Nonpoint Source Control Plan for the Sugar/Honey Creek Priority Watershed Project

This plan was prepared under the provisions of the Wisconsin Nonpoint Source Pollution Abatement Program by the Wisconsin Department of Natural Resources, the Department of Agriculture, Trade and Consumer Protection, and the Walworth and Racine County Land Conservation Departments.

Watershed Plan Organization Information

Sugar-Honey Creeks Watershed Citizens Advisory Committee

Peter Beierle, Chairperson; Representative, Southeast Rod & Gun Club
Tom Lightfield, Vice Chairperson
Joeann Douglas, Secretary

Mike Amon	Kathy Aron
John Bashaw	Ben Coopman
James Dowling	Gerhardt Immega
Roger Jacobsen	Tom Jorden
Ann Lohrmann	Thomas Lorden
Connie Lutz	John Lutz
Christopher Mann	Stanley Muzatko
Roger Peters	Gerald Petersen
Wayne Raislleger	Brent Redford
Tom Rossmiller	Terry Weter
	Scott Wilson

Natural Resources Board

Herbert F. Behnke, Chairman
Trygve A. Solberg, Vice Chairman
Neal W. Schneider, Secretary
Betty Jo Nelsen
Howard D. Poulson
James E. Tiefenthaler, Jr.
Stephen D. Willett

Walworth County Board

Allen Morrison, Chairperson
Richard H. Gruber, Administrative Coordinator

Agriculture, Conservation and Extension Committee

Mary Ann Pearce, Chairperson
Roy Lightfield, Vice Chairperson
Don Fredrich
Richard Kuhnke
Jerome Palzkill
Alex Smith

Racine County Board

Norman Bauernfeind, Chairperson
Jean M. Jacobson, County Executive

Planning and Development Committee Land Conservation Committee

Richard G. Rehberg, Chairperson
Keith E. Tschumper, Vice Chairperson
Wilbert P. Gumm, Secretary
Betsy Georg
John Hansen
Mike Miklasevich
Daniel F. Sharkozy

State of Wisconsin
Tommy G. Thompson, Governor

Wisconsin Department of Natural Resources

George E. Meyer, Secretary
Susan L. Sylvester, Administrator, Division of Water Quality
Paulette J. Harder, Director, Bureau of Watershed Management
Rebecca Wallace, Chief, Runoff Management Section

Land and Water Conservation Board

Robert Uphoff, Chairperson
Ken Van Dyke, Vice Chairperson
Wilbur Petroskey, Secretary
Russel Brock
Mary E. Bierman
Marigen Carpenter
George E. Nettum
James Bradley
George Meyer, DNR Secretary
David Schmiedicke, Department Of Administration Secretary Designee
Alan T. Tracy, Department of Agriculture, Trade and Consumer Protection Secretary

Wisconsin Department of Agriculture, Trade and Consumer Protection

Alan Tracy, Secretary
Nicholas Neher, Administrator, Division of Agriculture Resource Management

Dave Jelinski, Director, Bureau of Land and Water Resources
Keith Foye, Chief, Soil and Water Resource Management Section

Nonpoint Source Control Plan for the Sugar-Honey Creeks Priority Watershed Project

The Wisconsin Nonpoint Source Water Pollution Abatement Program

February 1997

This Plan Was Cooperatively Prepared By:

The Wisconsin Department of Natural Resources
Wisconsin Department of Agriculture, Trade and Consumer Protection
and
Walworth County and Racine County Land Conservation Departments

Publication WT-478-97

For copies of this document please contact:

Department of Natural Resources
Bureau of Water Resources Management
Nonpoint Source and Land Management Section
P.O. Box 7921
Madison, WI 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

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Bureau of Information Management Services Section, WDNR
Robert Queen, WDNR (Cover Photograph)

WISCONSIN DEPT. OF NATURAL RESOURCES

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary

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

February 11, 1997

IN REPLY REFER TO: 3200

Allen Morrison, Chairman
Walworth County Board
PO Box 1001
100 W. Walworth
Elkhorn, WI 53121

Allen

Dear Mr. Morrison:

I am pleased to approve the Sugar-Honey Creeks Priority Watershed Plan prepared through the Wisconsin Nonpoint Source Pollution Abatement Program. This plan meets the intent and conditions of S. 281.65, Wisconsin Statutes, and Chapter NR120, Wisconsin Administrative Code. This plan has been reviewed by the Department of Agriculture, Trade, and Consumer Protection. The plan went before the Land and Water Conservation Board on February 11, 1997, and was approved at that time. I am also approving this plan as an amendment to the Fox-Illinois River Basin Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Walworth County LCD staff that participated in preparing this plan. We look forward to assisting the Walworth County LCD and other units of government in the watershed in the implementation of the Sugar-Honey Creeks Priority Watershed Plan.

Sincerely,

George

George E. Meyer
Secretary

Congratulations on this fine project.

cc: Alan Tracey, DATCP
Jim Bradley, LWCB
Lou Olson, Walworth County LCD
Mary Ann Pearce, Walworth County LCC Chairman
Ruth Johnson, SER
Greg Pilarski, SER
Bob Biebel, SEWRPC
Keith Foye, DATCP
Cindy Hoffland, CA/8
Jan Whitcomb, WT/2

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

WISCONSIN DEPT. OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary

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

February 11, 1997

IN REPLY REFER TO: 3200

Norman Bauernfeind, Chairman
Racine County Board
Racine County Courthouse
730 Wisconsin Avenue
Racine, WI 53403

Norm

Dear Mr. Bauernfeind:

I am pleased to approve the Sugar-Honey Creeks Priority Watershed Plan prepared through the Wisconsin Nonpoint Source Pollution Abatement Program. This plan meets the intent and conditions of S. 281.65, Wisconsin Statutes, and Chapter NR120, Wisconsin Administrative Code. This plan has been reviewed by the Department of Agriculture, Trade, and Consumer Protection. The plan went before the Land and Water Conservation Board on February 11, 1997, and was approved at that time. I am also approving this plan as an amendment to the Fox-Illinois River Basin Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Racine County LCD staff that participated in preparing this plan. We look forward to assisting the Racine County LCD and other units of government in the watershed in the implementation of the Sugar-Honey Creeks Priority Watershed Plan.

Sincerely,

George

George E. Meyer
Secretary

Congratulations on this fine project

cc: Alan Tracey, DATCP
Jim Bradley, LWCB
Chuck Seegar, Racine County LCD
Richard G. Rehberg, Racine County LCC Chairman
Ruth Johnson, SER
Greg Pilarski, SER
Bob Biebel, SEWRPC
Keith Foye, DATCP
Cindy Hoffland, CA/8
Jan Whitcomb, WT/2

RESOLUTION NO. 41-12/96

ADOPTION OF SUGAR-HONEY PRIORITY WATERSHED PLAN

WHEREAS, the Walworth County Board of Supervisors on August 9, 1994, did adopt Resolution No. 22-08/94 supporting the designation of the Sugar-Honey Creeks Watershed as a "priority watershed" by the Department of Natural Resources, and

WHEREAS, the Walworth County Board of Supervisors on October 18, 1994, did adopt Resolution No. 37-10/94 to enter into an agreement - contract with the State of Wisconsin, Department of Natural Resources, whereby the Land Conservation Committee will undertake activities to develop a watershed plan, and

WHEREAS, the Land Conservation Committee perform the functions required by Chapter 92 of the Wisconsin Statutes as repealed and recreated by Chapter 346 Laws of 1981, to implement the watershed as designated, and

WHEREAS, the Walworth County Board of Supervisors on July 20, 1982, did adopt Resolution No. 56-07/82 creating the Walworth County Land Conservation, and

NOW THEREFORE, BE IT RESOLVED, that the Land Conservation Department in conjunction with the various State and Federal agencies involved has completed and compiled inventory findings for the purpose of developing a watershed plan for Sugar-Honey Creeks, and

BE IT FURTHER RESOLVED, that Walworth County Board of Supervisors approve the Sugar-Honey Priority Watershed Plan in compliance with NR 120, and be able to implement such plan as filed with the County Clerk.

Dated this 10th day of December 1996.

Allen L. Morrison
County Board Chair

Carol Kraus[illegible]
Attest: County Clerk

Policy and Fiscal Note Attached: ✓ Yes ______ No

Approved as to Form: ________ 10/28/96
Administrative Coordinator Date

Dennis D. [illegible] 10/29/96
Corporation Counsel Date

[illegible] 10/28/96
Finance Dept. Director Date

Action Required: Majority Vote Two-thirds Vote Other______

County Board Meeting Date: December 10, 1996

Unanimous vote (33 ayes)

8

December 10, 1996

RESOLUTION NO. 96-180

RESOLUTION BY THE PLANNING AND DEVELOPMENT COMMITTEE ADOPTING THE FINAL DRAFT OF THE NONPOINT SOURCE CONTROL PLAN FOR THE SUGAR-HONEY CREEKS PRIORITY WATERSHED PROJECT

To the Honorable Members of the Racine County Board of Supervisors:

BE IT RESOLVED that the Racine County Board of Supervisors hereby approves the Nonpoint Source Control Plan for the Sugar-Honey Creeks Priority Watershed. A copy of said plan is on file with the Racine County Clerk.

BE IT FURTHER RESOLVED by the Racine County Board of Supervisors that the Land Conservation Committee, sub-committee to the Planning and Development Committee, is hereby authorized to enter into cost share agreements for best management practices with landowners and units of government in this watershed.

BE IT FURTHER RESOLVED by the Racine County Board of Supervisors that the County Clerk is directed to send a certified copy of the adopted resolution to the Wisconsin Department of Natural Resources, Bureau of Water Resource Management, P. O. Box 7921, Madison, WI 53707, Attention Jan Whitcomb.

Respectfully submitted,

PLANNING & DEVELOPMENT COMMITTEE

1st Reading 12-10-96

2nd Reading 1-14-97

BOARD ACTION
Adopted yes
For ____
Against ____
Absent ____

VOTE REQUIRED: Majority

Prepared by:
Corporation Counsel

Richard G. Rehberg, Chairman

Keith E. Tschumper, Vice-Chairman

Wilbert P. Gumm, Secretary

John R. Hansen

Betsy Georg

Resolution No. 96-180
Page Two

Daniel F. Sharkozy

Michael J. Miklasevich

ATTACHMENT "A"
INFORMATIONAL ONLY

WHEREAS, the Sugar-Honey Creeks Watershed has been selected by the Wisconsin Department of Natural Resources for priority funding to control nonpoint sources of water pollution; and

WHEREAS, the inventory and planning phases of the project have been completed, under the direction of the Racine County Land Conservation Committee (sub committee to the Planning and Development), the Sugar-Honey Creeks Citizen Advisory Committee, in cooperation with the Wisconsin Department of Natural Resources; and

WHEREAS, a priority watershed plan has been prepared, which assesses the existing water quality and watershed conditions, identifies the management practices and actions necessary to improve or protect the water quality of the watershed, outlines the tasks required and the agency responsible for each and establishes the time frame and cost estimates for the project; and

WHEREAS, a public hearing for comments was held November 19, 1996, and the Racine County Land Conservation Committee (sub committee to the Planning and Development Committee) has reviewed this final draft of the Sugar-Honey Creeks Watershed plan and recommends approval of the plan to the Board; and

WHEREAS, the implementation of this plan will provide both technical assistance and cost share monies to eligible landowners within the priority watershed for the installation of best management practices designed to reduce the sources of nonpoint pollution and protect or improve the quality of Racine County's water resources.

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Sugar-Honey Creeks Priority Watershed Project Summary

The purpose of the Nonpoint Source Control Plan developed for this project is to assess the nonpoint pollutants in the Sugar-Honey Creeks Priority Watershed and guide the implementation of control measures. Nonpoint source control measures are needed to meet water resource objectives designed to protect and enhance the surface and groundwater in the watershed.

Nonpoint source pollution cannot be easily traced to a single point of origin such as a point source effluent discharge from a wastewater treatment plant or industrial plant. Nonpoint source pollution occurs when rainwater or snow melt flows across the land and picks up soil particles, organic wastes, fertilizers, or other pollutants and carries them to surface or groundwater. These soil particles and organic wastes contain phosphorus and nitrogen, the same compounds found in commercial fertilizers. Runoff from urban areas can contain heavy metals, PAH, sediment, and phosphorus. Nonpoint source pollution in the Sugar-Honey Creeks Watershed has lead to a general decrease in both surface and groundwater quality.

The predominant sources of nonpoint pollutants in the Sugar-Honey Creeks Watershed originate from croplands and animal lots, primarily in the form of excess sediment, phosphorus, and organic contaminants. Barnyards and cropland combined account for an estimated 97 percent of the total phosphorus. Cropland contributes 85 percent of the total sediment delivered to surface water in the watershed. These sources, particularly cropland, often have a negative effect on the surface water quality in the Sugar-Honey Creeks Watershed.

Secondary sources of nonpoint pollutants in the Sugar-Honey Creeks Watershed originate from gully and streambank erosion, primarily in the form of sediment deposition to the streams. Streambank and gully erosion account for an estimated 13 percent of the total sediment load to surface water in the project area. These sources also affect surface water quality in the Sugar-Honey Creeks Watershed.

The Nonpoint Source Pollution Control Plan for the Sugar-Honey Creeks Watershed was prepared by the Walworth County Land Conservation Department, the Racine County Land Conservation Department, the Department of Natural Resources (DNR), and the Department of Agriculture, Trade, and Consumer Protection (DATCP). The DNR selected the Sugar-Honey Creeks Watershed as a priority watershed project through the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1994. It joined approximately 70 priority watershed projects which are currently underway. An additional 20 projects are already completed. The Nonpoint Source Water Pollution Abatement Program was created in 1978 by the Wisconsin State Legislature. The program provides financial and technical assistance to landowners and local governments to reduce nonpoint source pollution.

The project is administered at the state level by DNR and DATCP. The Walworth County LCD and the Racine County LCD will administer the project at the local level with assistance from the University of Wisconsin-Extension and the Natural Resource Conservation Service (U.S. Department of Agriculture). This plan is primarily used by and written for the County LCDs, local units of government, lake districts, legislators, external program evaluators, the interested public, DNR, and DATCP.

General Characteristics

The Sugar-Honey Creeks Watershed drains 167.3 square miles in Walworth and Racine counties in southeast Wisconsin. It is located within the Fox River Basin. Sugar Creek and Honey Creek flow in a generally easterly direction until coming together at the Honey Lake impoundment. Honey Creek continues for a short distance before emptying into Echo Lake at Burlington and the Fox River. The point where Honey Creek drains into Echo Lake is the downstream limit of the watershed. Approximately 90 percent of the watershed lies within Walworth County with the balance in Racine County. The Sugar-Honey Creeks Watershed was divided into nineteen smaller drainage areas, called subwatersheds, for this planning effort.

Groundwater is the main source of drinking water in the watershed. Groundwater quality is generally considered good, however groundwater can be susceptible to contamination by human activity. Groundwater is held in thick, permeable layers of soil and rock. The principal aquifers of the Sugar-Honey Creeks Watershed are the sand-gravel aquifer, the Niagara aquifer, the Galena-Platteville aquifer, and the sandstone aquifer.

Agriculture is important to the area economy, as agriculture comprises over 70 percent of the overall land use in the watershed. While the number of farms in both Walworth and Racine counties have decreased steadily over the past 20 years, average farm size has increased. Population in the watershed is estimated at 14,900. Most towns and villages have grown over the past decade at rates ranging from two to 24 percent. Regional trends suggest that the watershed population will continue to grow due to its proximity to Milwaukee, Racine, and Kenosha.

Table S-1: Summary of Land Uses in the Sugar-Honey Creeks Watershed

Land Use	Acres	Percent
Agricultural	75,679	70.7
Woodland	10,195	9.5
Wetland	9,242	8.6
Surface Water	1,986	1.9
Parks and Recreation	789	0.7
Developed	8,463	7.9
Other (Extractive)	706	0.7

Source: SEWRPC, DNR, and Walworth and Racine LCDs

Sources of Nonpoint Pollution

The Walworth and Racine County LCDs collected data on agricultural lands, barnyards, streambanks, lake shores, and urban areas in the watershed. This data was analyzed and used to estimate the pollutant potential of these nonpoint sources. The following is a summary of the inventory results:

Upland Sediment Inventory

* More than 18,200 acres, or 23 percent of the agricultural land area was inventoried.

* An estimated 58,917 tons of sediment are delivered from cropland to watershed streams on an annual basis, or 85 percent of the total sediment load.

Streambank Erosion Inventory

* 60 miles of intermittent and perennial streams in the watershed were inventoried.

* An estimated 2,065 tons of sediment is eroded from streambanks annually, or about 3 percent of the total sediment load in the watershed.

Gully Erosion Inventory

* Gullies deliver an estimated 6,873 tons of sediment to the stream annually, or about 10 percent of the total sediment load.

Barnyard Runoff Inventory

* 108 barnyards and animal lots were inventoried

* An estimated 145,906 pounds of COD are delivered to surface waters annually.

* An estimated 2,712 pounds of phosphorus are delivered to the streams in the watershed on an annual basis. An additional 498 pounds of phosphorus are delivered annually to depressional areas.

Groundwater Inventory

* Of the 169 private wells in the watershed that were tested for nitrates, more than 28 percent of the well samples tested over the Preventative Action Limit (PAL) of 2 mg/l, and an addition 12 percent of the samples were above the Enforcement Standard (ES) Health Advisory Level of 10 mg/l.

* An inventory of geological features in the watershed identified areas susceptible to groundwater contamination. Areas of particular concern are those that contain sinkholes, have shallow soils, or a high density of fracture traces, all of which can act as a direct conduit to groundwater.

Shoreline Inventory

* 150,300 feet or 100 % of the total shoreline was inventoried.

* 1520 feet of shoreline are eroding, contributing 120 tons of sediment directly to lakes.

Urban Inventory

* An estimated 1,357 tons of sediment are delivered from urban land annually, or 2 % of the total load.

Project Goals

To protect and improve the aquatic habitat and water quality of the Sugar-Honey Creeks Watershed by reducing sediment; control and reduction of COD, and reduce fecal coliform bacteria colonies present in surface waters.

To improve and protect from degradation the groundwater of the Sugar-Honey Creeks Watershed through improved management of nutrients and pesticides, and through the development of a Wellhead Protection Plan for the Troy area.

Sediment Objective

To reduce overall sediment delivered to streams in the Sugar-Honey Creeks Watershed by 34 percent, the following will need to be achieved.

* Reduce sediment delivered to the streams from agricultural uplands by at least 17,600 tons annually, or 30 percent. This will also reduce total phosphorus delivery from agricultural uplands by 30 percent.

* Reduce sediment delivered to lakes from shorelines by 90 tons annually, or 75 % of the total sediment due to shoreline erosion.

* Reduce streambank erosion by a minimum of 25 percent and maintain or develop stream woodland and grassland corridors by developing buffers that provide wildlife habitat, canopy, bank stabilization, and sediment reduction.

* Reduce sediment delivered to streams within the Sugar-Honey Creeks Watershed from gully erosion by 50 percent, or 3437 tons, annually.

* Establish or maintain grassland and woodland corridors to protect or enhance the water resource. Corridors also provide wildlife habitat, streambank stabilization, canopy cover to lower stream temperatures, and pesticide and sediment retention.

* Reduce sediment delivered to streams from construction sites by a minimum of 50 % by installing and maintaining construction erosion control BMPs.

COD Objective

To reduce overall COD delivered to streams in the Sugar-Honey Creeks Watershed by 40 percent the following will need to be achieved:

* Reduce COD runoff from barnyards to streams in the watershed by at least 40 percent (similar reductions in phosphorus loadings from barnyards will occur from this objective).

* Eliminate manure applications on snow covered cropland not suited for winter spreading.

Groundwater Objective

* Eliminate direct discharges of nonpoint source pollutants to areas acting as a direct conduit to groundwater, such as sinkholes, unused wells, and creviced bedrock.

* Reduce the application of winter spread manure on unsuitable cropland.

* Reduce the over application of commercial and organic fertilizers on soils with potential for leaching contaminants into groundwater supplies.

* Provide landowners with an extensive informational and educational program to promote awareness and to accept responsibility for the groundwater resources.

Community Action Objective

To develop community awareness and action that fosters change that promotes sustained long term improvement and protection of the Sugar-Honey Creeks Watershed resources.

* Municipalities will minimize phosphorus, sediment, and other pollution to stormwater systems by informing their residents about the connection between stormwater runoff and surface water quality, and the adoption of urban BMPs, wellhead protection, and construction site erosion control.

* Youth will be able to describe the value of surface and ground water resources.

* Facilitate the organizing of a community group to provide protection and stewardship of the watershed over time.

* Local government officials will get information to help them to make decisions that protect local water quality and improve land use.

Critical Sites

Nonpoint source pollutant load reduction in the Sugar-Honey Creeks Priority Watershed Project will be achieved mainly through voluntary participation. However, state statutes require that the nonpoint source control plan contain the necessary language to ensure the reasonable likelihood of achieving water quality goals and objectives. Landowners with sites that meet the established critical site criteria are required by law to address those specific sites by reducing the nonpoint source pollutant load to an acceptable level. Pollutant reduction can occur solely through the action of the landowner with guidance from county staff or through watershed participation. Each identified site will be field verified before receiving notification as a critical site, with the findings sent to the DNR. Landowners will need to sign a cost share agreement with the Walworth or Racine County Land Conservation Department.

Notification of landowners with upland and barnyard critical sites will begin when Walworth and Racine counties have the ability to identify individual fields for specific management categories on the FOCS/WINHUSLE database. The highest ranked sites will be notified first until all landowners or land operators with critical sites are notified. The notification will include the following information:

* The 36 month period in which landowners are eligible for the full level of state cost sharing, after which the cost share rate decreases by 50 Percent.

* The potential consequences of either Chapter NR243 for animal waste, or s.281.20(1), (3), or (5), for sediment delivery and groundwater protection that landowners may face if no action is taken. Some of these include receiving a notice of discharge, requiring of a WPDES permit, or the issuing of a notice of intent.

* The right to appeal the designation of a critical site through a written request to the Land Conservation Committee (LCC) within 60 days of receipt of the notification letter. The LCC shall limit its appeal affirmation consideration to whether the critical site designation is consistent with critical site criteria established in the implementation plan.

Impact and Scope of Critical Sites

Surface Water

* Of the 108 barnyards inventoried, 7 have been designated as critical sites for control (6 percent of the total number of barnyards), which will result in achieving a minimum reduction of 47 percent of the barnyard COD objective.

* Of the estimated 65,365 acres of cropland in the watershed, an estimated 5,688 acres (or 9 percent) are designated as critical involving 101 landowners and 125 fields.

* Those construction sites not conforming to erosion control regulations established in local construction erosion control ordinances.

Management Actions

The Walworth and Racine County LCDs will contact all landowners who are eligible to receive cost share funds during project implementation. Management classifications are determined based on the level of pollution control needed to achieve water quality objectives in the watershed. Specific sites or areas within the watershed project are designated as either "critical", "eligible", or "ineligible". Designation as a critical site indicates that controlling that specific source is necessary if the pollutant reduction goals for the project are to be met. Nonpoint sources which are eligible but not critical contribute less of the pollutant load, but are included in cost sharing eligibility to further insure that water quality objectives are met. Landowners with eligible sites need not control every eligible source to receive cost share assistance.

The Walworth and Racine County LCDs will assist landowners in applying the BMPs. Practices range from alterations in farm management (such as changes in manure spreading and crop rotation) to engineered structures (such as diversions, sediment basins, and manure storage facilities), and are tailored to specific landowner situations. Walworth and Racine county staff will also examine the need for wellhead protection areas for municipal drinking water supplies.

Landowner Eligibility

Barnyard Runoff

To maintain cost effectiveness, only those landowners with barnyard sites delivering more than 5,000 pounds of COD to surface water on an annual basis will be eligible for a complete barnyard runoff management system (7 sites). Landowners with barnyards delivering 1,000 to 5,000 pounds of COD to surface water annually will be eligible to receive cost sharing for low cost diversions and roof gutters (35 sites). If these low cost practices do not reduce the annual COD level below 1,000 pounds, the livestock operation will be eligible for cost sharing on additional controls.

Table S-2: Barnyard COD

Management Category	COD (lbs./year)	Number of Barnyards	COD Controlled (lbs./year)	Percent of Reduction Objective
Critical	> 5,000 lbs. COD	7	28,314	47
Eligible	1,000 - 5,000 lbs. COD	35	71,840	53
Not Eligible	< 1,000 lbs. COD	66	0	0

Cropland Erosion

Upland sediment accounts for 85 % of the total sediment load. Control of this sediment source is key to reaching sediment reduction objectives. Approximately 28 percent of the pollutant reduction objective for sediment will be achieved through critical site designation and the subsequent installation of BMPs on cropland. In subwatersheds with a high sediment reduction objective, those fields eroding at rates greater than T and delivering sediment to surface waters at rates greater than 1.1 tons/acre/year will be designated as critical. In all other subwatersheds, those fields eroding greater than T and delivering sediment to surface waters at rates greater than 1.8 tons/acre/year will be critical. There are an estimated 125 fields that meet critical site criteria. Those fields not designated as critical and delivering sediment to surface waters at rates greater than or equal to 0.3 tons/acre/year will be eligible for cost shared practices.

To promote and encourage voluntary participation, only those landowners with upland fields that deliver sediment to the stream at the highest rates will receive the initial critical site notification (1,137 acres). The remainder of the critical sites will be notified at the rate of 20 % per year for the following four years, if they have not voluntarily entered the program during the intervening period. At the end of first five years of implementation, all critical sites will either have been notified or voluntarily participated.

Table S-3: Cropland Sediment Delivery

Management Category	USLE/Sediment Delivery (tons/yr)	Acres	Tons of Sediment Reduced	Percent of Reduction Objective
Critical	10,632	5,688	6,122	34 %
Eligible	47,485	53,890	11,556	66 %

Gully and Streambank Erosion
Gully and streambank erosion have not been determined to be a significant nonpoint source in the Sugar-Honey Creeks watershed, critical site designation will not be a component of control for these sites.

Gully Erosion
Gully erosion contributes an estimated 6,873 tons of sediment annually to surface waters. The target reduction objective for gully erosion is 50 %. Achieving this objective will reduce sediment delivery by 3,437 tons annually.

Table S-4: Eroding Streambanks

Management Category	Sediment Delivery (tons/year)	Number of Owners	Linear Feet	Target Reduction
Eligible	> 5 Tons/Yr	38	15,892	522 Tons/Yr (25 %)
Not Eligible	< 5 Tons/Yr			0

Project Implementation

Project Implementation is scheduled to begin in 1997 and continue for a period of ten years. Implementation will consist of ongoing educational programming for watershed residents, individual farm conservation planning, the signing of cost share agreements, urban pollution prevention, and practice installation.

Table S-5: Total Project Costs: Sugar-Honey Creeks

Eligible Activity	Walworth County (State & Local Shares)	Racine County (State & Local Shares)	Total Cost (State Share)
Cost Share Funds: Practices	$5,327,783	$233,325	$4,610,438
Cost-Share Funds: Easements	57,376	10,126	48,750
Local Assistance Staff Support	1,936,712	262,472	2,199,184
Information and Education Activities	28,763	9,588	38,351
Other (travel, supplies, etc.)	174,724	23,132	197,856
Urban Management	409,000	0	409,000
Engineering Assistance	20,000	10,000	30,000
Total	$7,954,358	$548,643	$7,533,579

Information and Education

The Walworth and Racine County LCDs will have primary responsibility for conducting an information and education program during the sign up and implementation phases of the project. University of Wisconsin-Extension staff in the counties will provide assistance. Education activities will be directed to all residents of the Sugar-Honey Creeks Watershed. The primary objectives are to:

* Build community awareness, appreciation and stewardship of the local water resources, and awareness of local water quality resource problems.

* Increase the understanding, knowledge, and skills necessary to implement solutions to water quality resource problems.

* Build awareness of the Sugar-Honey Creeks Priority Watershed and the Best Management Practices available to enhance and protect the water resource.

Conservation Planning and Contracting
Conservation planning and cost share agreements for installation of BMPs will be available to landowners throughout the implementation phase. Voluntary participation will be emphasized through out the project. Sites determined as critical will be a priority. Other sites will be targeted for pollution control using inventory information. All practices on agreements must be installed before the project is scheduled to end. Landowners must maintain practices for at least ten years from the installation of the final practice listed on the cost share agreement.

Cost-share agreements with structural BMPs are recorded with the register of deeds, and in the event of property being sold, the new landowner will be required to install and maintain the remaining Best Management Practices. Practices can be installed as soon as a landowner signs a cost-share agreement with the Walworth or Racine County Land Conservation Department.

Project Implementation Costs

The DNR will award grants to Walworth and Racine counties for the cost sharing of BMPs, staff support, and education activities. Estimates of the financial assistance needed to implement nonpoint source controls in the Sugar-Honey Creeks watershed are shown in Table S-5.

Municipalities and lake districts within the watershed are eligible to receive grants to implement the plan recommendations.

Project Evaluation and Monitoring

The evaluation strategy for the project involves collecting, analyzing, and reporting information to track watershed progress in three areas:

1. Administrative: This category includes the progress in providing technical and financial assistance to eligible landowners, and carrying out education activities identified in the plan. The Walworth and Racine County LCDs and participating municipalities will track the progress in this area and report to the DNR and DATCP on an annual basis.

2. Pollutant Reduction Levels: The Walworth and Racine County LCDs will calculate the reductions in nonpoint source pollutant loadings resulting from changes in land use practices and report to the DNR and DATCP during the annual review meeting.

3. Water Resources: The DNR may monitor changes in water quality, habitat, and water resource characteristics periodically during the project and at the end of the project period.

4. Urban Progress: Participating municipalities will attend annual meetings with the DNR and will provide an annual report specifying accomplishments.

CHAPTER ONE
Purpose, Legal Status and General Description

Wisconsin Nonpoint Source Water Pollution Abatement Program

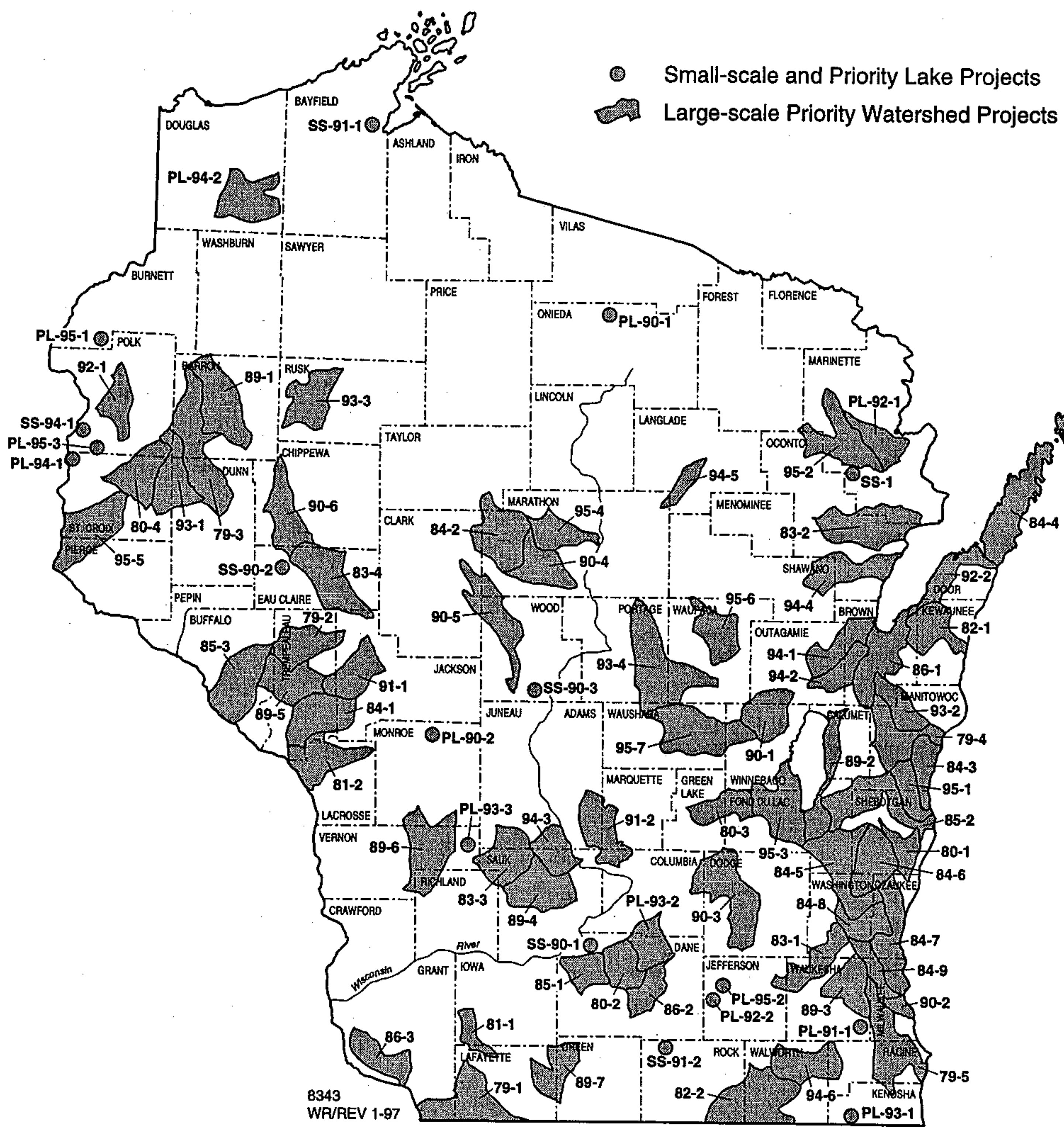
The State Legislature created the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1978. The goal of the Program is to improve and protect the water quality of streams, lakes, wetlands, and groundwater by reducing pollutants from urban and rural nonpoint sources. The 167.3-square-mile Sugar- Honey Creeks Watershed, located in Walworth and Racine Counties, was designated a "priority watershed" in 1994. The primary objective of this project is to reduce nonpoint source pollution loads and to enhance and protect the water quality of the streams, wetlands, groundwater, and lakes in the Sugar-Honey Creeks Watershed. The Sugar-Honey is part of the Illinois-Fox River Basin.

Nonpoint sources of pollution in the watershed include eroding agricultural lands, eroding streambanks and roadside, runoff from livestock wastes, agricultural practices, erosion from developing areas, and runoff from established urban areas. Pollutants from nonpoint sources are carried to the surface water or groundwater through rainfall runoff or seepage, and snowmelt.

The following is an overview of the Nonpoint Source (NPS) Priority Watershed program:

- The Department of Natural Resources (DNR) administers the program in cooperation with the Department of Agriculture, Trade and Consumer Protection (DATCP). Wisconsin is divided into 333 discrete hydrologic units called watersheds. These watersheds are assessed for water quality concerns as part of a comprehensive basin planning program. Watersheds with a high degree of water quality impairment from nonpoint sources of pollution become eligible for consideration as a priority watershed project. Approximately 20 projects are completed and 70 are underway. As directed by the state legislature, all of these high ranking watersheds, about 150, must be planned by 2015. Designation as a priority watershed project enables special financial support to local governments and private landowners in the watershed to reduce nonpoint source pollution.

Map 1: Priority Watershed Projects in Wisconsin
1996-1997



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).*

- A priority watershed project is guided by a plan such as this one, prepared cooperatively by the DNR, DATCP and local units of government, with input from a local citizen's advisory committee. Project staff evaluate the conditions of surface water and groundwater, and inventory the types of land use and nonpoint sources of pollution throughout the watershed. The priority watershed plan assesses nonpoint and other sources of water pollution and identifies best management practices (BMPs) needed to control pollutants to meet specific water resource objectives. The plan guides implementation of these practices in an effort to improve water quality.

- Upon approval by state and local authorities, local units of government implement the plan. Water quality improvement is achieved through mandatory and voluntary implementation of nonpoint source controls (BMPs) the adoption and enforcement of ordinances. Landowners, land renters, counties, cities, villages, towns, sanitary districts, lake districts, and regional planning commissions are eligible to participate.

- Counties, lake districts, and other government entities are eligible for local assistance and NPS grants to conduct eligible activities outlined in the plan. These activities can include the I & E program, contracting with eligible landowners for the installation of BMPs, and so forth.

- Technical assistance is provided to aid in the design of BMPs. State cost-share assistance is available to help offset the cost of installing these practices. Eligible landowners and local units of government are contacted by the local staff to determine their interest in installing the BMPs identified in the plan. Signed cost-share agreements list the practices, costs, cost-share amounts, and a schedule to install management practices. Municipal governments are also assisted in developing and installing BMPs to reduce urban pollutants.

- Informational and educational activities are developed to encourage participation.

- The DNR and DATCP review the progress of the counties and other implementing units of government, and provide assistance throughout the ten-year project. The DNR monitors improvements in water quality resulting from control of nonpoint sources in the watershed.

Legal Status of the Nonpoint Source Control Plan

The Sugar-Honey Creeks Priority Watershed 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 through the cooperative efforts of the DNR, DATCP, Walworth LCD, Racine LCD, the Sugar-Honey Creeks Citizens Advisory Committee, the Village of East Troy, and the City of Elkhorn.

This watershed plan is the basis for the DNR to enter into cost-share and local assistance grants with agencies responsible for project implementation and will be used as a guide to implement measures to achieve desired water quality conditions. If a discrepancy occurs between this plan and the statutes or the administrative rules, or if statutes or rules change during implementation, the statutes and rules will supersede the plan. This watershed plan does not in any way preclude the use by local, state or federal governments of normal regulatory procedures developed to protect the environment. All local, state, and federal permit procedures must be followed. In addition, this plan does not preclude the DNR from using its authority under chapters 147 and 144 of the state statutes to regulate significant nonpoint pollution sources in the project area.

This priority watershed plan was approved by DNR following approvals by the Land and Water Conservation Board, Walworth County, and Racine County.

Amendments to the Plan

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

Relationship of the Nonpoint Source Control Plan to the Stormwater Discharge Permit Program

Wisconsin's Pollution Discharge Elimination System (WPDES) Storm Water Permit Program is administered by DNR's Bureau of Watershed Management under Chapter 147 of the Wisconsin Statutes. This program is separate from the Nonpoint Source program and applies to certain classes of dischargers statewide as identified in NR 216. In cases where the programs do overlap, implementation grants may only apply to activities identified in the watershed plan. Practices to control construction site erosion and storm water runoff from new development are not eligible for cost sharing. In industrial areas, cost sharing is available as specified in NR 120.17 — only in the non-industrial parts of facilities where a problem has also been identified in the priority watershed plan.

Priority Watershed Project Planning and Implementation Phases

Planning Phase

The planning phase of the Sugar-Honey Creeks project began in 1994. The following information gathering and evaluation activities were completed during this stage:

- Determine the conditions and uses of groundwater, streams, and lakes.

- Inventory types of land uses and severity of nonpoint sources affecting groundwater, streams, and lakes.

- Evaluate the types and severity of other factors which may be affecting water quality. Examples include discharges from municipal wastewater treatment plants and natural or endemic stream conditions. (This has been completed through the ongoing integrated resource management planning efforts in the Illinois-Fox River Basin.

- Determine nonpoint source controls and other measures necessary to improve and/or protect water quality.

- Prepare and gain approval of a program for local implementation of the project so that plan recommendations would be carried out.

Implementation Phase

The implementation phase of the Sugar-Honey Creeks Priority Watershed Project began following review of the draft priority watershed plan, a public hearing, and approval by the DNR, LWCB, and the Board of Supervisors for Walworth and Racine counties. Public review during plan development occurred primarily through the efforts of the Sugar-Honey Creeks Citizen Advisory Committee.

During the implementation phase:

- DNR enters into local assistance agreements with local units of government that have implementation responsibilities identified in the plan. These agreements provide funds necessary to maintain the resources and staff required for plan implementation.

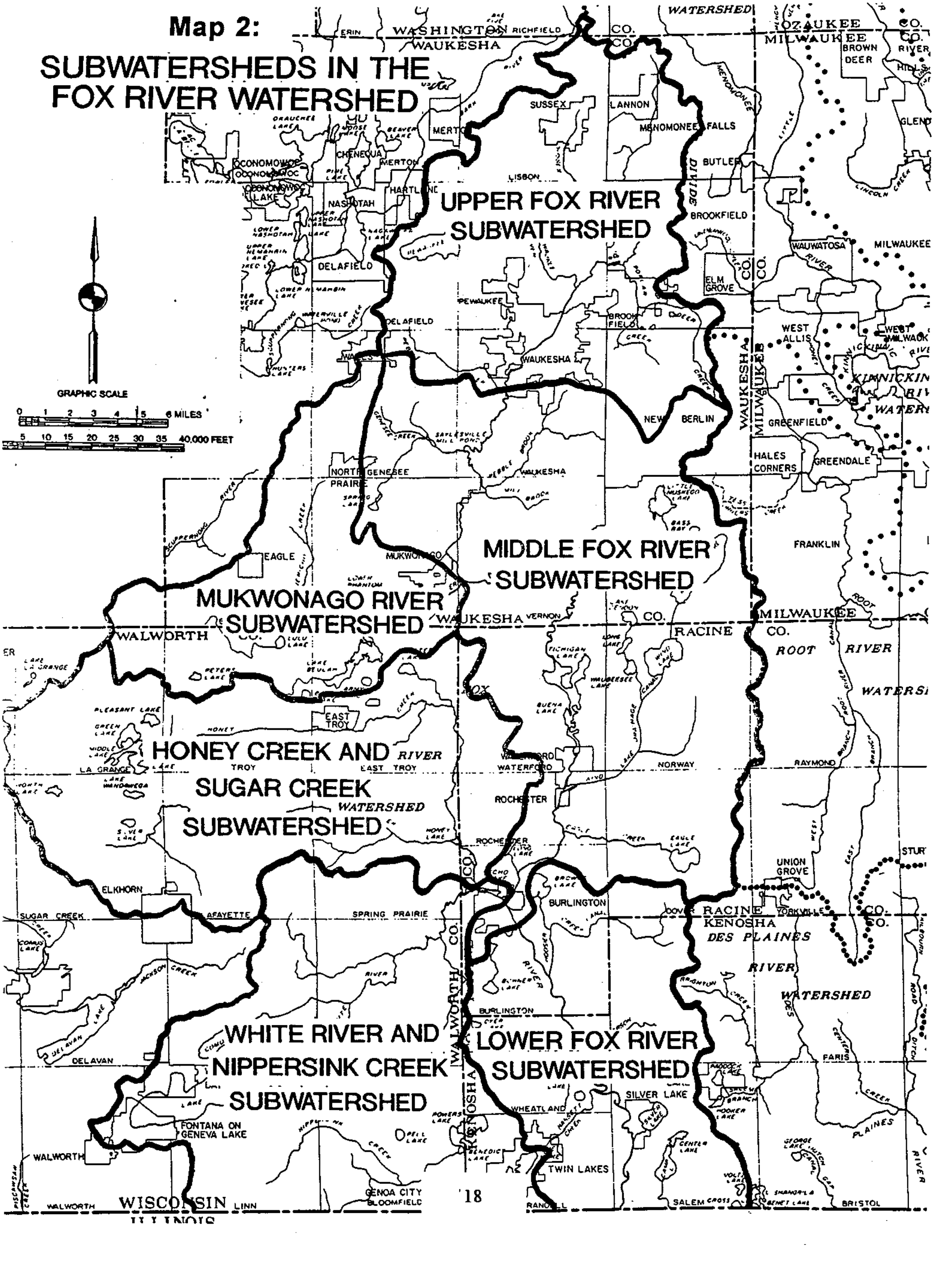
- In the rural portions of the watershed, the Walworth and Racine County LCDs contact eligible landowners to determine their interest in installing best management practices identified in the plan.

  In the urban portions of the watershed, the DNR or its designee contacts local units of government to discuss in detail the required actions for implementing the plan recommendations.

- In rural areas, the landowner signs a cost-share agreement with the county that outlines the practices, costs, cost-share amounts, and a schedule for installation of management practices. Practices are scheduled for installation after an agreement is signed. Practices must be maintained for at least 10 years (except where required as a component of another practice, high residue management systems, nutrient management, pesticide management, and cropland protection cover are exempt from the minimum 10 year operation and maintenance period, and only need to be maintained during the period for which cost sharing is received). Any easements which are acquired will be perpetual.

  In urban areas, similar processes are used. In some cases, the local units of government and the DNR sign agreements for urban practices. In other cases the agreements will be between local units of government and their private landowners.

Map 2: SUBWATERSHEDS IN THE FOX RIVER WATERSHED



CHAPTER TWO
Watershed Characteristics and Water Resource Conditions, and Goals

This Chapter discusses the cultural and physical characteristics, the water resource conditions, and goals for the Sugar-Honey Creeks Priority Watershed.

Cultural Features

Location and Community Information

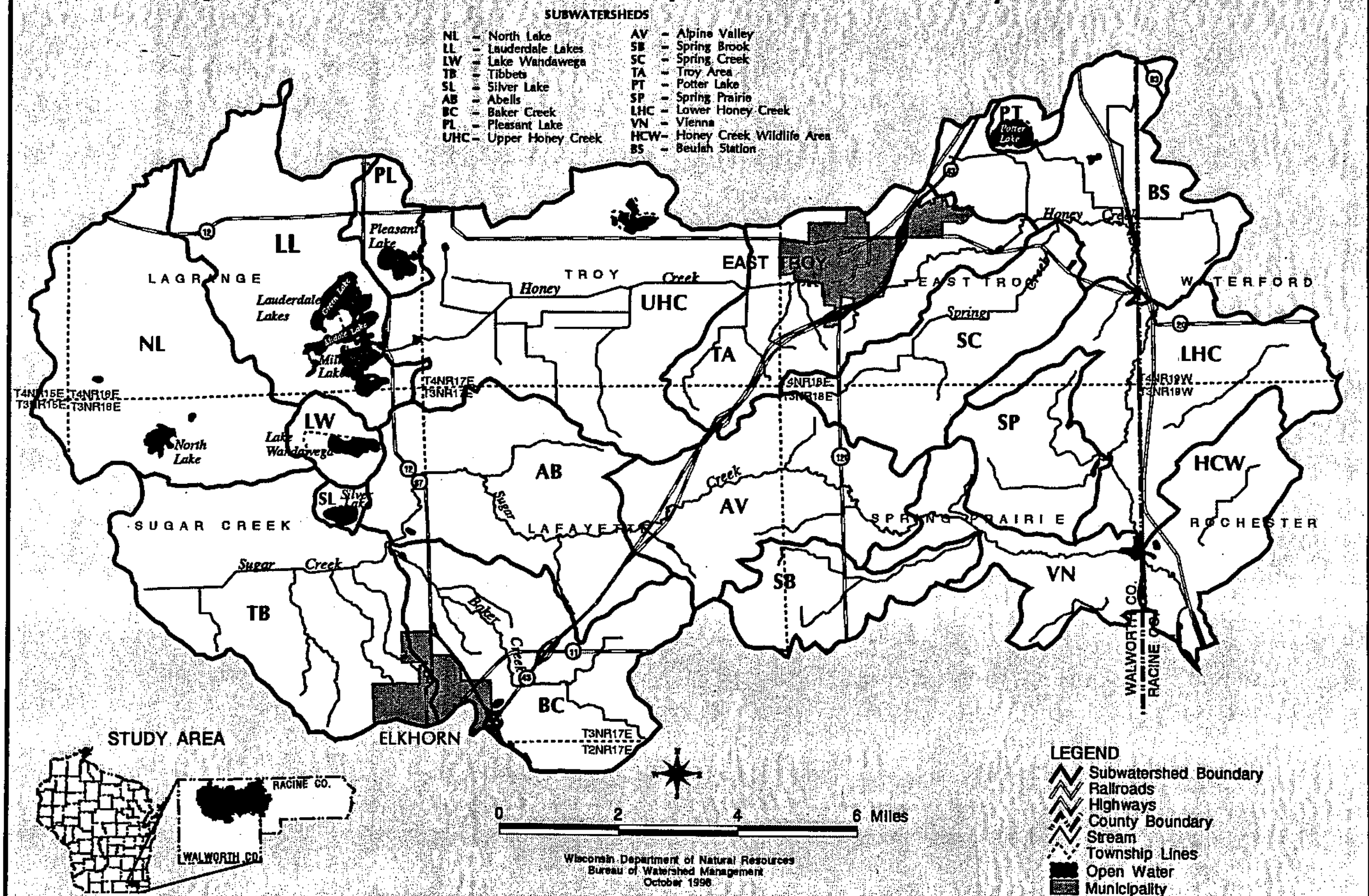
The Sugar-Honey Creeks Watershed is a 167.3-square-mile (107,060 acres) drainage basin located approximately 20 miles southwest of Milwaukee in south east Wisconsin (map 1-1). Approximately 90 percent of the watershed, or 150.6 square miles lies in Walworth County. The balance of the watershed, or 16.7 square miles, lies in Racine County. The Sugar-Honey Creeks Watershed is within the Illinois-Fox River Basin. Sugar and Honey Creeks merge below the Honey Lake dam and join the Fox River just north of the city of Burlington in Racine county.

Civil Divisions

The Sugar-Honey Creeks Watershed lies within Walworth and Racine counties. Incorporated areas wholly or partially in the watershed include the northern half of the city of Elkhorn and the village of East Troy. The watershed covers parts of the following towns:

Walworth County		Racine County
LaGrange	Troy	Waterford
East Troy	Sugar Creek	Rochester
Lafayette	Spring Prairie	Burlington
Richmond	Whitewater	
Geneva		

Map 3: Sugar and Honey Creeks Priority Watershed



Population Size and Distribution

The Sugar-Honey Creeks Watershed population is estimated to be about 14,900 persons. Most of the watershed population lives in rural unincorporated areas. Population in the watershed is growing. All towns and villages have a growth rate over the past decade ranging from 2 to 24 percent, with the exception of Geneva, La Grange, Richmond, and Spring Prairie townships which experienced declines in population ranging from 1 to 15 percent. The total estimated population of the watershed increased by 8 percent over this period. Regional trends suggest that the watershed's population will continue to grow due to its proximity to Milwaukee, Racine and Kenosha.

Land Uses

Rural land uses predominate in the watershed. Agriculture is the most important land use, comprising nearly 71 percent. The average farm size is 243 acres in Walworth County, and 200 acres in Racine County. In 1994, Walworth County ranked second statewide in soybean production, ninth in corn, and tenth in sweet corn. During the same year, Racine County ranked third in total soybean production and seventh in wheat (Wisconsin Agricultural Statistics, 1995). Wetlands and woodlands cover over 18 percent of the land area. Developed land uses occupy approximately 8 percent of the watershed (Table 2-1).

Table 2-1.Summary of Land Uses in the Sugar-Honey Creeks Watershed

Land Uses	Acres	Percent
Agricultural	75,679	70.7
Woodland	10,195	9.5
Wetland[1]	9,242	8.6
Surface Water	1,986	1.9
Parks and Recreation	789	0.7
Developed	8,463	7.9
Other (Extractive and Disturbed)	706	0.7

[1] See wetland section in this chapter for a more comprehensive estimate of wetland acreage.

Source: SEWRPC, DNR, and Walworth and Racine LCDs

Natural Resource Features

Climate and Precipitation

The frequency, duration and amount of precipitation influences surface and groundwater quality and quantity, soil moisture content, runoff characteristics, and the physical condition of waterways in the Sugar-Honey Creeks Watershed. The Sugar-Honey Creeks Watershed lies in the continental zone which is characterized by winters which are long and relatively cold and snowy and summers which are mostly warm with periods of hot humid conditions. Frost conditions usually occur from October to May. The mean annual precipitation in the watershed is approximately 36 inches. The driest months are December, January and February. The majority of precipitation falls in the form of thunderstorms during the growing season (May-September). Approximately 50 rainfall events per year occur in the watershed. A rainfall event is defined as a distinct period when precipitation is equal to or greater than 0.1 inch. Runoff can be high during rainfall events in March and April, when the ground is still frozen, the soil moisture content is high and little infiltration occurs.

Topography

The four major stages of glaciation that occurred in the region have laid the foundation for the physiology, the topography, and the soils of the watershed. The watershed is generally flat to gently rolling. The topographic relief in the watershed ranges from approximately 1,050 feet above sea level just west of the City of Elkhorn in the Town of Sugar Creek, to about 762 feet above sea level at Echo Lake in Racine County. Surface drainage networks are generally well connected, although some areas of the watershed are internally drained.

Topographic features of a watershed have a direct influence on the potential for soil erosion and sediment movement and deposition of streams and lakes. Sloping land under cultivation or construction is likely to impact surface water quality when used without the use of soil conservation practices or runoff management controls.

Geology

The bedrock geology of the watershed are the formations underlying the unconsolidated surface deposits. The bedrock formations, from oldest to youngest, includes Precambrian crystalline rocks; Cambrian sandstone; Ordovician dolomite, sandstone, and shale; and Silurian dolomite. Many of these rocks underlie only parts of the watershed. In the far western, northwestern area of the watershed in the vicinity of the Lauderdale Lakes, the Silurian Niagara dolomite and Maquoketa shale does not appear. The younger Niagara dolomite is found only in the southeastern part of the watershed. In the western area of the watershed, a deep bedrock valley trending southwest to northwest has the greatest depth of glacial deposits. All of the rock units dip toward the east.

The watershed is covered by a variety of glacial landforms and features including rolling ground and end moraines, outwash plains, and lake basin deposits. End moraines are formed by deposition at the margin of a glacier or at the time when the ice melting equaled the rate of ice advance. The end moraines left unsorted material ranging from fine clay to boulders. Ground moraines were formed beneath the ice and left deposits of unsorted materials with irregular thickness. Outwash plains consists of stratified glacial deposits that flowed with water from the melting ice. Lake basin deposits consist of materials deposited by water from melting ice blocks that formed freshwater lakes.

The unconsolidated glacial deposits cover the underlying bedrock formations. The depth of the unconsolidated material varies over the watershed, with the greatest depth in the western area in the deep bedrock valley. The depth of glacial material in the bedrock valley is up to 400 feet. Towards the east, the depth of the glacial deposits varies from 50 to 150 feet over bedrock.

The glacial deposits vary considerably in permeability over the watershed. Generally, the northwestern, north, and eastern area of the watershed has more permeable sandy glacial outwash and ice contact materials. The south and southwestern areas in the watershed have more end and ground moranic deposits, with corresponding increases in clayey soils and lower permeability.

