

Nonpoint Source Control Plan for the Narrows Creek and Baraboo River Priority Watershed Project



This Plan was prepared under the provisions of the Wisconsin Nonpoint Source Water Pollution Abatement Program by the **Wisconsin Department of Natural Resources**, the **Department of Agriculture, Trade and Consumer Protection**, and the **Sauk County Land Conservation Department**.

WATERSHED PLAN ORGANIZATION INFORMATION

Natural Resources Board

Herbert Behnke, Chair
Trygve Solberg, Vice Chair
Neal Schneider, Secretary
Betty Jo Nelsen
Mary Jane Nelson
James Tiefenthaler
Stephen Willett

Sauk County Land Conservation Committee

Mike Weiss, Chair
Dorothy Coens
John Taapken
James Leystra
George Foss
Harlan Bass, ASC member

Wisconsin Department of Natural Resources

George E. Meyer, Secretary
Lyman Wible, Administrator, Division for Environmental Quality
Bruce Baker, Director, Bureau of Water Resources Management
Rebecca Wallace, Chief, Nonpoint Source & Land Management Section

Wisconsin Department of Agriculture, Trade and Consumer Protection

Alan Tracy, Secretary
Nicholas Neher, Administrator, Division of Agricultural 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 Narrows Creek and Baraboo River Priority Watershed Project

The Wisconsin Nonpoint Source Water Pollution Abatement Program

September 1993

This Plan Was Cooperatively Prepared By:

**The Department of Natural Resources,
The Department of Agriculture, Trade and Consumer Protection,
The Sauk County Land Conservation Department and University of Wisconsin-Extension**

Publication WR-327-93

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 7291
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 Acknowledgements

Author

Karen Rahmeier - Bureau of Water Resources Management, DNR, Project Coordinator

Principal Contributors

Nancy Laukant - Sauk County Land Conservation Department, Technician
Joe Van Berkel - Sauk County Land Conservation Department, County Conservationist
Brent Bergstrom - Sauk County Land Conservation Department, Project Manager
Karl Hakanson - UWEX, Water Quality Specialist
Nancy Brereton - Soil Conservation Service, District Conservationist
Lynne Hess - DATCP, Project Planner
Keith Foye - DATCP, Project Planner
Andy Morton - DNR Southern District, Nonpoint Source Coordinator
Dave Marshall - DNR, Madison Area, Biologist

Editing, Layout and Design

Aaron Williamson, Bureau of Water Resources Management, DNR

Graphics/maps

Mary J. Luckhardt, NBR Advisory Committee (cover art)
DNR Bureau of Information/Geographic Services (maps)

Word Processing

Word Processing Staff, DNR

Additional Contributors

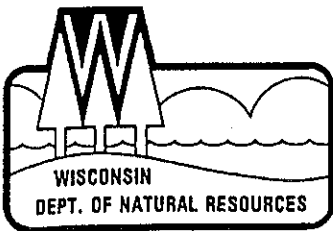
In addition to the people listed on the inside front cover and acknowledgement page, the author and principal contributors would like to acknowledge contributions from the following people:

Ken Baun, DNR Nonpoint Source & Land Management Section
Cindy Hoffland, DNR, Bureau of Community Assistance
Laura Chern, DNR, Groundwater Management Section
Mike Sorge, DNR, Southern District

Narrows Creek and Baraboo River Advisory Committee

Mary Luckhardt* - Farmer, Freedom township
Orland Reimer* - Farmer, town of Westfield, ASCS Committee
Herbert Brandt - town of Washington
Harold A. Dallmann - town of Freedom
Lloyd Dunse - Hillpoint Rod & Gun Club
Bill Friede - Reedsburg Outdoor Club
Herbert Klein - town of Excelsior
Tom Kreigl - Extension Service, UWEX, Agricultural Agent
Harold Kruse - Nature Conservancy, Farm Bureau, National Farmers Org.
Ken Lange - DNR, Naturalist
Marvin Laukant - Farmer, Westfield township
Gerald Lehman - town of Ironton
Edward Liegel - Crop Consultant
Harvey Myers - Farmer, Westfield township
Darrell Myers - Farmer, town of Westfield
Randy Refslend - village of West Baraboo
Orland Reimer - ASCS Committee
John Reuter - Farmer, town of Westfield
Jim Romber - Badger Fly-Fisherman
Darrell Schlieckau - Holtz Lime and Gravel
Randy Schneider - Reedsburg Outdoors Club
Evelyn Tetzlaff - Lake Virginia Management Dist.
Byron Tetzlaff - Lake Virginia Management Dist.
Jim Thieding - James Thieding Construction
Norman Vlcek - town of Baraboo
Jim Wheeler - Farmer, Ironton township
Lester Wiese - town of Westfield
Dick Wolkowski - UWEX, Soil Scientist

* Advisory Committee co-chairs



State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

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

Carroll D. Besadny
Secretary

October 26, 1992


Roger Shanks, County Board Chair
Sauk County
515 Oak Street
Baraboo, WI 53913

Dear Mr. Shanks:

I am pleased to approve the Narrows Creek and Baraboo River Priority Watershed Plan prepared through the Wisconsin Nonpoint Source Water Pollution Abatement Program. This plan meets the intent and conditions of s. 144.25, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. This plan has also been approved by the Department of Agriculture, Trade and Consumer Protection. I am also approving this plan as an amendment to the Lower Wisconsin Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Sauk County staff that participated in preparing this plan. We look forward to assisting Sauk County and the cities and villages in the watershed in the implementation of the Narrows Creek and Baraboo River Priority Watershed Plan.

Sincerely,



C. D. Besadny
Secretary

cc: Joe Van Berkel - Sauk Co. LCD
Andy Morton - SD
Dave Jelinski - DATCP
Becky Wallace - WR/2
Cindy Hoffland - CA/GEF 1
→ Karen Rahmeier - WR/2





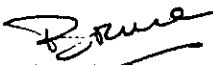
State of Wisconsin
Department of Agriculture, Trade and Consumer Protection

Alan T. Tracy, Secretary

801 West Badger Road • PO Box 8911
Madison, WI 53708-8911

October 16, 1992

Mr. Bruce Baker, Director
Bureau of Water Resources Management
Wisconsin Department of Natural Resources
Box 7921
Madison, WI 53707


Dear Mr. Baker:

The Department of Agriculture, Trade and Consumer Protection has reviewed and approves the "Nonpoint Source Control Plan for the Narrows Creek and Baraboo River Priority Watershed Project".

We look forward to assisting DNR and the Land Conservation Committee in Sauk County in implementing the project.

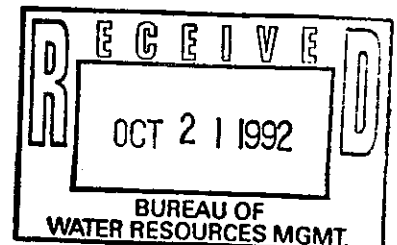
Please contact Lynne Hess (273-6206) if we can be of any further assistance in moving the project to implementation.

Sincerely,



Dave Jelinski, Director
Land and Water Resources Bureau
AGRICULTURAL RESOURCE MANAGEMENT DIVISION
(608) 273-6411

cc: Becky Wallace, WR/2
Joe Van Berkel, Sauk County LCD



RESOLUTION # 130 -92
APPROVING THE NARROWS CREEK AND BARABOO RIVER
PRIORITY WATERSHED PLAN

WHEREAS, the Sauk County Board of Supervisors previously agreed to participate with the Wisconsin Department of Natural Resources in a priority watershed project designed to improve and protect water quality in the streams and rivers within the designated watershed area; and

WHEREAS, the Land Conservation Department has cooperated with the appropriate state and federal agencies and the citizen's advisory committee to prepare a plan to review the existing water quality and watershed conditions, identify the type and amount of management practices needed, establish eligibility criteria for cost sharing of these practices and estimate costs for the project; and

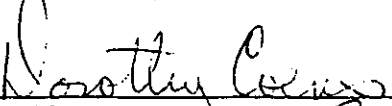
WHEREAS, the approval and implementation of this plan will provide cost sharing assistance to landowners within the watershed to help install pollution control practices and will provide funding and staff to the Land Conservation Department for educational programming and technical assistance to attempt to achieve water quality goals;

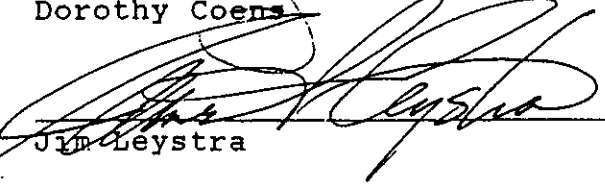
NOW, THEREFORE BE IT RESOLVED, by the Sauk County Board of Supervisors, met in regular session, that the "Nonpoint Source Control Plan for the Narrows Creek and Baraboo River Priority Watershed" be approved, and that the Land Conservation Committee be given the authority and responsibility to act in behalf of Sauk County to administer this priority watershed project as outlined in the plan.


For consideration by the Sauk County Board of Supervisors on September 22, 1992.

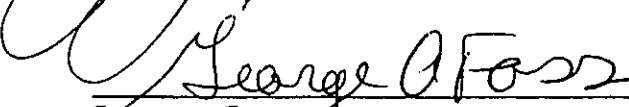
Respectfully submitted,
Land Conservation Committee


Mike Weiss, Chair


Dorothy Coens


Jim Leystra


John Taapken


George Foss

Harlan Bass

Fiscal Note:

Estimated County cost \$20,000/year X 8 years	=	\$ 160,000
Estimated Local Assistance Grant(DNR) to County	=	\$ 1,770,049
Estimated Cost Sharing provided to Landowners(DNR)	=	\$ 6,176,448

Copies of the Plan are available for review in the Land Conservation Department.

TABLE OF CONTENTS

	<u>Page</u>
Watershed Plan Organization Information	Inside Front Cover
Watershed Plan Acknowledgements	iii
RESOLUTIONS AND LETTERS OF APPROVAL	v
TABLE OF CONTENTS	ix
List of Maps	xiv
List of Appendices	xiv
SUMMARY	1
Introduction	1
General Watershed Characteristics	3
Water Quality	3
Sources of Pollution	4
Pollutant Reduction Levels	5
Management Actions	5
Funds Needed for Cost Sharing, Staffing, and Educational Activities	8
Project Implementation Schedule	9
Information and Education	9
Project Evaluation and Monitoring	10
CHAPTER ONE	
Introduction, Purpose, and Legal Status	11
Wisconsin Nonpoint Source Water Pollution Abatement Program	11
Legal Status of the Nonpoint Source Control Plan	12
Plan Organization	12
CHAPTER TWO	
General Watershed Characteristics	15
Land Size	15
Public Water Sources	16
Sanitary Sewer Service	16
Physical Setting	16
Climate and Precipitation	16
Topography	16
Geology	17
Soils	17
Water Resources	18
Streams	18

	<u>Page</u>
Lakes	19
Wetlands	19
Groundwater Resources	19
Endangered and Threatened Resources	23
Rare Species	23
Natural Areas	25
 CHAPTER THREE	
Water Quality Conditions, Objectives, and Nonpoint Sources	27
Water Pollution Basics	27
Establishing Water Resource Objectives	28
Pollutant Reduction Goals	31
Results of Nonpoint Source Inventories	31
Barnyard Runoff	31
Upland Sediment	32
Streambank Erosion	33
Winter Spreading of Manure	35
Field Nutrient and Pesticide Management Practices	36
General Watershed Description	37
Surface Water Quality Appraisal Summary	37
Subwatershed Discussions	40
Copper Creek Subwatershed (CC)	40
Hill Point Creek Subwatershed (HP)	41
Narrows Creek Subwatersheds (Upper, Middle, Lower)	42
Upper Narrows Subwatershed (UN)	47
Middle Narrows Subwatershed (MN)	48
Lower Narrows Subwatershed (LN)	49
Lake Virginia Subwatershed (LV)	50
Pine Creek Subwatershed (PC)	53
Reedsburg Rock Springs Subwatershed (RR)	54
Rock Springs Baraboo Subwatershed (RB)	57
Seeley Creek Subwatershed (SE)	57
Skillet Creek Subwatershed (SK)	59
Other Pollution Sources	60
 CHAPTER FOUR	
Management Actions: Pollution Control and Eligibility for Cost-Share Funding	63
Introduction	63
Management Categories	63
Management Category I	64
Management Category II	64
Management Category III	65
Criteria for Rural and Urban BMP Eligibility and Management Category	
Designation	65
Croplands and Other Upland Sediment Sources	71

	<u>Page</u>
Animal Lot Runoff	74
Nutrient Management Practices	75
Sinkholes	78
Manure Spreading Runoff	78
Streambanks	79
Wetland Restoration	82
Urban Nonpoint Sources	83
Management Actions	84
Urban Practices	84
Land Easements	86
Ordinances	89
Manure Storage Ordinance	89
Construction Site Erosion Ordinance	89

CHAPTER FIVE

County Implementation Program	91
Introduction	91
Project Participants: Roles and Responsibilities	92
Landowners and Land Operators	92
DNR	93
DATCP	94
Other Agencies	95
Agricultural Best Management Practices (BMPs)	95
BMPs Not Cost-Shared	100
Activities and Sources of Pollution Not Eligible For Cost Share Assistance	101
Cost-Share Budget	102
Cost of Installing BMPs	102
Easement Costs	102
Cost Containment	105
Cost Containment Procedures	105
Bids and Average Costs	105
Flat Rates	105
Cost-Share Agreement Reimbursement Procedures	105
Nonpoint Source Grant Agreement and Administration	105
Cost Share Agreement and Administration	106
Local Assistance Grant Agreement Administration	110
Budget and Staffing Needs	110
Grant Disbursement and Project Management Schedule	113
Involvement of Other Programs	114
Coordination With State and Federal Conservation Compliance Programs	114
Coordination with State and Federal Preservation Laws	114

	<u>Page</u>
CHAPTER SIX	
Information and Education Plan	115
General Description	115
Audience	115
Objectives	117
Citizen Participation	120
Delivery Team	123
Informational Resources Used to Guide the I&E Plan	123
Specific Information and Education Activities	124
Contacts with Community Leaders	125
Media Coverage	125
Watershed Implementation Informational Meetings	127
Self Directed Tours	127
Individualized Tours	127
On-Farm Demonstration Field Days	128
Streambank and Fisheries Habitat Restoration	128
Narrows Creek and Baraboo River Priority Watershed Boundary Signs	129
Project Participant Signs	129
Youth Programming	130
Individual and Small Group Nutrient Management Education	130
Lawn Fertilizers and Lake Virginia Water Quality	131
Project Evaluation	132
CHAPTER SEVEN	
Integrated Resource Management Program	139
Fisheries	139
Wetland Restoration	139
Riparian Zones	140
Stewardship	140
Natural Area Sites	140
CHAPTER EIGHT	
Project Evaluation	141
Introduction	141
Administrative Review	141
Accomplishment Reporting	141
Financial Expenditures	142
Time Spent On Project Activities	142
Pollutant Load Reduction	143
Key Nonpoint Sources for Evaluating Pollutant Load Reductions	143
Streambanks	143
Upland Sediment Sources	143
Barnyard Runoff	144

CHAPTER NINE

Water Resources Evaluation Monitoring	145
Goal and Objectives	145
Program Organization	145
Site Selection Criteria	146
Location	146
Size	146
Water Quality	146
Habitat	147
Site Selection Process	147
Evaluation Monitoring Approaches	147
Basin Assessment Approach	147
Special Project Approach	148

BIBLIOGRAPHY	151
------------------------	-----

List of Tables

Table S-1.	Land Use in the Narrows Creek and Baraboo River Watershed	3
Table S-2.	Best Management Practices Eligible for Cost Sharing Through the Narrows Creek and Baraboo Priority Watershed Project	7
Table S-3.	Cost Estimates for the Narrows Creek and Baraboo River Priority Watershed Project	9
Table 2-1.	Acreage for Different Subwatersheds	15
Table 2-2.	Nitrate Test Results for the Narrows Creek and Baraboo River Priority Watershed (1990-1991)	21
Table 3-1.	Narrows-Baraboo Summary of Upland Sediment Loading by Land Use . .	29
Table 3-2.	Narrows Creek/Middle Baraboo Watershed Resource Recommendations .	30
Table 3-3.	Barnyard Inventory Results: Narrows-Baraboo River Watershed	32
Table 3-4.	Mass Balance of Sediment	33
Table 3-5.	High Priority Subwatersheds (HP, LN, MN, SE, UN)*	34
Table 3-6.	Streambank and Habitat Degradation	35
Table 3-7.	Narrows Creek/Middle Baraboo Watershed Physical, Chemical, and Biological Data Summary of Named Streams	38
Table 3-8.	Narrows Creek/Middle Baraboo Watershed Physical, Chemical, and Biological Data Summary of Named Lakes	39
Table 4-1.	Medium Priority Subwatersheds (CC, LV, PC, RB, RR, SK) (excludes LV for barnyards)	66
Table 4-2.	High Priority Subwatersheds (HP, LN, MN, SE, UN)* (includes LV for barnyards)	67
Table 4-3.	All Subwatersheds	68

	<u>Page</u>
Table 4-4. Criteria and Management Categories for Eroding Agricultural Uplands in the Narrows Creek Baraboo River Watershed	69
Table 4-5. Rural Uplands Targeted for Sediment Control (incl. Quad3)	70
Table 4-6. Gully Erosion Eligibility Criteria in the Narrows Creek-Middle Baraboo River Watershed	72
Table 4-7. Animal Lot Runoff Eligibility Criteria in the Narrows Creek-Baraboo River Watershed	75
Table 4-8. Manure Spreading Runoff Eligibility Criteria	79
Table 4-9. Streambank Eligibility Criteria for the Narrows Creek Middle Baraboo . .	80
Table 5-1. State Cost-Share Rates for Best Management Practices	97
Table 5-2. Practices Using a Flat Rate for State Cost-Share Funding	98
Table 5-3. Cost-Share Budget Needs for Rural BMPs in Sauk County	103
Table 5-4. Estimated County Watershed Staff Needs for Project Implementation . . .	111
Table 5-5. Total Project Costs at 75% Landowner Participation Rate	112
Table 5-6. Grant Disbursement Schedule at 75% Landowner Participation	112
Table 6-1. Agency Labor Requirement Summary, in Hours	133
Table 6-2. Activity Budget Summary	133
Table 6-3. Individual Activity Labor Requirements and Budgets	134

List of Maps

Map S-1. Narrows Creek and Baraboo River Outline	2
Map 2-1. Narrows Creek and Baraboo River Watershed	20
Map 2-2. NBR Wells and Barnyards Sampled	22
Map 3-1. CC, LV, RR Subwatersheds	43
Map 3-2. HP, MN, UN Subwatersheds	45
Map 3-3. LN, SE Subwatersheds	51
Map 3-4. PC, RB, SK Subwatersheds	55
Map 3-5. Narrows Creek/Baraboo River (LW22) Basin Map/Point Sources	61
Map 4-1. High Priority Subwatersheds	73
Map 4-2. Nutrient Management Regions, Based on FPI	76

List of Appendices

APPENDIX A: Watershed Planning Methods	A-153
APPENDIX B: Glossary	B-163

SUMMARY

Introduction

The Narrows Creek and Baraboo River Priority Watershed Project plan assesses the nonpoint sources of pollution in the Narrows Creek and Baraboo River Watershed and guides the implementation of nonpoint source control measures. These control measures are needed to meet specific water resources objectives for Narrows Creek and the Baraboo River and tributaries. Nonpoint sources of pollutants most commonly found in this watershed include:

- polluted runoff from barnyards and feedlots
- sediment from cropland erosion
- sediment from eroding streambanks

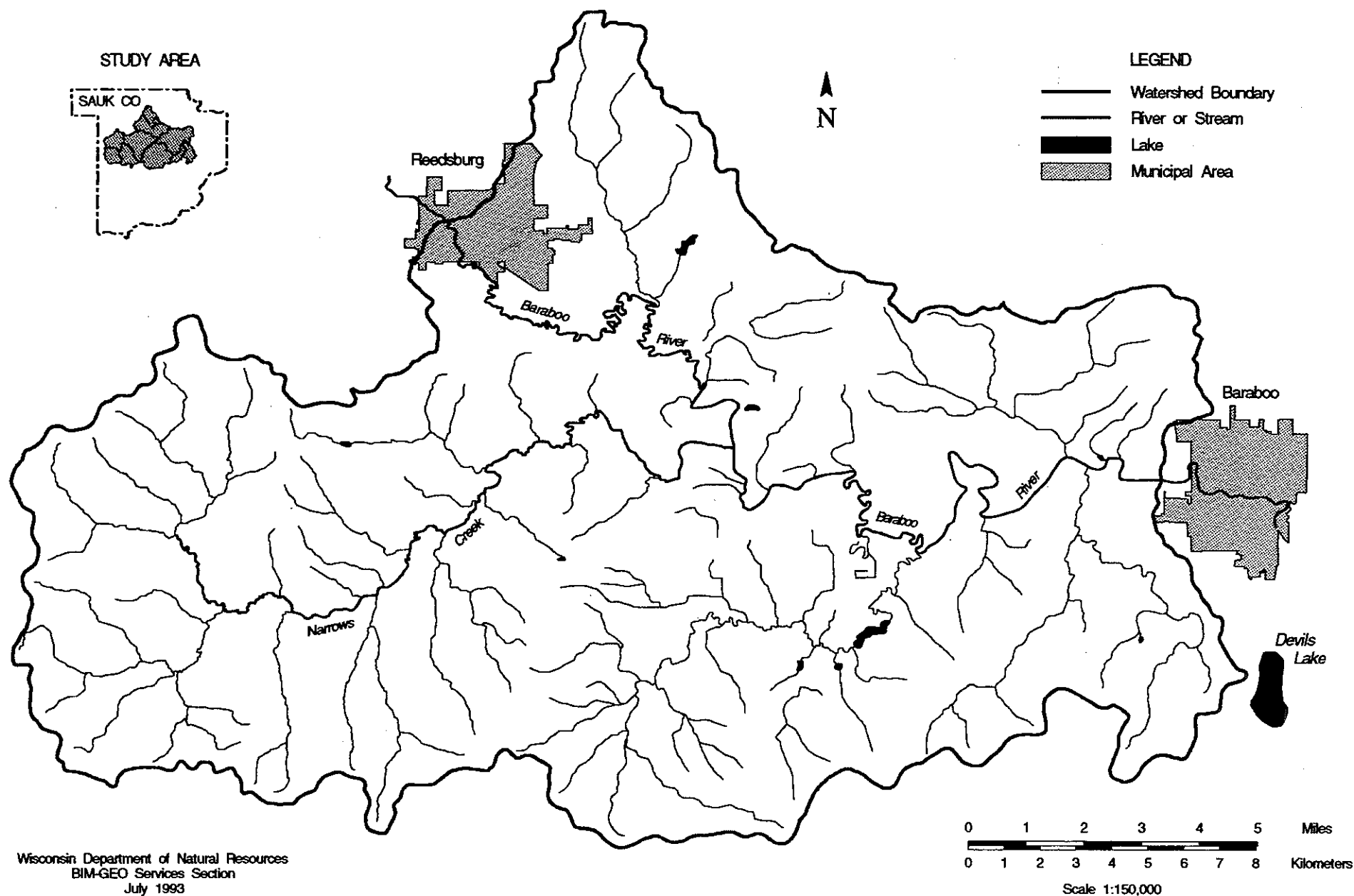
The purpose of this project is to reduce the amount of pollutants originating from nonpoint sources that reach surface water and groundwater within the Narrows Creek and Baraboo River Priority Watershed Project area.

The plan was prepared by the Department of Natural Resources (DNR), the Department of Agriculture, Trade, and Consumer Protection (DATCP), and the Sauk County Land Conservation Department (LCD), with assistance from the University of Wisconsin-Extension. The DNR selected the Narrows Creek and Baraboo River Watershed as a priority watershed project through the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1989. It joined over 50 similar watershed projects statewide where nonpoint source control measures are being planned and implemented.

The State Legislature created the Nonpoint Source Water Pollution Abatement Program in 1978. The program provides financial and technical assistance to landowners and local governments to reduce nonpoint source pollution.

The project is administered on the state level by the DNR and DATCP. The Sauk County LCD will administer the project locally with assistance from UW-Extension and the Soil Conservation Service (U.S. Department of Agriculture).

Map S - 1 Narrows Creek and Baraboo River - Outline



General Watershed Characteristics

The Narrows Creek and Baraboo River Watershed drains 175 square miles of land in Sauk County in southern Wisconsin (map S-1). The watershed is part of the Lower Wisconsin River Basin. For this planning effort, the Narrows Creek and Baraboo River Watershed was divided into 11 smaller drainage areas called subwatersheds (map 4-1).

Land use in the watershed, as shown in table S-1, is mainly agricultural, and is currently dominated by dairy farming. There are two urban areas in the watershed, the city of Reedsburg and the village of West Baraboo. A large portion of the watershed population lives outside incorporated areas, in small enclaves of residential development or on farmsteads.

Table S-1. Land Use in the Narrows Creek and Baraboo River Watershed

Land Use	Percent of Watershed
Agricultural	65%
pasture	13%
cropland	52%
Grassland	6%
Woodlots	23%
Developed	6%
Wetlands ¹	3%

¹ These are estimates of wetland acres based on WIN HUSLE inventory data. See wetland section in Chapter Two for a more comprehensive estimate of wetland acreage.

Source: DNR, Sauk County LCD

Water Quality

The Narrows Creek and Baraboo River Watershed supports diverse fisheries. Narrows Creek supports a smallmouth bass fishery. Sections of Seeley Creek support a Class II trout fishery. The streams are not reaching their highest production potential due to pollution from nonpoint sources. Eroding croplands and streambanks, and manure runoff from livestock operations are the major source of pollution in the watershed.

Segments of the following creeks were identified as currently supporting good quality sport fisheries with strong potential for improvement. The upper reach of Narrows Creek presently supports warm water sport fisheries but has the potential to support a cold water sport fishery. Skillet Creek presently supports warm water forage fisheries but has the potential to support a warm water sport fishery. The details of these assessments are discussed later in this watershed plan.

An inventory of groundwater quality was done along with animal lot inventories. Results show that, of the 340 well samples collected, 16% had nitrate levels over the enforcement standard of 10 mg/l and 62% had nitrate levels between 2 mg/l, the preventative action limit, and 10 mg/l. These nitrate levels are significant. Landowners will be offered a follow-up test for nitrate if their wells had nitrate levels over 10 mg/l. Landowners with nitrate levels between 2 and 10 mg/l will be offered a follow-up nitrate test.

Sources of Pollution

The Sauk County LCD collected data on all agricultural lands, barnyards, manure spreading practices and streambanks in the watershed. These data were used to estimate the pollutant potentials of these nonpoint sources. The amount of phosphorus carried in runoff from each barnyard to a receiving creek was calculated. The amount of sediment reaching streams from eroding agricultural lands and streambanks was also determined. In the Narrows Creek and Baraboo River Watershed, about 84% of the sediment deposited in streams annually is derived from agricultural upland erosion. Sixteen percent of the sediment reaching creeks originates from streambank erosion. The amount of sediment contributed from gullies was not estimated. The results of the investigations of nonpoint sources are summarized below.

Barnyard Runoff Inventory Results:

- 427 barnyards were assessed
- 140 barnyards contributed 70% of the organic pollutants that reach creeks

Manure Spreading Inventory Results:

- About 6000 total acres have manure applied
- About 3000 acres may have high pollution potential
- About 240 landowners spread on acres which may have high pollution potential

Streambank Erosion Inventory Results:

- 145 stream miles were inventoried
- 4,219 tons of sediment reach streams from eroding sites (16% of total sediment)
- There are 19 miles of eroding sites (13% of streambanks inventoried)

Upland Sediment Inventory Results:

- 114,309 total acres were inventoried
- 21,958 tons of sediment are delivered to streams: (84 % of total sediment)
 - 52 % from cropland
 - 23 % from grazed woodlots
 - 13 % from pastures
- 85,544 acres deliver 75 % of total sediment

Pollutant Reduction Levels

To improve water quality in the Narrows Creek and Baraboo River and its tributaries, this plan calls for:

- A 20% reduction in the sediment reaching streams from agricultural uplands in all subwatersheds.
- A 25% reduction in streambank sediment delivered to all streams and a 65% overall repair of bank habitat in all subwatersheds.
- A 65% reduction in organic pollutants from barnyards in all subwatersheds with an emphasis on the following high priority creeks: Narrows Creek, Seeley Creek, Hillpoint Creek.
- Control of at least 2000 tons of sediment/year through gully repair.

Management Actions

Management actions are described in terms of Best Management Practices (BMPs) needed to control nonpoint sources to reduce the pollutant levels described above. Cost share funds for installing pollutant control measures will be targeted at operations that contribute the most pollutants. Cost share funds will be available through the Wisconsin Nonpoint Source Water Pollution Abatement Program for certain Best Management Practices. As shown in table S-2, cost share rates range from 50 to 70%.

All landowners eligible to receive cost-share funds will be contacted by the Sauk County Land Conservation Department during project implementation. All Category I sources of nonpoint pollutants must be controlled if a landowner wants to participate in any aspect of the program.

The Sauk County Land Conservation Department will assist landowners in applying Best Management Practices. Practices range from alterations in farm management (such as changes in manure-spreading and crop rotations) to engineered structures (such as diversions, sediment basins, and manure storage facilities), and are tailored to specific landowner situations. Participation in the program is voluntary.

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

Agricultural lands

All agricultural lands contributing sediment to streams at a rate greater than "x" tons/acre/year (t/a/yr) and greater than "T" will be eligible for cost sharing and must be brought down to a rate of "x" t/a/yr and "T". The value of "x" varies by subwatershed, ranging from .17 in Seeley Creek to .65 in Skillet Creek. See chapter 4 of the plan for more detail. This involves an estimated 8835 critical acres of cropland, or 20% of the land in the watershed.

The BMPs identified by the Sauk County Land Conservation Department emphasize both improving farm management and controlling pollutants. Table S-2 shows the eligible practices and cost-share rates.

Animal lots

The manure from barnyards carried in runoff needs to be controlled at 269 of the 427 livestock operations. The highest level of control is needed for animal lots in the Hillpoint, Upper Narrows, Middle Narrows, Lower Narrows, Lake Virginia, and Seeley Creek subwatersheds. In these subwatersheds, all barnyards contributing more than 50 pounds of phosphorus will be Category I for cost sharing and need to reduce phosphorus loading to 30 pounds or less. Category II barnyards, those contributing between 50 and 30 pounds of phosphorus, will be eligible for cost sharing and need to lower phosphorus loading to 30 pounds or less. In all other subwatersheds, all barnyards contributing more than 60 pounds of phosphorus will be Category I for cost sharing and need to lower phosphorus loading to 40 pounds or less. Category II barnyards contributing between 60 and 40 pounds of phosphorus will be eligible for cost sharing and will need to reduce phosphorus loading to 40 pounds or less.

Table S-2. Best Management Practices Eligible for Cost Sharing Through the Narrows Creek and Baraboo Priority Watershed Project

Best Management Practices	State Cost-Share Rate
Contour Farming	50% (flat rate: \$6/acre)
Strip Cropping	50% (flat rate: \$12/acre)
Field Diversions and Terraces	70%
Grassed Waterways	70%
Reduced Tillage (No Till)	\$45/acre
Critical Area Stabilization	70% ^{1, 2}
Critical Pasture Stabilization	50%
Grade Stabilization Structures	70% ²
Agricultural Sediment Basins	70% ²
Shoreline and Streambank Stabilization	70% ²
Shoreline Buffers	70% ^{1, 2}
Barnyard Runoff Management	70%
Animal Lot Relocation	70%
Manure Storage Facilities	70% ³
Streambank Fencing	
high tensile	\$20.00/rod ²
barbed wire	\$14.40/rod ²
electric	\$ 9.60/rod ²
Woodlot Fencing	
high tensile	\$12.50/rod
barbed wire	\$ 9.00/rod
electric	\$ 6.00/rod
Wetland Restoration	70%
Nutrient and Pesticide Management	50%

1 Easements may be entered into with landowners identified in the watershed plan in conjunction with these BMPs. See "Management Actions" in this summary for areas where easements may apply.

2 With a matching local share, the state share cost sharing level may be increased up to 80 percent.

3 Maximum cost-share amount is \$20,000 including no more than \$15,000 for manure transfer equipment.

Manure-spreading

The Narrows Creek and Baraboo River project participants who winter-spread manure on 38 acres or more of "unsuitable" land will be targeted as Category I for control measures. These landowners are required to implement and adhere to a SCS "590 Nutrient Management" plan. Category II landowners are those who winter-spread on between 11 and 38 unsuitable acres. In this project "unsuitable" lands for winter manure spreading are lands with greater than 6% slope or which are flood prone. The Sauk County LCD will assist farm operators in preparing a management plan for proper manure spreading. A manure management plan identifies the proper spreading periods, application rates, and acceptable fields for manure spreading. A number of the manure management plans may identify the need for manure storage facilities to prevent winter manure spreading on unsuitable lands.

Nutrient and Pesticide Management

This watershed was used as a pilot project for the Field Practices Inventory (FPI). As part of FPI, a survey was taken of landowner fertilizer and pesticide practices. Based on the survey results that showed overapplication of nutrients, improved nutrient management will be stressed via cost sharing for Nutrient Management Plans (SCS 590 plans). Landowner eligibility for cost sharing will be based on subwatershed location. See chapter 4 of the watershed plan for more detail.

Streambanks

In high priority subwatersheds (Hillpoint, Upper Narrows, Middle Narrows, Lower Narrows, Seeley Creek), project participants with identified sites eroding at a rate over 0.2 tons/linear foot of eroding bank per year or over 20 tons/site/year or over 1,000 feet of trampled sites will be Category I. Those with erosion rates between 0.2 and 0.05 tons/linear foot/year and over 2.5 tons/site/year and between 500 and 1,000 feet of trampled feet, will be Category II. In all other subwatersheds there is no Category I for eroding streambanks. Category II for eroding banks is a site eroding at a rate over 0.2 tons/linear foot/year or greater than 10 tons/site/year. Eligibility for trampled banks is the same as for high priority subwatersheds: Category I is sites over 1,000 feet/landowner and Category II is sites between 500 and 1,000 feet/landowner. Overall, approximately 1,055 tons of sediment from streambanks must be controlled in the Narrows Creek and Baraboo River watershed.

Funds Needed for Cost Sharing, Staffing, and Educational Activities

Grants will be awarded to Sauk County by the DNR for cost sharing, staff support and educational activities. Table S-3 includes estimates of the financial assistance needed to implement the nonpoint source controls in the Narrows Creek and Baraboo River Watershed, assuming a 75% participation rate of eligible landowners.

Table S-3. Cost Estimates for the Narrows Creek and Baraboo River Priority Watershed Project

Eligible Activity	Total Cost¹	State Share¹
Cost Sharing	\$11,265,164	\$6,208,383
Easements	37,500	37,500
Sauk County Staffing	1,642,999	(56 staff years)
Other Direct (travel, supplies, etc.)	83,120	
Educational Activities	45,174	
Totals	\$13,073,957	\$8,017,176

¹ Estimates based on 75% participation.

Project Implementation Schedule

Project implementation is scheduled to begin in the fall of 1992. Participants can sign cost-share agreements during the first three years of implementation. There is a five year period to install practices. An eligible landowner or operator has three years before deciding to participate in the program, but practice installation can begin as soon as a landowner signs a cost-share agreement with the Sauk County LCD.

Information and Education

Sauk County LCD will have overall responsibility for the information and education program to be conducted throughout the project. University of Wisconsin-Extension staff in the county and in the area office will provide assistance. This program will be more intense during the first four years, activities diminishing during the rest of the project. The activities will include Best Management Practice demonstrations, tours, newsletters, and public meetings.

Project Evaluation and Monitoring

The evaluation strategy for the project involves the collection, analysis, and reporting of information to track progress in three areas:

1. **Administrative** - This involves tracking progress in both technical and financial assistance to eligible landowners, and carrying out education activities identified in the plan. The LCD will track progress in this area and report to the DNR and DATCP quarterly.
2. **Pollutant Reduction Levels** - The LCD will report reductions in nonpoint source pollutant loadings, from changes in land use practices, to the DNR and DATCP at an annual review meeting.
3. **Water Resources** - The DNR will monitor changes in water quality, habitat, and water resource characteristics.

CHAPTER ONE

Introduction, Purpose, and Legal Status

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 175 square-mile Narrows Creek and Baraboo River (NBR) Watershed, located in Sauk County, was designated a "priority watershed" in 1989.

Nonpoint sources of pollution include: eroding agricultural lands, streambanks, roadsides, existing and developing urban areas, runoff from livestock wastes, and gullies. Pollutants from nonpoint sources are carried to the surface water or groundwater through the action of rainfall runoff, snowmelt, and seepage.

The following is an overview of the program:

- The DNR and the DATCP administer the program. It focuses on critical hydrologic units called priority watersheds. The program is implemented through priority watershed projects.
- A plan prepared cooperatively by the DNR, DATCP and local units of government, with input from a local citizen's advisory committee, guides the priority watershed project. 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 to improve water quality.
- After approval by state and local authorities, local units of government implement the plan. Water quality improvement is achieved through voluntary implementation of nonpoint source controls (Best Management Practices) and the adoption of ordinances. Landowners, land renters, counties, cities, villages, towns, sanitary districts, lake districts, and regional planning commissions are eligible to participate.
- Technical assistance is provided to aid in the design of BMPs. State level cost share assistance is available to help offset the cost of installing these practices. Eligible landowners and local units of government are contacted by county LCDs to determine their interest in voluntarily 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.

