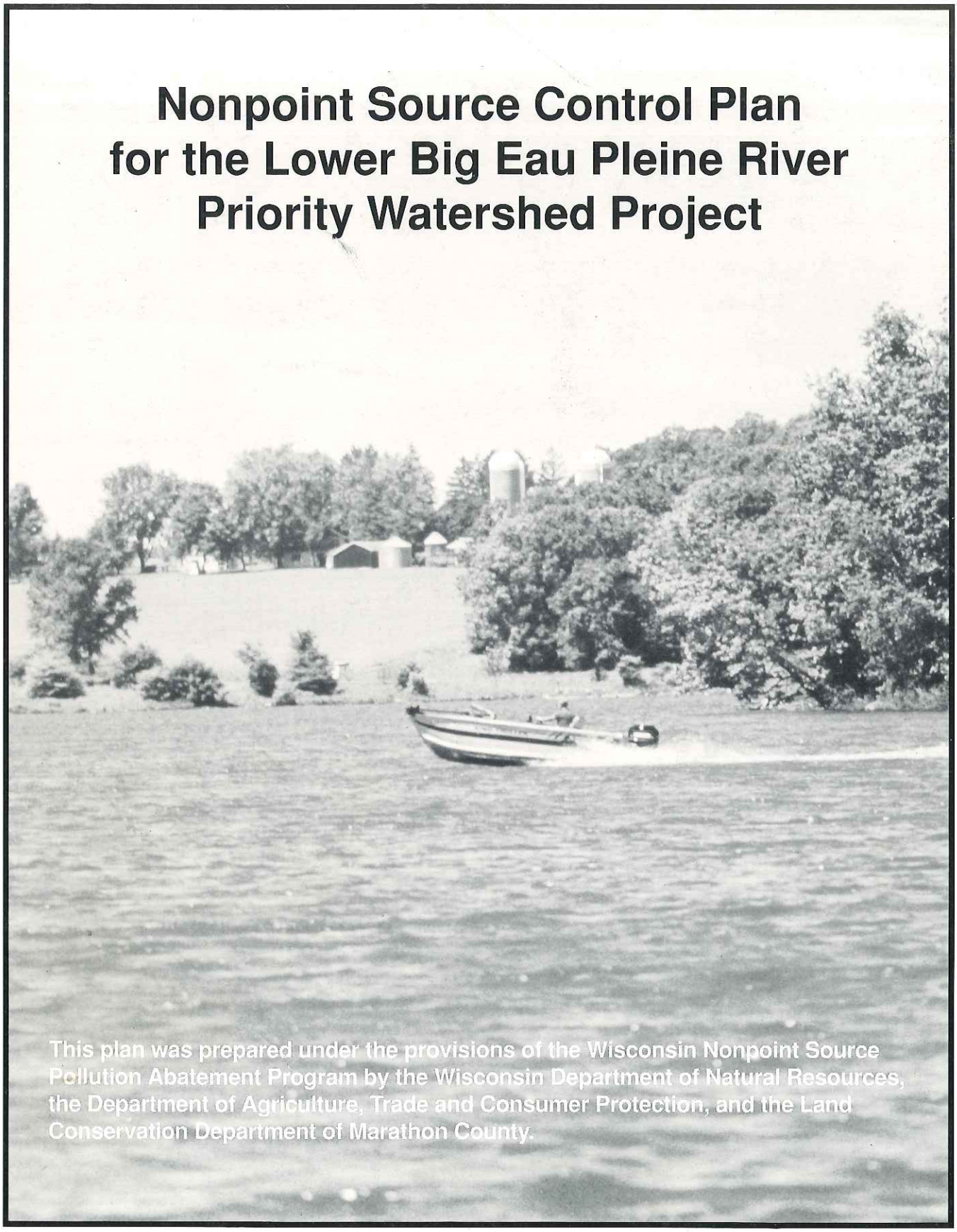
Nonpoint Source Control Plan for the Lower Big Eau Pleine River Priority Watershed Project



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

WATERSHED PLAN ORGANIZATION INFORMATION

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Nonpoint Source Control Plan for the Lower Big Eau Pleine River Waterhshed

Wisconsin Nonpoint Source Water Pollution Abatement Program

October 1993

Plan Cooperatively Prepared By:

Department of Natural Resources
Department of Agriculture, Trade and Consumer Protection
Marathon County Land Conservation Department

Publication WR-314-92

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Watershed Plan Credits

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In addition to the people listed on the inside front cover of this plan, the author and principal contributors would like to acknowledge the valuable contributions of the following people:

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March 30, 1993

FILE REF: 2600

Mr. Ted Tellekson, Chair
County Board of Supervisors
307 South 7th Avenue
Wausau, Wisconsin 54401

Dear Mr. Tellekson,

It is my pleasure to approve A Nonpoint Source Control Plan for the Lower Big Eau Pleine River Priority Watershed Project. This plan meets the intent and conditions of s. 144.25, Wisconsin Statutes, and Chapter NR 120 of the Wisconsin Administrative Code. The plan has been approved by Marathon County and the Wisconsin Department of Agriculture, Trade, and Consumer Protection. This letter completes the approval process set forth in Wisconsin Statutes and allows the granting of funds through the Nonpoint Source Water Pollution Abatement Program to implement the project.

I am also approving this plan as an amendment to the areawide water quality management plan for the Upper Wisconsin River, Central sub-basin.

The start of this project is an exciting milestone in our cooperative effort to improve water quality throughout the Upper Wisconsin River Basin. This plan, prepared jointly by staff from the Department of Natural Resources, the Department of Agriculture, Trade and Consumer Protection, and the Marathon County Land Conservation Department, is an example of the cooperative efforts that can help improve and protect the streams, rivers, and wetlands of the Lower Big Eau Pleine River watershed. I'm confident that the cooperative spirit shown throughout the development of this plan will continue during the implementation of this project.

Sincerely,

George C. Meyer

George E. Meyer
Secretary

cc: Dave Jelinski, Department of Agriculture, Trade and Consumer Protection
Dale Urso, DNR North Central District Director
Craig Karr, DNR Bureau of Community Assistance

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

February 25, 1993

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 Lower Big Eau Pleine River Priority Watershed Project".

We look forward to assisting the DNR and the Land Conservation Committee and staff in Marathon 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
Ken Lassa, Marathon County LCD

RESOLUTION
ADOPTING THE LOWER BIG EAU PLEINE RIVER
NONPOINT SOURCE PRIORITY WATERSHED PLAN
#R-109-92

WHEREAS, the Lower Big Eau Pleine River Watershed was designated by the Department of Natural Resources in 1990 under the Wisconsin Nonpoint Source Water Pollution Abatement Program, and

WHEREAS, this project is a continuation of the Upper Big Eau Pleine Watershed Project and compliments the goals of improved water quality in the Big Eau Pleine Reservoir, and

WHEREAS, the County Land Conservation Department in cooperation with the Wisconsin Department of Natural Resources and the Wisconsin Department of Agriculture, Trade and Consumer Protection conducted a detailed inventory of the land use within the watershed in 1991 and 1992, and

WHEREAS, this inventory resulted in the development of a detailed nonpoint source control plan for the watershed, and

WHEREAS, a number of public informational meetings have been conducted throughout the watershed, and an official public hearing was conducted on October 27, 1992, and

WHEREAS, pertinent public comments have been incorporated into the plan, and

WHEREAS, the County wishing to receive cost sharing grants for landowners in the watershed must first adopt the Lower Big Eau Pleine Watershed Plan.

NOW, THEREFORE, BE IT RESOLVED, by the Board of Supervisors of the County of Marathon that the Lower Big Eau Pleine Watershed Nonpoint Source Priority Watershed Plan be adopted and the implementation of the plan begin as soon as possible.

DATED: This 22nd day of December, 1992.

FISCAL IMPACT: Costs to the County for implementation of this watershed plan are reimbursed 100% by the State.

LAND CONSERVATION COMMITTEE

Richard Scheuer
Frank Zebro
Dale A. Barkow

STATE OF WISCONSIN)
)SS.
COUNTY OF MARATHON)

I, Louann E. Fenhaus, County Clerk in and for Marathon County, Wisconsin, hereby certify that the attached Resolution #R-109-92 adopted by the Marathon County Board of Supervisors at their Adjourned Annual meeting which was held December 22, 1992.

Louann E. Fenhaus

SEAL

Louann E. Fenhaus
Marathon County Clerk

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SUMMARY

Introduction

The Lower Big Eau Pleine River Priority Watershed Project plan assesses the nonpoint sources of pollution in the Lower Big Eau Pleine River Watershed and guides the implementation of nonpoint source control measures. These control measures are needed to meet specific water resources objectives for Lower Big Eau Pleine and its tributaries. This project complements the Upper Big Eau Pleine River watershed project which was selected in 1984. The primary objective of both projects is to reduce nonpoint source pollution to the Big Eau Pleine River Reservoir and to enhance and protect the water quality of streams in the Big Eau Pleine River watershed.

Nonpoint sources of pollutants most commonly found in this watershed include:

- polluted runoff from barnyards and feedlots
- sediment from cropland erosion
- runoff from winterspread manure

The purpose of this project is to reduce the amount of pollutants originating from nonpoint sources that reach surface water and groundwater within the Lower Big Eau Pleine 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 Marathon County Land Conservation Department (LCD). The DNR selected the Lower Big Eau Pleine River Watershed as a priority watershed project through the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1991. It joined approximately 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 DNR and DATCP administer this project at state level. The Marathon County LCD will administer the project locally with assistance from UW Extension and the Soil Conservation Service (U.S. Department of Agriculture).

General Watershed Characteristics

The Lower Big Eau Pleine River Watershed drains 139 square miles of land in Marathon County in central Wisconsin. The watershed is part of the Upper Wisconsin River Central Sub Basin. The Big Eau Pleine River drains to Lake Du Bay, a flowage of the Wisconsin River. The Lower Big Eau Pleine River Watershed was divided into 8 smaller drainage areas, called subwatersheds, for this planning effort (Map 2-1).

Land use in the watershed, as shown in Table S-1, is mainly agricultural, and is currently dominated by dairy farming. The watershed population is small, approximately 4,500 people. Most of the watershed population lives outside incorporated areas, in small enclaves of residential development or on farmsteads.

Table S-1. Land Use in the Lower Big Eau Pleine River Watershed

Land Use	Percent of Watershed
Agricultural	
pasture	4%
cropland	56%
Grassland	9%
Woodland	24%
Developed	3%
Wetland*	4%

*These are estimates of wetland acres based on WIN inventory data. See wetland section in Chapter 2 for a more comprehensive estimate of wetland acreage.

