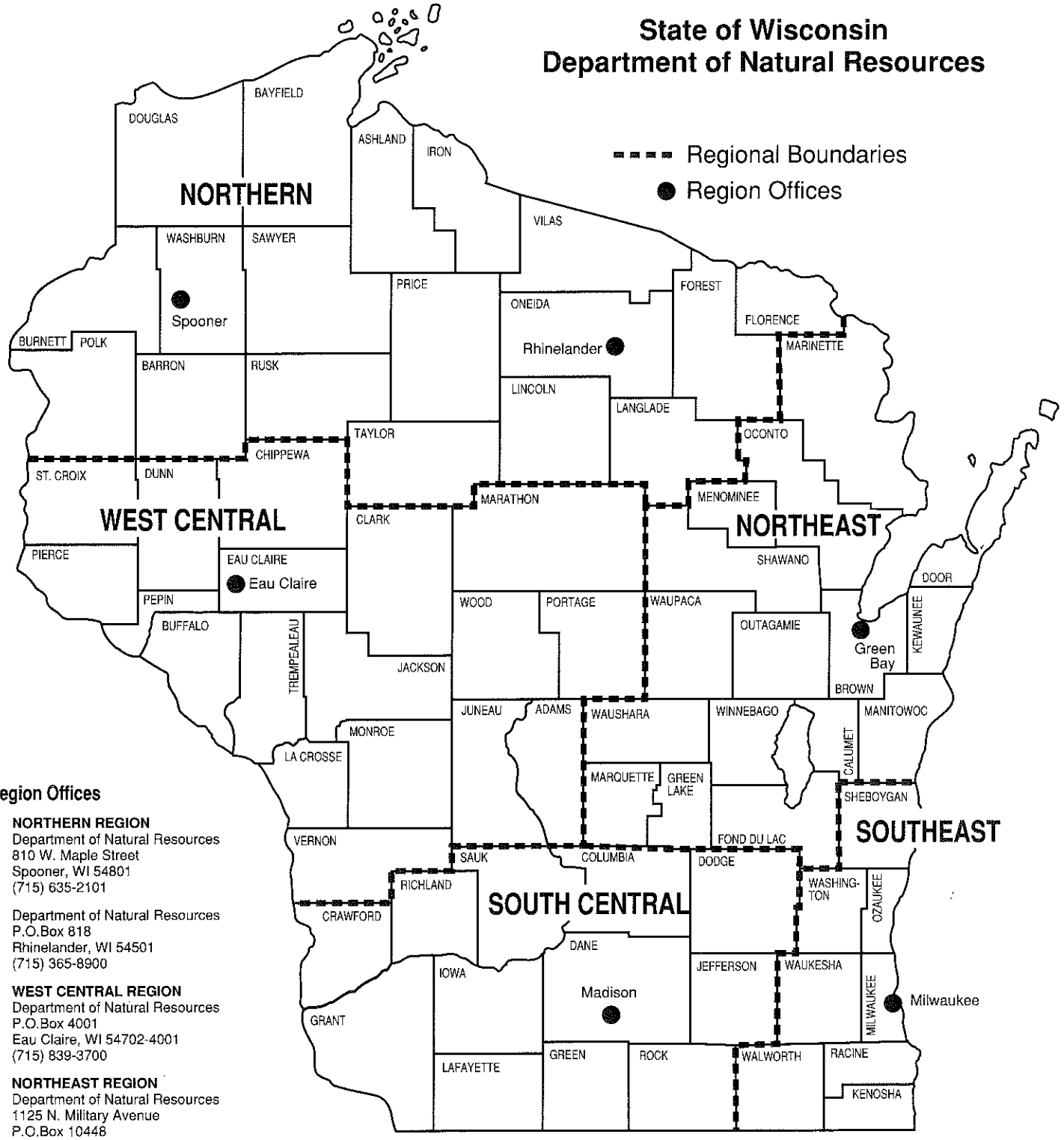

Region Offices

NORTHERN REGION
Department of Natural Resources
810 W. Maple Street
Spooner, WI 54801
(715) 635-2101

Department of Natural Resources
P.O.Box 818
Rhinelander, WI 54501
(715) 365-8900

WEST CENTRAL REGION
Department of Natural Resources
P.O.Box 4001
Eau Claire, WI 54702-4001
(715) 839-3700

NORTHEAST REGION
Department of Natural Resources
1125 N. Military Avenue
P.O.Box 10448
Green Bay, WI 54307
(414) 492-5800