- 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 eight 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 NBR 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 with the cooperative efforts of the DNR, DATCP, the Sauk County Land Conservation Department, local units of government and the NBR Citizens Advisory Committee.

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

Plan Organization

The remainder of this plan describes the watershed assessment, a detailed implementation program, and project evaluation. The contents of these areas are described below.

The Watershed Assessment

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

Chapter three, "Water Quality Conditions, Objectives and Nonpoint Pollution Sources," presents field inventory results and identifies the water quality or water resource problems and improvements that can be obtained through implementation of a nonpoint source control project. This chapter discusses the level of pollutant control needed to achieve the water resource objectives, and describes the nonpoint sources and other sources of pollution.

Chapter four, "Management Actions," identifies the level of rural nonpoint source pollution control needed to meet the water quality objectives. Eligibility criteria for funding to control nonpoint sources under the priority watershed project are also presented.

Detailed Program for Implementation

Chapter five, "County Implementation Program," describes how local units of government administer the project, and estimates a local assistance and management practice cost-share budget.

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

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

Project Evaluation

Chapter eight, "Progress Assessments," discusses how the amount of nonpoint source control, gained through installation of best management practices in the watershed, will be assessed.

Chapter nine, "Evaluation Monitoring," presents a strategy and schedule to monitor the water quality impacts of implementing nonpoint source controls in the NBR Watershed.

CHAPTER TWO

General Watershed Characteristics

Land Size

The NBR Priority Watershed is divided into 11 subwatersheds. The subwatersheds originate as upland flow that enters a specific stream before entering the Baraboo River. The Baraboo River and Narrows Creek are major streams that are divided into different sections by villages or a junction of streams.

Table 2-1 contains the acres and abbreviation codes for the individual subwatersheds and for the entire watershed.

Table 2-1. Acreage for Different Subwatersheds

Code	Name of Subwatershed	Acres
CC	Copper Creek	5,741
HP	Hill Point Creek	7,248
LN	Lower Narrows Creek	18,251
LV	Lake Virginia	1,076
MN	Middle Narrows Creek	9,313
PC	Pine Creek	4,166
RB	Rock Springs - Baraboo	20,239
RR	Reedsburg - Rock Springs	12,400
SE	Seeley Creek & Seeley Lake	19,663
SK	Skillet Creek	5,602
UN	Upper Narrows Creek	9,155
NBR	Narrows Creek and Baraboo Priority Watershed	112,852

Source: Sauk County Land Conservation Department

Public Water Sources

Groundwater sources provide most of the potable water in the watershed. Most of the groundwater is obtained from the Cambrian sandstone aquifer. Parts of Pine Creek, Seeley Creek and Skillet Creek subwatersheds are underlain by pre-Cambrian quartzite bedrock. Municipal water is pumped from the Cambrian sandstone aquifer, which serves approximately 60% of the watershed's population.

Sanitary Sewer Service

Sanitary sewer service is available within the villages of Loganville, Lime Ridge, North Freedom, Rock Springs and West Baraboo. The city of Reedsburg also has a sanitary sewer service. Sewage treatment plants for all municipalities provide secondary treatment with seasonal disinfection. They deliver effluent directly to the surface and/or indirectly to groundwater.

Physical Setting

Climate and Precipitation

The frequency, duration and amount of precipitation influences the quality and quantity of surface and groundwater, soil moisture content, runoff characteristics and the physical condition of waterways.

The NBR Priority Watershed lies in the temperate continental zone which is characterized by cold and snowy winters, and warm summers with short periods of hot and humid weather. Average annual precipitation for the region is about 32" of rain and melted snow. Most precipitation (60%) falls from April to September.

Topography

The driftless area of the watershed is a deeply dissected bedrock plateau with narrow ridges and steep sided valleys. The valleys lie 300 to 400 feet below the ridgetops and are up to 5 miles wide.

In the outwash plain of glacial Lake Wisconsin, terminal and ground moraines are prominent land features. The terrain varies from gently rolling hills to steep slopes. Quartzite rock is common in bedrock outcroppings in the glaciated area.

Geology

Dolomitic limestone, sandstone and quartzite form the bedrock in the watershed. Baraboo Quartzite is a pre-Cambrian metamorphic rock found in the east-central part of the county. It occurs in prominent upland topography called the Baraboo Bluffs or the Baraboo Range. This formation was buried beneath eroding sedimentary rock (limestone and sandstone) and is now being exposed, forming eroded outcroppings called monadnock. In the glaciated area, except for some of the steeper slopes, glacial drift covers the quartzite.

On the highest ridges, the unglaciated area is capped with a layer of the Oneta Dolomite Formation. Beneath this layer of limestone is the Trempealeau Group, followed by the Tunnel City Group and Elk Mound Group. In most areas the bedrock is covered with several feet of loess or bedrock residuum, or both.

Soils

A soil pollutant attenuation potential map was constructed for the watershed using the soil contaminant attenuation model (SCAM) developed by the Wisconsin Geological and Natural History Survey (Sutherland and Madison, 1987). The SCAM ranks soils from seven characteristics that potentially effect contaminant migration through the unsaturated zone. These characteristics include soil texture, subsoil texture, soil pH, soil depth, soil drainage class, subsoil permeability, and organic matter content. Soils are ranked as Best, Good, Marginal, or Least for potential pollutant attenuation. The map displayed the following results.

- **Lake Virginia and Copper Creek Subwatersheds**

Most soils ranked good to least. Soils are excessively drained, have medium to coarse texture, and are less than five feet thick. Underlying the subsoils are sandstone bedrock or outwash.

- **Reedsburg-Rock Springs Subwatershed**

Soils ranked good to least in this subwatershed. In the western portion of the subwatershed, soils are wet, poorly drained, medium textured and underlain by outwash sand or stratified loamy and sandy unconsolidated deposits. East of where the Baraboo River divides the subwatershed, soils are excessively drained, coarse textured and underlain by sandstone bedrock or outwash.

- **Upper Narrows and Hill Point Creek Subwatersheds**

Located in the driftless area, these soils are ranked best for pollutant attenuation potential. Soils are well drained, medium textured and more than sixty inches thick. Dolomite bedrock underlies soils in these subwatersheds.

- **Middle Narrows Subwatershed**

Soils ranked best to marginal. Soils along the stream beds ranked as marginal for pollutant attenuation and are well drained. These soils are of medium texture and only 20 to 40 inches deep. Soils located on the dolomite ridges ranked best. They are thicker (greater than five feet), well drained and have medium texture.

- **Lower Narrows, Seeley Creek, Rock Springs-Baraboo, Pine Creek, Skillet Creek Subwatersheds**

These soils ranked good to least, are well drained, and are medium textured. Soils are 20 to 40 inches thick and directly overlie Baraboo quartzite.

To determine if there is a relationship between nitrate concentrations in private wells and soil attenuation potential, well sample results were plotted on the SCAM map. No clear pattern of contamination was discernable. However, there may be a relationship between fertilizer application rates, soil attenuation potential and nitrate concentrations in private wells.

In the northern part of the watershed (the Copper Creek, Lake Virginia, and Reedsburg-Rock Springs subwatersheds), the Field Practices Inventory (FPI) showed that fertilizer application rates were grossly over UWEX recommendations. According to the SCAM, soils generally ranked marginal to least for attenuation potential. Sample analyses indicated that a relatively high percentage of wells had nitrate contamination. See table 2-2 for test results. It is possible that the over application of fertilizers combined with the low soil attenuation potential led to groundwater contamination in this area.

In the western driftless area (Upper Narrows, Hill Point, and Middle Narrows subwatersheds), soils are thicker and fertilizer application rates are also grossly above UWEX recommendations. While sample results are inconclusive, it appears that nitrate concentrations in wells are somewhat lower. This may indicate the soils are attenuating nonpoint source contaminants.

Water Resources

Streams

Perennial and intermittent streams and the Baraboo River are the predominant surface water features. The major tributaries, associated streams, lakes and subwatershed divides are shown in map 2-1. Perennial streams, with a combined length of 145 miles, maintain a continuous flow throughout most of the year. The middle section of the Baraboo River, from Reedsburg to the Highway 12 bridge in West Baraboo (30 miles long) is the predominant perennial stream in the watershed. Other perennial streams are Narrows, Copper, Hill Point, Pine, Seeley and Skillet Creeks. A portion of Seeley Creek is classified as Class II trout waters with brown trout as the dominant species. Narrows Creek supports a smallmouth bass fishery, while the Baraboo River has a sport fishery and is used for canoeing. These fisheries

are not reaching their fullest potential because of excess nutrients and sedimentation entering the streams. The pollution is caused by eroding streambanks, eroding cropland and improperly managed livestock operations.

Intermittent streams flow only when there is runoff or when groundwater discharge is highest. Intermittent waterways are the headwaters of many of the larger perennial streams. Their small size makes them particularly susceptible to nonpoint source pollution. Their dynamic nature does allow rapid improvement, however, if pollution sources are reduced.

Lakes

The two impoundments in the NBR Priority Watershed are at Lake Virginia and Seeley Lake. Lake Virginia covers 35 acres. It also has a residential development that surrounds the lake. Sunfish, bluegill and largemouth bass are commonly found in Lake Virginia. An aerator is used during the winter to try to prevent winterkills. Lake Virginia is popular for ice fishing.

Seeley Lake covers 60 acres and is surrounded by woodland and a few cropped fields. Largemouth bass, panfish, small perch and northern pike are the predominant fish species. Winter ice fishing is also popular on Seeley Lake.

Wetlands

Wetlands are a valuable natural resource for wildlife habitat, fish spawning and rearing, recreation, attenuation of runoff and flood flows and removal of pollutants.

Many wetlands were once drained to clear land and raise crops. Every subwatershed in the NBR Priority Watershed has restorable wetland acres. The watershed program will try to protect existing wetlands, and assist landowners who want to restore wetland areas. Guidelines for wetland restoration, are outlined in chapter 4.

Groundwater Resources

An aquifer is an underground rock or soil formation that stores and transmits water to lakes, streams, springs and wells. Driller construction reports, from wells installed in the NBR watershed, show that private wells obtain water mainly from three aquifers underlying the watershed: the Cambrian sandstone aquifer, the Pre-Cambrian quartzite bedrock, and glacially deposited sand and gravel.

The Cambrian sandstone aquifer provides water for most of the NBR Priority Watershed. The water level is found at various depths, depending on the topography, distance to a perennial stream and the characteristics of the underlying rock formation. The Cambrian aquifer produces high yields of water, averaging 400 to 500 gallons per minute.

In the Pre-Cambrian quartzite aquifer water is held in rock fractures. Well output is low and in many cases barely covers domestic uses.

Map 2 - 1 Narrows Creek and Baraboo River Watershed

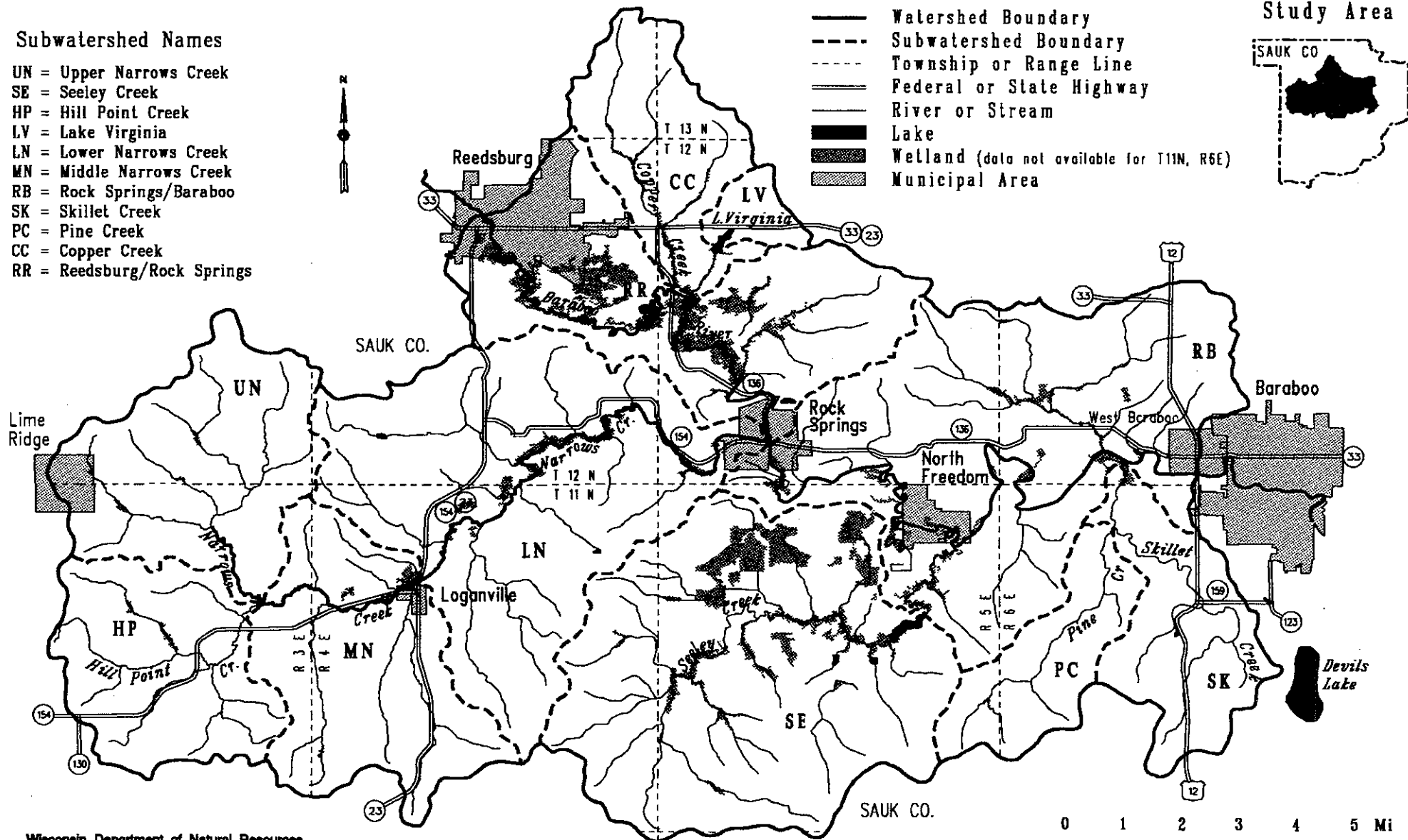
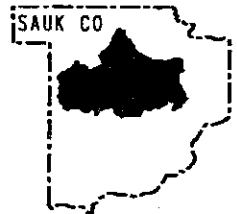
Subwatershed Names

UN = Upper Narrows Creek
 SE = Seeley Creek
 HP = Hill Point Creek
 LV = Lake Virginia
 LN = Lower Narrows Creek
 MN = Middle Narrows Creek
 RB = Rock Springs/Baraboo
 SK = Skillet Creek
 PC = Pine Creek
 CC = Copper Creek
 RR = Reedsburg/Rock Springs

Legend

- Watershed Boundary
- - - Subwatershed Boundary
- - - Township or Range Line
- == Federal or State Highway
- River or Stream
- Lake
- Wetland (data not available for T11N, R6E)
- Municipal Area

Study Area



A few wells in the eastern portion of the watershed obtain water from the sand and gravel aquifer. Driller construction reports show these wells generally produce between 15 and 30 gallons per minute.

Well samples were collected from farmstead wells while the animal lot inventory was being conducted during 1990-1991. A total of 340 samples were tested for nitrate levels; 22% (74) were below 2 mg/l; 62% (210) were between 2 and 10 mg/l, the preventative action limit; and 16% (56) tested above the enforcement standard for nitrates (above 10 mg/l).

Chapter NR 140 of the Wisconsin Administrative Code defines the preventative action limits and enforcement standards. Table 2-2 shows the results of the initial test for nitrates.

Map 2-2 shows locations of wells tested and barnyards inventoried. No attempt was made to correlate well construction with nitrate contamination.

Table 2-2. Nitrate Test Results for the Narrows Creek and Baraboo River Priority Watershed (1990-1991)

Watershed/Subwatershed	samples with N levels below 2 mg/l	samples with N levels between 2 and 10 mg/l	samples with N levels above 10 mg/l
Total Wells Tested for the Narrows Creek and Baraboo River	74	210	56
Copper Creek	1	8	7
Hill Point Creek	7	20	7
Middle Narrows Creek	18	34	6
Lower Narrows Creek	18	46	6
Lake Virginia	5	6	1
Pine Creek	0	4	1
Rock Springs-Baraboo	16	22	10
Reedsburg-Rock Springs	6	11	8
Seeley Creek	7	19	3
Skillet Creek	1	3	4
Upper Narrows Creek	8	37	3

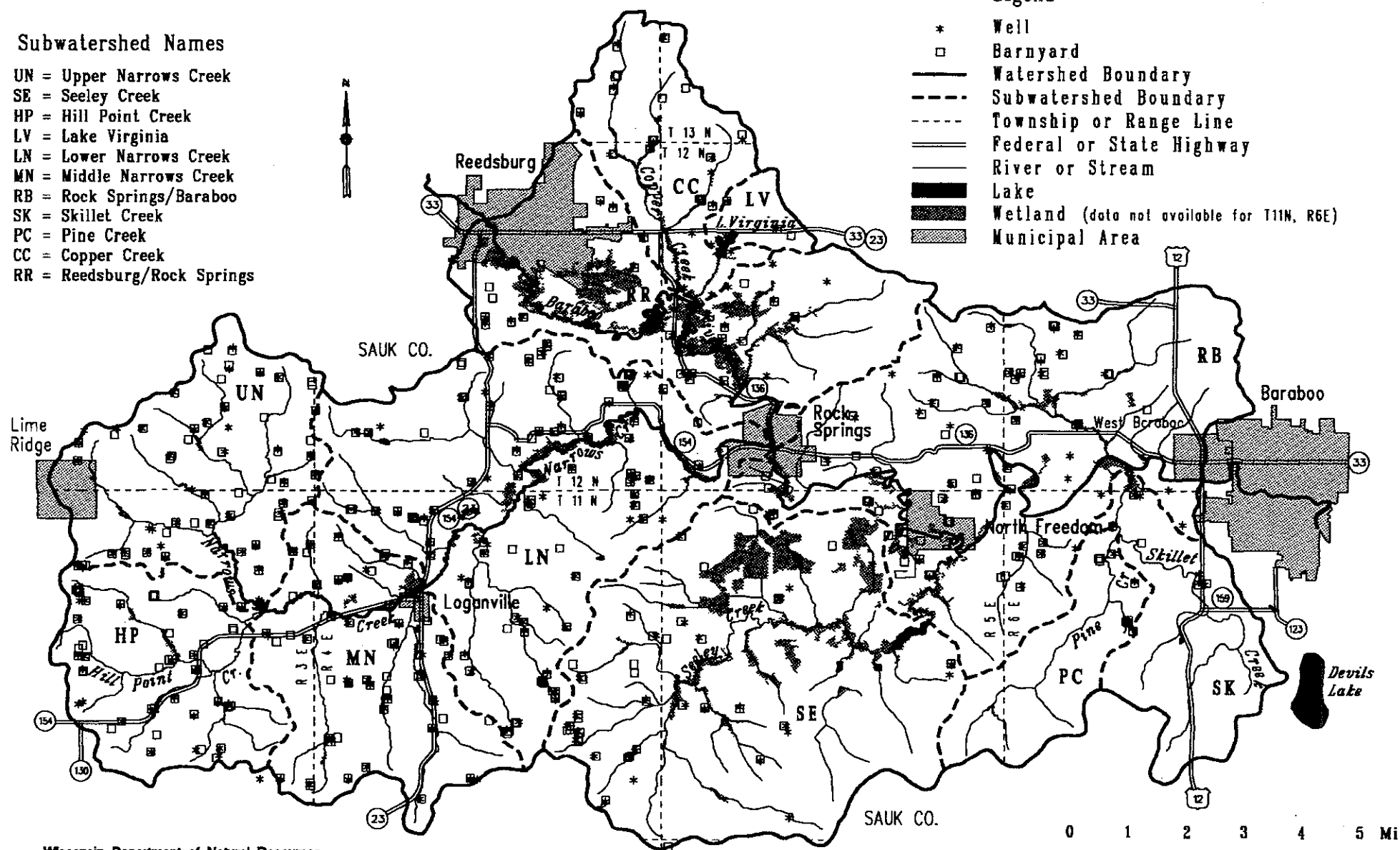
Map 2 - 2 Wells and Barnyards Sampled

Subwatershed Names

UN = Upper Narrows Creek
 SE = Seeley Creek
 HP = Hill Point Creek
 LV = Lake Virginia
 LN = Lower Narrows Creek
 MN = Middle Narrows Creek
 RB = Rock Springs/Baraboo
 SK = Skillet Creek
 PC = Pine Creek
 CC = Copper Creek
 RR = Reedsburg/Rock Springs

Legend

- * Well
- Barnyard
- Watershed Boundary
- - - Subwatershed Boundary
- - - Township or Range Line
- == Federal or State Highway
- River or Stream
- Lake
- Wetland (data not available for T11N, R6E)
- Municipal Area



Endangered and Threatened Resources

Information on endangered resources was obtained from the Bureau of Endangered Resources of the DNR. Endangered resources include rare species and natural communities. This section of the plan informs staff of specific species to protect when installing best management practices.

It should be noted that comprehensive endangered resource surveys have not been completed for the entire NBR 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 of Endangered Resources' endangered resource files are continuously updated from ongoing field work. There may be other records of rare species and natural communities that are in the process of being added to the database and so are not in the lists below. Updates or revisions of this watershed plan should be reviewed by the Bureau of Endangered Resources to include new records

Rare Species

Rare species are tracked by Wisconsin's Natural Heritage Inventory of the Bureau of Endangered Resources. Species tracked by the Inventory include species listed by the U.S. Fish and Wildlife Service or by the State of Wisconsin.

The following rare species are found within the Narrows Creek and Baraboo River Priority Watershed:

Wisconsin Endangered Species

Any species whose existence, as a viable component of this state's animal or plant communities, is in jeopardy, based on scientific evidence determined by the DNR. Wisconsin endangered species within the watershed are:

Asclepias purpurascens, purple milkweed
Falco peregrinus anatum, American peregrine falcon*
Helmitheros vermivorus, worm-eating warbler
Ophisaurus attenuatus, western slender glass lizard
Potamogeton pulcher, spotted pondweed
Quadrula fragosa, winged mapleleaf mussel*
Sistrurus catenatus, eastern massasauga rattlesnake

Wisconsin Threatened Species

Any species that is likely to become endangered within the foreseeable future, based on scientific evidence. Wisconsin threatened species within the watershed are:

Adoxa moschatellina, muskroot
Aconitum noveboracense, northern monkshood**
Agalinus gattingeri, round-stemmed false foxglove
Buteo lineatus, red-shouldered hawk
Carex prasina, drooping sedge
Casmerodius albus, great egret
Lespedeza virginica, slender bush clover
Lythrurus umbratilis, redbfin shiner
Macrhybopsis aestivalis, speckled chub
Oporornis formosus, Kentucky warbler
Platanthera flava, tubercled orchid
Polytaenia nuttallii, prairie parsley
Simpsonia ambigua, salamander mussel***
Vireo bellii, Bell's vireo
Wilsonia citrina, hooded warbler

Wisconsin Special Concern Species

Any species suspected, but not yet proven, of having abundance or distribution problems in Wisconsin. This category focuses attention on certain species **before** they become endangered or threatened. Wisconsin special concern species within the watershed are:

Aphredoderus sayanus, pirate perch
Aristida dichotoma, poverty grass
Accipiter cooperii, Cooper's hawk
Atrytonopsis hianna, dusted skipper butterfly
Callitriche heterophylla, large water starwort
Carex artitecta, dry woods sedge
Charidryas gorgone carlota, gorgone checker spot butterfly
Cordulegaster obliqua, arrowhead spiketail dragonfly
Dolichonyx oryzivorus, bobolink
Elaphe obsoleta, black rat snake
Gaeides xanthoides, great copper butterfly
Gnaphalium obtusifolium var saxicola, cliff cudweed***
Harkenclenus titus, coral hairstreak butterfly
Hesperia metea, cobweb skipper butterfly
Lepidostoma libum, a caddisfly
Lepidostoma vernale, a caddisfly
Lycaeides melissa samuelis, Karner blue butterfly***
Mitoura gryneus, olive hairstreak butterfly
Neurocordulia yamaskanensis, stygian shadowfly

Pieris protodice, checkered white butterfly
Poanes massasoit, mulberry wing butterfly
Potamogeton vaseyi, Vasey's pondweed
Satyrrium liparops strigosum, striped hairstreak butterfly
Scleria triglomerata, tall nut-rush
Solidago sciaphila, cliff goldenrod
Somatochlora tenebrosa, clamp-tipped emerald dragonfly
Utricularia geminiscapa, twin-stemmed bladderwort
Zealeuctra narfi, a rolled-winged winter stonefly

- * This species is on the Federal Endangered Species list as Endangered. A federally Endangered species is any species or subspecies which is in danger of extinction throughout all or a significant portion of its range.
- ** This species is on the Federal Endangered Species list as Threatened. A federally Threatened species is any species or subspecies which is likely within the foreseeable future to become endangered throughout all or a significant portion of its range.
- *** This species is a candidate for federal listing.

Due to a Barn Owl (*tuto alba*) sighting in 1990 an informational survey was conducted in the Hillpoint Creek and Middle Narrows Creek subwatersheds. The Barn Owl is endangered because its habitat, permanent grassland covers, and its nesting sites, old cement silos and old wooden abandoned barns, are disappearing. In 1986, there was only one wild active nest site known in the state.

The number of sightings of Blanding's Turtle (*Emydoidea blandingi*) was another unknown on the wildlife survey. The Blanding's turtle prefers open grassy marshes, mesic prairies, shallow slow-moving rivers, shallow lakes, and backwater sloughs.

Neither Blanding's Turtle nor Barn Owl appear on the lists provided by DNR Bureau of Endangered Resources because the statutory DNR process of verification and approval is not yet complete for these two species. This Blanding's Turtle survey was part of that process.

Any future sightings of either the Barn Owl or Blanding's Turtle should be reported to DNR Bureau of Endangered Resources at (608)266-7012 or to Sauk County Land Conservation Department (608)355-3245.

Natural Areas

Natural areas are sites that contain high quality examples of natural communities. State Natural Areas (SNAs) are officially designated by the DNR Natural Areas Program as deserving protection. They are owned by the DNR, other state and local agencies, or conservation organizations, and are managed to protect the natural resources.

The following State Natural Areas and natural areas were identified in the Narrows Creek and Baraboo River Priority Watershed. The natural communities found at each area are also listed.

State Natural Areas

Ablemans Gorge - shaded cliff, northern mesic forest (driftless area)
Devil's Lake Oak Forest - southern dry-mesic forest
McGilvra Woods - southern mesic forest
Pine Glen - southern dry forest, southern dry-mesic forest, northern dry-mesic forest,
cedar glade

Natural Areas

Ableman's Gorge Hemlocks - floodplain forest
Narrows Creek Gorge - floodplain forest, shaded cliff
Reedsburg Oak Forest - southern dry-mesic forest
Reedsburg School Forest - southern dry forest, sand barrens
Scenic Gorge - pine relict
Seeley Creek maple Forest - southern dry-mesic forest, southern mesic forest
Westfield Gorge - southern mesic forest
Westfield Oak Forest - southern dry-mesic forest

For specific information about these species or natural communities, contact the Bureau of Endangered Resources. 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.

CHAPTER THREE

Water Quality Conditions, Objectives, and Nonpoint Sources

Water Pollution Basics

Nonpoint sources are responsible for the degraded conditions of the streams in the Narrows Creek and Baraboo River (NBR) watershed. Excessive amounts of sediment, nutrients, and bacteria degrade the water quality, causing an unbalanced fish community with depressed populations and limited diversity. In this watershed the two most serious pollutant sources are manure and sediment. Manure contributes nitrogen and phosphorus. Sediment affects oxygen content and contributes phosphorus.

Manure

Manure contains several components that adversely affect water quality and aquatic life. Bacteria break down the manure, using oxygen in the process. This depletes the dissolved oxygen in the water that fish and other aquatic life require to survive. Also, manure contains nitrogen which can form ammonia in the streams and lakes. In high concentrations, ammonia is toxic to fish and other aquatic life. Ammonia toxicity depends on temperature and pH. The nutrients in manure, including nitrogen and phosphorus, also promote nuisance algae and weed growth in the streams and lakes.

Also, bacteria found in livestock manure is harmful to livestock that drink the water, and to humans using the water for recreation. The major sources of manure in this watershed are runoff from barnyards and improperly field-spread manure.

Steep slopes and narrow valleys present special manure management problems. Many barnyards and manure-spreading sites are located close to streams or on slopes. In either case, organic loading to streams is often significant.

Sediment

Sediment adversely impacts water resources in many ways. It degrades habitat that supports fish, aquatic insects and other forms of aquatic life. High sediment concentrations abrade fish gills, making the fish more susceptible to disease, and fills in pools and degrades fish spawning habitat. Suspended sediment also warms the water in the summer. This decreases the dissolved oxygen since warm water cannot hold as much oxygen as cold water.

The sources of sediment in this watershed are upland erosion from croplands, streambank erosion, and shoreline erosion. Heavy or long-term sediment deposits are less problematic in upland streams of the watershed. Gradients and higher velocities tend to scour streams of sediment, avoiding long-term habitat destruction caused by channelization or heavy sediment deposits. Instead, streambank erosion is the most common form of habitat destruction. See table 3-1 for a summary of sediment delivered to surface water based on land use.

Nitrates

Groundwater with nitrate levels greater than 10 mg/l exceed state groundwater standards. At this level infants should not drink the water because the nitrate interferes with the blood's ability to carry oxygen. High levels of nitrates may also be a sign that other contaminants are present in the drinking water. High nitrate concentrations are also linked to spontaneous abortions in livestock. The most likely sources of nitrates in the groundwater in this watershed are nitrogen fertilizers and manure applied to croplands. See groundwater discussion in chapter 2. Septic systems also contribute nitrates to groundwater.

Establishing Water Resource Objectives

Water quality objectives were developed by DNR staff with assistance from the Sauk County staff and the DATCP. Objectives were identified for each subwatershed and are listed in the following subwatershed descriptions. Details of objective development can be found in the *Narrows Creek and Baraboo River Water Resources Appraisal Report* (1992). For a summary, see table 3-2.

Streams with high resource priority include: Hill Point, Lower Narrows, Middle Narrows, Seeley Creek and Upper Narrows. In these streams, the overall objective is:

- enhance the smallmouth bass fishery

The objective for Seeley Creek/Seeley Lake is:

- improve the trout fishery

The objective for Lake Virginia is:

- raise dissolved oxygen levels

The objective for the remaining streams, Copper Creek, Pine Creek, and Skillet Creek, is:

- improve habitat and raise dissolved oxygen levels

The objective for groundwater is:

- promote nutrient management

Reducing bank erosion and sedimentation are also the objectives along the main stem of the Baraboo River, in subwatersheds Reedsburg-Rock Springs and Rock Springs-Baraboo.

Table 3-1. Narrows-Baraboo Summary of Upland Sediment Loading by Land Use

		Crop	%	Woods	%	Pasture	%	Grass	%	Resident	%	Wetland	%	All
CC	sediment load	626	81	8	1	74	10	7	1	54	7	0	0	769
	total acres	2579	45	1260	22	1059	19	642	11	161	3	0	0	5701
HP	sediment load	1189	88	13	1	73	5	2	0	70	5	3	0	1350
	total acres	5134	70	632	9	776	11	433	6	199	3	113	2	7287
LN	sediment load	4603	92	39	1	243	5	17	0	114	2	8	0	5024
	total acres	10269	57	2726	15	2627	14	1456	8	393	2	665	4	18136
LV	sediment load	155	77	1	0	1	0	1	0	43	21	0	0	201
	total acres	484	45	216	20	18	2	117	11	238	22	0	0	1073
MN	sediment load	1946	89	24	1	107	5	5	0	104	5	9	0	2195
	total acres	5938	64	1332	14	1183	13	392	4	284	3	174	2	9303
PC	sediment load	195	67	22	8	48	16	3	1	23	8	0	0	291
	total acres	782	18	2574	61	526	12	276	6	89	2	0	0	4247
RB	sediment load	2875	84	116	3	218	6	3	0	212	6	0	0	3424
	total acres	10046	50	5773	29	2124	11	1208	6	942	9	0	0	20093
RR	sediment load	3667	94	18	0	44	1	24	1	74	2	60	2	3887
	total acres	5787	46	2131	17	975	8	1937	15	419	3	1352	11	12601
SE	sediment load	1840	73	128	5	440	17	6	0	114	4	6	0	2534
	total acres	8499	43	5989	31	3925	20	512	3	322	2	341	2	19588
SK	sediment load	717	81	35	4	52	6	4	0	69	8	3	0	880
	total acres	1832	32	2578	46	575	10	357	6	200	4	98	2	5640
UN	sediment load	1427	88	10	1	113	7	1	0	72	4	6	0	1629
	total acres	7917	74	1065	10	1215	11	88	1	231	2	123	1	10639
AL	sediment load	19239	87	414	2	1413	6	74	0	949	4	95	0	22184
	total acres	59268	52	26276	23	15004	13	7417	6	6698	6%	2866	3%	114309

1. 'Pasture' includes 'WG' (Grazed Woodlots); ave. total acres W
2. 'Grassland' includes 'CRP'; ave. total acres CRP was 3%
3. 'Residential' includes 'FS' (Farmstead); total acres FS was 2%; total sed. load was 4%; but Lake Virginia subwatershed had 19% of LV acres and 16% of LV sediment

Table 3-2. Narrows Creek/Middle Baraboo Watershed Resource Recommendations

Subwatershed	Primary Water Resource	Resource Objectives	Use Impairment	Priorities for NPS Control
HP - Hillpoint UN - Upper Narrows MN - Middle Narrows LN - Lower Narrows	Hillpoint Creek Narrows Creek	Enhance the smallmouth Bass Fishery by improving dissolved oxygen levels and improving streambank habitat by reducing bank erosion, sedimentation and nutrient inputs to streams.	High amounts of Streambank Degradation, Sedimentation, Animal Waste, and Fertilizer Runoff, streambank habitat degradation	High - Animal Waste Control High - Sedimentation Reduction High - Streambank Habitat Improvement High - Nutrient Control
SE - Seely Creek	Seely Creek/ Seely Lake	Improve Trout Fishery by reducing oxygen depletion, stabilizing streambank habitat, reducing sedimentation, and reducing nutrient inputs to Lake.	High Water Temperatures, Streambank Degradation, low dissolved oxygen Waste	High - Animal Waste Control High - Sedimentation Reduction High - Streambank Habitat Improvement High - Nutrient Control
RR - Reedsburg	Baraboo River	Improve habitat and dissolved oxygen levels by reducing bank erosion, sedimentation and nutrient inputs to streams.	Moderate Sedimentation and Bank Erosion	Medium - Animal Waste Control Medium - Sedimentation Reduction Medium - Streambank Habitat Improvement Medium - Nutrient Control
CC - Copper Creek	Copper Creek	Improve habitat and dissolved oxygen levels by reducing bank erosion, sedimentation and nutrient inputs to streams.	Moderate Sedimentation and Bank Erosion	Medium - Animal Waste Control Low - Sedimentation Reduction Low - Streambank Habitat Improvement Low - Nutrient Control
LV - Lake Virginia	Lake Virginia	Improve dissolved oxygen levels by reducing nutrient inputs to lake	High Nutrient Loading and High Eutrophication	High - Animal Waste Control High - Sedimentation Reduction Low - Streambank Habitat Improvement High - Nutrient Control
RB - Rock Springs/Baraboo	Baraboo River	Improve habitat and dissolved oxygen levels by reducing bank erosion, sedimentation and nutrient inputs to streams.	Moderate Bank Erosion and Sedimentation	Medium - Animal Waste Control Medium - Sedimentation Reduction Medium - Streambank Habitat Improvement Medium - Nutrient Control
PC - Pine Creek	Pine Creek	Improve habitat and dissolved oxygen levels by reducing bank erosion, sedimentation and nutrient inputs to streams.	Moderate Bank Erosion and Sedimentation	Medium - Animal Waste Control Medium - Sedimentation Reduction Medium - Streambank Habitat Improvement Medium - Nutrient Control
SK - Skillet Creek	Skillet Creek	Improve habitat and dissolved oxygen levels by reducing bank erosion, sedimentation and nutrient inputs to streams.	Moderate Bank Erosion and Sedimentation to improve habitat	Low - Animal Waste Control Medium - Sedimentation Reduction Medium - Streambank Habitat Improvement Medium - Nutrient Control

Pollutant Reduction Goals

Pollutant load reductions are developed to achieve water quality objectives. One set of goals was established for the high priority watersheds, and a slightly different set was established for the medium priority watersheds. See chapter 4 for specific objectives. The following is a summary of reduction targets for the entire watershed.