Source: DNR

Water Quality

The Lower Big Eau Pleine River and the Big Eau Pleine reservoir support a warm water sport fishery. The streams of the watershed are not reaching their highest potential use due to pollution from point and nonpoint sources. Eroding croplands and streambanks and improperly managed livestock operations are the major sources of nonpoint pollution in the watershed.

Segments of Freeman Creek were identified as currently supporting good quality Class II and III Cold water brook and brown trout fisheries with strong potential for improvement to Class I trout fisheries. The details of these assessments are discussed later in this watershed plan.

An inventory of groundwater quality was done in conjunction with the animal lot inventories. Results show that 23 percent of the well samples collected had nitrate levels over the enforcement standard (health advisory level) of 10 milligrams per liter (mg/l) and 65 percent had nitrate levels between 2 mg/l, the preventative action limit, and 10 mg/l. These nitrate levels are significant.

Triazine sampling showed that 1 percent of the samples collected had triazine levels over 3.0 micrograms per liter (μg/l), the enforcement standard for triazine. Triazine is a man-made compound that, when present in groundwater, indicates groundwater contamination. Nineteen percent of the samples collected had triazine levels between 0.3 μg/l and 3.0 μg/l. The preventative action limit for triazine is 0.3 μg/l.

Sources of Water Pollution

The Marathon County LCD collected data on all agricultural lands, barnyards, manure storage sites, 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 Lower Big Eau Pleine River Watershed, about 95 percent of the sediment deposited in streams annually results from agricultural upland erosion. Three percent of the sediment reaching creeks originates from streambank erosion. Approximately two percent of the total sediment is contributed from shoreline erosion.

below is a summary of results of the investigations of nonpoint sources:

Barnyard Runoff Inventory Results:

- 208 barnyards were assessed
- These barnyards were found to contribute 9873 pounds of phosphorus to surface waters, annually.

Streambank Erosion Inventory Results:

- 49 stream miles were inventoried
- 830 tons of sediment reach streams from eroding sites (3 percent of total sediment)
- There are 2.5 miles of eroding sites (3 percent of streambanks inventoried)

Shoreline Erosion Inventory Results:

- 12 miles of reservoir shoreline were found to have either severe, moderate, or mild erosion from eroding sites
- the reservoir receives 513 tons of sediment annually (2 percent of total sediment)
- 55 landowners have mild, moderate, or severe erosion sites

Upland Sediment Inventory Results:

- 91,526 acres were inventoried
- streems receive 23,755 tons of sediment (95 percent of total sediment)
- 80 percent from cropland
- 8 percent from grazed woodlots
- 3 percent from pastures

Wetland Inventory Results:

- 4394 acres of wetlands inventoried
- 1510 acres of converted but restorable wetlands
- 2745 acres of grazed wetlands
- This inventory reflects just those wetlands influenced by human activity.

Pollutant Reduction Goals

To improve water quality in the Lower Big Eau Pleine River and its tributaries, this plan calls for the following:

Sediment Goal

Reduce overall sediment delivered by 35 percent. To meet this goal, the following is needed:

- Thirty-three percent reduction in sediment reaching streams from agricultural uplands in all subwatersheds.

- Forty-five percent reduction in streambank sediment delivered to all streams and a 25 percent overall repair of streambank habitat in all subwatersheds.

- Sixty percent reduction in shoreline sediment delivered to the reservoir.

Phosphorus Goal

Reduce overall phosphorus load by 50 percent. To meet this goal, the following is needed:

- Seventy percent reduction in organic pollutants from barnyards in all subwatersheds.

- Fifty percent reduction in organic pollutants from winterspread manure on "unsuitable" acres in all subwatersheds.

- Achieve the sediment goal above.

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

Algae Concentration Goal

Reduce algae concentration in the Eau Pleine Reservoir by 57 percent.

- A combined 50 percent reduction in phosphorus from both the Upper and Lower Big Eau Pleine River watersheds will reduce algae concentration in the Eau Pleine Reservoir by 57.

While plans for the Lower Big Eau Pleine River Watershed call for a 50 percent overall reduction in phosphorus, work in the Upper Big Eau Pleine watershed is critical in achieving this goal. To reduce overall sediment delivered by 35 percent, the following is needed:

- Thirty-three percent reduction in sediment reaching streams from agricultural uplands in all subwatersheds.

- Forty-five percent reduction in streambank sediment delivered to all streams and a 25 percent overall repair of streambank habitat in all subwatersheds.

- Sixty percent reduction in shoreline sediment delivered to the reservoir.

Phosphorus Goal

To reduce overall phosphorus load by 50 percent, the following is needed:

- Seventy percent reduction in organic pollutants from barnyards in all subwatersheds.

- Fifty percent reduction in organic pollutants from winterspread manure on "unsuitable" acres in all subwatersheds.

- Achievement of the sediment goal above.

This plan also calls for a restoration of 10 percent of degraded or prior converted wetlands.

Algae Concentration Goal

Reduce algae concentration in the Eau Pleine Reservoir by 57 percent.

- A combined 50 percent reduction in phosphorus from both the Upper and Lower Big Eau Pleine River watersheds will result in a 57 percent reduction in algae concentration in the Eau Pleine Reservoir.

Plans for the Lower Big Eau Pleine River Watershed call for a 50 percent overall reduction in phosphorus, but work in the Upper Big Eau Pleine watershed is critical to achieve this goal.

Management Actions

Management actions are described in terms of Best Management Practices (BMPs) needed to control nonpoint sources to 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 BMPs. As shown in Table S-2, cost-share rates range from 50 to 70 percent.

The Marathon County LCD will contact all landowners eligible to receive cost-share funds 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. Category I represents the level of pollution control needed to achieve water quality goals in the watershed. Nonpoint sources in Category II contribute less of the pollutant load than those in Category I. They are included in cost sharing eligibility to further insure that water quality goals are met. Controlling sources in this category is not mandatory for a landowner to receive cost-sharing for controlling other sources.

The Marathon County LCD will assist landowners in applying BMPs. Practices range from alterations in farm management (such as changes in manure-spreading and crop rotations) to engineered structures (such as 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 more than 0.4 tons/acre/year of sediment to streamsm are Category I for cost sharing and must be brought down to 0.2 tons/acre/year. This involves an estimated 16,379 critical acres of cropland, or 31 percent of the upland sediment in the watershed. Category II will include all lands contributing sediment to streams at rates between 0.2 and 0.4 tons/acre/year. This involves 9 percent of the upland sediment in the watershed.

Table S-2. BMPs Eligible for Cost Sharing Through The Lower Big Eau Pleine Priority Watershed Project

BMP	State Cost-share Rate
Contour Farming	50% (flat rate: $6/acre)
Strip Cropping	50% (flat rate: $10/acre)
Field Diversions and Terraces	70%
Grassed Waterways	70%
Reduced Tillage (No Till)	50% $10/acre
Critical Area Stabilization	70% [1,3]
Grade Stabilization Structures	70% [3]
Agricultural Sediment Basins	70%
Shoreline and Streambank Stabilization	70% [3]
Shoreline Buffers	70% [1,3]
Barnyard Runoff Management	70%
Animal Lot Relocation	70% [3]
Manure Storage Facilities	70% [2]
Livestock Exclusion from Woodlots	50%
Wetland Restoration[1]	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 Maximum cost-share amount is $20,000.

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

Animal lots

The manure from barnyards carried in runoff needs to be controlled at about 115 of the 208 livestock operations. Animal lots in the Rocky Run, Eau Pleine Reservoir, and Fenwood Creek subwatersheds need the highest level of control. All barnyards contributing more than 40 pounds of phosphorus are Category I for cost sharing and need to be brought down to the 20 pound level or less.

Category II barnyards, those which contribute between 30 and 40 pounds of phosphorus, will be eligible for cost sharing and need to be brought down to the 20 pound level, or less.

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

Manure-spreading

The Lower Big Eau Pleine River project participants who winter-spread manure on 16 or more acres of "unsuitable" land are targeted as Category I for control measures. These landowners must implement and adhere to a Soil Conservation Service (SCS) "590 Nutrient Management" plan. Category II landowners are those who winter-spread on 11 to 15 critical acres. In this project "unsuitable" lands for winter manure spreading have more than a four percent slope or are flood prone. The Marathon 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.

Streambanks

Project participants sites with streambank recession rates of more than 0.5 feet/year are Category I. Those with recession rates between 0.1 and 0.5 feet/year, are Category II. Overall, approximately 830 tons of sediment from streambanks are eligible for control in the Lower Big Eau Pleine River watershed.

The project will emphasize streambank erosion control and improving fish and wildlife habitat in all subwatersheds, to enhance water quality and recreational opportunities.

Shoreline Erosion

Shoreline erosion on the Big Eau Pleine Reservoir contributes three percent of the overall sediment delivered in the watershed. In the fall of 1991, the entire shoreline of the reservoir was inventoried. Inventory methods are outlined in Appendix A.

Category I sites for shoreline erosion are those with severe erosion. Severe sites have banks averaging six feet high, with a streambank recession rate of 0.5 feet per year.

Category II sites have moderate erosion. Moderate sites have banks averaging three feet high, with a streambank recession rate of 0.1 feet per year.

Category III sites have mild erosion. Mild erosion sites have an average bank height of 1.5 feet, with a streambank recession rate of 0.05 feet per year. See Table 4-7 for eligibility criteria.

Funds Needed for Cost Sharing, Staffing, and Educational Activities

The DNR will award grants to Marathon County for cost sharing, staff support and educational activities. Table S-3 includes estimates of the financial assistance needed to implement nonpoint source controls in the Lower Big Eau Pleine River Watershed, assuming a 75 percent participation rate of eligible landowners.

Table S-3. Cost Estimates for the Lower Big Eau Pleine River Priority Watershed Project

Eligible Activity	Total Cost	State Share*
Cost sharing	$4,738,750	$2,391,865
Easements	$50,000	$37,500
Marathon County Staffing	$1,099,733	$824,800
Educational Activities	$13,560	$10,170
Totals	$5,902,043	$3,264,335

* estimates based on 75% participation

Project Implementation Schedule

Project implementation is scheduled to begin in spring, 1993. Participants sign cost-share agreements during the first three years of the implementation period, then there is a five year period to install the practice. While an eligible landowner or operator has three years to determine whether to participate in the program, practice installation can usually begin as soon as a landowner signs a cost-share agreement with the Marathon County LCD.

Information and Education

The Marathon County LCD will have overall responsibility for conducting an information and education program during the project. University of Wisconsin Extension staff in the county will provide assistance. This program will be most intense during the first four years of the project and the activities will then taper off. The activities will include BMP demonstrations, tours, newsletters, and public meetings.

Project Evaluation and Monitoring

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

1. **Administrative**: This category includes the progress in providing technical and financial assistance to eligible landowners, and carrying out education activities identified in the plan. The LCD will track progress in this area and report to the DNR and DATCP quarterly.