SOUTHEAST REGION
Department of Natural Resources
2300 N. Dr. Martin Luther King Jr. Dr.
P.O.Box 12436
Milwaukee, WI 53212
(414) 263-8500

SOUTH CENTRAL REGION
Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg, WI 53711
(608) 275-3266

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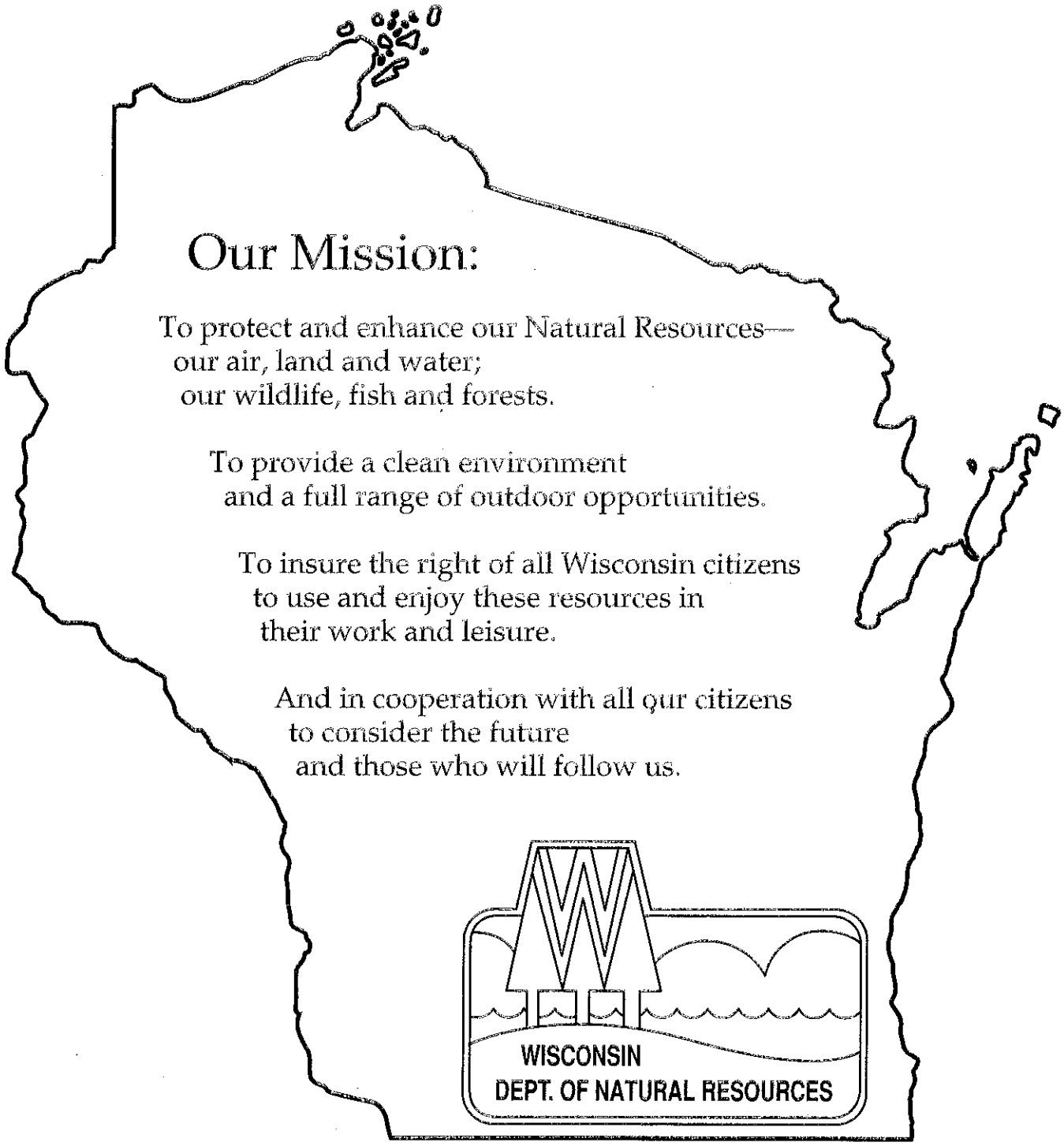

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To protect and enhance our Natural Resources—
our air, land and water;
our wildlife, fish and forests.

To provide a clean environment
and a full range of outdoor opportunities.

To insure the right of all Wisconsin citizens
to use and enjoy these resources in
their work and leisure.

And in cooperation with all our citizens
to consider the future
and those who will follow us.

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