1. Reduce overall sediment by 28%.
 - Reduce upland sediment delivered to streams by 20%
 - Reduce streambank erosion by 25%
 - Reduce gully erosion by controlling at least 2000 tons of erosion annually
2. Reduce 64% of phosphorus load from organic matter.
 - Reduce 64% of phosphorous load from barnyard runoff.
 - Winter spreading of manure: No specific goal established.
3. Restore 68% of streambank habitat.
4. Wetlands: No specific goal established.
5. Groundwater: No specific goal established.

Results of Nonpoint Source Inventories

Barnyard Runoff

Runoff carrying a variety of pollutants from barnyards and other livestock feeding, loafing, and pasturing areas is a significant source of pollutants in the streams of the NBR Watershed. Livestock operations comprised of 427 animal lots are a source of 22,851 average annual pounds of phosphorus. (The phosphorus is 6,793 pounds, based on a 10-year, 24-hour rainfall event.) See table 3-3 for inventory results. Most of the oxygen-demanding pollutants and nutrients associated with these operations drain via concentrated flow to creeks and wetlands.

Table 3-3. Barnyard Inventory Results: Narrows-Baraboo River Watershed

Subwatershed	Number of Barnyards	Total P* (lbs)	Percent P Load
Copper Creek	21	1,328	6
Hill Point Creek	48	2,423	11
Lower Narrows	95	6,258	27
Lake Virginia	3	237	1
Middle Narrows	55	6,258	9
Pine Creek	11	513	2
Rock Springs-Baraboo	66	2,922	13
Reedsburg-Rock Springs	23	1,152	5
Seeley Creek	38	2,427	11
Skillet Creek	3	203	1
Upper Narrows	64	3,292	14
Totals	427	22,851	100

*Based on Model for annual, 24-hour rainfall
P = Phosphorous

Sources: Sauk County Land Conservation Department, DNR, and DATCP

Upland Sediment

Intensive agricultural practices have caused considerable amounts of eroded soil to reach streams, ponds, and wetlands in the NBR Watershed. Upland erosion is the major source of sediments carried downstream, beyond individual subwatershed boundaries.

Upland sediment sources were evaluated for the entire watershed (175 square miles). The results of this inventory are summarized in table 3-4. An estimated 21,958 tons of soil erode annually from croplands, farmsteads, pastures, woodlots, grassland, and other "open areas". About 10% of this amount (2,195 tons/year) is delivered directly to wetlands or streams in the watershed. Uplands are the source of 84% of the sediment delivered to surface waters. Gullies also contribute to the total sediment delivered to surface waters, but the percent is unknown because a complete inventory was not done.

Table 3-4. Mass Balance of Sediment

Subwater-shed	Uplands (tons/yr)	Streambanks (tons/yr)	Percent Uplands	Percent Streambanks
CC	767	27	97	3
HP	1,349	504	73	27
LN	5,021	632	89	11
LV	201			
MN	2,194	1,364	62	38
PC	292	137	68	32
RB	3,421			
RR	3,886			
SE	2,538	378	87	13
SK	872	561	61	39
UN	1,417	616	70	30
Watershed Total	21,958	4,219	84%	16%

Streambank Erosion

Streambank erosion contributes 16% of the total sediment to surface waters in the NBR River watershed. See table 3-3. Sediment delivery has seriously affected recreational activities such as fishing and canoeing in the main stem of the Baraboo River. Of the approximately 145 miles of evaluated streams, significant erosion has occurred and/or aquatic habitat and water quality were degraded along approximately 19 miles (13%) of streambank. An estimated 4,219 tons of sediment are eroding into streams annually. See table 3-6 for streambank inventory results.

Table 3-5. High Priority Subwatersheds (HP, LN, MN, SE, UN)* (incl. LV for barnyards)

Pollutant Load Reductions		Attained by Management Strategies	
		Total Tons Inventoried	Tons Control (Category I)
I. Sediment (30%)		16,013	4,870
A. Upland (15%)		12,519	1,831
B. Streambank (30%)		3,494	1,039
C. Gullies ()		n.a.	2,000
		Total Pounds Inventoried	Pounds Control (Category I)
II. Organic Matter (68%)		16,735	11,470
A. Barnyards (68%)		16,735	11,470
		Total Trampled Feet Inventoried	Total Feet Control (Category I)
III. Habitat Repair (72%)		48,671	35,064
IV. Wetlands		n.a.	n.a.

- All land uses only agriculturally impacted sites.
- CAT II gives an additional 10% (1,193 tons), translating to total sediment reduction of 38%
- Setting the sediment cutoff value at 50% (instead of the 30% used) results in a sediment delivery reduction of only 0.6% (72 pounds/yr). Given the difficulty (technology limits) and cost, the decision was made to achieve significant sediment reduction from streambanks and gullies, and only 15% from uplands.
- Seeley Creek subwatershed has a large number of acres, but relatively little (43%) in cropland. Nearly all fields are already controlled to less than "T", thus improved control will be hard to achieve.

*Currently no tools exist to adequately estimate sediment from gullies.

Table 3-6. Streambank and Habitat Degradation

subwater-shed	Total Length (feet)	Eroded + Trampled (feet)	Eroded + Trampled (percent)	Total Sediment Loss (t/yr)	Sed. From Ag. Impact	Sed. From Non-Ag. Impact
CC	54,400	1,760	3	27	6	22
HP	84,000	13,365	16	504	479	19
LN	164,200	16,420	10	632	627	73
LV						
MN	122,700	24,135	20	1364	1019	341
PC	41,640	5,175	12	137	137	0
RB						
RR						
SE	143,780	9,420	7	378	137	242
SK	60,800	8,665	14	561	421	140
UN	92,400	18,994	21	616	695	67
Watershed Total	763,920 (feet)	97,934 (feet)	13%	4,219 (tons/year)	3,519 (tons/year)	903 (tons/year)

Note: No formal streambank inventory was done on LV, RB, RR. Lake Virginia has no streambanks to inventory. A quick canoe inventory of RB showed predominately stable streambanks, with a few badly eroded sites. RR is presumed to be similar to RB, based on staff experience with recreational canoeing on the river.

Winter Spreading of Manure

The most significant water quality problems associated with the spreading of livestock manure occur when wastes are spread on "critical" areas such as steeply sloped frozen ground, land in floodplains, or areas with shallow depth to groundwater. Estimates indicate that livestock manure is spread on 6,300 "critical" acres where runoff has a high potential to convey pollutants to both surface waters and groundwater. These estimates are from the Crossman Creek-Little Baraboo River Priority Watershed because a complete inventory was not done for Narrows Creek and Baraboo River. (A complete inventory is not available because uplands were "sub-sampled" in an effort to use staff time more efficiently.) The Crossman Creek-Little Baraboo River Watershed is directly upstream from NBR, mostly in Sauk County, and has similar area, topography, and land use.

Field Nutrient and Pesticide Management Practices

In addition to the watershed inventories, the NBR watershed project is being used as a pilot project to assess the usefulness of the Farm Assessment Technique (FAT) [recently modified and now called the Farm Practices Inventory (FPI)] (Nowak and Shephard, 1991). The FPI is an assessment of landusers' nutrient and pesticide management practices. The data, collected from interviews with over 200 farmers in conjunction with the barnyard inventory, will be used to identify current nutrient and pesticide management practices. The data will also be used to target areas that need management changes to reduce nonpoint source pollution in the NBR watershed. It can also be used to identify and highlight areas where sound water quality management practices are currently in use.

The data collected includes commercial fertilizer inputs, manure applications, crop rotations, pesticide selection and operator knowledge of the management practices. An important dimension of this type of assessment is to focus on current management, which can be supplemented by educational and technical assistance provided to farmers in the watershed.

The preliminary results of the FPI survey data are:

- There are many cases of nutrient over-application occurring in the NBR watershed. This hurts water quality and profitability.
- Much over-application results from inaccurate, or no crediting of manure and legume nutrient contributions.
- Lack of up-to-date knowledge prevents farmers from accurately evaluating and crediting nutrients from manure.
- Manure storage structures have had little impact on field nutrient management practices.
- Soil testing was not shown to effect field nutrient management practices.
- Before developing fertilizer recommendations, agri-business needs to take a more active role in requesting and using on-farm nutrient information to assist their clients in the proper use of manure and legume credits.
- There is a need to explore innovative ways to assist farmers in fully utilizing on-farm nutrient sources.
- Project information and assistance need to be targeted to the specific needs of the audience.

General Watershed Description

The major streams in the watershed are the Baraboo River and Narrows, Copper, Skillet, Pine, Seeley and Hill Point Creeks. Portions of Seeley Creek are classified as Class II trout waters with brown trout as the dominant species. Narrows Creek supports a smallmouth bass fishery. The Baraboo River supports a sport fishery and is also heavily used for canoeing. There are two impoundments in the project area, Lake Virginia (35 acres) and Seeley Lake (60 acres).

The watershed is almost entirely rural with the land use consisting primarily of cropland, woodland and pasture. (See table 3-1: Land Use in NBR.) Dairying is the major agricultural activity and manure runoff from barnyards and field spreading is a concern for the protection of water quality. Although cropping is less intense than in many areas of Wisconsin, much of the crop production occurs on steep slopes allowing severe erosion to occur.

Surface Water Quality Appraisal Summary

The Narrows Creek and Baraboo River Watershed lies predominantly in the driftless area while lower reaches pass through the outwash plain of ancient Lake Wisconsin. The upper and middle portions of Narrows Creek support a smallmouth bass fishery. This fishery appears to have comparable growth rates, and other conditions, associated with other smallmouth bass fisheries in southwestern Wisconsin. This makes Narrows Creek a valuable resource since smallmouth bass populations in southwest Wisconsin experienced a regional decline in quality from nonpoint source pollution.

Currently, the headwater of Seeley Creek is the only section of stream in the entire watershed classified as "trout waters". In order to improve and maintain this fishery, the animal waste and sedimentation problems must be addressed.

Lakes Virginia and Seeley both suffer from eutrophication problems caused by the overloading of nutrients. To improve the lakes, nutrient loading must be reduced to an acceptable level.

Other streams in the watershed, the tributaries to Narrows Creek and the Baraboo River, contain diverse populations of forage fish, and also provide excellent nurseries for young smallmouth bass.

Table 3-7. Narrows Creek/Middle Baraboo Watershed Physical, Chemical, and Biological Data Summary of Named Streams

Stream	Sub Watershed	Site(s)	Length (mi)	Gradient (ft/mi)	Base Flow (cfs)	Habitat Score	Current Stream Class	Potential Stream Class	HBI Date (Value)	Sampling Date	Temperature (°C)	D.O. (mg/l)	pH
Hill Point Creek	HP	STH "154"	4.0	30	1.3	142/FAIR	WWSF	WWSF	10/12/90 (5.256)	10/26/90	8.5	13.8	8.43
Narrows Creek	UN	Three Culvert Road	18.5	13	9.6	155/FAIR	WWSF	CWSF	10/15/89 (4.030)				
Narrows Creek	UN	Narrows Valley Road	2.0	30	0.88	145/FAIR	WWSF	WWSF	10/12/90 (5.220)	10/26/90	9.0	13.6	8.76
Narrows Creek	MN	No View Road	18.5	13	9.6	153/FAIR	WWSF	WWSF	10/15/89 (5.897)				
Eli Valley Creek	MN	Short Cut Road	2.75	36	0.73	201/POOR	WWFF	WWFF	10/12/90 (4.342)	10/26/90	7.8	12.8	8.24
Spring Valley Creek	MN	Spring Valley Road	2.25	44	1.1	158/FAIR	WWFF	WWFF	10/12/90 (5.697)	10/26/90	7.2	11.8	8.12
Narrow Creek	MN	HWY "154"	18.5	13	9.6	99/GOOD	WWSF	WWSF	10/15/89 (4.839)				
Copper Creek	CC	Beth Road	3.2	19	3.1	162/FAIR	WWFF	WWFF	10/30/90 (6.269)	11/13/90	7.5	13.0	7.73
Unnamed 12N R5E 29-2 (Rock Springs Creek)	RR	Schneider Road	2.0	20	0.96		WWFF	CWSF	04/26/91 (4.642)	04/26/91	15.0	10.6	
Seeley Creek	SE	Klein Road	11.0	21	5.76	129/GOOD	CWSF Class II	CWSF Class II	11/06/90 (7.875)	11/13/90	2.5	13.8	7.7
Seeley Creek	SE	CTH "W"	11.0	21	5.76	121/GOOD	CWSF Class II	CWSF Class II	10/12/90 (5.493)	10/26/90	8.0	12.2	7.72
Pine Creek	PC	CTH "W"	3.5	89	0.56	114/GOOD	WWFF	WWFF	11/16/90 (4.736)	10/26/90	6.4	11.4	7.1
Pine Creek	PC	Forrest Drive	3.5	89	0.56	72/GOOD	WWFF	WWFF	04/25/91 (5.181)	04/25/91	11.2	11.4	7.1
Skillet Creek	SK	HWY 159	6.0	38	0.87	109/GOOD	WWFF	WWSF	10/26/90 (5.326)	10/26/91	4.5	11.6	7.14
Skillet Creek	SK	CTH "W"	6.0	38	0.87	109/GOOD	WWFF	WWFF	10/12/90 (4.384)	10/26/91	5.5	10.9	7.18

Table 3-8. Narrows Creek/Middle Baraboo Watershed Physical, Chemical, and Biological Data Summary of Named Lakes

Lake	Sub Watershed	Site(s)	Surface Area (Acres)	S.D.F.	Maximum Depth	Classification	Sampling Date(s)	Surface Temperature (°C)	Surface D.O. (mg/l)	Conductance	Type	Monitoring
Seeley Lake	SE		60.42	2.83	10	Highly Eutrophic					Shallow	
Lake Virginia	LV	North South	35.0	3.5	15	Highly Eutrophic	04/02/91	9.1 7.4	10.7 11.7	.261 .260	Shallow Impoundment	-Self - Help Monitor -Byron Tetzloff
							06/13/91	25.0 25.3	11.0 12.4	.242 .254		Lake Management Planning Grant -Ambient Monitoring
							07/15/91	27.0 26.6	10.2 9.2	.260 .241		
							09/05/91	22.1 22.1	9.2 8.2	.245 .242		

Subwatershed Discussions

Here are abbreviations for designated biological uses in the subwatershed discussions.

COLD = Cold Water Communities; includes surface waters capable of supporting a community of cold water fish and other aquatic life or serving as a spawning area for cold water fish species.

WWSF = Warm Water Sport fish Communities; includes surface waters capable of supporting a community of warm water sport fish and/or serving as a spawning area for warm water sport fish.

WWFF = Warm Water Forage Fish Communities; includes surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.

Discussions also include the "class" of trout streams based on the publication "Wisconsin Trout Streams" [DNR Publ. 6-3600(80)] and Outstanding/Exceptional Resource Waters, Wisconsin Administrative Code NR 102.20 and NR 102.11.

Class I streams are high quality. Natural reproduction sustain fish populations.

Class II streams have some natural reproduction but may need stocking to maintain a desirable fishery.

Class III streams have no natural reproduction and require annual stocking of legal-size fish to provide sport fishing.

Copper Creek Subwatershed (CC)

Subwatershed Description

Copper Creek subwatershed lies between Reedsburg-Rock Springs and Lake Virginia subwatersheds in the northern portion of the watershed. Land use is 45% cropland, 22% woods, and 19% pasture (see table 3-1: Land Use in NBR). It drains an area of 5,741 acres, or 5% of the total watershed area. See map 3-1: CC, LV, RR Subwatersheds.

Water Resource Conditions

Copper Creek is a seepage and spring-fed stream that flows southeast, entering the Baraboo River 2.5 miles southeast of Reedsburg. This stream is shallow and is sandy throughout its length. The water warms considerably before reaching the mouth of the stream. The fishery is dominated by forage species although a few game fish may be present a short distance from the Baraboo River. There are 243 acres of adjoining wetland with 90 percent shrub swamp and 10 percent wet meadow. According to the HBI (Hilsenhof Biotic Index) in table 3-7 the

water quality is rated as "fair." This shows a substantial degree of organic pollution is likely. The habitat evaluation score is fair.

Nonpoint Pollutant Sources

Copper Creek subwatershed contains 21 animal lots and adds 1,328 pounds of oxygen depleting phosphorus (based on annual, 24-hour rainfall event) to the NBR surface water resources. This represents 6% of the phosphorus for the whole watershed.

Copper Creek subwatershed contributes 27 tons of sediment annually from its streambanks, with 4% of the length (1,910 feet) degraded and trampled by livestock. Copper Creek subwatershed delivers 767 tons of upland sediment annually, or 3% of the entire watershed load. Cropland delivers 81% of the load. Pasture and grazed woodlots add another 10%.

Water Resources Objectives

Reduce bank erosion and sedimentation and reduce organic pollution from excess fertilizer application.

Hill Point Creek Subwatershed (HP)

Subwatershed Description

Hill Point Creek subwatershed lies between the Upper Narrows and Middle Narrows subwatersheds in the southwestern part of the watershed. Land use is 70% cropland, 9% woods, and 11% pasture. It drains an area of 7,248 acres, or 6% of the total watershed area. It includes part of Hill Point village. See map 3-2: HP, MN, UN Subwatersheds.

Hill Point Creek is a seepage fed stream originating in west-central Sauk County and flows northeast through Hillpoint to the headwaters of Narrows Creek. Smallmouth bass constitute the sport fishery and an abundance of forage fish are found throughout the stream. Rubble and gravel are the principle bottom types. An adequate number of pools exist to support the smallmouth bass population. Over-grazing and heavy bank erosion are current land use problems.

Water Resource Conditions

Unnamed spring-fed streams drain this eastwardly flowing subwatershed that empties into the Narrows Creek. Hillpoint Creek is a good nursery for young smallmouth bass, as well as some adult fish. This portion of the watershed is of special concern because of its relationship with Narrows Creek smallmouth bass fishery. The HBI rating is "good", which indicates that some organic pollution is present. The habitat rating is "fair", which is indicates degraded streambanks.

Nonpoint Pollutant Sources

Hillpoint Creek subwatershed contains 48 animal lots that add 2,423 pounds of oxygen depleting phosphorus (based on annual, 24-hour rainfall event) to the NBR surface water resources. This represents 11% of the phosphorus for the whole watershed.

Hillpoint Creek subwatershed contributes 504 tons of sediment annually from its streambanks, with 11% of the length (9,515 feet) degraded and trampled by livestock.

Hillpoint Creek subwatershed delivers 1,349 tons of upland sediment annually, or 6% of the entire watershed load. Cropland is the major source, providing 88% of the load with pasture and grazed woodlots adding another 5%.

Water Resources Objectives

Improve the smallmouth bass fishery by reducing oxygen depleting substances that enter the stream, reduce the frequency of dissolved oxygen sags, and reduce sedimentation to improve streambank habitat.

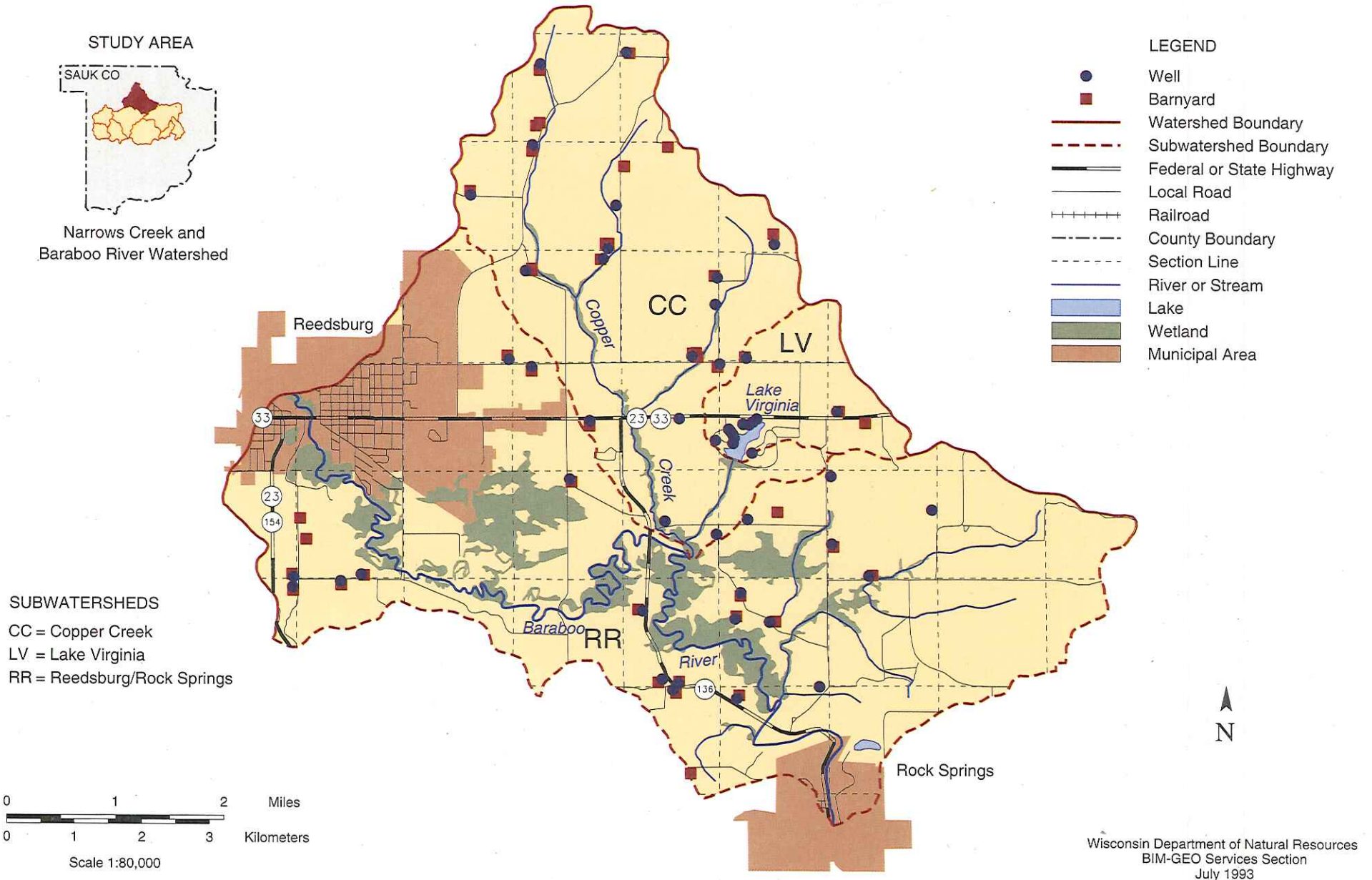
Narrows Creek Subwatersheds (Upper, Middle, Lower)

The three combined subwatersheds of Narrows Creek (Upper, Middle, Lower), drain 36,717 acres, representing 33% of the entire watershed. Tributaries include Upper Narrows, Middle Narrows, Lower Narrows, Eli Valley, Spring Valley, and other unnamed tributaries. Hillpoint ridge forms the western boundary and the Baraboo Bluffs form the southern boundary.

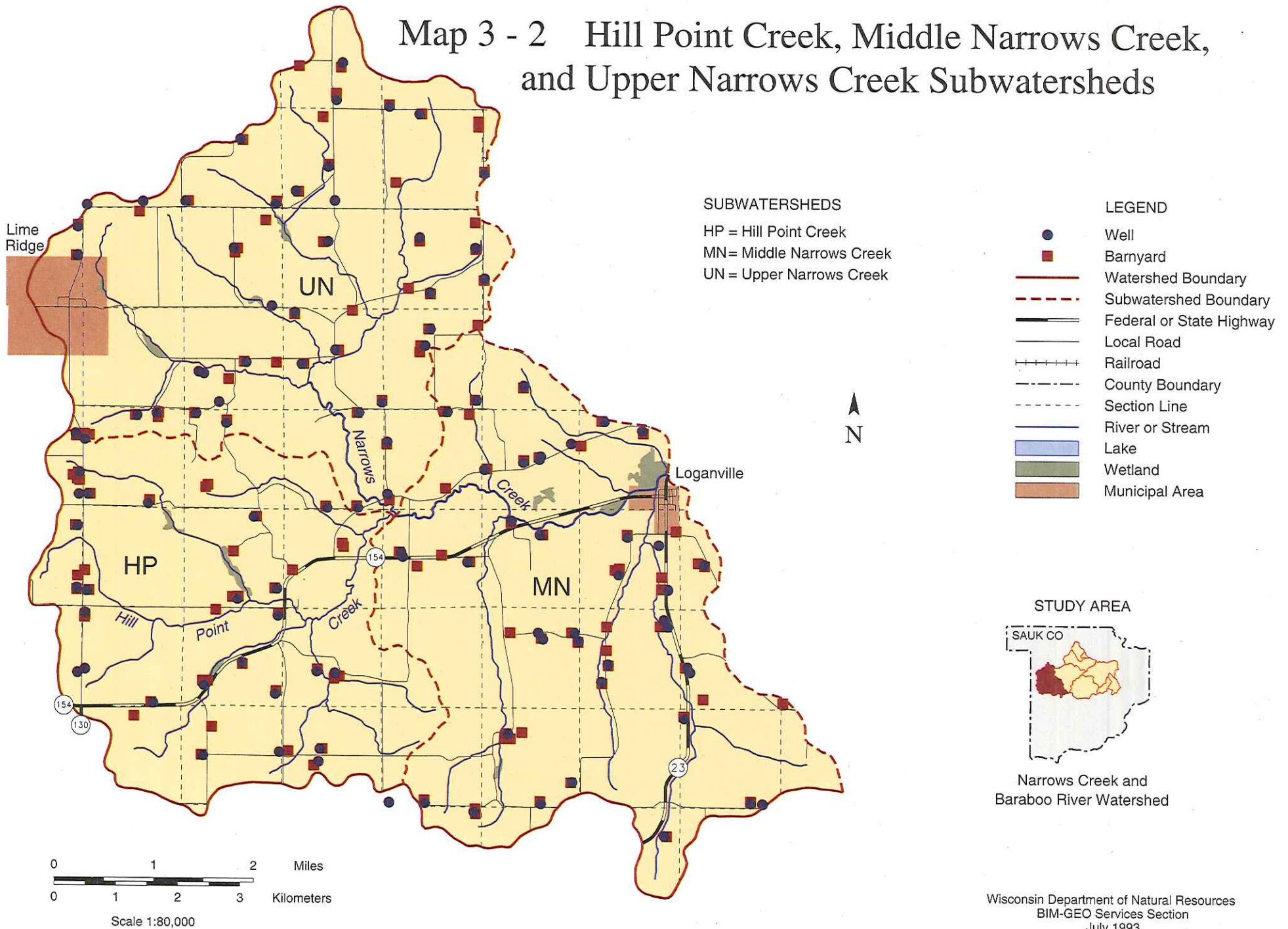
Narrows Creek is a low gradient seepage fed stream beginning near Lime Ridge, flowing southeast to Loganville, and then northeasterly to enter the Baraboo River at Rock Springs. Smallmouth bass and panfish constitute a majority of the fishery. Northern pike and rough fish are also present in varying numbers. Forage fish are abundant throughout the stream. Fish kills, caused by pollution from the Continental Condensing Corporation of Hillpoint, have occurred. To maintain the fishery, the stream was restocked with smallmouth bass following fish kills.

Approximately 90 percent of the watershed was cleared for agricultural purposes. Heavy bank erosion and siltation are major problems during periods of rapid runoff. Remnants of an old dam still exist on the stream where it flows through a narrow gorge in the Baraboo Range two miles west of Rock Springs. A total of 109 acres of fresh meadow and shrub swamp wetland is scattered along the stream. Muskrats are common and migratory waterfowl frequent the area. The Baraboo River and 17 road crossings provide access, and 25 dwellings adjoin the stream.

Map 3 - 1 Copper Creek, Lake Virginia, and Reedsburg/Rock Springs Subwatersheds



Map 3 - 2 Hill Point Creek, Middle Narrows Creek, and Upper Narrows Creek Subwatersheds



Narrows Creek contains a relatively good population of smallmouth bass. Although the stream is known to support smallmouth bass, little work has been done in assessing the fish population. Much of what was first known about the fishery comes from an investigation of a fish kill that occurred in 1957. This kill was caused by a fertilizer spill in one of the tributary streams. Smallmouth bass were a large portion of the game fish killed by the fertilizer spill.

The smallmouth bass fishery is a valuable asset. The smallmouth bass population is similar to others in southwestern Wisconsin and can experience the same nonpoint source pollution problems. Although habitat is good in areas, it would be greatly improved by removing silt and installing streambank protection (rip rap). As part of the water resources appraisal, a section of the stream upstream from Loganville was surveyed using electrofishing. Although the population density and size structure was typical for Southern Wisconsin smallmouth bass fisheries, there were very few bass captured in the fingerling year and size class. This possible year class failure could be the result of animal waste and/or nutrients entering the stream, depleting dissolved oxygen.

Upper Narrows Subwatershed (UN)

Subwatershed Description

Upper Narrows lies between Hillpoint and Middle Narrows subwatersheds. It includes Lime Ridge, in the western portion of the watershed. Land use is 74% cropland, 10% woods, and 11% pasture. It drains an area of 9,153 acres, or 8% of the total watershed area. See map 3-2: HP, MN, UN Subwatersheds.

Water Resource Conditions

Unnamed spring-fed streams drain this eastward flowing subwatershed that empties into the Narrows Creek. See the description for all of Narrows Creek above.

Nonpoint Pollutant Sources

Upper Narrows subwatershed contains 64 animal lots, adding 3,292 pounds of oxygen depleting phosphorus (based on annual, 24-hour rainfall event) to the NBR surface waters. This represents 14% of the phosphorus for the whole watershed.

Upper Narrows subwatershed contributes 616 tons of sediment annually from its streambanks, with 15% of the length (13,561 feet) degraded and trampled by livestock.

Upper Narrows subwatershed delivers 1,417 tons of upland sediment annually, or 6% of the entire watershed load. Cropland is the major source at 88% of the load with pasture and grazed woodlots adding another 7%.

Water Resources Objectives

Improve smallmouth bass fishery by reducing the amount of oxygen depleting substances entering the stream, reducing the frequency of dissolved oxygen sags, and reducing sedimentation to improve streambank habitat.

Middle Narrows Subwatershed (MN)

Subwatershed Description

Middle Narrows lies between Upper and Lower Narrows subwatersheds in the southwestern part of the watershed. Land use is 64% cropland, 14% woods, and 12% pasture. It drains an area of 9,313 acres, or 8% of the watershed area. Tributaries to Middle Narrows include Eli Valley Creek and Spring Valley Creek. See map 3-2: HP, MN, UN Subwatersheds.

Spring Valley Creek is a small seepage and spring-fed stream that flows northerly and enters Narrows Creek at Loganville. Bank erosion is a serious problem throughout its length. Forage fish are common in the large pools. Sand is the most common bottom type although the pools are silty. Most of the watershed is cultivated, however, hardwood forests are common on the steeper slopes.

Eli Valley Creek is a spring and seepage-fed tributary of Narrows Creek, located 2 miles west of Loganville. The stream is small and shallow with a rubble and silt bottom. Forage fish comprise the fishery. White suckers, creek chubs, stone rollers and Johnny darters are abundant. Six acres of shrub swamp wetland adjoin the central portion of the stream, and muskrats are present in the lower reaches.

Water Resource Conditions

Unnamed spring-fed streams drain this eastward flowing subwatershed that empties into the Narrows Creek. See the description for all of Narrows Creek above.

Nonpoint Pollutant Sources

Middle Narrows subwatershed contains 55 animal lots, adding 2,098 pounds of oxygen depleting phosphorus (based on annual, 24-hour rainfall event) to the NBR surface waters. This represents 9% of the phosphorus for the whole watershed. Middle Narrows subwatershed contributes 1,364 tons of sediment annually from its streambanks, with 8% of the length (10,085 feet) degraded and trampled by livestock.

Middle Narrows subwatershed delivers 2,194 tons of upland sediment annually, or 10% of the entire watershed load. Cropland is the major source at 89% of the load with pasture and grazed woodlots adding another 5%.

Water Resources Objectives

Improve and protect smallmouth bass fishery.

Lower Narrows Subwatershed (LN)

Subwatershed Description

Lower Narrows is the third largest subwatershed and lies between the Middle Narrows subwatersheds and the Baraboo River in the middle of the watershed. It almost reaches Loganville on the west and includes part of Rock Springs on the east. Land use is 57% cropland, 15% woods, and 14% pasture. It drains an area of 18,251 acres, or 16% of the total watershed area. See map 3-3: LN, SE Subwatersheds.

Water Resource Conditions

Unnamed spring-fed streams drain this eastward flowing subwatershed that empties into Narrows Creek. See the description for all of Narrows Creek above.

Nonpoint Pollutant Sources

Lower Narrows subwatershed contains more animal lots any other subwatershed. Ninety-five (95) animal lots add 6,258 pounds of oxygen depleting phosphorus (based on annual, 24-hour rainfall event) to NBR surface waters. This represents 27% of the phosphorus for the whole watershed.

Lower Narrows subwatershed contributes 632 tons of sediment annually from its streambanks, with 7% of the length (12,130 feet) degraded and trampled by livestock.

Lower Narrows subwatershed delivers 5,021 tons of upland sediment annually, or 23% of the entire watershed load. This is the largest percentage of sediment delivery by any single subwatershed. Cropland contributes 92% of the load with pasture and grazed woodlots adding another 5%.

Water Resources Objectives

Improve smallmouth bass fishery by reducing the amount of oxygen depleting substances entering the stream, reducing the frequency of dissolved oxygen sags, and reducing sedimentation to improve streambank habitat.

Lake Virginia Subwatershed (LV)

Subwatershed Description

Lake Virginia subwatershed is the smallest subwatershed and lies between Copper Creek and Reedsburg-Rock Springs subwatersheds. It drains an area of 1,076 acres, or 1% of the total watershed area, and is in the northern portion of the watershed. Land use is 45% cropland, 20% woods, 2% pasture, 11% grassland, and 22% residential. See map 3-1: CC, LV, RR Subwatersheds.

Lake Virginia was created in 1969 by an earthen dike with a 14-foot headwall on an unnamed tributary (18-15) to the Baraboo River. A local real estate agency created the lake to promote private development. A public historical park is located at the northwestern shore but does not adjoin the lake. Several dwellings now surround the entire lake.

Water Resource Conditions

Lake Virginia has a history of water quality problems including excessive aquatic plants, nuisance algae growths, and fish kills. Harvesting operations control rooted aquatic plants and aeration systems have been employed to prevent fish kills. As a response to low dissolved oxygen levels and fish kills in 1982 and 1984, the compressed air system was installed in 1985. After installing the aeration system, no fish kills were reported until 1990. Two fish kills were reported that year even though the aeration system was operating. The lake level was very low in 1990 in response to the drought.

In 1991, DNR Southern District Water Resources staff conducted lake monitoring on Lake Virginia to establish a data base for the Lake District and to calculate a Trophic Status Index. The district was granted a Lakes Planning Grant (NR 119) in October to develop a nutrient budget for the lake watershed and associated management recommendations. The consultant (Ayres Associates) will conduct a preliminary hydrological assessment from the land use assessment, conducted by the Sauk County LCD, and water quality monitoring data, from the DNR, to make water quality projections and management recommendations.

The total phosphorus levels in Lake Virginia are three times greater than the average Wisconsin impoundment. This represents a "very poor" water quality index.

The fishery is currently a warm-water sport fishery (WWSF), containing populations of panfish as well as largemouth bass. Lake Virginia is still classified as a panfish fishery, with limited numbers of largemouth bass and northern pike. In the summer of 1991, the lake was stocked with largemouth bass, bluegills, and fingerling walleyes by the Wisconsin DNR.