Soils

The soils found in the watershed originate from four major sources: glaciation, bedrock, weathering, wind, and fluvial action. The majority of the soils in the Sugar-Honey Creeks Watershed are grouped in the following soil associations:

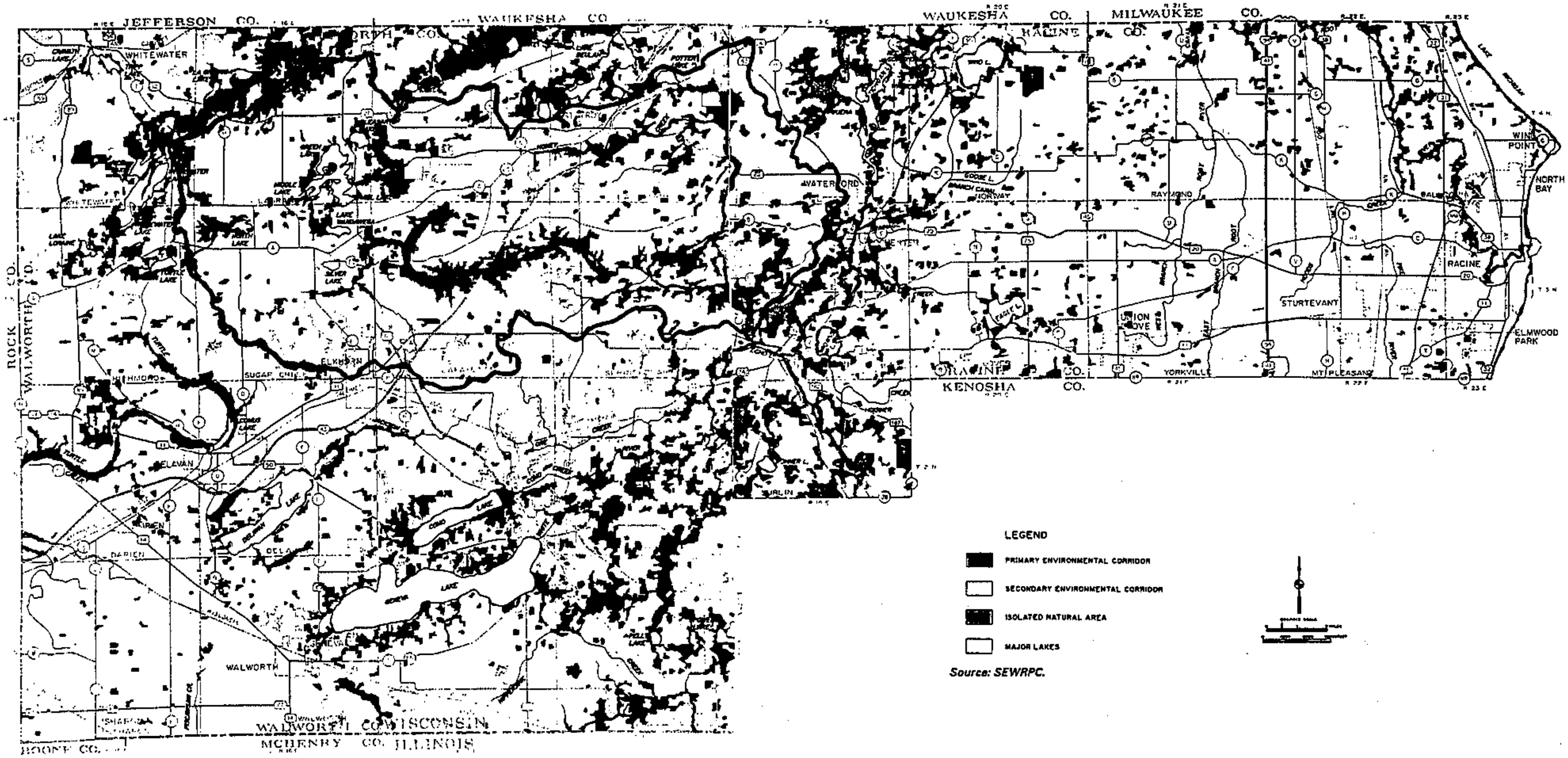
> Houghton-Palms association. Very poorly drained organic soils in depressions and on bottom lands.
>
> Pella-Kendall-Elburn association. Poorly drained and somewhat poorly drained soils that have a subsoil of silty clay loam; formed in loess and the underlying loam to clay loam glacial till or outwash and lacustrine materials derived from till.
>
> Miami-McHenry association. Well-drained soils that have a subsoil of clay loam and silty clay loam; formed in loess and the underlying sandy loam to loam glacial till, on uplands.
>
> Plano-Griswold association. Well-drained soils that have a subsoil of silty clay loam and sandy clay loam; formed in loess and the underlying sandy loam to loam glacial till, on uplands.
>
> Casco-Fox association. Well-drained soils that have a subsoil of clay loam; moderately deep over sand and gravel, on outwash plains and stream terraces.
>
> Plano, gravelly substratum-Warsaw association. Well-drained soils that have a subsoil of silty clay loam and clay loam; moderately deep and deep over sand and gravel, on outwash plains and stream terraces.

The nature of soils within the watershed affect the rate, amount, and quality of the surface water runoff exported from the land to the streams, rivers and lakes. The erosion potential of soils is based on their texture, structure, organic matter content, permeability, slope, and position on the landscape.

Environmental Corridors

Environmental corridors include those environmentally sensitive lands having the highest concentration of recreational, ecological, scenic, and cultural resources. Environmental corridors generally include one or more of the following elements of the natural resource base: 1. lakes and streams and associated shorelands and floodplains; 2. wetland; 3. woodlands; 4. prairies; 5. wildlife habitat; 6. areas covered by wet, poorly drained or organic soil; and 7. steeply sloping lands. In addition, any outdoor recreational sites, historic and archaeological sites, and natural and scientific areas are located in environmental corridors.

Map 4: ENVIRONMENTAL CORRIDORS AND ISOLATED NATURAL AREAS IN RACINE AND WALWORTH COUNTIES: 1980



Source: SEWRPC.

The Southeastern Wisconsin Regional Planning Commission, (SEWRPC) has defined and delineated the environmental corridors lying within Racine and Walworth counties. The environmental corridors within the Sugar-Honey Creeks Priority Watershed Project Area are generally found along Sugar and Honey creeks and their tributaries and adjacent to the six natural lakes.

The location and extent of the environmental corridors in the Sugar-Honey Creeks Watershed are shown on the Environmental Corridors and Isolated Natural Areas in Racine and Walworth Counties, 1980 map.

The preservation of the environmental corridors within the Sugar-Honey Creeks Priority Watershed Project Area is essential for protecting and improving the surface and ground water quality of the streams, tributaries, and lakes.

Natural and Scientific Area Sites

Natural and scientific area sites are sites that contain high quality examples of natural communities. Thirteen natural areas have been identified in the Sugar-Honey Creeks Priority Watershed. If specific locational or other information is needed about these natural communities or individual endangered species, contact the Bureau of Endangered Resources, DNR. **Please note** that the specific location of endangered resources is sensitive information. Exact locations **should not** be released or reproduced in any publicly disseminated documents.

Streams

Perennial and intermittent streams are the predominate surface water feature in the Sugar-Honey Creeks Watershed. Sugar Creek and Honey Creek are the primary streams in the watershed. Sugar Creek is 27.1 miles in length and Honey Creek is 26.8 miles in length.

Other primary streams in the watershed include Spring Creek, Spring Brook, and Bakers Creek. Perennial streams in the watershed have a combined length of nearly 77 miles, and include 39 perennial tributaries to Sugar Creek and 27 perennial tributaries to Honey Creek.

A number of intermittent streams flow only when there is run off or when groundwater discharge is present. Intermittent streams generally form the headwaters of perennial streams.

Many of the perennial and intermittent streams have been extensively modified through channelization to accommodate agricultural land uses.

Sugar-Honey Creeks Lakes

The Honey-Sugar River Watershed is located in the Fox (Illinois) River Basin and encompasses approximately 170 square miles of Walworth County. Seven lakes are located within the watershed ranging in size and morphological characteristics (Table 2-2).

Table 2-2. Size and Morphological Characteristics of Lakes

Lake Name	Surface Acreage	Maximum Depth (ft)	Average Depth (ft)	Watershed Acreage	Flushing Rate (vol/yr)	Watershed to Lake Ratio
Lauderdale	834	55	15.1	7,211	0.43	9:1
Pleasant	154	29	12.4	1,216	0.48	8:1
Potter	162	26	8	387	0.26	2:1
North	191	11	2.5	9,268	14.05	48:1
Wandewega	119	8	4	988	1.56	8:1
Silver	85	4	2.5	285	1.11	3:1
Honey	44	10	2.4	40,132	111.54	912:1

Lakes are commonly classified according to the degree of nutrient enrichment, or trophic state. The ability of lakes to support a diverse population of biological organisms and support a variety of recreational activities is often associated with the lake's productivity or trophic state. Typically, lakes are separated into three different trophic states: eutrophic, mesotrophic, and oligotrophic. Lillie et al. (1993) have developed specific equations for Wisconsin that convert different water quality parameters such as total phosphorus, secchi disk, and chlorophyll to Trophic State Index values ranging from 0 to 100. Trophic States can be correlated to specific biological and water clarity characteristics as shown in Table 2-2a.

Table 2-2a

Biological and Water Quality Condition of Lakes with Changes in the Trophic State Index	
TSI Less than 30	Classical oligotrophic lake with clear water, diverse algae populations, plenty of oxygen and cold water at the bottom, and a cold water fisheries.
TSI Between 30 and 40	Deeper lakes still oligotrophic, but bottom water of some shallower lakes may be warmer and depleted of oxygen during the summer.
TSI Between 40 and 50	Mesotrophic Lakes, with moderately clear water, more abundant algae and a greater chance of oxygen depleted from the bottom water.
TSI Between 50 and 60	Lakes becoming Eutrophic, with decreased clarity, reduced algae diversity, oxygen depleted bottom water during summer and abundant plant growth with a warm-water fisheries (bass, panfish, northern).
TSI Between 60 and 70	Blue-green algae become dominant and algal blooms are likely, with extensive plant growth and poor water clarity.
TSI Between 70 and 80	Classical eutrophic lake with heavily and recurring algae blooms, poor water clarity, dense plant growth limited by light penetration and declining fisheries.
TSI Greater Than 80	Algal blooms and scum very common, summer fish kills, few aquatic plants and fisheries dominated by rough fish.

Table 2. Lake Trophic State Index (TSI) correlation to biological characteristics including water clarity, aquatic plant growth, fish community and algal bloom frequency. Modified from WI Self-Help Lake Monitoring Summary Report, 1991-1992 (Temte et. al. 1993). Originally published by Heiskary and Lindbloom (1993) with criteria developed by Carlson (1977)

Oligotrophic lakes are nutrient poor lakes and generally have very clear water, few aquatic plants and low algae densities. Many oligotrophic lakes have very unproductive fisheries, while others can support good cold water fish species such as trout or small mouth bass. Mesotrophic lakes are moderately rich in nutrients and can support abundant aquatic plants, algae, and productive fisheries. Mesotrophic lakes seldom exhibit nuisance aquatic plant growths or algae blooms. Eutrophic lakes are nutrient rich and are characterized by excessive aquatic plant growth, noxious algae blooms, and poor water clarity. The fisheries in eutrophic lakes can range from very productive northern and bass fisheries to carp or bullhead dominated fisheries.

All the lakes have the potential to support a balanced warm water sport fisheries and full body contact recreation. In addition, the shallow lakes like Silver, North, and Wandewega have the potential to provide substantial wildlife habitat and coinciding recreational activities. All of the lakes within the Honey-Sugar Creeks Watershed are classified as mesotrophic to eutrophic.

Although a lake's TSI classification is correlated to a high degree with the in-lake total phosphorus concentration, other factors may influence the recreational and aesthetic value of a lake including turbidity, frequency of algal blooms, and abundance of aquatic plants. For most southeast Wisconsin lakes, phosphorus is the limiting nutrient. Therefore, reductions in the annual phosphorus input or "load" to a lake should result in improved water quality conditions such as fewer algal blooms and increase water quality. Since sediment can also transport phosphorus, reduction goals for sediment are also important to achieve improvements in water clarity. On the other hand, increases in water clarity will likely result in increases in aquatic plant abundance and distribution. Therefore, the preservation of fish and wildlife habitat and the enhancement of recreational uses depend not only on watershed control, but also on the in-lake management of exotic species (e.g. milfoil, zebra mussels, etc.) and the protection of shoreline and aquatic habitat including beneficial, native aquatic plants.

Wetlands

Wetlands are valuable natural resources. They provide wildlife habitat, fish spawning and rearing areas, recreation, storage of runoff and flood flows, and removal of pollutants. Wetlands in the watershed are mainly in the Sugar Creek and Honey Creek shorelands and floodplains. Shoreland wetlands support furbearers and waterfowl populations and may provide seasonal habitat for sport fish. There are also extensive wetland areas along the riparian corridors and headwaters of several perennial tributaries in the watershed

A wetland habitat inventory was done to identify existing and modified or converted wetlands for the purpose of protection from degradation or potential restoration. The focus of the inventory was on wetlands that are presently, or have been in the past, degraded through drainage, grazing, cropping, or other activities causing water storage loss, and build up of sediments. Data were gathered from Natural Resource Conservation Service maps, air photos, and the DNR wetland inventory maps. See Table 2-3A and 2-3B for Wetland Inventory Summary.

Recreation

The watershed's streams, wetlands, and lakes offer diverse and high-quality recreational opportunities. The most popular activities are fishing and boating. Other popular activities are wildlife observation, hiking, hunting, and trapping.

Table 2-3A. Wetland Inventory Summary: Honey Creek Watershed

Subwatershed	Prior Converted	Farmed Wetland	Natural Wetland
	acres	acres	acres
Upper Honey	3,208	1,407	1,236
Troy Area East Troy	1,426	760	740
Beulah Station	836	280	1,169
Spring Creek	538	414	386
Lower Honey Creek	1,187	145	498
Honey Creek Wildlife Area	435	50	889
Spring Prairie	675	313	532
Pleasant Lake	94	0	12
Potters Lake	0	0	6
Lauderdale Lake	163	21	156
North Lake	53	59	135
Totals	8,615	3,449	5,759

Table 2-3B. Wetland Inventory Summary: Sugar Creek Watershed

Subwatershed	Prior Converted	Farmed Wetland	Natural Wetland
	acres	acres	acres
Tibbets	3,671	1,953	347
Abells	966	1,340	1,542
Baker Creek	1,181	917	211
Alpine Valley	452	610	662
Spring Brook	347	513	201
Vienna	962	314	417
Wandawega	35	0	96
Silver	0	0	5
Total	7,614	5,647	3,481

Groundwater Resources

Regional Aquifers

Groundwater is the main source of drinking water in the Sugar-Honey Creeks Priority Watershed. Groundwater is stored underground in pore spaces and cracks within the soil and rock layers. Unconsolidated material and rock layers which hold groundwater are called aquifers.

Since 1936, the State of Wisconsin has required well drillers to document well construction and rock and soil layers encountered during well installation. Information from geologic logs, driller construction reports, and Wisconsin Geological and Natural History Survey (WGNHS) reports for Walworth and Racine Counties is included below. Principal aquifers within the watershed are the sand-gravel aquifer, the Niagara aquifer, the Galena-Platteville aquifer, and the sandstone aquifer. Most drinking water wells are less than 200 feet deep, within the various aquifer formations.

The sand-gravel aquifer consists of unconsolidated sand and gravel deposits in glacial drift and alluvium. These deposits occur over much of the county, either at land surface or buried beneath less permeable drift. Approximately 67% of the private domestic wells are completed in the sand-and-gravel aquifer. A number of high-capacity wells are finished in the aquifer, including two public water supply wells in the City of East Troy.

The Niagara aquifer in the watershed consists of dolomite of Silurian age. The Niagara formation overlies the Maquoketa Shale in the eastern third of the county. Approximately 11 percent of the private wells are completed in this aquifer.

The Galena-Platteville aquifer is the Galena-Platteville unit of Ordovician age in the western half of the county, where it is not overlain by Maquoketa Shale. In this area, where the Galena-Platteville unit is the uppermost bedrock, it is fractured and contains solution channels. Approximately 22% of the private domestic wells are finished in this unit.

The sandstone aquifer includes all sedimentary bedrock below the Maquoketa Shale, where the shale is present, and below the Galena-Platteville unit, where the shale is absent. The sandstone aquifer is continuous over the watershed. The City of Elkhorn has 4 public water supply wells which draw drinking water for the city from Ordovician water bearing formations. The City of East Troy has one public water supply well finished in the Ordovician dolomite - sandstone aquifer.

The Maquoketa Shale separates the Niagara dolomite formation from the Galena-Platteville and sandstone aquifers in the eastern part of the county. The Maquoketa Shale has been removed by erosion in the western area of the watershed. Because of its very low permeability, the shale restricts the vertical movement of water and confines water in the sandstone aquifer.

Direction of Groundwater Flow

The water table in the watershed for the most part lies within the glacial drift. The water table generally is a subdued replica of the land surface and is higher under topographic highs, such as those east of Elkhorn, and lower under topographic lows, such as along Honey Creek. Areas where the depth to water is less than 10 feet for at least part of the year occur in the low-lying parts of the county along streams, lakes, and wetlands.

Typically, groundwater flow in the surficial sand-gravel aquifers is towards local surface water features. Groundwater flow overall in the bedrock formations is towards the east, with localized cones of depressions centered around high capacity water supply wells.

Surface Water Conditions and Goals

Surface Water Use Classifications

Surface water quality standards and criteria are expressions of the conditions considered necessary to support biological and recreational uses. Water quality standards for recreational and biological uses are contained in Chapters NR 102, NR 104, and NR 105 Wisconsin Administrative Code.

In addition to these standards, other criteria were used to assess the suitability of surface waters for recreational and biological uses. Data characterizing stream size and accessibility were used to help determine the suitability and types of recreation a stream is capable of supporting. Information on current recreational use of surface waters (provided by users at public access points and discussions with local officials) is also used to assess suitability of surface waters for recreation. Use classifications and supporting water quality standards used in evaluating water resource conditions are discussed below.

Biological Stream Use

Wisconsin streams are classified according to the biological uses desired for each stream. These classifications are listed for each stream in the water quality management plans developed for each basin in the subwatershed discussions. Stream classification determines allowable pollutant loads to the system. Resources are classified as one of the following:

CW = Coldwater Communities: These streams are capable of supporting a community of coldwater fish (trout, sculpin) and other aquatic life or serve as spawning areas for coldwater fish species.
WWS = Warmwater Sport Fish Communities: These streams are capable of supporting a community of warmwater sport fish (bass, walleye, pike) or serve as spawning areas for warmwater sport fish.
WWF = Warmwater Forage Fish Communities: these streams are capable of supporting an abundant diverse community of forage fish (shiners, minnows) and other aquatic life (insects, clams, crayfish).
LFF = Limited Forage Fish Communities (Intermediate Surface Waters): These streams are capable of supporting small populations of forage fish that tolerate pollution, or fish and aquatic invertebrates that tolerate pollution. Small physical stream size and reduced stream flow usually limit the aquatic life.
LAL = Limited Aquatic Life (Marginal Surface Waters): These streams are capable at best of supporting a limited community of aquatic life. These streams are usually small, such as intermittent streams or concrete lining.

Recreational Stream Use

Recreational stream use classifications are described by a level of human body contact determined to be safe and reasonable. The system applies to all surface waters including those categorized as intermediate or marginal under the above referenced biological use classification system. Three designations are used under the recreational stream classification system. These designations are full body contact, partial body contact, and non-contact.

FBC = Full Body Contact: These waters are used for human recreation where immersion of the head is expected and occurs often. Recreation activities classified as full body contact include swimming, waterskiing, sailboarding, and other similar activities.

PBC = Partial Body Contact: These waters are used for human recreation where immersion of the head is not frequent and contact is most often incidental or accidental. Recreational activities classified as partial body contact include boating, canoeing, fishing, and wading.

NC = Non-contact: These waters should not be used for human recreation. This category is used infrequently when extenuating circumstances such as high concentrations of in-place pollutants, an uncontrollable pollution source, or other conditions dictate that contact with the water would be an unnecessary health risk.

All streams in the Sugar-Honey Creeks Watershed are designated as Partial Body Contact (PBC).

Sugar-Honey Creeks Water Resource Conditions

For inventory purposes, the Sugar-Honey Creeks Watershed project area was divided into 19 subwatersheds. The subwatershed areas and names are shown on the Sugar Honey Creeks Priority Watershed map, and are listed below.

Sugar Creek Subwatersheds	**Honey Creek Subwatersheds**
Abells	Beulah Station
Alpine Valley	Honey Creek Wildlife Area
Baker Creek	Lauderdale Lakes
Lake Wandawega	Lower Honey
Silver Lake	North Lake Direct
Spring Brook	Pleasant Lake
Tibbets	Potter Lake
Vienna	Spring Creek
	Spring Prairie
	Troy Area - East Troy
	Upper Honey

Map 5: Sugar and Honey Creeks Priority Watershed Pollution Reduction Goals

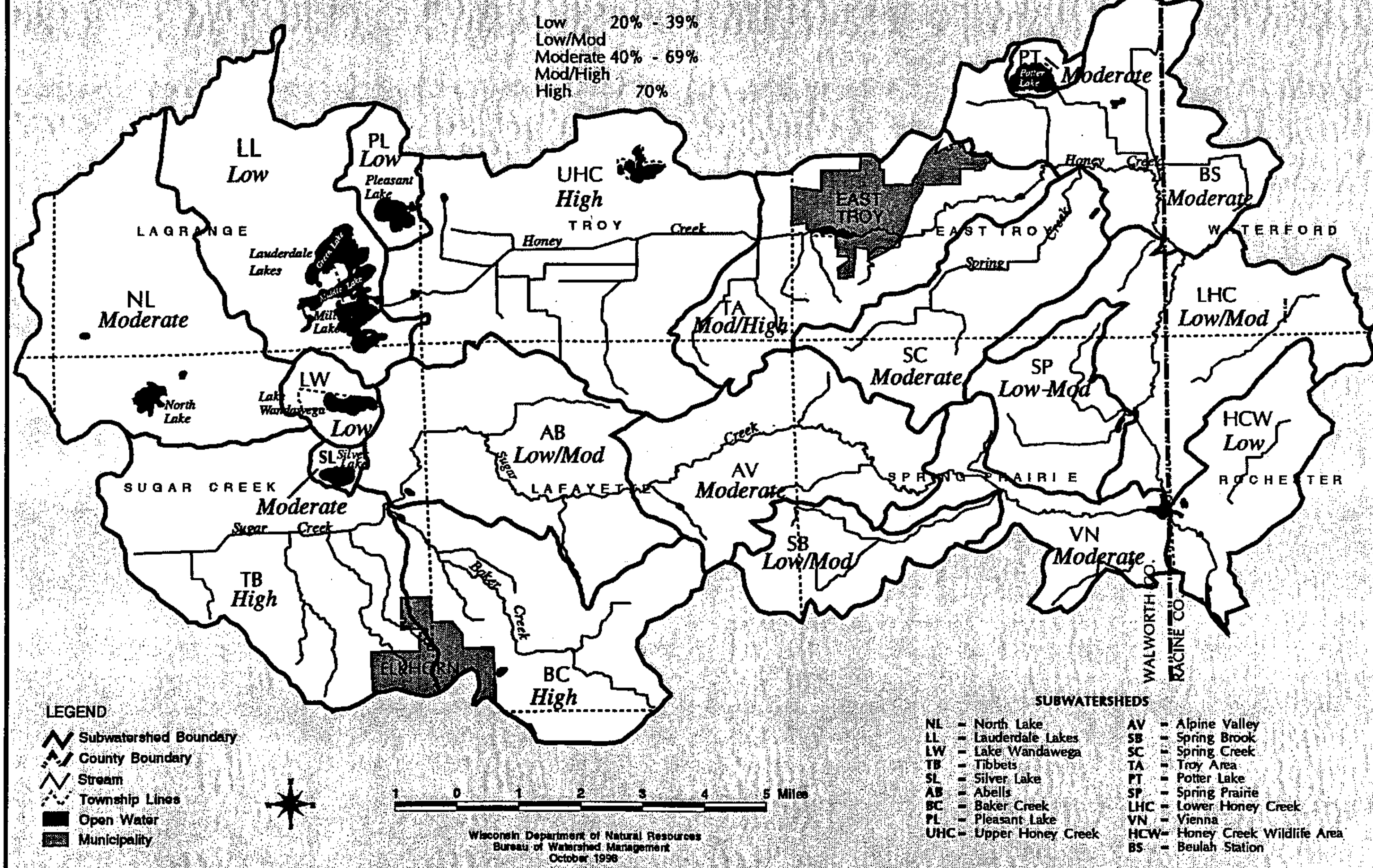


Table 2-4 **Summary of Aquatic Life & Water Quality Conditions For Streams In The Sugar-Honey Creeks Watershed.**

	HONEY		SUGAR	
Uses	Current Use (miles)	Potential Use (miles)	Current Use (miles)	Potential Use (miles)
CWSF	.9	3.8	.5	1.1
WWSF	0	6.3	1.5	8.7
WWFF	10.7	22.4	11.6	14.0
LFF	26.25	5.35	16.4	12.2
LAL	2.5	2.5	30.9	24.9
TOTAL	40.35	40.35	60.9	60.9

CWSF = Cold Water sport fish and aquatic life communities
WWSF = Warm water sport fish and aquatic life communities
WWFF = Warm and cold water forage fish communities
LFF = Limited forage fish communities
LAL = Limited aquatic life

The following sections describes the physical and water quality conditions for each subwatershed and lake in the Sugar-Honey Creeks Project Area. A more detailed description of each subwatershed can be found in the Sugar-Honey Creeks Priority Watershed Surface Water Appraisal, (Galarneau and Nelson). Tables found in Appendix A of this plan summarize the subwatershed conditions.

Honey Creek Watershed

Streams

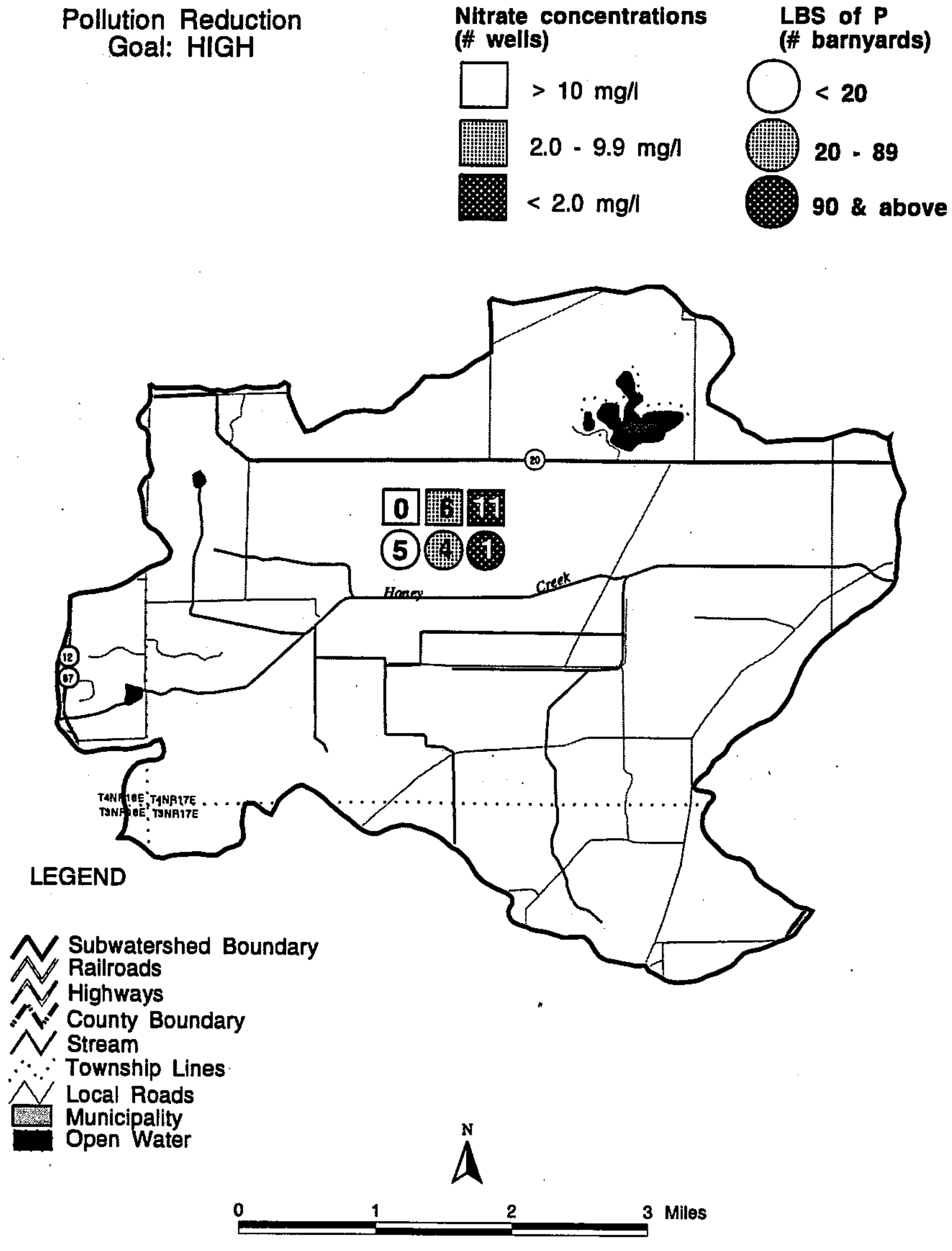
Upper Honey Subwatershed

The Upper Honey subwatershed is in Walworth County and encompasses the Lauderdale Lakes which are the headwaters of Honey Creek. This subwatershed contains 6.5 stream miles of Honey Creek from the Lauderdale Lakes just west of STH 67 extending downstream to CTH ES. There are six unnamed perennial tributary streams and one unnamed intermittent tributary stream in this sub-basin. The Upper Honey subwatershed has a drainage area of 12,350 acres and Honey Creek has a low-flow discharge $Q_{7,10}$ of 1.1 cfs at the outlet of Mill Lake (USGS 1992).

Agricultural land uses dominate this subwatershed. Specific causes of degraded water quality include; historical channelization, maintenance dredging, insufficient riparian buffer, lack of shading, and cropland runoff. These conditions result in the excessive nutrient and sediment loads, and nuisance vegetation and bacteria problems found in Honey Creek.

Honey Creek, downstream of the Lauderdale Lakes, flows through a natural channel for approximately 1.3 stream miles and receives water from numerous cold water springs. This stream reach provides excellent riparian and stream habitat to Honey Creek, excluding the small impoundment of Honey Creek (Cedar Grove Millpond) upstream of Pleasant Lake Road. The impoundment offsets some of the benefits provided by the cold water springs by enabling Honey Creek to warm up. Downstream of the impoundment are more springs which help to cool Honey Creek again prior to flowing to the channelized reaches downstream.

Map 6. Upper Honey Creek Subwatershed



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Troy Area Subwatershed

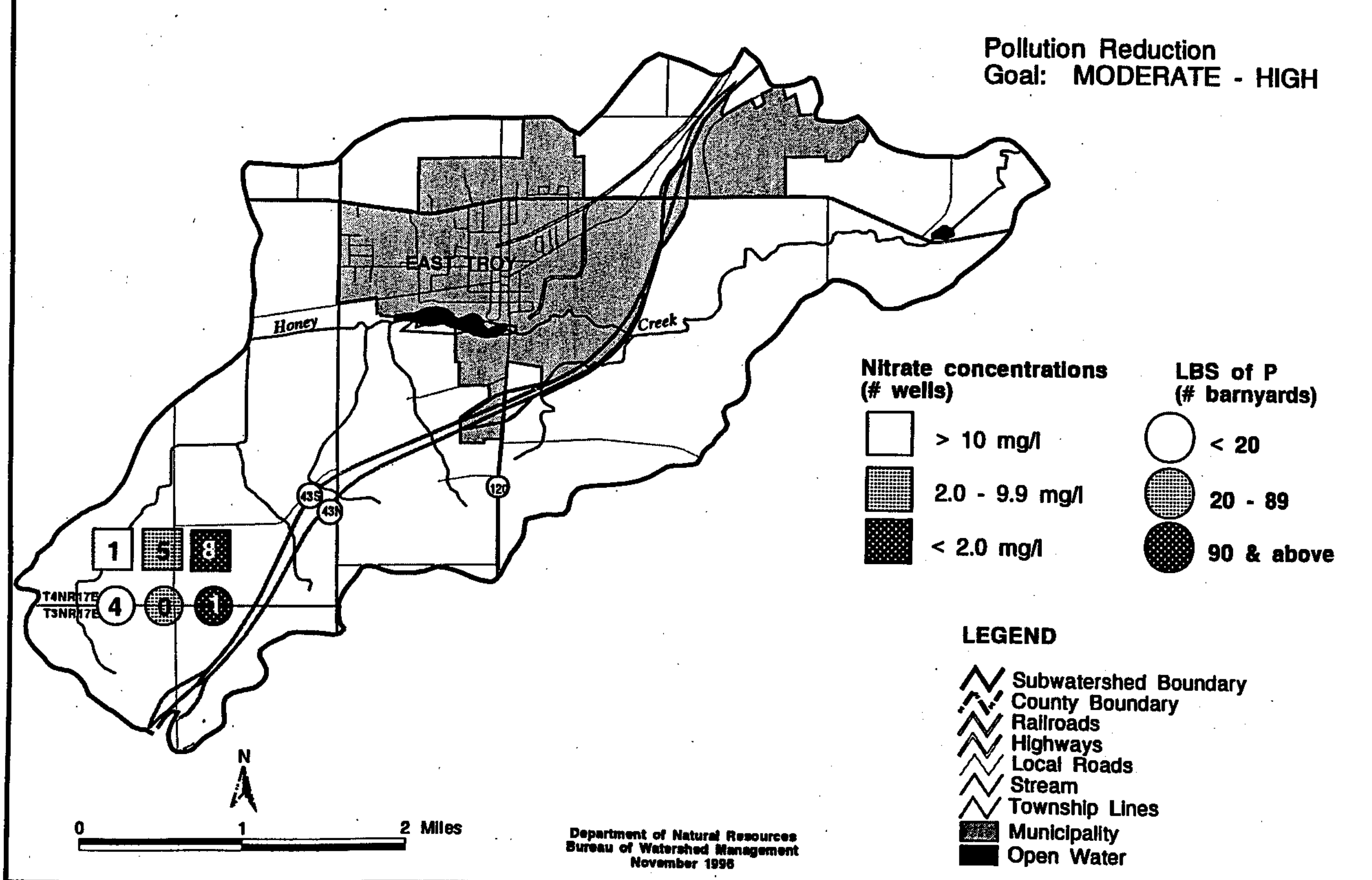
The Troy Area subwatershed is located in Walworth County and contains 7.3 stream miles of Honey Creek from CTH ES to just downstream of Hilburn pond. There are three unnamed perennial tributary streams and two unnamed intermittent tributary streams in this subwatershed.

Rural and urban pollution sources impair the water quality of Honey Creek within the Troy Area subwatershed. Rural pollution is primarily a result of agricultural activities and includes barnyard runoff, cropland erosion, stream bank pasturing, and historical channelization. Urban pollution sources include storm water runoff (numerous storm sewer outlets), trash (engine block, rakes, shovels, plastic swimming pool, etc.) deposited in the stream, two impoundments, and point source discharges (East Troy wastewater treatment plant, and Trent Tube Division). Sediment and nutrients are also carried into the Troy Area subwatershed from upstream sources. These conditions impact water quality by introducing; nutrient and sediment loads, fecal coliform bacteria impairment, metals, chlorides, poor aesthetics, and the loss of fish and macroinvertebrate habitat. The Honey Creek impoundments (East Troy and Hilburn Pond) create slow moving waters that allow for sedimentation (nutrient rich particles) which result in excessive algae growth (and low night time dissolved oxygen concentrations).

A process water settling pond historically operated by the Trent Tube Division in East Troy used to outlet into Honey Creek at stream mile 18.1. The pond has been abandoned and is dry. A pollution investigation was done in 1979 to determine its pollution contribution to Honey Creek. The results of the study indicated that water quality was being impaired by oil, grease, and suspended solids from the pond. Sediment samples were collected in Honey Creek well upstream of the pond outlet, in the pond and in the pond outlet channel just before it's confluence with Honey Creek. These samples were analyzed to determine the concentrations of numerous metals. Results showed no metals contamination at the upstream site, but contamination was extensive at the other two sites. The site in the pond was heavily polluted by chromium, copper, lead, nickel, and iron metals while the outlet channel was heavily polluted by chromium and nickel and moderately polluted with iron (Water Resources Management Files 1980). Consequently, there is the potential for elevated levels of contaminates in the sediments of Honey Creek downstream of this site. No sediment samples were collected in Honey Creek as part of this appraisal.

Honey Creek was historically channelized in a stream reach between I43 and Carver Road, presumably in an attempt to drain the wetlands in that area to make the land suitable for agricultural uses. Only the northernmost portion of this area appears to have ever been farmed successfully while the remaining area (> 90%) of this channelized section remained natural wetland. Consequently, winding through this wetland is the original stream channel which is still defined and holding water. This original stream channel can be clearly identified in aerial photographs and was field verified during 1995 stream appraisal monitoring. The feasibility of returning Honey Creek to its original channel should be investigated for many reasons. Most importantly, the original channel offers Honey Creek many meanders (increased stream length), a much lower upper bank, and the opportunity to naturally overbank into the surrounding wetlands during high flows where suspended solids and nutrients can settle, thus improving water quality.

Map 7. Troy Area Subwatershed

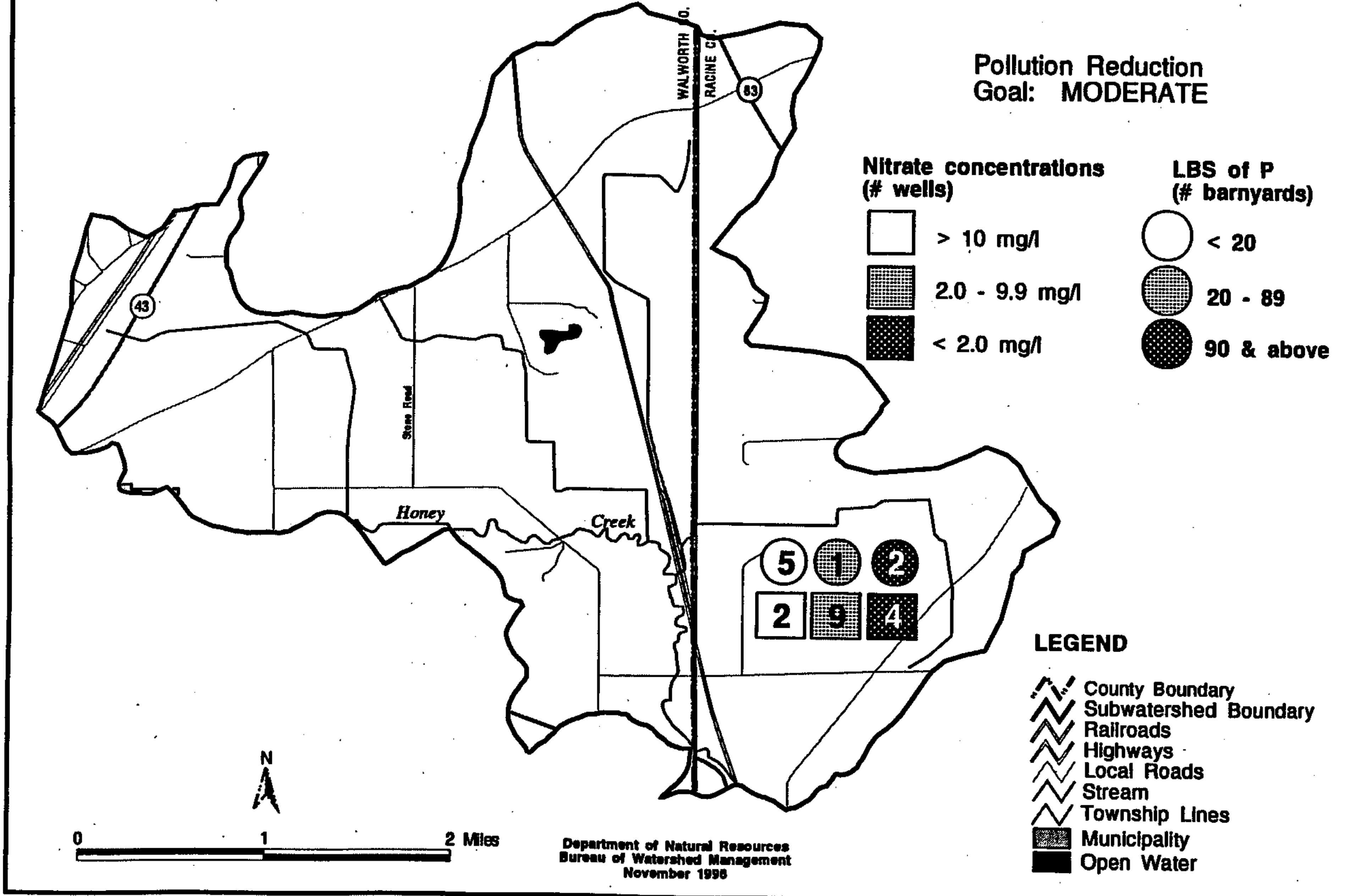


Beulah Station Subwatershed

The Beulah Station subwatershed is located in northeastern Walworth and northwestern Racine Counties and contains 3.8 miles of Honey Creek from downstream of Hilburn Pond to just upstream of STH 20. This subwatershed contains five unnamed perennial tributary streams. Agricultural nonpoint pollution sources are the main contributors to lower water quality in this section of Honey Creek. Conditions contributing to pollution include historic channelization, drain tiles, streambank pasturing, barnyard runoff, and cropland runoff. Consequently, water quality is impacted by the introduction of sediment loads, nutrient enrichment, potential fecal coliform bacteria impairment, and nuisance vegetation.

Honey Creek displays varying substrates in this subwatershed. In general, the thalweg was composed of gravel and cobble. Interspersed riffles, runs, and deep pools throughout much of this subwatershed, create a habitat capable of supporting diverse macroinvertebrate and fish communities. However, the perimeter of the stream channel in much of this subwatershed is laden with silt and sand.

Map 8. Beulah Station Subwatershed

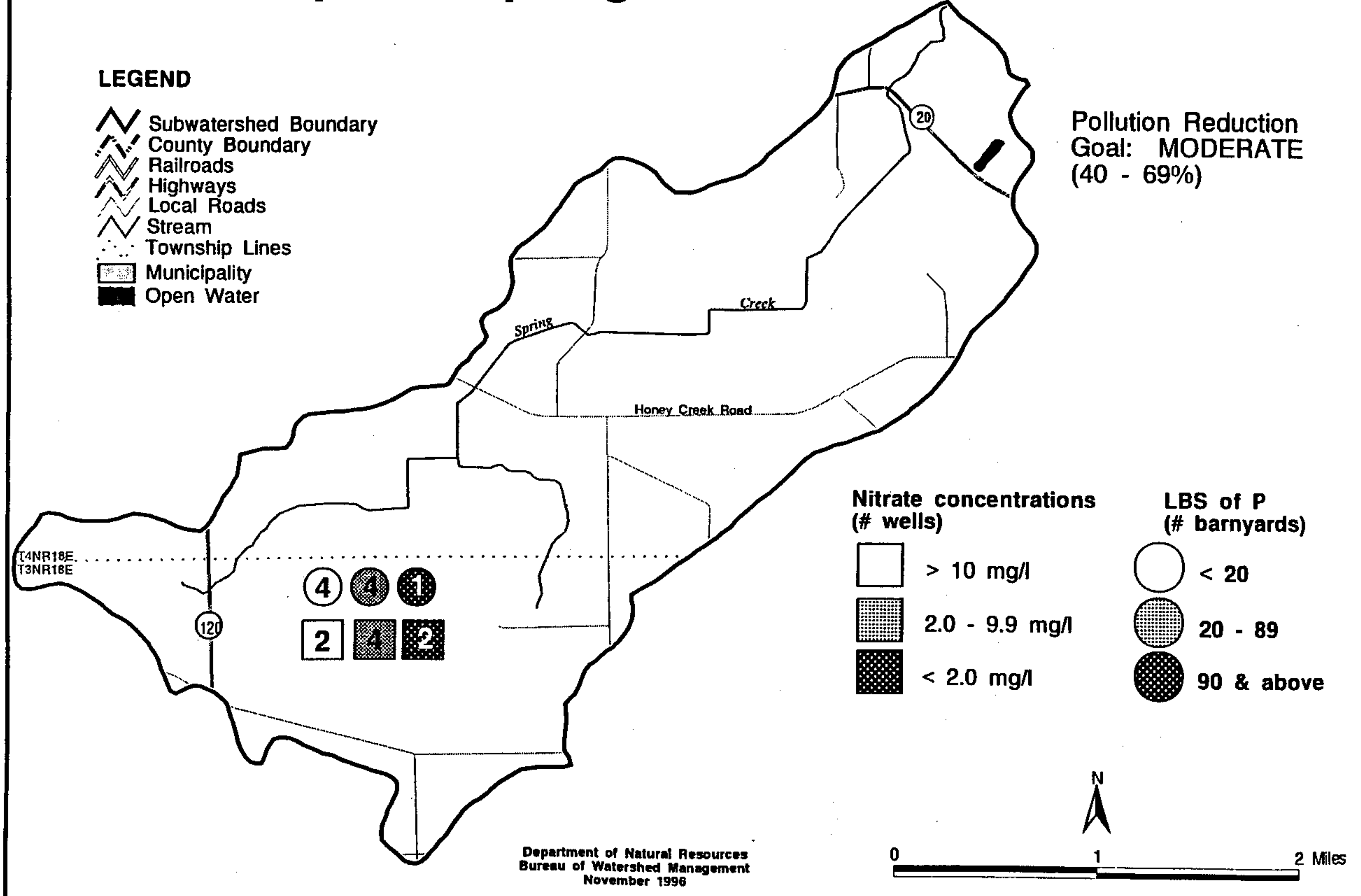


Spring Creek Subwatershed

The Spring Creek subwatershed is located in Walworth County and situated south of the Troy Area subwatershed. Spring Creek originates west of STH 120 and flows 6.3 miles in a northeasterly direction to its confluence with Honey Creek approximately 1/2 mile upstream of Bell School Road.

The headwaters of Spring Creek have been historically channelized and are impacted by agricultural land uses. The stream then flows into a small (approximately 0.4 miles long) natural lowland forest (upstream and downstream of Carver Rd.) section before entering another channelized agricultural area. Spring Creek ultimately flows into a well buffered wetland area downstream of STH 20 before its confluence with Honey Creek.

Map 9. Spring Creek Subwatershed



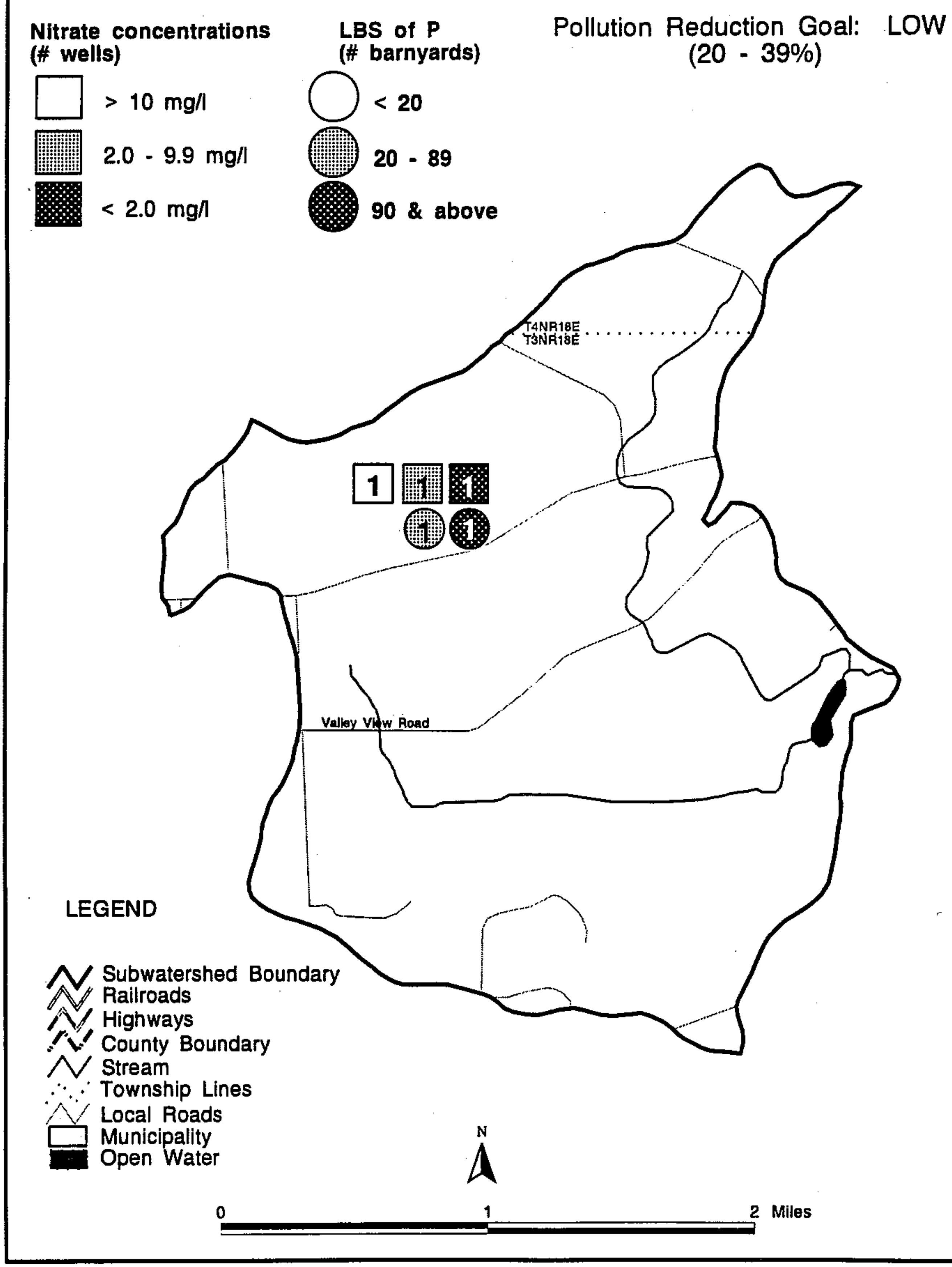
Spring Prairie Subwatershed

The Spring Prairie subwatershed is located south of both Beulah Station and Spring Creek subwatersheds in Walworth County. This subwatershed is drained by an unnamed stream, which has two branches, and flows into Honey Creek approximately 1 mile downstream of CTH D in Walworth County.

The north branch, Unnamed Perennial Stream A (SPP1), originates upstream of Honey Creek Road and flows 2.9 miles, generally south, to its confluence with Honey Creek. The headwaters of Perennial Stream A have been almost entirely eliminated, presumably through the use of drain tiles. This stream then flows through a spring fed, natural lowland forest/wetland section (approximately 0.2 miles long) upstream of Valley View Drive before entering a channelized region. Perennial Stream A ultimately flows through a well buffered wetland area before entering Honey Creek.

The south branch of Unnamed Perennial Stream A was observed to have a very low flow at Valley View Road and flows into a pond just downstream of the road. This branch flows into a wetland area and was not observed to be emerging out from the other side based on a survey conducted on July 5, 1995. Consequently, this branch was determined to be intermittent and was not observed to be contributing sediment or nutrients to the main branch.

Map 10. Spring Prairie Subwatershed

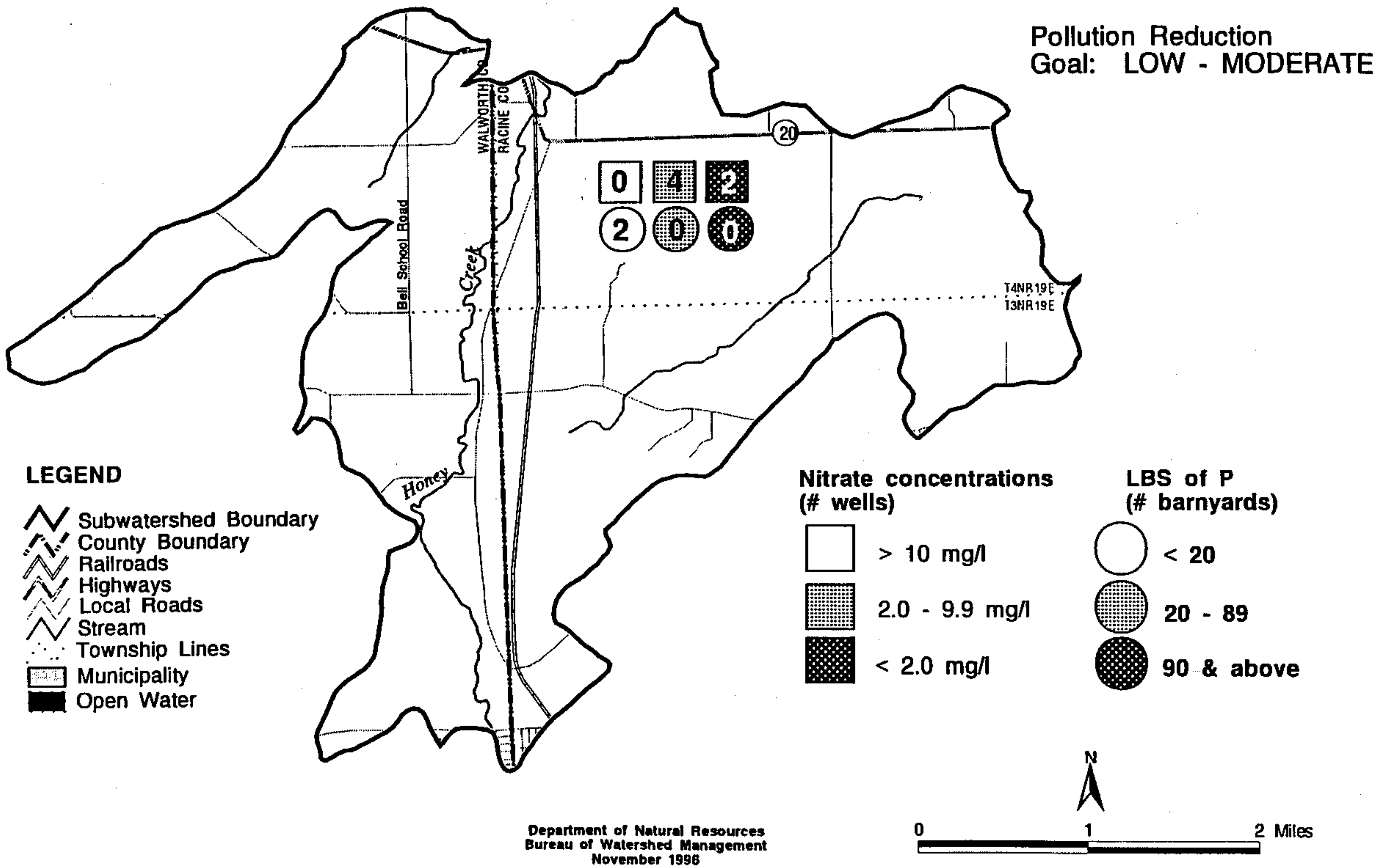


Lower Honey Creek Subwatershed

The Lower Honey Creek subwatershed is located in Walworth and Racine Counties and is situated south of the Beulah Station subwatershed. This subwatershed contains 6.6 miles of Honey Creek from just upstream of STH 20 to the confluence with Sugar Creek (below the Honey Lake Dam). Only one perennial tributary stream (L1) is located in this subwatershed.

Agricultural and residential nonpoint pollution sources are the main contributors to lower water quality in this section of Honey Creek. Conditions contributing to pollution include historic channelization, drain tiles, streambank pasturing, barnyard runoff, lawn care, and cropland runoff. Consequently, water quality is impacted by the introduction of sediment loads, nutrient enrichment, potential fecal coliform bacteria impairment, and nuisance vegetation.