2. **Pollutant Reduction Levels**: The LCD will calculate reductions in nonpoint source pollutant loadings resulting from changes in land use practices and report this information 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 in 1996 and at the end of the project period.

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 139 square-mile Lower Big Eau Pleine River Watershed, located entirely in Marathon County, was designated a "priority watershed" in October, 1990. This project complements the Upper Big Eau Pleine River project, selected in 1984. The primary objective of both projects is to reduce nonpoint source pollution loads to the Big Eau Pleine Reservoir and to enhance and protect the water quality of the streams in the Big Eau Pleine River watershed.

Nonpoint sources of pollution include: eroding agricultural lands, streambanks, roadsides, 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 Nonpoint Source Program (NPS) program:

- The DNR and DATCP administer the program. It focuses on critical hydrologic units called priority watersheds. The program is implemented through priority watershed projects.

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

- Upon approval by state and local authorities, local units of government implement the plan. Water quality improvement is achieved through voluntary implementation of nonpoint source controls (BMPs) 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 the 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 Lower Big Eau Pleine River 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. The cooperative efforts of the DNR, DATCP, the Marathon County LCD, local units of government and the Lower Big Eau Pleine River Citizens Advisory Committee prepared this plan.

The watershed plan is the basis for the DNR to enter into cost-share and local assistance grants and is used as a guide to implement measures to achieve desired water quality conditions. 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 covers three areas: the watershed assessment (Chapters 2, 3 and 4), a detailed program for implementation (Chapters 5,6 and 7), and project evaluation (Chapters 8 and 9). The contents of each chapter are described below.

The Watershed Assessment

Chapter 2, "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 3, "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 implementing 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 4, "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.

A Detailed Program for Implementation

Chapter 5, "County Implementation Program," describes how the local units of government administer the project, and estimates a local assistance and management practice cost-share budget.

Chapter 6, "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 7, "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 Lower Big Eau Pleine River Watershed.

Project Evaluation

Chapter 8, "Progress Assessments," discusses how to assess the amount of nonpoint source control gained through installation of best management practices in the watershed.

Chapter 9, "Evaluation Monitoring," presents a monitoring strategy and schedule to determine the water quality impacts of implementing nonpoint source controls in the Lower Big Eau Pleine River Watershed.

CHAPTER TWO
General Watershed Characteristics

Location

The Lower Big Eau Pleine River Watershed is a 139 square-mile drainage basin located approximately 15 miles southwest of the city of Wausau (population, 37,000) in central Wisconsin (Map 2-1). The selection of this watershed complements the Upper Big Eau Pleine River Priority Watershed Project which began in 1984. Together they cover the entire drainage area to the Big Eau Pleine Reservoir, an eutrophic impoundment (Map 2-2). The reservoir is operated by the Wisconsin Valley Improvement Company for flood control and as a source of water for low flow augmentation to the Wisconsin River. The outlet is directly connected to Lake Du Bay and the Wisconsin River. The Lower Big Eau Pleine Watershed is within the Upper Wisconsin River, Central sub-basin (Map 2-3). The following is a brief overview of the watershed's cultural and natural resource features.

Cultural Features

Civil Divisions

The Lower Big Eau Pleine River watershed lies completely within Marathon County. Incorporated areas in the watershed include the villages of Stratford (population 1500) and Fenwood (population, 214). The main public land within the watershed is the Eau Pleine County Park (1,450 acres), which is located on the north central shore of the Eau Pleine Reservoir.

Population Size and Distribution

The 1991 watershed population is estimated to be about 4500 persons. Most of the watershed population lives outside incorporated areas, in small enclaves of residential development or on farmsteads. Population growth rates in the watershed are stable. All townships and villages have a growth rate over the past decade of 2-10 percent, with the exception of the village of Fenwood. Regional trends suggest that the watershed's population will remain about the same over the next 20 years. This trend is similar to trends in other agricultural counties in the state.

Land Uses

Rural land uses predominate in the watershed. Agricultural and related open space are the most important land uses, comprising 60 percent. Dairy farming is the primary enterprise, with an average farm size of 160-200 acres. Marathon County ranks first statewide in milk, hay, corn, and corn silage production (Marathon County Soil Erosion Control Plan, 1988). Marathon County ranks first in the United States in the production of ginseng, a high value specialty crop (Soil Survey of Marathon County, WI, 1990). Woodlands are abundant and cover 24 percent of the land area. Developed land uses occupy less than three percent of the watershed (Table 2-1).

A large grus deposit lies within the Freeman Creek subwatershed, where the bedrock is exposed to natural weathering processes. Grus is economically valuable and is used locally for road construction and decorative landscaping.

Table 2-1. Summary of Land Uses in the Lower Big Eau Pleine River Watershed

Land Uses	Acres	Percent
Agricultural		
pasture	4,090	4%
cropland	51,211	56%
Grassland	7,883	9%
Woodland	22,421	24%
Developed	2,947	3%
Wetland*	2,974	4%

* These are estimates of wetland acres based on WIN inventory data. The estimates are of actual wetland acres, not cropped wet fields. See wetland section in this chapter for a more comprehensive estimate of wetland acreage.

Source: DNR

Special Land Uses

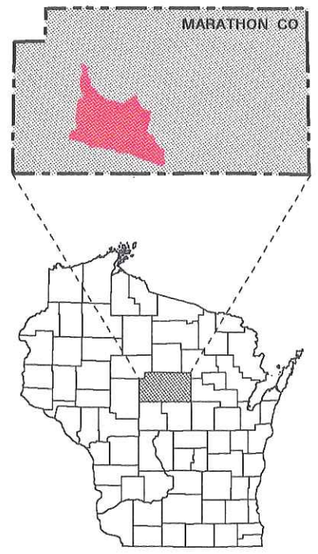
The two above mentioned activities, grus mining and ginseng farming are prevalent in the Lower Big Eau Pleine River watershed and are discussed in more detail. See the section on Other Pollutant Sources in Chapter 3 for a discussion of grus mining in the watershed.

Map 2 – 1 Lower Big Eau Pleine Watershed

SUBWATERSHEDS

BC = Burns Creek
FC = Fenwood Creek
LF = Lower Freeman Creek
RI = Big Eau Pleine River
RC = Rock Creek
RE = Big Eau Pleine Reservoir
RR = Rocky Run
UF = Upper Freeman Creek