Nonpoint Pollutant Sources

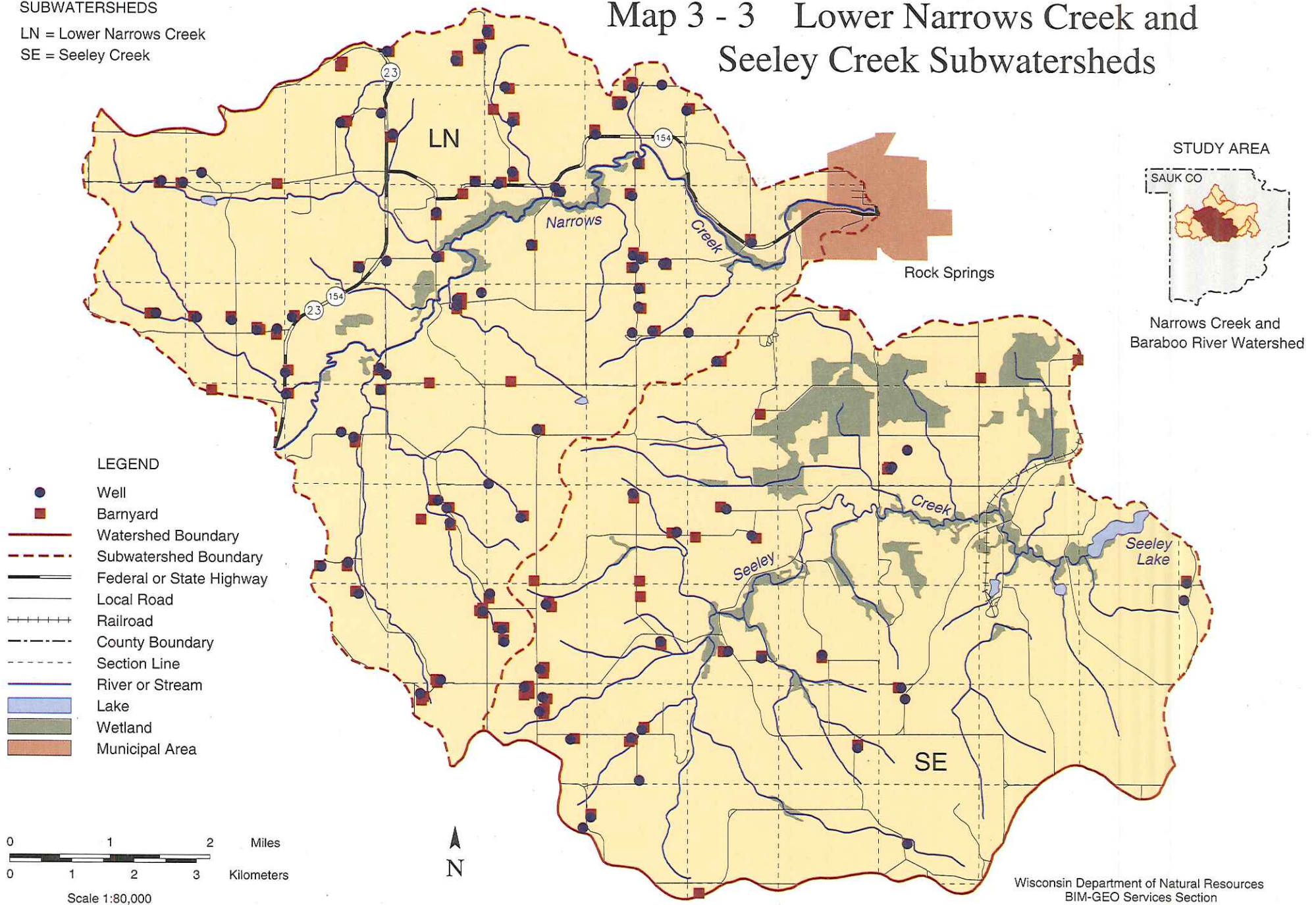
Lake Virginia subwatershed contains fewer animal lots than the other subwatersheds. Three animal lots add 237 pounds of oxygen depleting phosphorus (based on annual, 24-hour rainfall event) to NBR surface waters. This is 1% of the phosphorus for the whole watershed.

SUBWATERSHEDS

LN = Lower Narrows Creek

SE = Seeley Creek

Map 3 - 3 Lower Narrows Creek and Seeley Creek Subwatersheds



There are no streams in the Lake Virginia subwatershed, therefore, no streambank inventory was done on Lake Virginia subwatershed. Shoreline erosion was also not fully inventoried, but was assumed to contribute a small amount of sediment. There are no livestock pastured next to the lake.

Lake Virginia subwatershed delivers 201 tons of upland sediment annually, or only 1% of the entire watershed load. Cropland is the major source with 45% of the load. Pasture and grazed woodlots add 2%, residential areas add 21%, and woods add another 20%.

Water Resources Objectives

Increase dissolved oxygen levels by reducing nutrient inputs to the lake.

Pine Creek Subwatershed (PC)

Subwatershed Description

Pine Creek subwatershed lies between Seeley Creek and Skillet Creek subwatersheds in the southeastern portion of the watershed. Land use is 18% cropland, 61% woods, and 12% pasture. It drains an area of 4,166 acres, or 4% of the total watershed area. See map 3-4: PC, RB, SC Subwatersheds.

Water Resource Conditions

Unnamed spring-fed streams drain this subwatershed that flows eastward and empties into the Narrows Creek. Pine Creek is a high gradient spring fed stream flowing northeast to enter Skillet Creek 2.5 miles west of Baraboo. Bottom types are boulder, rubble and sand. The stream flows underground in many places as it winds through a narrow valley surrounded by pine and oak covered slopes. There is no sport fishery but forage species are common in the lower portions. Fresh meadow wetland totaling 32 acres adjoin the stream near its junction with Skillet Creek. Wildlife species such as waterfowl and muskrats utilize the stream. Access is possible from two bridges. Several dwellings are located along the banks.

Nonpoint Pollutant Sources

Pine Creek subwatershed contains 11 animal lots and adds 513 pounds of oxygen depleting phosphorus (based on annual, 24-hour rainfall event) to the NBR surface waters. This represents only 2% of the phosphorus for the whole watershed.

Pine Creek subwatershed contributes 137 tons of sediment annually from its streambanks, with 8% of the length (3,145 feet) degraded and trampled by livestock.

Pine Creek subwatershed delivers 292 tons of upland sediment annually, or only 1% of the entire watershed load. Cropland is the major source with 67% of the load. Pasture and grazed woodlots add another 16%.

Water Resources Objectives

Reduce bank erosion and sedimentation to improve habitat.

Reedsburg Rock Springs Subwatershed (RR)

Subwatershed Description

Reedsburg-Rock Springs subwatershed lies between Reedsburg and Rock Springs. It includes most of Reedsburg and part of Rock Springs, and is in the northern portion of the watershed. Land use is 46% cropland, 17% woods, and 8% pasture. It drains an area of 12,400 acres, or 11% of the total watershed area. See map 3-1: CC, LV, RR Subwatersheds.

Water Resource Conditions

The main stream Baraboo River is a valuable resource. It supports a sport fishery, provides important wildlife habitat and receives heavy recreational use (canoeing). Water quality information is lacking. No water resource appraisal monitoring was conducted on this reach of the river. This type of river bottom ecosystem is extremely important and should benefit from the nonpoint source control measures installed by the watershed project.

Nonpoint Pollutant Sources

Reedsburg-Rock Springs subwatershed contains 23 animal lots and adds 1152 pounds of oxygen depleting phosphorus (based on annual, 24-hour rainfall event) to the NBR surface water resources. This represents 5% of the phosphorus for the whole watershed.

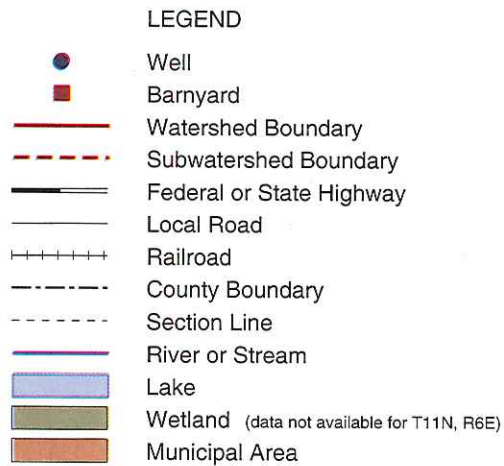
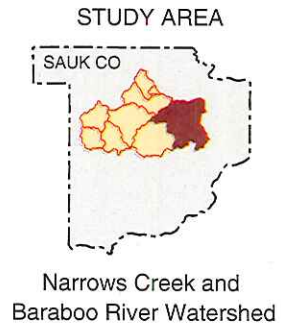
No streambank inventory of the Reedsburg-Rock Springs subwatershed was done, so an estimate of sediment coming from streambanks is not available.

Reedsburg-Rock Springs subwatershed delivers 3,886 tons of upland sediment annually, or 18% of the entire watershed load. Cropland is the major source with 94% of the load. Pasture and grazed woodlots add another 1%.

Water Resources Objectives

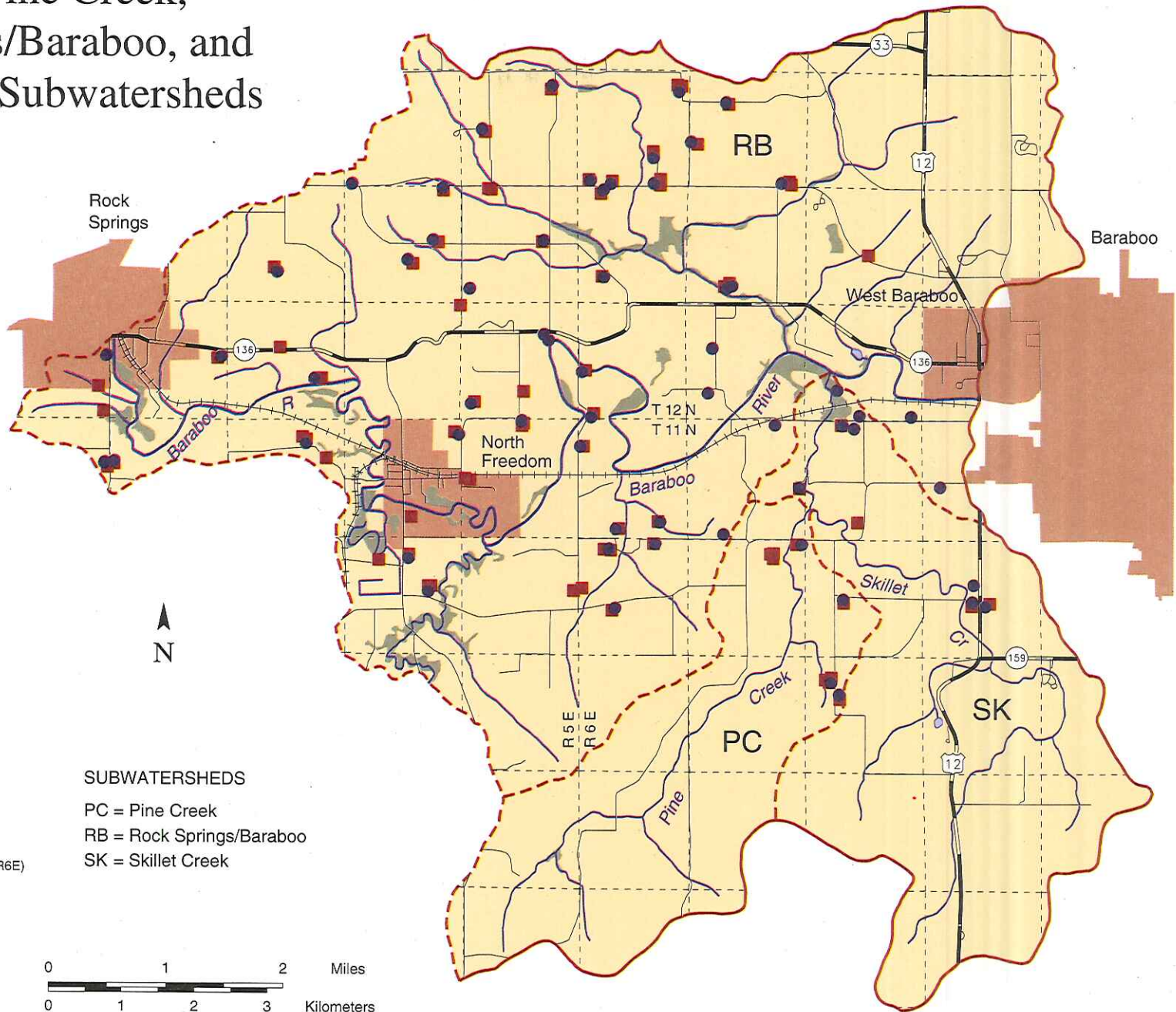
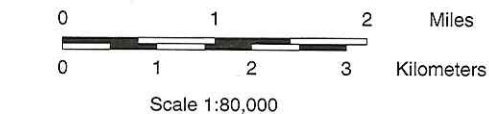
Reduce bank erosion to improve habitat.

Map 3 - 4 Pine Creek, Rock Springs/Baraboo, and Skillet Creek Subwatersheds



SUBWATERSHEDS

PC = Pine Creek
RB = Rock Springs/Baraboo
SK = Skillet Creek



Rock Springs Baraboo Subwatershed (RB)

Subwatershed Description

Rock Springs is the largest subwatershed and lies between Rock Springs and Baraboo. It includes part of Rock Springs, the village of West Baraboo, and the town of North Freedom. It is in the eastern portion of the watershed. Land use is 50% cropland, 29% woods, and 11% pasture. It drains an area of 20,239 acres, or 18% of the total watershed area. See map 3-4: PC, RB, SK Subwatersheds.

Water Resource Conditions

The main stream Baraboo River is a valuable resource. It supports a sport fishery, provides important wildlife habitat and receives heavy recreational use (canoeing). Water quality information is lacking. No water resource appraisal monitoring was conducted on this reach of the river. This type of river bottom ecosystem is extremely important and should benefit from the nonpoint source control measures installed by the watershed project.

Nonpoint Pollutant Sources

Rock Springs-Baraboo subwatershed contains 66 animal lots and adds 2922 pounds of oxygen depleting phosphorus (based on annual, 24-hour rainfall event) to the NBR surface waters. This represents 13% of the phosphorus for the whole watershed.

No streambank inventory of the Rock Springs-Baraboo subwatershed was done, so an estimate of sediment coming from streambanks is not available.

Rock Springs-Baraboo subwatershed delivers 3,421 tons of upland sediment annually, or 16% of the entire watershed load. Cropland is the major source with 84% of the load. Pasture and grazed woodlots add another 6%.

Water Resources Objectives

Reduce bank erosion to improve habitat.

Seeley Creek Subwatershed (SE)

Subwatershed Description

Seely Creek is the second largest subwatershed and lies between Lower Narrows subwatersheds and the Baraboo River. It includes Seeley Lake, La Rue, in the southern part of the watershed. Land use is 43% cropland, 31% woods, and 20% pasture. It drains an area of 19,663 acres, or 17% of the total watershed area. See map 3-3 LN, SE Subwatersheds.

Seeley Creek is a seepage and spring fed stream flowing northeast through the central portions of the county. It empties into the Baraboo River, one mile east of North Freedom. A dam on its lower reaches created Seeley Lake, 1.5 miles south of North Freedom. The upper four miles of the stream is managed for brown trout on a put and take basis. The stream below the trout water and downstream from the dam supports mainly forage fish, rough fish, and game fish associated with Seeley Lake. Bottom types in this area are mostly silt and sand and the water flows very slow. Wetland adjoining the stream totals 947 acres of which 70 percent is woody and 30 percent is non woody. Wildlife species present include puddle ducks near Seeley Lake and muskrats throughout the stream, but concentrated near the lake. Game species within the watershed include deer, raccoon, beaver, squirrels, ruffed grouse, and quail. Public frontage totals .06 mile adjacent to Seeley Lake. Additional access is available from the Baraboo River and nine bridge crossings.

Seeley Lake is a drainage-fed lake created by a dam with a 12-foot head on the lower reaches of Seeley Creek, two miles south of North Freedom. The dam was constructed in 1955 and the pond was treated with chemicals the same year to eliminate the rough and forage fish population. The DNR stocked northern pike, largemouth bass and bluegills in 1956. The fishery prospered for several years and a good growth rate of all species was reported. Today, only a limited fishery of northern pike, largemouth bass, and panfish exist. Heavy siltation and subsequent abundant growth of aquatic vegetation occurred from severe erosion in the watershed. Stunted panfish are also a problem at the present time. Ice fishing has been a popular activity for local people. The lake supports muskrat, mink, and migratory waterfowl. White-tailed deer, squirrels, fox, raccoon, and ruffed grouse inhabit the adjoining uplands. Public frontage totals .11 miles by a parking area at the dam. An unimproved boat launching ramp is also at this site. Additional access is possible from Seeley Creek and one bridge crossing.

Water Resource Conditions

Unnamed spring-fed streams drain this subwatershed flowing eastward, emptying into Seeley Lake, and eventually flowing into the Baraboo River.

Seeley Creek is currently classified as trout water above road crossing in the SW $\frac{1}{4}$ of Section 17. There are 4.0 miles of Class II trout water (see table 3-4) from this point to its headwaters. The main species is the Brown Trout (*Salmo trutta*). Some natural reproduction does occur in this section of stream. Brown Trout stocking has occurred in past years.

Seeley Lake is currently classified as highly eutrophic. This occurs mainly from excess loading of nutrients. By mid-summer the lake becomes very difficult to fish because of the excessive macrophyte growth. The fishery remains basically the same, with stable populations of panfish, largemouth bass, and northern pike.

Nonpoint Pollutant Sources

Seeley Creek subwatershed contains 38 animal lots, adding 2427 pounds of oxygen depleting phosphorous (based on annual, 24-hour rainfall event) to the NBR surface waters. This represents 11% of the phosphorous for the whole watershed.

Seeley Creek subwatershed contributes 378 tons of sediment annually from its streambanks, with only 2% of the length (3,380 feet) degraded and trampled by livestock.

Seeley Creek subwatershed delivers 2538 tons of upland sediment annually, or 12% of the entire watershed load. Cropland is the major source with 73% of the load. Pasture and grazed woodlots add another 17%.

Water Resources Objectives

Improve the trout fishery and reduce nutrient input to the lake to reduce eutrophication and dissolved oxygen depletion. Stabilize streambank habitat and reduce sedimentation.

Skillet Creek Subwatershed (SK)

Subwatershed Description

Skillet Creek subwatershed lies between Pine Creek subwatershed and Baraboo in the southeastern portion of the watershed, and includes portions of Devil's Lake State Park. Land use is 32% cropland, 46% woods, and 10% pasture. It drains an area of 5,602 acres, or 5% of the total watershed area. See map 3-4: PC, RB, SK Subwatersheds.

Water Resource Conditions

Skillet Creek is a small seepage and spring-fed stream that originates in the Baraboo Range and flows northwest to the Baraboo River two miles west of Baraboo. The stream bed is primarily sand and rubble. Large pools, created when the stream was larger in past years, still exist in several portions of the stream. An abundant forage fish population inhabits these pools. A low head dam located near the midpoint of the stream has created an area of wide sluggish water used for watering cattle. A narrow gorge and a small waterfall located 3 miles above the mouth once had aesthetic value. Cattle now pollute the pool below the waterfall and tourists discard piles of litter, greatly reducing the scenic value of the area. A trailer camp near the junction of Highway 12 and 159 is currently a potential source of sewage pollution. A total of 77 acres of wetland is scattered along the stream of which 79 percent is woody and 29 percent is nonwoody. Eleven dwellings are adjacent to the stream. Access is possible from the Baraboo River and ten bridge crossings.

Nonpoint Pollutant Sources

Skillet Creek subwatershed contains 3 animal lots, adding 203 pounds of oxygen depleting phosphorus (based on annual, 24-hour rainfall event) to the NBR surface water resources. This represents only 1% of the phosphorus for the whole watershed.

Skillet Creek subwatershed contributes 561 tons of sediment annually from its streambanks, with 3% of the length (1,855 feet) degraded and trampled by livestock.

Skillet Creek subwatershed delivers 872 tons of upland sediment annually, or 4% of the entire watershed load. Cropland is the major source with 81% of the load. Pasture and grazed woodlots add another 6%.

Water Resources Objectives

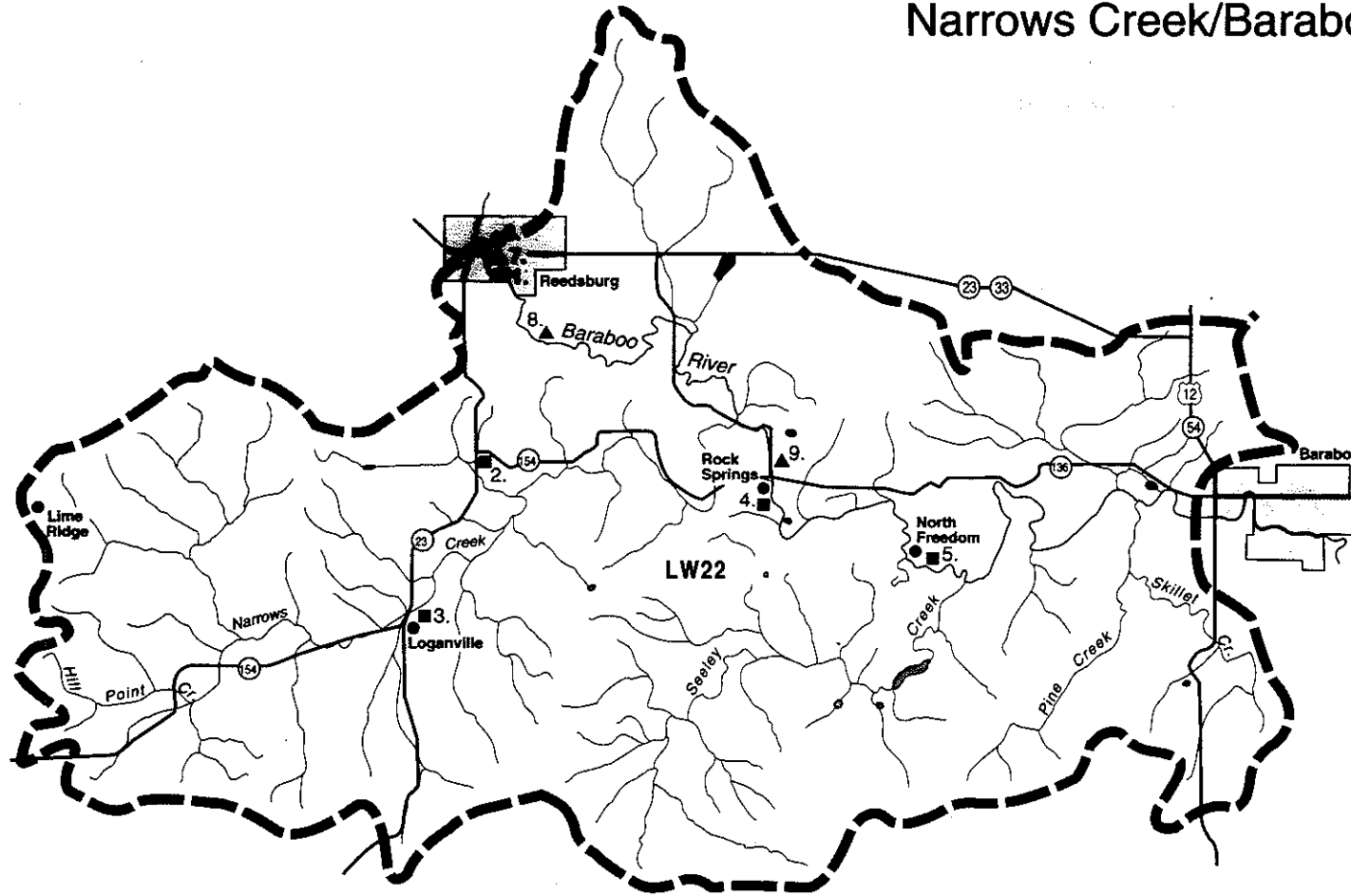
Reduce bank erosion and sedimentation to improve habitat.

Other Pollution Sources

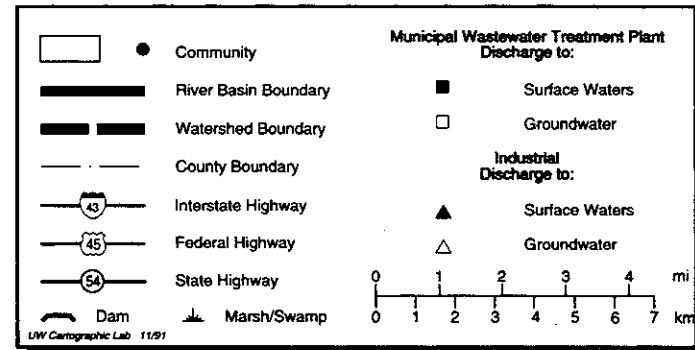
Municipal and Industrial Point Sources of Water Pollution

Possible sources of pollution in the watershed include five industrial facilities, one dairy coop, and one health care facility. Also, discharges of wastewater from permitted municipal and industrial sources are important considerations for improving and protecting surface water resources. See the *Lower Wisconsin River Basin Areawide Water Quality Management Plan*, November, 1988 (an updated Basin Plan is expected in 1992) for additional details on potential point sources. Treated effluent enters the watershed from municipal sewage plants in Reedsburg, Loganville, Rock Springs, and North Freedom. Permits issued by the DNR, under the Wisconsin Pollution Discharge Elimination System (WPDES) permit system, control most of these point sources. See map 3-5.

Narrows Creek/Baraboo River (LW22)



1. Reedsburg WWTP
2. Sauk County Health Care
3. Loganville WWTP
4. Rock Springs WWTP
5. North Freedom WWTP
6. Wisconsin Dairies Coop
7. Cellox Corp.
8. Reedsburg Foods
9. Martin Marietta Aggregates, Inc.



CHAPTER FOUR

Management Actions: Pollution Control and Eligibility for Cost-Share Funding

Introduction

This chapter identifies the nonpoint source controls implemented under the Narrows Creek and Baraboo River (NBR) Priority Watershed Project to meet the water quality objectives identified in chapter 3. The first part of this chapter addresses rural nonpoint source control needs. It defines management categories for each nonpoint source. These categories account for the severity of the source, and the need and practicality for control. The management categories are used to define which sources are eligible for financial and technical assistance under the priority watershed project.

While this watershed is predominantly rural in land use (roughly 94%), urban nonpoint source control needs will be addressed at the end of this chapter. The urban section will pertain most directly to the city of Reedsburg, the residential area around Lake Virginia (in close proximity to Reedsburg), and to the village of West Baraboo.

As previously discussed, human-induced and natural factors beyond the scope of the priority watershed project affect water resources in this watershed. Management actions related to point source control, Fisheries Management, Wildlife Management, and recreation are discussed in the integrated resource management chapter (chapter 7) of this plan.

Chapter 4 describes the management actions developed to meet the pollution reduction goals established during the water resource appraisal process. Also described below are the criteria that will determine the eligibility of each pollutant source for cost-share funding through the Nonpoint Source Program.

Management Categories

A management category defines measures needed to control a specific source in order to meet water resources objectives. Management categories then determine eligibility of specific sources for financial and technical assistance under the priority watershed project. When the

management categories are established, the underlying decisions are based on the biological and recreational potential of streams being considered and the current or suspected future impacts of nonpoint sources on those biological and recreational uses.

To improve water quality, and to increase the number of streams reaching their potential uses, each major nonpoint source pollution site (barnyards, manure-spreading, upland fields, streambank erosion or habitat degradation sites) is addressed. Management categories are determined from:

- Tons of sediment delivered to surface waters from eroding uplands and streambanks
- Feet of streambank trampled by cattle
- Pounds of phosphorus delivered to surface water annually from barnyard runoff
- The number of unsuitable acres winter-spread with manure

A definition of each management category is given below. Following this are the criteria used to define the management categories for each pollutant source.

County staff must confirm the criteria used to define these management categories at the time of a site visit. A source may be put into a different management category depending on the conditions found at the time of the site visit. The management category for a source may be revised up to the point when the landowner signs the cost-share agreement. Management Category I sources created by the landowner after the signing of a cost-share agreement, must be controlled at the landowner's expense.

Management Category I

Nonpoint sources in this category contribute a significant amount of the pollutants that impact surface waters. Reducing their pollutant load is critical to achieve the water quality objectives in the watershed project. These are considered essential to meet the water quality objectives.

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

Management Category II

Nonpoint sources in this category collectively contribute less of the pollutant load than those in Management Category I. These nonpoint sources are identified and included in cost-sharing eligibility to further insure that water quality objectives for pollutant controls are met. Nonpoint sources in this category are eligible for funding and/or technical assistance under

the priority watershed project. Controlling sources in this category is not mandatory for a landowner to receive funding for other source controls.

Management Category III

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

As explained in the previous chapter, conclusions from the Narrows Creek and Baraboo River Water Resources Appraisal Report (Sorge and Morton, January, 1992) show that controlling organic matter from barnyard runoff is critical for the success of this project. Of particular concern is the smallmouth bass fishery found in Narrows Creek. Since smallmouth bass are highly sensitive to dissolved oxygen content (which is related to organic matter levels) organic matter reduction will be a primary focus of this project. Reducing sediment from all sources is also a goal of the project, to protect or enhance the trout fishery found in one section of Seeley Creek.

Criteria for Rural and Urban BMP Eligibility and Management Category Designation

This section looks at nonpoint source pollution in the form of sediment (uplands, gullies, streambanks), nutrients (animal waste and fertilizer), excess chemicals (pesticides), habitat degradation (streambanks, livestock access), and wetland degradation. Sources of pollution include rural and urban land and management practices, but the dominant nonpoint pollution sources for rural and urban areas are different. For this reason, and because the city of Reedsburg and village of West Baraboo are in this watershed, this plan includes a section on urban best management practices. Eligibility criteria pertain to both rural and urban areas.

As explained in chapter 3, the watershed was divided into five "high priority" subwatersheds and six "medium priority" watersheds. Tables 4-1, 4-2, and 4-3 summarize the pollutant reduction goals for these two groups. The rest of this chapter will refer to the pollutant reduction goals for the entire watershed.

Table 4-1. Medium Priority Subwatersheds (CC, LV, PC, RB, RR, SK) (excludes LV for barnyards)

Pollutant Load Reductions		Attained by Management Strategies	
[Medium]		Total Tons Inventoried	Tons Control (Category I)
I. Sediment (25%)		10,164	2,507
A. Upland (27%)		9,437	2,507
B. Streambank (0%)		725	0
C. Gullies*		n.a.	n.a.
		Total Pounds Inventoried	Pounds Control (Category I)
II. Organic Matter (53%)		6,118	3,224
A. Barnyards (53%)		6,118	3,224
		Total Trampled Feet Inventoried	Total Feet Control (Category I)
III. Habitat Repair (36%)		6,910	2,495
IV. Wetlands		n.a.	n.a.

Note:

RB and RR were not formally inventoried for streambank sediment or habitat. See table 3-6.

*Currently no tools exist to adequately estimate sediment from gullies.

Table 4-2. High Priority Subwatersheds (HP, LN, MN, SE, UN)* (includes LV for barnyards)

Pollutant Load Reductions	Attained by Management Strategies	
	Total Tons Inventoried	Tons Control (Category I)
I. Sediment (30%)	16,013	4,870
A. Upland (15%)	12,519	1,831
B. Streambank (0%)	3,494	1,039
C. Gullies *	n.a.	2,000
	Total Pounds Inventoried	Pounds Control (Category I)
II. Organic Matter (68%)	16,735	11,470
A. Barnyards (68%)	16,735	11,470
	Total Trampled Feet Inventoried	Total Feet Control (Category I)
III. Habitat Repair (72%)	48,671	35,064
IV. Wetlands	n.a.	n.a.

- All land uses only agriculturally impacted sites.
- Category II gives an additional 10% (1,193 tons), for a total sediment reduction of 38%.
- Setting the sediment cutoff value at 50% (instead of 30%) results in a sediment delivery reduction of only 0.6% (72 pounds/yr.). Given the difficulty (technology limits) and cost, the decision was made to achieve significant sediment reduction from streambanks and gullies, and only 15% from uplands.
- Seeley Creek subwatershed has many acres, but relatively little (43%) in cropland. Nearly all fields are already controlled to less than "T", thus improved control will be hard to achieve.

*Currently no tools exist to adequately estimate sediment from gullies.

Table 4-3. All Subwatersheds

Pollutant Load Reductions	Attained by Management Strategies	
	Total Tons Inventoried	Tons Control (Category I)
I. Sediment (28%)	26,177	7,377
A. Upland (29%)	21,958	1,039
B. Streambank (25%)	4,219	1,039
C. Gullies *	n.a.	2,000
	Total Pounds Inventoried	Pounds Control (Category I)
II. Organic Matter (64%)	22,853	14,694
A. Barnyards (64%)	22,853	14,694
	Total Trampled Feet Inventoried	Total Feet Control (Category I)
III. Habitat Repair (68%)	55,581	37,559
IV. Wetlands	n.a.	n.a.

*Currently no tools exist to adequately estimate sediment from gullies.

Table 4-4. Criteria and Management Categories for Eroding Agricultural Uplands in the Narrows Creek Baraboo River Watershed

Subwatershed	Management Category	Eligibility Criteria	
		Sediment Delivery Rate* (t/a/yr)	Soil Loss (t/a/yr)
Copper Creek	I	over .21	& over "T"
	II	over .21	& under "T"
	III	under .21	
Hillpoint	I	over .30	& over "T"
	II	over .30	& under "T"
	III	under .30	
Lower Narrows	I	over .40	& over "T"
	II	over .40	& under "T"
	III	under .40	
Lake Virginia	I	over .36	& over "T"
	II	over .36	& under "T"
	III	under .36	
Middle Narrows	I	over .43	& over "T"
	II	over .43	& under "T"
	III	under .43	
Pine Creek	I	over .21	& over "T"
	II	over .21	& under "T"
	III	under .21	
Rock Springs-Baraboo	I	over .30	& over "T"
	II	over .30	& under "T"
	III	under .30	
Reedsburg-Rock Springs	I	over .60	& over "T"
	II	over .60	& under "T"
	III	under .60	
Seely Creek	I	over .17	& over "T"
	II	over .17	& under "T"
	III	under .17	
Skillet Creek	I	over .65	& over "T"
	II	over .65	& under "T"
	III	under .65	
Upper Narrows	I	over .18	& over "T"
	II	over .18	& under "T"
	III	under .18	

*Sediment delivery rate. Sediment delivered from each subwatershed will be reduced by 30%.

Table 4-5. Rural Uplands Targeted for Sediment Control (incl. Quad3)

Subwatershed		Total Acres (all)	Total Acres (crop)	Total Sediment (t/yr)	Management Category I			Management Category II			Mgmt. Cat. III
	t/a/yr*				Acres Mngd	Tons Controlled	%	Acres Mngd	Tons Controlled	%	(acres)
CC	0.21	5741	2381	767	552	97	13	830	62	8	4359
HP	0.30	7248	4533	1349	377	257	19	696	108	8	6175
LN	0.40	18251	10240	5021	3000	813	16	1928	143	3	13323
LV	0.36	1076	484	201	122	69	34	55	4	2	899
MN	0.43	9313	5630	2194	1206	512	23	744	42	2	7363
PC	0.21	4166	743	292	135	41	14	239	26	9	3792
RB	0.30	20239	9557	3421	1749	598	17	3230	384	11	15260
RR	0.60	12400	5787	3886	573	1425	37	972	22	1	10855
SE	0.17	19663	7469	2538	318	60	2	3540	699	28	15805
SK	0.65	5602	1742	872	211	277	32	281	30	3	5110
UN	0.18	9153	7092	1417	592	189	13	2202	201	14	6359
Watershed Total		112852	55658	21958	8835	4338	20%	14717	1721	8%	89300

*Sediment delivery rate. Sediment delivered from each subwatershed will be reduced by 30%.

Note: percent control = tons controlled/total tons sediment.

Croplands and Other Upland Sediment Sources

There are three primary sources of sediment: uplands, streambanks, and gullies. In this watershed, only sediment from uplands and streambanks was quantified. A rough inventory of gullies was also done. The results of this analysis, an approximate "mass balance," show 84% of the sediment coming from uplands and 16% from streambanks. See table 3-4.

Upland Erosion

Upland erosion represents 84% (21,958 tons) of the total sediment load to streams in the watershed. A 20% reduction in sediment from eroding fields was targeted for agricultural lands. This will bring all lands that contribute sediment to streams at a rate greater than "T" (the tolerable soil loss) down to "T". To be in Category I, landowners' fields must be above "T" and contribute more than the sediment cutoff value. The specific sediment delivery rate was calculated for each subwatershed at 30% of each subwatershed's upland "sediment delivery" (the amount of soil delivered to surface water), and is shown in tables 4-4 and 4-5. The sediment delivery rate from croplands in subwatersheds ranged from 0.20 to 0.67, with an average of 0.40 tons/acre/year (t/a/yr). Therefore, Category I will control an estimated 8,835 "critical" acres of cropland, 20% of the total watershed sediment load (4,338 tons).

An additional 8% of the sediment load delivered to the stream will be controlled through Category II, which includes an estimated 10,886 critical acres. This will control 1,517 tons. Category II includes landowners with fields below "T" but delivering sediment at a rate greater than the sediment cutoff. See table 3-3.

Reducing soil loss from upland fields can control sediment delivery, but there are limits to soil loss reduction if viable agricultural land remains in use. Generally, soil loss rates of 4 to 5 t/a/yr are tolerable in this part of Sauk County to maintain long-range soil productivity. Soil loss rates less than 3 t/a/yr can be achieved, but it becomes increasingly difficult to attain rates below this level over large areas. This is a concern since, in many of the subwatersheds, a large portion of the sediment delivered to surface water originates on croplands eroding at rates less than 3 t/a/yr. Consequently, management categories were first defined for this watershed based on sediment reduction goals established for the water resources. They were then modified to reflect the practical limitations to control soil loss.

Practical limitations lead to an unusually high number of critical acres in Category II. For example, in the second largest subwatershed, Seeley Creek, most of the fields are already managed to below "T". For this reason, only 2% of the sediment in that subwatershed is likely to be controlled through conventional management practices, Category I.

Furthermore, a significant reduction in soil loss rates has occurred in the last five years, since implementing management techniques through the Farmland Preservation Program and the 1985 and 1990 Federal Food Security Acts. The erosion rate for the NBR watershed was 5.55 t/a/yr in 1985. At the time of the inventory for this project in 1991, the watershed erosion rate decreased to 4 t/a/yr. It is possible that during the project, the reduction in soil loss from cropland will begin to correlate to a reduction of stream sediment deposition.