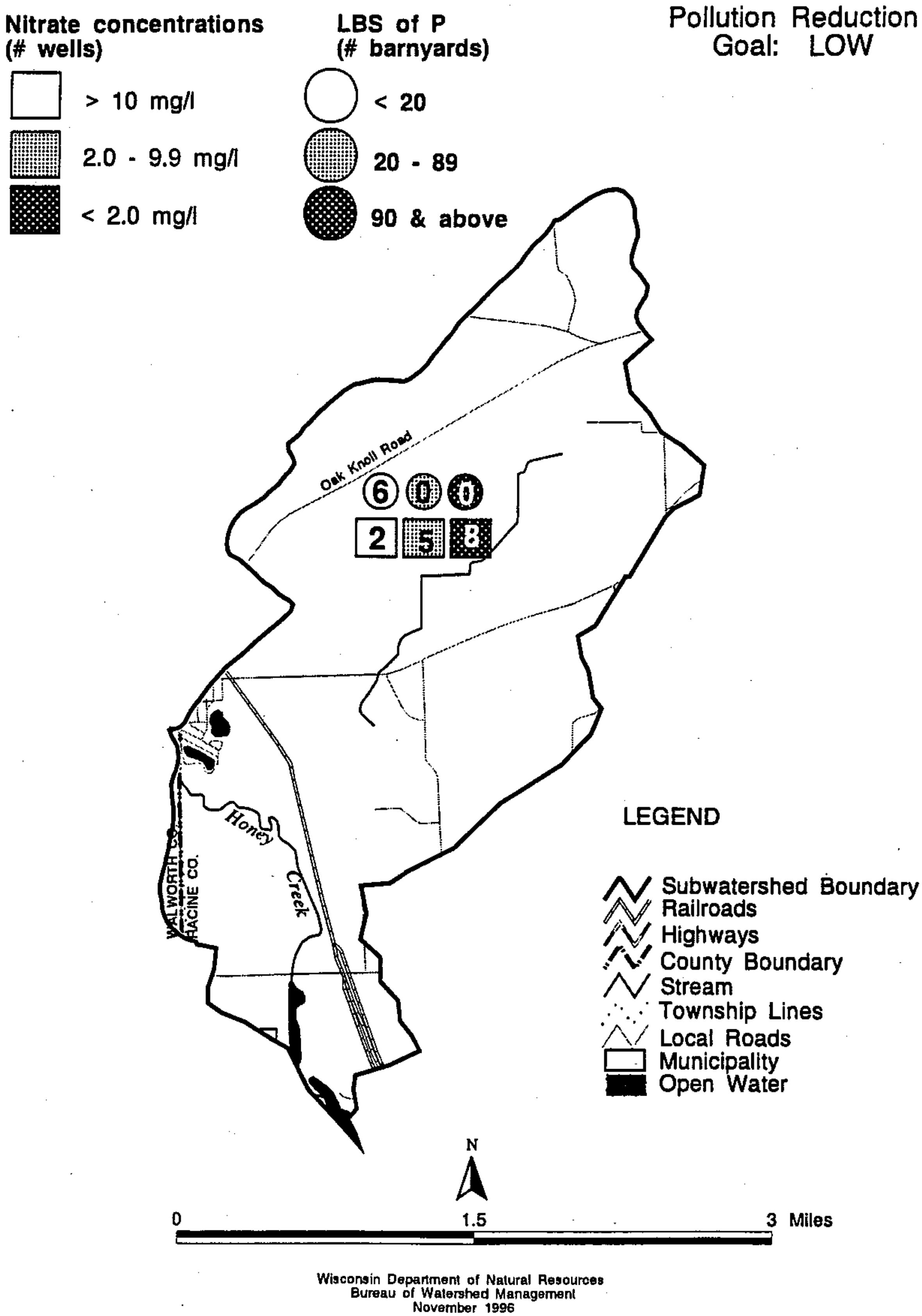
Map 11. Lower Honey Creek Subwatershed



Honey Creek Wildlife Area

The Honey Creek Wildlife Area subwatershed is located in Racine County and is characterized by wetlands with no channelized flow to Honey Creek. These wetland areas provide an important water quality function as a natural buffer to nonpoint source pollution runoff, fish spawning and rearing areas during high water times, and in riparian wetland areas. The wetland areas also provide good wildlife habitat.

Map 12. Honey Creek Wildlife Area Subwatershed



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Lakes

Lauderdale Chain Of Lakes

The Lauderdale Lakes are the head waters of the upper Honey Creek watershed and include three lake basins, Green (311 ac.), Middle (259 ac.) and Mill (271 ac.) lakes. The lakes encompass approximately 834 acres of surface water with an average depth of 15 feet. Green lake has a maximum depth of 55 feet, and both Middle and Mill have a maximum depth of approximately 40 feet. All three lake basins stratify during the summer and have historically had an anoxic hypolimnion (lack of oxygen in the bottom waters) (WDNR 1969).

A 7200 acre watershed drains to the Lauderdale Lakes equating to a 9 to 1 watershed to lake area ratio (Table 2-2). Based upon the average annual run-off of 8.6 inches, the Lauderdale Lakes flushing rate is 0.43 water volumes per year or 2.31 years to flush the complete lake volume.

Water Resource Conditions
All three lake basins of the Lauderdale Lakes have similar water quality and are classified as mesotrophic lakes with relatively low to moderate nutrient and chlorophyll concentrations and good water clarity with TSI values between 35 and 55. Surface total phosphorus from the 1960s and 1970s indicate slightly higher nutrient levels although Secchi disk measurements were similar or slightly better than present readings. Recent average spring total phosphorus at all three lake basins ranged narrowly from 20 ug/L to 23 ug/L with surface summer phosphorus concentrations ranging from 7 ug/l to 13 ug/L. The hypolimnion develops anoxia (no oxygen) in all three lake basin, which results in higher phosphorus concentrations as phosphorus is released from iron and other molecules. However, 1995 hypolimnetic phosphorus did not exceed 80 ug/L and was less than 25% soluble phosphorus. This is substantially below problematic hypolimnetic concentration of 200 ug/L to 800 ug/L and 80% soluble phosphorus that can result in substantial internal phosphorus loading in other Southeast Region lakes (e.g. Delavan, Wind, Bass Bay).

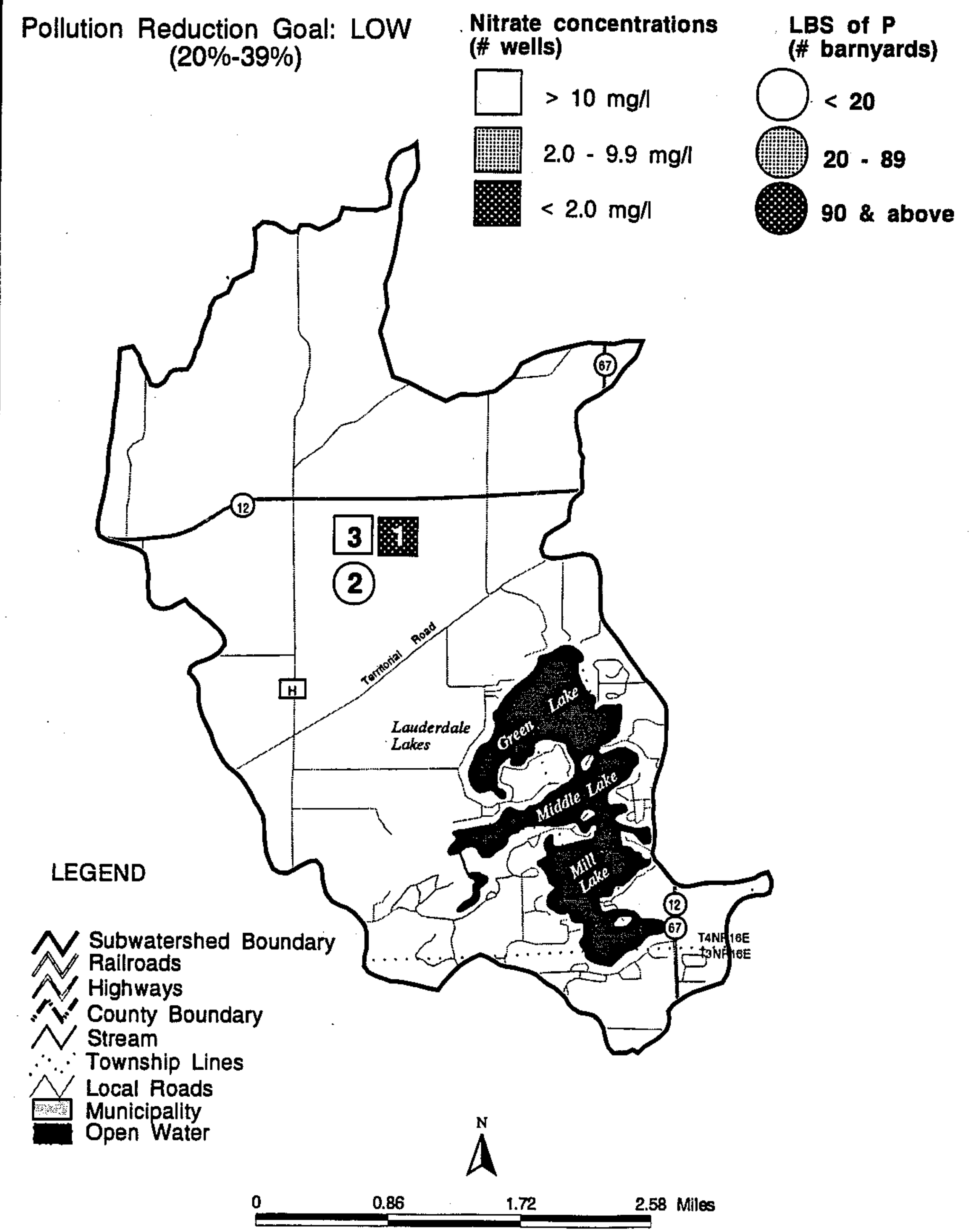
The surface phosphorus concentrations are well below the regional goal of 20 ug/L summer average phosphorus. Based upon 1995 summer phosphorus concentrations, all three lake basins, nuisance algae conditions are predicted to occur less than 4% of the time. Pre-development water quality values of 4 ug/L, 11.1 feet, and 3 ug/L are estimated for total phosphorus, Secchi disk, and chlorophyll-a, respectively. The best management watershed load results in a surface spring phosphorus concentration of 18 ug/L, 6.3 feet and 8 ug/L are estimated for total phosphorus, Secchi disk, and chlorophyll-a, respectively. Although total phosphorus concentrations change substantially between pre and post development and best management conditions, smaller changes in Secchi disk and chlorophyll-a are estimated.

Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for the Lauderdale Lakes

are to reduce phosphorus loading overall at least 14% from existing conditions to best managed conditions. This should result in improvements in water column phosphorus and long-term protection of water quality. Major changes in water clarity or chlorophyll concentrations are not expected.

Specific best management practices should target lake protection and nutrient sources from agricultural land and residential riparian properties. Assessment of the internal loading at all three basins should be continued by collection of in-lake monitoring .

Map 13. Lauderdale Lakes Subwatershed



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Pleasant Lake

Pleasant Lake is located within a 1,216 acre direct drainage basin . This equates to a 7.9 to 1 watershed to lake area ratio (Table 2-2). Based upon the average annual run-off of 8.6 inches, the lake flushing rate is 0.48 water volumes per year or 2.06 years to flush the complete lake volume. The lake encompasses approximately 154 acres of surface water with a maximum depth of 29 feet, an average depth of 12.4 feet, and a lake volume of 1,910 acre-feet.

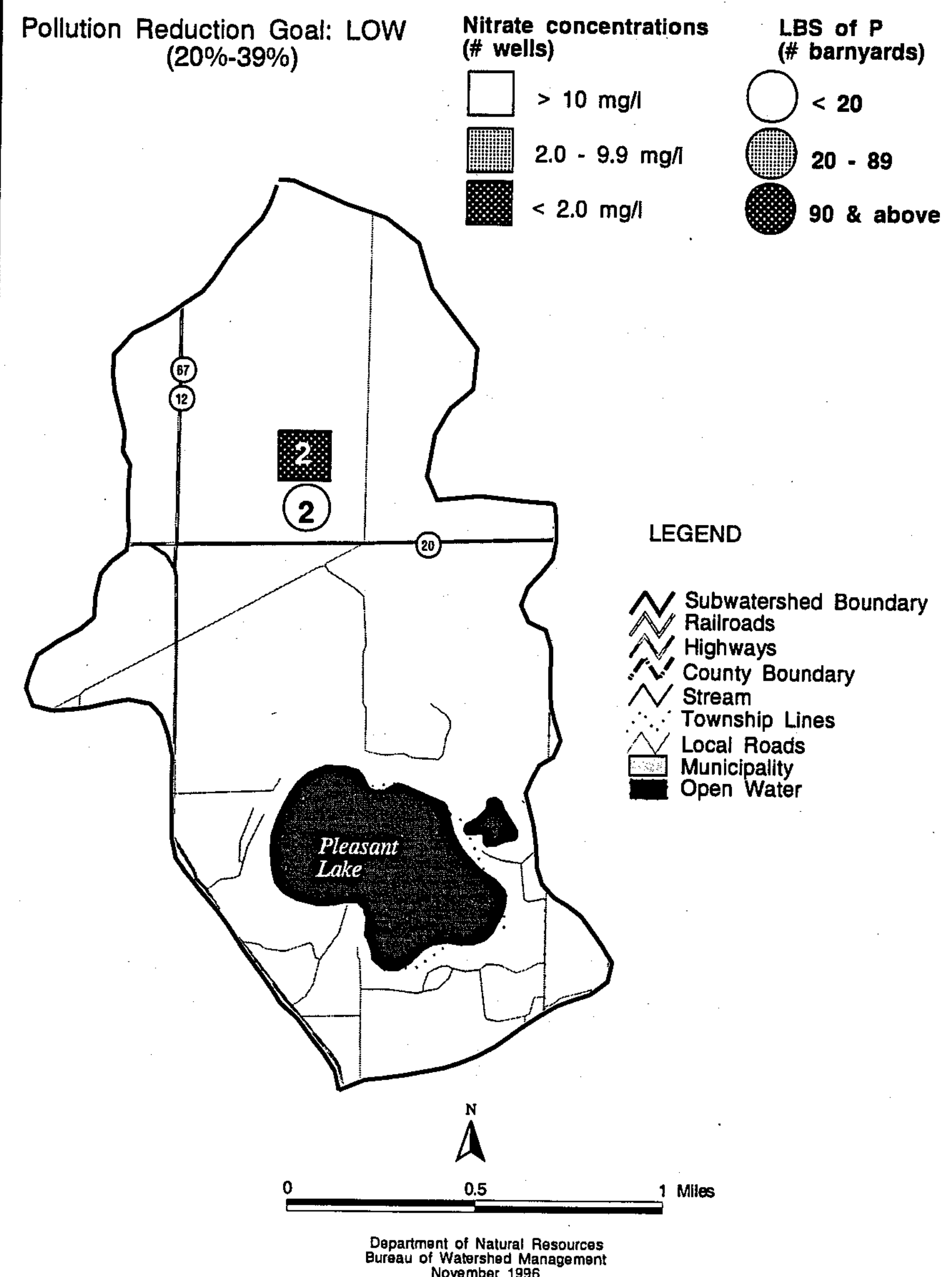
Water Resource Conditions
Pleasant Lake is classified as a mesotrophic lake with relatively low nutrient and chlorophyll concentrations and good water clarity. Surface total phosphorus from the 1960s and 1970s indicate higher nutrient levels, although Secchi disk measurements were similar or slightly better than present readings. Recent average spring total phosphorus ranged from 10 ug/L to 20 ug/L with surface summer phosphorus concentrations ranging from 3 ug/l to 14 ug/L. The corresponding TSI values from 1994 and 1995 indicate meso- to oligotrophic conditions. The surface phosphorus concentrations are well below the regional goal of 20 ug/L summer average phosphorus. Based upon 1995 summer phosphorus concentrations nuisance algae conditions are predicted to occur less than 0.3% of the time.

Although the hypolimnion develops anoxic conditions, 1995 hypolimnetic phosphorus concentrations did not exceed 23 ug/L and were far below problematic hypolimnetic concentration of 200 ug/L to 800 ug/L that result in substantial internal phosphorus loading. If alternative periods of stratification and destratification occur, the internal loading may be increased and lower hypolimnetic phosphorus concentrations observed. However, Pleasant Lake appears to be weakly stratified and according to the WILMS model, the watershed phosphorus load readily accounts for existing water quality conditions and would not indicate excessive internal loading.

Pre-development water quality values of 4 ug/L, 11 feet, and 3 ug/L are estimated for total phosphorus, Secchi disk, and chlorophyll-a, respectively. The best management watershed load results in a surface spring phosphorus concentration of 13 ug/L and 7.7 feet and 7 ug/L are estimated for Secchi disk and chlorophyll-a, respectively. Although total phosphorus concentrations change substantially between pre- and post development and best management conditions, only minor changes in Secchi disk and chlorophyll-a are anticipated.

Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for Pleasant Lake reduce phosphorus loading overall 11% from existing conditions to best managed conditions. Specific best management practices should target lake protection and nutrient sources from agricultural land and residential riparian properties.

Map 14. Pleasant Lake Subwatershed



Potter Lake

Potter lake (162 acres) has a direct drainage basin area of 380 acres equating to 2.3 to 1 watershed to lake area ratio (Table 2-2). Based upon the average annual run-off of 8.6 inches, the lake flushing rate is 0.26 water volumes per year or 3.9 years to flush the complete lake volume. The lake has a maximum depth of 26 feet, an average depth of 8 feet, and a lake volume of 1,304 acre-feet.

Water Resource Conditions

The extensive agriculture and riparian development adjacent to Potter lake has apparently impacted water quality. Potter Lake is classified as a meso-eutrophic lake with elevated nutrient and chlorophyll concentrations and degraded water clarity. Surface total phosphorus from the 1970s indicate higher nutrient levels although Secchi disk and chlorophyll TSI values are similar to recent readings. Spring total phosphorus values since 1993 have ranged from 20 ug/L to 26 ug/L with surface summer phosphorus concentrations ranging from 16 ug/l to 33 ug/L and TSI ranging from 40 to 60. Based upon 1995 summer phosphorus concentrations nuisance algae conditions are predicted to occur less than 16.4% of the time.

The lake stratifies weakly beginning in early summer, but may mix and re-stratify continually throughout the summer. This mixing and stratifying or polymitic conditions can contribute to increased internal nutrient loading under anoxic conditions (Cooke et al. 1993). The hypolimnion (bottom water) develops anoxic conditions beginning in June and continues to fall turn-over in September or October. Maximum hypolimnetic phosphorus concentrations do exceed 100 ug/L and in 1993 approached excessive concentrations of 300 ug/L. Hypolimnion phosphorus concentrations may also increase and decrease throughout the summer and may indicate transfer of the phosphorus into the surface waters.

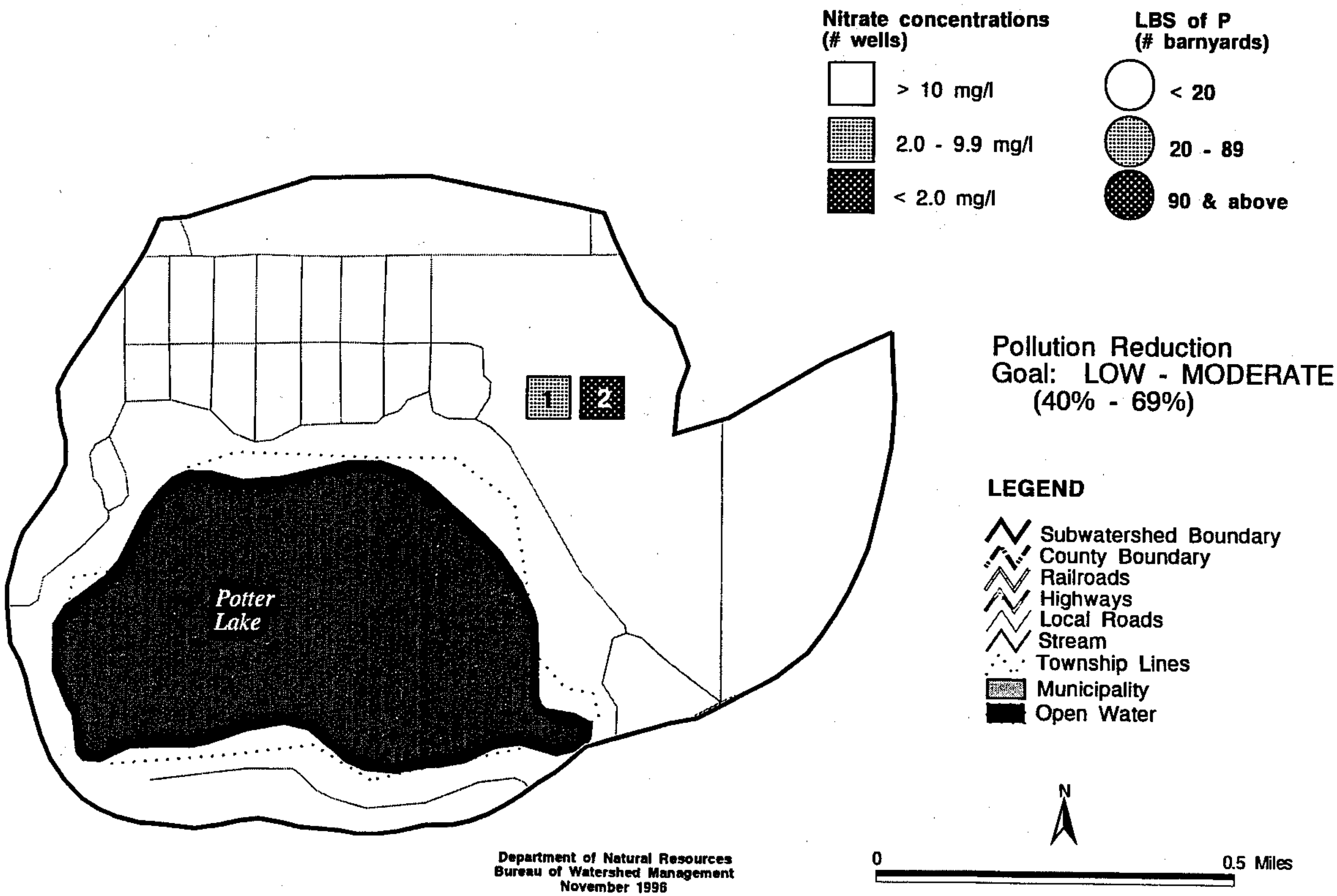
The surface phosphorus concentrations are above the regional goal of 20 ug/L summer average phosphorus. Pre-development water quality values of 5 ug/L, 9 feet, and 3 ug/L are estimated for total phosphorus, Secchi disk, and chlorophyll-a, respectively. The best management watershed load results in concentrations of 17 ug/L and 8 ug/L for total phosphorus and chlorophyll-a, respectively and a water clarity of 7.2 feet (assuming no change in the existing internal loading).

Water Resource Objectives and Management Recommendations

The water resource objectives and management recommendations for Potter Lake reduce phosphorus loading 29% overall from existing conditions to best managed conditions. Specific best management practices should first target nutrient sources from adjacent agricultural land and residential riparian properties. Further evaluation and quantification of the internal phosphorus load component should be undertaken.

If the best manage phosphorus load can be obtained, the cost effectiveness of an alum treatment should be evaluated if further improvements in water quality are still desired.

Map 15. Potter Lake Subwatershed



Sugar Creek Watershed

Streams

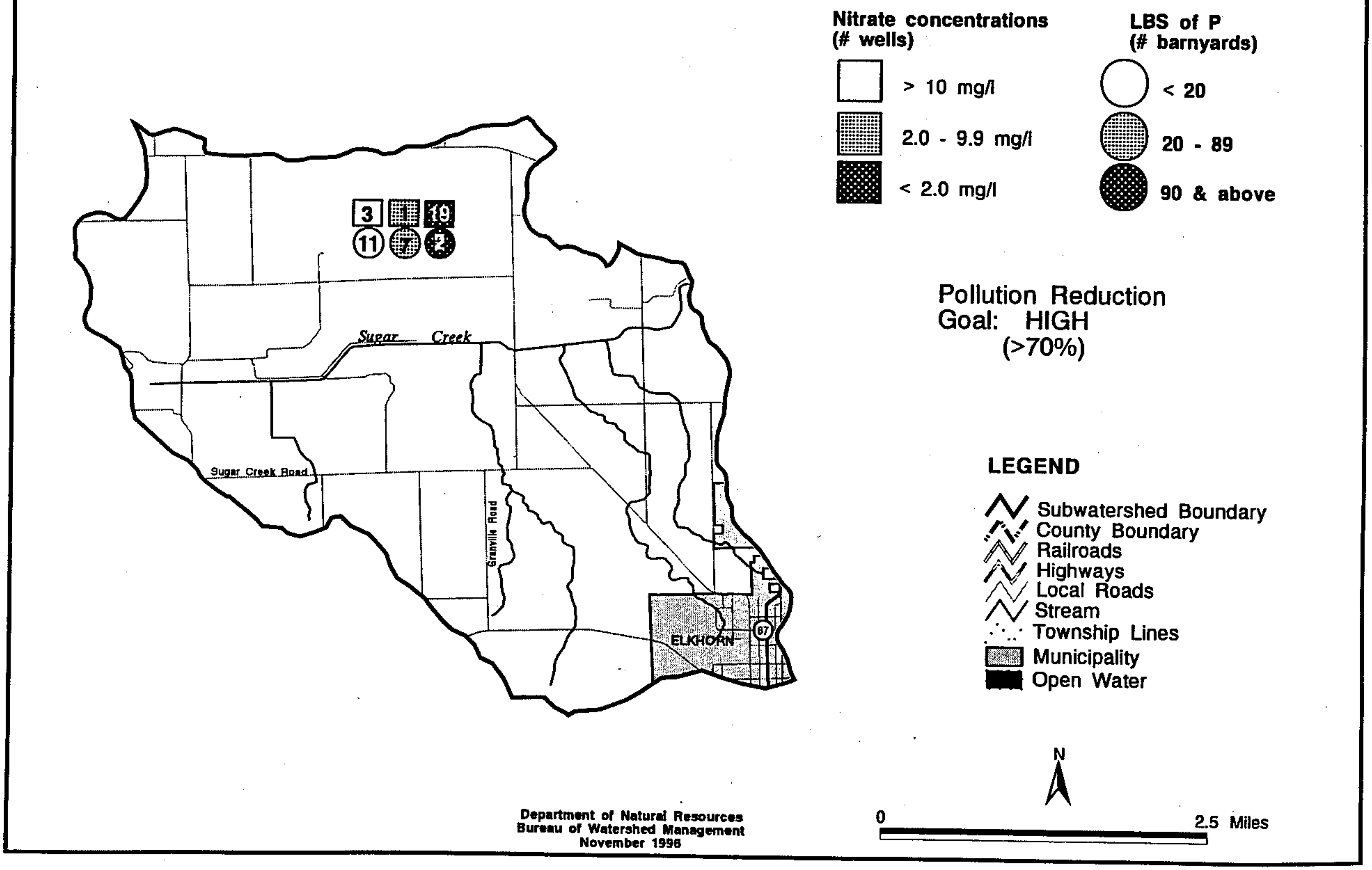
Tibbets Area Subwatershed

The Tibbets Area subwatershed is located in north central Walworth County and contains 4.6 miles of the Sugar Creek from CTH O to the confluence with Baker Creek. The headwaters of Sugar Creek are within this subwatershed and contain five unnamed perennial tributary streams and one unnamed intermittent stream.

Historic channelization and wetland drainage activities have transformed the headwaters of Sugar Creek from a stream flowing through a wetland area to a straight channel through extensive agricultural uses. Sugar Creek originates as a drain tile and a few springs, at the bottom of a deep channel, on the east side of CTH O. It then flows approximately 4 miles east in a historically channelized reach prior to a natural channel section just upstream of the confluence with Baker Creek.

Agricultural land uses dominate this subwatershed. Conditions that prompt degraded water quality include historical channelization, maintenance dredging, insufficient streambank filtration, bank debrushing, lack of shading, pesticide application, and cropland runoff. These conditions result in nutrients and sediment, potential pesticide contamination, and fecal coliform bacteria impairment.

Map 16. Tibbets Subwatershed

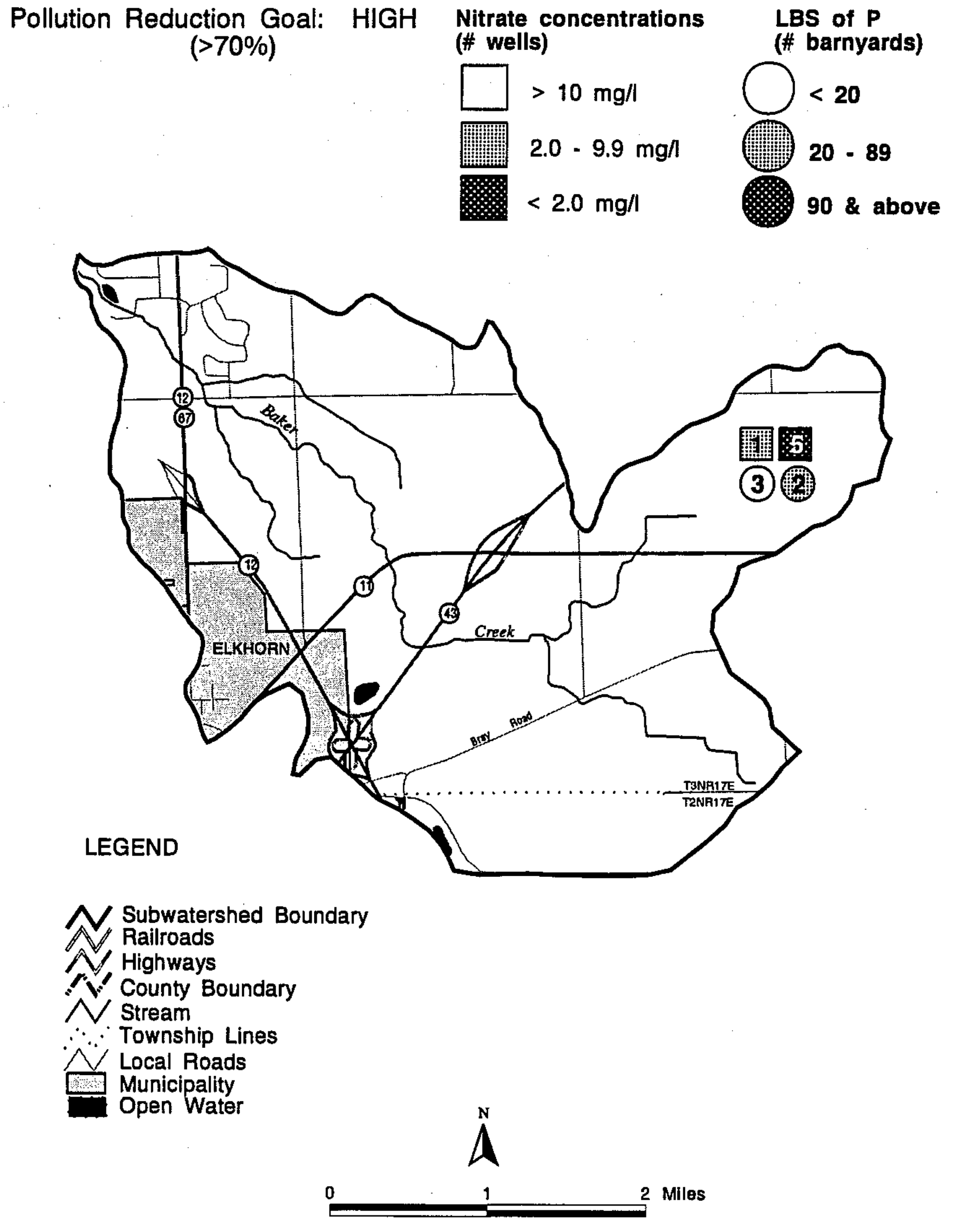


Baker Creek Subwatershed

The Baker Creek subwatershed includes the north side of the City of Elkhorn, east to CTH NN and Hospital Road. Baker Creek flows northwesterly primarily through agricultural lands, including row crops, barn yards, and streambank pasturing. Baker Creek flows through Evergreen golf course and some residential areas both along the mainstem and tributary streams. Baker Creek is 7.2 stream miles in length and confluent with Sugar Creek downstream from Foster Road.

Agricultural land uses dominate this subwatershed. Conditions that prompt degraded water quality include historical channelization, maintenance dredging, insufficient filtration, bank debrushing, lack of shading, pesticide application, and cropland runoff. These conditions induce nutrient and sediment loads, potential pesticide contamination, and nuisance vegetation and potential fecal coliform bacteria impairment.

Map 17. Baker Creek Subwatershed



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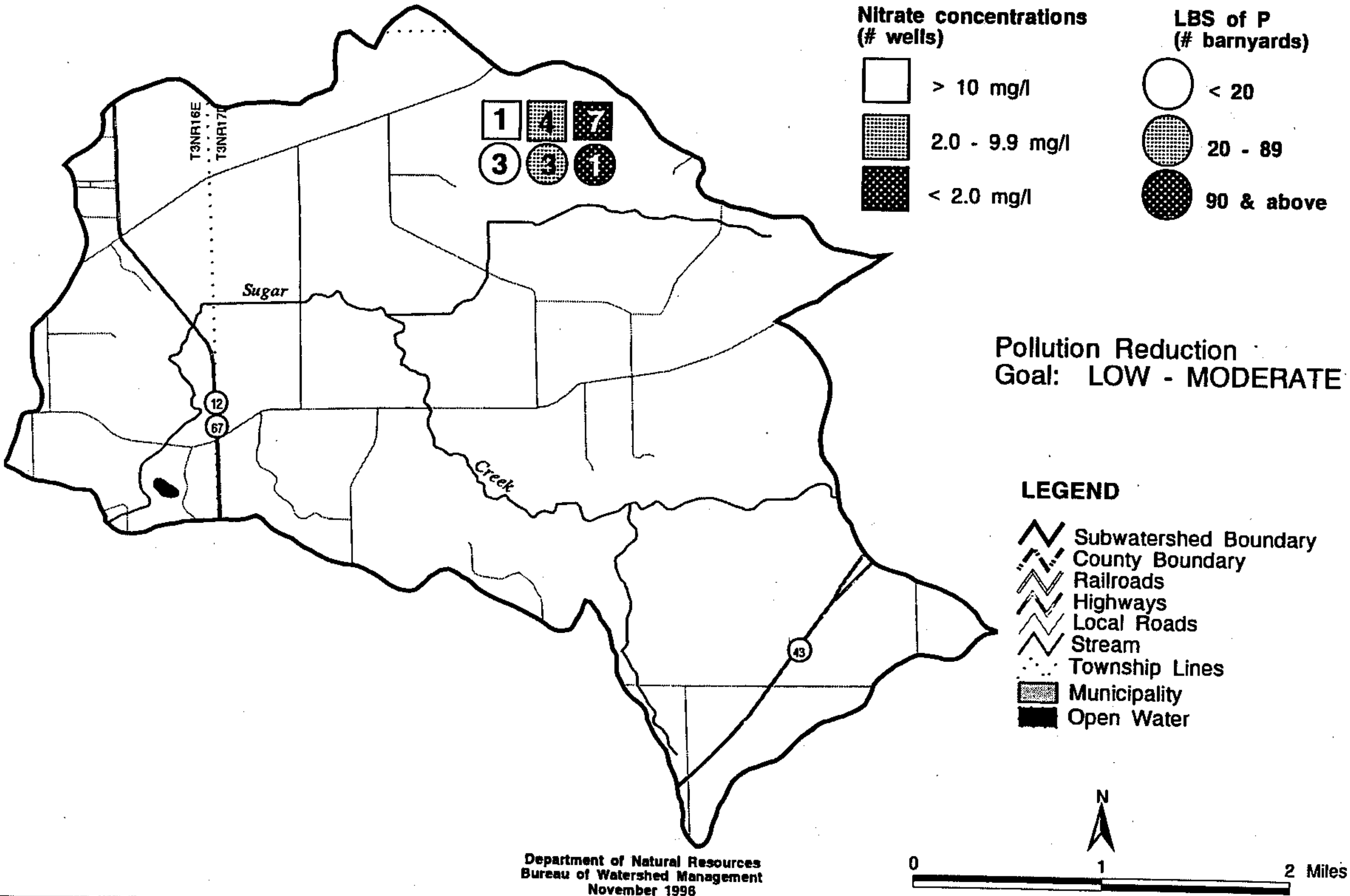
Abells Subwatershed

The Abells subwatershed is located in the townships of Sugar Creek and Lafayette within Walworth County. Abells subwatershed contains 8.2 stream miles of Sugar Creek from the confluence with Baker Creek to immediately upstream of the confluence with an Unnamed Perennial Stream just upstream from Hodunk Road. Water chemistry data were collected at the top and bottom of the subwatershed (downstream of CTH ES outside of Abells Corner, and upstream of Hodunk Road, respectively).

Agricultural land uses dominate the upper segment of the subwatershed from upstream of river mile 18.0. Downstream from CTH ES to Hodunk Road, Sugar Creek flows through approximately four miles of wetland and stream reach with large filtration areas along the channel. Conditions that result in degraded water quality primarily occur in the upper part of the subwatershed and include historical channelization, insufficient streambank filtration, bank debrushing, lack of shading, and cropland runoff. These conditions result in nutrient and sediment loads, and nuisance vegetation and potential fecal coliform bacteria impairment.

The downstream reaches perform an important function for Sugar Creek by dissipating stream energy and allowing for settling out of suspended solids and nutrient rich particles into the wetland and over bank areas. Water can then slowly and naturally reenter the main channel as storms recede. This makes for a less flashy stream, consequently a more stable stream habitat for fish and macroinvertebrate communities. This stream reach supports northern pike and provides a good sport fishery.

Map 18. Abells Subwatershed

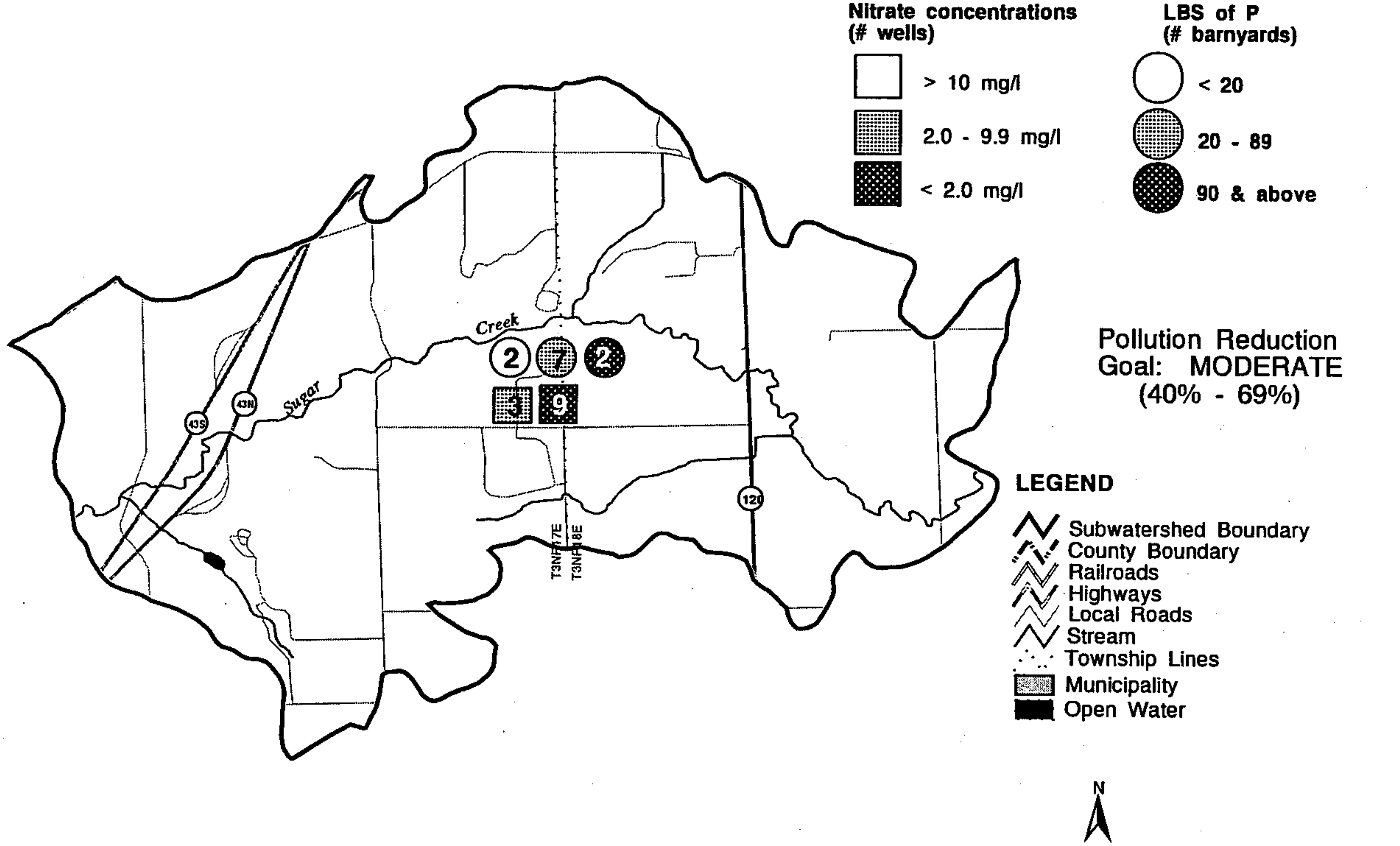


Alpine Valley Subwatershed

The Alpine Valley subwatershed is located in the townships of Lafayette and Spring Prairie within Walworth County. Alpine Valley subwatershed contains 8.8 stream miles of Sugar Creek from the confluence with an unnamed perennial stream just upstream of Hodunk Road to the confluence with an unnamed intermittent stream just downstream of Hargrave Road. Water chemistry data were collected at the top and bottom of the subwatershed (upstream of Hodunk Road, and downstream of Hargrave Road, respectively).

Woodlands, wetlands, and sparse residential land uses dominate the upper segment of the subwatershed down to the Alpine Valley golf course. The Alpine Valley golf course, ski hill, and resort are the dominate landuses for about a mile of Sugar Creek. Downstream from Alpine Resort area to Hargrave Road, Sugar Creek flows through land dominated by agricultural uses. Conditions that result in degraded water quality include historical channelization in tributary streams, insufficient streambank filtration, bank debrushing, lack of shading, urban debris, potential pesticide contamination, and cropland runoff. These conditions result in nutrient and sediment loads, and nuisance vegetation and potential fecal coliform bacteria impairment.

Map 19. Alpine Valley Subwatershed



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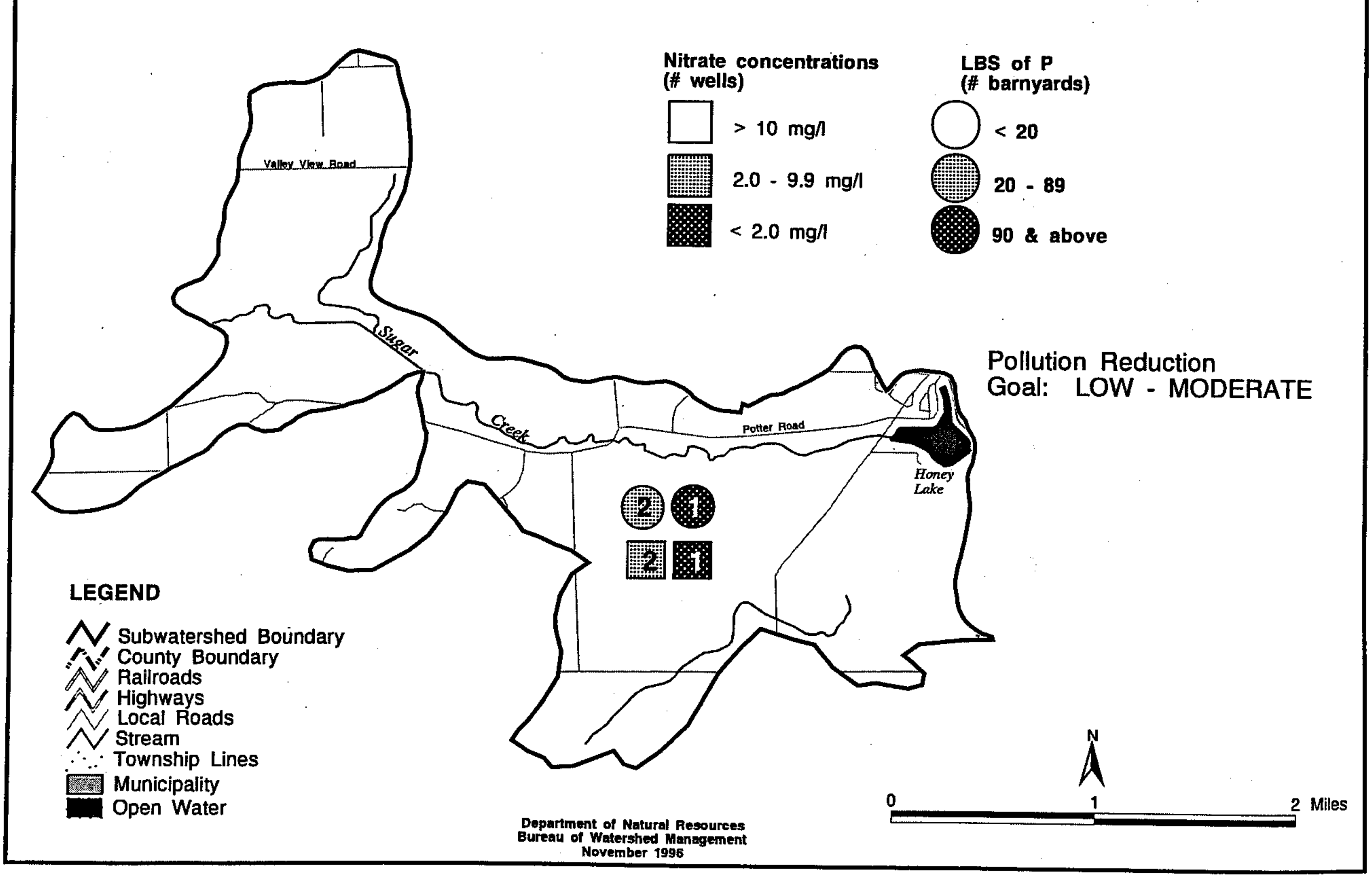
Vienna Subwatershed

The Vienna subwatershed includes five and a half free-flowing stream miles of Sugar Creek which flows into an impoundment, Honey Lake, formed by a dam on Sugar Creek. Honey Lake is on the very eastern edge of Walworth County. Vienna subwatershed begins just downstream of Hargrave Road.

Vienna subwatershed is a mix of agricultural and residential land uses. Agricultural land uses dominate the upper portion of the subwatershed and residential uses dominate the lower reaches including a new subdivision under development. Conditions that prompt degraded water quality include historical channelization, insufficient runoff filtration buffer, bank debrushing, streambank erosion, drain tiles, potential pesticide contamination from both agricultural fields and urban uses, streambank pasturing, and construction site erosion. These conditions result in nutrient and sediment loads, potential pesticide contamination, and nuisance vegetation and fecal coliform bacteria impairment in Sugar Creek.

Map 20. Vienna Subwatershed

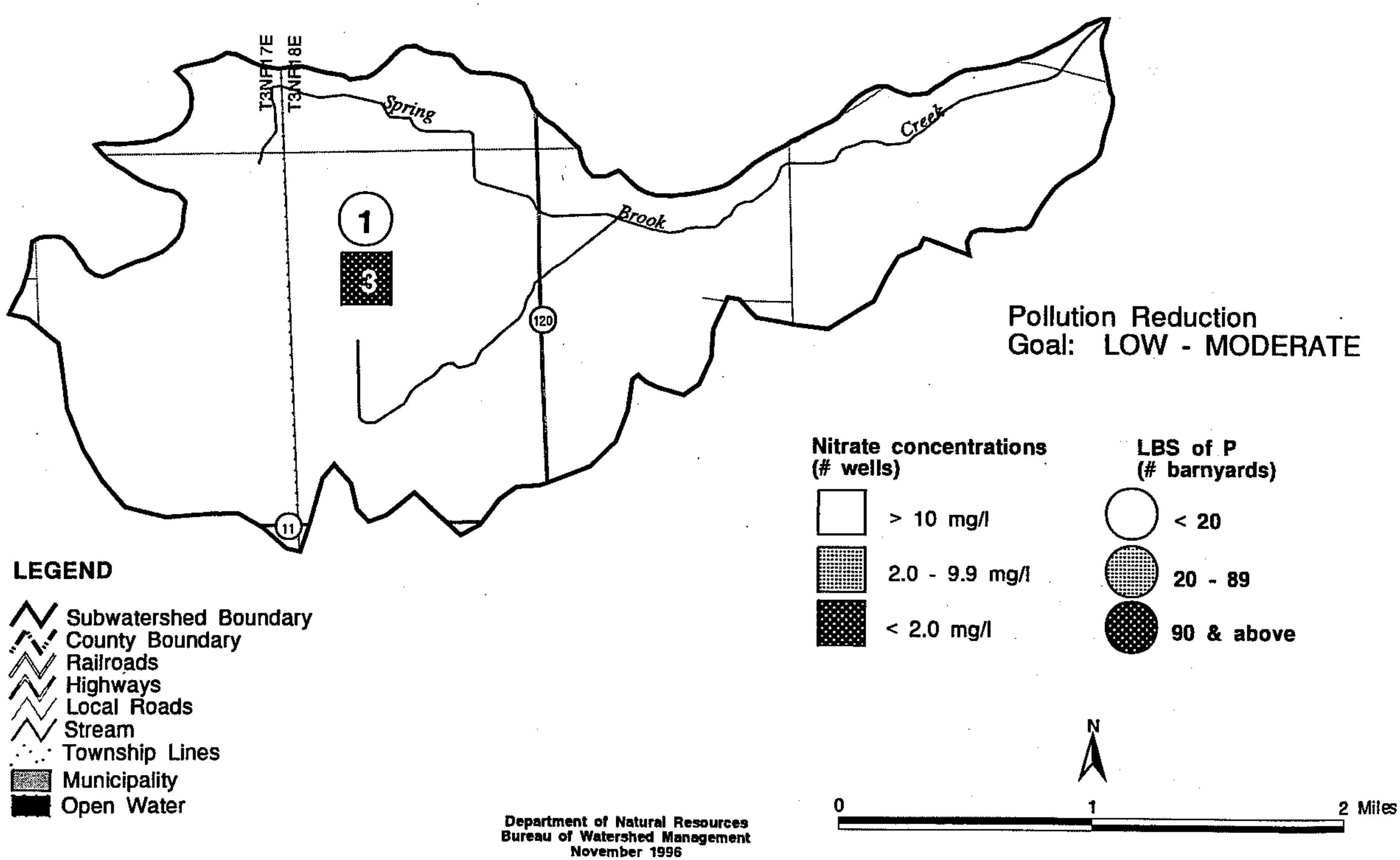


Spring Brook Subwatershed

The Spring Brook subwatershed is in Walworth County and originates with a north branch and mainstem which flow under STH 120 south of East Troy. The two branches of Spring Brook converge approximately 1/3 of a mile east of STH 120. Spring Brook flows east-northeast under Hargrave, then Potters Road on to a confluence with Sugar Creek. This subwatershed is comprised of agricultural and sparse residential areas. Agricultural uses are dominate and occur most densely in the headwaters and the lower reaches of the subwatershed. The steep hillsides in the middle portion of the subwatershed have both agricultural uses, including barnyards and pastures, as well as residential uses including a horse pasture.

Conditions that prompt degraded water quality include historical channelization, wetland drainage, maintenance dredging, insufficient streambank filtration, bank debrushing, lack of shading, barnyard, pasture, and cropland runoff. These conditions induce nutrient and sediment loads, and nuisance vegetation and fecal coliform bacteria impairment.

Map 21. Spring Brook Subwatershed



Lakes

North Lake

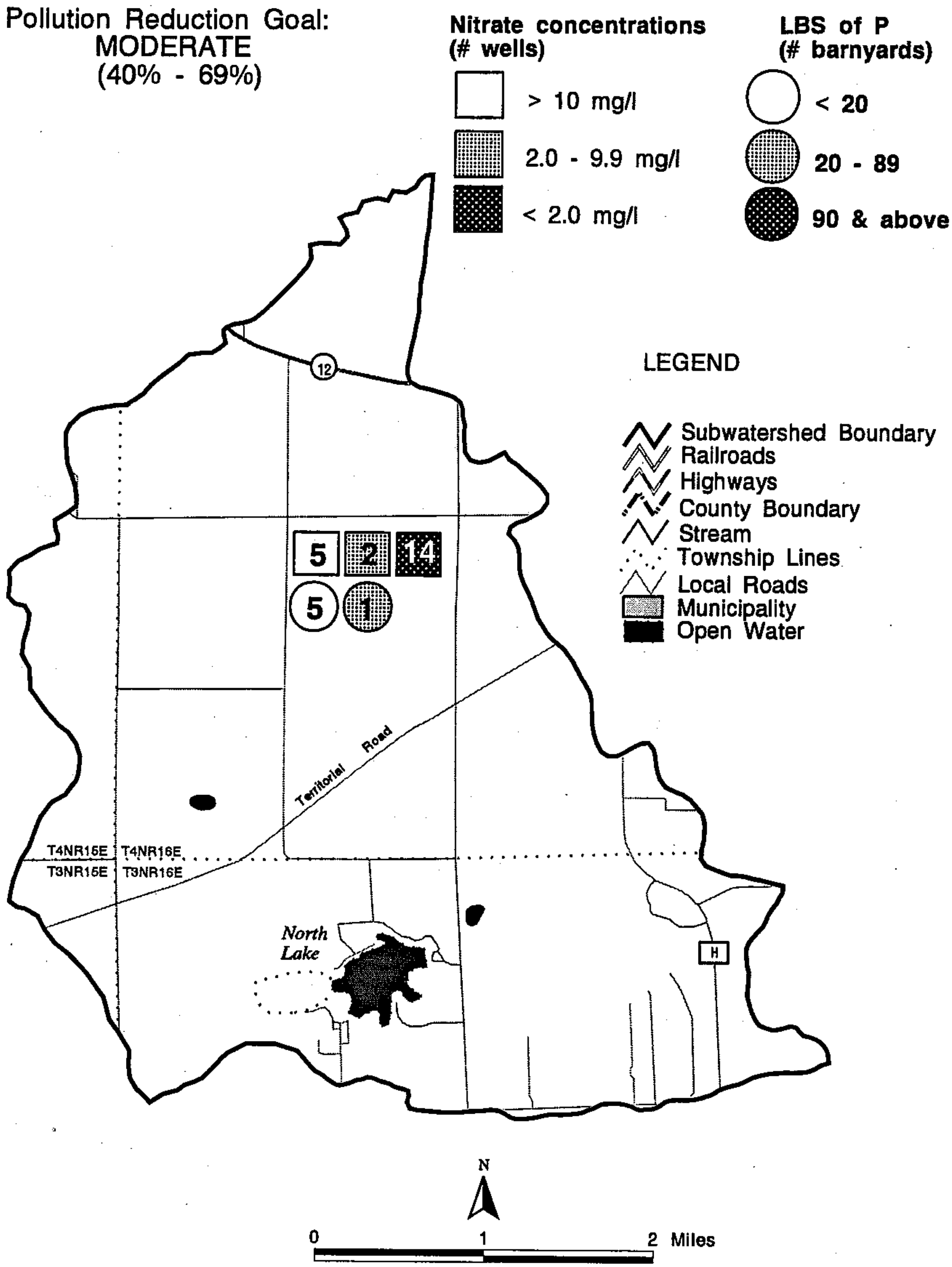
North lake (191 acres) is located within a 9,269 acre drainage basin. This equates to a 48.5 to 1 watershed to lake area ratio (Table 2-2). However, much of the 9,269 acre watershed appears to be internally drained and not hydrologically impacting North lake. Based upon the average annual run-off of 8.6 inches over the entire 9,269 acre watershed, the lake flushing rate is 14.1 water volumes per year, or approximately every month the lake volume is flushed completely. The lake encompasses approximately 191 acres of surface water with a maximum depth of 2.8 feet, an average depth of 2.5 feet and a lake volume of 475 acre-feet.