Study Area

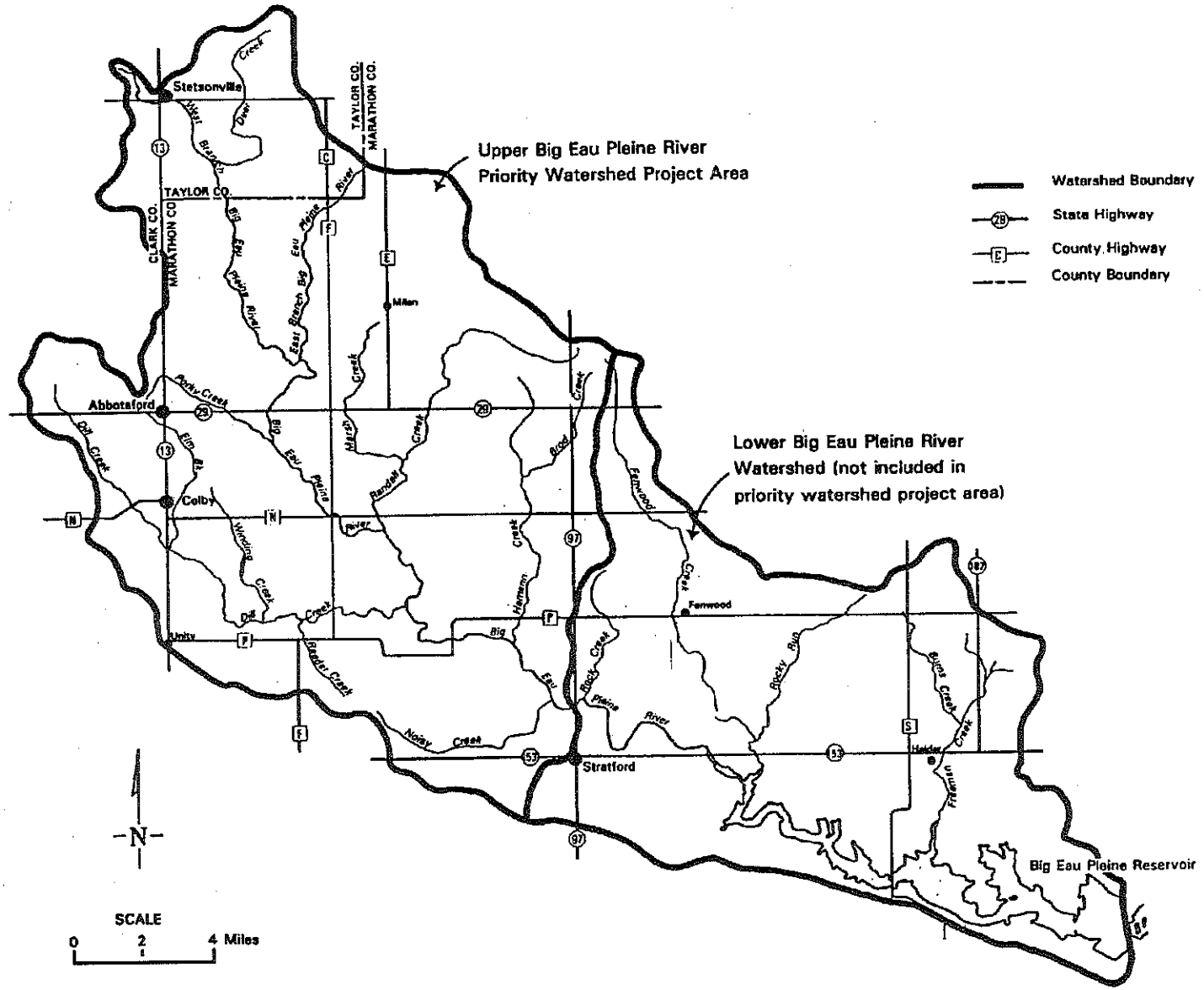


LEGEND

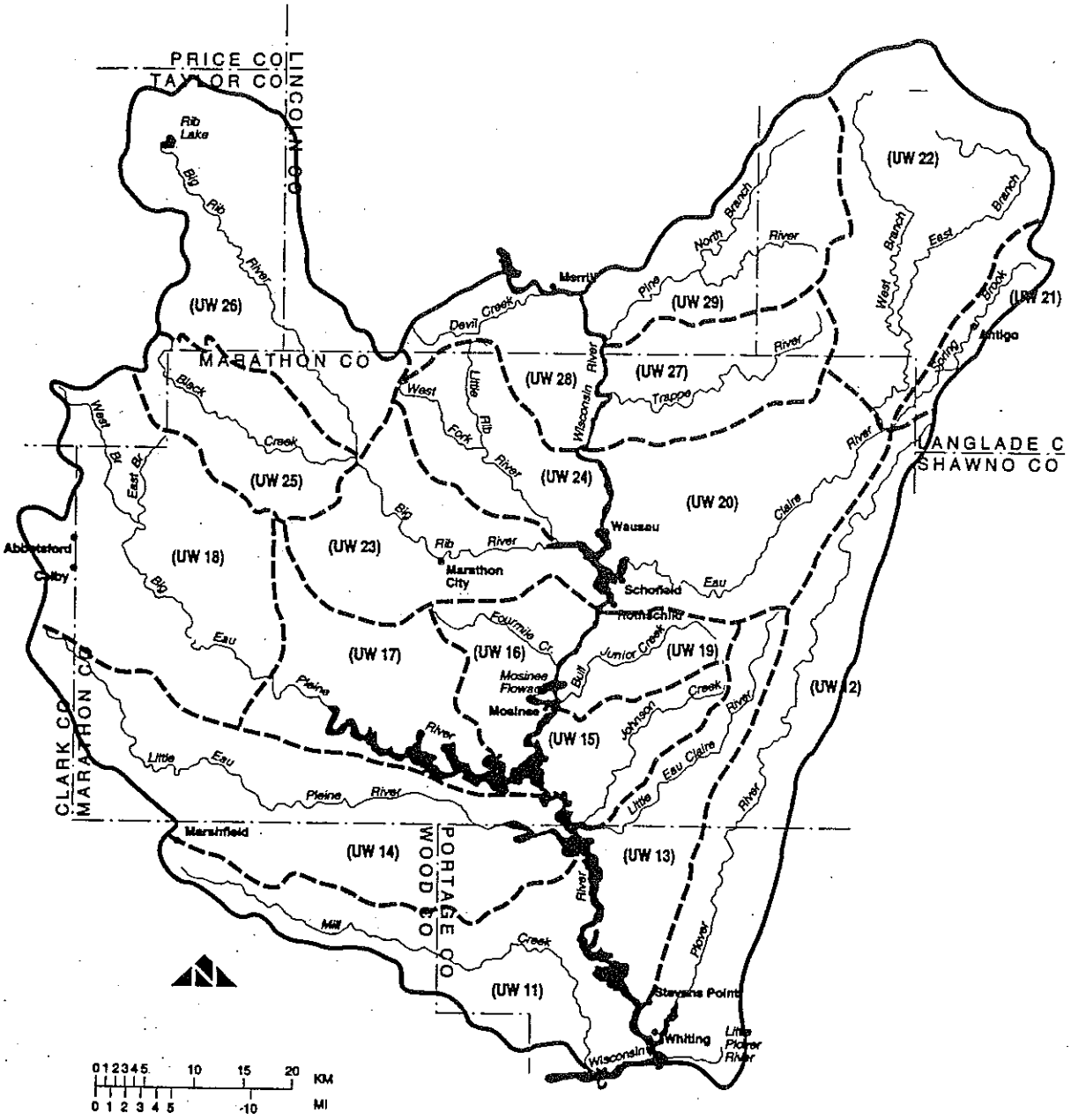
- Watershed Boundary
- Subwatershed Boundary
- County Boundary
- Federal or State Highway
- Township or Range Line
- River or Stream
- Lake or River
- Municipal Area

Wisconsin Department of Natural Resources
BIM-GEO Services Section
June 1993

Map 2-2 Upper and Lower Big Eau Pleine River Watershed and Reservoir



Map 2-3 Upper Wisconsin River, Central Sub Basin



Watersheds

1. (UW 11) Mill Creek
2. (UW 12) Plover/Little Plover Rivers
3. (UW 13) Little Eau Claire River
4. (UW 14) Little Eau Pleine River
5. (UW 15) Johnson Creek
6. (UW 16) Mosinee Flowage
7. (UW 17) Lower, Big Eau Pleine River
8. (UW 18) Upper, Big Eau Pleine River
9. (UW 19) Bull Junior Creek
10. (UW 20) Lower, Eau Claire River
11. (UW 21) Spring Brook
12. (UW 22) Upper, Eau Claire River
13. (UW 23) Lower, Rib River
14. (UW 24) Little Rib River
15. (UW 25) Black Creek
16. (UW 26) Upper, Rib River
17. (UW 27) Trappe River
18. (UW 28) Devil Creek
19. (UW 29) Pine River

UW Cartographic Lab 1990

Ginseng Farming

Marathon County has good conditions for growing ginseng: loamy, deep, well-drained soil and a long history of cultivating ginseng. Marathon County is the ginseng capital of the United States, producing approximately 10 percent of the world's supply of ginseng root. More than 90 percent of the cultivated ginseng grown in the U.S. is grown in Wisconsin and 90 to 95 percent of the Wisconsin grown ginseng is produced in Marathon County. It is estimated that Wisconsin grew 3000-5000 acres of ginseng in 1990. (Harrison, H.C., et al) In the Upper and Lower Big Eau Pleine River watershed, ginseng operations are mainly in the Rocky Run, Upper and Lower Freeman, Big Eau Pleine Reservoir and Burns Creek subwatersheds.

Ginseng is susceptible to a number of fungal diseases, so the crop requires a fairly intensive use of fungicides. The frequent use of fungicides and other pesticides creates the need for storage of large quantities of these substances. While the potential impacts of runoff or seepage of pesticides from ginseng operations on water quality are not known, and no nonpoint source inventories of ginseng operations were done as part of the watershed project, there is a potential for some cost-sharing of best management practices for ginseng growers. The Marathon County staff will evaluate operations for eligibility for practices as needed. DNR approval is needed before any cost-share agreement is signed.

Physical Setting

Climate and Precipitation

The frequency, duration and amount of precipitation influences surface and groundwater quality and quantity, soil moisture content, runoff characteristics, and the physical condition of waterways. The Lower Big Eau Pleine River Watershed lies in the continental zone which is characterized by long, relatively cold and snowy winters and warm summers with periods of hot and humid conditions. Mean annual precipitation for the region is about 33 inches of rain and melted snow. The majority of precipitation falls in the form of thunderstorms during the growing season (May-September). Most runoff occurs in February, March, and April when the land surface is frozen and soil moisture is highest.

Topography

The relief in the region is largely controlled by the glacial features and bedrock. Much of the Lower Big Eau Pleine Watershed is located within the western plains region. This region is a flat to gently rolling area with rich soils, and constitutes the county's major agricultural district. Along the Lower Big Eau Pleine River there are well dissected valleys, with relatively high local relief.

Geology and Soils

The Lower Big Eau Pleine River watershed lies primarily within the southern portion of the Canadian precambrian shield, which consists of granite and undifferentiated igneous and metamorphic rocks. These formations are estimated to be 5,000 to 15,000 feet thick. In the most recent glacial advance, the Green Bay lobe on the continental glacier covered the southeastern corner of the county, which contains most of the natural lakes. The balance of the county is covered by older drift from previous glaciers consisting of ground moraine and unpitted outwash. Most of the watershed wasn't covered by the most recent glacial advance and as a result there are none of the natural lakes typical of glaciated areas.

In many areas, granite has weathered to a poorly sorted, clayey residuum called grus. Local drillers commonly call this material rotten or decomposed granite. The residuum is recognized by its high silt and clay content and low sand content, and by its stratigraphic position directly over unweathered bedrock. (Kendy and Bradbury, 1987) Grus is formed by a natural weathering of bedrock which disaggregates individual grains of feldspars and quartz, leaving the granite fractured in the form of grus deposits.

The soils of Marathon originate from three major sources: continental glaciation, bedrock weathering, and fluvial action. The majority of the Lower Big Eau Pleine River watershed is underlain with soils of the Fenwood-Rietbrock-Rozellville Association. The Fenwood series consists of deep, well drained, moderately permeable soils on uplands underlain by bedrock. These soils formed in silty deposits underlain by loamy glacial till or in loamy residuum derived from the underlying bedrock, or in both. They are underlain by igneous and metamorphic rock. Slope ranges from 2 to 30 percent.

A small portion of the watershed, the Fenwood Creek subwatershed, is underlain by soils of the Withee-Marshfield Association. The Withee series consists of deep, somewhat poorly drained soils on ground moraines. These soils formed in silty deposits and in the underlying loamy glacial till. Permeability is moderately slow or moderate in the silty upper part of the profile and very slow in the substratum. Slopes range from one to six percent.

Surface Water Resources

Land drainage patterns in the Lower Big Eau Pleine River Watershed are delineated as eight individual subwatersheds.

Subwatersheds in the Lower Big Eau Pleine River Watershed

Big Eau Pleine Reservoir	(RE)
Big Eau Pleine River	(RI)
Burns Creek	(BC)
Fenwood Creek	(FC)
Upper Freeman Creek	(UF)
Lower Freeman Creek	(LF)
Rock Creek	(RC)
Rocky Run	(RR)

All convey surface water directly to, or via tributaries, the Lower Big Eau Pleine River. Major tributaries, associated streams, wetlands, the reservoir and subwatershed divides are shown in Map 2-1. (See Table 2-2)

Table 2-2. General Condition of Major Water Resources in the Lower Big Eau Pleine Watershed

Water Body	Biological Use		Problems related to Non-point Source Pollution
	Current	Potential	
RIVERS AND STREAMS			
Big Eau Pleine River	Warm Water Sport Fishery	SAME	nutrients, sediment
Burns Creek	Warm Water Forage Fishery	SAME	nutrients, sediment
Fenwood Creek	Warm Water Forage Fishery	SAME	sediment, turbidity
Freeman Creek	Cold Class III & II	Cold Class I	grus, sediment, nutrients
Rock Creek	Warm Water Forage Fishery	SAME	nutrients, sediment, turbidity
Rocky Run	Unknown		
LAKES AND IMPOUNDMENTS			
Big Eau Pleine Reservoir	See subwatershed description, page 44.		

Streams

Perennial and intermittent streams are the predominant surface water features. Perennial streams, which have a combined length of about 94 miles, maintain at least a small continuous flow throughout most of the year. The Lower Big Eau Pleine River (21 miles) is the longest perennial stream in the watershed. Other primary streams in the watershed are Freeman Creek, Burns Creek, Fenwood Creek, Rock Creek, and Rocky Run.