Gully Erosion

Gullies may be a significant cause of sediment in this watershed, therefore, they may be eligible for cost sharing. Criteria for eligibility will be based on the criteria used in other priority watersheds of similar topography. Because there was no inventory conducted for gully erosion, there is no estimate of the sediment control possible. There also is no estimate of the number of landowners eligible for gully erosion control measures. See table 4-6.

Table 4-6. Gully Erosion Eligibility Criteria in the Narrows Creek-Middle Baraboo River Watershed

Management Category	Eligibility Criteria (tons sediment/site/year)
I	Sites with: 1) gully depths of at least 3 vertical feet; 2) bare soils and evidence of active erosion; 3) direct connection with streams via channelized flow during runoff events; <u>and</u> 4) reasonable access to necessary machinery.
II	Sites with less than 3 vertical feet and <u>all</u> of the other criteria listed in Category I.

Sources: Sauk County Land Conservation Department, DNR, DATCP

To meet the overall sediment reduction goal of 30% in the high priority subwatersheds, at least 2,000 tons/year of sediment coming from gullies must be controlled.

Technical feasibility and cost effectiveness will be taken into account by county staff when determining which gullies are in Management Category I.

Cropland Eligible for Assistance to Comply With Other State or Federal Programs

To meet other resource management objectives, eligible croplands targeted through the priority watershed project may need practices in addition to those prescribed through the priority watershed project. In such cases, practices needed to further reduce erosion levels to comply with requirements of the State Farmland Preservation or Federal Food Security Act programs may be eligible for funding under the priority watershed project. In general, funding for these additional practices will be eligible as long as the costs for these practices are low to moderate. Examples of such practices include contour strip cropping or reduced tillage. High cost measures to provide additional sheet/rill erosion control on these lands will not be eligible for funding under the priority watershed project. Examples of such practices include field diversions or terraces. The county project management staff will determine eligibility of practices needed to achieve this additional level of soil loss control.

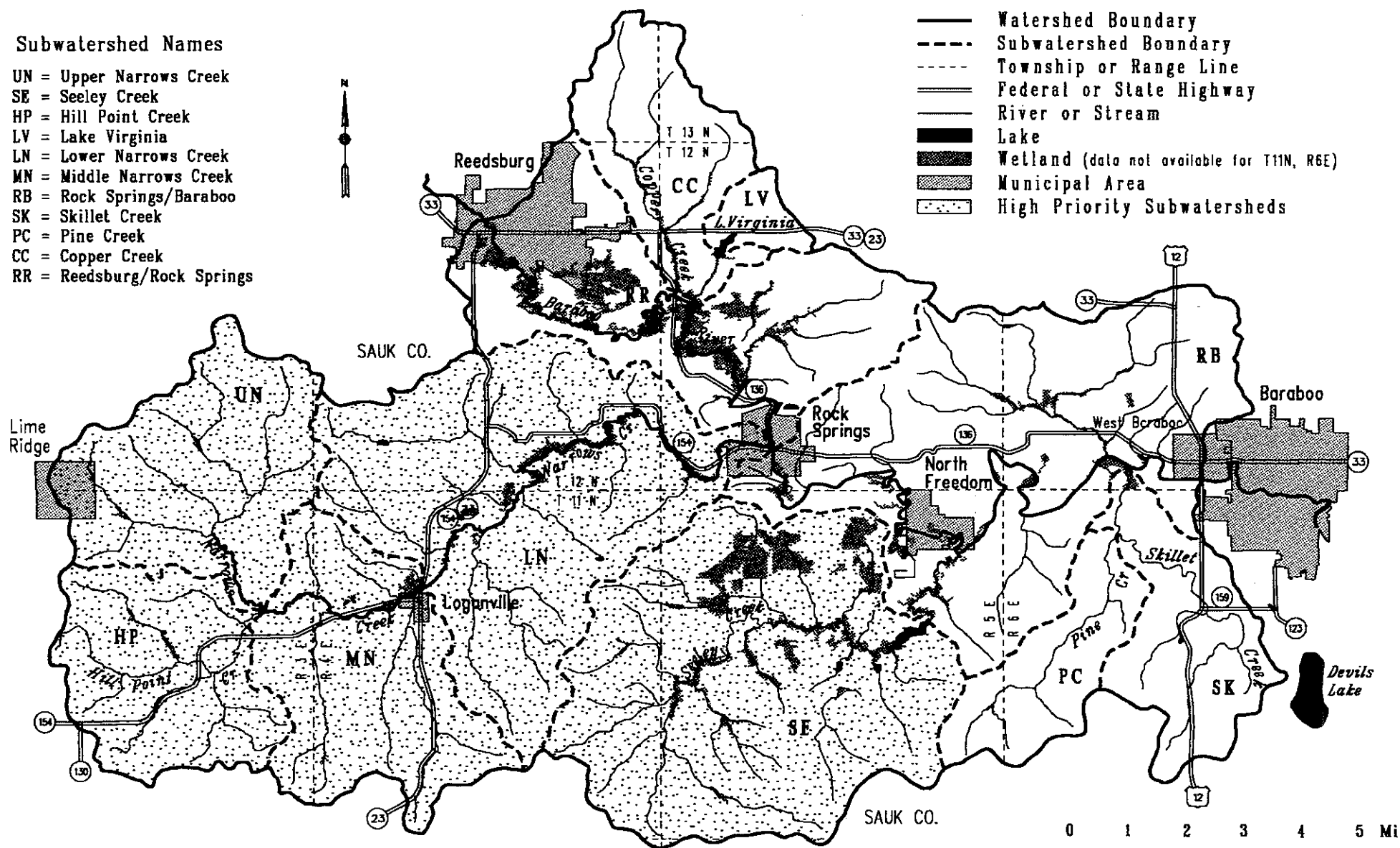
Map 4 - 1 High Priority Subwatersheds

Subwatershed Names

UN = Upper Narrows Creek
 SE = Seeley Creek
 HP = Hill Point Creek
 LV = Lake Virginia
 LN = Lower Narrows Creek
 MN = Middle Narrows Creek
 RB = Rock Springs/Baraboo
 SK = Skillet Creek
 PC = Pine Creek
 CC = Copper Creek
 RR = Reedsburg/Rock Springs

Legend

- Watershed Boundary
- - - Subwatershed Boundary
- - - Township or Range Line
- == Federal or State Highway
- River or Stream
- Lake
- Wetland (data not available for T11N, R6E)
- Municipal Area
- High Priority Subwatersheds



Animal Lot Runoff

To achieve the water quality objectives in the NBR project, a high level of control of animal lot runoff is necessary. The main resource to protect is the smallmouth bass fishery found in Narrows Creek. For this reason, the watershed was divided into high and medium priority subwatersheds, based on the presence of a smallmouth bass fishery, or highly eutrophic lake (Lake Virginia, Seeley Lake). See map 4-1.

For the high priority subwatersheds (Hillpoint, Lower Narrows, Lake Virginia, Middle Narrows, Seeley Creek and Upper Narrows) a 65% reduction of organic loading is necessary to meet the objectives. Category I landowners are those whose operations produce over 50 lbs of phosphorus, based on an annual load. These landowners will need to reduce loads down to 30 lbs or less in order to reach water quality goals. One hundred and fifty-eight landowners out of 293 (54%) fall into this category, yielding 68% control of organic loading. Category II landowners whose operations produce between 30 and 50 lbs phosphorus will need to reduce loads to 30 lbs or less to be eligible for cost sharing. Forty-eight barnyards fall into this category, yielding 7% control (see table 4-7).

For the medium priority subwatersheds (Copper Creek, Pine Creek, Rock Springs-Baraboo, Reedsburg-Rock Springs, Skillet Creek) a 50% reduction of organic loading is necessary to meet stated objectives. Category I landowners are those whose operations produce over 60 lbs of phosphorus. These landowners will need to reduce loads to 40 lbs or less in order to reach water quality goals. Forty-one landowners out of 124 (33%) fall into this category, yielding 53% control. Category II landowners whose operations produce between 40 and 60 lbs phosphorus will need to reduce loads to 40 lbs or less to be eligible for cost sharing. Twenty-two barnyards fall into this category, yielding 8% control (see table 4-7).

County personnel should focus on getting higher control in high priority subwatersheds.

Manure Storage Systems

Landowners are eligible for cost sharing for storage if a nutrient management plan, developed under SCS Standard 590, indicates that storage is necessary. See the section on Nutrient Management for nutrient management planning cost-share eligibility. Also, nutrient management plans will determine need for storage on farms which have Category I or II for Animal Lot Runoff or if the farm is Category I or II for Manure Spreading Runoff. See the sections on Animal Lot Runoff and Manure Spreading Runoff for details on barnyard manure spreading category eligibility. If a long term storage system (over 180 days) is cost-shared through the Nonpoint Source Program, no lands may be spread with manure in the winter in a fashion that exceeds NR 120 rules. See the Manure Spreading Runoff section for more information on Manure Storage Facility cost share eligibility.

Table 4-7. Animal Lot Runoff Eligibility Criteria in the Narrows Creek-Baraboo River Watershed

Management Category	Phosphorus Load Per Bamyard ¹	Number of Bamyards	Phosphorus Reduction
High priority subwatersheds (Hillpoint, Lake Virginia, Lower Narrows, Middle Narrows, Seeley Creek, Upper Narrows)			
I ²	greater than 50 lbs	158	72%
II ²	between 50 and 30 lbs	48	6%
III	less than 30 lbs	97	—
Medium priority subwatersheds (Copper Creek, Pine Creek, Rock Springs-Baraboo, Reedsburg-Rock Springs, Skillet Creek)			
I ²	greater than 60 lbs	41	53%
II ²	between 60 and 40 lbs	22	6%
III	less than 40 lbs	61	—

1. This is the annual phosphorus load result from the Wisconsin revised ARS model under a 4.2" rainfall.
2. Eligible to have a 590 plan written to determine storage.

Source: Sauk County Land Conservation Department, DNR, DATCP

Nutrient Management Practices

Improved nutrient management is needed in the watershed. Because the NBR Watershed was selected as a pilot project area for proper nutrient management, the county places importance in developing economic incentives to encourage landowner cooperation and participation. The results of the Field Practices Inventory (FPI) survey indicate the extent and cause of nutrient over application and identifies of two priority regions. See map 4-2.




The Lake Virginia and Copper Creek subwatersheds comprise one of these regions. The survey showed these subwatersheds have the highest average nutrient application rates. Private well testing showed that a relatively high percent of tested wells had nitrate contamination. (The well testing was not part of FPI.) Highlighting this relationship in educational efforts may generate initial interest in proper application rates of nutrients.

Map 4 - 2 Nutrient Management Regions, based on FPI*









Subwatershed Names

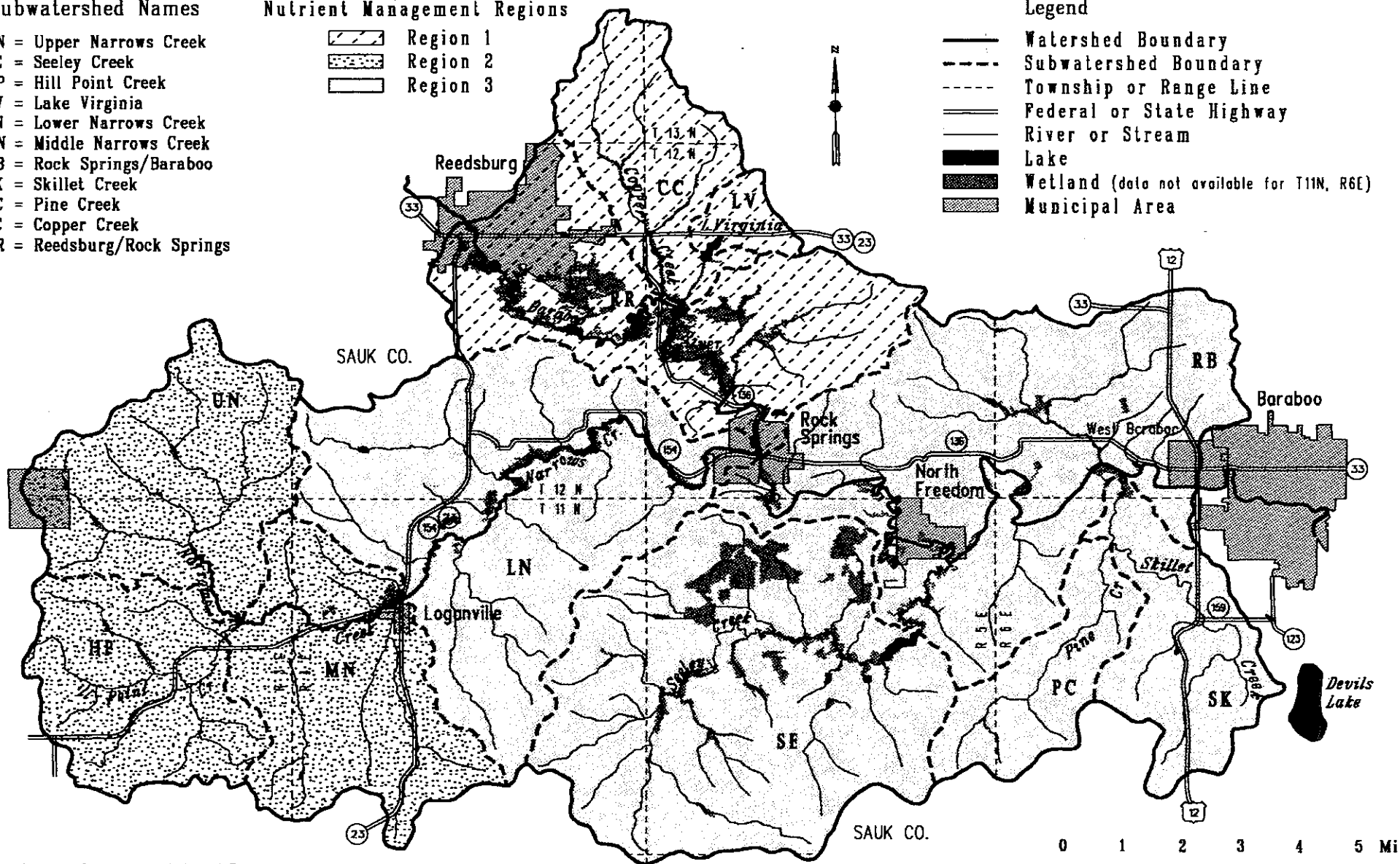
UN = Upper Narrows Creek
SE = Seeley Creek
HP = Hill Point Creek
LV = Lake Virginia
LN = Lower Narrows Creek
MN = Middle Narrows Creek
RB = Rock Springs/Baraboo
SK = Skillet Creek
PC = Pine Creek
CC = Copper Creek
RR = Reedsburg/Rock Springs

Nutrient Management Regions

-  Region 1
-  Region 2
-  Region 3

Legend

-  Watershed Boundary
-  Subwatershed Boundary
-  Township or Range Line
-  Federal or State Highway
-  River or Stream
-  Lake
-  Wetland (data not available for T11N, R6E)
-  Municipal Area



The second region includes the Upper Narrows, Middle Narrows, and Hillpoint subwatersheds, located in the headwaters of Narrows Creek. These subwatersheds are located in the driftless area. The topography of the driftless area is characterized by deep eroded valleys between flat bench-top land. Farms are generally located on the flat benches. Recharge areas for farmstead wells are limited by the deep valleys surrounding the flat benches. Because of the small recharge areas, the effect of nutrient management on groundwater nitrate levels may be seen more quickly than in other areas.

Preparing a Nutrient Management Plan (Soil Conservation Service-Technical Standard 590) for a farm is the preferred method to work with farmers to address nutrient management practices. Because of the time required to get a farmer to accept and understand the plan, the workload would be more than the LCD staff could handle.

Based on the FPI survey, improved nutrient management will be addressed by cost-sharing consultant fees. During the first two years, focus will be on the two priority areas. For three years, anyone interested in contracting to prepare a nutrient management plan for all cropland will be offered cost sharing of 50% (up to \$2.50 per acre), for all cropland, for three years.

In the first contracting year an independent crop consultant must prepare the plan. In the second year a crop consultant, a representative of a cooperative or other agricultural fertilizer sales firm, or the farmer could prepare the plan. The plans must meet SCS Standard 590, and be submitted to the Sauk County LCD for approval. Limiting first year contracts to crop consultants allows the LCD staff to review these plans with a limited clientele. This will give LCD staff time to become proficient at reviewing the plans before opening the program to a larger group of plan preparers. A maximum amount of contracted acres will be established for each of these priority areas, but will not exceed 35,678 acres total.

In the third year, cost sharing will be available for the entire watershed, but the combined maximum number of contracted acres would remain. Plans would be accepted from independent consultants, sales representatives or farmers as long as 590 standards are met. This will introduce improved nutrient management practices to the rest of the watershed while maintaining cost control.

The cost of the deep soil profile nitrate test will be included in the cost-sharing eligibility for this project. These tests would be available to anyone contracting to develop the 590 plan at the time of plan preparation. For more details, see the Information and Education chapter of this plan.

Pesticide Management

To protect water quality, proper pesticide management is important. Management practices eligible for cost sharing include the handling, disposal and application of pesticides, and the rate, method and timing of application to minimize pesticides entering surface and groundwater.

Sinkholes

LCD staff will evaluate sinkholes. If a sinkhole provides a direct conduit to groundwater for nonpoint pollution generated from an existing source (i.e., nearby barnyard, manure stack, direct drainage from a cropped field, etc.), the sinkhole shall be considered Category I. All other sinkholes would be considered Category II. However, the DNR, DATCP, and LCD staff will consider the practicality and cost of control when making an eligibility decision.

Manure Spreading Runoff

Because the upland inventory was done on a sub-sample basis, a complete inventory of acres spread with manure during the winter is not available. Therefore, eligibility criteria for this NBR plan will be based on eligibility criteria in the Crossman Creek-Little Baraboo River plan, written in 1985. The Crossman Creek-Little Baraboo River watershed is directly upstream from the Narrows Creek and Baraboo River watershed, and is also largely in Sauk County. Both Crossman Creek-Little Baraboo and Narrows Creek-Middle Baraboo have similar areas, topography, and land use.

<u>Crossman Creek</u>	<u>Narrows Creek</u>
214 sq. miles	175 sq. miles
566 barnyards	427 barnyards
242 acres/barnyard	262 acres/barnyard

Because the inventory was done by sub-sampling areas, no reduction in the total "critical acres" was set to meet water quality goals. Critical acres are defined as lands with either more than 6% slope, or are flood prone, or exceed the specifications in SCS Technical Guide Standard 590 "Nutrient Management" (without Appendix B).

Category I project participants winter-spread manure on more than 38 critical acres. These landowners are required to implement and adhere to a SCS Technical Guide Standard "590 Nutrient Management plan". Category II participants spread manure on 11 to 38 critical acres. These landowners are eligible to have a 590 plan written. See table 4-8.

As a cost-containment procedure, there will be a maximum 60 eligible storage systems. In the Crossman Creek-Little Baraboo Priority Watershed Project, only 32 systems were installed, 10% of those eligible (the 10% installation rate was due to low participation levels, not strict eligibility criteria). In the NBR project, 60 systems probably represent 20 to 30% participation, and should be within the range needed to meet water quality objectives.

Table 4-8. Manure Spreading Runoff Eligibility Criteria

Category	Number of Critical Acres Winter Spread (Crossman)	(Crossman Creek)	
		Number of Acres	Number of Landowners
I	38 or more	N.A.	9
II	between 11 and 38	N.A.	229*
III	under 11	N.A.	156
		6,296	394

*Not to exceed 60 storage systems for combined CAT 1 and CAT 2.

Sources: Sauk County Land Conservation Department, DNR, DATCP

The critical acres spread with winter-spread manure must be confirmed during a farm visit. This confirmation is based on an evaluation of the actual acres a landowner spreads in the winter. The need for a storage facility is determined from a farmer's ability to safely spread manure in the winter through the SCS "590 Nutrient Management plan." If a landowner is unable to meet this plan, a short or long-term storage system may be necessary. If a long-term (over 180 days) storage system is cost-shared through the watershed project, then no lands may be winter spread in a fashion that exceeds NR 120 rules.

SCS Standard 590 will also be used in the Nutrient Management portion of this plan and is cost-sharable, as explained in the Nutrient Management section of this chapter.

Streambanks

As with the other best management practices, both rural and urban areas are eligible for cost sharing to improve streambanks.

Streambanks are divided into "eroded" and "trampled" banks. Overall, 13% of the banks are degraded, varying by subwatershed from 3% to 21%. Generally, more than 10% is considered significantly degraded.

Streambank Erosion

Streambanks contribute 16% (4,228 tons) of the overall sediment delivered to streams in the watershed. Currently 6% of streambanks are degraded from erosion. The watershed was divided into high and medium priority subwatersheds, based on the presence of a smallmouth bass or trout fishery. See table 4-9 for high and medium priority subwatershed streambank criteria.

Table 4-9. Streambank Eligibility Criteria for the Narrows Creek Middle Baraboo River Watershed

Management Category	Criteria
STREAMBANK EROSION	
High priority subwatersheds (Hillpoint, Lower Narrows, Middle Narrows, Seeley Creek, Upper Narrows)	
I	Streambanks with an erosion rate over 0.2 tons/linear foot of eroding bank per year* <u>OR</u> greater than 20 tons/year/site.
II	Streambanks with an erosion rate of between 0.2 and 0.05 tons/linear foot of eroding bank per year* <u>AND</u> greater than 2.5 tons/year/site.
Ila*	Streambanks with an erosion rate below 0.05 tons/linear foot <u>AND</u> over 2.5 tons/year.
III	All other sites*.
Medium priority subwatersheds (Copper Creek, Lake Virginia, Pine Creek, Rock Springs–Baraboo, Reedsburg–Rock Springs, Skillet Creek)	
I	There is no Category I.
II	Streambanks with an erosion rate of 0.2 tons/linear foot of eroding bank per year* <u>OR</u> greater than 10 tons/year.
III	All other sites*.
STREAMBANK HABITAT (all subwatersheds)	
I	Trampled sites over 1,000 feet/landowner.
II	Trampled sites between 500 and 1,000 feet/landowner.
III	Trampled sites less than 500 feet/landowner.

*Eligible for shaping and seeding only.

*Sediment load reductions are applied on a riparian landowner basis.

Note: Category I includes only those sites where degradation was caused by an agriculturally related practice.

Sources: Sauk County Land Conservation Department, DNR, DATCP

High Priority Subwatersheds are Hillpoint, Lower Narrows, Middle Narrows, Seeley, and Upper Narrows. Category I participants for these subwatersheds have identified sites eroding at 0.2 tons/linear foot/year or over 20 tons/site/year. County staff will evaluate site accessibility/feasibility on Category I sites. Controlling all Category I streambanks, will achieve a 25% reduction in streambank erosion.

Category II participants are also eligible for streambank erosion control practices. Eligible streambanks erode between 0.2 and .05 tons/linear foot of eroding bank per year. In some cases there may be many feet of streambank eroding at a slower rate. These sites may contribute a significant amount of sediment to the streams, and can be managed by low cost practices, such as shaping and seeding. Category IIa pertains to these sites. Category IIa participants are only eligible for low cost erosion control practices such as shaping and seeding. Eligible streambanks for Category IIa erode below .05 tons/linear foot/year and above 2.5 tons/site/year.

Category III streambanks erode less than .05 tons/linear foot/year and less than 2.5 tons/site/year.

Note: Category I sites include only streambank degradation caused by an agriculturally related practice. Category II includes agriculturally related impacts as well as sites where streambank degradation was not caused by landowner management practices.

Medium Priority Subwatersheds are Copper Creek, Lake Virginia, Pine Creek, Rock Springs-Baraboo, Reedsburg-Rock Springs, and Skillet Creek. There is no Category I for these subwatersheds. Category II participants for these subwatersheds have sites eroding more than 0.2 tons/linear foot/year or over 10 tons/site/year. County staff will evaluate site accessibility and feasibility on Category II sites. Category III streambanks have an erode less than .2 tons/linear foot/year of streambank and less than 10 tons/site/year.

Livestock Access

Currently 7% of the streambanks are degraded from livestock trampling. Category I (essential) streambanks include trampled sites over 1000 feet/landowner. Category II (eligible) streambanks are all sites between 500 and 1000 feet/landowner. One thousand feet was chosen because it will control 67% of trampled streambank in the watershed. There are 21 landowners (37,564 streambank feet) in Category I, and 19 landowners (12,872 streambank feet) in Category II. These landowners have long segments of streambank that are trampled on both sides. See table 4-9.

Access restrictions will be outlined in a grazing management plan developed by county staff. Participating landowners with Category I sites will develop these grazing management plans as part of the cost share agreement. This management plan will require maintenance of a vegetated buffer along the banks of streams, lakes, and drainage ways for livestock. The objectives of the practice are to buffer nutrient runoff, protect fish and wildlife habitat, reduce bank erosion and in-stream turbidity, and preserve stream channel structure. Plans will be based on SCS Standard 510 and UW-Extension guidelines. Structural practices such

as fencing, stream crossings, watering access, watering facilities, spring development, and streambank and shoreland protection may be included in the practice.

Although not considered Best Management Practices, easements are available as useful legal tools, and their applicability is defined later in this chapter. The grazing management plan protects and stabilizes areas adjacent to streams. County staff will use their discretion concerning cost effectiveness and feasibility when applying Best Management Practices to protect and stabilize agriculturally impacted streambanks.

The Baraboo River

The bottom and banks of the Baraboo River are quite silty. Also, the banks are often high (more than 20 feet at one point), the river is wide (40 feet in places), the water is murky and heavily laden with sediment, there are numerous large log jams, and there are several dams that slow the water, causing more sediment to settle out. Complete control of streambank erosion and cattle access along the Baraboo River may be particularly difficult because of cost. Furthermore, the results may be hard to see because the slow water speed. Due to impediments such as log jams and dams, any stabilization of the banks may bring little change in river sediment levels. Still, nonpoint pollution degrades the water and fish habitat. Measures could be taken to mitigate the damage caused by sediment. An informal inventory of the stretch from Rock Springs to Baraboo showed predominantly stable streambanks. There were a couple of severely eroded sites, and a few sites where livestock severely trampling the banks, but overall the streambanks looked good. The river from Reedsburg to Rock Springs is assumed to be similar to the lower section, based on staff experience.

County staff will evaluate accessibility, feasibility, and cost effectiveness when determining eligibility for sites along the mainstream of the Baraboo River. Management criteria will be the same as for medium priority subwatersheds.

A *cost effectiveness* figure of \$30/ton/site/year of soil saved will be an initial guideline for the Baraboo River to determine the practicality of controlling sediment from a streambank site. The maintenance period is 10 years from the time the last cost shared practice on a cost share agreement is installed. An estimated 800 feet of riprap (or other high-cost BMP) will be needed along the Baraboo River. DNR approval will be required if more than 800 feet are needed.

Wetland Restoration

There will be no Category I sites for wetland restoration. No inventory was done specifically for this watershed project, but a wetland inventory was recently done by SCS (1991). All (SCS) inventoried wetlands will be Category II (eligible) for restoration, as will all prior converted wetlands, based on the criteria listed below.

Wetland restoration is an eligible BMP when used to control nonpoint sources of pollution. Secondary benefits of wetland restoration may be enhancement of fish and wildlife habitat.

Wetland restoration includes: plugging or breaking up of tile drainage systems, plugging open channel drainage systems, other methods that restore pre-development water levels of an altered wetland, or fencing to keep livestock out of a wetland.

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

- 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. Establishing permanent vegetation and disabling the drainage system will control this pollutant source.

- 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.

- Prior converted wetlands down-slope or up-slope from fields identified as Management Category I upland sediment sources through the WIN model.

Restoration of wetlands in these situations will do one of two things: 1) create a wetland filter that reduces the pollutants from an up slope field(s) to a water resource; or 2) reduce 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:

1. 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.
2. One or more of these same fields must still have a sediment loss rate (after the application any erosion control measures) greater than the "average sediment delivery rate".

Urban Nonpoint Sources

An informal inventory was done of the urban areas in the watershed. With this information, it was determined that the nonpoint source pollution was not severe enough to warrant an extensive inventory. However, nonpoint source pollution is definitely a problem in urban areas and should be controlled where possible. Critical urban nonpoint sources include runoff from existing urban areas including established commercial, industrial, institutional, freeways and residential land uses; and runoff from areas where new urbanization is anticipated.

Excessive fertilizer application along residential lakeshore property, specifically around Lake Virginia, is also an urban NPS. Lake Virginia residents will be offered soil sampling, and local fertilizer dealers will be contacted to provide low-phosphorous fertilizers. See chapter 6 for more details.

The city of Reedsburg is the largest urban area in this watershed. Reedsburg, the village of West Baraboo, and the individual townships in the watershed will be eligible for technical assistance and cost-sharing for urban Best Management Practices (BMPs). In an effort to focus the attention on areas that most likely contribute nonpoint source pollution, the DNR will not initiate contact with each township, since land use is predominantly (94%) rural. However, the DNR initiated several offers of technical assistance to Reedsburg, for a demonstration project.

Management Actions

Management actions are carried out by installing practices called Best Management Practices (BMPs). In urban areas, control practices may range from hydrologic alterations designed to detain pollutants or slow flows (wet detention ponds, grassed swales) to housekeeping practices (reducing sources of pet waste, road salts, lawn fertilizers and pesticides) to governmental controls (construction site erosion ordinances). The DNR and other agencies will assist local units of government to develop urban nonpoint pollutant source control measures.

Cost-share funds to install pollutant control measures will be targeted at sources contributing the most pollutants. Landowner and municipality eligibility for cost sharing these practices will depend on whether pollutant loads from their lands fall into the established pollutant reduction ranges set for each nonpoint source category. Cost share funds will be available through the Wisconsin Nonpoint Source Water Pollution Abatement Program for certain management actions.

Urban Practices

The following is a two step approach to control urban pollutant sources.

1. Adopting "Core" Elements

The "core" elements of the urban nonpoint source control program applicable to local units of government include basic measures that can be adopted without further technical study. The city of Reedsburg and the village of West Baraboo are eligible to receive technical and/or financial assistance through the priority watershed project provided they commit to implementing a core program within the first three years of the project. This program must be consistent with attaining pollutant reduction goals and water resource

objectives for existing urban land uses. Undeveloped sites are expected control nonpoint pollution as part of the development cost and are therefore not eligible for cost sharing.

The basic elements of the "core" program include:

- Developing, adopting, and enforcing a construction erosion control ordinance consistent with the "model" developed jointly by the Wisconsin League of Municipalities and the DNR. Construction erosion control practices should be consistent with the standards and specifications in the *Wisconsin Construction Site Best Management Practice Handbook*.
- Developing and implementing a community-specific program of urban "housekeeping" practices to reduce urban nonpoint source pollutants. This may combine information and education efforts, adopt ordinances regulating pet wastes, or change the timing and scheduling of leaf and brush collection.
- Implementing an information and education program in conjunction with the Sauk County UW-Extension Water Quality Specialist.

2. Adopting "Segmented" Elements

The "segmented" elements of the urban nonpoint source program include those requiring site-specific investigations before implementation (for example: constructing detention ponds after completing an engineering feasibility study). Communities are eligible to receive cost sharing for "segmented" elements provided "core" elements have been developed and implementation has begun. Cost sharing will be limited to elements of the segmented program completed within the eight-year implementation period of the project.

The higher cost of implementing this portion of the urban management program will require communities to budget expenditures over several years. Best Management Practices implemented under this portion of the program may include detention ponds, infiltration devices, streambank erosion controls and other structural means to reduce urban nonpoint source pollutants. This element also includes changes in street sweeping schedules and equipment.

Eligible components of the "segmented" program include:

- Conducting detailed engineering studies to determine the best way to implement community-specific nonpoint source control measures for identified existing land uses.
- Designing and installing structural urban Best Management Practices for existing urban areas.
- Developing management plans for planned future urban development. These plans will identify types and locations of structural urban Best Management Practices.

- Adopting and enforcing a comprehensive stormwater management ordinance encompassing current and planned future areas.

In order to reach the goals targeted for the city of Reedsburg and the village of West Baraboo, the key land uses needing controls were identified. These land uses are industrial, commercial, multi-family residential and medium density residential.

For a more detailed discussion of urban nonpoint source problems, practices, alternatives, and information & education strategies, see the I&E chapter (chapter 6).

Land Easements

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

- Shoreline Buffers
- Critical Area Stabilization
- Wetland Restoration

Although easements are not considered a best management practice, they can help achieve desired levels of nonpoint source pollution control in specific conditions. Easements are used to support BMPs, enhance landowner cooperation and more accurately compensate landowners for loss or altered use of property. The main reason for an easement must to improve water quality, but benefits of using easements in conjunction with a management practice are:

- Riparian easements can provide fish and wildlife habitat along with pollutant reduction
- easements are generally perpetual, so the protection is longer term than a management practice by itself.
- an easement may allow for limited public access (depending on the situation).

Land adjacent to "High Priority" Water Resources

High priority areas obtain easements to support critical area stabilization and shoreline buffers and include streams and wetlands that are most sensitive to nonpoint pollution. Added benefits include enhancements to aquatic habitat and, if agreed to by the landowner, public access to surface waters.

In this watershed, "high priority" waters include Hill Point, Lower Narrows, Middle Narrows, Seeley Creek, Upper Narrows, and all existing wetlands. These creeks have the highest potential to respond to streambank erosion control and habitat improvement measures and also have a high potential to receive public use.

Easements that establish permanent vegetative cover in these subwatersheds will be considered even though other lower costs practices, such as changes in crop rotation, reduced tillage, contour plowing or contour strips may provide an adequate level of control. Easements in these areas will also be considered as a cost-effective alternative to more expensive practices such as cropland terraces or agricultural sedimentation basins. Within these Subwatersheds, easements should be considered in the following situations:

- To exclude livestock from grazed wetlands or along eroding streambanks within the watershed.
- When eliminating row cropping and the establishing permanent vegetative cover stabilizes a critical area.
- To support eligible wetland restorations.
- When a barnyard or animal feedlot is located within the flood plain.- In this case, even on lands adjacent to "high priority" water resources, it must be shown that:
 - 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.

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

Other Portions of the Watershed

Throughout the watershed, easements should be considered:

- To support eligible wetland restorations.
- When a barnyard or animal feedlot is located within the flood plain. In this instance, it must be demonstrated that:

- 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 may also be used to support critical area stabilization and shoreline buffers in other portions of the watershed although the easement must offer pollution control at a cost that is competitive with other controls as required by NR 120. For example, the easement should cost less or similar to expensive practices (such as terraces or agricultural sediment basins) for continuous row crops where the only other alternative is retiring the land from production.

Easements may not be purchased with program funds to establish shoreline buffers or critical area stabilization practices *outside* high priority areas. Lower priority areas should use significantly lower cost practices such as changes in crop rotation, reduced tillage, contour plowing or contour strips to provide an adequate level of control.

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

Easements to Support Wetland Restoration

Easements may be used to support eligible wetland restoration projects. The cost-effectiveness criteria for using wetland restoration is relaxed everywhere in the watershed. This makes restoration project criteria similar to criteria for easements for shoreline buffers and critical area stabilization in areas adjacent to "high priority waters." Eligible wetland restorations are high priority areas and are not subject to usual cost-effectiveness criteria.

If wetland restoration does not involve purchasing an easement, then the LCD may sign a cost share agreement for the required costs and proceed to implement the practice.

Estimated Need for Easements

No estimate of the number of easements needed to control targeted pollution sources exists for this watershed.

Ordinances

Wisconsin Statutes require the DNR, in cooperation with DATCP, to perform a needs assessment for construction site erosion and manure storage ordinances. Each county must comply with the results of the needs assessment to be eligible for grants from the nonpoint source program.

Manure Storage Ordinance

Sauk County has enacted a DATCP approved manure storage ordinance that implements requirements outlined in Section 92.16 Wis. Stat. Sauk County administers the ordinance.

Construction Site Erosion Ordinance

Sauk County researched the extent of construction site erosion. Data was collected on the number of building permits issued per year, both in the county and in the watershed. The number of permits issued in the watershed area of the county is fairly high, 74 in 1991. These permits do not include the city of Reedsburg. Population trends over the past decade were reviewed. In four townships, the population is declining. The population is increasing in two townships adjacent to the city of Reedsburg and the village of West Baraboo. Because of this information, the DNR strongly suggests that Sauk county pass an ordinance for preventative reasons. Any construction site erosion control ordinance should meet the requirements of Section 144.266 of Wisconsin Statutes.

Extensive urban growth is occurring in the city of Reedsburg and the village of West Baraboo, and is expected to occur in Dellona, Excelsior, and Reedsburg townships. Construction erosion, if not controlled, will lead to large quantities of construction sediment entering the Baraboo River and several tributary creeks. To improve water quality controlling this erosion is essential. Adopting a construction site erosion control ordinance will be a condition of any Nonpoint Source Grant to Reedsburg or West Baraboo.