Water Resource Conditions
North Lake is classified as a meso-eutrophic lake with moderate amounts of nutrients and productivity, but has fairly good water clarity. The surface phosphorus concentrations are generally above the regional goal of 20 ug/L summer average phosphorus. 1995 fall turn-over total phosphorus was 16 ug/L while surface summer phosphorus concentrations averaged 40 ug/L with TSI ranging from 30 to 70. Based upon 1995 summer phosphorus concentrations nuisance algae conditions are predicted to occur less than 9.6% of the time.

Pre-development water quality values of 3 ug/L, 11 feet, and 2 ug/L are estimated for total phosphorus, Secchi disk, and chlorophyll-a, respectively. The best management watershed load results in a surface spring phosphorus concentration of 13 ug/L. A summer average Secchi disk and chlorophyll under best managed conditions are 6 feet and 7 ug/L, respectively. Given the shallow nature of North lake and the abundance of rooted aquatic plants, the lake is in the clear-water, aquatic plant dominated phase as shown in Hosper and Meijer (1993). Increased nutrient loading or shifts in the fish and zooplankton community, could cause the lake to shift to a turbid-water, algae dominated phase.

Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for North Lake reduce phosphorus loading 18.5% overall from existing conditions to best managed conditions. Specific best management practices should first target nutrient sources from agricultural land, urban development, and residential riparian properties. Further evaluation and quantification of the internal phosphorus load component should be undertaken following improvements in the watershed.

Map 22. North Lake Subwatershed



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Wandawega Lake

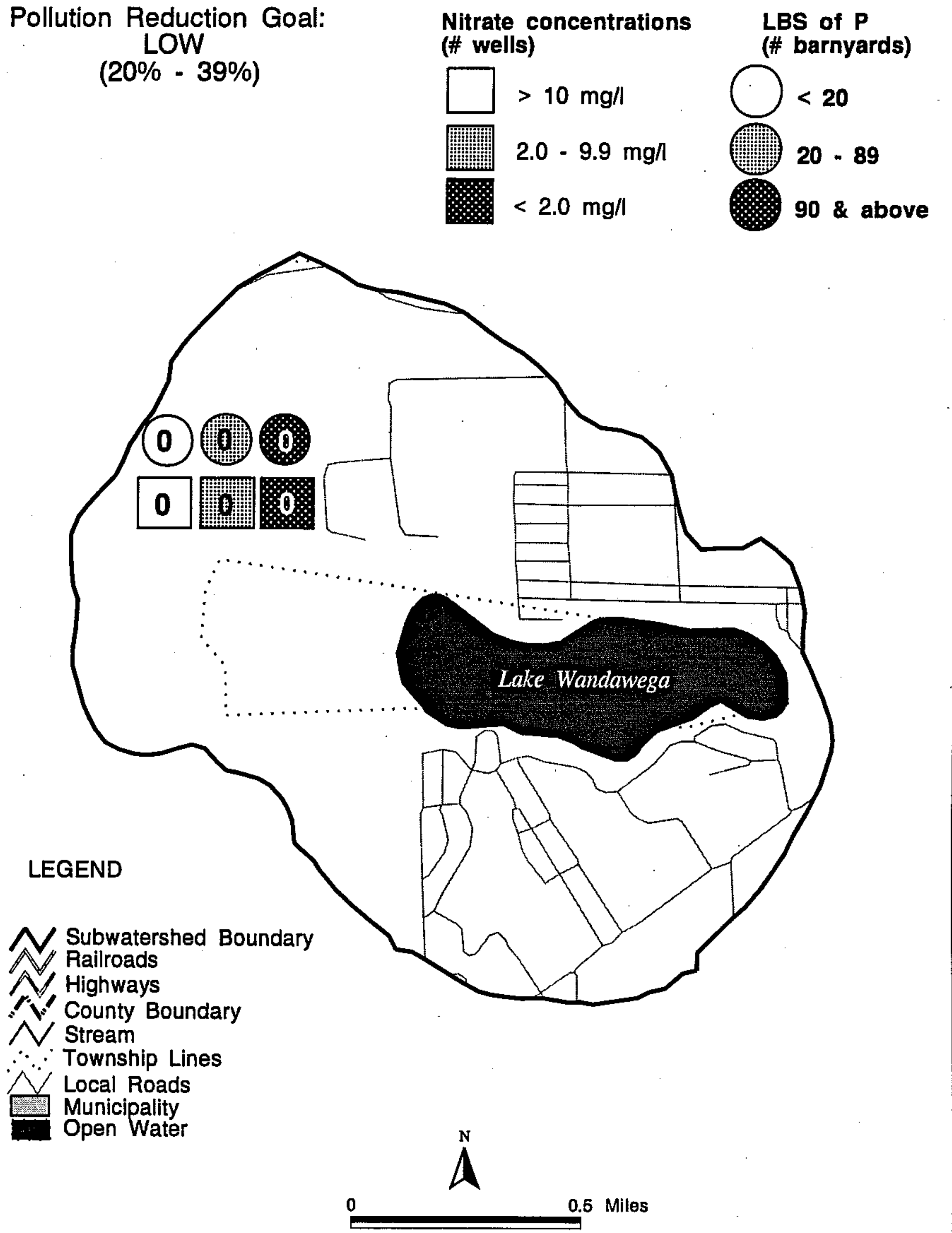
Wandawega Lake is located within a 988 acre direct drainage basin . This equates to a 8.3 to 1 watershed to lake area ratio (Table 2-2). Based upon the average annual run-off of 8.6 inches, the lake flushing rate is 1.56 water volumes per year, or approximately every 7.5 months the lake volume is flushed completely. The lake encompasses approximately 119 acres of surface water with a maximum depth of 8.0 feet, an average depth of 4 feet, and a lake volume of 480 acre-feet.

Water Resource Conditions
Wandawega Lake is classified as a fertile, mesotrophic lake with relatively low nutrient and chlorophyll concentrations and excellent water clarity but abundant aquatic plant growth. Chlorophyll data from the early 1980s also indicate good water clarity and low TSI. The 1995 spring total phosphorus was 10 ug/L while surface summer phosphorus concentrations averaged 15 ug/L with TSI values ranging below 50. The surface phosphorus concentrations are generally below the regional goal of 20 ug/L summer average phosphorus. Based upon 1995 summer phosphorus concentrations nuisance algae conditions are predicted to occur less than 13.4% of the time.

Pre-development water quality values of 3 ug/L, 11 feet, and 3 ug/L are estimated for total phosphorus, Secchi disk, and chlorophyll-a, respectively. A 18% reduction in the annual phosphorus load is required to achieve the best management watershed phosphorus load. Given the shallow nature of Wandawega lake and the abundance of rooted aquatic plants, the lake is in the clear-water, aquatic plant dominated phase as shown in Hosper and Meijer (1993). Increased nutrient loading or shifts in the fish and zooplankton community, could cause the lake to shift to a turbid-water, algae dominated phase.

Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for Wandawega Lake are to reduce the existing phosphorus load by 18% (Table 4). Specific best management practices should include aquatic plant and watershed protection activities.

Map 23. Lake Wandawega Subwatershed



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Silver Lake

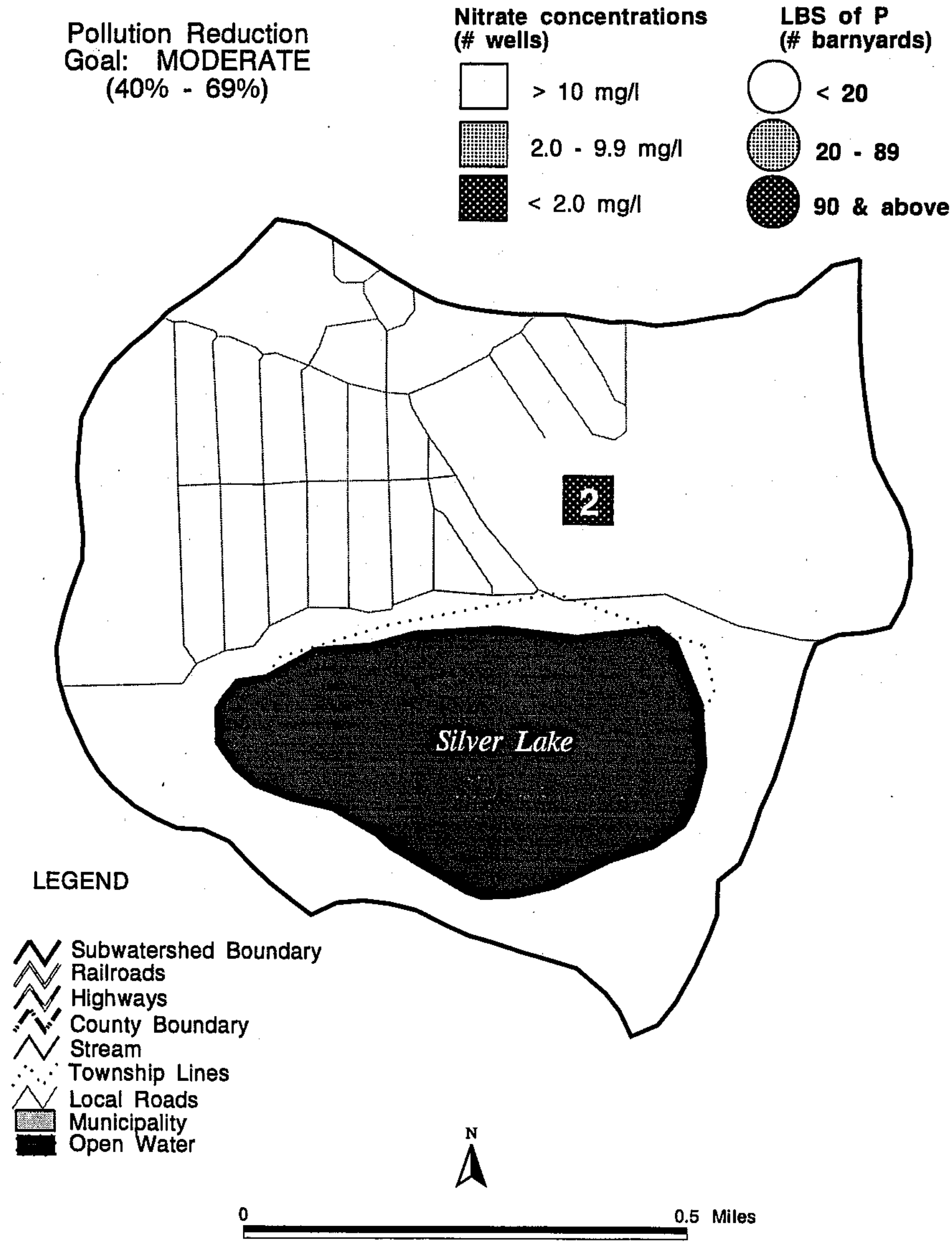
Silver Lake (84.5 acres) is located within a 285 acre direct drainage basin. This equates to a 3.4 to 1 watershed to lake area ratio (Table 2-2). Based upon the average annual run-off of 8.6 inches, the lake flushing rate is 1.11 water volumes per year, or approximately every 11 months the lake volume is flushed completely. The lake encompasses approximately 85 acres of surface water with a maximum depth of 3.0 feet, an average depth of 2.5 feet, and a lake volume of 211 acre-feet. The lake basin does not stratify.

Water Resource Conditions
Silver Lake is classified as a eutrophic lake with moderate amounts of nutrients and productivity and poor water clarity with TSI values ranging widely between 20 and 85. The 1995 fall turn-over total phosphorus was 21 ug/L while surface summer phosphorus concentrations averaged 61.3 ug/L. The surface phosphorus concentrations are generally above the regional goal of 20 ug/L summer average phosphorus. Based upon 1995 summer phosphorus concentrations nuisance algae conditions are predicted to occur less than 21.8% of the time.

Pre-development water quality values of 4 ug/L, 9.5 feet, and 3 ug/L are estimated for total phosphorus, Secchi disk, and chlorophyll-a, respectively. The best management watershed load results in a surface spring phosphorus concentration of 14 ug/L A summer average Secchi disk and chlorophyll under best managed conditions are 6 feet and 7 ug/L, respectively. Given the shallow nature of Silver Lake and the abundance of rooted aquatic plants, the lake is in the turbid-water, algae dominated phase as shown in Hosper and Meijer (1993). Decreased nutrient loading and shifts in the fish and zooplankton community, could cause the lake to shift to a clear-water, aquatic plant dominated phase.

Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for Silver Lake reduce phosphorus loading 33% overall from existing conditions to best managed conditions. Specific best management practices should first target nutrient sources from agricultural land, urban development, and residential riparian properties. Further evaluation and quantification of the internal phosphorus load component should be undertaken following improvements in the watershed.

Map 24. Silver Lake Subwatershed



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Honey Lake

Honey Lake (44 acres) is located at the discharge of the 40,132 acre Sugar River drainage basin. This equates to a 912 to 1 watershed to lake area ratio (Table 2-2). Based upon the average annual run-off of 8.6 inches, the lake flushing rate is 278 water volumes per year, or approximately every 1.3 days the lake volume is flushed completely. The lake encompasses approximately 44 acres of surface water with a maximum depth of 10.0 feet, an average depth of 5.86 feet, and a lake volume of 258 acre-feet calculated based upon 250,000 cubic feet of sediment removed during the 1986-1990 dredging project. With a maximum depth of only 10 feet, the lake basin does not stratify.

Water Resource Conditions
Honey Lake is classified as highly eutrophic lake with large amounts of nutrients and high productivity which results in poor water clarity in comparison with regional averages. 1995 late summer total phosphorus was approximately 140 ug/L, chlorophyll-a was 10.4 ug/L and water clarity was 2.7 feet measured with a secchi disk. The relatively low chlorophyll concentrations in the presences of the high phosphorus concentrations may be indication of light limitation caused by suspended solids (sediment).

The surface phosphorus concentrations substantially exceed the regional goal of 20 ug/L summer average phosphorus. Based upon 1995 summer phosphorus concentrations nuisance algae conditions occur approximately 44% of the time. Pre-development water quality values of 22 ug/L, 1.6 meters, and 10 ug/L are estimated for total phosphorus, Secchi disk, and chlorophyll-a, respectively. The best management watershed load results in a surface spring phosphorus concentration of 93 ug/L A summer average Secchi disk and chlorophyll under best managed conditions are 2.8 feet and 28 ug/L, respectively.

Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for Honey Lake reduce phosphorus loading 38% overall from existing conditions to best managed conditions. Specific best management practices should first target nutrient sources from agricultural land as detailed in the recommendations for Sugar Creek (Galarneau, in prep).

Groundwater Quality Conditions

Groundwater quality in the Sugar-Honey Creeks Watershed is generally considered good. Human activities, however, may adversely affect the quality of this resource. Potential point sources of groundwater contamination include spills, leaking underground storage tanks, pesticide contamination sites, old landfills, and unabandoned or improperly abandoned wells. Nonpoint sources include agricultural pesticides and fertilizers, septage spreading, and road salt.

In parts of Wisconsin, elevated nitrate levels in groundwater have been linked to agricultural practices, septage spreading, and faulty septic systems. As part of the Water Quality Appraisal Report Steve Galarneau, 1996, private well samples were collected and analyzed for nitrate (NO_3) + nitrite (NO_2). Sample analytical results are summarized in Table 2-5. Samples analyzed for nitrate (NO_3) + nitrite (NO_2) showed concentrations ranging from not detected to 28.2 parts per million or milligrams per liter (mg/L). The groundwater enforcement standard (ES) for nitrate is 10 mg/L. The state preventive action limit (PAL) is 2 mg/L.

Enforcement Standard (ES) Health Advisory Level: The concentration of a substance at which a facility regulated by DILHR, DATCP, DOT or DNR must take action to reduce the concentration of the substance in groundwater.

Preventative Action Limit (PAL): A lower concentration of a contaminant than the Enforcement Standard. The PAL serves to inform DNR of potential groundwater contamination problems, establish the level at which efforts to control the contamination should begin, and provide a basis for design codes and management criteria.

A total of 169 samples were collected. Twenty samples (12 percent) exceeded 10 mg/L and 48 (28 percent) of the samples exceeded 2 mg/L but were below 10 mg/L. Results so far do not indicate a pattern of groundwater contamination that can be linked to specific sources of nitrate. These results do not necessarily represent the overall groundwater quality of the watershed. Watershed staff also completed an analysis of 265 preexisting, nitrate sample records taken from five sources: WDNR, Bureau of Water Resources, Barnyard Inventory data, the Central Wisconsin GW Center, Burlington Hospital, and additional sampling. The ES was exceeded by 28 samples (11 percent). As with the Water Quality Appraisal results above, these results are close to the statewide average of 10 percent. North Lake Direct, Lauderdale Lakes, Tibbets, and Pleasant Lake were the only subwatersheds to produce more than 6 samples with nitrate results over 10 ppm.

Pesticides have been detected in groundwater in parts of Wisconsin, including the Sugar-Honey Creeks Watershed. Pesticide testing was not a component of the Water Quality Appraisal. Triazine screening (testing for atrazine and its metabolites, or breakdown products) was initiated but not completed in time to include in this document. Based on the results of past sampling, two atrazine prohibition areas have been established within the watershed. Chapter ATCP 30, Wisconsin Administrative Code, directs DATCP to create atrazine prohibition areas whenever it determines that supplementary atrazine use restrictions are needed to prevent or minimize groundwater contamination. The Walworth County atrazine prohibition areas encompass atrazine detections in groundwater exceeding the enforcement standard (ES) of 3.0 parts per billion specific in Chapter NR140. The prohibition areas in the watershed are:

PA93-65-01 - Town of Sugar Creek, centered on T3N, R16E, S8
PA93-65-02 - Town of Troy, centered on T4N, R17E, S22, 23.

No samples were collected for coliform bacteria or hazardous substances such as volatile organic compounds. Coliform bacteria can be a drinking water problem where septic systems, land spreading of manure, or barnyards are located upgradient (generally uphill) from a private well. Bacteria can enter the drinking water supply along the well casing of improperly constructed wells, through a cracked casing, through improperly capped wells, or through fracture flow in bedrock. Generally, wells with bacteria can be rehabilitated.

Volatile organic compounds generally enter a well from nearby leaking underground gasoline or other fuel storage tanks and spills. Once these compounds are in the groundwater they are difficult to clean up. In general, the contaminated wells have to be abandoned and a new well drilled.

Table 2-5. Well Sampling Results: Sugar-Honey Creeks Watershed

NITRATE

Subwatershed	Number of Nitrate Samples		Number of Nitrate Samples		Number of Nitrate Samples		
	Less than 2.0 mg/l	%	Between 2.0 and 10.0 mg/l	%	Greater than 10.0 mg/l	%	Total
Tibbets	19	83%	1	4%	3	13%	23
Baker Creek	5	83%	1	7%	0	0%	6
Abells	7	58%	4	33%	1	9%	12
Alpine Valley	9	75%	3	25%	0	0%	12
Spring Brook	3	100%	0	0%	0	0%	3
Vienna	1	33%	2	67%	0	0%	3
Upper Honey Creek	11	65%	6	35%	0	0%	17
Troy Area/East Troy	8	57%	5	36%	1	7%	14
Spring Creek	2	25%	4	50%	2	25%	8
Spring Prairie	1	33%	1	33%	1	33%	3
Beulah Station	4	27%	9	60%	2	13%	15
Lower Honey Creek	2	33%	4	67%	0	0%	6
Honey Creek Wildlife Area	8	54%	5	33%	2	13%	15
North Lake Direct	14	67%	2	9%	5	24%	21
Silver Lake	2	100%	0	0%	0	0%	2
Lake Wandawega	0	0%	0	0%	0	0%	0
Pleasant Lake	2	100%	0	0%	0	0%	2
Lauderdale Lakes	1	25%	0	0%	3	75%	4
Potter Lake	2	67%	1	33%	0	0%	3

NITRATE							
	Number of Nitrate Samples		Number of Nitrate Samples		Number of Nitrate Samples		
Subwatershed	Less than 2.0 mg/l	%	Between 2.0 and 10.0 mg/l	%	Greater than 10.0 mg/l	%	Total
Totals	101	60%	48	28%	20	12%	169

Water Supplies

Water supplies in the Sugar-Honey Creeks Watershed are obtained from both private groundwater wells and municipal systems. Potable water supplies are available throughout the watershed, but individual well yields and depths vary widely. All four of the aquifers described above are utilized for domestic, commercial, and industrial purposes.

Municipal systems within or near the Sugar-Honey Creeks Watershed (groundwater divides do not necessarily correspond with surface water divides, especially in the deeper systems) include the following:

> Burlington - 4 active wells in or near the watershed; all wells are finished in the sandstone aquifer.
>
> East Troy - 3 wells; 2 wells are finished in the sand-and-gravel aquifer, 1 well is finished in the sandstone aquifer.
>
> Elkhorn - 4 wells, all are finished in the sandstone aquifer.
>
> Troy Center - 1 well finished in the sandstone aquifer.
>
> Waterford - 2 wells near the watershed; 1 well is finished in the sandstone aquifer, 1 well is finished in the Niagara aquifer.

In addition to private and municipal community water supply systems, watershed residents may also rely upon other-than-municipal community systems and transient or non-transient non-community systems. Other-than-municipal community systems serve year-round residents, have at least 15 service connections, or serve at least 25 people for 60 or more days per year, and are not owned by a municipality. Non-community systems do not serve year-round residents. A non-community system that serves the same 25 people for 6 or more months per year is considered non-transient, otherwise the system is transient.

Potential Groundwater Quality Problems

Potential pollution associated with nonpoint sources is described in various sections throughout the remainder of this chapter. The WDNR Publication SW-144, The Wisconsin Remedial Response Site Evaluation Report (December 1991) lists Superfund sites, (no Superfund sites are located within the watershed), solid and hazardous waste disposal sites, leaking underground storage tank sites, and reported spill sites. Updated WDNR Emergency and Remedial Response Program data lists 25 program cases which have potential groundwater contamination in or near the Sugar-Honey Creeks Watershed.

Additional potential groundwater contamination sources within or near the watershed include those LUST and Spills cases not currently identified as contaminating groundwater. The WDNR Emergency and Remedial Response Program maintains this information. The following are those spill sites designated high priority:

Town/City	Town	Range	Section
Burlington	03	19E	30
Troy Center	04	17E	05

The WDNR Publication *Registry of Waste Disposal Sites in Wisconsin* lists sites within or near the Sugar-Honey Creeks Watershed at the locations provided below. This project is periodically updated and will change. These sites may be active or inactive and have not necessarily been identified as contaminating groundwater. This publication is periodically updated and will change.

Town/City	Town	Range	Section
Burlington	03	19E	29
East Troy	04	18E	31
East Troy	04	18E	15
East Troy	-	-	-
Elkhorn	-	-	36
Elkhorn	-	-	-
Elkhorn	-	-	-
Elkhorn	-	-	-
Elkhorn	-	-	-
LaGrange	04	16E	22
LaGrange	04	16E	16
Lafayette	03	17E	13
Lafayette	03	17E	18
Lafayette	03	17E	23
Lafayette	03	17E	07
Lafayette	03	17E	12
Spring Valley	03	18E	21
Spring Valley	03	18E	06
Sugar Creek	03	16E	09
Sugar Creek	03	16E	09
Sugar Creek	03	16E	02
Sugar Creek	03	16E	03
Troy	04	17E	16
Waterford	04	19E	34
Waterford	04	19E	06

Every public water supply facility (including municipal, other-than-municipal, and non-transient systems) must complete a WDNR Public Water Supply Contaminant Use Inventory (Form 3300-215). This form documents the type and number of all potential contaminant sources within 1,200 feet of each well in the system.

Since April 1992, the WDNR has required that a wellhead protection plan be developed for any new municipal well. The plan must include an inventory of existing potential contamination sources within a half-mile radius of the well, in addition to an assessment of existing potential sources within the well's recharge area. The plan also identifies the groundwater flow direction, the recharge area and zone of influence for the well, a wellhead protection area, public education and water conservation programs, a contingency plan, and a management plan. A wellhead protection plan has been developed for Elkhorn well number 7.

Water Quality Goals and Objectives

DNR staff with assistance from the Walworth and Racine County staff and the DATCP developed water quality goals and project objectives. Objectives for each subwatershed are included in the next section. Details can be found in the Sugar-Honey Creeks Priority Watershed Surface Water Resource Project Appraisal Report (Steve Galarneau, 1996) available through DNR's Southeast District Office.

Following are the general goals for water resources. For more specific goals, refer to the stream appraisals in the Appendix.

•**Protection**: Protection refers to maintaining the present biological and recreational uses supported by a stream or the reservoir. For example, if a stream supports a healthy warm water fishery and is used for full-body contact recreational activities, the goal seeks to maintain those uses.

•**Enhancement**: Enhancement refers to a change in the overall condition of a stream or lake within its given biological and recreational use category. For example, if a stream supports a warmwater fishery whose diversity could be enhanced, the goal focuses on changing those water quality conditions which keep it from achieving its full biological potential.

•**Restoration**: Restoration refers to upgrading the existing capability of the resource to support a higher category of biological use. An example would be a stream which historically supported healthy populations of warmwater game fish, but no longer does. This goal seeks to improve conditions allowing viable populations of forage and warmwater game fish species to become reestablished.

The goals and objectives of the Sugar-Honey Creeks Priority Watershed project focus on achieving optimum biological and recreational uses in Honey and Sugar creeks, their tributaries, and the lakes. The goals and objectives provide the basis for prescribing nonpoint source control, the selection of eligible best management practices, and the criteria by which water quality improvements will be evaluated when the project is completed.

The water resource goals and objectives for Sugar and Honey creeks, their tributaries, and the lakes focus on providing environmental conditions which allow the lakes and streams of the watershed to fully achieve their potential ecological uses. In many cases, other cultural factors that limit these water resources, such as point sources, channelization, wetland losses, and land development will also need to be addressed to see the full benefits of nonpoint source controls.

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

Based on the water quality appraisals for the streams and lakes in the Sugar-Honey Creeks Priority Watershed, the following project goals have been established for the watershed project:

1. Reduce sediment and other pollutants carried to the streams, tributaries, and lakes within the Sugar Honey Creeks Watershed.

2. Protect and restore the wetlands in the Sugar-Honey Creeks Watershed Project Area.

3. Improve or enhance the aquatic habitat in Sugar and Honey Creeks, the tributaries and the lakes.

4. Protect the groundwater quality in the Sugar-Honey Creeks Watershed.

5. Preserve the natural character and scenic beauty of Sugar and Honey Creeks, the tributaries, and the lakes within the project area.

The following water resource objectives and management needs have been determined for the streams and tributaries of the Sugar-Honey Creeks Watershed Project area.

1. Reduce sediment, organic matter, and phosphorus delivery to the streams and their tributaries.

2. Prevent construction site erosion.

3. Discourage stream debrushing.

4. Discourage channel dredging.

5. Establish or maintain stream buffer areas.

6. Prevent the discharge of urban run-off to the streams and their tributaries.

7. Protect springs.

8. Prevent wetland losses.

9. Stabilize eroding streambanks.

10. Discourage streambank pasturing.

The following water resource objectives and management recommendations have been determined for the lakes in the Sugar-Honey Creeks Priority Watershed project.

Because of the special sensitivity of lakes to phosphorus in these watersheds, special emphasis on nutrient management planning, including soils testing, will be given. Special emphasis will also be given to lawn care fertilization and pesticides through the I & E program.

Lauderdale Lakes
Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for the Lauderdale Lakes are to reduce phosphorus loading overall 13.8% from existing conditions (2,180 lbs/yr) to best managed conditions (1,880 lbs/yr). Specific best management practices should target lake protection and nutrient sources from agricultural land and residential riparian properties. Assessment of the internal loading at all three lakes should be continued by seasonal monitoring the deep hole nutrient levels.

Pleasant Lake
Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for Pleasant Lake reduce phosphorus loading overall 11% from existing conditions (280 lbs/yr) to best managed conditions (249 lbs/yr). Specific best management practices should target lake protection and nutrient sources from agricultural land and residential riparian properties.

Potter Lake
Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for Potter lake reduce phosphorus loading 52% overall from existing conditions (206 lbs/yr) to best managed

conditions (98.9 lbs/yr). Specific best management practices should first target nutrient sources from agricultural land and residential riparian properties. Further evaluation and quantification of the internal phosphorus load component should be undertaken.

North Lake
Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for North lake reduce phosphorus loading 39.2% overall from existing conditions (369 lbs/yr) to best managed conditions (224 lbs/yr). Specific best management practices should first target nutrient sources from agricultural land, urban development, and residential riparian properties. Further evaluation and quantification of the internal phosphorus load component should be undertaken following improvements in the watershed.

Wandawega Lake
Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for Wandawega Lake are to protect the lake from increased phosphorus loading. Specific best management practices should include aquatic plant and watershed protection activities.

Silver Lake
Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for Silver lake reduce phosphorus loading 33% overall from existing conditions (172 lbs/yr) to best managed conditions (115 lbs/yr). Specific best management practices should first target nutrient sources from agricultural land, urban development, and residential riparian properties. Further evaluation and quantification of the internal phosphorus load component should be undertaken following improvements in the watershed.

Honey Lake
Water Resource Objectives and Management Recommendations
The water resource objectives and management recommendations for Honey lake reduce phosphorus loading 38% overall from existing conditions (18,400 lbs/yr) to best managed conditions (11,400 lbs/yr). Specific best management practices should first target nutrient sources from agricultural land as detailed in the recommendations for Sugar Creek.

Groundwater Protection and Management Strategy

The following actions will be taken to achieve the project objectives for groundwater.

1. Nutrient Pest Management recommendations will be developed for consultants and landowners that include manure spreading and nutrient crediting, timing of alfalfa plow-down, cover crop use, and critical management zone identification.

2. Conservation Planners will identify groundwater management hazard areas in the landowners conservation plan.

3. Easements will be promoted by project staff as a viable alternative for landowners with areas that are susceptible to groundwater contamination.

4. Landowners will be encouraged to abandon existing wells that have not been in use for a period of one-year or more as a groundwater contamination prevention best management practice.

CHAPTER THREE
Nonpoint Source Pollutants, Objectives, and Cost-Share Eligibility Criteria

This section describes the results of the rural nonpoint source inventories, objectives, and cost-share eligibility criteria for each pollutant source. These sources include: rural sediments from upland areas, gully erosion, streambank and shoreline erosion, agricultural nutrients, and barnyard runoff.

Management Categories

Cost-share funds for installing pollutant control measures will be targeted at sites which contribute the greatest amounts of pollutants (upland fields, urban runoff, streambank and shoreline erosion, streambank habitat degradation sites, manure spreading, or barnyards). Management categories define which nonpoint sources are eligible for financial and technical assistance; they are based on the amount of pollution generated by a source and the feasibility of controlling the source. Specific sites or areas within the watershed project are designated as either "critical," "eligible," or "ineligible." Designation as a critical site indicates that controlling that source of pollution is essential for meeting the pollutant reduction objectives for the project. All critical sites must be controlled. Nonpoint sources which are eligible but not critical contribute less of the pollutant load, but are included in cost sharing eligibility to insure that water quality objectives are met. Landowners with eligible sites need not control every eligible source to receive cost-share assistance.

Management category eligibility criteria are expressed in terms of tons of sediment delivered to surface waters from eroding uplands and streambanks, chemical oxygen demand (COD) delivered to surface waters, the number of unsuitable acres spread with manure, feet of streambank trampled by cattle, and pounds of heavy metals and organics from urban areas. Management categories for particular sites may be revised up to the point that a landowner signs a cost-share agreement. Any newly created sources requiring controls after the signing of a cost-share agreement must be controlled at the landowners expense.

The Walworth and Racine County LCDs will assist landowners in applying BMPs. Practices range from alterations in farm management (such as changes in manure-spreading and crop rotations) to engineered structures (such as clean water diversions, sediment basins, and manure storage facilities), and are tailored to specific landowner situations.

Critical Site Management Category

Nonpoint source pollutant load reduction in the Sugar-Honey Creeks Watershed project will be achieved mainly through voluntary participation. Nonpoint sources included in the critical category contribute a significant amount of the pollutants impacting surface waters. State statutes require that the nonpoint source control plan designates the necessary activities to ensure the reasonable likelihood of achieving water quality goals and objectives. Landowners with sites that meet the established critical sites criteria are required by law to address those specific sites by reducing the nonpoint source pollutant load to an acceptable level. Pollutant load reduction can occur solely through the action of the landowner with guidance from county staff, or through watershed participation. Each site will be field verified before receiving notification as a critical site, with the findings sent to the DNR District Office. Landowners interested in receiving cost-share assistance for the installation of Best Management Practices will need to sign a cost-share agreement with their respective county Land Conservation Department.

Notification of landowners with known critical sites will begin 6 months following plan approval and will continue through the completion of the inventory. The first to begin the process shall be those highest ranked critical sites based on estimated pollutant contribution. Critical sites will provide at least 25 percent of the pollutant reduction objective. On-site visits will be conducted within a 6 month period. The purpose of the visit will be to verify that the location still meets the criteria for critical sites. The notification will include the following information:

- The 36 month period in which landowners are eligible for the full level of state cost-sharing, after which the cost-share rate decreases by 50 percent.

- The potential consequences that a landowner may face if no action is taken as defined in either Chapter NR243 for animal waste, or S.144.025 (2)(u)(v), or (w) for sediment and streambank delivery and streambank erosion.

- The right to appeal the designation of a critical site through a written request to the Land Conservation Committee of Walworth or
Racine County within 60 days of receipt of the notification letter.
(Economic hardship will only be considered for a structural Best Management Practice.)

A central component of the critical site management category are the AWAC recommendations. These recommendations include four prohibitions on basic activities associated with the raising of livestock:

- No overflow of manure storage structures.

- No unconfined manure stacking (piling) within water quality management areas (adjacent to streambanks, lakeshores, and in drainage channels).
- No direct runoff from feedlots or stored manure to waters of the state.
- No unlimited livestock access to waters of the state where high concentrations of animals prevent adequate sod cover maintenance.

Eligible Management Category

Specific nonpoint sources of pollution in this category contribute less significantly to surface and groundwater impacts. These sites are eligible for technical and cost-share assistance but are not as critical to reaching water quality objectives.

Other sites and practices which do not contribute pollution, but reduce pollutant loads, protect groundwater, or improve and protect habitat for wildlife and fish, will be eligible for cost-share assistance.

Ineligible Management Category

Sites which do not contribute significant amounts of pollutants are not eligible for funding and/or technical assistance under the priority watershed project. However, the site may be eligible under other DNR or Federal Programs, and can, if practical, be assisted by a county staff person.

Rural Nonpoint Source Pollutants

Barnyard Runoff

Surface drained barnyards

The barnyard pollution control objective is to reduce chemical oxygen demand (COD) in the streams and lakes of the Sugar-Honey Creeks Watershed by 40% (58,362 lbs.COD/yr). Runoff carrying a variety of pollutants from barnyards and other confined livestock areas is a major source of pollutants in the streams of this watershed. One hundred eight animal lots are a source of 145,906 pounds of COD annually (table 3-1).

Chemical oxygen demand is a measurement of all oxidizable matter which measures the lbs. of oxygen demanded by organisms for decomposition. Most of the oxygen-demanding pollutants and nutrients associated with these operations drain via concentrated flow to creeks and wetlands. Water quality is degraded by oxygen depletions caused by the decomposition of organic waste. When organic material reaches surface water, dissolved oxygen is depleted by organisms that decompose the waste. Organic material also poses a human health hazard because of the presence of bacteria and pathogens that make the water unfit for recreational use as well as for consumption. Water quality is further degraded by the excessive aquatic plant growth stimulated by phosphorus and nitrogen losses from the land. The dense aquatic plant growth causes severe oxygen fluctuations during plant photosynthesis (daytime), and respiration (night time), that causes additional stress to aquatic life.

Barnyard sites contributing a COD load greater than 5000 lbs. on an annual basis will be designated as a **critical site for control**. Those landowners with an animal lot designated as a critical site for control are eligible for a complete barnyard system, including a nutrient management plan, but will only be required to install clean water diversion practices. Installation of these low-cost, required, practices alone will provide 19% (28,314 lbs. COD/yr) of the annual COD load reduction.

Barnyard sites that contribute greater than 1000 lbs. of COD annually, will be considered **eligible** for cost-sharing. Having these livestock operations voluntarily participate in this watershed will be the most expedient and cost effective method of controlling the manure runoff and will be essential for reducing COD by 40 percent. Landowners in this voluntary category are eligible for cost sharing on clean water diversion practices. If these practices do not reduce the annual COD level below 1000 lbs., the livestock operation will be eligible for cost sharing on additional controls. A total of 21 percent (30,640 lbs. COD/yr) reduction will be obtained solely through voluntary participation.

Certain components of waste management systems (as specified in NRCS Std. 312), specifically those involving collection, handling and storage, require the preparation of a nutrient management plan (NRCS Std. 590) for the acreage that the manure may be spread. Roof Runoff Management (NRCS Std. 588), Livestock Exclusion (NRCS Std. 472), and Clean Water Diversion (NRCS Std. 362) are practices that are exempt from this requirement. Operations eligible for waste management systems are also eligible for cost-sharing of nutrient management and pest management (NRCS Std. 595) plans, soil testing, and crop scouting. See "Cropland Spread Manure & Pesticide Runoff" later in this chapter for additional detail.

Barnyard sites that contribute less than 1000 pounds of COD annually **will not be eligible** for cost sharing. There are approximately 58 landowners with animal lots in this category. It is possible that individual barnyard sites may become eligible for cost sharing if a determination is made by county staff and the DNR district biologist that corrective measures would improve water quality within a specific stream segment.

The development and implementation of a nutrient management plan will be a requirement for landowners receiving cost share dollars for the installation of a barnyard runoff management system. All nutrient pest management plans will be developed with a certified crop consultant. Those landowners installing low cost clean water diversions and or roof gutters will be encouraged to develop an nutrient pest management plan, but not required.

Internally drained barnyards drain to surface depressions or creviced bedrock rather than directly to surface waters or wetlands. Ten internally drained yards were identified in the Sugar-Honey Creeks Watershed. Eligibility for internally drained animal lots is based on a site by site analysis where significant groundwater contamination was determined to be likely. Field investigations will be conducted jointly by the county project staff, water resource management staff from the Department's Southeast District Office, and staff from the DATCP.

Table 3-1. **COD Delivery To Surface Waters**

Subwatershed Name	Inventory Results			Objective - 40 % Reduction In COD Loading					
				Critical - > 5,000 lbs. COD			Eligible - > 1,000 lbs. COD		
	# Barnyards	Lbs COD	% of Total COD From Barnyards	# Barnyards	Target - Pounds Reduced	% Reduced	# Barnyards	Target - Pounds Reduced	% Reduced
Sugar Creek Subwatersheds									
Abells	7	17,475	12.0%	1	5,428	3.7%	3	5,836	4.0%
Alpine Valley	10	19,757	13.5%	1	3,173	2.2%	6	11,945	8.2%
Baker Creek	5	5,710	3.9%	0	-	-	2	4,541	3.1%
Silver Lake	1	155	0	0	0	0	0	0	0
Spring Brook	1	610	.4%	0	0	0	0	0	0
Tibbets	20	32,302	22.1%	1	2,874	2.0%	9	21,479	14.7%
Vienna	3	2,141	1.5%	0	0	0	1	1,585	1.0%
Lake Wandawega	0	0	0	0	0	0	0	0	0
Honey Creek Subwatersheds									
Beulah Station	10	5,885	4.0%	0	0	0	1	3,063	2.0%

Subwatershed Name	Inventory Results			Objective - 40 % Reduction In COD Loading					
				Critical - > 5,000 lbs. COD			Eligible - > 1,000 lbs. COD		
	# Barnyards	Lbs COD	% of Total COD From Barnyards	# Barnyards	Target - Pounds Reduced	% Reduced	# Barnyards	Target - Pounds Reduced	% Reduced
Honey Creek Wildlife Area	5	785	15%	0	0	0	0	0	0
Lauderdale Lake	2	448	0.3%	0	0	0	0	0	0
Lower Honey	1	4,283	3.0%	0	0	0	1	4,283	3.0%
North Lake	4	3,366	2.3%	0	0	0	2	2,714	1.9%
Pleasant Lake	2	398	0.3%	0	0	0	0	0	0
Potter Lake	0	0	0	0	0	0	0	0	0
Spring Creek	9	21,188	14.5%	1	7,269	5.0%	4	7,258	5.0%
Spring Prairie	1	2,669	1.8%	0	0	0	1	2,669	1.8%
Troy Area-East Troy	7	10,840	7.4%	1	3,445	2.4%	2	2,097	1.4%
Upper Honey Creek	10	17,894	12.3%	2	6,125	4.2%	3	4,370	3.0%

Subwatershed Name	Inventory Results			Objective - 40 % Reduction In COD Loading					
				Critical - > 5,000 lbs. COD			Eligible - > 1,000 lbs. COD		
	# Barnyards	Lbs COD	% of Total COD From Barnyards	# Barnyards	Target - Pounds Reduced	% Reduced	# Barnyards	Target - Pounds Reduced	% Reduced
Total	98	145,906	100	7	28,314	19%	35	71,840	49%

Cropland Spread Manure & Pesticide Runoff

Manure storage as a component of the integrated crop management plan

The overall watershed objective is to reduce the amounts of nutrients, pesticides, and sediment that are being delivered to the stream. Mismanagement of cropland spread or stored manure, fertilizers, and pesticides causing runoff will be targeted for integrated crop management through the adoption of an NRCS Nutrient and Pest Management Plan (Std. 590 & 595). Development of a nutrient and pest management plan allows landowners an opportunity to balance water quality while maintaining a sustainable agricultural system that reduces excess nutrient applications and the costs associated with it. Reduced nutrient runoff is achieved by taking nutrient credits for legumes and landspread manure, in turn reducing applications of commercial nutrients. In addition, nutrient runoff will be reduce by the requirement of reducing soil erosion rates to the tolerable soil loss (T) as a minimum to qualify for nutrient management planning.

The potential for water quality problems caused by winter spreading manure generated at the 98 Walworth County and 10 Racine County livestock operations was assessed with the Manure Rating Storage Guide using the barnyard data, conservation plans, and aerial photos.

- Five livestock operations have no cropland to spread the manure.
- Nineteen livestock operations do not have enough owned cropland to spread manure.
- Forty five livestock operations were identified as needing more acres to daily spread during the 6 month period when the ground is frozen and pollution potential is greatest.

Eligibility for manure storage cost sharing will be based on the nutrient management plan, developed in accordance with NRCS Std. 590, demonstrating that manure cannot be practically managed during periods of snow covered, frozen, and saturated conditions without the use of storage practices. The nutrient management plan must also demonstrate that proper utilization of the manure can be achieved following adoption of the intended storage practice.

Cost sharing for manure storage facilities will also be based on the least cost system. These options may include manure stacks (in accordance with Std. 312), short term storage (capacity for 30 to 100 days production in accordance with Std. 313), and long term storage (capacity for up to 365 days production in accordance with Std. 313 or 425). Least cost analysis will also include evaluation of alternatives to storage. Alternatives to manure storage for reducing the surface water quality impact from the over application of manure to cropland are to:

* Reduce on-farm animal numbers
* Rent or purchase additional land that is suitable for winter spreading
* Haul manure or broker manure to a neighboring farm

Cost sharing will not be provided to landowners for manure storage or manure spreading if a nutrient management plan demonstrates that sufficient land is available for winter spreading.

Landowners receiving cost sharing to install a manure storage structure or implement a spreading program, will be required to develop a nutrient management plan with a certified crop consultant.

Nutrient and Pest Management

Farmers can benefit from nutrient and pest management plans by taking nutrient credits for legumes and landspread manure and reducing applications of commercial nutrients. Manure spreading runoff and management of nutrients and pesticides are addressed through two Natural Resource Conservation Service standards: Nutrient Management Standard 590 and Pest Management Standard 595.

Critical and Eligible livestock operations listed in table 2-1 will be encouraged to participate in an on-farm nutrient and pest management educational program to reduce over application of nutrients and pesticides. Up to 66,000 acres from these operations will be eligible to participate in this program.

Nutrient and pest management will be addressed with the development of both nutrient management (NRCS Std. 590) and pest management (NRCS Std. 595) plans, soil tests and crop scouting. These plans may be prepared by crop consultants and must be consistent with NRCS Standard 590 and 595. Landowners will be eligible to participate for up to three years and will receive reduced consultant fees. These plans will be submitted to and approved by the Walworth and Racine County Land Conservation Departments. Records should be kept showing progress towards reducing the use of fertilizer and pesticides.

Other practices that are singularly eligible for cost-sharing are soil and manure testing, crop scouting, and spill control basins for pesticide handling. Cost-sharing rate of 50% is given for all nutrient and pesticide management practices except for 70% on spill control basins.

Upland Sediment Runoff

<u>The cropland sediment reduction objective is to reduce the amount of cropland sediment delivered to surface waters from eroding cropland by an 30 percent (17,638 tons/acre/year).</u> Intensive agricultural practices have caused considerable amounts of eroded soil to reach streams, ponds, and wetlands in the Sugar-Honey Creeks Watershed. Upland erosion is the

major source of the sediments that are carried downstream, beyond individual subwatershed boundaries.

Upland sediment sources were evaluated through subarea sampling and extrapolation for the entire watershed, 167.3 square miles. The results of this inventory are summarized in Table 3-3a and 3-3b. An estimated 58,917 tons of soil per year are delivered to wetlands or streams in the watershed from cropland.

Soil erosion rates are calculated using the Universal Soil Loss Equation (USLE). Sediment delivery rates are calculated using the USLE in addition to other hydrology information located in the FOCS WINHUSLE model.

Cropland Critical Sites

In subwatersheds which have high sediment reduction objectives (see Tables 3 and 3a), those cropland fields eroding at rates greater than the tolerable soil loss T, and delivering sediment to surface waters at rates greater than 1.1 tons/acre/year will be targeted as critical sites and subject to pollution abatement action. For subwatersheds with moderate sediment reduction goals (see Tables 3 and 3b), any cropland eroding at a rate greater than the tolerable soil loss, T, and delivering sediment to surface water at rates greater 1.8 tons/acre/year, will be targeted as critical sites and subject to pollution abatement action. The sediment reduction rate is in accordance with the water resource appraisal completed for the Sugar-Honey Creeks Priority Watershed. Approximately 5,688 acres of cropland in the Sugar-Honey Creeks watershed (9%) meets the critical site criteria. Critical sites will affect an estimated 101 landowners who operate 125 fields within the watershed. When controlled through various management actions, these sites will account for 34% of the water quality objective for sediment reduction. This would reduce the sediment load delivered to watershed streams by an estimated 6,082 tons/acre/year. All critical site cropland fields will need to be reduced to T or less, and deliver sediment to the stream at 0.8 tons/acre/year or less. The average sediment delivery rate for the Sugar-Honey Creeks Watershed in 1996 was 0.9 tons/acre/year.

To promote voluntary participation, only those landowners with cropland fields delivering the highest sediment to the stream will receive initial critical site notification. This would consist of approximately 1,137 acres, or less than 2 percent of all cropland within the watershed. The remaining project inventory will continue at a rate of 20 percent per year for the next 4 years until 100 percent of the inventory has been completed.

During the fifth year of project implementation, the Sugar-Honey Creeks Priority Watershed will be evaluated by the Walworth and Racine County LCDs in conjunction with District Office DNR Staff for progress. If acceptable progress has been made prior to the fifth year of project implementation, the remaining critical sites that have not yet been notified by letter, will be reviewed on a subwatershed basis. A primary consideration in determing if acceptable progress is being made will be achieving 60 percent of the project's pollutant reduction objectives through cost share agreement sign-up.

The critical site verification contact strategy will focus on the development of cost share agreements with landowners that have cropland fields that meet the critical site criteria. The Farmland Preservation Program and cross-compliance activities will be used to maintain erosion levels below the tolerable soil loss (T).

Cropland Eligible Sites

Cropland fields not notified as critical sites that are delivering sediment to watershed streams at a rate greater or equal to 0.3 tons/acre/year will be eligible for control and pollution abatement. These sites will be categorized as eligible sites. When controlled through various management actions, these sites will account for 66 percent of the water quality objective for sediment reduction. This would reduce the sediment load delivered to watershed streams by an estimated 11,566 tons/acre/year. These eligible site cropland fields will need to reduce the sediment delivery rate to 0.6 tons/acre/year or less. **Cropland fields that deliver less than 0.3 tons/acre/year will not be eligible for cost sharing of sediment reducing practices.**

Federal Program Integration

Landowners with high sediment delivery fields will be encouraged to participate in future federal setaside programs which are Conservation Reserve Program (CRP) and Wetland Reserve.

Rotational Grazing

Rotational grazing will be promoted as a sediment reduction opportunity for watershed landowners. Informational and educational news letters and fact sheets will be widely distributed to encourage this practice.

Table 3-2. Summary of Upland Sediment Loading By Land Use: Sugar-Honey Creeks Watershed

Subwatershed		Cropland	Urban	Grassland	Pasture	Other	Woodlot	Surface & Wetland (%)	Totals
Tibbets	Acres	8,865	802	50	21	27	312	353	10,430
	Sediment	8,137	142			190			8,469
Baker Creek	Acres	5,664	700	282	257	139	237	259	7,538
	Sediment	7,090	104			34			7,228
Abells	Acres	4,302	495	39	45	274	855	1,570	7,580
	Sediment	4,923	77			370			5,370
Alpine	Acres	3,936	366	86	77	410	1,272	672	6,819
	Sediment	2,386	51			637			3,074
Spring Brook	Acres	2,375	95	14	95	20	275	211	3,085
	Sediment	2,554	10			5			2,569
Vienna	Acres	2,376	230	83	23	5	372	474	3,563
	Sediment	2,153	30			8			2,191
Upper Honey	Acres	9,539	563	105	69	28	759	1,288	12,351
	Sediment	6,314	92			50			6,456
Troy Area/East Troy	Acres	4,508	1,489	52	55	146	490	812	7,552
	Sediment	4,054	297			989			5,340
Spring Creek	Acres	4,355	177	23	103	22	280	389	5,349
	Sediment	5,271	17			52			5,340
Spring Prairie	Acres	2,051	144	34	93	2	383	557	3,264
	Sediment	1,800	19			10			1,829
Beulah Station	Acres	4,761	499	73	114	33	332	1,202	6,982
	Sediment	3,801	74			66			3,941

Table 3-2. Summary of Upland Sediment Loading By Land Use: Sugar-Honey Creeks Watershed

Subwatershed		Cropland	Urban	Grassland	Pasture	Other	Woodlot	Surface & Wetland (%)	Totals
Lower Honey Creek	Acres	4,959	511	446	241	116	838	556	7,667
	Sediment	1,578	86			223			1,887
Honey Creek Wildlife Area	Acres	1,704	301	507	98	20	386	948	3,964
	Sediment	1,186	45			44			1,275
North Lake Direct	Acres	7,017	450	171	153	56	1,286	338	9,471
	Sediment	4,190	74			8			4,272
Silver Lake	Acres	132	102	25	-	6	15	97	377
	Sediment	155	15			6			176
Lake Wandawega	Acres	223	304	165	-	10	191	215	1,108
	Sediment	210	48			7			265
Pleasant Lake	Acres	811	107	32	11	35	209	167	1,372
	Sediment	447	13			2			462
Lauderdale Lakes	Acres	4,230	881	165	76	132	1,572	951	7,927
	Sediment	2,466	123			16			2,605
Potter Lake	Acres	93	246	7	-	14	21	166	547
	Sediment	202	41			8			251
Totals	Acres	71,901	8,462	2,359	1,531	1,495	10,085	11,225	106,946
	Sediment	58,917	1,358			2,725			63,000

Notes: Sediment is reported in tons/year.
Cropland sediment does not include gully erosion.
Data was extrapolated from subarea sampling.
Other - includes Land Under Construction, Mineral Extraction and Recreation

Table 3-3A. Upland Sediments To Streams (High Control Watershed)

Subwatershed	Inventory Results				Objective- 30 % Reduction in Sediment Delivered						
	Area - (Acres)	Sediment Delivered (Tons Per Year)	Sediment Reduction Objective (%)	Sediment Reduction Objective (Tons)	Critical - >T Soil Loss and > 1.1 Sediment Delivered			Eligible - >T Soil Loss and <=0.3 Sediment Delivered or <= T and > 0.3 Sediment Delivered			Not Eligible (Acres)
					# Acres	Target - Tons Reduced	% Reduced	# Acres	Target - Tons Reduced	% Reduced	
Tibbets	8,865	8,137	30%	2,441	1,087	673	8%	7,249	1,768	22%	529
Baker Creek	5,664	7,090	30%	2,127	1,027	1,156	16%	4,601	971	14%	36
Upper Honey Creek	9,539	6,314	30%	527	527	213	3%	7,592	1,681	27%	1,420

Table 3-3A. Upland Sediments To Streams (Moderate Control Watershed)

Subwatershed	Inventory Results				Objective- 30 % Reduction In Sediment Delivered						
	Area - (Acres)	Sediment Delivered (Tons Per Year)	Sediment Reduction Objective (%)	Sediment Reduction Objective (Tons)	Critical - >T Soil Loss and > 1.8 Sediment Delivered			Eligible - >T Soil Loss and <=0.3 Sediment Delivered or <= T and > 0.3 Sediment Delivered			Not Eligible (Acres)
					# Acres	Target - Tons Reduced	% Reduced	# Acres	Target - Tons Reduced	% Reduced	
Abells	4,302	4,923	30%	1,477	900	1,161	24%	3,327	316	6%	75
Alpine Valley	3,936	2,386	30%	716	0	0	0%	3,581	716	30%	355
Vienna	2,376	2,153	30%	646	100	145	7%	2,226	501	23%	50
Spring Brook	2,375	2,554	30%	766	431	511	20%	1,728	255	10%	216
Troy Area	4,508	4,054	30%	1,217	383	582	14%	3,919	635	16%	206
Spring Creek	4,355	5,271	30%	1,582	243	443	8%	3,998	1,139	22%	114
Spring Prairie	2,051	1,800	30%	540	414	540	30%	1,318	0	0%	319
Beulah Station	4,761	3,801	30%	1,141	418	493	13%	3,387	648	17%	956
Lower Honey	4,959	1,578	30%	473	12	12	<1%	4,798	461	29%	149
Honey Creek Wildlife Area	1,704	1,186	30%	356	0	-	-	1,363	356	30%	327

Table 3-3B

Upland Sediments To Lakes

Subwatershed	Inventory Results				Objective- 30 % Reduction in Sediment Delivered						
	Area - (Acres)	Sediment Delivered (Tons Per Year)	Sediment Reduction Objective (%)	Sediment Reduction Objective (Tons)	Critical - >T Soil Loss and > 1.8 Sediment Delivered			Eligible - >T Soil Loss and <=0.3 Sediment Delivered or <= T and > 0.3 Sediment Delivered			Not[1] Eligible (Acres)
					# Acres	Target - Tons Reduced	% Reduced	# Acres	Target - Tons Reduced	% Reduced	
North Lake	2,491	4,190	30%	1,257	98	145	3%	2,372	1,112	27%	21
Potters Lake	93	202	30%	61	48	48	24%	45	13	6%	0
Silver Lake	132	155	30%	47				132	47	30%	0
Lake Wandawega	223	210	30%	63				223	63	30%	0
Pleasant Lake	456	447	30%	134				456	134	30%	0
Lauderdale	2,575	2,466	30%	740				2,575	740	30%	0
Total	65,365	58,917	30%	17,678	5,688	6,122	10%	54,890	11,556	20%	4,773

Note: Cropland acres for North Lake, Pleasant Lake, and Lauderdale Lake only includes acres draining to surface waters and not depressional areas.