While the Big Eau Pleine River supports a warm water sport fishery, the upland watershed, specifically (Freeman Creek subwatershed) contains approximately 12 miles of cold water streams including 5.6 miles of classified trout waters. The Big Eau Pleine River and many other streams are not reaching their highest potential use due to pollution from nonpoint sources. Eroding croplands and streambanks and improperly managed livestock operations are the major sources of pollution in the watershed. Burns Creek and Fenwood Creek support Warm Water Forage Fishery and Limited Forage Fishery. The fishery status in the remaining streams in the watershed is unknown.

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.

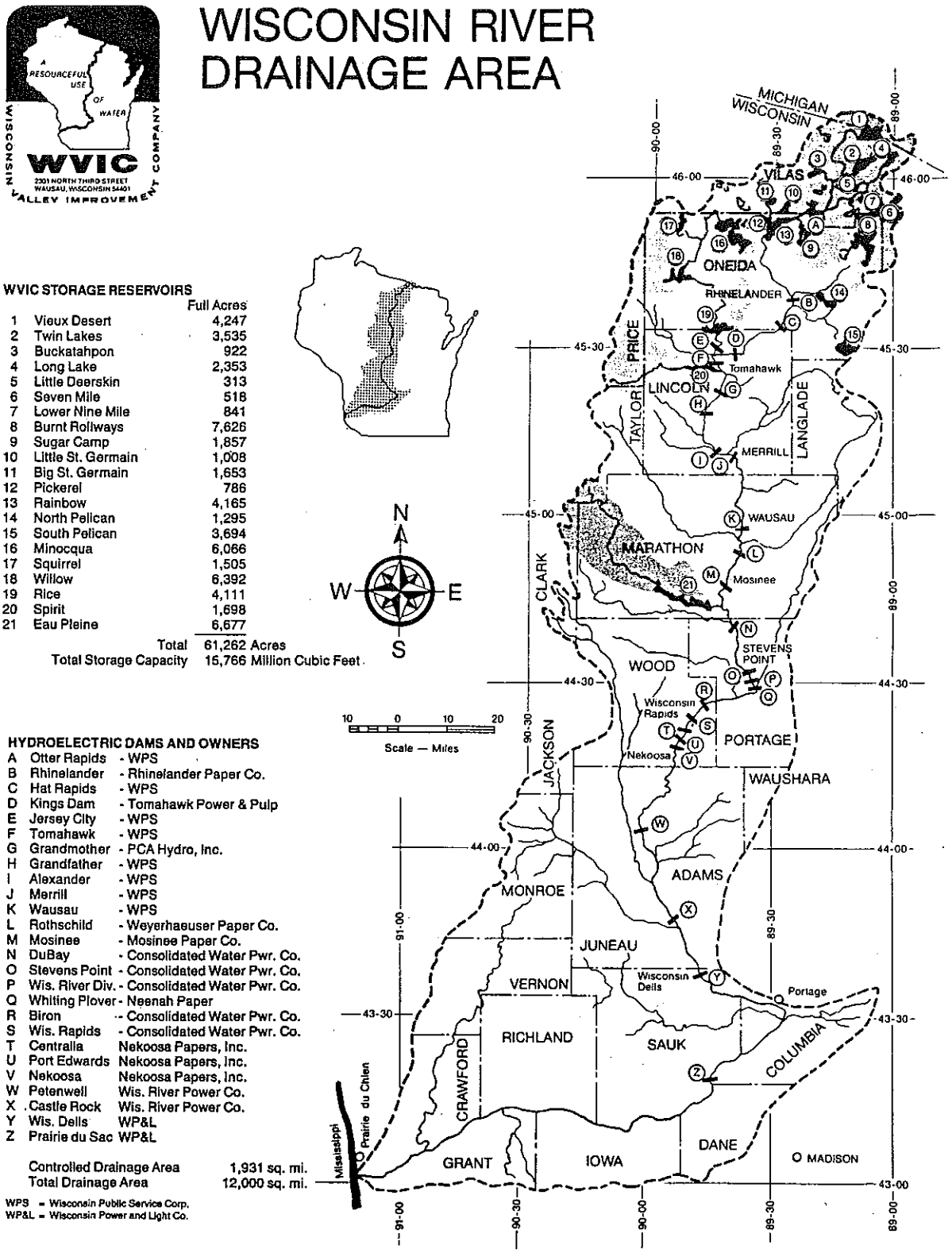
Big Eau Pleine Reservoir

The Big Eau Pleine Reservoir was created in 1937 by the Wisconsin Valley Improvement Company as part of the system of reservoirs used for low flow augmentation and flood control of the Wisconsin River. The reservoir is close to 7000 acres at full pool and has 66 miles of shoreline. The reservoir receives drainage from both the lower and upper (224 square miles) portion of the Big Eau Pleine River watershed. It is the largest body of water in Marathon County, and it offers a diverse recreational resource, including picnicking, boating and year-round fishing. The reservoir has a history of water quality problems including fish kills from drawdown during winter ice cover, eutrophication, algae blooms, excess levels of sediment, nutrients and organic matter.

The Big Eau Pleine Reservoir is one of the 21 storage reservoirs in the Wisconsin River Drainage area. The outlet is directly connected to Lake Du Bay, located on the Wisconsin River. Lake Du Bay is the site of one of the 26 power dams on the Wisconsin River. (See Map 2-4)

A shoreline erosion inventory was done on the reservoir to determine the amount of sediment being delivered to the reservoir from the shoreline. The results of this inventory are in Chapter 3 and inventory methods are described in Appendix A.

Map 2-4. Wisconsin River Drainage Area



Wetlands

Wetlands are valuable natural resource features. Their values include wildlife habitat, fish spawning and rearing, recreation, attenuation of runoff and flood flows and removal of pollutants. Wetlands in the watershed are mainly in the Big Eau Pleine River floodplain. Floodplain wetlands support furbearers and water fowl populations and may provide seasonal habitat for sport fish. There are also extensive wetland areas along the riparian corridor of Fenwood Creek.

A wetland and wildlife habitat inventory was done to identify existing and modified or converted wetlands to protect them from degradation or for potential restoration. The focus of the inventory was on wetlands that are presently or were degraded through drainage, grazing, cropping, or other activities causing water storage loss, build up of sediments, and drainage to vegetation. Appendix A describes methods used in the inventory. Data was collected on 585 wetlands (4,393 acres), with an average of 7.5 acres/site. Data was gathered from SCS maps, air photos, and the DNR Wetland Inventory maps, and therefore is a more comprehensive estimate than indicated in Table 2-1, Summary of Land Uses. Guidelines for wetland restoration, which will be a component of this project, are outlined in Chapter 4. See Table 2-3 for Wetland Inventory Summary.

Groundwater Resources

Groundwater in Marathon County is pumped from aquifers in the Precambrian and Cambrian rock formations and the glacial drift. This water meets most of the domestic, livestock, and irrigation needs in Marathon County. (See Figure 2-1)

Regional Aquifers

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

Since 1936, the state has required well drillers to document well construction and rock and soil layers encountered during well installation. Geologic logs and driller construction reports for private wells located in the watershed indicate that the Precambrian granite aquifer is the main source of drinking water in the Lower Big Eau Pleine Priority Watershed. Groundwater occurs only in fractures in the granite, limiting the amount of water available to private wells. Private wells in the granite aquifer produce between 35 and less than one gallon per minute (gpm).

Table 2-3. Wetland Inventory Summary: Lower Big Eau Pleine River Watershed

Subwatershed	Prior Converted		Grazed Wetland		Excavated Wetland		Farmed in Dry Years		Converted Wetland		Vegetation Recently Removed		Abandoned Farmland Wetland		Total Sites	Total Acres
	number of		number of		number of		number of		number of		number of		number of			
	sites	acres	sites	acres	sites	acres	sites	acres	sites	acres	sites	acres	sites	acres		
Upper Freeman	6	7	15	129											21	136
Lower Freeman	20	57	17	134	4	13									41	204
Rock Creek	17	110	21	189			1	3	1	4					40	306
Burns Creek	12	41	35	339											47	380
Rocky Run	48	256	49	418	1	3					1	32	1	9	100	718
BEP Reservoir	33	91	57	597	3	13	1	7	1	5					95	713
Fenwood Creek	84	594	48	594	1	4					1	4	1	8	135	1204
BEP River	67	354	34	345	4	13					1	21			106	733
Totals	287	1510	276	2745	13	46	2	10	2	9	3	57	2	17	585	4394

A few wells in the watershed tap the grus layer, producing slightly more water than wells drawing from the granite. A few shallower wells draw water from glacially deposited sediments. The sediments are described as predominantly hill slope sediment derived from the weathering of the underlying bedrock (mostly granite and sandstone) mixed with glacially transported material. The thickness of the sediments ranges from 6 to 50 feet in Marathon County.

Direction of Groundwater Flow

In general, regional groundwater flow is toward the southeast toward the Wisconsin River and its tributaries. Locally, groundwater within the Lower Big Eau Pleine Watershed flows toward the Big Eau Pleine River and reservoir. Depth to groundwater in the watershed varies depending on the local topography. Depth to the water table generally ranges from 0 to 20 feet in the outwash and glacial lake deposits and from 50 to 100 feet in areas of pitted outwash. It is as much as 170 feet in end moraines. Depth to water table in the area of ground moraines ranges from 20 to 50 feet.

Groundwater Quality

Groundwater quality in the Lower Big Eau Pleine Watershed is generally considered good. As part of the Water Quality Appraisal, private well samples were collected and analyzed for nitrates and triazine. Sample analytical results are summarized in Table 2-4. Samples analyzed for nitrate showed concentrations ranging from, no detects to 23 parts per million (mg/l). One milligram per liter is equivalent to one drop in a 10 gallon fish tank. The groundwater enforcement standard (ES) for nitrate is 10 mg/l. Nitrate concentrations above 2 mg/l exceed the states preventative action limit (PAL).