Sauk County is encouraged to adopt a construction site erosion control ordinance. However, a construction site erosion control ordinance is not required as a grant condition at this time. A water quality assessment of construction site erosion impacts may be conducted by the DNR to reevaluate the need for a county erosion control ordinance in Sauk County when any of the following situations occur:

- Development of a parcel of 5 or more acres where earth disturbing construction occurs within the unincorporated areas of the watershed over a one year period. This acreage does not include service or utility construction such as sewer or water extensions, highway or telephone construction.

- Service or utility construction such as highways, sewer or water extensions, etc. take place in unincorporated areas of the watershed regardless of the acreage involved.

The focus of this assessment is not directly related to the service construction, but the erosion control in the developing area in response to the service or utility construction. An example is the construction of a subdivision that resulted from a sewer/water extension.

- Identifiable water quality degradation from sediment.

For any construction occurring in Sauk County, the DNR suggests that the *Wisconsin Construction Site Erosion Best Management Handbook* (DNR Publication WR-222-89) be used as a reference.

CHAPTER FIVE

County Implementation Program

Introduction

This chapter identifies how to implement the management actions for nonpoint source control described in chapter 4, and describes the county's nonpoint source implementation strategy for rural areas. The success of this priority watershed project depends on the aggressive implementation of these nonpoint source pollution control strategies.

This chapter specifically identifies:

- the agencies and units of government responsible for carrying out identified tasks
- best management practices (BMPs) necessary to control pollutants on the critical sites identified in chapter 4
- the cost-share budget and cost-share agreement reimbursement procedures including administrative procedures to carry out the project
- cost containment policies
- staffing needs including total hours per year and number of staff to be hired
- schedules to implement the project
- the involvement of other programs
- the project budget including the expense for cost-sharing; and staffing for technical assistance, administration, and the information and education program

Project Participants: Roles and Responsibilities

Landowners and Land Operators

Owners and operators of public and private lands are important participants in the priority watershed program. They will adopt BMPs to reduce nonpoint sources of water pollution and protect and enhance fish habitat, wildlife and other resources. Landowners and land operators in the Narrows Creek and Baraboo River (NBR) Watershed eligible for cost-share assistance through the priority watershed program include, individuals, Sauk County, other governmental units as described in NR 120.02(19), corporations, the State of Wisconsin.

Sauk County is the primary unit of government responsible for implementing this plan in rural areas.

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

The specific responsibilities for the county are defined in the Wisconsin Administrative Rules, s. NR 120.04, and are summarized below:

- Identify in writing a person to represent the county during project implementation.
- Contact all owners or operators of lands identified as significant nonpoint sources (Category I) within one year of signing the nonpoint source grant agreement. This chapter includes the county's strategy for contacting landowners.
- Develop farm conservation plans consistent with project needs.
- Enter into nonpoint source cost-share agreements with eligible landowners and enforce the terms and conditions of cost-share agreements as defined in s. NR 120.13, Wisconsin Administrative Code.
- Enter into cost-share agreements with the DNR for land the county owns or operates, to correct identified nonpoint sources and fulfill their obligations as a cost-share recipient.
- Design best management practices and verify proper practice installation.
- Reimburse cost share recipients for the eligible costs of installing BMPs at rates consistent with administrative rules and established in this plan.

- Prepare and submit annual work plans for activities necessary to implement the project. The Sauk County LCD shall submit a workload analysis and grant application to the DATCP as required in s. Ag. 166.50.
- Prepare and submit to the DNR and DATCP the annual resource management report required under s. NR 120.21(7) to monitor project implementation by tracking changes in the nonpoint source inventory, and quantifying pollutant load reductions resulting from installed BMPs.
- Participate in the annual watershed project review meeting.
- Conduct the information and education activities identified in this plan as their responsibility.

Department of Natural Resources

The role of the DNR is identified in s. 144.24, Stats. and s. NR 120, Wis. Adm. Code. (NR 120) The DNR has been statutorily assigned the overall administrative responsibility for the Wisconsin Nonpoint Source Pollution Abatement Program. The DNR's role is summarized below.

Project Administration

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

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

Financial Support

Financial support to implement the priority watershed project is provided to each county in two ways; as a local assistance grant agreements, and a nonpoint source grant agreements. These agreements are described later in this chapter.

The DNR may also enter into cost-share agreements directly with local or state units of government to control pollution sources on land the governments own or operate.

Project Evaluation

The DNR has responsibility for priority watershed project monitoring and evaluation activities. These efforts determine if changes in water quality occur from best management practices and other pollution controls that are installed or implemented. The water quality

evaluation and monitoring strategy for the Narrows Creek and Middle Baraboo River Watershed are included in chapter 9. The DNR documents the results of monitoring and evaluation activities in interim and final priority watershed project reports.

Technical Assistance

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

Other Responsibilities

- Selecting a District Nonpoint Source Coordinator to arrange for DNR staff to assist county staff with site reviews to determine the impacts of nonpoint sources on wetlands and/or groundwater quality.
- Assist county staff to integrate wildlife and fish management concerns into selection and design of BMPs.

Department of Agriculture, Trade and Consumer Protection

The role of the DATCP is identified in s. 144.25, stats., ch. 92 stats., and NR 120. In summary, the DATCP will:

- Manage a training program for the staff involved with project implementation.
- Cooperate with the University of Wisconsin - Extension to act as a clearinghouse for information related to agricultural best management practices, sustainable agriculture, and nutrient and pesticide management.
- Assist the counties with information and education activities described in this plan.
- Assist county staff to identify watershed participants subject to federal or state conservation compliance programs.
- Assist counties, if requested, to develop a manure storage ordinance.
- Assist county staff to complete annual workload analyses and grant applications for work conducted under the priority watershed project.
- Participate in the annual project review meetings.
- If the need arises, assist in developing technical standards for agricultural BMPs, and provide technical assistance to county staff to apply these practices.
- Assist county staff to evaluate the site specific practicality of implementing rural best management practices.

Other Agencies

The Narrows Creek and Baraboo River Watershed Project will receive assistance from the agencies listed below.

Soil Conservation Service (SCS)

This agency works through the local LCC to provide technical assistance for planning and installing conservation practices. If SCS staff time is available, the local SCS personnel will work with the county staff to provide assistance with technical work when requested by the Land Conservation Committee. Personnel from the area SCS office will provide staff training and engineering assistance for best management practices. DATCP will assist SCS to coordinate the Narrows Creek and Baraboo River Priority Watershed Project with the conservation compliance and other conservation provisions of the 1985 and subsequent Federal Farm Bills.

University of Wisconsin Extension (UWEX)

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

Agricultural Stabilization and Conservation Service (ASCS)

ASCS administers most of the federal programs that stabilize prices paid to producers for agricultural products and administers federal funds for rural soil, water and other resource conservation activities. The Agricultural Conservation Program (ACP) administered by ASCS will, to the extent possible, be coordinated with the Narrows Creek and Baraboo River Priority Watershed Project. In addition, other conservation incentives such as the Conservation Reserve Program (CRP) will be used whenever possible to control critical nonpoint sources of pollution.

Agricultural Best Management Practices (BMPs)

BMPs Eligible For Cost-Sharing And Their Rates

BMPs are the practices identified in NR 120 which are determined in this watershed plan to be the most effective controls of the nonpoint sources of pollution. The practices eligible for cost-sharing under the Narrows Creek and Middle Baraboo River Watershed Project and the cost share rates for each BMP are listed in table 5-1 and 5-2 below.

Design and installation of all BMPs must meet the conditions listed in NR 120. These practices generally use specific standard specifications included in the SCS 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 DNR may approve alternative best management practices and alternative design criteria based on the provisions of NR 120.15 where necessary to meet the water resource objectives.

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

Commonly used BMPs

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

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

Reduced Tillage A system which leaves a roughened surface or substantial amounts of crop residue in or on the soil surface after crops are planted. The system consists of no more than one primary tillage pass in the fall or spring and no more than 2 passes with light or secondary tillage equipment prior to planting. It is utilized in two situations; one for continuous row crops or long corn rotations, the other for short crop rotations or for the establishment of forages and small grains.

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

Critical Pasture Stabilization A special category under critical area stabilization, this practice is stabilization applied to pastured areas. This practice applies to severely over-grazed pastures with high soil loss. It includes the establishment of a permanent vegetative cover and the installation of permanent and/or moveable fencing to control the livestock access to the various areas of the pasture. The practice must include a management plan for the landowner to follow in order to insure that the pasture is managed in such a way that erosion above 4 t/ac/yr does not occur.

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

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

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

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

Best Management Practice	State Cost Share Rate
Field Diversions and Terraces	70%
Grassed Waterways	70%
Critical Area Stabilization	70% ^{1,3,6}
Grade Stabilization Structures	70%
Critical Pasture Stabilization Structures	50%
Agricultural Sediment Basins	70%
Shoreline and Streambank Stabilization	70% ³
Shoreline Buffers	70% ^{1,3}
Barneyard Runoff Management	70%
Animal Lot Relocation	70%
Manure Storage Facilities	70% ²
Wetland Restoration	70% ^{1,3}
Nutrient and Pesticide Management	50% ^{4,7}
Spring Development	70% ⁵

1. Easements may be entered into with landowners identified in the watershed plan in conjunction with these BMPs. See Chapter 4 for an explanation of where easements may apply.
2. Maximum cost share amount is \$20,000.
3. If an additional 10% is funded by Sauk County or other group, DNR will add 10%, making the cost share rate 90%.
4. See Chapter 4 for details of nutrient management strategy.
5. If approved by DNR as alternative BMP.
6. This is critical area stabilization other than tree planting. See table 5-2 for the tree planting flat rate.
7. Spill control basins have a state cost share rate of 70%.

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

Best Management Practice	Flat Rate
Contour Farming	\$6.00/acre ⁴
Contour or Field Strip Cropping ¹	\$12.00/ac ⁴
Reduced Tillage ³	\$15.00/acre ⁴
Streambank Fencing ²	
high tensile	\$20.00/rod ⁵
barbed wire	\$14.40/rod ⁵
electric	\$9.60/rod ⁵
Woodland Fencing ²	
high tensile	\$12.50 ⁶
barbed wire	\$9.00/rod ⁶
electric	\$6.00/rod ⁶
Critical Area Stabilization	
Tree Planting ²	\$125.00/ac ⁵

1. Wildlife habitat recreation components of this practice are cost-shared at 70%.
2. If an additional 10% is funded by Sauk County or other group, DNR will add 10%, making the cost share rate 90%.
3. \$15/acre for one year only for reduced tillage on crop rotations involving hay. \$45/acre over 3 years for reduced tillage on continuous row croplands.
4. Rate determined by Administrative Code, NR 120.
5. These represent 80% of total cost.
6. These represent 50% of total cost.

Shoreline and Streambank Stabilization Stabilizing and protecting streams and lake banks from erosion and protecting fish habitat and water quality from livestock access. This practice includes streambank riprap, streambank sloping and seeding, stream crossings, watering ramps, streambank fencing and fish habitat structures. This practice may include pasture pumps for watering livestock.

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

Field Diversions The purpose of this practice is primarily to divert excessive or damaging water to where it can be transported safely.

Barnyard Runoff Management Structural measures such as filter systems and/or diversions and rain gutters to redirect surface runoff around the barnyard, and collect, convey or temporarily store runoff from the barnyard.

Manure Storage Facility A structure to store manure for the time needed to reduce its impact as a nonpoint source of pollution. This practice applies to livestock operations 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.

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

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

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.

Wetland Restoration Constructing berms or destroying tile lines or drainage ditches to create conditions suitable for wetland vegetation.

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

Pesticide Management Managing the handling, disposal and application of pesticides including the rate, method and timing of application to minimize pesticides entering surface and groundwater.

Pesticide Mixing and Loading Facilities The components of a mixing and loading facility eligible for cost sharing are: site preparation (excavation and fill), concrete slab, a sump area, plumbing, pumps, rinsate tanks, and the storage building (provided the building is built for chemical storage only, and is on the same site as the mixing and loading area). The concrete under the storage building will also be eligible if the building and concrete are contiguous with the main concrete slab.

Spring Development Improving springs and seeps by excavating, cleaning, capping, or providing collection and storage facilities. This provides a watering area for livestock and restricts their access to the spring area, reducing wet area damage and improving water quality.

Shoreland Grazing Management A management plan that provides for the maintenance of a vegetated buffer along the banks of streams, lakes and drainage ways in the presence of livestock. The objectives of the practice are to buffer nutrient runoff, protect fish and wildlife habitat, reduce bank erosion and in-stream turbidity, and preserve stream channel structure. Plans will be based on SCS Std. 510 and UWEX guidelines (such as A3529). Structural practices such as fencing, stream crossings, watering access, watering facilities, spring development, and streambank and shoreland protection may be included in the practice. Implementation of shoreland grazing management will take one of the following forms based on an evaluation of both environmental and management factors:

- a. ***Livestock Exclusion*** Total livestock exclusion through the use of fencing or relocation, from all or portions of the shoreland. Used when other means can not be expected to provide adequate shoreland protection.
- b. ***Limited Term or Deferred Grazing*** Controls animal density (stocking rate) to maintain vegetative cover and limits grazing.
- c. ***Rotational Grazing*** A grazing management scheme that divides the pasture into multiple cells (usually 5 to 30) that receive a short, but intensive, grazing period followed by a recovery period of approximately 28 days. Rotational grazing increases pasture production while enhancing a dense, stable vegetative cover.

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

BMPs Not Cost-Shared

BMPs not cost-shared, but will be included in the cost share agreement if necessary to control the nonpoint sources, are listed in NR 120.17. Several examples are included below.

- the portion of a practice to be funded through other programs

- practices previously installed and necessary to support cost-shared practices will be referenced as "must follow current conservation plan"
- changes in crop rotations and other activities normally and routinely used in growing crops or which have installation costs that can be passed on to potential consumers
- changes in location of unconfined manure stacks involving no capital cost
- manure spreading management
- other activities the DNR and the County determines are necessary to achieve the objectives of the watershed project

Activities and Sources of Pollution Not Eligible For Cost Share Assistance

Priority watershed cost-share funds cannot be used to control sources of pollution and land management activities specifically listed in NR 120.10(2). The following is a partial list of ineligible activities most often inquired about for cost-sharing in rural areas.

- operation and maintenance of cost-shared BMPs
- actions that drain or clear land as the primary objective
- practices already installed, except for repairs to the practices rendered ineffective from circumstances beyond the landowner's control
- Activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) Program or covered in other ways by Chapter 147 of Wis. Stats. (including livestock operations with more than 1,000 animal units, or livestock operations issued a notice of discharge under ch. NR 243)
- septic system controls or maintenance
- dredging activities
- silvicultural activities
- bulk storage of fertilizers and pesticides
- activities and structures intended primarily for flood control
- Practices required to control sources adequately controlled at the time the cost-share agreement was signed, except those that occur beyond the control of the landowner
- Other practices or activities not meeting program objectives determined by the DNR

Cost-Share Budget

Cost of Installing BMPs

The quantity and type of management practices that are required to meet this project's water quality objectives are listed in table 5-3. The cost of installing BMPs are listed in this table assuming landowner participation rates of 100% and 75%. Also included are the units of measurement and cost share amount per unit for the various BMPs.

The cost of installing Best Management Practices is approximately \$11 million, assuming 100% participation.

- State funds necessary to cost-share at 100% participation would be about \$8 million.
- The local share provided by landowners and other cost-share recipients would be about \$3 million.

At a 75% level of participation, the state funds needed to cover capital installation would be about \$6 million.

Easement Costs

Chapter 4 identifies where nonpoint source program funds can be used to purchase easements. The estimated cost of purchasing easements on eligible lands is shown in table 5-3. At 100% participation, the estimated purchase price of easements on eligible lands would be \$50,000. At 75% participation, the cost would be \$37,500. The easement costs would be paid for entirely by the state. However, it is very difficult to determine landowner response to easements as a management tool. Easements are a relatively new tool in the Priority Watershed Program. Therefore, it is very difficult to estimate cost.

Table 5-3. Cost-Share Budget Needs for Rural Best Management Practices in Sauk County

Management Needs, Best Management Practices	Number	Cost/Unit	Total Cost ¹	100% Participation		75% Participation	
				State Share ⁹	Local Share ⁹	State Share	Local Share
Upland NPS Control							
Change in Crop Rotation	1,624 ac	NA ²	0	0	0	0	0
Contour Cropping	360 ac	\$6.00	2,160	2,160	(3)	1,620	0
Contour Strip Cropping	10,922 ac	\$12.00	131,064	131,064	(3)	98,298	(3)
Reduced Tillage ⁴	4,198 ac	\$45.00	188,910	188,910	(3)	141,683	0
Reduced Tillage ⁵	5,826 ac	\$15.00	87,390	87,390	(3)	65,543	0
Critical Area Stabilization ⁶	640 ac	\$1,000.00	640,000	512,000	128,000	384,000	96,000
Critical Area Pasture Stab.	3,200 ac	\$200.00	640,000	320,000	320,000	240,000	240,000
Grass Waterways	75 ac	\$1,500.00	112,500	78,750	33,750	59,063	25,313
Field Diversions & Terraces	10,000 ft	\$2.50	25,000	17,500	7,500	13,125	5,625
Grade Stabilization ⁸	50 ea	\$8,000.00	400,000	320,000	80,000	240,000	60,000
Agricultural Sediment Basin ⁸	25 ea	\$10,000.00	250,000	200,000	50,000	150,000	37,500
Nutrient Management	35,676 ac	\$15.00 ¹⁰	535,140	267,570	267,570	200,678	200,678
Pesticide Management	9000 ac	\$2.00	18,000	9,000	9,000	6,750	6,750
Pesticide Mixing and Loading Sites	(1 ea)	\$15,000.00	\$15,000	\$10,500	\$4,500	\$7,875	3,375
Shoreline Buffers ⁸	100 ac	\$200.00	20,000	16,000	4,000	12,000	3,000
Wetland Restoration ⁸	25 ea	\$2,000.00	50,000	40,000	10,000	30,000	7,500
Livestock Exclusion ⁷	5,000 rods	\$20.00	100,000	100,000	(3)	75,000	(3)
Animal Waste Management							
Barnyard Runoff Control							
Complete System	150 ea	\$25,000.00	3,750,000	2,625,000	1,125,000	1,968,750	843,750
Roof Gutters	300 ea	\$2,000.00	600,000	420,000	180,000	315,000	135,000
Clean Water Diversion	200 ea	\$2,500.00	500,000	350,000	150,000	262,500	112,500
Lot Relocation	4 ea	\$20,000.00	80,000	56,000	24,000	42,000	18,000
Manure Storage Facility ⁶	60 ea	\$30,000.00	1,800,000	1,200,000	600,000	900,000	450,000
Manure Spreading Management	210 ea	NA (2)	0	0	0	0	0

Table 5-3. Cost-Share Budget Needs for Rural Best Management Practices in Sauk County

Management Needs, Best Management Practices	Number	Cost/Unit	Total Cost ¹	100% Participation		75% Participation	
				State Share ⁹	Local Share ⁹	State Share	Local Share
Streambank Erosion Control							
Shape and Seeding	48,000 ft	\$10.00	480,000	384,000	96,000	288,000	72,000
Fencing	2,000 rods	\$20.00	40,000	40,000	(3)	30,000	(3)
Riprap	20,000 ft	\$20.00	400,000	320,000	80,000	240,000	60,000
Livestock/Machinery Crossing/Watering Ramp	150 ea	\$1,500.00	225,000	180,000	45,000	135,000	33,750
Limited Grazing	40 ac	NA ²	0	0	0	0	0
Remote Watering Systems	30 ea	\$2,000.00	60,000	48,000	12,000	36,000	9,000
Subtotal:			\$11,265,164	\$8,277,844	\$2,987,320	\$6,208,383	\$2,240,490
Easements	500 ac	\$500.00	50,000	50,000	0	37,500	0
TOTALS			\$11,515,164	\$8,527,844	\$2,987,320	\$6,395,883	\$2,240,490

1. Total cost to control identified critical pollution sources
2. NA means that cost share funds are not available for this practice
3. Local share consists of labor and any additional equipment costs, also see flat rates
4. Reduced tillage on continuous row crops, or greater than 3 years of corn in succession - only as part of wildlife restoration
5. Reduced tillage, including no-till, on rotations including hay
6. Maximum cost-share is \$20,000 of which a maximum of \$5,000 can be for waste transfer
7. Cost share rate will depend on type of fence installed.
8. If an additional 10% is funded by Sauk County or other group, DNR will add 10%, making the cost share rate 90%. This table calculated at 80%.
9. For cost share rates by percentage or by flat rate, see tables 5-1 and 5-2.
10. At \$5/acre for 3 years.

Source: DNR; DATCP; and the Land Conservation Department of Sauk County

Cost Containment

Cost Containment Procedures

Chapter NR 120 requires this plan to identify cost containment procedures.

Cost-share payments will be based on actual installation costs. If actual installation costs exceed the amount of cost-sharing determined by the bidding, range of costs, and average cost methods, the amount paid to the grantee may be increased with approval from the Land Conservation Committee. Appropriate documentation regarding the need for changes will be submitted to DNR. The cost containment procedure to be used is described in the county's bidding procedure. Copies of the bidding procedure can be obtained from the county LCD. If the procedure changes, the DNR should be notified.

Bids and Average Costs

All structural BMPs in Sauk County are required to be bid out according to the LCD bidding procedure. Nonstructural BMPs are subject to average costs to verify cost containment. In Sauk County, conservation practices estimated to cost more than \$2,500 are to be bid according to Sauk County LCD's bidding procedure. Conservation practices estimated to cost less than \$2,500 are subject to average cost.

Flat Rates

BMPs using flat rates are shown in table 5-2. The rates shown are the state's share of the practice installation costs. The county has established flat rates for the landowner's labor and machinery. See the county's policy for these rates.

Cost-Share Agreement Reimbursement Procedures

Nonpoint Source Grant Agreement and Administration

General Information

The Nonpoint Source Grant Agreement transmits funds from the DNR (through the Nonpoint Source Program) to Sauk County for use in funding the state's share of cost-share agreements. Cost share agreements transmit funds from the county to the landowners.

A portion of the Nonpoint Source Grant is forwarded to Sauk County to allow the county to set up an "up front" account. Funds from this account are used by the county to pay

landowners after practices are installed under the project. As this account is drawn down, the county will request reimbursements from the DNR to replenish the account. The county will submit reimbursement requests quarterly or sooner if needed. This reimbursement schedule will insure that the "up front" account balance is maintained at an adequate level. The NPS Grant Agreement will be amended annually to provide funding needed for cost sharing for the year. The funds obligated under cost-share agreements must never exceed the total funds in the NPS Grant Agreement.

Fiscal Management Procedures, Reporting Requirements

Sauk County is required by NR 120 to maintain a financial management system that accurately tracks the disbursement of all funds used for the Narrows Creek and Middle Baraboo River Watershed Project. The records of all watershed transactions must be retained for 3 years after the date of final project settlement. A more detailed description of the fiscal management procedures can be found in NR 120.25 and NR 120.26.

Cost Share Agreement and Administration

Purpose and Responsibilities

Consistent with s. 144.25, Stats. and NR 120, Wis. Adm. Code, cost-share funding is available to landowners for part of the costs of installing BMPs to meet the project objectives. Landowners have three years after formal approval of the watershed plan to enter into cost-share agreements. Practices included on cost-share agreements must be installed within the schedule agreed to on the cost-share agreement. Unless otherwise approved by the DNR, the schedule to install BMPs will be within 5 years of signing of the cost-share agreement. Practices must be maintained for a minimum of ten years from the date of installing the final practice included in the cost-share agreement.

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

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

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

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

Sauk County is responsible for enforcing compliance of cost-share agreements to which it is a party. Where the DNR serves as a party to an agreement with a unit of government, the DNR will take responsibility for monitoring compliance. The responsible party will insure that BMPs installed through the program are maintained according to the operation and maintenance plan for the practice for the appropriate length of time. Sauk County will check for compliance with practice maintenance provisions once every three years after the last practice is installed. The county must check maintenance at its own expense when the Nonpoint Source Agreement ends, unless state funding for this activity becomes available at any time during the implementation or monitoring phase of this project.

Landowner Contact Strategy

The following procedure will be used to make landowner contacts.

1. During the first three months of the implementation period, all landowners or operators with eligible nonpoint sources will receive a mailing from the county that explains the project and how they can become involved.
2. After initial landowner mailings, county staff will make personal contacts with all landowners identified as having critical nonpoint sources of pollution (Management Category I). These contacts will occur in the cost-share sign-up period.
3. The county will continue to make contacts with eligible (Management Category I and II) landowners and operators until they have made a definite decision regarding participation in the program.
4. The county will contact all eligible landowners (as defined in number 3) not signing cost-share agreements six months prior to the end of the cost-share sign-up period.

Procedure for Developing a Cost Share Agreement

Eligibility for cost-sharing is verified following a site visit, using the criteria described in chapter 4.

Developing farm conservation plans will be the primary method used to develop cost-share agreements. These plans are specific to a particular landowner and are a comprehensive

approach to abate nonpoint pollution sources, and conserve soil and other resources. The farm plan considers the sustainability of the agricultural resources and the management decisions of the owner or operator.

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

The following procedure will be used by the county to develop and administer agreements. Below are the steps from initial landowner contact to completion of BMP maintenance.

1. Landowner and county staff meet to discuss the watershed project, NPS control practice needs, and coordination with conservation compliance provisions if applicable.
2. Landowner agrees to participate with the watershed project.
3. The county prepares a farm conservation plan.
4. The landowner agrees to the plan, a Cost Share Agreement is prepared and the landowner and county sign both documents. A copies of the Cost Share Agreement (CSA) are sent to the DNR Southern District Nonpoint Source Coordinator and the landowner. The CSA will be recorded by the county with the County Register of Deeds. Only the first page of the original CSA needs to be recorded with the Register of Deeds. Sauk County LCD keeps a copy of the first page and the rest of the original CSA.
5. Practices are designed by the county, or their designee, and a copy of the design is provided to the landowner.
6. The landowner obtains the necessary bids or other information required in the cost containment policy.
7. Amendments to the CSA are made if necessary.
8. The county staff oversee practice installation.
9. The county verifies the installation.
10. The landowner submits paid bills and proof of payment (canceled checks or receipts marked paid) to the county.
11. Land Conservation Committees or their designated representative and, if required, county boards, approve cost-share payments to landowners.
12. The county issues checks to respective landowners and project ledgers are updated.

13. The county records the check amount, number, and date.
14. The DNR reimburses the county for expended cost-share funds.

Identifying Wildlife and Fishery Needs

The Sauk County staff will consult with the DNR's Southern District wildlife management and fisheries management staff to optimize the wildlife and fish management benefits of nonpoint source control BMPs. Specifically, the county staff will contact DNR staff if, in the county's opinion, fence rows, rock piles, wetlands, or other wildlife habitat components will be adversely affected by installing agricultural BMPs.

The DNR staff will assist county staff at the County's request by:

1. Identifying streambank protection practices that benefit fish and wildlife.
2. Identifying wildlife habitat components that could be incorporated into vegetative filter strips along streams or in upland areas.
3. Reviewing placement of agricultural sediment basins to assure that negative impacts on stream fish and aquatic life do not occur, and recommending wildlife habitat components.
4. Providing technical assistance when BMP installation requires the removal of obstructions or other wildlife habitat by proposing measures to minimize impact on wildlife habitat.
5. Providing assistance to resolve questions concerning effects of agricultural nonpoint source BMPs on wetlands.

Submittal to the DNR

Cost-share agreements do not need prior approval from the DNR, except in the following instances:

- where cost-share funds are to be used for practices on land owned or controlled by the county
- for agreements or amendments where the cost-share amount for all practices for a landowner exceeds \$50,000 in state funds
- for grade stabilization structures and agricultural sediment basins with embankment heights between 15 and 25 feet and impoundment capacities of 15 to 50 acre feet
- for streambanks controlled with riprap or other materials with banks over 6 feet, according to NR 120.14. If applications are similar to each other in content, they will be reviewed to determine if future applications need this approval procedure

- for animal lot relocation
- for roofs over barnyards or manure storage facilities

Local Assistance Grant Agreement Administration

General Information

The Local Assistance Grant Agreement (LAGA) is a grant from the DNR to Sauk County to support their staff costs and the cost of carrying out this watershed plan. Consistent with NR 120, the county will use funds from the LAGA for additional staff to implement the project and conduct information and education activities. Other items such as travel, training, and certain office supplies are also supported by the LAGA. Further clarification of eligible costs supported by this grant is given in NR 120.14(4) and (6).

Grant Agreement Application Procedures

The county conducts an annual review of the Local Assistance Grant Agreement by developing an annual workload analysis. This workload analysis estimates the work needed to be accomplished each year. The workload analysis is provided to DATCP and DNR for review and clarification. Along with the workload analysis, a grant application form is sent. Funds needed to complete the agreed on annual workload are amended to the local assistance grant agreement.

Fiscal Management Procedures, Reporting Requirements

NR 120 requires Sauk County to maintain a financial management system that accurately tracks the disbursement of all funds used for the Narrows Creek and Baraboo River Watershed Project. The records of all watershed transactions must be retained for 3 years after the date of final project settlement. A more detailed description of the fiscal management procedures can be found in NR 120.25 and NR 120.26. The county sends quarterly reports to the DNR, accounting for staff time, expenditures, and accomplishments regarding activities funded through the watershed project. Reimbursement requests may be included with the quarterly project reports. Time reports are sent to DATCP quarterly.

Staffing Needs

Budget and Staffing Needs

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

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

Activity	Project Years When Work Will be Done	Sauk County	
		75% Landowner Participation (Staff Hours)	50% Landowner Participation (Staff Hours)
Project & Financial Mgmt.	1-8	8,000	8,000
Information & Education Program*	1-8	8,078	8,078
Pre-Contact Office Inventory Landowner Contacts, & Progress Tracking	1-3	3,443	2,295
Conservation Planning & Cost Share Agreement Development	1-3	2,918	1,945
Plan Revisions and Monitoring	1-8	3,195	2,130
Practice Design & Installation	1-8		
Upland Sediment Control		27,002	18,002
Animal Waste Management		36,975	24,650
Streambank Erosion Control		11,645	7,763
Training	1-8	5,784	5,784
Total LCD Workload:		107,040	78,647
Estimated Staff Required for Years 1-3:		8.3 per yr	6.1 per yr
Hours		16,743 per yr	12,286 per yr
Estimated Staff Required for Years 4-8:		6.2 per yr	4.6 per yr
Hours		12,582 per yr	9,243 per yr

* Information and Education hours shown here include time estimated for watershed I&E position working out of UWEX office.

Source: WI DNR; WI DATCP and Land Conservation Department of Sauk County

Table 5-5. Total Project Costs at 75% Landowner Participation Rate

Item	Costs (State Share)
Cost Share Funds: Practices	6,208,383.00
Cost Share Funds: Easements	37,500.00
Local Assistance Staff Support*	1,642,999.26
Information/Education Direct	45,174.00
Other Direct (travel, supplies, etc.)	83,120.00
TOTAL	\$8,017,176.26

* Salary + Indirect = \$32,000/year

Source: WI DNR; WI DATCP and Land Conservation Department of Sauk County

Table 5-6. Grant Disbursement Schedule at 75% Landowner Participation

Item	Project Year			
	1	2	3	3-8
Cost-Share Funds: Practices	\$1,227,790	\$2,455,579	\$2,455,579	\$0
Cost-Share Funds: Easements	7,500	15,000	15,000	0
Local Assistance Staff Support	257,507	257,507	257,507	870,477
Information/Education: Direct	6,090	18,575	5,135	22,599
Other Direct: (travel, supplies, etc.)	16,624	16,624	16,624	33,248
TOTAL	\$1,515,511	\$2,755,285	\$2,749,845	\$926,324

Source: DNR; Wisc. Dept. of Agriculture, Trade, and Consumer Protection; and the Land Conservation Department of Sauk County

Staff Needs

Table 5-4 lists the total estimated staff needed to implement the project. Figures are provided for both the 50% and 75% levels of participation. A total of about 107,040 staff hours are required to implement this plan at a 75% landowner participation rate. This includes 7,866 staff hours to carry out the information and education program.

Current Workload Analysis shows three employees in Sauk county working on the Narrows Creek and Baraboo River Project. The county and agencies will determine the need for additional staff based on further analysis of the project requirements. The annual Workload Analysis will be used to determine on-going staff needs. The county will assess the number and type of staff required for the final five years of the project based on the actual landowner participation following the three year cost-share sign-up period.

Staffing Costs

The estimated cost for staff at the 75% participation rate (see table 5-5) is approximately \$1.6 million. All of these costs, except some direct cost items, will be paid for by the state.

Schedules

Grant Disbursement and Project Management Schedule

Implementation may begin upon approval of this watershed plan and acceptance of Nonpoint Source Grant by the Sauk County Board; Wisconsin DATCP; and the DNR. The priority watershed project implementation period lasts eight years. It includes an initial three year period for contacting eligible landowners and signing cost-share agreements. Practices on any cost-share agreement must be installed within a five years from the date of the last signature on a cost-share agreement.

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

The disbursement of the grants (Local Assistance and Nonpoint Source) to Sauk County will be based on an annual workload analysis and grant application process. The estimated grant disbursement schedule based on 75% participation by eligible landowners is in table 5-6.

Total Project Cost

The total state funding required to meet the rural nonpoint source pollution control needs at a 75% level of landowner participation is presented table 5-5. This figure includes the capital

cost of practices, staff support, and easement costs presented above. The estimated cost to the state would be \$8.0 million.

Involvement of Other Programs

Coordination With State and Federal Conservation Compliance Programs

The Narrows Creek and Baraboo River Watershed Project will be coordinated with the conservation compliance features of the Wisconsin Farmland Preservation Program (FPP) administered by DATCP, and the Federal Food Security Act (FSA) administered by the Soil Conservation Service. DATCP will assist Sauk County and the SCS office to identify landowners within the watershed who are subject to the compliance provisions of FPP and FSA. Conservation Farm Plans were completed for all landowners in FSA on December 31, 1989. Sauk County completed FPP conservation plans by July 1, 1990.

There will be a need to implement the conservation plans and, in the future, amend these plans during the implementation phase of the watershed project. Watershed project supported staff will revise the conservation plans developed for FPP. They will inform SCS of changes in FSA plans resulting from management decisions and the installation of needed BMPs for nonpoint source pollution abatement. This comprehensive approach to farm planning will facilitate consideration of the various goals and objectives for all the programs in which the landowner participates.

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

Coordination with State and Federal 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 for participation in the program. As a result, the federal Historic Preservation Act of 1966, as amended, and the state historic preservation statute, s. 44.40 Wisc. Stats., were combined to produce a cultural resource management program that is both compatible to preserving cultural sites and implementing the watershed project.

CHAPTER SIX

Information and Education Plan

General Description

The Information and Education (I&E) Plan describes the methods and procedures that will be implemented to inform and educate the public about the Narrows Creek and Baraboo River watershed and the Narrows Creek and Baraboo River Priority Watershed project (NBR). It will also serve as a guide during implementation and evaluation of the plan. The proposed activities are based on availability of funds and review of annual work plans. The activities may be revised through the annual work plan procedure.

Audience

There are two principle audience groups for this I&E plan:

1. Those who should make management changes in their land, their businesses, and their everyday activities to reduce nonpoint source pollution.
2. Those who are in a position to support the first group in making these changes.

The predominant members of the first group are landowners and land managers. Since farming, and dairy farming in particular, is the dominant land use affecting water quality in the NBR watershed, much of the I&E activities will be directed at farmers. The following are individuals who make day-to-day and long range management decisions effecting water quality.

Decision Makers/Land Mangers

- Farm operators
- Tenant farmers
- Amish community
- Loggers
- County and town governments
- Farm owners
- Rural landowners
- Elected officials
- Contractors

The second audience group includes those individuals and groups who provide educational, consulting and material services to land managers. These groups are often in community leadership positions.

Supporters of Change

- Independent Crop Consultants
- Banks and credit institutions
- Farm organizations
- Teachers and schools
- Conservation/Environmental organizations
- NBR watershed advisory committee
- Agricultural suppliers
- Business organizations
- Youth organizations
- Outdoor sports organizations
- Contractors
- Religious organizations

Watershed clientele will be reached in a variety of ways. The most important is direct one-on-one contact. This will occur through on-farm visits, over the telephone and by personal letter. In addition, mass mailings will be used to publicize project activities, upcoming events and deadlines.