[1] < T Soil Loss and < 0.3 Sediment Delivered (acres)

Gully Erosion Runoff

Gully erosion contributes an estimated 6,873 tons of the total annual sediment load to surface water in the watershed. Since gully erosion has not been identified as a significant problem in the Sugar-Honey Creeks watershed, no critical sites for control have been identified.

The gully erosion reduction objective is to achieve an overall sediment reduction level of 50 percent, or 3437 tons, annually.

Gully Sites

The landowners who enter into a voluntary cost share agreement will be required to control 100 percent of the total sediment load delivered to surface water from gullies on their land.

Soil erosion that occurs from gully activity on cropland will mainly be controlled through the installation of grassed waterways. In some instances, other Best Management Practices such as high residue management and/or the installation of structural practices that reduce peak flow and increase infiltration upfield may reduce or eliminate the need for grassed waterways.

If an on-site evaluation of an active gully leads local LCD staff to the conclusion that the installation of structural practices would not be cost effective, that site will be deemed as ineligible for those specific practices. All active gullies will be eligible for critical area stabilization and seeding.

Streambank Erosion Runoff

Streambank erosion contributes 3 percent of the total sediment to surface waters in the Sugar-Honey Creeks Watershed. Approximately 60 miles of streams and tributaries were evaluated. Significant erosion has occurred and/or aquatic habitat and water quality were degraded along approximately 4 miles of streambank. An estimated 2,065 tons of sediment are eroding into streams annually. The streambank erosion objective is to reduce sediment entering streams by 25 percent (517 tons). See Table 3-5 for streambank inventory results.

Livestock Access

Livestock trampling was observed on 3,750 feet of streambanks in the Sugar-Honey Creeks Watershed. All trampled streambanks are eligible for cost-share assistance for fencing.

Table 3-4. Streambank Inventory Results: Sugar-Honey Creeks Watershed Streambank Erosion and Degraded Habitat

Sugar Creek Subwatersheds	Inventoried Streambank Length (feet)	Eroded Sites (feet)	Degraded Banks With Livestock Access	Total Sediment Loss Tons/Year
Abells	84,000	1,100	125	225
Alpine Valley	125,000	3,500	0	440
Baker Creek	52,000	3,325	1,325	302
Spring Brook	34,000	490	110	54
Tibbets	83,000	4,030	420	388
Vienna	15,000	995	220	158
Totals	317,400	13,440	2,200	1,567

Source: Walworth County LCD

Honey Creek Subwatersheds	Inventoried Streambank Length (feet)	Eroded Sites (feet)	Degraded Banks With Livestock Access	Total Sediment Loss Tons/Year
Beulah	79,000	810	225	78
Troy Area East Troy	60,000	1,220	300	106
Honey Creek Wildlife Area	35,000	92	0	21
Spring Creek	33,000	814	300	83
Spring Prairie	15,000	285	200	46
Upper Honey Creek	93,000	1,475	350	133
Lower Honey Creek	42,000	207	175	52
Totals	357,000	4,903	1,550	519

Source:
Walworth and Racine County LCDs

Table 3-5. Streambank Erosion

	Inventory Results			Objective and Eligibility criteria			
	Inventoried stream length (ft)	Total Sediment Delivery - Tons per year	Total Length Degraded By Livestock Access	Eligible Streambanks Total Sediment Delivery > 5 Tons/Site		Sediment Reduction (%)	Sediment Reduction (Tons)
Sugar Creek Subwatersheds				# owners	feet		
Abells	84,000	225	125	3	1,000	25%	56
Alpine Valley	125,000	440	0	4	3,050	25%	110
Bakers Creek	52,000	302	1,325	3	3,000	25%	76
Spring Brook	34,000	54	110	2	450	25%	13
Tibbets	83,000	388	420	6	3,500	25%	97
Vienna	15,000	158	220	3	900	25%	40
Total	393,000	1,567	2,200	21	11,900	25%	392

Table 3-5. Streambank Erosion

Honey Creek Subwatersheds	Inventory Results			Objective and Eligibility Criteria			
	Inventoried stream length (ft)	Total Sediment Delivery - Tons per year	Total Length Degraded By Livestock Access	Eligible Streambanks Total Sediment Delivery > 5 Tons/Site		Sediment Reduction (%)	Sediment Reduction (Tons)
				# owners	feet		
Beulah	79,000	78	225	3	700	25%	20
Troy Area East Troy	60,000	106	300	4	1,000	25%	27
Honey Creek Wildlife Area	35,000	21	0	1	92	25%	5
Spring Creek	33,000	83	300	2	750	25%	21
Spring Prairie	15,000	46	200	2	200	25%	11
Upper Honey Creek	93,000	133	350	4	1,100	25%	33
Lower Honey Creek	42,000	52	175	1	150	25%	13
Total	357,000	519	1,550	17	3,992	25%	130

Table 3-6. Shoreline Erosion

Subwatershed	Inventory Results			Objective		
	Inventoried Length (Feet)	% of Total Shoreline	Total Sediment Loss - Tons Per Year	Any Site > .1 Foot/Year Lateral Recession Rate		
				Length (Feet)	% Control	Sediment Reduction Tons/Year
Potters	11,000	100%	11	220	75%	8
Silver	7,900	100%	5	65	75%	4
Wandawega	11,000	100%	13	155	75%	10
North	25,000	100%	4	85	75%	3
Honey	7,400	100%	7	140	75%	5
Pleasant	14,000	100%	9	145	75%	7
Mill	25,000	100%	8	115	75%	6
Green	21,000	100%	12	85	75%	9
Middle	28,000	100%	51	510	75%	38
Total	150,300	100%	120	1,520	75%	90

Shoreline Erosion Runoff

While shoreline erosion on the lakes in the Sugar-Honey Creeks Watershed is essentially a natural process—caused by wind, wave, and ice action, it may be affected by water level fluctuations, human disturbance, and shoreline land use practices. A shoreline erosion inventory was done during the fall of 1995. See Appendix D for inventory methods. The inventory showed that 1,520 feet of shoreline is eroding. Shoreline erosion is estimated to contribute 120 tons annually to the lakes, which is less than one percent of the total sediment delivered to surface waters. See Table 3-6 for inventory results.

While the inventory does not identify shoreline erosion as a major sediment problem, there are areas where erosion is severe and shoreline habitat is being affected. This situation was observed on the western shoreline of Mill Lake along a channel in the vicinity of Bubbling Springs.

No critical sites for shoreline erosion were identified.

Eligible area sites are those with moderate erosion. Moderate erosion sites are defined as having banks averaging three feet in height, with a lateral recession rate of 0.1 feet per year.

Pollutant Reduction and Project Objectives For Rural Nonpoint Sources

Objectives for water quality in the Sugar-Honey Creeks were identified earlier in the chapter as protection, enhancement, and restoration or water resources. In rural areas these will be achieved through project objectives for sediment, phosphorus, and groundwater.

The following is a summary of reductions to be targeted for the entire watershed.

Sediment Objective:

Reduce overall sediment delivered by 34 percent. To meet this, the following is needed:

- Thirty percent reduction in sediment reaching streams from agricultural uplands in all subwatersheds.
- Twenty-five percent reduction in streambank sediment delivered to all streams.
- Seventy-five percent reduction in shoreline sediment delivered to the lake.
- Fifty percent reduction in gully erosion.

Phosphorus Objective:

Reduce overall phosphorus load by 30 percent. In order to meet this objective, the following is needed:

- Forty percent reduction in P from barnyards in all subwatersheds.

- Thirty percent reduction in P from rural and urban sediment sources.

In addition, this plan calls for a restoration of 10 percent of degraded or prior converted wetlands.

Tables 3-10, 3-11 and 3-12 summarize the sediment, COD, and phosphorus reduction objectives for the Sugar-Honey Creeks Priority Watershed Project.

Urban Inventory Results, Nonpoint Source Pollutants, Pollution Reduction Objectives, and Eligibility Criteria

An urban nonpoint source inventory and analysis was conducted to identify and prioritize major and minor constraints to achieving water quality goals in the Sugar-Honey Creeks watershed. This section describes the urban nonpoint source pollutants as well as the management needs and reduction objectives for each pollutant in the Sugar-Honey Creeks watershed. It includes assessments for stormwater conveyance, sediment from construction site erosion and streambank erosion, pollution prevention practices, and urban toxic pollutants carried in runoff. The section ends with a summary of the pollutant reduction and project objectives for urban nonpoint sources.

Description of Urban Runoff

The principal water quality and quantity problems derived from urban runoff result from many factors including:

- Loadings of sediment, nutrients, heavy metals, and other toxic materials.
- Stream channel modifications, including straightening and lining with concrete.
- Hydrologic disturbances, including flashy high flows and loss of base flow.
- Streambank erosion.

Urban runoff carries a variety of pollutants to surface water. Pollutants found in urban runoff include heavy metals (lead, copper, zinc, cadmium, and chromium) and a large number of toxic organic chemicals (polychlorinated biphenyls, polycyclic aromatic hydrocarbons, pesticides, and many others). Other substances in urban runoff include sediment, nutrients, bacteria, and protozoans.

The delivery of pollutants to streams from existing urban areas depends on the types of urban land uses, the types of storm water conveyance systems, and urban pollution prevention practices, such as street sweeping, yard waste collection, and waste oil recycling programs. Freeways, commercial, and industrial areas have the highest unit/area/year pollutant loads, producing the most significant amounts of metals and other urban toxic pollutants. Medium density and multi-family residential areas also generate metals, sediment, and phosphorus, and include large impervious areas. Residential areas contain more lawn area than commercial areas, while commercial areas have more rooftop, street, and parking lot surfaces. Lawns can also contribute phosphorous from grass clippings, leaves, pet waste, and debris that get washed into storm sewers or roadside ditches; and from fertilizer and pesticide over applications and spills. Rooftop areas are important sources of zinc and atmospheric pollutants. Their connection to the storm drainage system may be direct or indirect, depending on the use of downspouts, grassed areas, drain tiles, etcetera.

Urban land uses and anticipated growth are summarized in Table 3-7A. Typical pollutant generation rates from urban land uses is shown in Table 3-7. Existing urban land uses in the Sugar-Honey Creeks watershed and their respective amounts and types of pollutant loads are shown in Table 3-8. The greatest amount of urban land in the watershed is concentrated around the Village of East Troy and the northern half of the City of Elkhorn. Additional urban lands are found in developments around some of the lakes in the watershed. Runoff from new urban areas has the potential to further degrade lake and stream water quality unless stormwater management controls are incorporated during development. Because different land use development patterns can have significantly different impacts on water quality in lakes and streams, funding may be available to study the water quality impacts associated with various types or patterns of land use development. Funding may also be available to help develop new or revise existing subdivision ordinances, zoning ordinances, or land use plans as they relate to the goals in the plan.

Table 3-7A. Increases in Urban Land Use Within the Sugar-Honey Creek's Priority Watershed, 1990 to 2010

	1990		Planned Increment		Year 2010	
Land Use Category	Acres	% of Total	Acres	% Change	Acres	% of Total
Residential	3,936	45	1,811	46	5,747	51.7
Commercial	167	2	10	6	177	1.6
Industrial	187	2	136	73	323	2.9
Governmental, Institutional	255	3	15	6	270	2.4
Streets/Hwy	3,482	39	279	8	3,761	33.8
Recreational	788	9	55	7	843	7.6
Totals	8,815	100	2,306	+26	11,121	100

Source: SEWRPC, Village of East Troy, City of Elkhorn

Table 3-7. Typical Pollutant Generation Rates From Urban Land Uses

Land Use	Unit Area Load (pounds/acre/year)				
	Sediment	Phosphorus	Lead	Zinc	Other Concerns
Highways/Streets	880	0.9	5.5	2.1	volatile organics
Industrial	1,000	1.5	2.4	2.1	volatile organics
Commercial	1,000	1.5	2.7	2.1	volatile organics
Shopping Centers	440	0.5	1.1	0.6	volatile organics
High Density Residential	420	1.0	0.8	0.7	pesticides
Medium Density Residential	190	0.5	0.2	0.2	pesticides
Low Density Residential	10	0.04	0.01	0.04	pesticides
Parks	3	0.03	0.005	-	pesticides

Source: DNR. Note: In each subwatershed these figures were adjusted for specific watershed conditions.

Table 3-8. Urban Land Use and Nonpoint Source Loads in the Sugar Creek Watershed: 1990 (Total Watershed Area = 40,502.83 Acres)

Subwatershed	Urban Land Use		Sediment		Phosphorus		Lead[1]	
	Acres	%[2]	Tons/Yr	%	Pounds/Yr	%	Pounds/Yr	%
Tibbets	802	7.7	141.77	29.8	201.71	32.1	65.79	29.1
Abells	495	6.5	77.50	16.3	50.65	8.0	35.11	15.5
Baker Creek	700	9.3	104.0	21.8	145.74	23.2	48.17	21.3
Alpine Valley	366	5.3	50.67	10.6	68.13	10.8	17.6	7.8
Spring Brook	95	3.1	9.7	2.0	14.13	2.2	5.67	2.5
Vienna	230	6.5	29.98	6.3	49.39	7.8	17.58	7.8
Wandawega	304	37.4	47.65	10	75.66	12.0	27.58	12.2
Silver	102	27.1	14.6	3.1	23.65	3.8	8.79	3.9
Total Sugar Creek	3,094		475.87	99.9	629.06	99.9	226.3	100.1

1 Lead is used as an indication of metal loadings contributed from land uses.
2 percent of land in urban land uses in subwatershed.

Source: DNR

Table 3-8. Urban Land Use and Nonpoint Source Loads in the Honey Creek Watershed: 1990 (Total Watershed Area = 66,558.59 Acres)

Subwatershed	Urban Land Use		Sediment		Phosphorus		Lead[1]	
	Acres	%[2]	Tons/Yr	%	Pounds/Yr	%	Pounds/Yr	%
Upper Honey	563	4.5	91.56	9.6	133.77	9.6	54.23	11.3
Troy Area/East Troy	1,489	19.7	297.2	33.7	422.31	30.4	138.18	29.0
Beulah Station	499	7.1	74.4	8.4	119.58	8.6	43.47	9.2
Spring Creek	177	3.3	16.74	1.9	27.42	2.0	10.14	2.1
Lower Honey	511	6.7	85.52	9.7	138.24	10	50.24	10.5
Honey Lake Wildlife	301	7.6	45.42	5.2	79.34	5.7	25.58	5.4
Spring Prairie	144	4.4	19.1	2.1	30.69	2.2	10.55	2.2
Pleasant Lake	107	7.8	13.5	1.5	20.80	1.5	6.82	1.4
Potters Lake	246	4.5	41.06	4.7	66.62	4.8	24.13	5.1
Lauderdale Lakes	881	11.0	122.7	13.9	227.26	16.4	70.31	1.5
North Lake[3]	450	4.4	73.7	8.4	121.0	8.7	43.0	9.0
Total Honey Creek	5,368		880.9		1,387.03		476.65	

1 lead is used as an indication of metal loadings contributed from urban land uses.
2 Percent of land in urban land uses in the subwatershed.
3 North Lake Subwatershed is internally drained.

Source: DNR

Table 3-9. Grass Swale Drainage, Street Sweeping, and Stormwater Ponds By Land Use For Municipalities in the Sugar-Honey Creeks Watershed

Municipality	Land Use	Acres	Percent Drained by Grass Swales	Street Sweeping (sweepings/yr)	Stormwater Ponds
East Troy	Residential	811	20	18	None
	Commercial	54	20	18	None
	Industrial	60	20	18	None
	Institutional	99	0	18	None
Elkhorn	Residential	381	10	4	None
	Commercial	42	10	20	None
	Industrial	27	10	4	None
	Institutional	50	10	4	None

Note: Estimated infiltration rate for soils in both municipalities is 0.6-2.0 (in/hr)

Source: DNR

Stormwater Conveyance

Description
Storm water is most commonly conveyed to streams through a combination of storm sewers, roadside ditches, grassed swales, and ponds. Storm sewers transport runoff rapidly with no pretreatment or filtering of the runoff before it enters streams. Properly designed grassed swales generally reduce runoff volume because of infiltration, and sod vegetation serves to remove some pollutants from runoff before it flows into streams and storm sewer systems.

The types and amounts of pollutants transported by runoff depend on the way that pollutant-bearing surfaces are connected to the storm drainage system. For example, commercial parking areas and arterial streets, deliver the highest concentrations of lead, asbestos, cadmium, and street sediment because normally these areas are drained by storm sewers that discharge to a stream or lake.

Reducing pollutant transport to surface waters involves reducing the amount of urban storm water reaching streams, primarily from impervious surfaces. This is accomplished by increasing the infiltration of storm water into the soil and ground layers. Storm water infiltration on a suitable site can effectively reduce nonpoint pollution. In addition, infiltration can help stabilize the hydrology of small urban streams by replenishing groundwater, much of which is ultimately discharged to surface water. Infiltration can reduce bank erosion and the need for expensive, highly engineered streambank stabilization structures. Infiltration practices can be used with wet detention ponds to supplement pollutant removal effectiveness or reduce pond size.

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

Management Needs and Alternatives
Hydrologic analyses have not been conducted to investigate the effect of management alternatives on reducing and preventing streambank erosion and bed scour, or on maintaining stream base flows. These studies will need to be conducted as part of future stormwater management feasibility studies for nonpoint source control in established urban areas. Table 2-16 shows the percent of grass swale drainage, street sweeping frequency, and number of stormwater ponds for each municipality in the Sugar-Honey Creeks watershed.

Five management alternatives were considered for each municipality. These management alternatives present a range of practices and control effectiveness which include:

1. Do nothing.

2. Increase catch basin cleaning to at least two times each year on [2]targeted urban land uses.

3. Increase street sweeping to at least two times per month on targeted urban land uses.

4. Install and maintain construction site erosion control measures to control 50 percent of the sediment generated.

5. Detain runoff from 50 percent of targeted land uses.

The analysis of management alternatives assumes that stormwater ponds will trap all sediment particles of 20 microns or larger. This will result in about a 50 percent control of suspended sediment and about 30 percent control of phosphorus and heavy metals in urban runoff. The analysis assumes an infiltration rate of 0.5 inches per hour for infiltration basins and grassed swales. This is a moderate rate of infiltration that will provide less control of pollutants than stormwater ponds. The actual infiltration rate in the Sugar-Honey Creeks watershed is a range of 0.6-2.0 inches per hour. Higher infiltration rates of about 2.5 inches per hour would provide excellent control of pollutants. Existing levels of street sweeping and grassed swale drainage are accounted for in evaluating these alternatives.

Stormwater ponds and infiltration practices should only be installed when specifically called for in detailed feasibility studies. These practices should be located where land availability and soil conditions are suitable for providing a high level of control as determined by detailed feasibility studies. Infiltration basins or trenches would provide groundwater recharge and base flow enhancement.

Feasibility studies will be needed to select the site specific stormwater detention and infiltration practices consistent with this watershed plan. The cost and complexity of studies will vary, depending on land use and the compatibility of the existing storm sewer networks with locating structures. Assistance available to communities under the priority watershed project to develop nonpoint source controls in established urban areas is presented in Chapter Four.

Catch basin cleaning is used to remove leaf litter, accumulated dirt, and debris to improve water quality of downstream surface waters. Catch basins can be cleaned either manually with a shovel, or by machine using a clamshell bucket, or specially designed equipment including bucket loaders, and vacuum attachments to street sweepers. Cost sharing is authorized for partial support of supplementary catch basin cleaning for existing target land uses. Supplementary catch basin cleaning is defined as levels greater than one cleaning for each catch basin per year in target land use areas.

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[2] Targeted urban landuses include commercial, industrial, and high density residential.

Cost sharing will be available for a maximum five year period, beginning when the community first accepts cost share funds for catch basin cleaning. Eligible cost components include:

- direct and indirect staff costs to operate the cleaning equipment including wages, salaries, benefits, and overhead (Only cost of "additional staff" as defined in NR120.02 is eligible).
- fuel, equipment maintenance, and equipment depreciation,
- disposal of collected materials.

Costs will be supported at a cost share rate of 100 percent for staff costs and 50 percent for other costs listed above. Cost sharing will be on a reimbursement basis. Following the five year period of cost share eligibility, the community must maintain through the end of the Priority Watershed Project period at its own expense a comparable catch basin cleaning schedule in those areas for which it received cost sharing. This requirement will be waived at such time the area is retrofitted with BMPs consistent with the recommendations of this watershed plan.

Street sweeping involves the use of brush or vacuum style sweepers to remove leaf litter and accumulated dirt from street surfaces on a schedule designed for improving quality of downstream surface waters. Cost sharing is authorized for partial support of supplementary street sweeping for existing target land uses. Supplementary sweeping is defined as levels above the 1996 level of street sweeping but only on land uses deemed as target.

Supplementary street sweeping is supported at a 50 percent cost share rate and available for a maximum five year period, beginning when the community first accepts cost share funds for street sweeping. Eligible cost components and cost sharing rates are the same as for catch basin cleaning (see above). Following the five year period of cost share eligibility, the community is expected to maintain at its own expense through the end of the Priority Watershed Project period a comparable street sweeping schedule in those areas for which it received cost sharing. This requirement will be waived when the area is retrofitted with BMPs consistent with the recommendations of this plan.

Objectives

The management objective for the five existing developed subwatersheds (Baker Creek, Troy Area, Lauderdale Lakes, Potter Lake, and Tibbets) is to achieve a 30 percent reduction of pollutants. The management of pollutants from existing developed areas can be accomplished through activities such as street sweeping, catch basin cleaning, replacing stormsewer inlets with catch basins and construction site erosion control. Structural best management practices including retrofitting existing stormwater ponds and construction of new stormwater ponds may be considered when specifically called for by comprehensive stormwater management plans.

The long-term management goal for future development in all subwatersheds is to achieve a 75 percent reduction of pollutants. The management of pollutants from future development requires wet detention (or a corresponding level of infiltration based on an equivalent amount of pollutant removal) for all target land use areas. Those activities recommended for existing developed areas should also be conducted in future developed areas. Grassed swales should be considered in new developments rather than curb and gutter. Stormwater management ordinances for future development can specify criteria for these controls.

Analysis of storm water management techniques shows that certain activities such as streetsweeping, catch basin cleaning and construction site erosion control; and certain best management practices (BMPs), such as infiltration basins and storm water detention ponds, can significantly reduce sediment and other pollutant loadings to lakes and streams. Adoption of storm water management ordinances and use of storm water management practices will be a priority in the implementation of this plan.

Redeveloped urban areas should have storm water quality and flow control practices included as part of the development.

Construction Site Erosion

Description

Construction sites are those areas in any phase of construction that involves disturbing the soil through grading or excavation. Construction sites in the project area entail new development and renovation or redevelopment. Examples of renovation and redevelopment activities include utility replacement, street replacement, bridge reconstruction, or rehabilitation of commercial, industrial, or residential areas.

Construction site erosion is a major water quality concern in the watershed. For the purpose of this planning effort, an inventory of land under construction was conducted to determine the extent of contruction in the watershed and the effectiveness of construction site erosion prevention and control methods. There were 237 acres of land under construction observed during the period of March 1996 through September 1996. Construction erosion prevention and control was generally found to be effective in the rural areas where construction sites were limited to single-family residential construction. Construction erosion and prevention and control on large developments generally failed to include structural best management practices to collect sediment, such as sediment traps and basins. It was estimated that construction erosion, during the inventory period, generated and discharged 1303 tons of sediment to adjacent waterways.

Uncontrolled construction site erosion can devastate aquatic communities in rivers and lakes receiving sediment-laden runoff. The reduced capacity of stormwater conveyance systems resulting from sedimentation can cause localized flooding. Importantly, water quality improvements occurring through implementation of nonpoint source control practices for existing urban areas can be negated by construction site erosion pollution sources. Predicting rates of construction site erosion is difficult. However, erosion rates exceeding 75 tons/acre/ year can occur. This rate of erosion is greater than occurs on the most severely eroding croplands and 65 times the sediment loading rate from existing commercial and industrial areas. Often the proximity of construction sites to storm sewers or other drainage ways serving urban areas results in nearly all of the sediment being delivered to streams and lakes.

Management Needs and Alternatives

Construction site erosion control throughout most of the watershed project area is critical to achieving sediment reduction goals. Without at least a 70 percent control of the sediment from these sites, construction site erosion will remain a serious deterrent to desired water quality and aquatic life in the watershed project area.

Average annual sediment loading to streams from construction erosion for 1990 to 2010 conditions was determined by multiplying the amount of land planned for construction by an average of 30 tons per acre per year. This rate of erosion and sediment control is based on observed land development patterns and generalized climatic conditions. It is estimated that in the years between 1990 and 2010, construction erosion will contribute about 3459 tons per year of sediment to streams in the project area, if construction erosion prevention and control methods and measures are not used

Critical Sites Designation

Critical sites for land under construction will include those construction sites in the Honey-Sugar Creeks Watershed Project Area that <u>do not</u> conform to local construction site erosion control ordinances, if applicable, or the Walworth County Construction Site and Stormwater Management Ordinance.

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

One of the two municipalities in the project area, Elkhorn, has ordinance requirements for controlling construction site erosion and sedimentation. Walworth County has an active construction site erosion control ordinance and stormwater ordinance which governs all development activities in the county outside of incorporated municipal boundaries. Racine County does not have erosion control and stormwater management ordinances for development in unincorporated areas. In addition, developers are governed by state regulations (Ch. 281 Wis. Stats. Note: This was formerly numbered Ch. 144) set forth by the Department of Commerce (DOC) for erosion control on sites with one and two family dwellings; and the DNR Wisconsin Pollutant Discharge Elimination System (WPDES) permit regulations for sites greater than five acres.

Despite these regulations, several potential impediments to effective erosion control exist. For example, developers sometimes perceive erosion control as an add-on cost and not a built-in cost of construction, enforcement is often done only in response to complaints, maintenance of erosion control is often poor, unnecessary grading and excavation is commonplace, soil is routinely tracked onto roads because preventative measures are not a high priority for builders, and there is often confusion about who is responsible for installing erosion control practices.

Local ordinances must meet the applicability and content requirements of NR 120.16 dealing with erosion control. The "Model Construction Site Erosion Control Ordinance," developed cooperatively by the DNR and the League of Wisconsin Municipalities (DNR, 1987), and suggested changes to the model ordinance (set forth by Mr. James H. Schneider, League Legal Counsel, in the March 1989 issue of "The Municipality") will be used as guides to determine adequacy of ordinances. Erosion control practice standards and applicability criteria should be consistent with those set forth in the Wisconsin Construction Site Best Management Practice Handbook (DNR, 1989).

The following is a list of specific recommendations that units of government and developers should address in developing an effective construction site erosion control program.

- Municipalities and counties should review (and modify where needed) their existing ordinances to assure effective penalties for non-compliance and responses to concerns of citizens, inspection staff, and developers.

- Municipalities and counties should evaluate staffing and training needs for effective ordinance administration and enforcement.

- Municipalities and counties should evaluate their permit fee schedule to investigate ways to raise revenue to support effective enforcement activities.

- Developers and contractors need to know what is expected of them, and they need better access to technical information through seminars and other educational activities and materials.

- Erosion control inspectors need specific guidelines for documenting ordinance violations in order to provide for more consistent and effective legal action.

An erosion control information and education strategy is described in Chapter Six.

Objectives
High priority items to improve compliance include more consistent enforcement, hiring and training of additional inspection staff where needed, new fee structures to cover the cost of improved staffing, and more effective court action when ordinance violations occur.

Because of the gaps in state agency regulations, construction erosion control is best accomplished through a local erosion control ordinance, locally administered building codes, practice standards and application guidelines, an effective administrative program and effective enforcement. Training programs are needed for staff administering ordinances and developers who are responsible for installing and maintaining the erosion control practices.

Urban Streambank Erosion

Description
Urban streambank erosion is caused primarily by channelization, upstream modifications, and increased impervious surfaces associated with new development causing greater runoff from the site than in the predeveloped conditions. These conditions result in a changing stream hydrology, which is characterized as "flashy" and having increasing volumes and peak flows. This exposes and erodes the banks, destroying the natural conditions needed for healthy aquatic communities. Also, the channel is scoured during heavy rainfall events, displacing in-stream cover such as rocks and logs and flushing away aquatic life as well.

Generally, the urban streams in the Sugar-Honey Creeks watershed have minimal to no streambank erosion. No sites within urban areas were identified during the stream inventory as needing stabilization BMPs. As the municipalities continue to expand outwards and more development occurs through the watershed, however, the potential exists for these streams to experience significant erosion problems. These problems can be minimized or avoided by incorporating proper stormwater management methods in new development.

Management Needs and Alternatives
Peak flow reduction through application of upstream detention, riparian buffers, or other BMPs is needed to prevent future streambank erosion. Future inventories of urban streambank erosion should be conducted during the project implementation phase. If problem areas develop in the future, streambank stabilization techniques should be applied.

Management criteria developed for eroding streambanks are based primarily on the rate at which sediment is being released into streams by the cutting action of stream flows. Secondary considerations include stream channel obstructions and riparian habitat degradation. Eroding streambanks contributing 20 tons or greater of sediment per year to the stream are eligible for stabilization measures through the watershed project.

Options to control streambank erosion include structural controls such as riprap, shaping and seeding, fiber rolls and other bioengineering techniques. Less intrusive measures such as brush cutting to increase light penetration and vegetation establishment may also be effective. Foregoing control all together may be necessary if the degree of site disturbance needed to install practices offsets the benefits to the stream.

If bridges or other in-stream structures deteriorate or are removed, newly exposed streambanks may begin to erode. When this occurs, the DNR and the appropriate unit of government will jointly evaluate the severity of the erosion and assign the site a management recommendation. Eligibility of sites for technical and financial assistance will be consistent with the criteria described above.

Easements and acquisitions, as well as preserving and creating streamside buffers are also encouraged as a means of controlling streambank erosion.

Objectives

Maintain streambank stability and prevent future erosion in critical areas. Preserve and create streamside buffers.

Pollution Prevention Practices

Description

Pollution prevention practices are conducted to remove pollution at its source and prevent the need for treatment once they enter the resource. Practices include street sweeping, yard waste collection, recycling programs, and a variety of behavioral changes.

These factors affect the amount of pollutants from urban surfaces carried to lakes and streams by runoff. Street sweeping removes some of the particulate pollutants from street and parking lot surfaces before they can be transported to surface waters. Repeated street sweeping of commercial and industrial areas in the early spring, to remove winter accumulation of sand and street dirt, and in the fall, to remove leaves, provides the greatest benefit. The potential for lawn care chemicals to be carried by runoff to nearby streams and drainageways is also a concern. Fertilizer residues and pet wastes can enrich surface waters with nutrients and promote algae growth. Pesticides can add to toxic pollution.

Many benefits can be gained through changes in lifestyle by urban residents such as reducing the amount of automobile traffic and adopting erosion control practices. There are many actions individuals can take; the following is a partial list:

- Control construction site erosion.

- Remove street dirt, leaves and debris from catch basins, streets and parking lot surfaces through municipal street maintenance and leaf collection programs.

- Reduce or eliminate the use of galvanized roof materials and gutters, a primary source of zinc in urban runoff. Revise municipal building codes where possible.

- Remove pet wastes immediately from lawns, sidewalks, and streets to reduce bacterial contamination of urban runoff. Enforce local pet waste ordinances and familiarize pet owners with good pollution prevention practices.

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

- Dispose of automobile waste fluids such as radiator water and engine oil appropriately, keeping them out of the storm sewer system. Set up municipal recycling programs for antifreeze and waste oil. Create partnerships with car dealerships and auto maintenance shops in the watershed project area. Discourage dumping waste oil on the ground or in storm sewers.

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

- Minimize use of street de-icing compounds.

- Reduce the amount of motorized traffic through car pooling or other transportation.

- Reduce the areal extent of parking lots.

- Restrict development in environmental corridors.

- Promote the use of cluster developments.

Objective
Encourage the use of pollution prevention practices, such as those listed through local programs. This goal ties together closely with the information and education component of the project.

Urban Toxic Pollutants

Description

An important means for improving water quality in the Sugar-Honey Creeks and their tributaries is to prevent high concentrations of toxic materials in urban runoff. Four pollutants (sediment, phosphorus, zinc, lead) were chosen to characterize the type and severity of urban nonpoint pollution. Five subwatersheds - Baker Creek, Troy Area, Lauderdale Lakes, Potter Lake, and Tibbets - contribute a majority of the estimated sediment, phosphorus, zinc and lead loading to lakes and streams coming from urban sources in the watershed.

The management alternatives analysis indicates that pollution prevention activities and potential structural BMPs for nonpoint source control in established areas are needed in the five subwatersheds to achieve the previously described pollutant reduction objectives. In addition, each community will be expected to conduct the "core" activities of the plan described in Chapter Three, with a primary emphasis on urban pollution prevention and educational activities.

Objective

Prevent loadings of heavy metals and other toxic materials that would exceed acute and chronic toxicity standards as identified in Wis. Adm. Code NR 105.

Pollutant Reduction Goals and Project Objectives for Urban Nonpoint Sources

A summary of the reduction goals and objectives:

- Reduce overall pollutant loading (1990 baseline) within five subwatersheds: Baker Creek, Troy Area, Lauderdale Lakes, Potter Lake, and Tibbets by 20 percent by the year 2010.
- Reduce future pollutant loadings in all subwatersheds by 75%.
- Achieve high levels of sediment reduction from construction site erosion control practices.
- Improve municipal pollution and citizen prevention practices including street sweeping and catch basin cleaning.

The adequacy of these goals will be reviewed after five years (or sooner if future water quality data indicate a need for revision as determined by the watershed project Technical Advisory Committee).

Eligibility for Wetland Restoration and Easements

Wetland Restoration

There will be no Critical areas for wetland restoration. All inventoried farmed wetlands and converted wetlands will be classified as eligible for restoration if the sites meet the criteria below. The targeted objective is to restore 10 percent of the wetlands sites inventoried. See Table 2-3a and 2-3b for wetland inventory details.

Wetland restoration is considered as a best management practice for the purpose of controlling nonpoint sources of pollution. Wetland restoration includes: the plugging or breaking up of existing tile drainage systems, the plugging of open channel drainage systems, other methods of restoring the pre-development water levels of an altered wetland, and the fencing of wetlands to exclude livestock. Secondary benefits of wetland restoration may be enhancement of fish and wildlife habitat.

Wetland restoration is an available option to address any of the following:

1. Cultivated hydric soils with tile or open channel drainage systems discharging to a stream or tributary.

   Wetland restoration will reduce the amount of nutrients and pesticides draining from the altered wetland to a water resource either by establishing permanent vegetation or altering the drainage system.

2. Pastured wetlands riparian to streams, or tributaries.

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

3. Prior converted wetlands downslope or upslope from fields identified as Critical for upland sediment sources.

   Restoration of wetlands in these situations will do one of two things: 1) create a wetland filter which reduces the pollutants from an upslope field(s) to a water resource; or 2) reduces the volume and/or velocity of water flowing from an up-slope wetland to a down-slope critical field. Two eligibility conditions must be met to use wetland restoration in this situation:

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

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

Land Easements

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

- Shoreline Buffers: vegetative areas which minimize nonpoint source impacts and other direct impacts to streams;

- Critical Area Stabilization: stabilization efforts needed on sites that either erode at an excessive rate, or have high sediment delivery rates to surface water;

- Wetland Restoration: areas where wetlands are intentionally restored or enhanced in order to improve their ecological values, such as natural filters of surface water.

Easements may also be considered for protecting municipal well heads if it can be established that vegetative cover will aid in correcting an existing groundwater quality threat.

Although easements are not considered a best management practice, they can help achieve desired levels of nonpoint source pollution control in specific conditions. Easements are used to support best management practices, enhance landowner cooperation and more accurately compensate landowners for loss or altered usage of property. The benefits of using easements in conjunction with a management practice are: 1) riparian easements can provide fish and wildlife habitat along with the pollutant reduction function; 2) easements are generally perpetual, so the protection is longer term than a management practice by itself; and 3) an easement may allow for limited public access (depending on the situation). However, the primary justification of an easement must be for water quality improvement.

Easements should be considered in the following situations:

1. To exclude livestock from grazed wetlands or along eroding streambanks within the watershed. Easements are strongly recommended whenever:

   - there is any grazing of wetlands.

   - livestock density is so great that areas of unvegetated soil exist within 60 feet of streams or intermittent streams.

- where streambanks are severely trampled and eroding.

- channel erosion is exacerbated by livestock grazing such that unvegetated streambanks are two feet or more in height.

2. When elimination of row cropping and the establishment of permanent vegetative cover will stabilize a critical area. Easements are strongly recommended whenever:

   - Row cropping is occurring within 60 feet or less of streams or intermittent streams.

   - Row cropping is being practiced on slopes greater than 20 percent.

3. To support eligible wetland restorations. Easements are strongly recommended whenever:

   - The eligible wetland restoration is greater than 25 acres in size.

4. When a barnyard or animal feedlot is located within the flood plain and: a) a permanent easement is the least-cost alternative to provide adequate pollution reduction or b) a permanent easement provides a greater level of pollution reduction than on-site engineering options at a price that is cost-effective when compared to the level of pollution reduction and the price of the available engineering options. Easements are strongly recommended whenever:

   - Engineering options would require intensive management in order to continue to provide adequate pollution reduction.
   - Surrounding land use is largely agricultural and it is anticipated that it will remain so for two decades or more.

Land Acquisition

Units of Government, including Lake Protection and Rehabilitation Districts, within the Honey-Sugar Creeks Priority Watershed Project Area are eligible for nonpoint source grants to supplement the purchase of land in fee that is contributing or will contribute nonpoint source pollution. The targeted objective for land acquisition in the Honey-Sugar Creeks Priority Watershed Project Area is approximately 40 acres. This may increase after additional inventories and land acquisition strategies are developed by the individual units of government located in the project area.

Eligibility Criteria

To be eligible for land acquisition, lands must meet one of the following three criteria:

* Only lands located in the environmental corridors of the Sugar-Honey Creeks Priority Watershed Project Area will be eligible for land acquisition grants.

* Any cropland proposed for acquisition must have sediment delivery levels above the criteria for critical or eligible as specified in the Rural Eligibility section of this plan.

* Any acquisition proposal must meet the applicable goals of the Sugar-Honey Creeks Priority Watershed Project.

Ordinances

Manure Storage Ordinance

Surface water and groundwater resources are at risk when animal waste storage facilities are improperly located, designed, or constructed. Manure overflows and storage facility failures are a serious threat to aquatic life. Counties adopt animal waste storage ordinances to prevent ground and surface water pollution by assuring the proper design, construction, location, and management of permitted facilities. An ordinance must meet the guidelines adopted by DATCP and cite the applicable NRCS construction and management standards. Ordinances require permits for the installation, modification, and major repair of animal waste storage facilities.

To assure protection of surface and groundwater from animal waste storage facilities throughout the watershed, the adoption of an animal waste storage ordinance in Walworth County is required within 2 years of plan approval by the Walworth County Land Conservation Board (Racine County is exempt.) Certain costs for the development and administration of the ordinance are eligible for reimbursement under the Priority Watershed Project. As required by State statutes, the County must repay to the State all Nonpoint Source Grant agreement funds if the ordinance is not adopted. This will be a condition of the Walworth County Nonpoint Source Grant Agreement.

Construction Site Erosion and Stormwater Management

Cost for the development and administration of land use ordinances which are related to water quality are eligible for reimbursement under the priority watershed project.

A number of local governments recognize that the cost of *preventing* damage from erosion and sedimentation is often less than the cost of *correcting* damage from erosion. Also, many believe that the cost of preventing erosion damage should be borne by those benefiting from the development rather than by taxpayers paying to remove sediment from ditches, culverts, streets, harbors, lakes, and streams. These local governments are developing or amending subdivision ordinances, zoning ordinances, and other local ordinances to include stormwater and erosion control requirements for developing land areas.

Chapter 236 of the Wisconsin Statutes gives cities, villages, towns, and counties authority to control erosion from developing subdivisions and smaller land divisions. This chapter establishes the minimum standards and procedures for land division in Wisconsin. The chapter enables local governments that have an established planning agency to adopt subdivision ordinances that are more restrictive than the state standards. Several of these government units have included runoff and erosion control provisions in their ordinances. These ordinances typically require a developer to submit a detailed plan specifying control measure for minimizing erosion and runoff during and after development. Typically, before a final plat is filed the person who reviewed the erosion and runoff control plan visits the development site and certifies that the measures have been installed in accordance with the plan.

Similar to erosion control, Wisconsin cities, villages, towns, and counties have authority to adopt a stormwater management zoning ordinance. A draft Model Stormwater Management Zoning Ordinance has been developed by the DNR in 1995. This model ordinance is meant to be complimentary to the model construction site erosion control ordinance prepared in 1987 by the DNR, in conjunction with the Wisconsin League of Municipalities.

The DNR suggests that the Wisconsin Construction Site Erosion Best Management Handbook (DNR Publication WR-222-93) and the Wisconsin Stormwater Manual (DNR Publication WR-349-94) be used as a reference for any development that occurs in the Sugar-Honey Creeks Project.

All municipalities and Racine county are encouraged to adopt construction site erosion control and stormwater management zoning ordinances.

Other Pollution Sources

Many pollution sources contributing to surface water quality degradation in the watershed are typically not addressed by the priority watershed project. Control of these pollution sources occurs through other state and county regulatory programs, as described below.

Industrial Point Sources of Pollution

Discharges of wastewater from permitted municipal and industrial sources are important considerations for improving and protecting surface water resources. Chapter 283, Wis. Stats. (Note: This chapter was formerly numbered 147), requires any person discharging pollutants into the waters of the state to obtain a Wisconsin Discharge Elimination System (WPDES) Permit issued by the DNR.

Sewage Treatment Systems

Sanitary sewer service is available in some areas throughout the Sugar/Honey Creek Watershed. Approximately 5,000 persons, 34 percent of the watershed population, receive service. Wastewater generated by the remainder of the watershed residents is disposed of through private on-site systems.

Municipal Waste Water Treatment Plants

The village of East Troy and city of Elkhorn have municipal wastewater treatment plants that discharge to surface water.

Village of East Troy Wastewater Treatment Plant: The village of East Troy WWTP came on line March, 1983 with a project life span until 2003. Treatment of wastewater is accomplished with extended aeration and a tertiary filter. Average usage is 702,000 gallons per day with a maximum wasteload of 1.5 million gallons per day. Sludge is land spread on 226 acres near the East Troy airport with the plant discharging the treated waste directly into Honey Creek.

City of Elkhorn Wastewater Treatment Plant: The city of Elkhorn wastewater is handled by the Walworth County Metropolitan Sewerage District. WALCOMET expanded operation in the summer of 1996, with the expansion designed to handle 5.5 million gallons per day by 2006. The system uses an activated sludge-extended aeration treatment system. The plant discharges the treated waste to Turtle Creek, which is outside the watershed area. Sludge is land spread outside the watershed area.

Private Sewage Systems

Septic systems consist of a septic tank and a soil absorption field. Septic systems fail due to soil type, location of system, poor design, or improper maintenance, such as tanks going unemptied. Pollutants from septic system discharges are nitrates, bacteria, viruses, and hazardous materials from household products. Generally, in the Sugar/Honey Creek Watershed, the majority of soils are suitable for conventional septic tank soil absorption systems. The majority of the watershed is associated with the Miami-McHenry Soils series which are well drained soils with the underlying sandy loam till or outwash sands. Most areas throughout the watershed are suitable for some sort of septic system. Landspreading of septic system waste during the winter months can also create surface water quality problems.

Counties have been using the Wisconsin Fund since 1981. The Wisconsin Fund is a Private Sewage System Replacement Grant Program offering financial assistance designed to help eligible homeowners and small business operators offset the costs of replacing a failing septic system. The program is administered by the Walworth and Racine County's Zoning Departments. The grant program applies to principal residences and small businesses built prior to July 1, 1978, and is subject to income and size restrictions. Seasonal homes are not eligible for participation in this program. Interested individuals should contact their county zoning department for more information.

Solid Waste Disposal Sites

Troy Area Landfill

The Troy Area Landfill is located in the East Troy township, T4N, R18E, SEC 31. The landfill opened in 1986 and stopped operations in 1996. The 60 acre site, owned by BFI, will be capped and officially closed by the fall of 1996. No groundwater contamination problems exist at the site. Private water supplies do not reveal any contamination. There are no other active landfill sites in the Sugar-Honey Creeks Watershed.

Other Landfills

There has been 16 other landfill sites identified by the Solid Waste Departments of Walworth and Racine counties. These sites have been abandoned and are unclassified. The sites administration will be handled through the respective counties Solid Waste Departments.

Petroleum Storage: Leaking Underground Storage Tank (LUST) Sites

The Wisconsin Remedial Response Site Evaluation Report (DNR publication number SW-144-91) lists the sites identified through the LUST program. There are 19 sites currently listed within the watershed as of the date of publication of this plan.

Other Contaminated Sites

The Wisconsin Remedial Response Site Evaluation Report also has the Inventory of Sites or Facilities Which May Cause or Threaten to Cause Environmental Pollution and the Spills Program List which includes sites or facilities identified under the Hazardous Substance Spill Law. There have been 41 sites identified as potentially affecting the groundwater within the Sugar-Honey Creeks watershed.

Non-Metallic Mining

The presence of glacial till and outwash deposits within the watershed have caused numerous mining opportunities in both Walworth and Racine Counties. Both counties have established programs for coping with sedimentation, stormwater, and restoration concerns within the framework of county approvals.

The Sugar-Honey Creeks Watershed contains 1,974 acres of land designated for non-metallic mining land use. The non-metallic mines are located on 30 separate sites. Of the 30 known mining sites, 15 are presently active. The active mining sites contain 1,734 acres of area, or 88% of the total non-metallic mining land use. Nine of the 15 active mining sites have restoration requirements as part of County Land Disturbance Permits or Conditional Use approvals granted in the 1980's and 90's. Active sites with restoration plans constitute 71.5% of the actively mined area for a total of 1,240 acres. The remaining active sites have either partial restoration agreements with the Counties or possess grandfather status.

Four of the active mining sites have external drainage to surface waters within the Watershed. These four sites drain 662 acres of area. The externally drained sites are served by sediment basins and stormwater control structures. On site review for compliance with clean out and maintenance measures on these and future active externally drained pits must be established and continued within the Watershed in order to prevent water quality degradation.

Table 3-10. Sediment Reduction Objectives Walworth and Racine Counties

Source	Sediment Delivered (tons)	Sediment Reduction Objective	Sediment Reduced (tons)	Percent of total
Cropland	58,917	30%	17,675	82%
Gully Erosion	6,873	50%	3,436	9%
Streambank	2,065	25%	516	3%
Shoreline	120	75%	90	<1%
Urban nonpoint	1,357	30%	407	2%
Others	2,725	75%	2,044	4%
Total	72,057	34%	24,168	100%

Table 3-10. Sediment Reduction Objectives Walworth County

Source	Sediment Delivered (tons)	Sediment Reduction Objective	Sediment Reduced (tons)	Percent of total
Cropland	55,037	30%	16,511	82%
Gully Erosion	6,186	50%	3,093	9%
Streambank	1,977	25%	494	3%
Shoreline	120	75%	90	<1%
Urban nonpoint	1,232	30%	369	2%
Others	2,475	75%	1,856	4%
Total	67,027	33%	22,413	100%

Table 3-10. Sediment Reduction Objectives Racine County

Source	Sediment Delivered (tons)	Sediment Reduction Objective	Sediment Reduced (tons)	Percent of total
Cropland	3,880	30%	1,164	77%
Gully Erosion	687	50%	343	14%
Streambank	88	10%	9	2%
Shoreline	0	0	0	0
Urban nonpoint	125	30%	37	2%
Others	250	75%	187	5%
Total	5,030	35%	1,740	100%

Table 3-11. COD Reduction Objectives Walworth and Racine Counties

County	COD Delivered (lbs)	COD Reduction Objective	COD Reduced (lbs)	Percent of Total
Walworth	143,512	41%	58,362	41%
Racine	2,394	0%	0	0
Total	145,906	40%	58,362	40%

Table 3-12. Phosphorus Reduction Objectives Walworth and Racine Counties

Source	Phosphorus Delivered (lbs)	Phosphorus Reduction Objective	Phosphorus Reduced (lbs)	Percent of total
Barnyards	2,712	40%	1,085	4%
Cropland	58,917	30%	17,675	93%
Urban	2,016	30%	605	3%
Total	63,645	30%	19,365	100%

Table 3-12. Phosphorus Reduction Objectives Walworth County

Source	Phosphorus Delivered (lbs)	Phosphorus Reduction Objective	Phosphorus Reduced (lbs)	Percent of total
Barnyards	2,632	40%	1,053	4%
Cropland	55,037	30%	16,511	93%
Urban	1,806	30%	542	3%
Total	59,475	30%	18,106	100%

Table 3-12. Phosphorus Reduction Objectives Racine County

County	Phosphorus Delivered (lbs)	Phosphorus Reduction Objective	Phosphorus Reduced (lbs)	Percent of total
Barnyards	80	0%	0	0%
Cropland	3,880	30%	1,164	95%
Urban	210	30%	63	5%
Total	4,170	30%	1,259	100%

CHAPTER FOUR
Sugar-Honey Creeks Priority Watershed Implementation Program

Introduction

This chapter identifies the means for implementing the rural and urban management actions for nonpoint source pollution control described in the previous chapter. It is divided into two major sections. The first describes the nonpoint source implementation strategy for rural areas. The second section describes the urban implementation strategy. The success of this priority watershed project depends on the aggressive implementation of these nonpoint source pollution control strategies.

This chapter identifies:

- The best management practices (BMPs) necessary to control pollutants on the sources identified in Chapter Two;
- The cost containment policies;
- The cost-share agreement procedures;
- Schedules for implementing the project and critical site notification;
- The project budget including the expense for cost-sharing; and staffing for technical assistance, administration, and the information and education program.

Agricultural and Urban Best Management Practices (BMPs)

BMPs Eligible For Cost-Sharing And Their Rates

Best management practices control nonpoint sources of pollution and are identified in NR 120. The practices eligible for cost-sharing and the cost share rates for each BMP are listed in tables 4-1 and 4-2 below; the BMPs listed in table 4-1 can either be cost-shared at 50% or at the flat rates listed.

Design and installation of all BMPs must meet the conditions listed in NR 120. Generally these practices use specific standard specifications included in the NRCS Field Office Technical Guide. In some cases additional specifications may apply. The applicable specifications for each BMP can be found in NR 120.14. The Department may also approve other alternative best management practices and design criteria based on the provisions of NR 120.15.

If the installation of BMPs destroys significant wildlife habitat, NR 120 requires that habitat will be recreated to replace the habitat lost. The DNR District Private Lands Wildlife Specialist or a designated individual will assist the LCD in determining the significance of wildlife habitat and the methods used to recreate the habitat. Every effort shall be made during the planning, design, and installation of BMPs to prevent or minimize the loss of existing wildlife habitat. Wildlife habitat restoration components of the practice are cost-shared at 70 percent.

Table 4-1. Practices Using a Flat Rate for State Cost-Share Funding

BEST MANAGEMENT PRACTICE	FLAT RATE
Contour Farming	\$ 9.00/ac[1]
Contour Stripcropping	\$ 13.50/ac[1]
Cropland Protection Cover	\$25.00/ac[3]
Reduced Tillage	\$ 18.50/ac[2]
Vegetated Buffers	\$125.00/ac[4]

[1] Wildlife habitat restoration components of this practice are cost-shared at 70%.
[2] \$18.50 per acre per year for up to 3 years for high residue management.
[3] Up to three years.
[4] \$125.00/ac for up to 5 years. (This is currently a pilot BMP in the Branch River Watershed; when approved for use statewide, it will be cost-shared in this project.)
The sediment delivery of a field adjacent to buffer must be < .6 tons/acre/year.

Table 4-2. State Cost-Share Rates for Best Management Practices[1]

BEST MANAGEMENT PRACTICE	STATE COST SHARE RATE
Nutrient and Pesticide Management	50%
Pesticide Handling Spill Control Basins	70%
Livestock Exclusion from Woodlots	50%
Intensive Grazing Management	50% [2]
Manure Storage Facilities	70% & 50% [3]
Animal Waste System Storage Abandonment	70%
Field Diversions and Terraces	70%
Grassed Waterways	70%
Critical Area Stabilization	70% [4]
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Field Windbreaks and Windbreak Renovation	70%
Shoreline and Streambank Stabilization	70% [4]
Shoreline Buffers	70% [4]
Wetland Restoration	70% [4]
Barnyard Runoff Management	70%
Animal Lot Relocation	70%
Roofs for Barnyard Runoff Management and Manure Storage Facilities	70%
Well Abandonment	70%
Structural Urban BMPs	70% [5]
Milking Center Waste Control	70%
Cattle Mounds	70%
Lake Sediment Treatment	70%

[1] Table 4-1 shows BMPs cost shared at a flat rate.
[2] A maximum of $2,000 for watering system
[3] Manure storage is cost-shared at 70% for the first $20,000 of cost and at 50%for the remaining cost, not to exceed $35,000.
[4] Easements may be entered into with landowners identified in the watershed plan in conjunction with these BMPs. See Chapter Two for an explanation of where easements may apply.
[5] The maximum cost-share rate for land acquisition, storm sewer rerouting, and removal of structures necessary to install structural urban BMPs is 50%.

Following is a brief description of some of the most commonly used BMPs listed above. A more detailed description of these practices can be found in NR 120.14.

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

Contour Stripcropping. Growing crops in a systematic arrangement of strips or bands, on the contour, in alternate strips of close grown crops, such as grasses or legumes, and row-crops.

Field Stripcropping. Growing crops in a systematic arrangement of strips or bands across the general slope (not on the contour) to reduce water erosion. The crops are arranged so that a strip of grass or close-growing crop is alternated with a clean-tilled crop or fallow.

Field Diversions. The purpose of this practice is primarily to divert water from areas it is in excess or is doing damage to where it can be transported safely.

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

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

Reduced Tillage. A system which leaves at least 30 percent of the ground covered with crop residue after crops are planted. Systems include no-till, mulch-till, ridge-till or strip-till.

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

Pesticide Management. The management of the handling, disposal and application of pesticides including the rate, method and timing of application to minimize the amount of pesticides entering surface and groundwater. This practice includes integrated pest management scouting and planning.

Cropland Protection Cover (Green Manure). Cropland protection cover are close-growing grasses, legumes, or small grain grown for seasonal soil erosion protection and soil improvement.