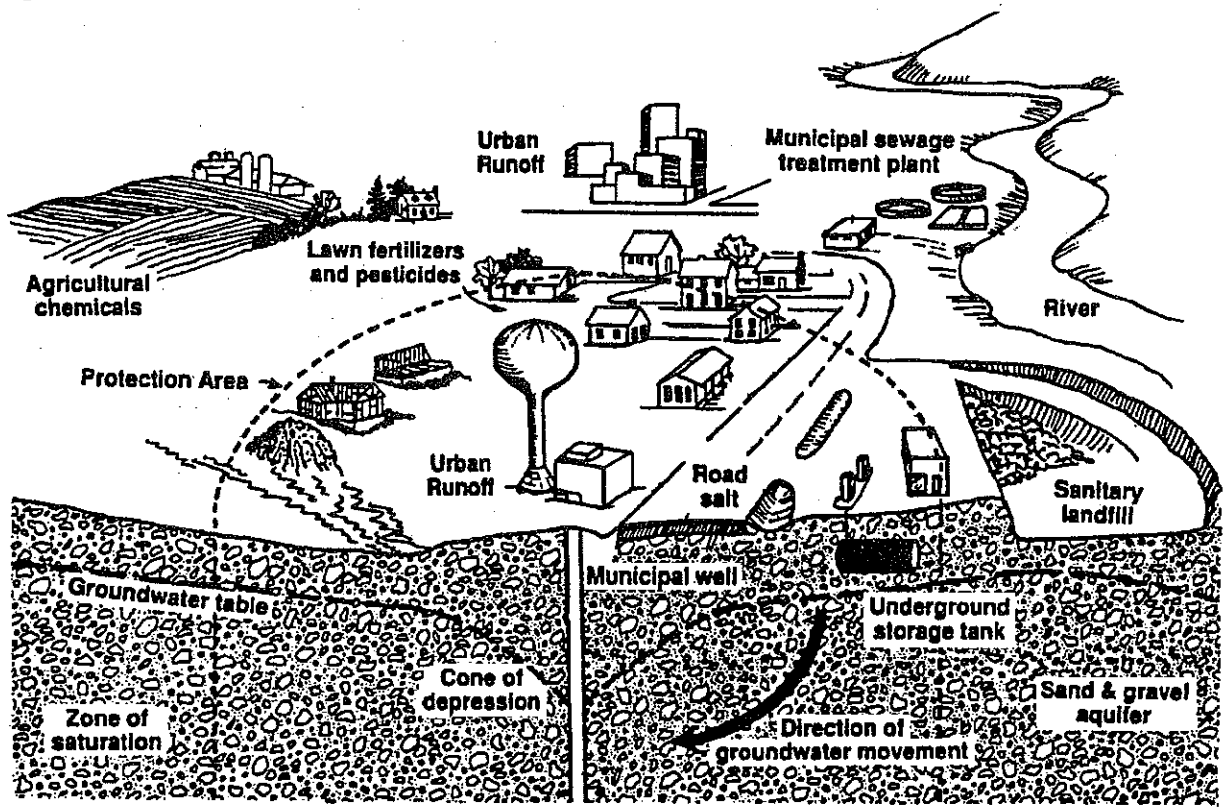
Enforcement Standard (ES) (Health Advisory Level): The concentration of a contaminant at which the enforcing agency, either the Department of Industry, Labor & Human Relations, the DATCP, or DNR, must take action.
Preventative Action Limit (PAL): A lower concentration of a contaminant than the Enforcement Standard, the PAL is a warning that human activities are affecting groundwater quality.

Fifty-one samples (22 percent) exceeded 10 mg/l and 195 (84 percent) of the samples exceeded 2 mg/l. Results so far do not indicate a pattern of groundwater contamination that can be linked to specific sources of nitrate.

Table 2-4. Well Sampling Results: Lower Big Eau Pleine River Watershed Fall, 1991

TRIAZINE						
Subwatershed	Number of Triazine Samples		Number of Triazine Samples		Number of Triazine samples	
	less than 0.3 µg/l	%	between 0.3 and 3.0 µg/l	%	greater than 3.0 µg/l	%
Big Eau Pleine River	29	88	4	12	-	0
Fenwood Creek	44	94	3	6	-	0
Lower Freeman Creek	16	76	5	24	-	0
Rock Creek	13	87	2	13	-	0
Rocky Run	21	66	11	34	-	0
Upper Freeman	5	83	1	17	-	0
Big Eau Pleine Res.	47	72	18	28	-	0
Burns Creek	9	75	2	17	1	8
Totals	184	80%	46	19%	1	1%
NITRATE						
Subwatershed	Number of Nitrate Samples		Number of Nitrate Samples		Number of Nitrate samples	
	less than 2.0 mg/l	%	between 2.0 and 10.0 mg/l	%	greater than 10.0 mg/l	%
Big Eau Pleine River	2	6	23	70	8	24
Fenwood Creek	16	34	24	51	7	15
Lower Freeman Creek	2	10	12	57	7	33
Rock Creek	3	13	10	67	2	13
Rocky Run	5	16	20	62	7	22
Upper Freeman	-	03	4	67	2	33
Big Eau Pleine Res	7	11	41	63	17	26
Burns Creek	1	8	10	84	1	8
Totals	36	12%	144	65%	51	22%

Figure 2-1. Groundwater Schematic



Concentrations of triazine in the Lower Big Eau Pleine River Watershed ranged from not detected to 17.4 μg/l. One microgram per liter is comparable to one drop in 10,000 gallons (a small swimming pool). One sample (less than 1 percent) exceeded the ES (health advisory level) while 47 samples (20 percent) had detects (traces) of triazine. As with nitrate contamination, no specific source of contamination is indicated by the results.

In August, 1992 an Atrazine Prohibition Area was proposed for designation in the Burns Creek subwatershed. The area covers 7 1/2 sections (4,800 acre) in the towns of Cassel and Emmet. The use of atrazine may be prohibited in this area, if approved.

No samples were collected for coliform bacteria or hazardous substances such as volatile organic compounds. Coliform bacteria can be a drinking water problem where a septic systems or barnyards are located uphill from a private well. Bacteria can enter the drinking water supply along the well casing of improperly constructed and located wells. Wells with high levels of bacteria can be rehabilitated and used.

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

Potential Groundwater Quality Problems

Tables 2-5 (a-d), Potential Groundwater Contamination Sources, list sites located within or near the Lower Big Eau Pleine Priority Watershed which can cause or threaten groundwater contamination according to the DNR's Solid and Hazardous Waste Program. Specific information on the sites is available from the DNR's North Central District Office located in Rhinelander.

Superfund

The Mid-State Disposal Superfund site, located in the town of Cleveland, is a privately owned landfill which operated from 1971 until 1979. The 22 acre site consists of two abandoned landfill areas and an abandoned paper mill disposal lagoon. Asbestos waste, garbage, sludge, fly ash, solvents, pesticides and paint were disposed of in the unlined landfills and a clay lined lagoon. Depth to groundwater at the site varies from five to ten feet below the ground surface. Rock Creek is one-half mile, and Fenwood Creek is one mile from the site.

Spills listed below, from the "Spills Summary Report", (April 30, 1991), include spills reported to the DNR only. Locations of the spills are approximate in most cases.

Table 2-5a. Superfund (August, 1992)

Site Name	Location	Status	Substance
Mid-State Disposal	Cleveland	National Priority List	Volatile Organics Heavy Metals

Solid and Hazardous Waste Disposal Sites

The sites listed as Waste Disposal Sites are from the DNR's "Registry of Waste Disposal Sites in Wisconsin" (February, 1990) which lists known solid and hazardous waste disposal site. The list includes both active, inactive and abandoned sites. Inclusion on the list does not mean that environmental contamination has occurred, is occurring, or will occur in the future. The registry is a source of general information of the location of waste disposal sites in Wisconsin.

Leaking Underground Storage Tank Sites

Active Leaking Underground Storage Tank (LUST) sites are listed in Table 2-5c. Sites listed are currently in some phase of investigation or cleanup and are on the "List of Active Leaking Underground Storage Tanks" (April 13, 1992).

Table 2-5b. Waste Disposal Sites (February 1990)

Site Name	Location
Rock Refining	Cleveland
Village of Stratford	Cleveland
Town of Emmett	Emmett
Town of Green Valley	Green Valley
Village of Stratford	Stratford
Town of Wien	Wien

Farm Stored Pesticides

On April 22, 1992, Marathon County hosted an Agricultural Clean Sweep to collect cancelled, damaged, and unwanted pesticides stored on farms. The purpose of the collection is to protect groundwater and improve safety by reducing the amount of agri-chemicals and hazardous wastes stored on farms. This clean sweep collected 16,238 pounds of agri-chemicals and hazardous wastes. A Household Clean Sweep was held the following day. A grant from the DATCP sponsored these programs in part. Additional Clean Sweeps may be held in Marathon County in the future.

Table 2-5c. Leaking Underground Storage Tanks (April, 1992)

Site Name	Location	Status	Substance
Fischer Transportation	Fenwood	No Action	Diesel
General Telephone	Stratford	Remedial Action	Other
Krause Property	Stratford	No Action	Other
Stratford Rendering	Stratford	Investigation	Fuel Oil
Telschow Oil	Stratford	No Action	Other
Marathon County Coop	Halder	Investigation	Multiple

Remedial Action -Cleanup in progres.
Investigation -Field investigation of source and extent of contamination underway.
Unknown -No status report at time of printing.
No Action -No action taken yet.

Reported Spill Sites

Table 2-5d. Spills (April, 1991)

Location	Action	Substance
Fenwood	Clean up	Diesel
Fenwood	Investigation	Diesel
Stratford	Investigation	Diesel
Stratford	No Action	Waste oil and water
Stratford	Investigation	Sludge

No Action -No on-site investigation.
Investigation -On-site assessment to confirm release, identify potential responsible parties, assess environmental harm and direct potential responsible party to take action.
Cleanup -DNR hired cleanup contractor.

Archaeological Sites: Coordination with State and Federal Historical 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, Wis. Stats., were blended to produce a cultural resource management program which is both compatible to preserving cultural sites and implementing the watershed project.

There are five known archaeological sites within the Lower Big Eau Pleine River watershed. The sites are indian villages and burial grounds along the banks of the Big Eau Pleine River. These areas will need special consideration when structural best management practices are developed. Settling basins, manure storage structures, and streambank or shoreline shaping and riprapping are likely practices that may impact archaeological sites. As discussed above, state and federal laws require preservation of archaeological resources within the framework of the Priority Watershed Program.

The Lower Big Eau Pleine River Priority Watershed Project will address these concerns with the following procedures:

1. Marathon County will obtain State Historical Society inventory maps from the regional State Historical Society office, and plot sites on topographic maps. Counties will also obtain a supply of landowner questionnaires from the historical society to identify additional non-inventoried sites.

2. Data will be sent to the State Historical Society for a determination of archaeological significance. In addition, landowners will have their lands evaluated by county staff for the need to conduct an archaeological survey (essentially compare property with known archaeological site locations). The historical society will determine the need for additional, extensive surveys. The counties and the DNR District Nonpoint Source Coordinator will also be involved in this determination.

3. If the inventory or questionnaire does reveal an archaeological site and the proposed best management practice may impact the site, an archaeological survey conducted by a qualified archaeologist will need to be completed. The survey will assess the potential of the practice to significantly impact the site. Alternative best management practices may need to be considered both before and after the results of the survey.

4. A cost-share agreement is signed *before* the survey is conducted. In certain instances a survey may reveal a significant archaeological site which precludes the installation of a particular BMP at that specific site. Cost-share agreements will contain language which nullifies or partially nullifies the cost-share agreement based on the final results of the archaeological survey.