Public and private groups will be enlisted to help educate their members and the general public about the watershed and the NBR project. The following groups and institutions will be informed of watershed activities and will be encouraged to take part in the NBR project activities and to offer their expertise where appropriate. These groups include:

Farm Organizations

Council on Cooperatives
Farm Bureau
Farmers Union
Livestock Associations
National Farmers Organization
Forage Council
Southwest Wisconsin Farmers
 Research Network
Wisconsin Rural
 Development Center

Agriculture Supply Dealers

R&L Supply Cooperative
Farmer's Union Cooperative
Danco Prairie FS Cooperative
Cropmate Company

Government Agencies

USDA SCS & ASCS
Land Conservation Department
County UWEX office
WI DATCP
WI DNR
UW-Madison Nutrient and Pesticide
 Management Program Specialists,
 Area Water Quality Agents, and
 Specialists

Outdoor/Environmental

Badger Fly Fishers
Ducks Unlimited
Nature Conservancy
Friends of Sauk County
Pheasants Forever
Natural Beauty Council
Hillpoint Rod & Gun Club
North Freedom Rod & Gun Club
Reedsburg Outdoor Club
Circus City Sportsman's Club

Business & Industry Associations

Baraboo Chamber of Commerce
Reedsburg Chamber of Commerce

Educational Institutions

UW Center Baraboo
Madison Area Technical College
Reedsburg Area Schools
Rock Springs Elementary
Loganville Elementary
Baraboo Area Schools
North Freedom Elementary

Youth Organizations

4-H Boy Scouts
FFA Girl Scouts

Local and statewide print, radio and television media will be utilized to publicize and inform the public about the NBR project, upcoming events and related activities. Media outlets to be used include:

Print Media

Wisconsin State Farmer
Agriview
Country Today
Baraboo News Republic
Reedsburg Times Press
Sauk-Prairie Star

Radio

WHA - Madison
WTSO - Madison
WMFW & WRDB - Reedsburg
WRPQ - Baraboo
WNNO - Wisconsin Dells

Newsletters

Agricultural Stabilization and
Conservation Service (ASCS)
Land Conservation Department (LCD)
UWEX - Agriculture
UWEX - Family Resources
UWEX - 4-H/Youth

Objectives

The overall objective of the this I&E plan is to further the goals of the Wisconsin Nonpoint Source Water Pollution Abatement project (NPS) and the Narrows Creek and Baraboo River (NBR) Priority Watershed project. This main goal is to protect Wisconsin's water resources from nonpoint source pollution. These objectives are to be met by increasing public awareness, interest, and participation in the NBR watershed project, and increasing use of practices and structures to alleviate water quality problems. For this to happen, watershed project clientele need to develop awareness, appreciation and knowledge of many related subjects.

Resource Appreciation

Watershed clientele will need to better appreciate the value of the water resources in the NBR River watershed. They will also need to better understand how their land management activities affect the quality of water resources.

Problem Recognition

Watershed clientele will need to become aware of the causes of nonpoint source water pollution and how such pollution interferes with the health, public use and enjoyment of streams, lakes and groundwater.

Project Awareness

Watershed clientele need to become aware of the NBR River Priority Watershed project and how it addresses water quality problems.

Solution Awareness

Watershed clientele need to learn about practices and water quality structures that protect and improve water quality. Special emphasis will be given to the economics of using these practices and installing these structures.

Knowing about, and interest in the NBR watershed, its condition, and solutions is not enough to protect and improve water quality. The two most important steps have not yet been taken. Watershed clientele must use their knowledge and interest to take meaningful steps towards solving NPS pollution in their communities.

Project Participation

Watershed clientele need to participate in the project's procedures and activities to achieve any water quality improvements to the NBR watershed.

Solution Implementation

The ultimate goal of this plan is to change behavior to foster lasting improvements in water quality and the riparian ecology in the NBR watershed. This will only happen when the citizens of the watershed make decisions and take actions directed at improving the condition of the watershed. This can be done through participation in the NBR project cost-share agreements and by learning about and using practices and techniques that reduce adverse impacts on water quality.

Specifically, the NBR priority watershed project I&E plan is designed to bring about individual and community awareness of, active interest in and, knowledge about:

- The NBR watershed; its condition; the value and utility of the riparian environment, clean surface water and groundwater.
- How present land use practices and everyday habits threaten these resources and contribute to the degradation of water quality in the watershed. Impacts of nonpoint source water pollution on wildlife, recreation, drainage, health and the economy will also be stressed. Specific threats to the watershed include:

Sediment and nutrient loading from:

- Barnyard runoff
- Streambank erosion (recessional, slumping and livestock trampling)
- Cropland erosion
- Urban runoff from pavement, lawns, and construction sites

Groundwater contamination by improper handling or use of:

- Pesticides
- Nitrogen fertilizers
- Animal manures
- Petroleum products
- Residential septic systems
- Household and industrial hazardous wastes

- The purpose, operation and benefits of the NBR priority watershed project and how it assists with structural and managerial improvements that address nonpoint source water quality problems in the watershed.
- How individuals can manage their land and farms in ways that protect and improve water quality without sacrificing the profitability of their farms, specifically:
 - a. Assistance available to design, construct, operate and maintain barnyard water quality structures that significantly reduce the amount of nutrients and sediments that reach surface waters.
 - b. Assistance available to design, construct, and maintain streambank restoration practices that significantly improve water quality and game and non-game wildlife habitat, and how to manage livestock on pasture in ways that do not degrade streams and the riparian environment.
 - c. How to implement soil conservation practices which reduce soil erosion on croplands to achieve water quality objectives.
 - d. Proper use of, and reduced reliance on, purchased fertilizers and pesticides, where applicable, and how to reduce movement of these materials to streams, lakes, and groundwater.
 - e. How to properly credit the nutrients from livestock manure and legume crops to reduce the possibility of surface and groundwater contamination due to the over application of nitrogen and phosphorous. Landowners will be assisted in learning how to design whole-farm crop nutrient plans, using the SCS 590 Standards as a guide.
 - f. Creating easements along waterways and on wetlands as a means to protect these critical areas.
 - g. Those who rely on private wells for their drinking water will be offered education and assistance regarding potential threats to their well water. They will learn how to assess well contamination potential, how to take steps to prevent contamination, what to do if wells are contaminated, and proper well abandonment.

The I&E plan and the NBR project can only be considered a success when significant numbers of watershed clientele become involved and implement solutions that reduce NPS pollution. The awareness, interest, and education components outlined above are required for taking action and implementing solutions. The goal is widespread use of practices, methods, systems and structures, in fields, farmsteads, barnyards, businesses and homes, that protects and improves water quality and the natural environment in the NBR watershed.

The need for I&E activities does not end with the three year sign-up period. The educational efforts need to continue in the areas of project implementation, structure maintenance, soil erosion control, nutrient and pesticide management, manure handling, groundwater protection, stream management, urban practices and other related nonpoint source water pollution issues.

Citizen Participation

A key element of the I&E plan is to promote citizen participation. This includes not only participation in the project, but in genuine concern about the NBR watershed and commitment to its protection. The need for sound land management and farming practices does not stop when the NBR project is over. The citizens of the watershed are ultimately responsible for the long term care and maintenance of their own community. Many of the components of the I&E plan can provide the initial mechanism whereby people take "ownership" of water quality issues.

This "ownership" will be nurtured by creating a participatory environment where citizens become an integral component of the I&E activities. This approach recognizes the experience and knowledge already present in the community. This wealth of knowledge will be used by allowing citizens to share their experiences and views and to become actively involved in the project. The intent is to develop local educators and community leaders who adopt a pro-active rather than a re-active attitude towards NPS problems and solutions. This also gives the NBR staff greater access to clientele feedback and will help make the project more meaningful and more effective.

This level of citizen participation will be achieved in three ways. (1) A citizens advisory committee will serve as a link between the NBR staff and the citizens of the watershed. (2) Locate, train and utilize people in the watershed who, because of their knowledge and experience with subjects pertinent to water quality and land management, and willingness to take an active role, can act as mentors and provide leadership to others about practical solutions to NPS problems. (3) Develop peer support groups where citizens share ideas and experiences about NPS pollution topics. This will help create an environment where individuals learn about, and find their own solutions to NPS pollution problems with the support and encouragement of their peers.

Citizen Advisory Committee

The NBR citizen advisory committee (CAC) is established and met several times since 1990. The committee's primary function is to provide public feedback and guidance to the project staff. This helps provide the staff with a more accurate assessment of the needs and opinions of the public. Staff will use this feedback to administer the project in a way that is more acceptable and useful to the citizens in the watershed. When the NBR project plan is approved and the project sign up period begins, the CAC will continue to play an important role.

The I&E Plan will attempt to strengthen the NBR CAC as an advising and educational body. This will be accomplished by evaluating, and revising as needed, the role, function, activities and members of the committee on an ongoing basis. This is to ensure that the CAC is serving a useful purpose for both CAC members, citizen and NBR staff. Each aspect of the CAC will be outlined below:

- **Role**

The CAC does not have a formal role as yet. A role for the committee will be developed to better direct its actions. It will consist of a statement that specifies what the CAC is supposed to do. It will be negotiated between the NBR staff and the CAC members. The role will stipulate what is expected of the CAC, from both the NBR staff and citizen perspective. It is a document that can evolve over time depending on the preference of the committee members.

- **Function**

The CAC can serve the watershed project in a number of ways. It is hoped that through proper organization and effort from the NBR staff, the CAC can achieve a number of related benefits. They are:

- Broaden the NBR project's base of community and political support.
- Nurture local ownership of the project.
- Educate influential community leaders (formal and informal leaders).
- Increase NBR staff access to public opinions and concerns.
- Identify and promote creative solutions.
- Develop future community leaders.

- **Activities**

The CAC can be involved in a number of activities beneficial to the watershed project beyond the 'advising' activities mentioned above. CAC members will decide which activities to undertake. To date, the CAC has provided input on watershed plan development and various I&E activities, such as watershed boundary signs and field days. Guest speakers on a variety of subjects have appeared before the CAC to provide education on water quality subjects. Future activities may include:

Hosting and running public information meetings.
Guiding and/or hosting watershed tours.
Assisting NBR staff in identifying watershed contacts.
Working with landowners to place watershed signs.
Developing watershed bulletin boards, and other activities.

- **Members**

Membership consists of people who live in the watershed, express an interest in being on the CAC and attend CAC meetings. Members include mainly area farmers in addition to group representatives, town chairpersons and others. The goal is to have a membership that represents the diversity of opinions in the watershed. As the CAC evolves, attempts will be made to include, as active members, people who represent different interest groups, people with useful skills, and people with leadership abilities.

Different interest groups include farmers, hunters and anglers, elected officials, conservation and environmental groups, business leaders, rural landowners and members of civic groups.

Useful skills and attributes include media or marketing skills, education skills, people with enthusiasm and creativity, people who network well with a wide variety of different groups.

The I&E plan recognizes that leaders can be both formal or informal in nature. They can offer leadership in specialized areas of expertise or as consensus builders, offering leadership in a more general manner.

Attempts will be made to include as many of these different people and characteristics on the CAC as possible.

Leadership Development

Many of the landowners in the watershed are already concerned about the condition of the water resources and have implemented practices and systems that reduce the potential for resource degradation. These individuals can act as mentors to others in the watershed who are considering adopting these practices. An objective of the I&E plan is to seek out these individuals and encourage them to share their experiences with others. These individuals can host on-farm demonstrations, conduct on-farm research, take part in the individual NPM and Farm-A-Syst training, and can eventually help others do the same. The watershed staff can support these individuals, to increase confidence in their abilities, and encourage them to share their experiences.

Group Activities

Many of the activities in the I&E plan are designed to create an environment where those who are considering adopting water quality practices can do so without fear of making costly

mistakes or acting outside of community norms. Many of the individual and small group activities allow people to share their concerns and to go at their own speed when learning new practices. The I&E plan will strive to create a "user friendly" atmosphere where people interested in similar topics can learn about them together. The individualized watershed tours, Farm-A-Syst and NPM training are examples, as are the streambank restoration projects. This provides group learning activities to accommodate a greater variety of learning styles.

The theme of these participation efforts is that the citizens of the watershed are ultimately responsible, not only for the success of the NBR project, but also for the long term condition and care of the watershed. The I&E plan will attempt to empower the citizens towards this end.

Delivery Team

The Sauk County Land Conservation Department (LCD) and the University of Wisconsin-Extension (UWEX) will take the lead role in conducting the information and education plan. The Sauk County Conservationist, the Sauk County LCD NBR coordinator, and the NBR Information and Education Coordinator, will share primary responsibility for implementing the I&E plan. They will work with the entire staff of the Sauk County LCD, the Sauk County Agricultural Agent, SCS staff, the UW-Madison Nutrient and Pesticide Management Program's Area Coordinator and staff, the UWEX Southern Area Water Quality Agent, UW-Madison Specialists, and DNR and DATCP state NPS Specialists.

In addition, the I&E plan will be furthered by the NBR citizens advisory committee, farmers and others who conduct on-farm demonstrations, and other individuals and groups. By supporting the NBR watershed project, these people lend credibility and acceptance of the project throughout the community.

Informational Resources Used to Guide the I&E Plan

Considerable research data from the natural and social sciences will be used to develop and implement this I&E plan. These resources will be used in conjunction with the barnyard and streambank inventories taken as part of the watershed project, and the USDA SCS Soil Survey of Sauk County. These resources are:

- Face-to-face survey of farmers in the watershed, assessing nutrient and pesticide management (Farm Assessment Technique, now called Field Practices Inventory (FPI)).
- Mail survey sent to farmers in the watershed assessing their information and communication channels.
- Farm well nitrate tests conducted in watershed

- Soil Contaminant Attenuation Model (SCAM) of Sauk County soils
- Groundwater table map for Sauk County (pending funding)
- Farm-A-Syst for assessing threats to groundwater from farmstead activities.

These informational resources will help form a better understanding of the relationship between the physical conditions present and land use patterns, and how they both impact the watershed. Using these data sources will target project resources to regions where specific water quality problems exist, or to activities that contribute to specific water quality problems. This approach avoids treating all landowners or farmers as a homogeneous group. There are a wide variety of soils, enterprise types and individual management styles that have very different effects on water quality. Targeting project resources uses project funds more efficiently.

Specific Information and Education Activities

This section lists specific I&E activities. While many of these activities have multiple and complementary functions, there should be a distinction between informational and educational activities. Informational activities attempt to create awareness of an issue or subject by using newsletters, news releases, media coverage, and project displays and signs. Educational activities try to teach participants new knowledge and first hand experience with water quality issues, practices, and structures. These activities include youth education, one-on-one nutrient and farmstead assessment consulting, and farmer participatory trials. Watershed tours and field days are somewhere in between and serve both educational and informational functions, depending on individual knowledge level and participation.

A final aspect of the I&E plan builds broad-based community support for the NBR project. Many of the planned activities reach people who are not eligible to participate in the project's cost-shared practices, or engage in any other project activities. However, building a political base of support in the community can greatly increase the chances of project success. Therefore, many of the I&E activities are designed to create this base of support. News releases, presentation to groups, and personal contacts are examples. The following lists separate I&E activities to be taken.

NBR Project Newsletter

The newsletters will provide timely, area-specific information to project participants and citizens in the watershed. The newsletter will raise and maintain project awareness. Articles and input from citizens will be solicited to generate local interest in the project.

Objectives: Resource appreciation, problem recognition, project awareness, solution awareness

- Audience:** Watershed clientele, agencies, businesses, general public
- Schedule:** One issue, fall 1992 and four issues per year (Fall, Winter, Spring, Summer) during 1993-95; two issues per year (Fall, Spring) during 1996-2000

When possible, project information and promotion materials will be distributed through existing newsletters that reach the project's target audiences, e.g., newsletters from ASCS, LCD, UWEX, DNR, and agricultural supply cooperatives. One project related article will be published in a non-project newsletter each quarter during 1992-95.

Contacts with Community Leaders

Watershed staff will make direct contacts with members of the agricultural businesses, state, city and county government and community leaders throughout the project to assure the purpose and operation of the project are understood.

- Objectives:** Problem recognition, project awareness, solution awareness, project support
- Audience:** State, city, county and town government, agri-businesses, financial institutions, community leaders, and area newspapers, radio and television stations
- Schedule:** As opportunities and needs arise, contacts will be made either in person, over the telephone, by mail or facsimile.

Media Coverage

Local and state news media will be used to advertize and promote the activities of the NBR project. News releases will be issued regarding upcoming events, such as field days and sign up deadlines.

During the last year of contract sign-up, a major media campaign will take place to encourage landowners to participate in the project. This additional promotion will encourage landowners who have not signed contracts to sign-up. Promotional ideas may include notices in the print media and advertisements and public announcements on the radio.

- Objectives:** Project awareness, solution awareness
- Audience:** Watershed clientele, agencies, business, and general public
- Schedule:** Print media: News articles as needed, with a target of 3 articles per quarter 1992-95.

- Radio: Target of 3 messages per quarter 1992-95
- Television: To advertize a major watershed event, target of coverage once during 1992-95.

Presentations to Groups

Presentations will be provided to specific groups about the watershed and progress of the NBR project. Local units of county, village, and town government will have the opportunity to learn about and react to the watershed plan and the progress of the NBR Program.

Other interested groups will also have the opportunity for watershed staff to present information about the NBR project relative to their needs and interests. This may include civic, business, conservation, environmental, fishing and agricultural groups and organizations. Watershed staff will make available to these groups, interest-specific presentations to their members.

- Objectives: Resource appreciation, problem recognition, project awareness, solution awareness, project support
- Audience: Local government officials and interested groups
- Schedule: One in 1992, three in 1993, one in 1994, additional presentations on request

Project Display

A project display board will be developed for exhibit at county fairs, conferences and meetings, and in bank lobbies, libraries and other public locations. It will be made from high quality poster display board (already owned by the LCD) with accompanying photographs, descriptions and informational materials. Different topics will be developed for use with different audiences.

- Objectives: Problem recognition, solution awareness, project awareness
- Audience: General public
- Schedule: Developed display in winter 1992. The display will be used as needed, and when opportunities arise

Watershed Implementation Informational Meetings

Two meetings will be held, one at the beginning of the three year sign-up period, and one at the start of the project's implementation phase (at the end of the sign-up period). These meetings will focus on the procedures and requirements landowners must follow to participate in the NBR project. The initial sign-up meeting will cover eligibility criteria, available practices and cost share availability. The implementation meeting will cover topics related contracting the practices, landowner responsibilities, and structure maintenance. Both meetings are open to the public.

- Objectives: Project awareness, solution awareness, project participation, solution implementation
- Audience: Watershed landowners and contractors
- Schedule: Start of three year sign-up period and again at the start of implementation period

Self Directed Tours

Streambank management and barnyard tours will be conducted. These tours show interested landowners how to protect streams from runoff and nutrient contamination. The tours will show actual streambank restoration and barnyard structures that were installed as part of the NBR project. These tours also provide an opportunity to learn about the local geology, soils, ecology and fisheries in the watershed. Citizen input will include hosting a tour, and they may conduct the tour as well.

- Objectives: Resource appreciation, problem recognition, solution awareness, project awareness, project participation
- Audience: Watershed clientele, state, county and town officials, media
- Schedule: One per year during 1993, 1994, and 1995.

Individualized Tours

Streambank management and barnyard tours will be conducted individually. Landowners will be contacted and invited to join 1 to 3 other landowners on a personalized tour of specific watershed sites or projects. Tours will bring together small groups interested in particular topics. The topics can be similar to the self directed tours, but will offer more one-on-one contact with watershed staff and landowners who installed structures and use water quality management practices. The choice of sites are decided by tour participants.

Objectives: Resource appreciation, problem recognition, solution awareness, project awareness, project participation

Audience: Watershed clientele, state, county and town officials

Schedule: Ten per year 1993, 1994, and 1995

On-Farm Demonstration Field Days

On-farm demonstrations are more than simply "demonstrating" a practice, method or system in a farm setting. On-farm demonstrations can be a learning process for farmers, researchers and agency personnel by defining and refining an appropriate place for particular technologies. Farmers and agency personnel can gain useful insights through conducting on-farm demonstrations, as well as learning about each other's needs and perspectives.

Farmers often do not adopt practices, methods or systems because they are either unable, unwilling, or both. Many reasons for the farmers' inability or unwillingness to adopt certain practices are often rational and correct. On-farm demonstrations have the ability to address many obstacles to adopting practices.

Specifying and knowing the target audience is central to a successful on-farm demonstration effort. On-farm demonstrations will be placed in different regions of the watershed to reflect the range of soil and geographic conditions that exist in the watershed and affect water quality. Demonstrations will also be placed on farms typical of the area in terms of enterprise mix, size, reliance on hired labor, etc. The UW's NPM program specialists will be enlisted to assist with on-farm demonstrations and share their expertise in this area. Invited speakers will include UW and other agency specialists and farmers who currently use the demonstrated practices successfully. As the project progresses, cooperating farmers will be encouraged and assisted to take an active role in the design and implementation of the plots and field days.

Objectives: Problem awareness, solution awareness, project awareness, project participation, solution implementation (by cooperating farmer)

Audience: Watershed clientele with identified nonpoint source problems, other area farmers, general public

Schedule: One field day in 1992, three on-farm field days in 1993, and two each in 1994 and 1995

Streambank and Fisheries Habitat Restoration

Landowners can receive 70% cost sharing for streambank restoration work. An additional 20% may be available from Sauk County (10%) and DNR (10%). In-kind contributions

(such as labor) from groups interested in assisting in the restoration can cover the remaining 10%. Fishing and conservation groups will be solicited to work with interested landowners in cooperative efforts. Interested landowners and groups will be brought together to work on a section of stream needing restoration. This cooperative effort will demonstrate the benefits of having both parties work together. These groups then have the experience to continue this work on their own. Groups and individuals who successfully used this approach elsewhere will be invited to share their experiences with NBR landowners.

- Objectives: Solution awareness, project awareness and participation, solution implementation
- Audience: Watershed clientele with identified nonpoint source problems, other area farmers, anglers, general public
- Schedule: One cooperative effort in 1993 and 1994, with follow-up 1995

Narrows Creek and Baraboo River Priority Watershed Boundary Signs

Seven watershed boundary signs will be erected at key locations by main highways on the boundary of the watershed. This informs the public of the watershed's existence and creates awareness of the NBR project. The citizens advisory committee will take the lead on this project. They will contract with local sign shops to design, build and install the signs. Compensation may be required for placing signs on private property.

- Objectives: project awareness
- Audience: General public
- Schedule: Erected fall 1992

Project Participant Signs

After completing a water project, each watershed client will be offered a sign furnished by the LCD. The signs will show who is involved in the project and will visibly provide progress of the project. These signs will also create a sense of project ownership by participants, and can instill a sense of community involvement.

- Objectives: project awareness, project support
- Audience: Watershed clientele
- Schedule: Signs offered when projects are completed

Youth Programming

Involving youth in watershed and water quality education activities can have long term benefits to the community. Since today's youth will be future leaders, education about the need for natural resource conservation is essential. Interest in educational activities and programs will be solicited through teachers and administrators from the various schools and youth organizations. Water quality and watershed educational materials will be developed and used with existing materials. Educational programs and activities will be offered and implemented as schools and youth organizations become aware and interested in the project.

- | | |
|-------------|--|
| Objectives: | Resource appreciation, problem recognition, project awareness, solution awareness |
| Audience: | Students K through 12, and watershed youth involved in 4-H, Future Farmers of America and Vocational-Agriculture programs |
| Schedule: | Distribute educational material annually to area schools. project materials were developed in 1992. Begin distributing materials in 1993. Develop water resources projects and conduct field trips as requested by schools and youth organizations, with a goal of one per year in 1993, 1994, and 1995. |

Individual and Small Group Nutrient Management Education

Individualized education will concentrate on decreasing surface and groundwater pollution by increasing efficient use of animal manures, commercial fertilizer and field applied pesticides. Participating farmers will engage in one-on-one instruction with the Watershed Education Specialist. The Soil Conservation Service Technical Guide, Section IV 590 will serve as the basis for developing nutrient plans.

The following strategy details the number of nutrient management plans eligible for cost sharing in specific subwatersheds. In the first year, 50 nutrient plans will be solicited from the Copper Creek, Lake Virginia, Upper Narrows, Middle Narrows, and Hillpoint sub-watersheds. In the first year (1993), these plans can only be written by independent crop consultants. In the second year (1994) 40 more plans will be targeted. Crop consultants, agronomists, or the farmers themselves could write these plans and would be in the same sub-watersheds as year one. In 1995 the entire watershed is eligible to participate with 32 plans eligible to be written. Cost-share funds covering 50% of the cost of completing nutrient plans will be available. Over the life of the project, a maximum of 122 plans are eligible for cost sharing. Each written plan will be reviewed the following two years, therefore, 50, 90, 72, and 32 plans will be reviewed in 1994, 1995, 1996, 1997, respectively. Topics included in the nutrient management education effort are:

- Soil testing for Phosphorus, Potassium and pH
- Use of the Preplant Soil Nitrate Test

- Understanding and use of soil test recommendations
- Manure Spreader Calibration
- Nitrogen crediting for manure and legumes grown in rotation
- Calibration of manure and fertilizer applicators
- Record keeping

Lawn Fertilizers and Lake Virginia Water Quality

Lake Virginia homeowners will be eligible for consultation and cost-share funds to prevent over fertilization on lawns and gardens in the Lake Virginia subwatershed. Cost-share funds will be made available for homeowners to conduct soil tests. Recommendations will be based on the soil tests to prevent excessive fertilizers, especially phosphorous, from being applied. Participating local fertilizer dealers will help obtain the necessary fertilizer blends, if necessary. A cost-share rate of \$10 per sample will be made available for up to 40 Lake Virginia homeowners. Homeowners will also be offered information about landscaping alternatives that lessen nutrient loading to the lake. The NBR staff will work with the Lake Virginia Property Owners Association to promote and conduct this activity.

- Objectives: Problem recognition, solution awareness, project participation, solution implementation
- Audience: Project clientele
- Schedule: Plans eligible to be written with cost-shared funds (122 total): 50 in 1993, 40 in 1995, 32 in 1996. Plans reviewed (2 years for each plan): 50 in 1994, 90 in 1995, 72 in 1996, 32 in 1997.

Individual Farmstead Assessment/Groundwater Education

Individualized education will concentrate on potential threats to private wells from farm and barnyard activities. Participants will use the Farm-A-Syst system to learn about what causes groundwater contamination, the physical factors contributing to the potential for groundwater contamination, and how to reduce the threat of groundwater contamination from farmstead activities. Topics include analysis of threats to groundwater contamination from:

- Site Characteristics
- Condition and location of wells (including depth, construction, stratigraphy)
- Condition and location of septic tanks
- Condition and location of petroleum storage facilities
- Condition and location of barnyards and manure storage facilities
- Storage and handling of agri-chemicals

- Objectives: Problem recognition, solution awareness, project participation

Audience: Watershed clientele

Schedule: Individual and small group instruction with 40 contract holders per year in 1993 and 1994. Follow-up as needed in 1995.

Project Evaluation

The "Farm Practices Inventory" (FPI) survey, now known as the Farm Assessment Technique (FAT) survey, will be used to determine changes in knowledge levels and adoption of improved field level nutrient and pesticide management techniques. The overall objective of the FAT in the NBR, is to identify farmer needs to guide and evaluate agency information and education efforts to promote nutrient and pesticide management practices. The FAT survey conducted during the inventory phase of the watershed project serves as the baseline to measure behavioral changes throughout the project. Comparing farmers' behavior at the start and end of the project will show changes, if any, resulting from project activities. These changes can then be use to predict changes in water quality.

In addition, Sauk County will retest a random selection of the private wells nitrate levels.

Objectives: project evaluation

Audience: agency staff and administrators

Schedule: final assessment survey at completion of NBR project

Table 6-1. Agency Labor Requirement Summary, in Hours
(All labor requirements shown in hours)

	1992	1993	1994	1995	1996	1997	1998	1999	2000
UWEX	580	1,900	1,840	1,612					
LCD	118	404	352	564	356	184	56	56	56
			LCD Total:		2,146 hours				
			UWEX Total:		5,932 hours				
			Labor Total:		8,078 hours				

Table 6-2. Activity Budget Summary (All budget figures in dollars)

	1992	1993	1994	1995	1996	1997	1998	1999	2000
Project Newsletter	300	1,200	1,200	1,200	600	600	600	600	600
Media Promotions				500					
Presentations	150	450	150						
Project Display	250	250	200						
Watershed Meetings	475			600					
Self Guided Tours		1,250	1,000	1,000					
Individual Tours		500	500	500					
On-Farm Field Days	440	1,320	880	880					
Stream Restoration		100	100	50					
Boundary Signs	4,375	175	175	175	175	175	175	175	175
Participant Signs		4,000							
Youth Education		100	100	100					
NPM Education	100	750	350	350					
Farm-A-Syst Packets	400	480	480	144					
FPI Survey									14,000
Annual Totals	6,090	10,575	5,135	5,499	775	775	775	775	14,775
Grand Total	\$45,174								

Table 6-3. Individual Activity Labor Requirements and Budgets
(All labor requirements shown in hours All budget figures in dollars)

1. NEWSLETTERS: One newsletter fall 1992, four in 1993, 1994, and 1995, two newsletters each year 1996 to 2000.									
Labor Requirements	1992	1993	1994	1995	1996	1997	1998	1999	2000
UWEX	36	132	132	132					
LCD	26	104	104	104	52	52	52	52	52
Total hours	62	236	236	236	52	52	52	52	52
Budget									
Postage	250	1,000	1,000	1,000	500	500	500	500	500
Film	50	200	200	200	100	100	100	100	100
Total Dollars	300	1,200	1,200	1,200	600	600	600	600	600
2. A. and B. CONTACTS AND MEDIA COVERAGE									
Labor Requirements	1992	1993	1994	1995	1996	1997	1998	1999	2000
UWEX	32	48	48	48					
LCD	20	20	20	228	4	4	4	4	4
Total hours	52	68	68	68	4	4	4	4	4
Budget									
No direct costs for this activity									
3. PRESENTATIONS									
Labor Requirements	1992	1993	1994	1995					
UWEX	44	20	8						
LCD	28	28	8	208					
Total hours	72	48	16						
Budget									
Meals	100	300	100						
Room Rental	50	150	50	500					
Total Dollars	150	450	150						
4. PROJECT DISPLAY									
Labor Requirements	1992	1993	1994	1995					
UWEX	16	36	36	36					
LCD		4	4	4					
Total hours		40	40	40					

Table 6-3. Individual Activity Labor Requirements and Budgets
(All labor requirements shown in hours All budget figures in dollars)

Budget	1992	1993	1994						
Film Development	150	150	100						
Room Rental	100	100	100						
Total Dollars	250	250	200						
"Development" includes film, processing, enlargement and mounting.									
5. PROGRAM SIGN-UP AND IMPLEMENTATION MEETINGS									
Labor Requirements	1992	1993	1994	1995					
UWEX	12			12					
LCD	12			12					
Total hours	24			24					
Budget									
Room Rental	75			100					
Refreshments	400			500					
Total Dollars	475			600					
6. SELF GUIDED TOURS									
Labor Requirements	1992	1993	1994	1995					
UWEX	8	40	40	40					
LCD		40	40	40					
Total hours	8	80	80	80					
Budget									
Signs		250							
Advertisement		1000	1000	1000					
Total Dollars		1250	1000	1000					
7. INDIVIDUALIZED TOURS									
Labor Requirements	1992	1993	1994	1995					
UWEX	16	200	200	200					
LCD	40	40	40	40					
Total hours	16	240	240	240					
Budget									
Van Rental		500	500	500					
Total Dollars		500	500	500					

Table 6-3. Individual Activity Labor Requirements and Budgets
(All labor requirements shown in hours All budget figures in dollars)

8. ON-FARM FIELD DAY DEMONSTRATIONS									
Labor Requirements	1992	1993	1994	1995					
UWEX	48	144	96	96					
LCD	32	96	64	64					
Total hours	80	240	160	160					
Budget									
Meals	300	900	600	600					
Tent	90	270	180	180					
Lab Fees	50	150	100	100					
Total Dollars	440	1320	880	880					
9. STREAMBANK RESTORATION WORKSHOPS									
Labor Requirements	1992	1993	1994	1995					
UWEX	40	48	48	16					
LCD		16	16	8					
Total hours	40	64	64	24					
Budget									
Van Rental		100	100	50					
Total Dollars		100	100	50					
10. BOUNDARY SIGNS									
In 1992 the staff of the LCD, and the I&E specialist, along with the CAC will work together to design, purchase and install seven watershed boundary signs. They will contribute 8, 8, and 32 hours respectively on this project.									
Budget	1992	1993	1994	1995	1996	1997	1998	1999	2000
Signs	3500								
Install	700								
(DOT) Permits & Property rental	175	175	175	175	175	175	175	175	175
Total Dollars	4375	175	175	175	175	175	175	175	175
11. PARTICIPANT SIGNS									
In 1993 LCD staff and UWEX staff will contract for 200 participant signs. This will require 8 hours from the UW staff and 4 from LCD staff. These signs are projected to cost \$2000.									

Table 6-3. Individual Activity Labor Requirements and Budgets
(All labor requirements shown in hours All budget figures in dollars)

12. YOUTH EDUCATION									
Labor Requirements	1992	1993	1994	1995					
UWEX	24	32	32	32					
LCD		16	16	16					
Total hours	24	48	48	48					
Budget									
Materials		100	100	100					
Total Dollars		100	100	100					
13. INDIVIDUAL NUTRIENT MANAGEMENT EDUCATION									
Labor Requirements	1992	1993	1994	1995	1996	1997			
UWEX Review		350	440	640					
Education	200	550	460	260					
LCD Review		40	40	40	300	128			
Total hours	200	940	840	1040	300	128			
Budget									
Materials		500	100	100					
Scale Rental	100	250	250	250					
Total Dollars	100	750	350	350					
14. INDIVIDUAL AND SMALL GROUP FARM-A-SYST TRAINING									
Labor Requirements	1992	1993	1994	1995					
UWEX	104	300	300	100					
Total Hours	104	300	300	100					
Budget Farm-A-Syst Packets @ \$12 each, 40 in 1993 and 1994, 12 in 1995									
Farm-A-Syst		480	480	144					
Total Dollars		480	480	144					
15. PROJECT EVALUATION									
At the completion of the NBR project it is proposed that the Nutrient and Pesticide Management Program at the UW-Madison will be contracted to conduct the Farm Practices Inventory to evaluate the success of the nutrient management aspects of the project. This will require 36 hours of LCD staff time and will cost \$14,000 for the entire survey.									

CHAPTER SEVEN

Integrated Resource Management Program

b1

This chapter defines the principles and guidelines that make sure the watershed project is coordinated with other DNR resource management programs and activities. Each of these activities is described below.

Fisheries

The DNR actively studied ways to improve the smallmouth bass fishery in the Lower Grant River Priority Watershed Project (Grant County), particularly in Rattlesnake Creek. The results and experience from Rattlesnake Creek will be incorporated into the Narrows Creek and Baraboo River (NBR) Priority Watershed Project, with emphasis on the smallmouth bass fishery in Narrows Creek. Watershed Best Management Practices (BMPs) such as streambank protection, shoreline buffer strips, and easements should be implemented in a way that enhances fishery management goals. Rock rip rap should be installed and should use large diameter sized rock so the placement and size of rock will positively benefit smallmouth bass habitat. The fishery manager should be consulted for the design of streambank protection.

Wetland Restoration

Significant amounts of restorable wetland areas exist in this watershed. This is especially true for the floodplain areas along the mainstream of the Baraboo River. The general guidelines for wetland restoration, easement acquisition, and shoreline buffers to protect existing wetlands should be followed. The DNR private lands manager will identify wetlands that are important wildlife habitats. Shoreline buffer easements may be acquired adjacent to these wetlands to better protect them from sedimentation and other nonpoint source pollution.

Wetlands (existing and restorable) have been identified in the wetlands inventory conducted by the Soil Conservation Service (SCS). Sauk County Land Conservation Department staff will use the SCS wetland inventory to help locate wetlands. In addition to the normal priority watershed funding, additional cost sharing may be available to provide for a 100% payment to install this BMP. This additional funding may be available through the District Private Lands Manager and/or the U.S. Fish and Wildlife Service. Eligibility for this

additional funding would be determined by the private lands manager or DNR District Nonpoint Source Coordinator.

Riparian Zones

Where possible, riparian zones along creeks should be protected with fencing or managed grazing to protect them from over-grazing and trampling. This can be accomplished through easements to receive lasting protection. These areas are important wildlife habitats, particularly for wood ducks.

Stewardship

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

The following streams are considered eligible for acquisition under the Stewardship Program in the Watershed:

Narrows Creek	18.5 miles	Sauk County
Hillpoint Creek	4.0 miles	Sauk County

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

Natural Area Sites

Several natural area sites exist in this watershed, as mentioned in chapter 2. To the extent possible, project managers will protect and properly manage these sites in the NBR watershed.

CHAPTER EIGHT

Project Evaluation

Introduction

This chapter briefly summarizes the plan to monitor the progress and evaluate the effectiveness of the Narrows Creek and Baraboo River (NBR) Priority Watershed Project. The evaluation strategy includes these components:

1. administrative review
2. pollution reduction evaluation
3. evaluation monitoring (see chapter 9)

Information on the first two components will be collected by the Sauk County Land Conservation Departments (LCD) and reported on a regular basis to DNR and DATCP. The DNR will conduct evaluation monitoring. DNR's Bureau of Community Assistance will provide additional information on the numbers and types of practices on cost share agreements, funds encumbered on cost share agreements, and funds expended.

The LCD, DATCP and DNR will cooperatively prepare a final report. It will summarize the administrative activities, pollutant load reductions, and water quality information and make conclusions on the success of the project.

Administrative Review

The first component, the administrative review, will focus on the progress of Sauk County 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 Computer Assisted Management and Planning System, called CAMPS, is a computer data management system developed by the U.S. Soil Conservation Service (SCS). The SCS, DNR and DATCP use CAMPS to meet the accomplishment reporting requirements of all

three agencies. The Sauk County LCD will collect data on administrative accomplishments using CAMPS, and will provide this to DNR and DATCP for program evaluation.