Intensive Grazing Management (Rotational Grazing). Intensive grazing management is the division of pastures into multiple cells that receive a short but intensive grazing period followed by a period of recovery of the vegetative cover. Rotational grazing systems can correct existing pasturing practices that result in degradation and should replace the practice of summer dry-lots when this practice results in water quality degradation.

Critical Area Stabilization. The planting of suitable vegetation on nonpoint source sites and other treatment necessary to stabilize eroding lands.

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

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

Shoreline and Streambank Stabilization. The stabilization and protection of stream and lake banks against erosion and the protection of fish habitat and water quality from livestock access.

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

Lake Sediment Treatment. Lake sediment treatment is a chemical, physical, or biological treatment of polluted lake sediments. Sources of pollution to the lake must be controlled prior to treatment of lake sediments. Treatment does not include dredging.

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

Barnyard Runoff Management. Structural measures to redirect surface runoff around the barnyard, and collect, convey, or temporarily store runoff from the barnyard.

Animal Lot Relocation. Relocation of an animal lot from a critical site such as a floodway to a suitable site to minimize the amount of pollutants from the lot to surface or groundwater.

Manure Storage Facility. A structure for the storage of manure for a period of time that is needed to reduce the impact of manure as a nonpoint source of pollution. Livestock operations where this practice applies are those where manure is winter spread on fields that have a high potential for runoff to lakes, streams, and groundwater. The facility is needed to store and properly spread manure according to a management plan.

Manure Storage System Abandonment. Manure storage system abandonment is the proper abandonment of leaking and improperly located manure storage systems, including: a system with bottom at or below groundwater level, a system whose pit fills with groundwater, a system whose pit leads into the bedrock, a system which has documented reports of discharging manure into surface or groundwater due to structural failure, and a system where there is evidence of structural failure. The practice includes proper removal and disposal of wastes, liner materials, and saturated soil as well as shaping, filling, and seeding of the area.

Milking Center Waste Control Systems. A milking center waste control system is a piece of equipment, practice, or combination of practices installed in a milking center for purposes of reducing the quantity or pollution potential of the wastes.

Pesticide Handling Spill Control Basins. Spill control facilities consist of structures designed to contain accidental spills or overflows from pesticide mixing, loading, and unloading operations for the purpose of groundwater and surface water protection.

Roofs for Barnyard Runoff Management and Manure Storage Facilities. Roofs for barnyard runoff management and manure storage facilities are a roof and supporting structure constructed specifically to prevent rain and snow from contacting manure.

Well Abandonment. Well abandonment is the proper filling and sealing of a well to prevent it from acting as a channel for contaminants to reach the groundwater or as a channel for the vertical movement of surface water to groundwater.

Livestock Exclusion from Woodlots. The exclusion of livestock from woodlots to protect the woodlots from grazing by fencing or other means.

Cattle Mounds. Cattle mounds are earthen mounds used in conjunction with feeding and dry lot operations and are intended to provide a dry and stable surface area for cattle.

Structural Urban Best Management Practices. These practices are source area measures, transport systems, and end-of-pipe measures designed to control storm water runoff rates, volumes and discharge quality. These practices will reduce the amount of pollutants carried in runoff and flows destructive to stream habitat. These measures include such practices as infiltration trenches, porous pavement, oil water separators, sediment chambers, sand filtration units, grassed swales, infiltration basins, and detention/retention basins.

Easements. Easements are legally binding restrictions on land titles. Easements are purchased to provide permanent vegetative cover.

Land Acquisition. The Purchase of land in fee which is contributing or will contribute nonpoint source pollution. The purchase of land or the interest in land for the construction of an urban structural best management practice.

Interim Best Management Practices

Under some circumstances, practices may be recommended that are not included on the BMP list. Administrative Rule NR 120.15 provides for alternative practices where necessary to meet the water resource objectives identified in the watershed plan. The Department may identify in the nonpoint source grant agreement the design criteria and standards and specifications where appropriate, cost share conditions, and cost share rates for each interim best management practice.

Manure Spreading Alternative. The rental of additional land to enable the livestock producer to have sufficient cropland to safely spread animal waste.

Field Windbreaks. A living barrier of trees or combination of trees and shrubs located adjacent to or established in a field, designed to protect the area from wind erosion. snow.

For more information on Interim Best Management Practices see Appendix B.

Practices Not Cost-Shared

Practices not cost-shared, but which shall be included on the cost share agreement if necessary to control the nonpoint sources, are listed below (as listed in NR 120.17):

- That portion of a practice to be funded through other programs.
- Practices previously installed and necessary to support cost-shared practices.
- Changes in crop rotations.
- Changes in location of unconfined manure stacks involving no capital cost.
- Non-stationary manure spreading equipment.
- Practices needed for land use changes during the cost-share agreement period
- Other practices determined necessary to achieve the objectives of the watershed project.

- Minimum levels of street sweeping catch basin cleaning and leaf collection.
- Structural Urban BMP's serving new development.

Activities and Sources of Pollution Not Eligible For Cost Share Assistance

Priority watershed cost-share funds cannot be used to control sources of pollution and land management activities specifically listed in NR 120.10(2). The following is a partial list of those ineligible activities:

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

Rural Implementation Strategy

Money for cost share agreements is distributed by the Walworth and Racine County LCDs' from a Nonpoint Source Grant provided by the DNR. Walworth and Racine County LCDs' receive additional grant money to support administrative responsibilities. Cost share agreements are binding contracts between landowners and the Walworth and Racine County LCDs'. Landowners must meet eligibility requirements defined in Chapter Three.

The following procedure will be used to make landowner contacts.

- During the first three months of the implementation period, all landowners or operators with known eligible nonpoint sources will receive a mailing from the county explaining the project and how they can become involved. During the first 5 years of the implementation period, county staff will complete the inventory of land resources (20% per year). Additional eligible landowners or operators will receive a county mailing as they are identified.

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

- The county will continue to make contacts with eligible landowners and operators until they have made a definite decision regarding participation in the program.

- The county will contact all eligible landowners not signing cost-share agreements by personal letter six months prior to the end of the seven year cost-share sign-up period.

- **Schedule of Critical Site Verification and Notification**

  Within 6 months following plan approval, the process of notification to land owners and operators with critical site barnyards and upland will begin as stated in NR 120.09. The first to begin the process will be the highest ranked barnyards. County staff will continue to locate upland sites which meet the critical sites criteria during the five year inventory period following plan approval. Site visits on individual sites meeting the critical site criteria will be conducted in order to verify the findings. Our goal will be to contact critical site landowners and operators and allow them an opportunity to voluntarily participate before receiving a critical site notice within 60 days following verification. A site is no longer considered a critical site if the site no longer meets the criteria, it has implemented BMP's, or if the department determines that the watershed objectives have been achieved.

Urban Implementation

Core Activities of the Management Program

The core activities of the nonpoint source control program applicable to local units of government include basic measures that can be implemented without further study. Adopting a community specific core program is the first step in the implementation process. Communities will need to commit to implementing the core program within the first three years of the project. This is a prerequisite to receive technical and financial assistance through the priority watershed project. This requirement applies only to the receipt of funds used directly by the municipality as a grantee, such as where the municipality installs, owns and operates a BMP. It does not apply to those instances where the municipality acts as a grantor, passing cost-share funds through to private landowners. This means that individual landowners could receive cost-share funds from the DNR for the installation of BMPs prior to a municipality's agreement to conduct core activities of the urban program.

The basic activities of the core program are:

- Effectively enforce the construction erosion control provisions in local ordinances based on the state model ordinance and state building codes.

- Develop and implement a community specific program of urban pollution prevention practices which reduce nonpoint source pollution. This would include efforts such as adoption of ordinances regulating pet wastes, changes in the timing and scheduling of leaf collection, catch basin cleaning, street cleaning, use of phosphorus-free fertilizers, and pollution prevention at public works yards.

- Implement an information and education program consistent with the intents and purposes of Chapter 6 of this watershed plan.

- Following the completion and adoption of the DNR Storm Water Management Guidebook and Model Ordinance (in preparation), storm water management ordinances should be incorporated in the core program.

Segmented Activities of the Management Program

The segmented activities of the nonpoint source management program include those requiring site specific investigations prior to installation (example: detention ponds needing an engineering feasibility study).

The higher costs of implementing this portion of the urban management program require communities to budget expenditures over the course of several years. Best management practices implemented under this portion of the program include detentions ponds, infiltration devices, stream bank erosion controls, and other structural means for reducing urban nonpoint source pollution. These components also include changes in schedules and equipment used for catch basin cleaning.

Furthermore, detailed studies are needed for these practices, including engineering feasibility and other site specific investigations for existing and new development. Study results will determine the best means for reducing urban nonpoint sources in a specific community by more site specific application of the plan recommendations.

Communities can implement the segmented activities of the urban management strategy any time following development and initial implementation of the core program. However, cost sharing will be limited to segmented program activities completed within the ten year implementation period.

The basic activities of the segmented program are:

- Conduct detailed engineering studies to determine the best means to implement nonpoint source control measures for established urban areas. These studies should set forth the allocation of local costs between municipalities where more than one municipality contributes runoff to a BMP. The allocation should result in an equitable distribution of costs based on the contribution of each municipality to the total pollutant load or storm water runoff volume being controlled. This activity will also consider supplementary catch basin cleaning as components of the control strategy for established urban areas.

- Design and install BMPs for existing urban areas, including detailed engineering studies.

- Develop, as needed, storm water management plans for existing and planned urban development. These plans will identify the type and locations of BMPs.

- Adopt and enforce a storm water management ordinance consistent with the state's model storm water ordinance (in preparation)

- Develop municipal well head protection plans.

Program Participants -- Roles and Responsibilities

The specific roles and responsibilities for program participants are summarized below. The primary participants include local units of government (examples: cities, villages, county, local public works departments), the DNR, other state agencies, landowners, and land operators. Where applicable roles and responsibilities are discussed with respect to the previously described core and segmented activities. As noted in Chapter 1, "Plan Purpose and Legal Status," implementation begins following approval of this priority watershed by

Walworth County, Racine County, and the DNR with input from representatives of the Watershed Project Advisory Committee.

Local Units of Government Core Program Roles and Responsibilities

The following is a schedule for implementing the core activities of the nonpoint source control strategy for this priority watershed project. Each participating unit of government should:

1. Identify in writing an authorized representative for the local unit of government within 30 days of the start of implementation.

2. Identify the roles and responsibilities of the county, cities villages, developers, contractors, and landowners for controlling construction erosion in all areas of the watershed project area within 6 months of the start of implementation. Develop administrative procedures, and determine staff needs to enforce construction erosion control ordinances and building codes in all communities within 12 months of the start of implementation. Within 12 months of the start of implementation, amend current construction erosion control ordinances to address problems listed in Chapter 3.

3. Develop and implement a community specific program of urban pollution prevention practices. This may include but is not limited to a combination of information and education efforts, adoption of ordinances regulating pet wastes, catch basin cleaning, street sweeping and public work yard pollution prevention plans, and changes to the timing and scheduling of leaf and yard waste collection. Activities and a schedule for implementation will be negotiated by the local unit of government and the DNR within 12 months of the start of implementation.

4. Implement the information and education strategy as described in Chapter 6.

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

6. Prepare and submit to DNR an annual report for the purpose of monitoring project implementation.

7. Participate in the annual watershed project review meeting.

Local Units of Government Segmented Program Roles and Responsibilities

The following is a schedule for the segmented activities of the nonpoint source control strategy for this priority watershed project. Each municipality should:

1. Within 12 month of the start of implementation, identify the high priority subbasins the community wishes to address for nonpoint source management. This list can be amended throughout the 8 year project period.

2. Conduct engineering feasibility and site location studies for urban nonpoint source control practices in high priority areas of existing urban development. A commitment to implementing the recommendations will be required as a condition for financial assistance for these studies.

3. Adopt, administer, and enforce a storm water management ordinance within 12 months of the approval date of the state's model storm water management ordinance (in preparation).

4. Enter into cost-share agreements for eligible best management practices.

   a. For practices installed and maintained by private individuals, the cost-share agreement is between the landowner and the local unit of government. The local units of government will be required to:

   - Design or contract for the design of best management practices and verify proper BMP installation.

   - Request reimbursement from the DNR for practices installed by private landowners. Eligible BMPs must be listed in the cost-share agreement signed prior to construction.

   - Reimburse landowners for the eligible amount of cost sharing.

   - Monitor landowner compliance with provisions of the cost-share agreement.

b. For practices installed and maintained by a local unit of government, the cost-share agreement is between the unit of government and the DNR. Where more than one municipality contributes runoff to a control practice, the DNR will enter into cost-share agreements consistent with an equitable allocation based on contributions to the pollutant loads and storm water volumes being controlled.

c. Practice maintenance is the responsibility of the grant recipient. In come cases, urban storm water pollutants are generated wholly or in part by a community different than that in which the stormwater control practice is located.

   In these instances, there are several alternatives to properly distribute the financial burden of practice maintenance. Two examples are presented below. In each example, the upstream community generates all or part of the urban pollutant load to the best management practice, which is located in the downstream community.

- The downstream community can act as grant recipient, which includes ultimate accountability for practice maintenance. The responsibility could then be delegated, all or in part, to the upstream community through an inter-governmental agreement.

- The upstream community can act as the grant recipient, which includes accountability for practice maintenance. The downstream community could provide, through an inter-governmental agreement, all or part of the local share of the practice installation cost.

5. Develop alternative financing and implementation plans which describe the methods for raising revenue to administer local pollution control programs in each municipality. These studies will be conducted concurrently with the other high priority activities of the segmented program.

6. Develop information needed for project evaluation to DNR.

DNR

The DNR has been assigned the overall administrative responsibility for the Wisconsin Nonpoint Source Water Pollution Abatement Program in s. 144.24 Stats, and s. NR 120, Wis. Adm. Code. (NR120). This includes providing financial support for local staff and installation of managment practices, assisting local units of government to integrate wildlife and fish management concerns into selection and design of BMPs and conducting project evaluation activities. The DNR's role in assisting local units of government in carrying out the core and segmented activities are as follows:

DNR Core Program Roles and Responsibilities

1. Assist local governments to enforce construction erosion control provisions developed in accordance with the DNR - DOC Memorandum of Understanding.

2. Review community specific program of urban pollution prevention practices for nonpoint source control.

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

4. Review and approval annual project implementation reports.

5. Participate in the annual watershed project review meeting.

6. Track changes in urban pollutant loads using information supplied by local units of government.

DNR Segmented Program Roles and Responsibilities

1. Develop a model stormwater management ordinance. Assist communities with adoption and enforcement of stormwater management ordinances.

2. Assist communities to develop priorities, schedules, and requirements for segmented activities.

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

4. Enter into cost-share agreements with local units of government for nonpoint source controls on eligible lands owned or operated by the local government.

5. Review designs of urban nonpoint source BMPs for which cost-share agreements are signed.

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

Cost-Share Budget

Costs of Installing BMPs

The quantity and type of management practices that are required to meet the water quality objectives of this project are listed in Table 4-3. The capital cost of installing the BMPs are listed for a 75 percent landowner participation rate. Units of measurement and cost per unit for the various BMPs are also included.

The capital cost of installing the Best Management Practices is approximately $ 7.5 million. This budget assumes 75 percent participation, the level adequate to meet the established watershed objectives.

- State funds necessary to cost-share this level of control would be approximately $4.6 million.

- The local share provided by landowners and other cost-share recipients would be approximately $ .9 million.

Easement and Land Acquisition Costs

Chapter Two identifies where nonpoint source program funds can be used to purchase easements. The estimated cost of purchasing easements or land acquisition on eligible lands in Walworth and Racine Counties is shown in Table 4-3a. At 75 percent participation, the estimated purchase price of easements and land acquisition on eligible lands would be $48,750. Easements are funded at the 100 percent level, and can be purchased by the state of Wisconsin or an eligible project sponsor. Land acquisition by an eligible sponsor is funded at the 50 percent level.

Cost Containment

Cost Containment Procedures

Chapter NR 120 requires that cost containment procedures be identified in this plan to control the costs of installing BMPs. The cost containment procedure to be used by Walworth and Racine Counties is described below. The bidding procedure and average cost and flat rate lists can be obtained from the county LCD.

Bids: Competitive bids will be required for all structural BMPs with estimated total costs, as determined by the project technician, exceeding $5,000. The bidding process requires a minimum of three bids from qualified contractors in itemized bid format. In cases where only one bid is received, the Walworth and Racine County LCD's will determine if the bid constitutes an appropriate cost for the project. If no bids are received or if the lone bid is not deemed appropriate, counties will limit cost sharing based on average costs.

Average Costs: Average costs will be used for all structural BMPs with an estimated cost of less than $5,000 and for all non-structural BMPs not using a flat rate, unless the cost share recipient decides, and the county agrees, to bid the installation of the BMPs. If the cost share recipient or any county decides to bid a structural BMP under $5,000, the bid procedure will apply.

Flat Rates: BMPs using flat rates are shown in Table 4-1. The rates shown are the State's share of the practice installation costs.

Payments for "in kind" contributions will be based on the county's guidelines. Cost share recipients who wish to install a BMP using their own labor, material, and equipment must submit a quote plus one quote from a qualified contractor for the practice installation.

The Wisconsin Conservation Corps may be used to install BMPs for cost share recipients.

Cost-share payments will be based on actual installation costs. If actual installation costs exceed the amount of cost-sharing determined by cost estimates, then the amount paid the grantee may be increased with the approval of the Walworth and Racine County LCD's. Appropriate documentation regarding the need for changes will be submitted to the DNR.

Budget and Staffing Needs

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

Staff Needs and Costs

Table 4-5 lists the total estimated staff needed to implement the project assuming a 75 percent level of participation by eligible landowners. This is the participation rate needed to meet water quality objectives. A total of approximately 95,220 staff hours are required to implement this plan. This includes 10,021 staff hours to carry out the information and education program.

During 1997, 2.3 positions are being funded on the Sugar-Honey Creeks Priority Watershed project staff. The Walworth and Racine County LCDs' and agencies will determine the need for additional staff based on the annual Workload Analysis.

The estimated cost for staff at the 75 percent participation rate (see Table 4-6) is approximately $ 2.2 million. These costs will be paid by the state through the Local Assistance Grant Agreement.

Table 4-3a Cost-Share Budget Needs for Management Practices for the Sugar-Honey Creeks Watershed

BMP	Number/Acres				Cost/Unit ($)	Total Cost	75% Participation required to meet Objectives	
	Walworth	Racine	Total				State Share	Local Share
Upland Control								
Change Crop Rotation(1)	16,309	1000	17,309	ac	NA	0	0	0
Contour Cropping(1)	1,268	400	1,668	ac	9	15,012	11,259	0
Contour Strip Cropping	507	50	557	ac	13.5	7,520	5,640	0
Field Strip Cropping(1)(2)	1500	100	1600	ac	7.5	12,000	9,000	0
High Residue Management (1)(2)	146,784	7500	154,284	ac	18.5	2,854,254	2,140,691	0
Cropland Protection Cover (1)(2)	1,200	150	1,350	ac	25	33,750	25,313	0
Rotational Grazing	5	0	5	ac	4,000	20,000	7,500	7,500
Critical Area Stabilization	254	10	264	ac	800	211,200	110,880	47,520
Grass Waterways	115	5	120	ac	3,000	360,000	189,000	81,000
Field Diversions/ Terraces	25,000	0	25,000	ft	3	75,000	39,375	16,875
Grade Stabilization	5	1	6	ea	4,000	24,000	12,600	5,400
Ag. Sediment Basin	10	3	13	ea	10,000	130,000	68,250	29,250
Veg. Riparian Buffers(1)(3)	6,000	60	6,060	ac	125	757,500	568,125	0
Shoreline Buffer	1,200	30	1,230	ac	400	492,000	258,300	110,700
Nutrient Management (2)	75,000	1950	76,950	ac	6	461,700	173,138	173,138

Upland Control								
Nutrient/Pest Management (2)	25,000	600	25,600	ac	10	256,000	96,000	96,000
Spill Control Basin	4	1	5	ea	15,000	75,000	39,375	16,875
Wetland Restoration	100	8	108	ea	2,000	216,000	113,400	48,600
Manure(2) (4) Spreading(5)	500	355	855	ac	25	21,375	16,031	0
Field (4) Windbreak(5)	5000	0	5,000	ft	.20	1,000	525	225
Livestock Exclusion, Woods	0		0	ft	1	0	0	0
Barnyard Runoff Control								
Filter Strip/ Wall	20	0	20	ea	30,000	600,000	315,000	135,000
Roof Gutters	40	1	41	ea	1,500	61,500	32,288	13,838
Clean Water Diversion	25	1	26	ea	2,500	65,000	34,125	14,625
Roofs	0	0	0	ea	25,000	0	0	0
Manure Storage (6)	3	0	3	ea	40,000	120,000	58,500	31,500
Manure Storage Abandonment	1	0	1	ea	10,000	10,000	5,250	2,250
Cattle Mounds	0	0	0	ea	3,000	0	0	0
Animal lot Abandonment/ Relocation	1	0	1	ea	60,000	60,000	31,500	13,500
Well Abandonment	30	25	55	ea	500	27,500	14,438	6,188
Milking Waste Control	10	0	10	ea	7,000	70,000	36,750	15,750
Streambank Erosion Control								
Shape and Seeding	15,800	700	16,500	ft	10	165,000	86,625	37,125
Fencing	3,750	0	3,750	ft	2	7,500	3,938	1,688

Upland Control								
Rock Riprap	500	0	500	ft	30	15,000	7,875	3,375
Bio-Bank Stabilization	9,000	300	9,300	ft	20	186,000	97,650	41,850
Crossing	2	0	2	ea	2,000	4,000	2,100	900
Remote Watering Systems	0	0	0	ea		0	0	0
Subtotal						7,414,811	4,610,438	950,670
Land Acquisition	17	3	20	ac	2,500	50,000	18,750	18,750
Easements	17	3	20	ac	2,000	40,000	30,000	0
Total						7,504,811	4,659,188	969,520

(1) Local share consists of labor and equipment costs. Also see flat rates in table 3-1.
(2) Number of acres shown reflects 3 times the eligible acres.
(3) Number of acres shown reflects 5 times the eligible acres. This is currently a BMP in the Branch River Watershed. When approved for statewide use, this BMP will be cost shared in this project. The sediment delivery of a field adjacent to buffer must be < .6 tons/ac/year.
(4) This rate is contingent on the approval of this interim BMP. See Appendix B.
(5) 50 % of the total eligible costs for rental acres or a flat rate of $25.00/acre not to exceed $30,000 per watershed participant.
(6) Maximum cost-share is $35,000. 70 % of the first $20,000 and 50 % of the remaining cost including waste transfer equipment.
(7 This practice may include crop systems for wind erosion.)

Source: Wisconsin DNR, DATCP, Walworth and Racine Counties

Table 4-3b Cost-Share Budget Needs for Management Practices in Walworth County for the Sugar-Honey Creeks Watershed

BMP	Number/Acres		Cost/Unit ($)	Total Cost	75% Participation Required to meet Objectives	
					State Share	Local Share
Upland Control						
Change in Crop Rotation(1)	16,309	ac	NA	0	0	0
Contour Cropping(1)	1,268	ac	9	11,412	8,559	0
Contour Strip Cropping(1)	507	ac	13.5	6,845	5,134	0
Field Strip Cropping (1)	1,500	ac	7.5	11,250	8,438	0
High Residue Management(1)(2)(7)	146,784	ac	18.5	2,715,504	2,036,628	0
Cropland Protection Cover (Green Manure)(1)	1,200	ac	25	30,000	22,500	0
Intensive Grazing Management (Rotational Grazing)	5	ea	4,000	20,000	7,500	7,500
Critical Area Stabilization	254	ac	800	203,200	106,680	45,720
Grass Waterways	115	ac	3,000	345,000	181,125	77,625
Field Diversions and Terraces	25,000	ft	3	75,000	39,375	16,875
Grade Stabilization	5	ea	4,000	20,000	10,500	4,500
Agricultural Sediment Basin	10	ea	10,000	100,000	52,500	22,500
Vegetative Riparian Buffers (1)(3)	6,000	ac	125	750,000	562,500	0
Shoreline Buffers	1200	ac	400	480,000	252,000	108,000
Nutrient Management (2)	75,000	ac	6	450,000	168,750	168,750
Nutrient and Pest Management (2)	25,000	ac	10	250,000	93,750	93,750
Spill Control Basin	4	ea	15,000	60,000	31,500	13,500
Wetland Restoration	100	ea	2,000	200,000	105,000	45,000
Manure Spreading(2)(4)(5)	500	ac	25	12,500	9,375	0
Field Windbreak(5)	5000	ft	.2	1,000	525	225
Livestock Exclusion, Woods	0	ft	1	0	0	0

Barnyard Runoff Control						
Filter Strip/ Filter Wall	20	ea	30,000	600,000	315,000	135,000
Roof Gutters	40	ea	1,500	60,000	31,500	13,500
Clean Water Diversion	25	ea	2,500	62,500	32,813	14,063
Roofs	0	ea	25,000	0	0	0
Manure Storage Facility (6)	3	ea	40,000	120,000	58,500	31,500
Manure Storage Facility Abandonment	1	ea	10,000	10,000	5,250	2,250
Cattle Mounds	0	ea	3,000	0	0	0
Animal Lot Abandonment/Relocation	1		60,000	60,000	31,500	13,500
Well Abandonment	30		500	15,000	7,875	3,375
Milking Center Waste Control	10	ea	7,000	70,000	36,750	15,750
Streambank Erosion Control						
Shape and Seeding	15,800	ft	10	158,000	82,950	35,550
Fencing	3,750	ft	2	7,500	3,938	1,688
Rock Riprap	500	ft	30	15,000	7,875	3,375
Bio-Bank Stabilization	9,000	ft	20	180,000	94,500	40,500
Crossing	2	ea	2,000	4,000	2,100	900
Remote Watering Systems	0	ea	2,000	0	0	0
Subtotal				7,103,711	4,412,888	914,895
Land Acquisition	17	ac	2,500	42,500	15,938	15,938
Easements	17	ac	2,000	34,000	25,500	0
Total				7,180,211	4,454,326	930,833

(1) Local share consists of labor and equipment costs. Also see flat rates in table 3-1.
(2) Number of acres shown reflects 3 times the eligible acres.
(3) Number of acres shown reflects 5 times the eligible acres. This is currently a BMP in the Branch River Watershed. When approved for statewide use, this BMP will be cost shared in this project. The sediment delivery of a field adjacent to buffer must be < .6 tons/ac/year.
(4) This rate is contingent on the approval of this interim BMP. See Appendix B.
(5) 50 % of the total eligible costs for rental acres or a flat rate of $25.00/acre not to exceed $30,000 per watershed participant.
(6) Maximum cost-share is $35,000. 70 % of the first $20,000 and 50 % of the remaining cost including waste transfer equipment.
(7) This practice may include crop systems for wind erosion.

Source: Wisconsin DNR, DATCP, and Walworth County

Table 4-3c Cost-Share Budget Needs for Management Practices in Racine County for the Sugar-Honey Creeks Watershed

BMP	Number/Acres		Cost/Unit ($)	Total Cost	75% Participation Required to meet Objectives	
					State Share	Local Share
Upland Control						
Change in Crop Rotation(1)	1000	ac	NA	0	0	0
Contour Cropping(1)	400	ac	9	3,600	2,700	0
Contour Strip Cropping(1)	50	ac	13.5	675	506	0
Field Strip Cropping(1)	100	ac	7.5	750	563	0
High Residue Management(1)(2)(7)	7500	ac	18.5	138,750	104,063	0
Cropland Protection Cover (Green Manure)(1)	150	ac	25	3,750	2,813	0
Intensive Grazing Management (Rotational Grazing)	0	ea	4,000	0	0	0
Critical Area Stabilization	10	ac	800	8,000	4,200	1,800
Grass Waterways	5	ac	3,000	15,000	7,875	3,375
Field Diversions and Terraces	0	ft	3	0	0	0
Grade Stabilization	1	ea	4,000	4,000	2,100	900
Agricultural Sediment Basin	3	ea	10,000	30,000	15,750	6,750
Vegetative Riparian Buffers (1)(3)	60	ac	125	7,500	5,625	0
Shoreline Buffers	30	ac	400	12,000	6,300	2,700
Nutrient Management (2)	1950	ac	6	11,700	4,388	4,388
Nutrient and Pest Management (2)	600	ac	10	6,000	2,250	2,250
Spill Control Basin	1	ea	15,000	15,000	7,875	3,375
Wetland Restoration	8	ea	2,000	16,000	8,400	3,600
Manure Spreading	355	ac	25	8875	6656	0
Livestock Exclusion, Woods	0	ft	1	0	0	0
Field Windbreak (4)	0	ft	0	0	0	0
Barnyard Runoff Control						
Filter Strip/ Filter Wall	0	ea	30,000	0	0	0
Roof Gutters	1	ea	1,500	1,500	788	338
Clean Water Diversion	1	ea	2,500	2,500	1,313	563

Roofs	0	ea	25,000	0	0	0
Manure Storage Facility (3)	0	ea	40,000	0	0	0
Manure Storage Facility Abandonment	0	ea	10,000	0	0	0
Cattle Mounds	0	ea	3,000	0	0	0
Animal Lot Abandonment/Relocation	0			0	0	0
Well Abandonment	25		500	12,500	6,563	2,813
Milking Center Waste Control	0	ea	7,000	0	0	0
Streambank Erosion Control						
Shape and Seeding	700	ft	10	7,000	3,675	1,575
Fencing	0	ft	2	0	0	0
Rock Riprap	0	ft	30	0	0	0
Bio-Bank Stabilization	300	ft	20	6,000	3,150	1,350
Crossing	0	ea	2,000	0	0	0
Remote Watering Systems	0	ea	2,000	0	0	0
Subtotal				311,100	197,550	35,775
Land Acquisition	3	ac	2,500	7,500	2,813	2,813
Easements	3	ac	2,000	6,000	4,500	
Total				324,600	204,863	35,588

(1) Local share consists of labor and equipment costs. Also see flat rates in table 3-1.

(2) Number of acres shown reflects 3 times the eligible acres.
(3) Number of acres shown reflects 5 times the eligible acres. This is currently a BMP in the Branch River Watershed. When approved for statewide use, this BMP will be cost shared in this project. The sediment delivery of a field adjacent to buffer must be < .6 tons/ac/year.
(4) This rate is contingent on the approval of this interim BMP. See Appendix B.
(5) 50 % of the total eligible costs for rental acres or a flat rate of \$25.00/acre not to exceed \$30,000 per watershed participant.
(6) Maximum cost-share is \$35,000. 70 % of the first \$20,000 and 50 % of the remaining cost including waste transfer equipment.
(7) This practice may include crop systems for wind erosion.

Source: Wisconsin DNR, DATCP, and Racine County

Table 4-4. Cost-Share Budget Needs for Urban Management Practices in the Sugar-Honey Creeks Watershed (over ten years)

Item	State Share	Landowner Share	East Troy	Elkhorn	Total
Local Assistance Staff Support	100,000	0	0	0	100,000
Information and Education Direct	5,000	0	0	0	5,000
Other Direct (travel, supplies, etc.)	5,000	0	0	0	5,000
Cost-Share Funds: Practices on Established Urban Areas[1,2]	210,000	0	45,000	45,000	300,000
Cost-Share Funds: Streambank Stabilization[1]	0	0	0	0	0
Construction Site Erosion Control Practices ($250/acre)	0	62,500	0	0	62,500
Storm Water Planning ($100/acre)[1]	84,000	0	18,000	18,000	120,000
Cost-Share Funds: Easements	5,000	0	0	0	5,000
TOTAL	409,000	62,500	63,000	63,000	597,500

1 The local share of the cost of practices on established urban areas, streambanks and storm water planning may be paid by private landowners or other state agencies instead of local governments where applicable.

2 BMPs for established urban areas estimated at $70,000 state share per acre of wet pond and $20 per catch basin cleaning. Pond costs include land purchases at 50% state cost-share rate and design work at 100% state share. Local governments bear the additional cost of operation and maintenance which is estimated at $2,000 per pond acre per year (not included in the table).

Source: DNR

The costs presented in Table 4-4 assume $20 per catch basin cleaning. The plan calls for two catch basin cleanings per year. The state would fund 50 percent of the cost of the second cleaning per year until detention practices are installed or the end of five years, whichever comes first.

The average cost of streambank stabilization design and construction is estimated at $200 per foot, based on actual project costs for riprap and bioengineering installations.

The cost of preparing construction site erosion control plans has not been estimated. It will be borne primarily by the private sector to meet requirements of local ordinances, state building codes and storm water permits.

It is assumed that construction site practices will average $250 per acre. All of this cost will be borne locally by the private developers, contractors and landowners to meet requirements of local ordinances, state building codes, and state storm water permits.

Funding is available on a limited basis to initially support the cost of reviewing and amending construction erosion control ordinances. Within five years, it is expected that the local government will charge building permit fees adequate to support enforcement and periodic updating of erosion control ordinances.

Likewise, the cost of additional staff for developing storm water management ordinances will be funded 50 percent by the DNR for the first five years. Permit fees should be structured so that continued funding is available for enforcement of ordinances.

Table 4-5 Estimated Staff Needs for Project Implementation at 75 Percent Landowner Participation

Activity	Project years when work will be done	Walworth County Staff Hours	Racine County Staff Hours
Project and Financial Management	1-10	7,000	1000
Information and Education Program	1-3	3,306	1080
	4-10	4,039	1596
Pre-Contact Office Inventory; Landowner Contracts and Progress Tracking	1-7	8,000	600
Conservation Planning and Cost-Share Agreement Development	1-7	9,000	1,000
Plan Revisions and Monitoring	1-10	2,000	400
Practice Design and Installation	1-10		
Upland Sediment Control		39,570	2,825
Animal Waste Mgmt.		2,284	73
Streambank Erosion Control		4,434	215
Easements		270	48

Critical Site Documentation & Enforcement	**1-5**	**2,000**	**80**
Training	**1-10**	**2,500**	**800**
Urban Management	**1-10**	**750**	**0**
Stormwater Planning	**1-10**	**350**	**0**
Total:		**85,503**	**9,717**

Estimated Staff Required for years 1-5	**4.8**	**0.5**
Hours per year	**10,046**	**1,088**
Estimated Staff Required for years 6-10	**3.7**	**0.4**
Hours per year	**7,722**	**855**

Source: DNR; DATCP and the Walworth and Racine County LCD's

Table 4-6. State Share of Total Project Costs at 75 percent Landowner Participation

Item	Walworth County	Racine County	Total Cost (State Share)
Cost-Share Funds: Practices	$4,412,888	$197,550	$4,610,438
Cost-Share Funds: Easements and Land Acquisitions	41,438	7,313	48,751
Local Assistance Staff Support	1,936,712	262,472	2,199,184
Information and Education Direct	28,763	9,588	38,351
Other Direct (travel, supplies, etc.)	174,724	23,132	197,856
Engineering Assistance	20,000	10,000	30,000
Urban Management Practices	409,000	0	409,000
Total	$7,023,525	$510,053	$7,533,578

Salary + Indirect = $45,355/yr

Source: DNR, DATCP, and Walworth and Racine County LCD's

Implementation Schedule

Total Project Cost

The state funding required to meet the rural and urban nonpoint source pollution control needs is presented in Table 4-6. This figure includes the capital cost of practices, staff support, and easement costs presented above. The estimated costs to the state are $7.5 million (for 75% participation). The sum of estimated cost to landowners and others is $1.16 million.

This cost estimate is based on projections developed by the agency planners and local staff. Historically, the actual expenditures for projects are less than the estimated costs. The factors affecting expenditures for this watershed project include the amount of cost sharing that is actually expended, the number of staff working on the project, and the amount of support costs.

Grant Disbursement and Project Management Schedule

Implementation may begin upon approval of this watershed plan by the Walworth and Racine County Boards, LWCB, and the DNR. The priority watershed project implementation period lasts ten years. Cost share agreements with Critical and Eligible landowners can be signed through the first 7 years of implementation. Practices on any cost-share agreement must be installed within five years of signing the CSA. Limited extensions of the installation period for practices on individual cost-share agreements must be approved by DNR.

The disbursement of the grants (Local Assistance and Nonpoint Source) to Walworth and Racine Counties will be based on an annual workload analysis and grant application process.

CHAPTER FIVE
Integrated Resource Management Program

Introduction

The purpose of this chapter is to identify existing state, federal, and local resource management programs which provide benefits for water quality and/or fish and wildlife resources in the Sugar-Honey Creeks watershed. Watershed staff will work to coordinate the efforts of these programs to provide the best possible management of land and water resources in the watershed. This comprehensive approach will facilitate consideration of the various goals and objectives for all the programs in which the landowner participates. Each of these activities is described below.

Fisheries and Wildlife Management

Watershed best management practices (BMPs), such as streambank protection, shoreline buffer strips and easements, should be implemented in a manner that preserves and enhances the management goal of providing a quality fishery in the Sugar-Honey Creeks Watershed. Specifically, all streambank protection BMPs should be installed using large diameter-sized rock below the water line. Rock riprap should be installed and sized so that the placement and size of rock will positively benefit fish habitat. Vegetative shoreline erosion control using emergent aquatic vegetation for habitat enhancement should be used where applicable. Wildlife habitat components should also be incorporated into vegetative filter strips along streams or in upland areas.

Shoreline erosion control measures will be installed in a manner beneficial to fisheries and wildlife habitat. DNR Fish Management and Wildlife Management personnel will be consulted for input in the design of streambank and shoreline protection BMPs to maximize benefits to the fish and wildlife communities. In cooperation with counties, DNR staff will also review placement of agricultural sediment basins, and provide technical assistance when the installation of BMPs will require the removal of obstructions or other wildlife habitat. The counties and DNR staff will propose measures to minimize impact on wildlife habitat, *and assist in resolving questions concerning effects of agricultural nonpoint source BMPs on wetlands.*

Wetland Protection, Restoration and Enhancement

Wetlands serve as filtering and settling areas for sediment, nutrients, and pesticides. Wetlands in the Sugar-Honey Creeks Priority Watershed Project area also serve to recharge and discharge groundwater. Groundwater discharge from wetlands provide essential baseflow to many tributaries in the watershed.

The protection of existing wetland through land use controls, acquisition, or the purchase of conservation easements is recommended in the Sugar-Honey Creeks Priority Watershed Project Area.

Wetland restoration, enhancement, buffers, easements, and acquisition are eligible cost-share activities and practices through this program. Financial and technical assistance to restore and enhance wetlands is also available from NRCS, U.S. Fish and Wildlife Service, the DNR private lands manager, or several nonprofit conservation organizations such as Wisconsin Waterfowl Association. Racine and Walworth Counties will coordinate wetland restorations activities with these agencies and organizations to insure wetland protection and restoration goals in the Sugar-Honey Creeks Priority Watershed are met.

Groundwater Management

Wells provide a direct conduit for pollutants to reach groundwater resources. Preventing well contamination and sealing abandoned wells are important steps for protecting these resources. If not properly sealed, abandoned wells can directly channel contaminated surface water or shallow groundwater into deeper drinking water aquifers, bypassing the normal purifying action that takes place as surface water slowly percolates downward. Abandoned wells are a significant threat to groundwater quality in the Sugar-Honey Creeks Priority Watershed.

Walworth and Racine will encourage all landowners to properly seal abandoned wells. Information on the proper abandonment procedures will be provided to landowners when unused,improperly located or constructed, or abandoned wells are located.

Well Abandonment

The Agricultural Conservation Program (ACP), which is administered by the Farm Services Agency (FSA), at one time provided cost-share assistance to Sugar-Honey Creeks watershed farm operators to properly seal abandoned wells to protect groundwater resources. As of October 12, 1996, three landowners have participated in the federal well abandonment program in the Sugar-Honey Creeks project area. FSA no longer provides cost share assistance for well abandonment.

Wisconsin Well Compensation Grants

Wisconsin's Well Compensation grant program provides financial assistance to replace or treat private wells contaminated with heavy metals, pesticides, solvents or gasoline. Wells must exceed state or federal drinking water standards. Replacement of wells contaminated with bacteria or nitrate are not eligible for cost-sharing, with the exception of livestock wells contaminated with more than 40 ppm of nitrate. DNR district water supply personnel should be consulted for more information concerning income limits and other eligibility requirements.

Eligible landowners will be encouraged to apply for well replacement funds through the Wisconsin Well Compensation Grant Program.

Private Sewage System Maintenance and Rehabilitation

Poorly sited or improperly functioning private sewage systems have the potential to contaminate groundwater and surface waters in the Sugar-Honey Creeks watershed. Pollutants from sewage system discharge includes bacteria, viruses, household chemicals, nitrates, and phosphorus. Many sewage systems located in riparian areas are out-dated and installed in soils which do not adequately filter pollutants due to the poor filtering ability of the soil and/or a high water table. Failing sewage systems in riparian areas are a special concern since pollutants can enter the surface waters with minimal filtering. Sewage system failure is often due to poor maintenance, primarily a failure to pump septic tanks on a regular basis.

Walworth and Racine Counties' staff will prepare educational materials to promote the proper maintenance of private sewage systems. Sewage system maintenance and household tips to reduce groundwater contamination will also be stressed during field visits and "home environmental audits".

Financial assistance to reduce septic system inputs are not eligible under the Priority Watershed Program.

See also the I & E section.

Wisconsin Fund

The Private Sewage System Replacement & Rehabilitation Grant Program (Wisconsin Fund) provides financial incentives to protect and improve groundwater quality in Wisconsin. The Wisconsin Fund provides funds to update private sewage systems installed before 1978. To be eligible the septic system must have been inspected by the Walworth or Racine Counties' Sanitarian and determined to be failing by discharging waste to the groundwater or surface water. Only permanent residences qualify, and there are income restrictions. Applications for Wisconsin Fund assistance are made through the Walworth or Racine Counties' Planning and Zoning Department.

Riparian Zones

Cattle access to streams and lakes has not been identified as a serious problem in the watershed. Any sites impacted by cattle access that are identified during the implementation phase of the project will be eligible for cost-share grants through the Sugar-Honey Creeks Project. Sensitive riparian areas can be acquired through easements so they receive lasting protection.

Stewardship

The Stewardship Program enables the purchase of land or easements to protect sensitive environmental areas. The streambank protection program under The Stewardship Program is an important additional means of protecting water quality. Sugar and Honey creeks and their tributaries have been selected and are eligible to receive Stewardship funding for easement acquisition. Under this program, the DNR, units of government, and qualified non-profit conservation organizations (NCOs) can purchase or obtain streambank easements. If needed, the DNR will financially support the fencing of the stream to protect it from livestock access.

Forestry Programs

Private woodlands are abundant within the Sugar-Honey Creeks watershed. Private woodlands contribute to the quality of water resources and fish and wildlife resources in the watershed. Financial assistance is available for forest management and soil and water resource protection through the Stewardship Incentive Program (SIP), the Managed Forest Law Program (MFL) and other forest stewardship programs. Additional information can be found in DNR publication FR-093-95, Wisconsin Forestry Best Management Practices For Water Quality, developed by DNR Bureau of Forestry.

Stewardship Incentive Program

The Stewardship Incentive Program (SIP) was developed to stimulate enhanced management of forest lands by cost-sharing approved management practices. SIP provides cost share funding of up to 75% for practices that provide soil and water protection. The SIP program applies to nonindustrial private forest land of 10 acres or more on forested or forest related (i.e., prairie, wetlands) lands. Practices that are cost-shared by SIP include development of a landowner forest stewardship plan, site preparation and tree planting, timber stand improvement, windbreak and hedgerow establishment, soil and water protection and improvement, riparian and wetland protection and improvement, fisheries habitat enhancement, wildlife habitat enhancement, and forest recreation enhancement.

Managed Forest Law

The goal of the Managed Forest Law (MFL) program is to encourage long-term sound forest management. MFL is a tax incentive program for industrial and nonindustrial private woodland owners who manage their woodlands for forest products while also managing for water quality protection, wildlife habitat, and public recreation. In return for following an approved management plan, property taxes are set at a lower rate than normal. At a later time when the landowner receives an income from a timber harvest, some of the deferred tax is collected in the form of a yield tax. Management plans are based on the landowners objectives. These plans may address harvesting, planting, thinning, release, and soil erosion on a mandatory basis while addressing other practices such as wildlife and aesthetic activities on a voluntary basis. Twelve landowners in the Sugar-Honey Creeks Project Area have woodland management plans approved by the WDNR.

Other Stewardship Programs

Another forest stewardship programs available to watershed landowners include the Forest Improvement Program (FIP). This program provide funding for the establishment of timber stands.

Walworth and Racine Counties' staff and DNR Foresters will encourage eligible forest landowners in the Sugar-Honey Creeks watershed to participate in Forest Stewardship

Programs to benefit water resources and forest habitat. Protection of soil and water resources should be addressed in all SIP and MFL plans where applicable.

Coordinating Regulations, Permits, and Zoning

Best management practices that address streambank and shoreline erosion such as riprap or vegetative stabilization will require permits from the DNR. Any BMP which effects wetland form or function may require permits from the DNR, Walworth or Racine Counties' Zoning office, and the US Army Corps of Engineers.

Walworth County and Racine County LCD's will work closely with the DNR Water Regulation and Zoning staff, the County Zoning Departments, and the US Army Corps of Engineers to assure that necessary permits are received prior to the installation of shoreline stabilization practices.

In an attempt to protect the use, enjoyment, and water quality of our lakes and streams the state, federal, and local government regulates some activities on riparian properties. Activities that disturb or remove the natural vegetation surrounding our lakes and streams reduces the buffering capacity of the area and often drastically increases erosion, sedimentation, and nutrient runoff. Many lakefront property owners, particularly those who are purchasing waterfront property for the first time, are not aware of these regulations or the need for them.

Floodplain, Shoreland, and Shoreland-Wetland Zoning

County shoreland zoning ordinances protect riparian areas along navigable waterways by limiting development. The goals of the program are to protect water quality, protect natural scenic beauty, and prevent the destruction of near shore habitat. These ordinances use minimum structural setbacks, minimum lot sizes, land division review, and limiting uses of wetlands as tools to reach these goals. Other tools that are used include protection of vegetative buffers, restrictions on grading and filling in riparian areas, and enforcement of sanitary and well codes.

City and village shoreland-wetland zoning ordinances protect wetlands within shoreland zones by restricting structural development and limiting filling and grading of wetlands.

The main purpose for adopting county, city, and village floodplain zoning ordinances is to protect life and property. However, proper floodplain management can have secondary benefits to water quality by recognizing the natural functions and values of floodplain areas and protecting these resources. Limiting development in floodplain areas reduces the amount of nonporous areas thereby reducing the amount of runoff to surface water.

Local governments must work with the DNR to ensure proper enforcement of these ordinances and the protection of riparian and floodplain areas. Local governments are *encouraged to adopt more restrictive regulations if resource protection warrants it. For more information concerning floodplain, shoreland, or shoreland-wetland zoning restrictions, contact your local zoning administrator or building inspector. For assistance on evaluating ordinance language you should contact your local DNR Regional Headquarters.*

Coordination With State and Federal Conservation Programs

The Sugar-Honey Creeks Watershed Project will be coordinated with the conservation compliance features of the Wisconsin Farmland Preservation Program (FPP) administered by DATCP, and the Conservation Provisions of the USDA Federal Farm Bill administered by the Natural Resource Conservation Service and the Farm Service Agency (FSA). DATCP will assist the LCD and the NRCS offices to identify landowners within the watershed that are subject to the compliance provisions of FPP and the Federal Farm Bill. Conservation Farm Plans were completed for all landowners in Federal Farm programs by December 31, 1989. There are 177 FPP plans and 511 Federal Farm Bill plans within the watershed project.

Following is a brief summary of programs administered by the Natural Resources Conservation Service:

Environmental Quality Incentives Program - The Environmental Quality Incentives Program (EQIP) consolidates the functions of four existing conservation programs into one and focuses assistance to locally identified conservation priority areas or areas where agricultural improvements will help meet water quality goals. The program will be funded at $200 million annually, nationwide. Funds will be used to pay for technical assistance and cost sharing on conservation practices. Fifty percent of the funds are dedicated to conservation associated with livestock operations.

Wetland Reserve Program - The Wetland Reserve Program (WRP) has been extended through the year 2002. WRP is a voluntary program to restore and protect wetlands on private property. The program provides financial incentives to enhance wetlands in exchange for retiring marginal agricultural land. Landowners who choose to participate in WRP may sell a conservation easement or enter into a cost share restoration agreement. Other agencies and private conservation organizations may provide additional assistance for easement payment and wetland restoration costs as a way to reduce the landowners share of the costs. Such special partnership efforts are encouraged. Recent changes in the program provide landowners more options for protecting wetlands. Landowners are now able to choose between permanent easements, 30 year easements, or restoration only cost share agreements.

Conservation Reserve Program - The Conservation Reserve Program (CRP) has also been extended through the year 2002, and is administered by the Farm Services Agency (FSA). CRP assists owners and operators conserve and improve soil, water, and wildlife resources by converting highly erodible and other environmentally sensitive acreage used to produce agricultural commodities to a long term vegetative cover. CRP participants enroll contracts for 10 to 15 years in exchange for annual rental payments and cost share assistance for installing certain conservation practices. Applicants submit bids to enroll their acreage. The maximum rental payments paid to successful applicants reflect site based soil productivity, prevailing local cash equivalent rental rates, and maintenance cost. The rental payment portion of the financial assistance provided through the CRP program may be piggy backed with other nonfederal programs. Cost sharing for practice installation may also be combined with other nonfederal programs, provided that the total cost share assistance does no exceed the cost of the practice.

Farmland Protection Program - The program provides assistance to states with existing farmland protection programs to purchase conservation easements.

Wildlife Habitat Incentive Program - Provides incentives to improve wildlife habitat on private lands.

Coordination with Lake Management Districts

Lake management districts are local units of government established for the purpose of protecting and rehabilitating lakes. Walworth County staff members will continue to cooperate with the lake communities on watershed projects, attending board meetings, and public meetings upon request. Fact sheets and other educational materials targeting riparian landowners will be distributed to lake district representatives. As local units of government, lake management districts may apply for local assistance grants. Lauderdale Lakes, Potters Lake, Pleasant Lake, and Honey Lake have an established inland lake protection and rehabilitation district under Ch. 33 Wis. Stats.

Coordination with Lakes Associations

Lake Associations are voluntary organizations. They raise money for special projects, cosponsor lake fairs and other events that educate and inform the public about lake issues, and they participate in local actions to protect and improve lakes. Lake associations are eligible for nonpoint source program local assistance grant funds if they meet the following criteria:

- They must be incorporated under Chapter 181 Wisconsin Statutes.
- They must specify in the articles of incorporation or by-laws that they support the protection or improvement of inland lakes for the benefit of the general public and demonstrate this by their past actions.

- They must allow membership in the association to any individual living on or within one mile of the lake for at least one month each year or individuals who own real estate on or within one mile of that lake.

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

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

State Lake Planning and Lake Protection Grant Programs

Local units of government, lake management and rehabilitation districts, and qualified lake associations and NCOs in the watershed are eligible to receive Lake Planning Grants and/or Lake Protection Grants to do the following:

- Gather lake and watershed information and prepare lake management plans.

- Develop environmental ordinances to improve and protect lake water quality and lake ecosystems.

- Purchase property which will significantly contribute to lake water quality or lake ecosystems. (Note: dam property purchase or alteration is ineligible.)

- Restore wetlands.

Lake Planning Grant funds are available at a 75% cost share rate for up to $10,000 per two-year period and $30,000 for the life of the program. Lake Protection Grant funds are limited to $100,000 for property purchases, wetland restorations, and regulation development, and program funds must be matched with an equal share by the local government. Efforts will be made to identify those projects and activities that lake communities can sponsor and fund to supplement the Sugar-Honey Creeks Priority Watershed Project.

Coordination with Local Farm, Fish, Wildlife, and Conservation Groups

Local Sporting and Conservation clubs provide a grass roots support for protection of local waters and other conservation concerns. Past efforts have included assistance in implementation, funding, and education about farm and crop management, stream protection, and wildlife habitat restoration and creation.

A list of groups likely to be involved in the Sugar-Honey Creeks Priority Watershed include:

- Michael Fields Institute
- Sally's Marsh and Hunt Club
- Triangle Sportsmen's Club
- Southeast Rod and Gun Club
- Ducks Unlimited
- Nature Conservancy
- Walworth County Farm Bureau
- 4-H Groups
- Friends of Lakeland Agriculture Complex
- Lauderdale Lakes Association

Many other groups will be contacted and invited to participate with the Sugar-Honey Creeks Watershed project.

Archaeological Sites: Coordination with State and Federal Historic Preservation Laws

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

There are 151 historic structures,27 archeological sites, and 31 burial sites known to exist within the Sugar-Honey Creeks Priority Watershed. These areas will need special consideration when structural best management practices are being considered. Settling basins, manure storage structures, and streambank or shoreline shaping and riprapping are practices that may impact archaeological sites. As discussed above, state and federal laws require preservation of archaeological resources within the framework of the NPS Program.

Before finalizing the cost-share agreement with the landowner, project staff should review the maps showing known archaeological and historic sites. If a known site occurs in the vicinity of a proposed BMP, this does not necessarily mean the BMP needs to be moved or altered. In some cases, the specific location of the BMP will not actually be near enough to the location of the known site to warrant further review. Project staff should visit the area and conduct a "pre-review" to ensure that the *specific* location of the proposed BMP will not disturb the known archaeologic or historic site. Instructions and Cultural Resource Site Review Documentation forms are available in the Implementation Manual.

If it is too difficult to determine through a pre-review, or if it appears that the known site would indeed be disturbed, contact the Wisconsin State Historical Society to set up a formal Archaeological or Historic Site Review of the area. Any costs incurred as part of a site review *will not be passed on to the landowner.* The DNR's Nonpoint Source Pollution Abatement Program will pick up the costs of professional historic and/or archaeological site reviews. In some cases, a representative from the U.S. Natural Resources Conservation Service (NRCS) may conduct the review.

Practices of concern

- Archaeological Sites
  - Field Diversions
  - Terraces
  - Grade Stabilization Structures
  - Agricultural Sediment Basins
  - Streambank and Shoreline Stabilization
  - Sediment Retention, Erosion or Water Control Structures
  - Structural Urban Practices
  - Wetland Restoration

- Buildings
  - Barnyard Runoff Management Systems
  - Animal Lot Relocation
  - Manure Storage Facilities
  - Roofs for Barnyard/Manure Storage Facilities

Practices - No Concern Needed for Cultural Sites

- Contour Farming
- Contour Strip-cropping
- Field Strip-cropping
- Reduced Tillage
- No-till Systems
- Permanent Vegetative Cover
- Cropland Protective Cover
- Critical Area Stabilization
- Nutrient Management
- Pesticide Management
- Shoreline Buffers
- Livestock Exclusion from Woodlots
- Grass Waterways

Endangered and Threatened Resources

Water Quality improvements will benefit endangered resources directly or indirectly depending on the species and natural communities. Information on threatened and endangered resources was obtained from the Bureau of Endangered Resources of the DNR. Endangered resources include rare species and natural communities. It should be noted that comprehensive endangered resource surveys have not been completed for the entire Sugar-Honey Creeks Priority Watershed. The lack of additional occurrence records does not preclude the possibility that other endangered resources are present in the watershed. In addition, the Bureau's endangered resource files are continuously updated from ongoing field work. There may be other records of rare species and natural communities which are in the process of being added to the database and so are not listed in this document.

Rare Species

Rare species are tracked by Wisconsin's Natural Heritage Inventory of the Bureau of Endangered Resources. Species tracked by the inventory include those that are listed by the U.S. Fish and Wildlife Service or by the state of Wisconsin.