Endangered and Threatened Resources

Information on threatened and endangered resources was obtained from the Bureau of Endangered Resources (BER) of the DNR. Endangered resources include rare species and natural communities.

Noted that comprehensive endangered resource surveys were not completed for the entire Lower Big Eau Pleine River 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 BER's endangered resource files are continuously updated from ongoing field work. There may be other records of rare species and natural communities which are in the process of being added to the database and so are not in the lists below.

Rare Species

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

The following rare species are found within the Lower Big Eau Pleine River Priority Watershed:

Wisconsin Endangered Species

Any species whose continued existence as a viable component of this state's wild animals or wild plants is determined by the DNR to be in jeopardy on the basis of scientific evidence. Our files do not contain records of any Wisconsin Endangered species in this watershed

Wisconsin Threatened Species

Any species which appears likely, within the foreseeable future, on the basis of scientific evidence, to become endangered.

Clemmys insculpta, wood turtle
Emydoidea blandingii, Blanding's turtle
Haliaeetus leucocephalus, bald eagle*
Pandion haliaetus, osprey
Tympanuchus cupido, greater prairie chicken

Wisconsin Special Concern Species

Any species about which some problem of abundance or distribution is suspected in Wisconsin, but not yet proven. The purpose of this category is to focus attention on certain species *before* they become endangered or threatened.

Nycticorax nycticorax, black-crowned night heron
Phalacrocorax auritus, double-crested cormorant
Clinostomus elongatus, red side dace
Ardea herodias, great blue heron
Gavia immer, common loon

* The bald eagle is also 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.

Natural Areas

Natural areas are sites that contain high quality examples of natural communities. The following natural areas have been identified in the Lower Big Eau Pleine River Priority Watershed. The natural communities found at each area are also listed.

Bahr Woods stream (fast, hard, cold), northern mesic forest
Cleveland Woods floodplain forest, northern mesic forest, stream (fast, hard, cold)
Eau Pleine Park Woods northern mesic forest
Emmet Woods northern mesic forest
Hardwood Hill northern mesic forest
Hein Woods northern mesic forest
Mead Conifer Swamp northern wet forest, emergent aquatic
Petzhold Woods northern mesic forest
Weber Woods northern mesic forest

If specific locations or other information is needed 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

Introduction

Topics covered in this chapter include:

- major nonpoint source pollutants
- establishment of water quality objectives
- results of nonpoint source inventories
- individual subwatershed's general characteristics
- amount of pollutant control necessary to achieve desired water resource conditions
- other potential pollutant sources

Major Nonpoint Source Pollutants

Nonpoint sources are responsible for the degraded conditions of the streams in this watershed. Excessive amounts of sediment, nutrients, and bacteria degrade water quality causing unbalanced fish communities with depressed populations and limited diversity. In this watershed the two most serious pollutants are manure and sediment. These are discussed below.

Manure

Manure contains several components that adversely affect water quality and aquatic life. Manure entering a stream breaks down, resulting in depletion of the 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, the ammonia is toxic to fish and other aquatic life. Ammonia toxicity is temperature and pH dependent. The nutrients in manure (including nitrogen and phosphorus) also promote nuisance algae and weed growth in the streams and lakes. Finally, the bacteria found in livestock manure is harmful to livestock drinking the water, and to humans using the water for recreation. The major sources of manure in this watershed are runoff from barnyards and runoff from improperly field-spread manure.

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 the water resources in many ways. It degrades habitat for fish and aquatic insects that support fish and other forms of aquatic life. High sediment concentrations abrade fish gills making the fish more susceptible to disease, fills in pools and degrades fish spawning habitat. Suspended sediment also warms the water in the summer, and 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. This is due to the gradients and higher velocities that can scour streams of sediment and therefore do not result in long-term habitat destruction caused by channelization or heavy sediment deposits. Instead, streambank erosion is the most common form of habitat destruction.

Nitrates

Groundwater with nitrate levels greater than 10 mg/l exceed state groundwater standards. At this level it is recommended that infants not consume the water because the nitrate interferes with the ability of the blood to carry oxygen. High levels of nitrates may also indicate other contaminants in the drinking water. High nitrate concentrations in the drinking water 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 Chapter 2 for groundwater discussions.

Water Quality Conditions and Recreational Uses

Streams

Named streams in this watershed include the Lower Big Eau Pleine River, Rocky Run, Rock Creek, Freeman Creek, Burns Creek, and Fenwood Creek. The Big Eau Pleine River is the primary stream in the watershed. It begins as an intermittent stream in northeastern Clark County, and flows southeasterly for 30 miles, where it empties into the Eau Pleine Reservoir which flows to Lake Du Bay and the Wisconsin River in south central Marathon County. The portion of the Big Eau Pleine River in the Lower Big Eau Pleine River watershed is eight miles long. The Lower Big Eau Pleine River has a warm water sport fishery including smallmouth bass, walleye, northern pike and crappie, as well as numerous carp and forage species. Biotic indexes range from good to fair. See Appendix A for information on biotic index.

Freeman Creek is the stream with the highest resource priority. In this stream, the overall objective is to upgrade a segment of the stream from a stream classification of a COLD Class II to a COLD Class I stream. See definitions of stream classifications on page 40.

Reservoir

The Big Eau Pleine River Reservoir exhibits variable water quality with seasonally heavy aquatic weed growth. The reservoir is capable of producing an outstanding sport fishery. However it is characterized as hypereutrophic and has a history of fish kills and algae blooms. Aeration during much of the winter is necessary to avoid major oxygen depletion and subsequent fish kills.

The remaining streams in the watershed will be described in more detail in the subwatershed descriptions later in this chapter.

Recreational Uses

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

The Big Eau Pleine Reservoir is used for a wide range of recreational activities. It is locally important because it draws many people from central Wisconsin where there are very few lakes large enough for most boating or deep enough to support a quality fishery. Recreational facilities on the reservoir include a large Marathon County park on the north shore with two swimming beaches, campgrounds, picnic areas, private and commercial facilities for camping, several boat landings and a moderate amount of recreation and private year round housing.

Water Quality Objectives

The DNR staff, with assistance from the Marathon County staff and DATCP, developed water quality objectives. Objectives were identified for each subwatershed and are listed in the following subwatershed descriptions. Details of objective development can be found in the *Lower Big Eau Pleine River Water Resources Appraisal Report* (Kreitlow, 1992).

Here are the general objectives for streams and the reservoir:

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

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

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

The water quality conditions needed to support the objectives for streams and lakes are the basis for determining the type and level of nonpoint source control to be implemented under the priority watershed project.

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

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, and populations are 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.

See Table 3-1 for a summary of the water resources conditions and objectives for the Lower Big Eau Pleine River watershed.

Table 3-1. Water Resource Conditions and Objectives for the Big Eau Pleine Reservoir and Major Streams in the Lower Big Eau Pleine River Watershed

Subwatershed	Stream Name	Length (Miles)	Biological Use* Current Use/Miles	Potential Use/Miles	Supporting Potential Use Fully-Part-Not (Miles)	Limiting Factors**	Observed or Potential Sources***	Water Resource Goals
Freeman Creek	Freeman Creek	0-1.4 2.4	WWSF/1.4[e] COLD/1.0[e] Class III	Same	1.4 1.0	FLOW,HAB, SED,TURB, TEMP	BY,SB, PSB,NMM, PSI	Maintain woodland & wetland-corridors Improve fish habitat so creek can reach potential (Class I)
	Class II	2.4-7.0	COLD/4.6[e] Class I	COLD/4.6	4.6			Control runoff from granite sites Control point source discharge-and current species diversity Maintain redside dace population Control overland runoff to stabilize Fence Cattle out
	Unnamed Creek (T27N,R5E,S26,NENE)	0-3.0	COLD/3.0[b] Class II	Same		ALG,HAB, NUT,FLOW	PSB/CL	Improve fish habitat Maintain redside dace population
	Unnamed Creek (T27N,R5E,S24,SENW)	0-2.0	WWFF/2.0	Same		HAB,FLOW, SED,NUT	SB,PSB,CL	Reduce sediment & nutrient loading Maintain WWFF Preserve wooded corridor that exists-west of Maple Leaf Road
	Unnamed Creek (T27N,R5E,S24,SWNE)	0-1.0	COLD/1.0	Same		HAB,NUT, SED,TURB	CL,PSB	Preserve hardwood/wetland corridor-that exists above Hwy 107 Improve trout habitat Control cropland runoff
Rock Creek	Rock Creek	0-5.0	WWFF/5.0[f]			ALG,SED, NUT,FLOW	SB,PSB	Improve & Maintain forage fishery Preserve redside dace habitat Reduce sediment & nutrient loading to Big Eau Pleine River Reduce sediment delivery by rip-rapping banks on Lower Rock Creek
Rocky Run	Rocky Run	0-6.0	UNKNOWN/6.0[f]			HAB,FLOW, BAC,NUT, ALG,TURB	SB,BY, PSB,CL	Improve & maintain present fishery Reduce nutrient & sediment loading Maintain or preserve wooded stream-corridors Control overland runoff as a means of stabilizing stream flow

Table 3-1. Water Resource Conditions and Objectives for the Big Eau Pleine Reservoir and Major Streams in the Lower Big Eau Pleine River Watershed

Subwatershed	Stream Name	Length (Miles)	Biological Use* Current Use/Miles	Potential Use/Miles	Supporting Potential Use Fully-Part-Not (Miles)	Limiting Factors**	Observed or Potential Sources***	Water Resource Goals
Big Eau Pleine Reservoir	Big Eau Pleine	0-13	WWSF/13.0	Same	13.	NUT,SED, ALG,DO	NPS,SL	Improve warm water sport fishery Improve water quality & aesthetics Enhance existing recreational-opportunities Reduce shoreline erosion
	Unnamed Creek (T26N,R5E,S4, NENW)	0-2.0	Unknown/2.0			HAB,SED, FLOW	SB	Maintain woodland corridor
	Unnamed Creek (T26N,R6E,S6, NENW)	0-2.0	Unknown/2.0			HAB,SED, FLOW,TURB	PSB,SB	Improve fish habitat and water quality by keeping cattle out of creek Reduce sediment & nutrient delivery to the reservoir
Big Eau Pleine River	Big Eau Pleine River	13.0-21.0	WWSF/8.0[f]	Same	8.	BAC,SED, NUT,HAB	SB,NPS, PSM,CL	Reduce sediment & nutrient River-delivery to Big Eau Pleine Res. Improve & maintain warm water sport fish habitat Reduce nutrient loading from-point source dischargers -(municipal/industrial) Reduce periodically high-bacteria levels Control overland runoff so -frequency of water level-fluctuations are reduced
Burns Creek	Burns Creek	0-5.0	WWFF/5.0[e]	Same	5.0	BAC,NUT, FLOW,DES, HAB	SB,PSB,CL	Improve fish habitat and species-diversity Maintain redside dace populations Reduce overland runoff to stabilize - flows Preserve wetland corridor
Fenwood Creek	Fenwood Creek	0-1.5 1.5-17.0	WWFF/1.5[e] LFF/15.5[c]	Same	1.5 15.5	SED,FLOW, BAC,NUT, ALG,HAB	PSB,SB, NMM,CL, PSM	Reduce sediment, nutrient & organic-matter delivery to the reservoir Improve fish habitat Control overland runoff as a means of stabilizing stream flows