The Sauk County LCD will provide the following data to the DNR and DATCP quarterly:

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

In addition to quarterly reports, Sauk County representatives will meet with DNR and DATCP staff annually to review progress and plan for the subsequent year.

Financial Expenditures

Sauk County will provide the following financial data to the DNR and DATCP quarterly:

- 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 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 LCD staff, and
- amount of money paid for installation of BMPs, and money encumbered in cost share agreements

Sauk County will also provide both agencies with the following financial data annually:

- staff training expenditures
- interest money earned and expended
- total county LCD budget and expenditures on the project

Time Spent On Project Activities

Sauk County will provide time summaries to both departments for the following activities quarterly:

- project and fiscal management
- clerical assistance

- pre-design and conservation planning activities
- technical assistance: practice design, installation, cost share agreement status review and monitoring
- educational activities
- training activities
- leave time

Pollutant Load Reduction

Key Nonpoint Sources for Evaluating Pollutant Load Reductions

The purpose of the second evaluation component, pollutant load reduction, is to calculate reductions in the amount of key pollutants as a result of installing BMPs. Three key sources were identified to estimate changes in pollutant loads that reach creeks in the NBR Watershed: 1) streambank erosion, 2) upland sediment, and 3) runoff from barnyards and fields spread with manure.

As described in chapter 3, this plan calls for the following pollutant reductions for the entire watershed:

- a 25% reduction in sediment delivered to streams and a 68% overall repair of bank habitat
- a 28% reduction watershed-wide in sediment entering creeks from agricultural uplands, streambanks, and gullies.
- a reduction of the "top" 64% of manure and organic matter entering creeks from barnyards.

Streambanks

Sauk County LCD staff will calculate changes in streambank sediment in terms of tons of sediment and length of eroding sites. A tally will be kept of landowners contacted, the amount of streambank sediment being generated at that time, and changes in erosion levels estimated after installing BMPs.

Upland Sediment Sources

Sauk County will use the WIN (Wisconsin Nonpoint Source) model to estimate sediment reductions from changes in cropping practices. The counties will provide data for the WIN model quarterly through CAMPS, as described above.

Barnyard Runoff

Sauk County will use the BARNY (Modified ARS) model to estimate phosphorus reductions from the installation of barnyard control practices. The county will report the information to the DNR through CAMPS.

CHAPTER NINE

Water Resources Evaluation Monitoring

Goal and Objectives

The goal of the priority watershed evaluation monitoring program is to evaluate the progress of the nonpoint source control program toward improving the quality of water resources.

Evaluation monitoring objectives are to:

- Evaluate the attainment of water quality "objectives" that result from implementation of BMPs at specific sites.
- Evaluate the attainment of pollutant load reduction goals, and the effectiveness of those goals in improving water quality at specific sites.
- Evaluate BMP implementation, and their effectiveness in reducing the problems that contribute to non-attainment of water quality objectives at specific sites.
- Evaluate the priority watershed plan's applicability to the management of water resources, and the attainment of water quality standards and beneficial uses.

Program Organization

- Evaluation monitoring activities in priority watersheds will be planned and conducted according to monitoring program guidance in the Bureau's Surface Water Monitoring Strategy.

Evaluation monitoring can be conducted at selected sites in basins on the 5-year basin assessment schedule, or at selected sites as special projects, depending on other monitoring priorities.

- Evaluation monitoring may be conducted on selected waterbodies in priority watersheds that meet specific site selection criteria. These sites would be part of a statewide strategy designed to meet program evaluation monitoring goals and objectives.
- Evaluation monitoring need not be conducted in each priority watershed.

Site Selection Criteria

The following criteria are suggested for site selection in agricultural watersheds for intensive evaluation as part of basin assessments, or as special projects.

Location

- Where BMPs are planned but not yet implemented in priority watersheds.
- Where serious water quality, habitat or both problems exist, and a direct cause/effect relationship between problems and nonpoint sources are obvious.
- Where a high probability exists that appropriate BMPs will be installed in the site's watershed. If possible, final monitoring site selection should come after signing cost-share agreements. Extra effort should be made to achieve full participation by all landowners.
- Where sites are not meeting attainable uses and have a high potential to improve from managing nonpoint sources.
- Where reference sites with similar characteristics, including attainable uses, are available in the same or adjacent watersheds. A reference site can be either an impacted site that will not be managed, or preferably, a site without water quality problems and meeting attainable uses. The important consideration is that reference site conditions are not expected to change, except from climatic conditions.
- Where sites have adequate access for sampling personnel and equipment.

Size

- Sites should be located on permanent streams large enough to support well developed fish communities. Streams should be 5 to 30 feet wide with base flows of 1 to 20 cubic feet per second (cfs).
- Watersheds should be manageable with areas of 5 to 50 sq. miles.

Water Quality

- Suspected or known water quality problems should be caused by manageable nonpoint sources, such as barnyards or feedlots.
- Point sources should not be present or not significant.

- Potential sources of problems that cannot or are unlikely to be managed should not be present.

Habitat

- Habitat problems should be caused by poor land use practices immediately adjacent to or near sites, and in-stream habitat should have a high potential to improve following implementation of BMPs
- Sites should not be selected that have been ditched within 10 to 15 years

Site Selection Process

Potential evaluation monitoring sites can be located while conducting basin assessments, or appraisal monitoring in newly selected priority watersheds. Selecting potential sites during the appraisal monitoring process is recommended.

Reconnaissance surveys can be conducted to locate sites that meet evaluation monitoring criteria in on-going priority watershed projects. When potential sites are located by reconnaissance, data should be obtained to determine if site selection criteria are met. County staffs should be contacted to determine the potential for landowner participation.

Sites selected for evaluation should meet most of the selection criteria, including the presence of appropriate reference sites.

Evaluation Monitoring Approaches

Priority watershed evaluation monitoring projects can be conducted as part of basin assessments on a 5-year schedule, or as special projects subject to the Bureau of Water Resources approval of annual monitoring plans. Intensive evaluation monitoring will continue to be conducted at "master monitoring" sites by the Bureau of Research, USGS and WRM staff. Basin assessments, special projects and monitoring project work planning are discussed in the Bureau's Monitoring Strategy.

The following evaluation monitoring options are provided as a guide to develop monitoring plans. Any option, or a combination of options, may be used to evaluate priority watershed projects.

Basin Assessment Approach

1. Select specific sites in priority watersheds that meet site selection criteria, including at least one reference site per treatment site. Intensively monitor these sites during the basin assessment year to establish pre-implementation surface water conditions. Evaluation monitoring projects should be designed to fit individual site characteristics, but should generally include collection of water chemistry, habitat, fish community and macroinvertebrate data.

These same sites should be monitored again in 5-years (post-implementation) when the basin is scheduled to be reassessed. These data would be compared to pre-implementation data to evaluate site specific improvements resulting from implementation of BMPs. Monitoring on a 5-year schedule could continue if appropriate.

2. Repeat appraisal type monitoring at selected sites in priority watersheds on the 5-year basin assessment schedule.

The general water resource conditions in all priority watersheds will be assessed by conducting appraisal monitoring for developing priority watershed management plans. Appraisal monitoring provides a general water resource quality and problems assessment that, when repeated during future basin assessments, can be used to evaluate surface water quality improvements, especially where they are significant.

When conducted on the 5-year basin assessment schedule, pre-implementation appraisal monitoring data may be compared to watershed-wide assessment (using appraisal monitoring techniques) data, to provide a general, but adequate priority watershed project evaluation.

This approach would provide an evaluation of more surface waters in a priority watershed, and an evaluation of the overall results of a priority watershed project.

Special Project Approach

This approach is essentially the same as the basin assessment intensive monitoring approach (option 1), except that sites may be monitored more frequently, and would be planned as special projects. Guidance for special project planning is provided in the Bureau's Monitoring Strategy.

The DNR recommends a 5-year basin assessment monitoring approach, as discussed in option 2. Except where an intensive special project monitoring approach may be recommended at unique sites that anticipate severe problems, highly valued resources, high participation levels, and a measurable response. For example, a small scale watershed project like Black Earth Creek.

Two sites will be selected as part of the evaluation monitoring strategy for the Narrows Creek and Baraboo River Priority Watershed Project. The monitoring activities and the description of the site are described below.

- **Streambank Protection.** This site is located on the Orland Reimer and Gerald Radtke farms west of Loganville on Narrows Creek. This reach of stream was surveyed by electrofishing in 1991 (summer) to determine the condition of the smallmouth bass population. The site will be surveyed again during the last year of the project to determine if the bass responded to any improvements in habitat or water quality attained by the project.
- **Barnyard Runoff Management.** A macroinvertebrate (HBI) and habitat study will be conducted at a site before and after an animal waste control system is installed. This will be done in consultation with the Sauk County Land Conservation Department. The HBI and habitat evaluation will be done at least 2 years after installing the best management practices so improvements in water quality and habitat will have time to take effect.
- **Groundwater.** Sauk County will retest a random selection of private wells for nitrate levels.

BIBLIOGRAPHY

- Ball, J., 1982. "Stream Classification Guidelines for Wisconsin." *Draft DNR Technical Bulletin*. Unpublished.
- Bannerman, R., 1991. *Nonpoint Source Evaluation Monitoring Activities*. DNR Publication # WR-279-91.
- Baun, K. 1992. *Wisconsin Barnyard Runoff Model: Version 2.1*. DNR Publication # WR 285-91.
- DNR Bureau of Endangered Resources. 1992. *Endangered Resource Survey Data*. Unpublished.
- Hilsenhof, W. 1982. "Using a Biotic Index to Evaluate Streams in Wisconsin." *DNR Technical Bulletin # 132*.
- Madison, F., and Cates, K. *Soil Containment Attenuation Model (SCAM)*. University of Wisconsin-Extension. Unpublished.
- Norton, A. and Sorge, M., 1992. *Water Resources Appraisal Report of the Narrows Creek Priority Watershed Project*. DNR Southern District. Unpublished.
- Nowak, P. and Shepard, R. 1991. *Farm Practices Inventory (FPI) - Utilizing a Needs Assessment in a Water Quality Program Implementation*. Nutrient and Pest Management Program, University of Wisconsin-Extension, Environmental Resources Center. Unpublished.
- Nowak, P. and Shepard, R. 1991. *Initial Frequency Report for Narrows-Baraboo Watershed*. Nutrient and Pest Management Program, University of Wisconsin-Extension, Environmental Resources Center. Unpublished.
- United States Department of Agriculture, Soil Conservation Service, University of Wisconsin Madison. 1977. *Soil Survey of Sauk County*.
- DNR. 1985. *A Nonpoint Source Control Plan for the Crossman Creek - Little Baraboo Priority Watershed*.
- DNR. 1987. *Lower Wisconsin River Basin Areawide Water Quality Management Plan*. Publication # WR-001-86 REV.
- DNR. 1992. *A Nonpoint Source Control Plan for the Lower East Branch Pecatonica River Priority Watershed Project*. Publication # WR-288-92.
- DNR. 1978. Wisconsin Administrative Code, Chapter NR 120, Nonpoint Source Pollution Abatement Program: Register, November 1989, No. 406. 26 p.

APPENDIX A

Watershed Planning Methods

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

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

Evaluating Water Quality and Aquatic Habitat

The DNR is responsible for:

- designating the biological and recreational uses that surface waters can support under proper management
- prescribing the water quality required to sustain these designated uses
- indicating the methods to implement, achieve and maintain those conditions

The DNR's Southern District Water Resources Management staff conducted investigations of the existing quality and natural resource conditions for Narrows Creek and Baraboo River in 1991. They evaluated water quality problems and established a basis for setting water resources management objectives. The water resource appraisal report documents the detailed assessment results.

Data Collection

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

Subwatershed Delineation and Stream Segmentation: Before collecting field data, the watershed was divided into hydrologic subwatersheds. This was accomplished using 1"=400' scale aerial photographs and 1"=2,000' (7.5 minute) U.S. Geological Survey quadrangle maps. These maps were also used to divide the perennial and intermittent stream network into segments. Stream segments were used to separate portions of waterways where either natural conditions or human-induced changes resulted in pronounced differences in stream character and/or water quality.

Stream Habitat Evaluation: Information characterizing stream habitat including flow rate and depth, substrate quality, channel configuration, stability, and water temperature were collected using techniques developed by the DNR. The data were evaluated using DNR's Stream Classification Guidelines (Ball, 1982).

Water Quality Assessment: Surface water quality was assessed through review of historical water chemistry data and an evaluation of bottom dwelling animals (macroinvertebrates) using the Hilsenhoff Biotic Index (Hilsenhoff, 1982). Extensive bacteria (fecal coliform) surveys were conducted to assess the suitability of surface waters for recreational use. Private well samples were collected and analyzed for nitrate + nitrite. Analytical data were used to assess the quality of groundwater in the watershed.

Fisheries Resource Assessment: Fish communities were assessed qualitatively using a combination of historical data (Fago, 1984) and information collected during this investigation. Resident fish populations in the streams, lakes, and impoundments were sampled using seines and electric shocking equipment.

Navigability and Recreational Use Determinations: The extent and degree to which streams are navigable was determined based on evidence of canoeing or boating, field data including evidence of stream alteration or use, and information that landowners or other local experts provided. Recreational uses were determined through field observations, file data and information from local users.

Data Interpretation

The data described above were used to determine the existing and potential biological and recreational uses for surface waters. The existing uses reflect present biological and recreational conditions. Potential uses reflect biological and recreational conditions that could be achieved under prescribed types and levels of management. Even though existing and

potential uses of a surface water are the same, management programs can result in significant changes in the quality of the aquatic environment. Use classifications and supporting water quality standards used in evaluating water resource conditions are discussed below.

Biological Stream Use Classification

Biological stream use classes describe the fish species or other aquatic organisms supported by a stream system. Designation is based on the ability of a stream to provide suitable habitat and water quality conditions for fish and other aquatic life. The following biological stream use classification system was used statewide and was applied to surface waters in the Narrows-Baraboo Watershed.

COLD= Cold Water Communities include surface waters capable of supporting a community of cold water fish and other aquatic life or serving as a spawning area for cold water fish species.
WWSF= Warm Water Sport fish Communities include surface waters capable of supporting a community of warm water sport fish and/or serving as a spawning area for warm water sport fish.
WWFF= Warm Water Forage Fish Communities include surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.
LFF= Limited Forage Fish Communities

Discussions also include the "class" of trout streams based on the publication "Wisconsin Trout Streams" [DNR Publ. 6-3600(80)] and Outstanding/Exceptional Resource Waters, Wisconsin Administrative Code NR 102.20 and NR 102.11.

Class I trout streams are high quality with populations sustained by natural reproduction.
Class II trout streams have some natural reproduction but may need stocking to maintain a desirable fishery.
Class III trout streams have no natural reproduction and require annual stocking of legal-size fish to provide sport fishing.

Recreational Stream Use Classification

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 noncontact.

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.

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.

Noncontact: 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.

Water Quality Standards and Criteria

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) was also used to assess suitability of surface waters for recreation.

Additional information used to assess the suitability of surface waters for biological uses includes recommended maximum nutrient levels, suspended solids concentrations and the extent to which streambeds are clogged with sediment.

Groundwater quality standards for substances of public health concern and public welfare concern are contained in Chapter NR 140 Wisconsin Administrative Code. The enforcement standards (ES) and preventative action limits (PAL) are defined in chapter 2. If well sample results exceeded the nitrate + nitrite ES, owners were sent a notice warning them that infants under six months and pregnant women should not drink the well water. At nitrate + nitrite levels greater than 40 mg/l, owners are eligible to apply for well compensation funds from the Bureau of Water Supply.

Assessing Pollution Sources

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

Rural Nonpoint Sources

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

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

The County LCD staff conducted inventories during 1990-1991. Inventory procedures are documented below. The DNR in cooperation with the DATCP and the LCD staff completed the data analyses. Inventory and evaluation procedures are summarized below.

Barnyard and Livestock Area Runoff

The Sauk County LCD staff mapped the locations of barnyards in the watershed on 1"=2,000' scale topographic maps. A field survey of each barnyard was conducted to collect information needed to determine its pollution potential.

The barnyard data was used in the "BARNY" Model (Baun, 1991), a modification of the animal lot runoff model, which the U.S. Department of Agriculture, Agricultural Research Service developed (Young, 1982). Information about the mass loading of total annual phosphorus was generated to evaluate the relative pollution potential of each barnyard. The livestock operations were ranked according to their potential to impact surface and/or groundwater quality.

Upland Erosion and Sediment Delivery

The LCD staff conducted the inventory on about 35 square miles, or 20 percent of the watershed, using existing data and field investigations. Cropland, pastures, grasslands, woodlands and other open (non-urban) land uses were investigated. Existing data sources included site specific farm conservation plans, 1"=400' scale aerial photographs, and U.S. Geological Survey 1"=2,000' scale quadrangle maps. The information obtained for each parcel included size, soil type and erodibility, slope percent and length, land cover, crop rotation, present management, overland flow distance and destination, channel type and receiving water.

Upland erosion and sediment delivery was determined using the Wisconsin Nonpoint Source WIN Model (Baun & Snowden, 1987). The WIN model calculates the average annual quantity of eroded soil reaching surface waters from each farm field. The determination is made based on a "typical" year of precipitation. Estimated sediment delivery was used to assess the relative pollution potential of each farm field in the watershed.

Streambank Erosion

The LCD staff and the DNR conducted field surveys on about 70 miles of perennial and intermittent streams located in rural areas. The method used is a modification of the streambank erosion analysis included in Phase II of the Land Inventory Monitoring process used by the U.S. Department of Agriculture, Soil Conservation Service. At locations where erosion was occurring, the following information was recorded:

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

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

Runoff from Areas Winter-spread with Livestock Waste

This analysis was done to estimate the pollution potential associated with winter-spreading livestock waste in the watershed. The information collected for the barnyard and upland erosion surveys was used in this evaluation.

This analysis was completed using a three-step process. First, the number of acres that each livestock operation needed to landspread manure was calculated for a six-month period

approximating when manure cannot be incorporated into the ground because of frozen or saturated conditions. The amount of manure that each operation generated was based on the number and type of livestock.

Second, the land available to each livestock operation for winter-spreading was characterized according to its environmental sensitivity. Lands having slopes equal to or greater than six percent or located within the floodplain were considered to have a high potential to deliver landspread manure to lakes and streams during periods of spring thaw.

Third, the number of sensitive acres winter-spread with manure was estimated for each livestock operation based on the number of acres needed for winter-spreading and the proportion of lands available to the livestock operation determined to be environmentally sensitive. This number was used to indicate the relative pollution potential of each livestock operation due to runoff of winter-spread manure.

Streambank Erosion

Rural streambank erosion survey techniques were applied to portions of urban streams where streambank erosion was suspected to be a problem. Sites were selected based on information from the DNR water resources staff and local municipal staff.

Other Pollution Sources

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

The DNR conducted an inventory and evaluation of these other pollution sources. Inventory results and recommendations for alleviating the water quality impacts of these other pollution sources are documented in chapter 4.

Establishing Water Resource Objectives

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

Establishing Pollution Reduction Goals

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

Developing a Nonpoint Source Management Strategy

The final step in the planning process is to develop a strategy to achieve the nonpoint source pollution reduction goals identified in the plan. Several items are addressed in developing the management strategy including:

- Critical nonpoint pollution sources.
- Effective management practices and guidelines for use of state cost-share funds for practice installation.
- Responsibilities, estimated workloads and work schedules for local implementing agencies, and guidelines for use of state funds to support local implementation activities.
- Estimated cost of installing practices and supporting staff at the local level.
- Information and education needs.
- Project evaluation needs.

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

- Evaluating pollutant loading for each nonpoint source in each subwatershed.
- Determining the relative importance of controlling each source (barnyards, urban runoff, cropland erosion, etc.) to achieving the water resource objectives.
- Developing criteria to determine which sources need to be controlled.
- Applying the criteria to determine eligibility for participation in the priority watershed project.

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

The Sauk County LCD convened an advisory committee to assist in preparing this watershed plan.

APPENDIX B

Glossary

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 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. Thus algae effect the oxygen content of water. Nutrient-enriched water increases algae growth.

AMMONIA:

A form of nitrogen (NH₃) found in human and animal wastes. Ammonia can be toxic to aquatic life.

ANAEROBIC:

Without oxygen.

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.

ATTENUATION:

To lessen the amount, force, magnitude or value of potential contaminants. Includes process such as: desorption, absorption, recycling, adhesion, chelation, cation exchange.

AVAILABILITY:

The degree to which toxic substances or other pollutants that are present in sediments or elsewhere in the ecosystem 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. The amount of oxygen, pH, temperature and other conditions in the water can affect availability.

BACTERIA:

Single-cell, microscopic organisms. Some can cause disease, and some are important in the stabilization of organic wastes.

BASIN PLAN:

See "Areawide Water Quality Management Plan".

BENTHIC ORGANISMS (BENTHOS):

The 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.

BIOCHEMICAL OXYGEN DEMAND (BOD):

A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. BOD₅ is the biochemical oxygen demand measured in a five day test. The greater the degree of pollution, the higher the BOD₅.

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.

CLEAN WATER ACT:

See "Public Law 92-500."

CONSERVATION TILLAGE:

Planting row crops while disturbing the soil only slightly. In this way a protective layer of plant residue stays in the surface; erosion is decreased.

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 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, as a pollutant suggests that 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.

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.

ECOSYSTEM:

The interacting system of biological community and its nonliving surrounding.

EFFLUENT:

Solid, liquid or gas wastes (byproducts) disposed on land, in water or in air. As used in the RAP (Remedial Action Plan) generally means wastewater discharges.

EFFLUENT LIMITS:

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

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.

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 leading to increased production of aquatic organisms. Eutrophication can be accelerated by human activity such as agriculture and improper waste disposal.

FECAL COLIFORM:

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

FISHABLE AND SWIMMABLE:

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

GREEN STRIPS:

See buffer strip.

GROUNDWATER:

Underground water-bearing areas generally within the boundaries of a watershed, which fill internal passageways of porous geologic formations (aquifers) with water and flows in response to gravity and pressure. It is 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-term 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.

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 that seeps from a pile or cell of solid materials and contains water, and 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 BALANCE:

A study that examines all parts of the ecosystem to determine the amount of toxic or other pollutants 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 "Oligotrophic.")

MILLIGRAMS PER LITER (mg/l):

A measure of the concentration of substance in water. For most pollution measurement this is the equivalent to "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 is one-third of the lowest flow that occurs once every 10 years for a seven day period.

NONPOINT SOURCE POLLUTION (NPS):

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

NPS:

See nonpoint source pollution.

OLIGOTROPHIC:

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

PESTICIDE:

Any chemical agent used for control of 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.

PHOSPHORUS:

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

PLANKTON:

Tiny plants and animals that live in water.

POINT SOURCES:

Sources of pollution with discrete discharges, usually from a pipe or outfall.

POLLUTION:

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

PRIORITY WATERSHED:

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

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 set 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 discharges of pollutants to obtain a permit and meet the conditions of the permit. To accomplish this pollution cleanup, billions of dollars were 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 plant owned by a city, village or other unit of government.

RAP:

See Remedial Action Plan.

RECYCLING:

The process where waste materials are transformed into new products.

REMEDIAL ACTION PLAN:

A plan designed to restore beneficial uses to a Great Lakes Area of Concern.

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.

SCAM:

See soil contaminant attenuation model.

SECONDARY IMPACTS:

The indirect effects that an action can have on the health of the ecosystem or the economy.

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 and liquid percolates through the drain field.

SLUDGE:

A byproduct of wastewater treatment from waste solids suspended in water.

SOIL CONTAMINANT ATTENUATION MODEL:

A model that attempts to show how effectively soil attenuates contaminants. Sometimes used in relation to protecting groundwater.

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.

TOXicity:

The degree of danger posed by a toxic substance to animal or plant life. Also see acute toxicity, chronic toxicity and additivity.

TREATMENT PLANT:

See wastewater treatment plant.

TROPHIC STATUS:

The level of growth or productivity of a lake as measured by phosphorus content, algae abundance, and depth of light penetration.

TURBIDITY:

Lack of water clarity. Turbidity is usually closely related to the amount of suspended solids in water.

UNIVERSITY OF WISCONSIN EXTENSION (UWEX):

A special outreach, education branch of the state university system.

VARIANCE:

Government permission to delay or make an 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.

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 percent of organic pollutants.

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 inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a variety of vegetative or aquatic life. Wetland vegetation requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas.

WISCONSIN ADMINISTRATIVE CODE:

The set of rules written and used by state agencies to implement state statutes. Administrative codes are subject to public hearing and have the force of law.

WISCONSIN FUND:

A state program that helps pay the cost of reducing water pollution. Funding for the program comes from general revenues and bonds and is based on a percentage of the state's taxable property value. The Wisconsin Fund includes these programs:

Point Source Water Pollution Abatement Grant Program - Provides grants for 60 percent 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.

PRIORITY WATERSHED PROJECTS IN WISCONSIN 1992

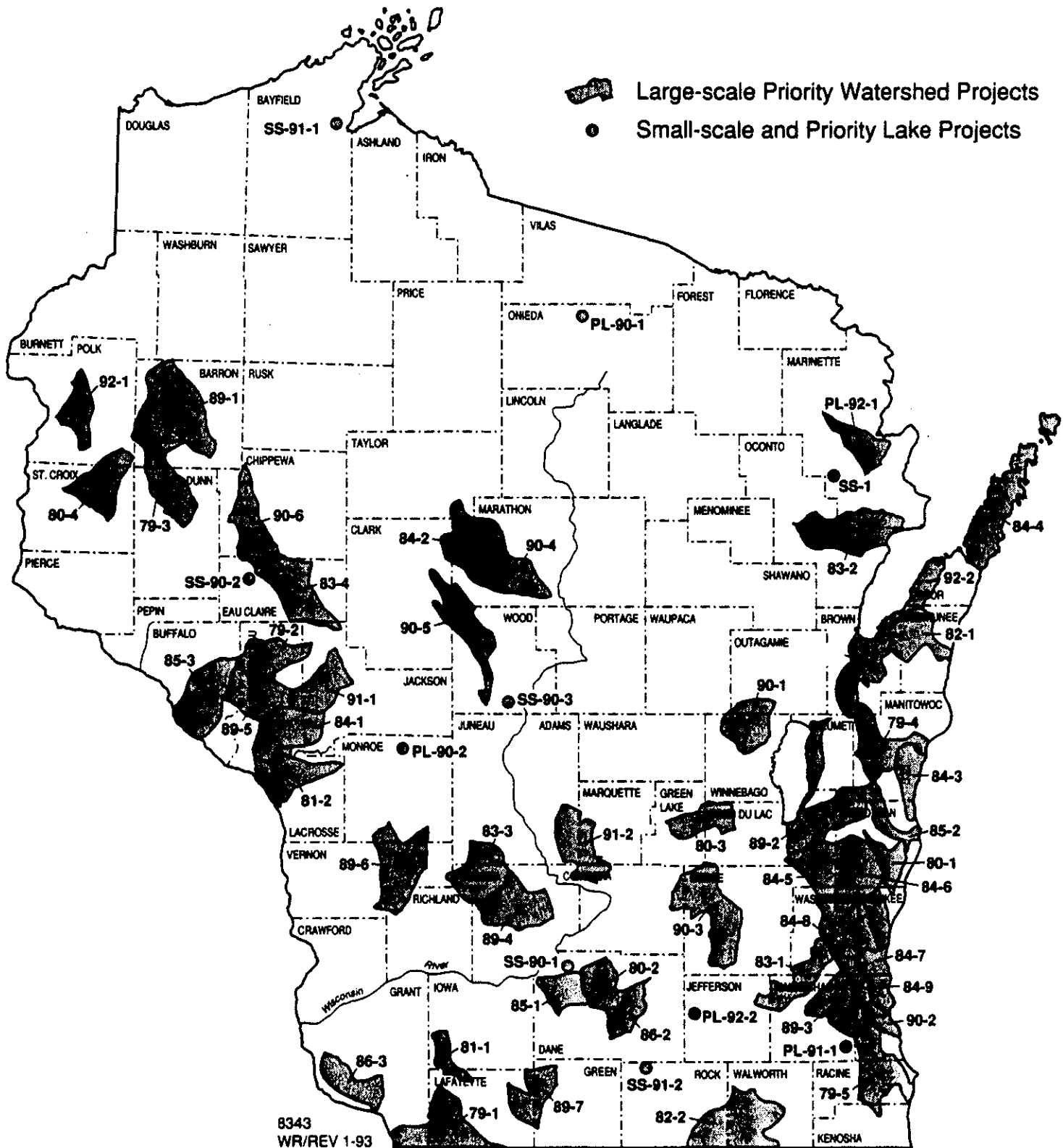
<u>Map Number</u>	<u>Large-scale Priority Watershed Project</u>	<u>County(ies)</u>	<u>Year Project Selected</u>
79-1	Galena River*	Grant, Lafayette	1979
79-2	Elk Creek*	Trempealeau	1979
79-3	Hay River*	Barron, Dunn	1979
79-4	Lower Manitowoc River*	Manitowoc, Brown	1979
79-5	Root River*	Racine, Milwaukee, Waukesha	1979
80-1	Onion River*	Sheboygan, Ozaukee	1980
80-2	Sixmile-Pheasant Branch Creek*	Dane	1980
80-3	Big Green Lake*	Green Lake, Fond du Lac	1980
80-4	Upper Willow River*	Polk, St. Crox	1980
81-1	Upper West Branch Pecatonica River*	Iowa, Lafayette	1981
81-2	Lower Black River	La Crosse, Trempealeau	1981
82-1	Kewaunee River*	Kewaunee, Brown	1982
82-2	Turtle Creek	Walworth, Rock	1982
83-1	Oconomowoc River	Waukesha, Washington, Jefferson	1983
83-2	Little River	Oconto, Marinette	1983
83-3	Crossman Creek/Little Baraboo River	Sauk, Juneau, Richland	1983
83-4	Lower Eau Claire River	Eau Claire	1983
84-1	Beaver Creek	Trempealeau, Jackson	1984
84-2	Upper Big Eau Pleine River	Marathon, Taylor, Clark	1984
84-3	Sevenmile-Silver Creeks	Manitowoc, Sheboygan	1984
84-4	Upper Door Peninsula	Door	1984
84-5	East & West Branch Milwaukee River	Fond du Lac, Washington, Sheboygan, Dodge, Ozaukee	1984
84-6	North Branch Milwaukee River	Sheboygan, Washington, Ozaukee, Fond du Lac	1984
84-7	Milwaukee River South	Ozaukee, Milwaukee	1984
84-8	Cedar Creek	Washington, Ozaukee	1984
84-9	Menomonee River	Milwaukee, Waukesha, Ozaukee, Washington	1984
85-1	Black Earth Creek	Dane	1985
85-2	Sheboygan River	Sheboygan, Fond du Lac, Manitowoc, Calumet	1985
85-3	Waumandee Creek	Buffalo	1985
86-1	East River	Brown, Calumet	1986
86-2	Yahara River - Lake Monona	Dane	1986
86-3	Lower Grant River	Grant	1986
89-1	Yellow River	Barron	1989
89-2	Lake Winnebago East	Calumet, Fond du Lac	1989
89-3	Upper Fox River (Ill.)	Waukesha	1989
89-4	Narrows Creek - Baraboo River	Sauk	1989
89-5	Middle Trempealeau River	Trempealeau, Buffalo	1989
89-6	Middle Kickapoo River	Vernon, Monroe, Richland	1989
89-7	Lower East Branch Pecatonica River	Green, Lafayette	1989
90-1	Arrowhead River & Daggets Creek	Winnebago, Outagamie, Waupaca	1990
90-2	Kinnickinnic River	Milwaukee	1990
90-3	Beaverdam River	Dodge, Columbia, Green Lake	1990
90-4	Lower Big Eau Pleine River	Marathon	1990
90-5	Upper Yellow River	Wood, Marathon, Clark	1990
90-6	Duncan Creek	Chippewa, Eau Claire	1990
91-1	Upper Trempealeau River	Jackson, Trempealeau	1991
91-2	Neenah Creek	Adams, Marquette, Columbia	1991
92-1	Balsam Branch	Polk	1992
92-2	Red River - Little Sturgeon Bay	Door, Brown, Kewaunee	1992

<u>Map Number</u>	<u>Small-scale Priority Watershed Project</u>	<u>County(ies)</u>	<u>Year Project Selected</u>
SS-1	Bass Lake*	Marinette	1985
SS-90-1	Dunlap Creek	Dane	1990
SS-90-2	Lowes Creek	Eau Claire	1990
SS-90-3	Port Edwards - Groundwater Prototype	Wood	1990
SS-91-1	Whittlesey Creek	Bayfield	1991
SS-91-2	Spring Creek	Rock	1991

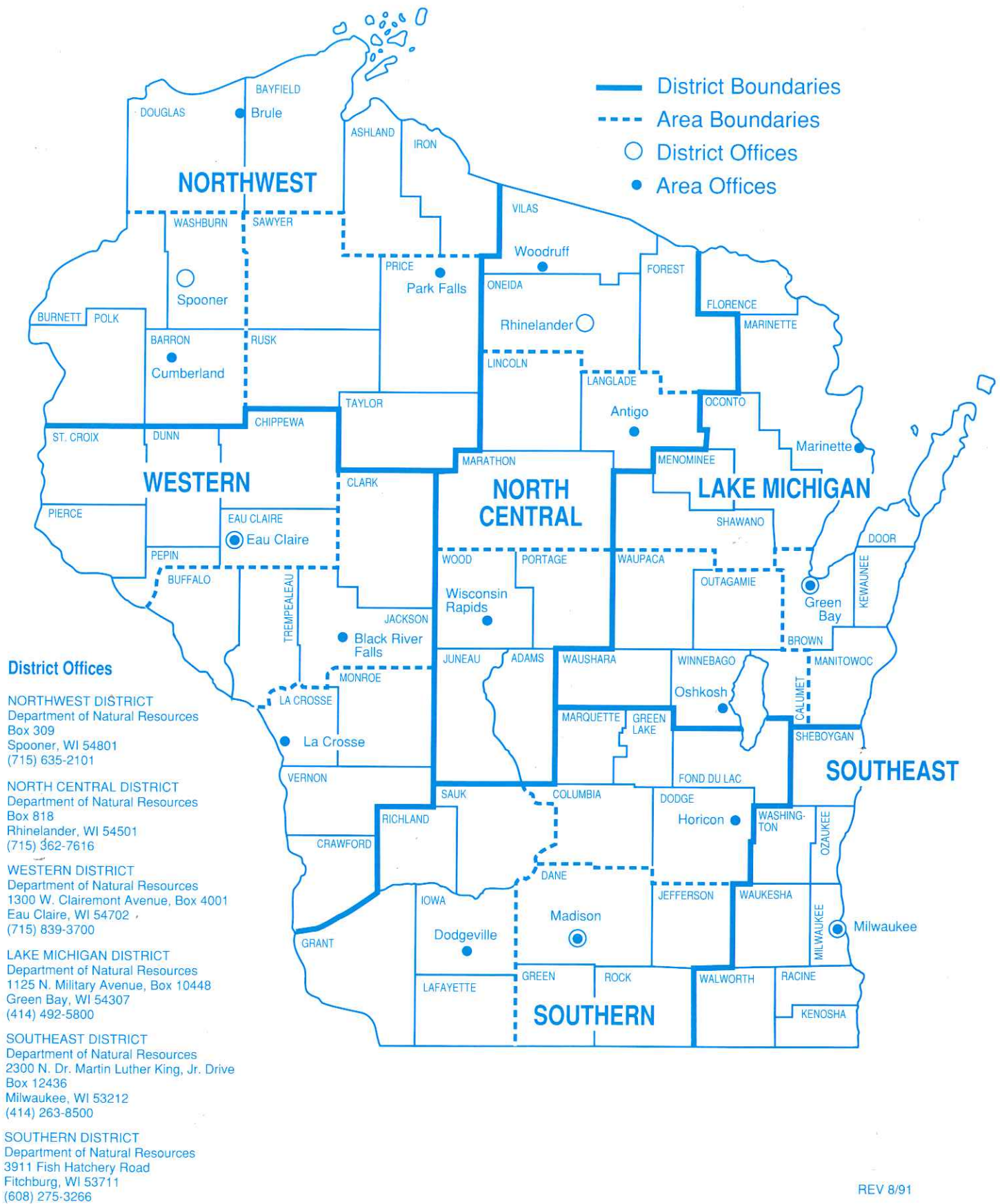
<u>Map Number</u>	<u>Priority Lake Project</u>	<u>County(ies)</u>	<u>Year Project Selected</u>
PL-90-1	Minocqua Lake	Oneida	1990
PL-90-2	Lake Tomah	Monroe	1990
PL-91-1	Little Muskego, Big Muskego and Wind Lakes	Waukesha, Racine, Milwaukee	1991
PL-92-1	Lake Noquebay	Marinette	1992
PL-92-2	Lake Ripley	Jefferson	1992

* Project completed

Priority Watershed Projects in Wisconsin 1992



DNR Field Districts and Areas



A blue line-art outline of the state of Wisconsin, including its major water bodies like Lake Superior, Lake Michigan, Lake Koshong, and Lake Monie. The text and logo are positioned within the map's outline.

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.



PRINTED
ON RECYCLED
PAPER