Wisconsin Endangered Species

An endangered species is one whose continued existence as a viable component of this state's wild animals or wild plants is determined by the DNR to be in jeopardy on the basis of scientific evidence. Wisconsin endangered species within the watershed are:

Scirpus cespitosus var callosus, tussock bulrush (plant);

Plantanthera leucophaea, prairie white-fringed orchid (plant);

Luxilus chrysocephalus, striped shiner (fish);

Camassia scilloides, wild hyacinth (plant);

Ranunculus cymbalaria, seaside crowfoot (plant);

Collinsonia canadensis, canada horse-balm (plant);

Eleocharis quadrangulata, squarestem spikebush (plant);

Ruellia humilis, hairy wild petunia (plant);

Asclepias purpurascens, purple milkweed (plant).

Wisconsin Threatened Species

A threatened species is one which, if not protected, has a strong probability of becoming endangered. Wisconsin threatened species within the watershed are:

Cypripedium candidum, small white lady's-slipper (plant);

Gentiana alba, yellow gentian (plant);

Eleocharis rostellata, beaked spikebrush (plant);

Notropis anogenus, pugnose shiner (fish);

Lepomis megalotis, longear sunfish (fish);

Besseya bullii, kitten tails (plant);

Tofieldia glutinosa, sticky false-asphodel (plant).

Wisconsin Special Concern Species

A special concern species is one which some problem of abundance or distribution is suspected in Wisconsin, but not yet proven. The purpose of this category is to focus attention on certain species **before** they become endangered or threatened. Wisconsin special concern species within the watershed are:

Cardamine pratensis var palustris, cuckoo flower (plant);

Cypripedium papviflorum, small yellow lady's-slipper (plant);

Cypripedium reginae, showy lady's-slipper (plant);

Trillium recurvatum, reflexed trillium (plant);

Liatris spicata, blazing star (plant);

Thalictrum Revolutum, waxleaf meadowrue (plant);

Hedyotis caerulea, innocence (plant);

Gentrianopsis procera, lesser fringed gentian (plant);

Minuatria dawsonensis, rock stitchwort (plant);

Solidago ohioensis, Ohio goldenrod (plant);

Equisetum palustre, marsh horsetail (plant);

Scleria verticillata, low nutrush (plant).

The following species are of special concern, but have no laws regulating use, possession, or harvesting:

Erimyzon sucetta, lake chubsucker (fish);

Etheostoma microperca, least darter (fish);

Coregonus artedi, lake herring (fish);

Poanes massasoit, mulberry wing (butterfly);

Euphyes conspicuus, black dash (butterfly)

Objectives

Endangered resource objectives for the Sugar-Honey Creeks Watershed area:

1. Prairie remnants occurring within the watershed are a priority for protection.

2. Wet and mesic prairies and open fens occurring in the watershed should be protected and are very important to ensuring improved water quality.

3. Due to lack of comprehensive species inventories conducted in the Sugar-Honey Creeks Watershed project area, there is a need to perform specific surveys.

A Regional Land Use Plan For Southeast Wisconsin: 2010

The Regional Land Use Plan for Southeast Wisconsin: 2010 recommends the promotion of relatively compact, centralized regional growth patterns, with urban development occurring generally in concentric rings, outward from, existing urban centers in the region. It can be concluded that urban development in the Sugar-Honey Creeks Watershed should only occur within the Village of East Troy, City of Elkhorn, or City of Burlington sewer service areas. Development outside of the urban service area should only occur at densities that will protect surface and ground water resources, as well as preserve environmental corridors.

Park and Open Space Plans (SEWRPC)

Racine and Walworth counties have approved Park and Open Space Plans. These plans were developed by the Southeast Wisconsin Regional Planning Commission (SEWRPC).

It is recommended that all environmental corridors be preserved in essentially natural, open space through a combination of public ownership and public land use controls. The preservation of these corridors in open space will avoid the creation of costly environmental problems such as flooding, and water pollution, and will serve to maintain a high level of environmental quality in the Sugar-Honey Creeks watershed project area.

Coordination With Wisconsin Department of Transportation (DOT)

Highway expansion and maintenance projects and activities should be planned and implemented to conform with the water resource objectives of this plan.

The Wisconsin Department of Transportation should insure that wetland losses in the Sugar-Honey Creeks Watershed due to highway expansion and maintenance be mitigated or replaced in the watershed.

CHAPTER SIX
Information and Education Activities

Goal

This strategy will help achieve the water quality objectives listed in Chapter 2 by encouraging participation in the Sugar-Honey Creeks Watershed Project.

I & E Objectives

1. Farmers will minimize nutrient, sediment, and other pollution from farming activities by adopting Best Management Practices (BMP's).

2. Lakeshore residents will minimize phosphorus, sediment, and other pollution from lakeshore property and septic systems by adopting lake friendly yard care practices, and proper septic system maintenance.

3. Municipalities will minimize phosphorus, sediment, and other pollution to stormwater systems by informing their residents about the connection between stormwater runoff and surface water quality, and the adoption of Urban BMP's, wellhead protection, and construction site erosion control.

4. Youth will be able to describe the value of surface and ground water resources.

5. Local government officials will get information to help them make decisions that protect local water quality and improve land use.

The following components are identified for each of these objectives: audience, message, and potential activities.

Audience: Groups or individuals that should be targeted.

Message: Key information to communicate to the target audience.

Activities: Suggested activities to get messages to the target audience and encourage actions.

Activities will be selected and presented in an annual information and education plan. New activities may be included as needed to respond to changing needs of the program and the evaluation of past activities.

Who Developed the I&E Strategy?

The education strategy was developed by the Project Team with assistance from the watershed's Citizens Advisory Committee, the Department of Natural Resources (DNR), and the UW-Extension (UWEX).

The Walworth County and Racine County Land Conservation Departments (LCDs) will take lead responsibility for the implementation of the strategy. UWEX, DNR, and Department of Agriculture Trade and Consumer Protection (DATCP) will provide assistance. The LCDs will work with local units of government and organizations such as lake rehabilitation districts, villages, lake associations, and other community groups and businesses to help implement this strategy.

How the I&E Strategy Works

The process for achieving each of the five I&E objectives follows three steps that began during the planning phase of the watershed project. Although Step 1 initially came before Step 2, and Step 2 before Step 3, Step 3 is not the end of the process. Instead, the results gained from Step 3 are used to justify the repetition or modification of I&E activities used in Steps 1 and 2, and the addition of new I&E activities. Regular evaluation of I&E activities used in Steps 1 and 2 will continue until satisfactory progress is made towards the five I&E objectives.

Step 1: Activities that explain key concepts

- Explain what the local water quality problems are
- Promote the ecological, recreational, and economic value of local water resources, groundwater and surface water
- Encourage citizen participation into the project to strengthen local ownership of the project and build trust between landowners and the LCD's.

Step 2: Activities that let key audiences know how the watershed project can help them

- Explain what BMP's are available and how they protect water quality and save time, resources, and money

- Explain the different financial incentives that are available through the project.
- Encourage individuals and groups to "do their part" for water quality by providing volunteer opportunities to protect local water resources.
- Recognize individuals and groups that help protect water quality.

Step 3: Formative Evaluation

- Assess progress towards the five I&E objectives and gather information to improve I&E activities and identify new activities.

Objective 1

Farmers will minimize nutrient, sediment, and other pollution from farming activities by adopting Best Management Practices (BMP's).

Audience

Individual farmers (operators)
Farmland owners
Ag consultants (agronomists)
Implement dealers
Cooperatives
Members of the local Farm Bureau and Farmers Union

Key Messages

- Farmers should get involved in project implementation
- Nutrient management planning can help you manage your farm efficiently.
- BMPs can help keep soil and nutrients on your farm.
- BMPs help preserve ground and surface water quality.
- Cost sharing is available to implement BMPs (emphasize year 1-5).
- To be effective, BMP's require proper use and maintenance
- Ground water pollution is much easier to prevent than to clean up
- Abandoned wells should be capped to protect ground water
- Preserving stream corridors and wetlands is important
- Farming wetlands may not be cost effective
- Wetlands protect water quality by trapping nutrients from runoff

Activities

- One-on-one contacts
- Citizen advisory committee meetings
- Informational meetings (e.g., open house)
- Tour rural BMP demonstration sites
- Presentations at farmer organization meetings

- Newsletter articles (e.g., watershed newsletter)
- Newsletter articles for other newsletters (e.g., FSA, UWEX, lake organizations, cooperatives)
- News releases
- Recognition for farms that install Best Management Practices
- Displays (e.g., County Fairs, Dairy Breakfast)
- Field days (e.g., conservation tillage trials; nutrient management demonstration site)
- Information distribution
- Direct Mail

Objective 2

Lakeshore residents will minimize phosphorus, sediment, and other pollution from lakeshore property and septic systems by adopting lake friendly yard care practices, and proper septic system maintenance.

Audience

Lakeshore residents
Builders and developers
Rehabilitation districts
Landscapers
Lakeshore homeowner associations
Zoning Board of Adjustment

Messages

- Lake residents should get involved in project implementation
- Maintain water quality for fish/water sports
- Yard waste/pet waste should be managed properly.
- Lawn fertilizer requirements are limited - don't over-fertilize.
- Buffer strips of vegetation preserve water quality.
- Septic systems require regular maintenance.
- Infiltration areas minimize run off.
- Erosion from construction sites should be controlled.
- Wetland areas protect water quality

Activities

- Newsletter articles
- Newsletter articles for local lake association newsletters
- News releases
- Lawn care and landscaping workshop
- Tour Flag Island demonstration site

- Information distribution (e.g., posters in restaurants, bait shops, gas stations, boat launches)
- Presentations at lake group meetings
- Tour of lake friendly lawn care practices (buffers on lakes, proper lawn care, aquatic vegetation management)
- Displays at area lake fairs
- Direct mail fact sheet on septic system maintenance, and other appropriate information, to lake leaders
- Citizen advisory committee meetings

Objective 3

Municipalities will minimize phosphorus, sediment, and other pollution to stormwater systems by informing their residents about the connection between stormwater runoff and surface water quality, and the adoption of urban BMP's, wellhead protection, and construction site erosion control.

Audience

Municipal officials
County officials

Messages

- Municipalities should get involved with project implementation
- Construction site erosion is a preventable water quality problem
- Stormwater drains run directly into Sugar Creek and Honey Creeks
- Leaves, grass clippings, pet wastes, and fertilizer in storm drains cause water quality problems.

Activities

- Direct mail existing fact sheets
- News releases
- Youth activity - storm drain stenciling
- Watershed newsletter
- Assist local municipalities develop I&E activities
- Newsletter articles for municipal newsletters
- Construction site erosion control workshops
- Citizen advisory committee meetings

Objective 4

Youth will be able to describe the value of water resources and the importance of preserving them.

Audience

Students
Teachers
Members of youth groups

Messages

- Water resources are community assets
- We all have a role in keeping the water clean and protecting habitat
- Acknowledge contributions of cost share participants toward improved water quality.
- Clean water (especially groundwater) is important to health
- Quality groundwater is important to the success of the local economy
- Quality surface water improves our quality of life
- Good water quality for fishing and other water sports

Activities/delivery

- Newsletter articles
- News releases
- Presentations to youth groups
- Youth activity (teacher training)
- Volunteer monitoring (e.g., WAV Program)
- Information distribution

Objective 5

Local government officials will get information to help them make decisions that protect local water quality and improve land use.

Audience
Elected officials
County staff
Public works employees

Messages
- Local government officials should get involved in project implementation
- Standards, training, and funding are in place to reduce urban runoff pollution
- Funding sources are available for structural BMP's and stormwater planning

- Clean streets mean cleaner water
- BMP's may be needed to clean stormwater runoff
- A construction site erosion control ordinance and effective enforcement may help improve or protect water quality
- Growth and development impact water quality

Activities

- Presentations for elected officials and staff
- Newsletter articles
- Information distribution
- One-on-one meetings
- Tour
- Construction site erosion control workshop
- Citizen advisory committee meetings

Evaluation

A summary evaluation of information and education activities will be prepared annually. Formative evaluation will be built into program activities where feasible. Types of formative evaluation may include surveys (i.e., questionnaires after events, phone surveys, direct mail surveys), one-on-one interviews with watershed participants, observations from staff or watershed volunteers, assessments of event attendance, group assessment techniques (i.e., focus groups, brainstorming, community forums), or case studies (i.e., signs of success). The results from the formative evaluations will be used to modify activities to make them more effective at encouraging residents to participate in the project.

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

Activity	Total Direct Costs For Year One	Required Staff Hours Per Year	
		Years 1-3	Years 4-10
One-on-one contacts	0	470	243
Informational meetings	$400	56	20
Tours	$1,000	56	32
Presentations	200	52	28
Newsletter articles	0	72	40
News releases	0	16	16
Recognition of participants	300	28	44
Field days	$300	64	20
Direct mail	$1,500	36	26
Lawn care workshop	500	52	0
Displays	250	60	28
Construction site erosion control workshop	0	12	12
Youth activity	$400	72	40
Volunteer monitoring	1,000	84	76
Information distribution	50	104	52
CAC meetings	$100	64	32
Assist local municipalities	0	40	40
Farm/Household Hazardous Waste	$7500	56	56
Water Quality through the Land Protection Planning Workshop	0	68	0
Promotion Items	1000	0	0
Totals	$14,500.00	1462	805

Table 6-2. Per County Staff Hours for Information & Education Budget & Staff Needs

Activity	Walworth Co Required Staff Hours Per Year		Racine Co. Staff Hours Per Year	
	Years 1-3	Years 4-10	Years 1-3	Years 4-10
One-on-one contacts	390	195	80	48
Informational Meetings	36	12	20	8
Tours	48	24	8	8
Presentations	36	12	16	16
Newsletters articles	48	24	24	16
News releases	12	12	4	4
Recognitions of participants	24	36	4	8
Field days	48	12	16	8
Direct Mail	24	18	12	8
Lawn Care workshop	36	0	16	-
Displays	36	12	24	16
Construction Site Erosion Control Workshop	12	12	-	-
Youth Activity	48	24	24	16
Volunteer Monitoring	60	60	24	16
Information Distribution	72	36	32	16
CAC Meetings	48	24	16	8

Activity	Walworth Co Required Staff Hours Per Year		Racine Co. Staff Hours Per Year	
Assist local municipalities	24	24	16	16
Farm / Household Hazardous Waste	40	40	16	16
Water Quality for Land Protection Planning Workshop	60	0	8	0
Total	1102	577	360	228

CHAPTER SEVEN
Project Evaluation

This chapter briefly summarizes the plan for monitoring the progress and evaluating the effectiveness of the Sugar-Honey Creeks Priority Watershed Project. The evaluation strategy includes these components:

- Administrative review
- Pollution reduction evaluation
- Watershed Resource Evaluation Monitoring

Information on the first two components will be collected by the Walworth and Racine County LCDs and reported on a regular basis to the DNR and the DATCP. The project team will meet early in the year throughout the implementation phase to review and evaluate the accomplishments of the preceding year and develop goals for the following year. Additional information on the numbers and types of practices on cost-share agreements, funds encumbered on cost-share agreements, and funds expended will be provided by the DNR's Bureau of Community Assistance. The Watershed Resource Evaluation Monitoring follows guidance established by DNR's Bureau of Water Resources Management to select and monitor specific sites in the watershed to evaluate resource quality changes.

Administrative Review

The first component, the administrative review, will focus on the progress of Walworth County, Racine County, and other units of government in implementing the project. The project will be evaluated with respect to accomplishments, financial expenditures, and staff time spent on project activities.

Accomplishment Reporting

The Walworth LCD and Racine LCD will provide the following data to the DNR and the DATCP annually:

- Planned and completed BMPs
- Planned and completed conservation systems
- Major information and education activities undertaken

Accomplishment data is summarized in the Annual Accomplishment Report prepared by DATCP and DNR, and is also discussed at watershed review meetings held annually for projects in implementation. Additional evaluation data provided by Walworth and Racine LCDs for the annual watershed review include:

- Adoption of manure storage ordinance
- Pollutant load reductions (described below)
- Status of grants and related financial activities
- Evaluation of landowner contacts and participation
- Status of project administration including data management, staff training, and BMP monitoring
- Status of nutrient management planning, and easement acquisition and development
- Effectiveness of county directed construction site erosion control activities
- Status of storm water management activities for new development
- Progress towards I & E activities

Likewise, participating local units of government implementing the urban nonpoint source management program meet at least annually with DNR staff to review progress. The DNR and local units of government will jointly evaluate the urban implementation program. Annual reports of governmental units will include:

- Information and education activities
- Construction site erosion control ordinance amendments adopted and enforcement
- Number of permits monitored for ordinance compliance
- Implementation of urban "housekeeping" program activities
- Acres of existing (1996) urban development, by land use, covered by storm water management plans for controlling water quality
- Acres of new (post-1996) urban development, by land use, covered by storm water management plans for controlling water quality
- Storm water management ordinance provisions adopted and enforcement

Details of the reporting requirements are contained in DNR Publication WR-223-94, which is reviewed every two years by DATCP and DNR and revised as necessary.

The Field Offices Computing System (FOCS) is a computer data management system that has been developed by the U.S. Natural Resources Conservation Service (NRCS). The NRCS, the DNR, and the DATCP use FOCS to meet the accomplishment reporting requirements of all three agencies. Walworth County LCD and Racine County LCD will use FOCS to collect data for administrative accomplishments, and will provide the information to the DNR and the DATCP for program evaluation.

Financial Expenditures

Walworth County LCD, Racine County LCD, and other participating units of government will provide the following financial data to the DNR and the DATCP on an annual basis:

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

The Walworth LCD, Racine LCD, and other participating units of government will also provide the DNR with the following financial data on an annual basis:

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

Time Spent On Project Activities

The Walworth County LCD, Racine County LCD, and other participating governmental units with local assistance grants will provide time summaries to both departments on an annual basis.

Nonpoint Source Pollutant Load Reduction

The purpose of the second evaluation component, pollutant load reduction, is to estimate reductions in nonpoint source pollutants as a result of signing cost share agreements with landowners and installing BMPs. Key sources were identified for estimating changes in pollutant loads that reach surface waters in the Sugar-Honey Creeks Watershed. Data collected for evaluation include sediment load reduction from uplands, streambanks and gullies, acres with nutrient management plans, barnyards and phosphorus, reduced winter spreading of manure, and streambank (habitat) protection. Chapter Three of this plan describes target pollutant reductions for each of the subwatersheds.

Cropland Sources

Walworth and Racine LCDs will use the WIN-HUSLE (Wisconsin Nonpoint Source) model to estimate sediment reductions due to changes in cropping practices. The Walworth and Racine LCDs will use FOCS to provide data for the WIN HUSLE model on an annual basis, as described above.

Streambank Sources

The Walworth County LCD and the Racine County LCD staff will estimate changes in streambank sediment erosion. A tally will be kept of landowners contacted, the amount of streambank sediment (in tons) being generated at the time of contact, and changes in erosion levels estimated after contracting for and installing BMPs.

Barnyard Runoff

County LCDs will use the BARNY model to estimate phosphorus and COD reductions due to the installation of barnyard control practices. The LCDs will report the information to the DNR through FOCS. In the event that FOCS is replaced, the replacement system will be used for all project tracking. Records will be kept on the number of acres with nutrient and pesticide management plans and acres with reduced winter manure spreading.

Construction Sites

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

Urban Areas

Participating local units of government will report annually to the DNR on any activities that may result in changes in urban pollutant loadings. Such activities include acres of existing

(1996) and new (post-1996) urban land, by land use, served by new storm water BMPs; new urban lands, by land use, not served by storm water BMPs; and other information requested by the DNR concerning BMP characteristics.

Water Resource Evaluation Monitoring

Limited funds and the intensive staffing needed to properly evaluate water quality changes prohibits monitoring each watershed individually. Instead, two types of evaluation monitoring are being conducted on a state-wide basis: Whole Stream Monitoring and Signs of Success.

The goal of the evaluation monitoring activities is to determine the progress the Nonpoint Source Program is making towards improving the quality of Wisconsin's water resources.

Evaluation monitoring activities were developed to answer five questions about the water resource objectives and the pollution reduction goals:

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

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

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

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

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

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

Whole Stream Monitoring Sites

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

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

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

A total of about $8,360,000 would be needed for the stream monitoring, if the work is carried out over a period of eleven years. The success of the evaluation monitoring activities depends on the installation of all the best management practices at the Whole Stream Monitoring Sites.

Signs of Success

Signs of Success (SOS) is short-term monitoring designed to provide some early evidence that better land management does make a difference. One site is being sought for each watershed project. Signs of Success will focus on one practice such as barnyard runoff controls, manure storage, or streambank fencing that is expected to have an early effect on the adjacent stream.

Monitoring will take place over a two-year period--the year before and the year after a practice is installed. Expected positive improvements will be on those sites where degraded habitat has occurred. Habitat sampling and photographs will be used to indicate the benefit of the practice. Limited chemical monitoring and fish sampling will be done at some sites.

The results of the Signs of Success monitoring will be featured in educational materials such as local newsletters and newspapers and the statewide newsletter "Fields and Streets."

SOS sites within the Sugar-Honey Creeks Watershed project area are still being identified. Sites will be determined by the District Water Quality Biologist. SOS evaluation will start shortly after the implementation stage begins, and may continue throughout the project.

Single Source Monitoring

In addition to Signs of Success, the project may also consider possible single source monitoring sites for evaluating project water quality impacts. Single source monitoring is a more in depth look at the effects of BMPs on water quality, includes some water chemistry, and covers a longer time period. Whether or not single source monitoring is pursued will depend on the availability of suitable sites for this type of monitoring, finding landowners willing to cooperate, the level of interest of the LCDs, and the availability of funding.

Evaluation of Special Approvals for Innovative Approaches

Evaluation of special approvals for interim BMPs and other innovative approaches will be conducted by the Walworth and Racine county staff at least every three years and for the final report.

Interim Best Management Practices

Interim BMPs were created to meet the specific and individual needs identified during the planning process of the Sugar-Honey Creeks Priority Watershed Project and will be used on a trial basis. These interim BMPs (Appendix B) will be evaluated by the County LCDs and the DNR for their effectiveness in reducing nonpoint source pollution before consideration as a standard BMP. These two cost shared practices are: Sugar-Honey Creeks manure spreading alternative and field windbreaks and field windbreak renovation.

Evaluation will include an analysis of practice utility based on landowner acceptance, state and landowner cost, and if possible, the amount of pollution controlled. The report will also include a discussion of results, problems encountered, likelihood of transferability to other watershed projects, and recommendations based on local experience with the BMPs.

During the fifth year of project implementation, the Sugar-Honey Creeks Priority Watershed will be evaluated by the Walworth and Racine County LCDs in conjunction with District Office DNR Staff for progress. If acceptable progress has been made prior to the fifth year of project implementation, the remaining critical sites that have not yet been notified by letter will be reviewed on a subwatershed basis. Acceptable progress is defined as 60 percent of the projects pollutant reduction objectives through cost share agreement sign -up.

Final Report

A Final Report will be jointly prepared for the Sugar-Honey Creeks Priority Watershed Project within 18 months of the end of the grant period. This report will include information on pollution load reduction achieved, effectiveness at addressing nonpoint threats to groundwater, landowner participation, project management, grant management, and technical assistance provided to landowners. It will also serve as the final evaluation of special approvals and innovative approaches. The report will summarize findings from Signs of Success Monitoring and conclusions drawn from comparisons made with the Master Monitoring Site.

The Final Report is developed to evaluate progress made toward attaining water quality and pollution reduction objectives, evaluate BMP effectiveness, and provide recommendations which target key areas needing improvement in the NPS program. It will be jointly prepared by the Walworth County LCD and Racine County LCD, with review by DNR, and DATCP.

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APPENDIX A
Water Quality Appraisal

LAND USE IN THE ABELLS SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	4,389.50	57.90
Commercial	18.08	0.24
Extractive	176.70	2.33
General Parking	0.07	0.00
Governmental and Institutional	11.35	0.15
Industrial	10.18	0.13
Landfill	5.53	0.07
Park and Recreational	88.98	1.17
Single-Family Residential	215.42	2.84
Streets and Highways	238.37	3.14
Other Transportation, Communication, and Utilities	1.13	0.01
Surface Water	27.74	0.37
Wetlands	1,542.25	20.34
Woodlands	855.55	11.29
Total	7,580.85	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE ALPINE VALLEY SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	4,111.28	60.29
Commercial	12.05	0.18
Extractive	34.18	0.50
Governmental and Institutional	5.07	0.07
Industrial	1.05	0.02
Park and Recreational	361.70	5.30
Single Family Residential	117.96	1.73
Streets and Highways	222.92	3.27
Other Transportation, Communication, and Utilities	8.06	0.12
Surface Water	9.93	0.15
Wetlands	662.53	9.72
Woodlands	1,272.27	18.66
Total	6,818.99	100.00

Source: SEWRPC, 1996

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LAND USE IN THE BAKER CREEK SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	6,218.73	82.49
Commercial	29.97	0.40
Extractive	12.69	0.17
General Parking	0.26	0.00
Governmental and Institutional	19.62	0.26
Industrial	17.00	0.23
Multi-Family Residential	12.09	0.16
Park and Recreational	108.95	1.45
Single-Family Residential	180.92	2.40
Streets and Highways	421.00	5.58
Other Transportation, Communication, and Utilities	19.68	0.26
Surface Water	48.81	0.65
Wetlands	211.23	2.80
Woodlands	237.48	3.15
Total	7,538.42	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE BEULAH STATION SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	4,918.59	70.13
Commercial	3.36	0.05
Extractive	13.05	0.19
Governmental and Institutional	3.27	0.05
Industrial	18.73	0.27
Landfill	35.69	0.51
Multi-Family Residential	0.78	0.01
Park and Recreational	11.63	0.17
Single-Family Residential	180.49	2.57
Streets and Highways	217.80	3.11
Other Transportation, Communication, and Utilities	75.57	1.08
Surface Water	32.97	0.47
Wetlands	1169.10	16.67
Woodlands	332.81	4.75
Total	7,013.86	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE EAST TROY SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	4,599.95	60.91
Commercial	59.73	0.79
Extractive	23.16	0.31
General Parking	0.38	0.01
Governmental and Institutional	109.51	1.45
Industrial	73.00	0.97
Landfill	123.13	1.63
Multi-Family Residential	18.79	0.25
Park and Recreational	13.50	0.18
Single-Family Residential	420.30	5.57
Streets and Highways	645.34	8.55
Other Transportation, Communication, and Utilities	163.26	2.16
Surface Water	71.75	0.95
Wetlands	740.42	9.80
Woodlands	489.62	6.48
Total	7,551.84	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE HONEY CREEK WILDLIFE AREA SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	2,310.88	58.30
Commercial	1.15	0.03
Extractive	16.89	0.43
Park and Recreational	0.86	0.02
Single-Family Residential	156.11	3.94
Streets and Highways	90.48	2.28
Other Transportation, Communication, and Utilities	53.72	1.36
Surface Water	59.06	1.49
Wetlands	888.90	22.42
Woodlands	385.88	9.73
Total	3,963.92	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE LAKE WANDAWEG SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	393.86	35.55
Commercial	1.11	0.10
Governmental and Institutional	8.26	0.75
Park and Recreational	2.95	0.27
Single-Family Residential	221.98	20.04
Streets and Highways	69.15	6.24
Other Transportation, Communication, and Utilities	3.76	0.34
Surface Water	119.69	10.80
Wetlands	95.82	8.65
Woodlands	191.31	17.27
Total	1,107.90	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE LAUDERDALE LAKES SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	4,398.10	54.93
Commercial	3.15	0.04
Governmental and Institutional	7.19	0.09
Industrial	0.84	0.01
Park and Recreational	124.02	1.55
Single-Family Residential	589.55	7.36
Streets and Highways	281.00	3.51
Surface Water	795.56	9.94
Wetlands	155.89	1.95
Woodlands	1,651.62	20.63
Total	8,006.92	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE LOWER HONEY CREEK SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	5,653.10	73.73
Commercial	3.18	0.04
Extractive	96.44	1.26
Governmental and Institutional	3.45	0.04
Industrial	16.98	0.22
Multi-Family Residential	0.21	0.00
Park and Recreational	13.56	0.18
Single-Family Residential	251.24	3.28
Streets and Highways	163.59	2.13
Other Transportation, Communication, and Utilities	72.75	0.95
Surface Water	57.45	0.75
Wetlands	497.90	6.49
Woodlands	837.58	10.92
Total	7,667.43	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
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LAND USE IN THE NORTH LAKE DIRECT SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	7,336.10	77.45
Commercial	2.34	0.02
Extractive	43.62	0.46
Governmental and Institutional	5.18	0.05
Industrial	4.69	0.05
Landfill	8.58	0.09
Park and Recreational	7.95	0.08
Single-Family Residential	218.50	2.31
Streets and Highways	219.94	2.32
Other Transportation, Communication, and Utilities	0.31	0.00
Surface Water	202.73	2.14
Wetlands	135.13	1.43
Woodlands	1,286.48	13.58
Total	9,471.55	100.00

Source: SEWRPC, 1996

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LAND USE IN THE PLEASANT LAKE SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	855.09	62.35
Commercial	1.45	0.11
Park and Recreational	32.53	2.37
Single-Family Residential	57.30	4.18
Streets and Highways	48.81	3.56
Surface Water	155.34	11.33
Wetlands	11.92	0.87
Woodlands	209.04	15.24
Total	1,371.50	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
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LAND USE IN THE POTTER LAKE SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	106.02	19.38
Commercial	0.97	0.18
Park and Recreational	10.14	1.85
Single-Family Residential	206.98	37.84
Streets and Highways	35.51	6.49
Surface Water	159.76	29.20
Wetlands	6.44	1.18
Woodlands	21.25	3.88
Total	547.05	100.00

Source: SEWRPC, 1996

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11/17/95

LAND USE IN THE SILVER LAKE SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	162.59	43.16
Governmental and Institutional	1.22	0.32
Single-Family Residential	73.89	19.61
Streets and Highways	26.81	7.12
Other Transportation, Communication, and Utilities	0.34	0.09
Surface Water	91.54	24.30
Wetlands	5.26	1.40
Woodlands	15.11	4.01
Total	376.75	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE SPRING BROOK SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	2,484.68	80.49
Extractive	15.02	0.49
Governmental and Institutional	5.41	0.18
Industrial	0.58	0.02
Single-Family Residential	36.91	1.20
Streets and Highways	56.21	1.82
Other Transportation, Communication, and Utilities	1.85	0.06
Surface Water	10.70	0.35
Wetlands	200.66	6.50
Woodlands	274.97	8.91
Total	3,087.00	100.00

Source: SEWRPC, 1996

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LAND USE IN THE SPRING CREEK SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	4,484.07	83.82
Extractive	18.44	0.34
Single-Family Residential	86.94	1.63
Streets and Highways	90.41	1.69
Other Transportation, Communication, and Utilities	0.37	0.01
Surface Water	2.85	0.05
Wetlands	386.16	7.22
Woodlands	280.20	5.24
Total	5,349.42	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE SPRING PRAIRIE SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	2,179.33	66.76
Commercial	1.39	0.04
Governmental and Institutional	1.86	0.06
Single-Family Residential	83.70	2.56
Streets and Highways	54.54	1.67
Other Transportation, Communication, and Utilities	3.13	0.10
Surface Water	25.21	0.77
Wetlands	531.65	16.29
Woodlands	383.57	11.75
Total	3,264.39	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE TIBBETS SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	8,955.51	85.87
Commercial	21.21	0.20
General Parking	0.61	0.01
Governmental and Institutional	64.14	0.61
Industrial	11.99	0.11
Multi-Family Residential	16.39	0.16
Park and Recreational	7.60	0.07
Single-Family Residential	375.71	3.60
Streets and Highways	288.75	2.77
Other Transportation, Communication, and Utilities	22.98	0.22
Surface Water	5.71	0.05
Wetlands	347.00	3.33
Woodlands	312.10	2.99
Total	10,429.70	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE UPPER HONEY SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	9,721.14	78.71
Commercial	7.81	0.06
Extractive	15.89	0.13
Governmental and Institutional	7.49	0.06
Industrial	31.69	0.26
Multi-Family Residential	1.47	0.01
Park and Recreational	3.55	0.03
Single-Family Residential	277.80	2.25
Streets and Highways	230.47	1.87
Other Transportation, Communication, and Utilities	5.87	0.05
Surface Water	52.37	0.42
Wetlands	1,235.95	10.01
Woodlands	759.29	6.15
Total	12,350.80	100.00

Source: SEWRPC, 1996

RPB/RTG/pk
LU-1990.rpb
11/17/95

LAND USE IN THE VIENNA SUBBASIN: 1990

Land Use Classification	Area (acres)	Percent
Agricultural and Other Open Land	2,376.53	66.70
Commercial	0.31	0.01
Governmental and Institutional	2.42	0.07
Park and Recreational	0.34	0.01
Single-Family Residential	134.80	3.78
Streets and Highways	81.45	2.29
Other Transportation, Communication, and Utilities	11.39	0.32
Surface Water	56.75	1.59
Wetlands	417.42	11.71
Woodlands	481.80	13.52
Total	3,563.22	100.00

Source: SEWRPC, 1996

Water Resource conditions and objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Upper Honey Subwatershed							
Perennial Stream A (TM1) Stream mile 25.6	0.9	CW / 0.9	CW / 0.9	Size and depth.	Natural.	Natural.	This area is rapidly urbanizing. Impede urban runoff and construction site runoff Maintain excellent wildlife area. Discourage impacts to numerous springs in area which flow to the unnamed tributary and to Honey Creek.
Recreational use		PBC / 0.9	PBC / 0.9	Size and depth.	Natural.	Natural.	None.
Perennial Stream B (TM2) Stream mile 24.6	1.9	LFF / 1.9	WWF / 1.9	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Nuisance Vegetation ???	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 1.9	PBC / 1.9	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.

Perennial Stream C (TM4) Stream mile 24.3	0.45	LFF / 0.45	LFF / 0.45	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Nuisance Vegetation.	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 0.45	PBC / 0.45	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.
Perennial Stream D (TM5) Stream mile 24.2	1.2	LFF / 1.2	LFF / 1.2	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Nuisance Vegetation.	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 1.2	PBC / 1.2	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.
Perennial Stream E (TM6) Stream mile 23.9	---	---	---	Loss of stream flow from Honey Creek (see next column).	Water diversion from Honey Creek. Picks up several more tributary streams and drainage ditches and flows back into Honey Creek at TM7.	Same	Eliminate water diversion from Honey Creek (see TM7 for all other management recommendations).

Perennial Stream F (TM7) Stream mile 22.1	5.9	LFF / 5.9	WSF / 5.9 (LFF if Honey Creek diversion at TM6 was eliminated)	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuaution	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen. Nuisance vegetation	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 5.9	PBC / 5.9	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.

Water Resource Objectives and Management Recommendations for Upper Honey Subwatershed

Upper Honey Subwatershed

Recommended Phosphorus Reduction - High

Recommended Suspended Solids Reduction - High

Recommend fecal coliform bacteria (MFFCC)
- reduction to less than 200 colonies/100ml

Stream	Location (RM = river mile)	Recommendations
Honey Creek	RM 26.8 - 25.5	Prevent construction site runoff and urban runoff from reaching Honey Creek. Maintain the large filter strip (buffer area) to allow for the settlement of sediment and nutrients from runoff and to protect the springs and wetland area. Discourage construction and other manipulative activities in the wetlands. Discourage impacts to all springs in the area.
Honey Creek	RM 24.7 - 23.9	Provide shading to the stream (trees, shrubs, etc.). Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Honey Creek	RM 23.9	Discourage water diversion.
Honey Creek	RM 23.9 - 20.6	Provide shading to the stream (trees, shrubs, etc.). Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Perennial Stream A	TM1	See Recommendations for Honey Creek at RM 25.5-26.8.
Perennial Stream B	TM2	Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Provide shading to the stream (trees, shrubs, etc.). Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Perennial Streams C & D	TM4, TM5	Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff.

		Provide shading to the stream (trees, shrubs, etc.). Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Perennial Stream F	TM6, TM7	Discourage the diversion of Honey Creek at TM6. Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Provide shading to the stream (trees, shrubs, etc.). Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.

Water Resource Conditions and Objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Troy Area Subwatershed							
Perennial Stream A (TA1) Stream mile 20.1	0.7	WWF / 0.7	WWF / 0.7	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of welands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 0.7	PBC / 0.7	Bacteria.	Fecal Coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.
Perennial Stream B (TA4) Stream mile 17.6	0.3	LFF / 1.9	WWF / 1.9	Loss of fish and macroinvertebrate habitat.	Channelization. Bank debrushing.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	East Troy WWTP effluent and natural low-flow.	East Troy WWTP effluent and natural low-flow.	None.
				Trophic/community imbalance. Potential chlorine toxicity.	Nutrients. Dissolved oxygen. Potential chlorine toxicity.	Urban runoff. East Troy WWTP.	Reduce nutrient loading Maintain adequate dechlorination of East Troy WWTP effluent.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Channelization.	Reduce or eliminate NPS runoff. Discourage future channelization.
Recreational use		PBC / 1.9	PBC / 1.9	Bacteria.	Fecal coliform.	East Troy WWTP, urban runoff.	Reduce or eliminate NPS runoff. Maintain adequate chlorination (and subsequent dechlorination) of WWTP effluent.
				Size and depth.	Natural.	Natural.	None.

Perennial Stream C (TA5) Stream mile 16.3	0.6	LFF / 0.6	LFF / 0.6	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Historic agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Channelization/snag removal.	Discourage future channelization and limit snag removal.
Recreational use		PBC / 0.6	PBC / 0.6	Size and depth.	Natural.	Natural.	None.
Intermittent Stream D (TA2) Stream mile 19.3	1.5	LAL / 1.5	LAL / 1.5	Stream flow fluctuation or low-flow.	Natural.	Natural	Discourage channelization and bank debrushing. Discourage future drainage of wetlands.
				Size and depth.	Natural.	Natural.	None.
Intermittent Stream E (TA3) Stream mile 19.1	1.0	LAL / 1.0	LAL / 1.0	Stream flow fluctuation or low-flow.	Natural.	Natural	Discourage channelization and bank debrushing. Discourage future drainage of wetlands.
				Size and depth.	Natural.	Natural.	Urbanizing area - control construction site erosion. BFI is in the headwaters - maintain adequate protection of the tributary from site runoff.

Water Resource Objectives and Management Recommendations for Troy Area Subwatershed

Troy Area Subwatershed

Recommended phosphorus reduction - Moderate to High

Recommended suspended solids reduction - Moderate to High

Recommend fecal coliform bacteria (MFFCC)
- reduction to less than 200 colonies/100ml

Stream	Location (RM = river mile)	Recommendations
Honey Creek	downstream of East Troy Dam	Remove urban debris (engine block, shovels, etc.).
Honey Creek	RM 18.4 - 16.3	Discourage future dredging and wetland drainage activities.
Honey Creek	RM 16.3 - 15.6	Investigate the feasibility of restoring Honey Creek to it's original channel in this section. Discourage future dredging and wetland drainage activities.
Honey Creek	RM 15.6 - 14.1	Discourage future dredging and wetland drainage activities.
Honey Creek	RM 14.1 - 13.9	Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities. Provide shading to the stream (trees, shrubs, etc.). Discourage future bank debrushing.
Honey Creek	RM 13.9 - 13.0	Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff.
Perennial Stream A	TA1	Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from cropland runoff. Discourage future dredging activities. Provide shading to the stream (trees, shrubs, etc.). Discourage future bank debrushing.
Perennial Stream B	TA4	Discourage future dredging and wetland drainage activities. Provide shading to the stream (trees, shrubs, etc.). Discourage future bank debrushing.

Perennial Streams C	TA5	Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.

Water Resource Conditions and Objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Beulah Station Subwatershed							
Perennial Stream A (B1) Stream mile 13.0	2.3	LFF / 2.3	LFF / 2.3	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of welands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen. Pesticides and herbicides.	Cropland runoff. Drain tiles.	Reduce nutrient loading Stop pesticides and herbicides from reaching the stream.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 2.3	PBC / 2.3	Bacteria.	Fecal Coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.
Perennial Stream B (B2) Stream mile 12.4	0.8	LFF / 0.8	LFF / 0.8	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Channelization.	Reduce or eliminate NPS runoff. Discourage future channelization.
Recreational use		PBC / 0.8	PBC / 0.8	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.

Perennial Stream C (B3) Stream mile 10.8	2.7	LFF / 2.7	WWF / 2.7	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Nuisance Vegetation.	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 2.7	PBC / 2.7	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.
Perennial Stream D (B4) Stream mile 10.8	2.6	LFF / 2.6	WWF / 2.6	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Nuisance Vegetation.	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 2.6	PBC / 2.6	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.

Perennial Stream E (B5) Stream mile 10.5	2.8	LFF / 2.8	WWF / 2.8	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Nuisance Vegetation.	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 2.8	PBC / 2.8	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.

Water Resource Objectives and Management Recommendations for Beulah Station Subwatershed

Beulah Station Subwatershed

Recommended phosphorus reduction - Moderate

Recommended suspended solids reduction - Moderate

Recommend fecal coliform bacteria (MFFCC)
- reduction to less than 200 colonies/100ml.

Stream	Location (RM = river mile)	Recommendations
Honey Creek	RM 13.0 - 12.4	Discourage future dredging and wetland drainage activities. Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from cropland runoff.
Honey Creek	RM 12.4 - 11.6	Discourage streambank pasturing. Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities.
Honey Creek	RM 11.6 - 9.2	Maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities.
Perennial Stream A	B1	Establish a filter strip of sufficient width (primarily upstream and downstream of Bell School Road) to allow for the settlement of sediment, nutrients and pesticides from cropland runoff. This is particularly critical in the areas where cropland runoff is being funneled directly to the stream. Discourage future dredging activities. Provide shading to the stream (trees, shrubs, etc.). Discourage future bank debrushing.
Perennial Stream B	B2	Discourage future dredging and wetland drainage activities. Discourage future bank debrushing. Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff.
Perennial Streams C	B3	Discourage streambank pasturing downstream of Stone Road.

		Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff throughout but specifically downstream of Stone Road. Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Perennial Streams D	B4	Discourage future dredging and wetland drainage activities. Establish a filter strip of sufficient width (upstream reaches of the stream) to allow for the settlement of sediment and nutrients from runoff.
Perennial Streams E	B5	Discourage future dredging and wetland drainage activities. Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff.

Water Resource Conditions and Objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Spring Creek Subwatershed							
Perennial Stream Spring Creek Stream mile 12.4	6.3	WWF / 6.3	WWS / 6.3	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Cropland runoff. Pasture. Drain tiles.	Reduce nutrient loading.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 6.3	PBC / 6.3	Bacteria.	Fecal Coliform.	Cropland and pasture runoff. Drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.

Water Resources Objectives and Management Recommendations for Spring Creek Subwatershed

Spring Creek Subwatershed

Recommended phosphorus reduction - Moderate

Recommended suspended solids reduction - Moderate

Recommend fecal coliform bacteria (MFFCC)
- reduction to less than 200 colonies/100ml.

Stream	Location (RM = river mile)	Recommendations
Spring Creek	RM 6.3 - 3.5	Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities. Provide shading to the stream (trees, shrubs, etc.). Discourage future bank debrushing.
Spring Creek	RM $\simeq$ 3.4	Discourage streambank pasturing (horses) upstream of Carver Rd. Maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff from the pasture.
Spring Creek	RM 3.1 - 0.7	Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities. Provide shading to the stream (trees, shrubs, etc.). Discourage future bank debrushing.
Spring Creek	RM 0.7 - 0.0	Discourage future wetland drainage activities. Maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff.

Water Resource Conditions and Objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Spring Prairie Subwatershed							
Perennial Stream A SPP1 Stream mile 4.8	2.9	LFF / 2.9	Cold Water / 2.9	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Cropland runoff. Pasture. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 2.9	PBC / 2.9	Bacteria.	Fecal Coliform.	Cropland and pasture runoff. Drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.

Water Resource Objectives and Management Recommendations for Spring Prairie Subwatershed

Spring Prairie Subwatershed	Recommended phosphorus reduction - Low to Moderate
	Recommended suspended solids reduction - Low to Moderate
	Recommend fecal coliform bacteria (MFFCC) - reduction to less than 200 colonies/100ml

Stream	Location (RM = river mile)	Recommendations
Perennial Stream A	Upstream of Valley View Dr.	Protect the springs and the surrounding wetland. Discourage future wetland drainage activities. Maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff.
Perennial Stream A	Upstream of Valley View Dr.	Discourage future bank debrushing and provide shading (trees, shrubs, etc.) to the stream to prevent stream warming. Discourage future dredging and wetland drainage activities. Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff.

Water Resource Conditions and Objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Lower Honey Creek Subwatershed							
Perennial Stream A (L1) Stream mile 8.0	1.2	LFF / 1.2	LFF / 1.2	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 1.2	PBC / 1.2	Bacteria.	Fecal Coliform. (Potential)	Cropland runoff. Drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.

Water Resource Objectives and Management Recommendations for Lower Honey Creek Subwatershed

Lower Honey Creek Subwatershed

Recommended phosphorus reduction - Low to Moderate (High for Perennial Stream A)

Recommended suspended solids reduction - Low to Moderate (High for Perennial Stream A)

Recommend fecal coliform bacteria (MFFCC) - reduction to less than 200 colonies/100ml.

Stream	Location (RM = river mile)	Recommendations
Honey Creek	RM 9.2 - 6.0	Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities. Provide shading to the stream (trees, bushes, etc.). Discourage future bank debrushing.
Honey Creek	Downstream of CTH D (RM 6.0)	Remove urban debris (tires, barrels, etc.) from Honey Creek. Discourage mowing lawn up to the edge of the stream. Establish a filter strip for runoff filtration purposes. Discourage future bank debrushing.
Honey Creek	RM 6.0 - 3.2	Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities. Provide shading to the stream (trees, bushes, etc.). Discourage future bank debrushing.
Honey Creek	RM 3.2 - 2.6	Discourage bank debrushing (except as required to maintain dike integrity along the impoundment). Discourage mowing lawn to the edge of the stream. Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff.
Perennial Stream A	L1	Establish/maintain a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future bank debrushing.

High reduction of total phosphorus and suspended solids.

Water Resource Conditions and Objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Tibbits Subwatershed							
Perennial Stream A (TB1) Stream mile 26.5	1.3	LFF / 1.3	LFF / 1.3	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Nuisance Vegetation. Potential pesticide contamination.	Cropland runoff. Drain tiles. Pesticide application to adjacent fields.	Reduce nutrient loading. Encourage filter strips along stream channel. Encourage nutrient pest management analysis to elliminate potential of pesticides from reaching the stream.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 1.3	PBC / 1.3	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.
Perennial Stream B (TB2) Stream mile 26.2	1.1	LFF / 1.1	LFF / 1.1	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Potential pesticide contamination.	Cropland runoff. Drain tiles.	Reduce nutrient loading. Encourage filter strips along stream channel. Encourage nutrient pest management analysis to elliminate potential of pesticides from reaching the stream.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 1.1	PBC / 1.1	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.

Perennial Stream C (TB3) Stream mile 25.0	1.2	LFF / 1.2	LFF / 1.2	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization Bank debrushing Drainage of wetlands	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Nuisance Vegetation. Potential pesticide contamination.	Cropland runoff. Drain tiles. Inadvertent spraying of pesticides in stream channel.	Reduce nutrient loading. Encourage filter strips along stream channel. Encourage nutrient pest management analysis to elliminate potential of pesticides from reaching the stream.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 1.2	PBC / 1.2	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles.	Reduce or eliminate NPS runoff.
				Size and depth.	Natural.	Natural.	None.
Perennial Stream D (TB4) Stream mile 24.8	2.7	LFF / 2.7	LFF / 2.7	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Nuisance Vegetation.	Cropland runoff. Drain tiles.	Reduce nutrient loading. Establish a filter strip along entire channel.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 2.7	PBC / 2.7	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles. Horse pasture in upstream reaches.	Reduce or eliminate NPS runoff. Establish a filter strip along entire channel.
				Size and depth.	Natural.	Natural.	None.

Perennial Stream E (TB5) Stream mile 24.1	2.8	WWF / 2.8	WWF / 2.8	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Enclosure. Bank debrushing. Drainage of wetlands.	Urban and Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural low-flow.	Urban stormwater runoff. Natural low-flow.	Establish urban stormwater management planning for water quality and quantity.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen. Potentially high chlorides.	Cropland runoff. Drain tiles. Urban stormwater runoff.	Reduce nutrient loading. Establish a filter strip along entire channel.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal. Urban stormwater runoff.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 2.8	PBC / 2.8	Bacteria.	Fecal coliform.	Cropland runoff and drain tiles. Urban stormwater runoff.	Reduce or eliminate NPS runoff. Establish a filter strip along entire channel. planning for water quality and quantity.
				Size and depth.	Natural.	Natural.	None.
Intermittent Stream F (TB6) Stream mile 23.8	2.7	LAL / 2.7	LAL / 2.7	Stream flow fluctuaution or low-flow.	Flashy stream. Natural intermittent flow.	Agricultural uses. Natural.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands. Encourage filter strips along ephemeral stream channel.
				Embedded substrates.	Sediment and suspended solids during high flow.	Cropland runoff and drain tiles.	

Water Resource Objectives and Management Recommendations for Tibbits Area Subwatershed

Tibbits Area Subwatershed

Recommended Phosphorus Reduction - High

Recommended Suspended Solids Reduction - High

Recommend fecal coliform bacteria (MFFCC)
- reduction to less than 200 colonies/100ml

Stream	Location (RM = river mile)	Recommendations
Sugar Creek	RM 27.2 - 23.4	Provide shading to the stream (trees, shrubs, etc.). Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Perennial Stream A	TB1	Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Provide shading to the stream (trees, shrubs, etc.). Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Perennial Stream B	TB2	Maintain filter strip that exists from confluence to stream mile 0.3. Establish filter strips of sufficient width to allow for the settlement of sediment and nutrients from runoff for both branches. Discourage future dredging and wetland drainage activities. Remove the fish barrier at the confluence with Sugar Creek.
Perennial Stream C	TB3	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Provide shading to the stream (trees, shrubs, etc.). Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Perennial Stream D	TB4	Same as TB3. Maintain / establish adequate buffer at pasture upstream of Sugar Creek Road.
Perennial Stream E	TB5	Same as TB3. Identify source of high conductivity from the stormsewer at the headwaters of the tributary. Stabilize stream bank downstream of Schmidt Road (eroded because of the bridge).

Water Resource Conditions and Objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Baker Creek Subwatershed							
Perennial Stream A (BC1) Stream mile 3.7	7.2	WWF / 7.2	WWS / 7.2	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification. Bank debrushing. Drainage of wetlands. Fish barrier at Potters Road.	Agricultural uses. Residential uses. Golf course.	Discourage future channelization and bank debrushing/mowing. Discourage future drainage of wetlands. Establish a buffer strip along entire stream channel.
				Trophic community imbalance.	Nutrients. Dissolved oxygen. Potential pesticide contamination.	Cropland runoff. Streambank pasturing. Residential and golf course fertilizer and pesticide use along stream. Residential and golf course mowing to bank and grass clippings in stream.	Reduce nutrient loading. Establish filter strip along entire channel. Cease dumping grass clippings into stream or along stream banks. Prevent pesticides and fertilizer from reaching stream. Fence domestic animals from the stream.
Recreational use							
				Stream flow fluctuation or low-flow.	Flashy stream. Natural low-flows.	Drain tiles. Highway runoff. Residential and golf course runoff.	Manage stormwater runoff from highways, residential and business properties and golf course runoff. None for low-flow conditions.
				Embedded substrates. Turbidity.	Sediment and suspended solids.	Cropland runoff. Streambank pasturing. Residential and golf course fertilizer and pesticide use along stream. Streambank erosion along golf course.	same as above
		PBC / 7.2	PBC / 7.2	Bacteria	Fecal coliform.	Cropland runoff, drain tiles, residential runoff, potential failed septic.	Reduce stormwater runoff. Correct any failed septic systems.
				Size and depth.	Natural.	Natural.	None.

Perennial Stream B (BC6) Stream mile 1.5	1.6	LFF / 1.6	LFF / 1.6	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification. Bank debrushing. Drainage of wetlands.	Agricultural uses. Residential uses (mowing along stream bank).	Discourage future channelization and bank debrushing/mowing. Discourage future drainage of wetlands. Establish a buffer strip along entire stream channel.
				Trophic community imbalance.	Nutrients. Dissolved oxygen. Potential pesticide contamination.	Cropland runoff. Residential fertilizer and pesticide use.	Reduce nutrient loading. Establish filter strip along entire channel. Cease dumping grass clippings into stream or along stream banks. Prevent pesticides and fertilizer from reaching stream.
				Stream flow fluctuation or low-flow.	Natural low-flow.	Natural low-flow.	None.
				Embedded substrates. Turbidity.	Sediment and suspended solids.	Cropland runoff, drain tiles, residential runoff. Streambank erosion where grass has been mowed to the stream bank.	Same as above.
Recreational use		PBC / 1.6	PBC / 1.6	Bacteria	Fecal coliform.	Cropland runoff, drain tiles, residential runoff, potential failed septic.	Reduce stormwater runoff.
				Size and depth.	Natural.	Natural.	
Perennial Stream C (BC8) Stream mile 1.2	1.2	LFF / 1.2	LFF / 1.2	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification/relocation.	Culvert under STH67 and relocated along STH 12 & 67.	Discourage future channel modifications.
				Trophic community imbalance.	Nutrients. Dissolved oxygen. Potential high chlorides.	Highway stormwater runoff. Potential construction site erosion during future planned highway work.	Establish a buffer strip along entire stream channel. Encourage stormwater management and construction site management practices.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural.	Highway stormwater runoff. Natural low-flow.	same as above
Recreational use		PBC / 1.2	PBC / 1.2	Embedded substrates. Turbidity.	Sediment. Suspended solids.	Highway stormwater runoff.	same as above
				Bacteria	Fecal coliform.	Road stormwater runoff.	same as above
				Size and depth.	Natural.	Natural.	none.

Intermittent Stream A (BC4) Stream mile 1.7	1.4	LAL / 1.4	LAL / 1.4	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification. Bank debrushing.	Agricultural uses in headwaters and residential uses near confluence with Baker Creek.	Establish a buffer strip along entire stream channel. Discourage mowing across stream channel.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural low-flow.	Cropland runoff.	Encourage stormwater management practices.
				Trophic/community imbalance.	Nutrients. Potential pesticide contamination.	Cropland runoff. Residential lawn care (fertilizer, pesticides)	Establish filter strip.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Bank erosion.	Control runoff from cropland. Establish filter strip.

Water Resource Objectives and Management Recommendations for Baker Creek Subwatershed

Baker Creek Subwatershed

Recommended Phosphorus Reduction - High

Recommended Suspended Solids Reduction - High

Recommend fecal coliform bacteria (MFFCC)
- reduction to less than 200 colonies/100ml

Stream	Location (RM = river mile)	Recommendations
Baker Creek	RM 7.2 - 3.7	Provide shading to the stream (trees, shrubs, etc.). Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Baker Creek	RM 2.6 - 2.2	Address barnyard runoff from upstream of Cobb Road. Discourage (eliminate if possible) livestock access to Baker Creek both upstream and downstream of Cobb Road. Discourage mowing along streambank upstream of Cobb Road. Allow stream bank wetland plants tb become reestablished. Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Provide shading to the stream (trees, shrubs, etc.). Discourage future dredging and wetland drainage activities. Discourage future bank debrushing. Remove the fish barrier from the culvert under Cobb Road.
Baker Creek	RM 2.2 - 1.7	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Provide shading to the stream (trees, shrubs, etc.). Discourage future bank debrushing. Discourage mowing lawns to streambank. Determine the presence of the failed residential septic system(s).
Baker Creek	RM 1.6 - 1.5	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff.

		Discourage future bank debrushing. Discourage future dredging. Discourage mowing lawns to streambank. Discourage piling brush debris and grass clippings along streambank. Remove the fish barrier from the culvert under Potters Road.
Baker Creek	RM 1.5 - 1.2	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Establish and maintain natural and diverse vegetation along stream bank. Discourage future bank debrushing. Discourage mowing to streambank. Discourage grass clippings from reaching the stream.
Baker Creek	RM 1.2 - 0.9	Discourage (eliminate if possible) livestock access to Baker Creek. Establish a filter strip of sufficient width to allow for the settlement of sediment, and nutrients from runoff. Discourage future bank debrushing. Discourage future dredging and wetland drainage activities.
Baker Creek	RM 0.9 - 0.0	Maintain filter strip of sufficient width to allow for the settlement of sediment, and nutrients from runoff. Discourage future bank debrushing. Discourage future dredging and wetland drainage activities.
Perennial Stream B	BC6	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Discourage future bank debrushing. Discourage future dredging. Discourage mowing lawns to streambank.
Perennial Stream C	BC8	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and roadside runoff where possible. Discourage future bank debrushing. Discourage future dredging. Discourage future channel relocation. Encourage appropriate construction site erosion practices during future road construction and diligent maintenance of erosion control methods.
Intermittent Stream A	BC4	Establish a filter strip of sufficient width to allow for the settlement of sediment,and nutrients from runoff.

Discourage future bank debrushing.
Discourage future dredging.
Discourage mowing lawns to streambank.

Water Resource Conditions and Objectives for Sugar-Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Abells Subwatershed							
Perennial Stream A (AB1) Stream mile 19.9	1.2	LFF / 1.2	LFF / 1.2	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Cropland runoff. Drain tiles.	Reduce nutrient loading.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 1.2	PBC / 1.2	Size and depth.	Natural.	Natural.	None.
Perennial Stream B (AB2) Stream mile 19.1	2.0	LFF / 2.0	LFF / 2.0	Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Embedded substrates.	Sediment.	Natural.	None.
Recreational use		PBC / 2.0	PBC / 2.0	Size and depth.	Natural.	Natural.	None.
Intermittent Stream H (AB8) Stream mile 19.8	0.1	LAL / 0.1	LAL / 0.1	Stream flow fluctuation or low-flow.	Flashy stream and natural low-flow.	Agricultural uses and potential construction site erosion. Natural low-flow.	Reduce or eliminate NPS runoff.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Potential construction site erosion.	Reduce or eliminate NPS runoff. Encourage appropriate protection from future construction site erosion.
Intermittent Stream C (AB3) Stream mile 18.0	0.6	LAL / 0.6	LAL / 0.6	Stream flow fluctuation or low-flow.	Flashy stream and natural low-flow.	Agricultural uses and potential construction site erosion. Natural low-flow.	Reduce or eliminate NPS runoff.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Potential construction site erosion.	Encourage appropriate protection from future construction site erosion.

Intermittent Stream D (AB4) Stream mile 16.2	1.5	LAL / 1.5	LAL / 1.5	Stream flow fluctuation or low-flow.	Flashy stream and natural low-flow.	Agricultural uses and potential construction site erosion. Natural low-flow.	Reduce or eliminate NPS runoff.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Potential construction site erosion.	Encourage appropriate protection from future construction site erosion.
Intermittent Stream E (AB5) Stream mile 15.8	1.1	LAL / 1.1	LAL / 1.1	Stream flow fluctuation or low-flow.	Flashy stream and natural low-flow.	Agricultural uses and potential construction site erosion. Natural low-flow.	Reduce or eliminate NPS runoff.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Potential construction site erosion.	Encourage appropriate protection from future construction site erosion.
Intermittent Stream F (AB6) Stream mile 15.3	0.7	LAL / 0.7	LAL / 0.7	Stream flow fluctuation or low-flow.	Flashy stream and natural low-flow.	Agricultural uses and potential construction site erosion. Natural low-flow.	Reduce or eliminate NPS runoff.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Potential construction site erosion.	Encourage appropriate protection from future construction site erosion.
Intermittent Stream G (AB7) Stream mile 15.2	0.6	LAL / 0.6	LAL / 0.6	Stream flow fluctuation or low-flow.	Flashy stream and natural low-flow.	Agricultural uses and potential construction site erosion. Natural low-flow.	Reduce or eliminate NPS runoff.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Potential construction site erosion.	Encourage appropriate protection from future construction site erosion.

Water Resource Objectives and Management Recommendations for Abells Subwatershed

Abells Subwatershed

Recommended Phosphorus Reduction - Low to Moderate

Recommended Suspended Solids Reduction - Low to Moderate

Recommend fecal coliform bacteria (MFFCC)
- reduction to less than 200 colonies/100ml

Stream	Location (RM = river mile)	Recommendations
Sugar Creek	RM 21.8 - 18.6	Provide shading to the stream (trees, shrubs, etc.). Establish a filter strip of sufficient width to allow for the settlement of sediment, and nutrients from runoff. Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Sugar Creek	RM 19.8 & 19.2	Remove old metal 55 gallon barrels from stream.
Sugar Creek	RM 18.6 - 14.4	Protect wetlands and filtration strip along stream channel.
Perennial Stream A	AB1	Maintain filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Provide shading to the stream (trees, shrubs, etc.). Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Perennial Stream B	AB2	Maintain filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Provide shading to the stream (trees, shrubs, etc.). Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Intermittent Stream H	AB8	Maintain filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities. Discourage future development of drainage area from increasing flows to pond and channel. Provide adequate construction site erosion control practices for any new development.

Water Resource Conditions and Objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Alpine Valley Subwatershed							
Perennial Stream A (AP1) Stream mile 14.4	1.5	WWS / 1.5	WWS / 1.5	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification. Severe bank erosion in upper reaches. Fish barrier below impoundment.	Old fish hatchery ponds. Campground lake (impoundment).	Stabilize banks in headwater reaches.
				Stream flow fluctuation or low-flow.	Natural and impoundment.	Natural and impoundment.	None.
				Embedded substrates. Stream bank erosion upstream of impoundment.	Sediment.	Flashy stream in headwater reaches.	Reduce stormwater runoff.
Recreational use		PBC / 1.4 FBC / 0.1	PBC / 1.4 FBC / 0.1	Size and depth.	Natural. Impoundment	Natural. Impoundment	None.
Perennial Stream B (AP2) Stream mile 13.7	0.5	LFF / 0.5	LFF / 0.5	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification.	Culvert under I43.	None.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural.	Natural.	None.
				Iron bacteria.	Natural.	Natural.	None.
Recreational use		PBC / 0.5	PBC / 0.5	Size and depth.	Natural.	Natural.	None.
Perennial Stream C (AP3) Stream mile 13.6	0.6	LFF / 0.6	LFF / 0.6	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification.	Culvert under wayside and under I43.	None.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural.	Natural.	None.
				Embedded substrates.	Sediment. Suspended solids.	Cropland runoff. Drain tiles.	Reduce nutrient loading
				Iron bacteria.	None.	None.	None.
Recreational use		PBC / 0.6	PBC / 0.6	Size and depth.	Natural.	Natural.	None.

Perennial Stream D (AP20) Stream mile 12.6	0.1	LFF / 0.1	LFF / 0.1	Stream flow fluctuation or low-flow.	Natural	Natural	None.
Recreational use		PBC / 0.1	PBC / 0.1	Size and depth.	Natural	Natural.	None.
Perennial Stream E (AP9) Stream mile 11.7	0.6	LFF / 0.6	CWF / 0.6	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification. Bank debrushing.	Golf course.	Discourage future channelization and bank debrushing.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural	Golf course fairways. Natural.	Establish filter strip.
				Trophic/community imbalance.	Nutrients. Potential pesticide contamination.	Golf course runoff.	Reduce nutrient loading. Reduce pesticide treatment along stream.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Golf course runoff.	Reduce or eliminate NPS runoff. Discourage future channelization modification.
Recreational use		PBC / 0.6	PBC / 0.6	Size and depth.	Natural.	Natural.	None.
Perennial Stream F (AP10) Stream mile 11.6	0.6	WWF / 0.6	WWF / 0.6	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification in lower reaches.	Golf course.	Discourage future channelization and bank debrushing.
				Trophic/community imbalance.	Nutrients. Potential pesticide contamination.	Golf course fairways. Natural.	Establish filter strip. Reduce nutrient loading. Reduce pesticide treatment along stream.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Golf course runoff.	Reduce or eliminate NPS runoff. Discourage future channelization modification.
Recreational use		PBC / 0.6	PBC / 0.6	Size and depth.	Natural.	Natural.	None.
Perennial Stream G (AP12) Stream mile 10.8	0.8	WWF / 0.8	WWF / 0.8	Loss of fish habitat.	Channel blockage	Large pipes in stream channel probably for the golf course.	Reinstall the pipes so as not to block the stream flow (this would require a permit).
				Trophic/community imbalance	Potential pesticide contamination.	Golf course runoff.	Reduce pesticide treatment along stream.
Recreational use		PBC / 0.8	PBC / 0.8	Size and depth.	Natural.	Natural.	None.

Perennial Stream H (AP13) Stream mile 10.6	0.5	LFF / 0.5	LFF / 0.5	Stream flow fluctuation or low-flow.	Natural	Natural	None.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Unknown (from small feeder streams)	Reduce or eliminate NPS runoff.
Recreational use		PBC / 0.5	PBC / 0.5	Size and depth.	Natural.	Natural.	None.
Perennial Stream I (AP14) Stream mile 10.4	0.5	CWF / 0.5	CWF / 0.5	Stream flow fluctuation or low-flow.	Natural	Natural	None
Recreational use		PBC / 0.5	PBC / 0.5	Size and depth.	Natural.	Natural.	None.
Perennial Stream J (AP15) Stream mile 9.2	1.0	LFF / 1.0	LFF / 1.0	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification. Bank debrushing.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural	Cropland runoff. Drain tiles. Natural low-flow.	Establish filter strip.
				Trophic/community imbalance.	Nutrients. Dissolved Oxygen.	Cropland runoff. Drain tiles.	Reduce nutrient loading.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 1.0	PBC / 1.0	Size and depth.	Natural.	Natural.	None.
Perennial Stream K (AP16) Stream mile 7.7	2.0	LFF / 2.0	LFF / 2.0	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification. Bank debrushing.	Agricultural uses.	Discourage future channelization and bank debrushing.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural	Cropland runoff. Drain tiles. Natural low-flow.	Establish filter strip.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Cropland runoff. Drain tiles.	Reduce nutrient loading.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 2.0	PBC / 2.0	Size and depth.	Natural.	Natural.	None.

Perennial Stream L (AP18) Stream mile 7.2	0.7	LFF / 0.7	LFF / 0.7	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification. Bank debrushing.	Agricultural uses.	Discourage future channelization and bank debrushing.
				Stream flow fluctuation or low-flow.	Natural	Natural low-flow.	None.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Drain tiles.	Reduce nutrient loading.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Channelization/snag removal.	Discourage future channelization modification.
Recreational use		PBC / 0.7	PBC / 0.7	Size and depth.	Natural.	Natural.	None.
Perennial Stream M (AP21) Stream mile 6.7	0.2	LFF / 0.2	LFF / 0.2	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification. Bank debrushing.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural	Cropland runoff. Natural low-flow.	Establish filter strip in headwater reaches.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Cropland runoff. Drain tiles.	Reduce nutrient loading.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization.
Recreational use		PBC / 0.2	PBC / 0.2	Size and depth.	Natural.	Natural.	None.
Intermittent Stream N (AP4) Stream mile 13.1	0.6	LAL / 0.6	LAL / 0.6	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification.	Culvert under I43.	None.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural low-flow.	Highway runoff. Natural low-flow.	Control highway runoff.
				Size and depth.	Natural.	Natural.	None.
Intermittent Stream O (AP5) Stream mile 13.0	0.6	LAL / 0.6	LAL / 0.6	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification.	Culvert under I43.	None.
				Stream flow fluctuation or low-flow.	Natural low-flow.	Highway runoff. Natural low-flow.	None.
				Loss of fish habitat during free-flowing periods.	Fish barrier	Large cement blocks near the confluence.	Remove or move block(s).
				Size and depth.	Natural.	Natural.	None

Intermittent Stream P (AP6) Stream mile 12.5	0.5	LAL / 0.5	LAL / 0.5	Stream flow fluctuation or low-flow.	Natural low-flow.	Natural low-flow.	None.
				Size and depth.	Natural.	Natural.	None.
Intermittent Stream Q (AP7) Stream mile 12.1	0.5	LAL / 0.5	LAL / 0.5	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification.	Agricultural uses.	Discourage future channelization and bank debrushing.
				Stream flow fluctuation or low-flow.	Flashy stream. Natural low-flow.	Barnyard Runoff. Highway runoff. Natural low-flow.	Control barnyard and highway runoff.
				Size and depth.	Natural.	Natural.	None.
Intermittent Stream R (AP8) Stream mile 12.0	0.6	LAL / 0.6	LAL / 0.6	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification.	Agricultural uses.	Discourage future stream enclosure, channelization, and bank debrushing.
				Stream flow fluctuation or low-flow.	Nutrients. Flashy stream. Natural low-flow.	Cropland runoff. Natural low-flow.	Reduce or eliminate NPS runoff from croplands.
				Size and depth.	Natural.	Natural.	None.
Intermittent Stream S (AP11) Stream mile 11.1	1.0	LAL / 1.0	LAL / 1.0	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification.	Enclosed under golf course.	Discourage future stream enclosure, and channelization.
				Stream flow fluctuation or low-flow.	Natural low-flow.	Natural low-flow.	None.
				Size and depth.	Enclosed.	Enclosed.	None.
Intermittent Stream T (AP17) Stream mile 7.2	0.7	LAL / 0.7	LAL / 0.7	Stream flow fluctuation or low-flow.	Natural low-flow.	Natural low-flow.	None.
				Size and depth.	Natural.	Natural.	None
Intermittent Stream U (AP19) Stream mile 5.6	0.9	LAL / 0.9	LAL / 0.9	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channel modification. Road culverts.	Agricultural uses.	Discourage future stream enclosure, channelization, and bank debrushing.
				Stream flow fluctuation or low-flow.	Nutrients. Flashy stream. Natural low-flow.	Cropland runoff. Natural low-flow.	Reduce or eliminate NPS runoff from croplands. Establish a filter strip.
				Size and depth.	Natural.	Natural.	None.

Water Resources Objectives and Management Recommendations for Alpine Valley Subwatershed

Alpine Valley Subwatershed	Recommended Phosphorus Reduction - Moderate
	Recommended Suspended Solids Reduction - Moderate
	Recommend fecal coliform bacteria (MFFCC) - reduction to less than 200 colonies/100ml

Stream	Location (RM = river mile)	Recommendations
Sugar Creek	RM 14.3 - 12.1	Maintain existing filter strip. Minimize roadside application of pesticides in vicinity of stream and drainage ways.
Perennial Stream A	AP1	Identify source(s) of flashy flows in headwater reaches (upstream of the impoundment) and stabilize stream banks. Identify options for eliminating fish barrier at downstream side of impoundment. Maintain existing filter strip upstream of Hodunk Road.
Perennial Stream C	AP3	Identify source(s) of flashy flows in headwater reaches (upstream of the wayside) and stabilize stream banks. Maintain filter strip that exists from wayside down to confluence with Sugar Creek.
Sugar Creek	RM 12.0 - 9.2	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Provide shading to the stream (trees, shrubs, etc.). Discourage future dredging and wetland drainage activities. Discourage future bank debrushing. When golf cart bridge requires replacement, WRM recommends spanning the creek more so as to prevent stream flow barrier during high flows and enable canoe passage underneath. Remove 55 gal. barrel from Sugar Creek (approx. RM 11.9)
Perennial Stream E	AP9	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Provide shading to the stream (tall grasses, trees, shrubs, etc.).

		Discourage mowing through stream channel.
Perennial Stream F	AP10	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff.
Perennial Stream G	AP12	Maintain filter strip. Identify options for moving pipes in stream which cause a fish barrier. Remove urban debris from channel (rim, trash, etc.)
Perennial Stream J	AP15	Maintain filter strip in lower reaches. Identify source(s) of flashy flows in headwater reaches and stabilize stream banks.
Sugar Creek	RM 9.2 - 5.6	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Discourage direct runoff via channelized flow from cornfield at stream mile 5.6. Stabilize banks through this stream reach. Remove urban debris from Sugar Creek; 55 gal. drum at stream mile 7.2, and couch at stream mile 5.6.
Perennial Stream K	AP16	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff.
Perennial Stream M	AP21	Establish a filter strip of sufficient width in the headwater reaches to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff.
Intermittent Stream Q	AP7	Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Identify source(s) of flashy flows in headwater reaches and stabilize stream banks.
Intermittent Stream R	AP8	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients and herbicides/pesticides from runoff.
Intermittent Stream U	AP19	Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Identify source(s) of flashy flows in headwater reaches and stabilize stream banks.

Water Resource Conditions and Objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Vienna Subwatershed							
Perennial Stream A (V1) Stream mile 4.8	0.6	LFF / 0.6	LFF / 0.6	Loss of fish and macroinvertebrate habitat.	Channelization. Drainage of welands.	Agricultural uses. Residential use (riprap placed in stream channel)	Discourage future channelization. Discourage future drainage of wetlands. Discourage future placement of rock riprap in stream channel.
				Stream flow fluctuation or low-flow.	Gully erosion. Natural low-flow.	Agricultural field in headwater reach. Natural.	Reduce or eliminate gully erosion. None.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal.
Recreational use		PBC / 0.6	PBC / 0.6	Bacteria	Fecal coliform	Horse pasture	Reduce or eliminate stormwater runoff from the agricultural field upstream of the horse pasture.
				Size and depth.	Natural.	Natural.	None.
Intermittent Stream A (V2) Stream mile 4.3	1.2	LAL / 0.1	LAL / 0.1	Stream flow fluctuation or low-flow.	Flashy stream and natural low-flow.	Agricultural uses and potential construction site erosion. Natural low-flow.	Reduce or eliminate NPS runoff.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Potential construction site erosion.	Reduce or eliminate NPS runoff. Encourage appropriate protection from future construction site erosion.
Intermittent Stream C (V3) Stream mile 3.2	0.3	LAL / 0.3	LAL / 0.3	Stream flow fluctuation or low-flow.	Flashy stream and natural low-flow.	Construction site erosion. Natural low-flow.	Reduce or eliminate NPS runoff.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Construction site erosion.	Encourage appropriate protection from future construction site erosion.

Water Resource Objectives and Management Recommendations for Vienna Subwatershed

Vienna Subwatershed

Recommended Phosphorus Reduction - Moderate

Recommended Suspended Solids Reduction - Moderate

Recommend fecal coliform bacteria (MFFCC) - reduction to less than 200 colonies/100ml

Stream	Location (RM = river mile)	Recommendations
Sugar Creek	RM 5.5 - 4.8	Maintain filter strip that exists. Discourage future bank debrushing.
Sugar Creek	RM 4.8 - 4.0	Maintain filter strip that exists. Discourage future bank debrushing. Discourage future dredging activities. Discourage use of farm equipment crossing through stream channel.
Sugar Creek	RM 4.0 - 0.5	Establish a filter strip of sufficient width to allow sediment to settle out and prevent nutrients and fecal coliform bacteria from entering the stream. Discourage streambank pasturing.
Perennial Stream A	V1	Identify exact source of sediment from headwaters area. Establish a filter strip of sufficient width to allow sediment to settle out and prevent nutrients and fecal coliform bacteria from entering the stream. Discourage streambank pasturing. Discourage placing riprap in stream. Remove enough riprap to reestablish a defined channel and eliminate the fish barrier.
Intermittent Stream B	V2	Maintain filter strip that exist.
Intermittent Stream C	V3	Establish and maintain adequate construction site erosion practices to prevent sediment runoff. Establish appropriate stormwater runoff measures to prevent increased flows to Intermittent Stream C.

Water Resource Conditions and Objectives for Sugar/Honey Creeks Watershed, Walworth & Racine Counties

Subwatershed Stream	Length (miles)	Current Use/Miles	Potential Use/Miles	Problems or Threats to Potential Uses	Factors Causing Problems or Threats	Observed or Potential Sources	Water Resource Management Recommendations
Spring Brook Subwatershed							
Spring Brook, North Branch (SB1) Stream mile 0.3	2.1	LFF / 2.1	WFF / 2.1	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Channelization. Bank debrushing. Drainage of wetlands.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Stream flow fluctuation or low-flow.	Natural.	Natural.	None.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Cropland runoff. Drain tiles.	Reduce nutrient loading. Establish filter strips.
				Embedded substrates. Turbidity.	Sediment. Suspended solids.	Cropland runoff. Channelization/snag removal.	Reduce or eliminate NPS runoff. Discourage future channelization and limit snag removal. Establish filter strip.
Recreational use		PBC / 2.1	PBC / 2.1	Bacteria	Fecal coliform	Cropland runoff.	Establish filter strip.
				Size and depth.	Natural.	Natural.	None.
Spring Brook (SB2, SB3 & SB7) Stream mile 0.3 - 3.0	4.4	WFF / 4.4	WFF / 4.4	Loss of fish and macroinvertebrate habitat. Loss of wildlife habitat.	Historical channelization. Bank debrushing. Drainage of wetlands in headwaters.	Agricultural uses.	Discourage future channelization and bank debrushing. Discourage future drainage of wetlands.
				Trophic/community imbalance.	Nutrients. Dissolved oxygen.	Cropland runoff. Drain tiles. Barnyards and pastures.	Reduce nutrient loading. Establish filter strips. Eliminate or reduce barnyard and pasture runoff.
				Stream flow fluctuation or low-flow.	Natural low-flow.	Natural low-flow.	None.
				Embedded substrates and turbidity.	Sediment (particularly in the headwater reaches). Suspended solids.	Cropland runoff. Drain tiles. Barnyards and pastures. Streambank erosion in downstream reaches. Potential construction site erosion.	Establish filter strips. Eliminate or reduce barnyard and pasture runoff. Encourage construction site erosion practices for all new construction.
				Bacteria	Fecal coliform.	Cropland runoff. Drain tiles. Barnyards and pastures.	Establish filter strips. Eliminate or reduce barnyard and pasture runoff.
Recreational use		PBC / 4.4	PBC / 4.4	Size and depth.	Natural.	Natural	None.

Water Resource Objectives and Management Recommendations for Spring Brook Subwatershed

Spring Brook Subwatershed

Recommended Phosphorus Reduction - Low to Moderate

Recommended Suspended Solids Reduction - Low to Moderate

Recommend fecal coliform bacteria (MFFCC)
- reduction to less than 200 colonies/100ml

Stream	Location (RM = river mile)	Recommendations
Spring Brook	RM 4.4 - 3.7	Provide shading to the stream (trees, shrubs, etc.). Establish a filter strip of sufficient width to allow for the settlement of sediment and nutrients from runoff. Discourage future dredging and wetland drainage activities. Discourage future bank debrushing.
Spring Brook	RM 3.7 - 2.7	Maintain and protect streambank buffer.
N. Br. Spring Brook	Entire branch	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Provide shading to the stream (trees, shrubs, etc.). Discourage future bank debrushing. Discourage future dredging.
Spring Brook	RM 1.7 - 1.5	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and fecal coliform bacteria from runoff. Prevent runoff from pastures and barnyards in this stream reach.
Spring Brook	RM 0.6 - 0.0	Establish a filter strip of sufficient width to allow for the settlement of sediment, nutrients, and herbicides/pesticides from runoff. Discourage future bank debrushing. Discourage future dredging and wetland drainage activities.

APPENDIX B
Interim Best Management Practices

DNR Nonpoint Source Pollution Abatement Program

Interim Best Management Practice

(The Nonpoint Source Pollution Abatement Program will no longer use alternative as the defining word for interim Best Management Practices (BMPs). Interim BMPs are created to meet the specific and individual needs identified during the planning process of a priority watershed project and will be used on a trial basis. The practice will be evaluated for its effectiveness before consideration as a BMP. A procedure defining the process for interim BMP approval will be detailed within the Implementation Handbook).

A. Name of practice:

Sugar-Honey Creeks Manure Spreading Alternative

B. Definition:

The Sugar-Honey Creeks manure spreading alternative is the rental of additional lands to enable the livestock producer to have sufficient cropland to safely spread animal waste.

C. Purpose:

Many areas of Wisconsin generate more manure than can be utilized without potentially impacting the surface and groundwater of the state. This interim best management practice will provide the relief and incentive to spread manure where it can be agronomically and environmentally applied to agricultural lands in a safe manner. It is the intent of this practice to provide producers with a cost effective alternative to manure storage structures, reducing capital costs for both the producer and the priority watershed program.

This practice will provide the local governmental unit with an additional management tool as well as providing the landowner with another viable alternative to constructing a manure storage facility.

D. Conditions:

1) Those producers with an existing manure storage structure must have manures tested to identify nutrient values.

2) All manure spreaders must be calibrated.

3) All lands receiving manure as a result of this BMP must have a current nutrient management plan meeting NRCS Field Office Technical Guide Standard 590, including all owned and rented cropland.

4) Those lands which drain into natural lakes will have the nutrient management plan developed based on phosphorus (Honey Lake is considered an impoundment, not a natural lake).

5) Vehicles used to haul liquid manure a distance greater than three miles must be liquid tight.

6) Cost sharing may be provided for:

a. the nutrient management plan for the land receiving the product that is contiguous to land within the watershed.

b. soil (and manure testing for operators with an existing manure storage structure) testing to determine nutrient content.

c. the rental of land within 3.0 miles of the farmstead that is generating excess manure provided that:

1) the participant does not own, rent, operate, or have a vested interest in the land at the time the agreement is signed;

2) the landowner is willing to enter into a rental agreement that identifies the use for manure application;

3) the cost-share will be used for the needed spreadable acres only, as identified within the 590 - Nutrient Management Plan.

d. three times within the grant period, with a $15,000.00 maximum incentive per watershed participant.

7) Cost sharing may not be provided for:

a. farmsteads that have adequate lands available to apply manure meeting NRCS Standard 590;

b. the field application of manure;

c. equipment needed to load, haul, or apply the manure;

d. the rental of land beyond 3.0 miles;

e. landowners who have received cost sharing for the installation of manure storage structures.

8) Cost sharing will be provided at a flat rate of:

a. 50% of the cost of the nutrient management plan, soil test, (and manure/byproduct testing for those with an existing manure storage structure.

b. a flat rate of $25 per acre for rental acres needed for additional manure spreading.

9) For evaluation purposes of the cost share agreement, this interim BMP will be considered to be applied when the manure has been properly managed on an annual basis.

APPROVED: Andrew Wallace Jr. — 11/4/96

Planning Unit Leader — Date

APPROVED: Gordon P. Stevenson — 12/06/96

Technical Unit Leader — Date

APPROVED: Gordon Stevenson — 12/06/96

Section Chief — Date

for Becky Wallace

DNR Nonpoint Source Pollution Abatement Program

Interim Best Management Practice

(The Nonpoint Source Pollution Abatement Program will no longer use alternative as the defining word for interim Best Management Practices (BMPs). Interim BMPs are created to meet the specific and individual needs identified during the planning process of a priority watershed project and will be used on a trial basis. The practice will be evaluated for its effectiveness before consideration as a BMP. A procedure defining the process for interim BMP approval will be detailed within the Implementation Handbook).

A. Name of practice:

Sugar-Honey Creeks Field Windbreaks and Windbreak Renovation.

B. Definition:

A strip or belt of trees and/or shrubs established in or adjacent to a field.

C. Purpose:

To reduce soil blowing and the suspension of sediments that frequently carry herbicides, fertilizers, and other contaminants to surrounding surface water areas. Proper placement of field windbreaks will reduce the volume of sediments entering adjacent surface water bodies, conserve soil moisture, and protect crops from wind damage.

D. Eligibility Parameters for Field Windbreak Establishment

1) Field windbreaks can be installed to protect cropland that is currently exceeding the tolerable soil loss level "T", as calculated by the WEQ (Wind Erosion Equation) or at levels needed to reduce crop damage and the saltation and suspension of sediments by wind, that are contaminating surface water bodies. These levels, if less than "T", must be documented in the local Field Office Technical Guide.

A) The renovation of an existing windbreak is an eligible practice provided that one of the following conditions exist:

Renovation is needed to provide adequate soil loss protection ("T") or level determined by the FOTG.

The renovation will assure that nonpoint source pollution levels will meet the nonpoint source water quality goals and objectives.

2) Wildlife and environmental consideration shall be given when designing this practice.

3) A Cost-Share Agreement shall be signed by the landowner.

4) This system shall be maintained for a minimum of ten years from the installation date of the final practice listed on the cost share agreement.

5) Windbreaks shall be strategically located to minimize soil deposition to surface water. If it is necessary to place a windbreak near surface water, the windbreak shall be established at least 20 feet from the waters edge to reduce the chance of soil deposition to the stream.

6) Windbreak establishment, renovation, and planning considerations shall follow NRCS Technical Guide Specification Numbers

382 - Fencing
392 - Field Windbreaks
650 - Windbreak Renovation

E. Maintenance

An operation and maintenance plan for field windbreaks will include documentation that meets the following criteria:

1) Dead trees or shrubs will be replaced whenever their absence will have a negative affect on windbreak performance.

2) Windbreaks should be thinned whenever crowding is contributing to reduced growth rates, limb loss, or insect and disease problems.

3) Whenever feasible and economically practical, windbreaks should be protected from insect and disease damage. Care should be taken in the selection of species that are not subject to known local insect and disease problems.

4) Windbreak plantings should be planned so that protection from physical damage is assured. Posting, flagging, and fencing can be used to exclude vehicles from the plantings.

F. Cost-sharing is authorized:

1) At a rate of 70% for planting trees or shrubs as needed for restoring or establishing field windbreaks. Eligible components will include site preparation, plant materials, installation, weed control, fencing, and protective tree shelters.

2) Eligible components for windbreak renovation will be provided at a rate of 70% and includes thinning, pruning, girdling, and tree removal.

G. Cost-sharing is not authorized for:

1) Fencing for property boundary delineation.

2) Planting orchard trees or plantings for ornamental purposes.

3) The establishment of field windbreaks in areas which the landowner or operator will allow livestock access.

4) Sites where there is no direct benefit to protecting the surface water resource.

APPROVED: Richard Wedepohl — 01/10/97
Planning Unit Leader — Date
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APPENDIX C
List of Acronyms

ACP	Agricultural Conservation Program
BARNY	Barnyard nutrient analysis model
BIM-GEO	DNR Bureau of Information Management-Geographical Unit
BMP	Best Management Practice
CAC	Citizen Advisory Committee
COD	Chemical Oxygen Demand
CRP	federal Cropland Reserve Program
CSA	Cost share agreement
DATCP	Wisconsin Department of Agriculture, Trade, and Consumer Protection
DILHR	Department of Industry, Labor, and Human Relations
DNR	Wisconsin Department of Natural Resources
EQIP	Environmental Quality Incentive Program
FFA	Future Farmers of America
FOCS	Field Offices Computing System
FPP	Wisconsin Farmland Protection Program
FSA	Farm Service Agency (United States Department of Agriculture)
GW	groundwater
I&E	Information and Education
LCC	Land Conservation Committee
LCD	Land Conservation Department
LWCB	Land and Water Conservation Board
NPM	Nutrient and Pest Management
NRCS	Natural Resource Conservation Service
SHS	Wisconsin State Historical Society
SIP	Stewardship Incentive Program
SOS	Signs of Success monitoring program
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UWEX	University of Wisconsin-Extension
WGNHS	Wisconsin Geological and Natural History Survey
WIN-HUSLE	sediment transfer model based on the Universal Soil Loss Equation
WPDES	Wisconsin Pollutant Discharge Elimination System [permit system]
WRP	Wetland Reserve Program
WUWN	Wisconsin Unique Well Number assigned to well sample sites

APPENDIX D
Watershed Planning Methods

Watershed Planning Methods

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

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

Evaluating Water Quality and Aquatic Habitat

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

The DNR's Southeast District water resources staff conducted investigations of the existing water resource conditions for the lakes and the streams in the Sugar-Honey Creek watershed from May 1995 through November 1995. Their purpose was to evaluate water quality problem and establish a basis for setting water resource management objectives. Detailed assessment results are documented in the Sugar-Honey Creeks Priority Watershed Surface Water Appraisal-Draft (Galarneau and Nelson, 1996) and the Sugar-Honey Creeks Priority Watershed Lakes Water Quality Appraisal Report-Draft (Helsel, 1996).

Data Collection

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

Subwatershed Delineation and Stream Segmentation

Prior to collecting field data, the watershed was divided into 19 subwatersheds. These delineations were used to divide the perennial and intermittent stream networks into segments and each subwatershed into smaller hydrologic units. Stream segments were used to separate portions of waterways where there were pronounced differences in stream character and/or quality.

Stream Habitat Evaluation

Information characterizing stream habitat-including flow rate and depth, substrate quality, channel configuration, streambank stability, and water temperature-were collected using techniques that the DNR developed. The data were evaluated using habitat protocols developed by Ball (1982) and Simonson et al. (1994). In conjunction with this assessment, the Fish Habitat Rating developed by Simonson, Lyons and Kanehl (1994) was also determined.

Fish Surveys

Fish communities were assessed qualitatively using a combination of historical data and information collected during 1995.

Fish community surveys were conducted on Baker Creek, Spring Brook and four unnamed tributaries in the Honey-Sugar Creeks watershed project area. Fish collections and habitat were assessed using the Index of Biological Integrity (IBI) protocol developed by Lyons (1992).

Water Quality Assessment

Streams

Water quality was assessed through a review of historical water chemistry data, sampling selected sites for total phosphorus, total suspended solids and fecal coliform, and sampling for fish and invertebrates. Macroinvertibrate (kick net) samples were collected in the autumn of 1995 and analyzed using the Hilsenhoff's Biotic Index (Hilsenhoff 1987) and other biometric indices (Szctyko, 1988) to determine the present condition of the streams in the Sugar-Honey Creeks Watershed.

Lakes

In order to evaluate lake water quality, five to ten years of water quality data is typically required. The 7 lakes of the Sugar-Honey Creeks watershed were monitored intensively in 1995 and the data has limited use to evaluate current water quality conditions of the lakes.

Navigability and Recreational Use

The extent and degree to which streams are navigable was determined based on evidence of canoeing or boating, field data, and information from landowners and local experts. Recreational uses were determined through field observations, file data, and information from local users.

Data Interpretation

The information described above was used to determine the existing and potential biological and recreational uses for the surface waters in the Sugar-Honey Creeks watershed.

Assessing Pollution Sources

Rural Nonpoint Sources

The purpose of the pollution source assessment is to identify the rural and urban sources and quantities of pollutants impacting surface waters.

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

- Eroding croplands
- Eroding and trampled streambanks
- Barnyard and livestock area runoff
- Runoff from areas of winterspread manure

The Racine County and Walworth County Land Conservation Departments (LCD) conducted rural land use inventories from 1995 through 1996. The Walworth County and Racine County Land Conservation Department in cooperation with the Department of Natural Resources (DNR) and the Department of Agriculture, Trade, and Consumer Protection (DATCP) completed data analysis.

Upland Erosion and Sediment Delivery: The Land Conservation Department Staffs conducted the inventory on 23 percent of the rural uplands within the Sugar-Honey Creeks Watershed. The information obtained for each parcel included size, soil type, erodibility, slope and slope length, land cover, crop rotation, present management, overland flow distance, channel type, and channel length.

Upland erosion and sediment delivery was determined using the Wisconsin Nonpoint Source (WINHUSLE) Model (Baun and Snowden).

The WINHUSLE predicts the average annual quantity of eroded soil reaching surface waters from each farm field. The determination is made based on a "typical" year of precipitation. Estimated sediment delivery was used to assess the relative pollution of each farm field in the watershed.

Streambank and Shoreline Erosion: The LCD staffs conducted field surveys on approximately 100 miles of streams and tributaries and all shorelines of the 7 lakes in the Honey-Sugar Creeks watershed.

A modified version of the streambank erosion analysis included in the Phase II of the Inventory

Monitoring process used by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) was used to estimate the amount of sediment lost annually from each eroded streambank site. At locations where erosion was occurring, the following information was recorded:

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

Runoff from Areas Winterspread with Livestock Waste: This analysis was done to estimate the pollution potential associated with land spreading livestock waste in the watershed. The information collected during the barnyard inventory, upland erosion inventories, and with the pilot nutrient management plans was used in this evaluation.

The analysis included looking at the number of acres that each livestock operation needed to landspread manure and the acres of sensitive land unavailable for manure application. The relative pollution potential of each livestock operation for runoff of landspread manure was determined.

Barnyard and Livestock Area Runoff: The Land Conservation Department (LCD) conducted field surveys of 108 barnyards in the Sugar-Honey Creeks watershed to collect information needed to determine their pollution potential.

The barnyard data was used in the BARNY Model (Baun, 1987). Information about the mass loading of total phosphorus and chemical oxygen demand (COD) generated during a 10-year, 24-hour rainfall event was used to evaluate the pollution potential of each barnyard. The livestock operations were ranked according to their potential to impact surface and/or groundwater quality.

Urban Nonpoint Sources

Principal urban nonpoint sources evaluated in preparing this plan include:

* Existing urban lands
* Construction Erosion
* Streambank and shoreline erosion.

Land use data provided by the Southeastern Wisconsin Regional Planning Commission, (SEWRPC) was used to quantify urban land use and estimate the existing urban pollution loads.

Construction sites in the Sugar-Honey Creeks watershed were identified. The effectiveness of erosion prevention and control on each site was evaluated.

Streambanks and shorelines in urban areas were inventoried using the same techniques used for the rural inventory.

Other Pollution Sources

Additional sources of surface water pollution included an inventory of the mineral extraction sites in the Sugar-Honey Creeks watershed.

An evaluation of the effectiveness of erosion prevention and sediment control methods used in the process of mineral extraction was conducted.

Well Sampling

Several private wells were sampled in the Sugar-Honey Creeks watershed to determine the extent of ground water contamination. All private wells were sampled where barnyard field inventories were collected. Other private wells were randomly selected throughout the watershed to sample and test.

Establishing Water Resources Objectives

Recreational and biological resources objectives were established for each of the streams and lakes in the watershed. These objectives identify how this project is anticipated to change the quality of the aquatic environment for recreational and biological uses.

Establishing Pollution Reduction Goals

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

Nonpoint source goals in this plan are a refinement of the recommendations contained in water quality management plans prepared by the Southeast Wisconsin Regional Planning Commission (SEWRPC).

The nonpoint source pollution reduction goals in this plan specifically target the control of sediment, phosphorus, and COD in rural areas and the control of sediment, phosphorus, urban toxic materials, and stream flow changes in urban areas.

Water resource objectives presented in this plan recognize that pollution control and resource management efforts beyond the scope of the nonpoint source control program are needed to achieve the identified objectives. These will include implementation of other recommended management actions which the SEWRPC establishes in the amended areawide water quality management plan for southeastern Wisconsin.

Developing a Nonpoint Source Pollution Control Strategy

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

* Critical nonpoint pollution sources.
* Effective management practices and guidelines for the use of state cost share funds for practice installation.
* Estimated cost of installing practices and supporting staff.
* Responsibilities, estimated workload and work schedules for local implementing agencies and guidelines for the use of state funds.
* Information and education needs.
* Project evaluation needs.

Identification of critical nonpoint sources eligible for cost-sharing assistance and enforcement and technical assistance under the Nonpoint Source Water Pollution Program were determined by:

* Evaluating pollutant loading for each nonpoint source in watershed.
* Determining the relative importance of controlling each source to achieving the water resource objectives.
* Developing criteria to determine which sources need to be controlled.
* Applying the criteria to determine eligibility for participation in the priority watershed project.

This evaluation was carried out on a subwatershed and watershed basis for the rural and urban nonpoint sources. The result is a site specific ranking of the nonpoint sources and determination of the assistance to be made available through the nonpoint source program for their control.

Involving the Public and Local Units of Government

The DNR and the LCDs convened an advisory committee and several technical work groups for the purpose of developing this watershed plan. The advisory committee and the workgroups reviewed land and water resources assessment, information, and assisted in the development of water resource objectives, pollution reduction goals, and a pollution control strategy.

APPENDIX E
GLOSSARY

ACUTE TOXICITY:

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

ADVANCED WASTEWATER TREATMENT:

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

AGRICULTURAL CONSERVATION PROGRAM (ACP):

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

ALGAE:

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

AMMONIA:

A form of nitrogen (NH_3) found in human and manures. Ammonia can be toxic to aquatic life.

ANAEROBIC:

Without oxygen.

ANOXIC:

AREA OF CONCERN:

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

AREAWIDE WATER QUALITY MANAGEMENT PLANS (208 PLANS):

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

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

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

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

BARNY:
The Wisconsin Barnyard runoff model, a computer model used to assess the water quality impacts of barnyards or feedlots. It was developed by DNR with assistance from NRCS and DATCP.

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

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

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

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

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

BIOCHEMICAL OXYGEN DEMAND (BOD):

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

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

BIOTA:
All living organisms that exist in an area.

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

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

CARCINOGENIC:
A chemical capable of causing cancer.

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

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

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

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

CLEAN WATER ACT:

See "Public Law 92-500."

COMBINED SEWERS:

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

CONFINED DISPOSAL FACILITY (CDF):

A structure built to contain and dispose of dredged material.

CONGENERS:

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

CONSERVATION TILLAGE:

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

CONSUMPTION ADVISORY:

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

CONTAMINANT:

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

CONVENTIONAL POLLUTANT:

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

COST-EFFECTIVE:

A level of treatment or management with the greatest incremental benefit for the money spent.

CRITERIA:

See water quality standard criteria.

DIEL:

DIOXIN (2,3,7,8-tetrachlorodibenso-p-dioxin):

A chlorinated organic chemical which is highly toxic.

DISINFECTION:

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

DISSOLVED OXYGEN (DO):

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

DISTRICTS:

DNR field offices. There are six DNR administrative districts in the state (see inside back cover for map).

DREDGING:

Removal of sediment from the bottom of water bodies.

ECOSYSTEM:

The interacting system of biological community and its nonliving surrounding.

EFFLUENT:

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

EFFLUENT LIMITS:

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

EMISSION:

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

ENVIRONMENTAL PROTECTION AGENCY (USEPA):

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

ENVIRONMENTAL REPAIR FUND:

A fund established by the Wisconsin Legislature to deal with abandoned landfills.

EPIDEMIOLOGY:

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

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

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

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

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

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

FILAMENTOUS ALGAE:

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

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

GREEN STRIPS:
See buffer strip.

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

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

HEAVY METALS:

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

HERBICIDE:

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

INFLUENT:

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

IN-PLACE POLLUTION:

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

ISOROPYLBIPHENYL:

A chemical compound used as a substitute for PCB.

LANDFILL:

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

LEACHATE:

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

LOAD:

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

MACROPHYTE:

A rooted aquatic plant.

MASS:

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

MASS BALANCE:

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

MESOTROPHIC:

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

MILLIGRAMS PER LITER (mg/1):

A measure of the concentration of substance in water. For most pollution measurement this is the equivalent of "parts per million".

MITIGATION:

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

MIXING ZONE:

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

NONPOINT SOURCE POLLUTION (NSP):

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

OLIGOTROPHIC:

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

OUTFALL:

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

PATHOGEN:

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

PELAGIC:
Referring to open water portion of a lake.

PERIPHYTON:

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

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

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

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

PHOTOSYNTHESIS:

PLANKTON:
Tiny plants and animals that live in water.

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

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

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

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

PRETREATMENT:

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

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

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

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

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

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

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

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

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

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

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA):

This federal law amends the Solid Waste Disposal Act of 1965 and expands on the Resource Recovery Act of 1970 to provide a program that regulates hazardous wastes, to eliminate open dumping and to promote solid waste management programs.

RETRO-FIT:

The placement of an urban structural practice in an existing urban area, which may involve rerouting existing storm sewers and/or relocating existing buildings or other structures.

RIPARIAN:

Belonging or relating to the bank of a lake, river or stream.

RIPRAP:

Broken rock, cobbles, or boulders placed on the bank of a stream to protect it against erosion.

RULE:

Refers to Wisconsin administrative rules. See Wisconsin Administrative Code.

RUNOFF:

Water from rain, snowmelt, or irrigation that flows over the ground surface and returns to streams. Runoff can collect pollutants from air or land and carry them to receiving waters.

SECONDARY IMPACTS:

The indirect effects that an action can have on the health of the ecosystem or the economy.

SECONDARY TREATMENT:

Two-stage wastewater treatment that allows the coarse particles to settle out, as in primary treatment, followed by biological breakdowns of the remaining impurities. Secondary treatment commonly removes 90% of the impurities. Sometimes "secondary treatment" refers simply to the biological part of the treatment process.

SEDIMENT:

Soil particles suspended in and carried by water as a result of erosion.

SEICHES:

Changes in water levels due to the tipping of water in an elongated lake basin whereby water is raised in one end of the basin and lowered in the other.

SEPTIC SYSTEM:

Sewage treatment and disposal for homes not connected to sewer lines. Usually the system includes a tank and drain field. Solids settle to the bottom of the tank. Liquid percolates through the drain field.

SLUDGE:

A byproduct of wastewater treatment; waste solids suspended in water.

SOLID WASTE:

Unwanted or discharged material with insufficient liquid to be free flowing.

STANDARDS:

See water quality standards.

STORM SEWERS:

A system of sewers that collect and transport rain and snow runoff. In areas that have separated sewers, such stormwater is not mixed with sanitary sewage.

SUPERFUND:

A federal program that provides for cleanup of major hazardous landfills and land disposal areas.

SUSPENDED SOLIDS (SS):

Small particles of solid pollutants suspended in water.

SYNERGISM:

The total effect is greater than the sum of the individual effects. For example, the characteristic property of a mixture of toxicants that exhibits a greater-than-additive cumulative toxic effect.

TERTIARY TREATMENT:

See advanced wastewater treatment.

TOP-DOWN MANAGEMENT:

A management theory that uses biomanipulation, specifically the stocking of predator species of fish to improve water quality.

TOTAL MAXIMUM DAILY LOADS:

The maximum amount of a pollutant that can be discharged into a stream without causing a violation of water quality standards.

TOXIC:

An adjective that describes a substance which is poisonous, or can kill or injure a person or plants and animals upon direct contact or long-term exposure. (Also, see toxic substance.)

TOXIC SUBSTANCE:

A chemical or mixture of chemicals which, through sufficient exposure, or ingestion, inhalation of assimilation by an organism, either directly from the environment or indirectly by ingestion through the food chain, will, on the basis of available information cause death, disease, behavioral or immunologic abnormalities, cancer, genetic mutations, or development of physiological malfunctions, including malfunctions in reproduction or physical deformations, in organisms or their offspring.

TOXICANT:
See toxic substance.

TOXICITY:
The degree of danger posed by a toxic substance to animal or plant life. Also see acute toxicity, chronic toxicity and additivity.

TOXICITY REDUCTION EVALUATION:
A requirement for a discharger that the causes of toxicity in an effluent be determined and measures taken to eliminate the toxicity. The measures may be treatment, product substitution, chemical use reduction or other actions that will achieve the desired result.

TREATMENT PLANT:
See wastewater treatment plant.

TROPHIC STATUS:
The level of growth or productivity of a lake as measured by phosphorus content, algae abundance, and depth of light penetration.

TURBIDITY:
Lack of water clarity. Turbidity is usually closely related to the amount of suspended solids in water.

UNIFORM DWELLING CODE:

a statewide building code for communities larger than 2500 residents specifying requirements for electrical, heating, ventilation, fire, structural, plumbing, construction site erosion, and other construction related practices.

UNIVERSITY OF WISCONSIN-EXTENSION (UWEX):
A special outreach, education branch of the state university system.

VARIANCE:
Government permission for a delay or exception in the application of a given law, ordinance or regulation. Also, see water quality standard variance.

VOLATILE:
Any substance that evaporates at a low temperature.

WASTELOAD ALLOCATION:

Division of the amount of waste a stream can assimilate among the various dischargers to the stream. This limits the amount (in pounds) of chemical or biological constituent discharged from a wastewater treatment plant to a water body.

WASTEWATER:

Water that has become contaminated as a byproduct of some human activity. Wastewater includes sewage, washwater and the water-borne wastes of industrial processes.

WASTE:

Unwanted materials left over from manufacturing processes, refuse from places of human habitation or animal habitation.

WASTEWATER TREATMENT PLANT:

A facility for purifying wastewater. Modern wastewater treatment plants are capable of removing 95% of organic pollutants.

WATER QUALITY AGREEMENT:

The Great Lakes Water Quality agreement was initially signed by Canada and the United States in 1972 and was subsequently revised in 1978 and 1987. It proves guidance for the management of water quality, specifically phosphorus and toxics, in the Great Lakes.

WATER QUALITY LIMITED SEGMENT:

A section of river where water quality standards will not be met if only categorical effluent standards are met.

WATER QUALITY CRITERIA:

A measure of the physical, chemical or biological characteristics of a water body necessary to protect and maintain different water uses (fish and aquatic life, swimming, etc.).

WATER QUALITY STANDARDS:

The legal basis and determination of the use of a water body and the water quality criteria, physical, chemical, or biological characteristics of a water body, that must be met to make it suitable for the specified use.

WATER QUALITY STANDARD VARIANCE:

When natural conditions of a water body preclude meeting all conditions necessary to maintain full fish and aquatic life and swimming, a variance may be granted.

WATERSHED:

The land area that drains into a lake or river.

WETLANDS:

Areas that are inundates or saturated by surface or groundwater at a frequency and duration sufficient to support a variety of vegetative or aquatic life. Wetland vegetation requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas.

WINHUSLE:

A computer model for evaluating sediment delivery to suface waters from agricultural lands. It was developed by DNR with assistance from NRCS.

WISCONSIN ADMINISTRATIVE CODE:

The set of rules written and used by state agencies to implement state statutes. Administrative codes are subject to public hearing and have the force of law.

WISCONSIN FUND:

A state program that helps pay the cost of reducing water pollution. Funding for the program comes from general revenues and bonds and is based on a percentage of the state's taxable property value. The Wisconsin Fund includes these programs:

Point Source Water Pollution Abatement Grant Program - Provides grants for 60% of the cost of constructing wastewater treatment facilities. Most of this program's money goes for treatment plant construction, but three percent of this fund is available for repair or replacement of private, on-site sewer systems.

Nonpoint Source Water Pollution Abatement Grant Program - Funds to share the cost of reducing water pollution. Nonspecified sources are available in selected priority watersheds.

Solid Waste Grant Program - Communities planning for solid waste disposal sites are eligible for grant money. $500,000 will be available each year to help with planning costs.

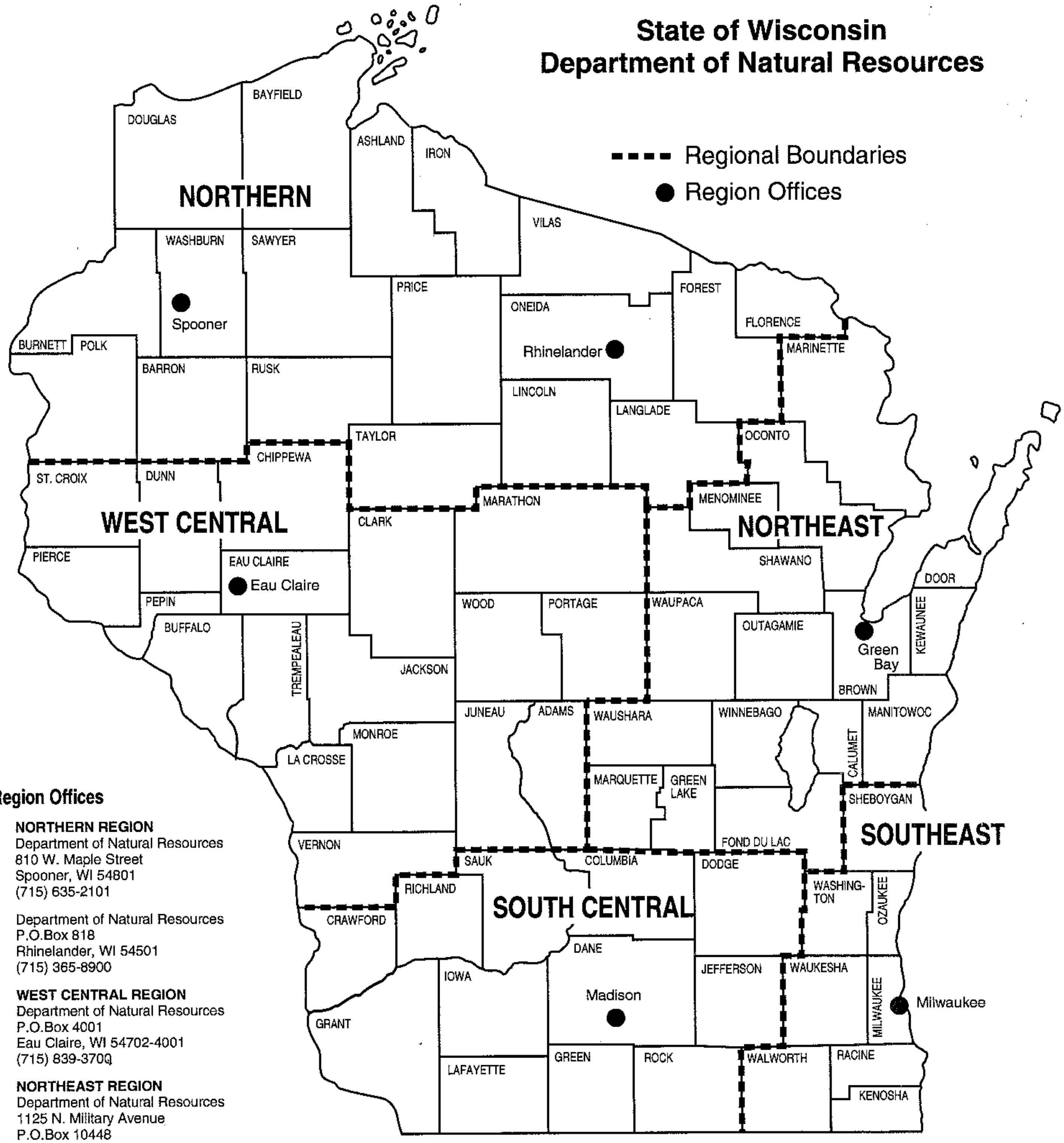
WISCONSIN NONPOINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM:

A state cost-share program established by the State Legislature in 1978 to help pay the costs of controlling nonpoint source pollution. Also known as the nonpoint source element of the Wisconsin Fund or the Priority Watershed Program.

WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES):

A permit system to monitor and control the point source dischargers of wastewater in Wisconsin. Dischargers are required to have a discharge permit and meet the conditions it specifies.

State of Wisconsin
Department of Natural Resources



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Our Mission:

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.

WISCONSIN
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