Table 3-1. Water Resource Conditions and Objectives for the Big Eau Pleine Reservoir and Major Streams in the Lower Big Eau Pleine River Watershed

LEGEND:

a The current use classification listed in NR 104.
b Trout stream identified in the "blue" Trout Stream Book (DNR,1980).
c A formal classification or classification review has been completed and approved. (These are classifications that have been completed but for one reason or another will not appear in NR 104).
d A formal classification or classification review has been completed. Based on this analysis the current NR 104 is incorrect and should be changed the next time NR 104 is revised.
e Recent studies or the professional judgement of a fish manager or aquatic biologist familiar with the water indicates this is the biological use the stream is currently meeting or has the potential to meet.
f Other information used

* Biological Use, Existing - this column indicates the existing biological use supported by the stream as defined in NR 102 (04)(3) under fish and aquatic life uses.
COLD - cold water communities
WWSF - warm water sport fish communities
WWFF - warm water forage fish communities
LFF - limited forage fishery (intermediate surface waters)

Biological Use, Potential: This column indicates the biological use a stream or stream segment could meet if it was well managed and pollution sources controlled. In many cases the potential use is the same as the existing use. In other streams potential use may be higher than the existing use. Abbreviations are the same as those used in the existing use columns. The sources of information are indicated by footnotes on each table. The classifications for trout streams came from "Wisconsin Trout Streams" {DNR Publ. 6-3600(80).

Supporting Potential Use: This column indicates whether a stream is fully, partially, or not meeting its potential biological use. An entry in any of the columns indicates the relationship between actual stream use and potential use. For example, if the entire length of a stream is listed under the "Fully" column, the stream has no problems which can be controlled. When a portion or all of a stream length is listed under another heading the stream is affected by some manageable factor, and the biological use of the stream can probably be improved.

** Limiting Factors
HAB - Habitat (lack of cover, sedimentation scouring etc.)
SED - Sedimentation (filling in of pools)
TEMP - Temperature (extreme high for trout)
DO - Dissolved Oxygen (to low)
FLOW - Flooding or fluctuating water levels
ALG - Algae (abundant)
NUT - Nutrient enrichment
TURB - Turbidity
BAC - Bacteria (MMFCC/100ml)

*** Observed or Potential Sources
NPS - Unspecified nonpoint sources
CL - Cropland erosion
SL - Shoreline erosion
SB - Streambank erosion
PSB - Streambank pasturing
BY - Barnyard or exercise lot runoff
PSM - Point source, municipal treatment plant discharge
PSI - Point source, industrial discharge (rotten granite pit de-watering)
NMM - Non-metallic mining (rotten granite/gravel)

Subwatershed Discussions

The Big Eau Pleine Reservoir Subwatershed (RE)

Subwatershed Description

The Big Eau Pleine Reservoir was originally constructed in 1937 to store water seasonally to help maintain uniform flow in the Wisconsin River. A private corporation, Wisconsin Valley Improvement Company, manages the Big Eau Pleine Reservoir water levels through dam operation. With a maximum surface area of 6,677 acres at full pool level, the reservoir is one of the larger lakes in Wisconsin. The maximum depth is 46 feet and the shoreline totals 79 miles. Under the maximum vertical drawdown of 31.5 feet, the surface area is reduced to 212 acres. The reservoir is not drawn down to minimum level every year but normal operation always provides some storage capacity for spring runoff. The reservoir subwatershed drains an area of 31,678 acres, 35 percent of the total watershed area. (See Map 3-1)

Water Quality Conditions

The Big Eau Pleine Reservoir has historically had periodic water quality problems. There are reports of fish kills during some drawdown periods since the early 1940s. Also, fish kills historically occurred during non drawdown periods due to other factors such as industrial and municipal waste discharges (Coon, 1992). These fish kills have occurred when sediments and related organic materials, carried into the reservoir annually, are resuspended during winter drawdown and consume the available oxygen stores.

The Big Eau Pleine reservoir is capable of producing an outstanding sport fishery including black crappie, walleye, northern pike, muskellunge and yellow perch. Carp are a major component of the total fish population.

There have been fecal coliform bacteria problems, with levels exceeding 400 colonies per 100 ml at the Eau Pleine Park beach.

The reservoir is considered a fertile waterbody and has even been characterized as hypereutrophic. Dense blue-green algae blooms occur each summer which restrict body contact recreation and cause noxious odors. Some of the blue-green algae have been found to be toxin-producing. Algae blooms commonly reduce water clarity to less than two feet.

The low oxygen and fish kill problems are the result of oxygen consumption by decaying organic matter. Organic matter enters the reservoir via tributaries and is also produced internally by the algae. Some of the organic matter settles to the bottom as sediment.

Map 3 – 1 Lower Big Eau Pleine Reservoir Subwatershed

BARNYARD RUNOFF (Phosphorus Loading) *

- Greater than 40 lbs.
- 30 to 40 lbs.
- Less than 30 lbs.

GROUNDWATER NITRATE LEVELS *

- Greater than 10 mg/liter (ES)**
- 2 to 10 mg/liter (exceeds PAL)***
- Less than 2 mg/liter

*Well and Barnyard results based on single inventory during Spring, 1992
**Enforcement Standard
***Preventative Action Limit

0 1 2 3 Miles

0 1 2 3 4 5 Kilometers

Scale 1:85000

Study Area

Lower Big Eau Pleine Watershed

Wisconsin Department of Natural Resources
BIM-GEO Services Section
June 1993

LEGEND

- Watershed Boundary
- Subwatershed Boundary
- County Boundary
- Federal or State Highway
- Local Road
- Railroad
- Section Line
- River or Stream
- Lake or River
- Municipal Area

Organic sediment can exert a very large oxygen demand. The fluctuating water level promotes turbulence which resuspends this sediment. The mixing of sediment with overlying water accelerates the oxygen consuming process. Hypolimetic oxygen demand, that is independent of drawdown, also occurs.

The excessive algae production is supported by high concentrations of nutrients. The original sources of nutrients come from outside the reservoir. Some of the nutrients settle to the bottom and are stored in the sediment. These can then be recycled back to the water column and made available for algae production. This is not an infinite cycle, however, because a portion of the nutrients are annually exported with water and sediment flow out of the reservoir.

The relationship of the oxygen depletion problem in the reservoir to watershed loading is not as clear as the phosphorus relationship. Oxygen-consuming organic matter is both produced in the reservoir and carried in from upstream sources. The effects are generally observed in the winter when the reservoir water level is reaching its minimum depth and area.

There has not been the large body of research on BOD dynamics in lakes such as that on phosphorus. Reducing the watershed delivery of organic matter and phosphorus will help prevent the oxygen depletion, but there is no mathematical basis to predict this relationship. Like the phosphorus prediction, the needed load reduction is probably greater than is practical under current land use. Therefore, the goal should be to reduce the oxygen-consuming organic load to the greatest extent practicable.

Nonpoint Source Pollutants

There are many sources of pollutants to the Big Eau Pleine Reservoir. Some are natural and have entered the surface waters in Wisconsin since glacial times. Human-induced pollutants are usually of greater significance and can include municipal and industrial, point sources, cheese factory and agricultural waste, fertilizer loss, septage, and soil runoff.

- The Lower Big Eau Pleine Reservoir subwatershed contains 53 animal lots, which add 2420 pounds of phosphorus, annually. This represents 24 percent of the phosphorus from the entire watershed.

- Upland sediment delivery in the reservoir subwatershed is 83,420 tons, annually, or 35 percent of the entire watershed load. Cropland is the major source, with 80 percent of the load from this subwatershed.

- Shoreline erosion contributes two percent of the total sediment delivered to the reservoir.

Controlling nutrient and organic pollution loads will be the most effective way to improve water quality in the Big Eau Pleine Reservoir. Algae require many nutrients and may be controlled by reducing the availability of any of these nutrients to a critical level that will inhibit their growth. Research has demonstrated the most common factor inhibiting algae

growth in lakes is a shortage of phosphorus. It also happens that the chemical characteristics of phosphorus make it feasible to control.

Lake modeling (Vennie, 1982) of the Big Eau Pleine Reservoir for the years 1975 and 1976 predicted the phosphorus load reductions needed to control algae production. These predictions are summarized in Table 3-2. Although it is doubtful that phosphorus loading can be reduced to the levels shown in Table 3-2 as "Desirable Loads", a considerable reduction is possible and would have a beneficial effect.

Table 3-2. Big Eau Pleine Reservoir Average Phosphorus Loading During 1975 and 1976

	Mixed Spring Total Phosphorus	(Upstream to HWY S) Segment 1	(HWY S to HWY O) Segment 2	(HWY O to Dam) Segment 3
Measured Loads*	(~200mg/l)	12.55	5.30	8.10
Desirable Loads*	(10mg/l)	0.82(93.5%)	0.48(90.9%)	0.77 (90.5%)
Excessive Load*	(20mg/l)	1.64 (87%)	0.96(81.9%)	1.54 (81.1%)

* Units are gm/sq - m/yr, and the number in parentheses is the reduction needed to reach loading limit.

The reservoir was separated into three segments for the modeling effort (Vennie, 1982). Segment one, the uppermost part, requires the greatest phosphorus load reduction to improve water clarity. The model predicted segment one as needing an 87 percent loading reduction to prevent an excessive phosphorus concentration and a 93 percent reduction to reach the 0.01 part per million phosphorus concentration which limits algae growth. With even the best of management on the Upper Big Eau Pleine River Watershed, this large loading reduction probably cannot be achieved.

The modeling (Vennie, 1982) also predicted that 50 percent reduction in phosphorus load would produce a 57 percent reduction of algae concentration, while a 20 percent phosphorus reduction would reduce algae production by 25 percent. A 57 percent or a 25 percent reduction of algae growth in the reservoir would produce a significant improvement in water clarity and would do much to alleviate the algae scum accumulation and resulting odor problems. Algae reduction should be a water quality goal for the reservoir. The largest algae reduction improvement will be seen in the uppermost segment of the reservoir because the Big Eau Pleine River discharges directly to segment one of the reservoir.

The phosphorus loading from both point and nonpoint sources in the Upper Big Eau Pleine watershed is illustrated in Figure 3-1. Figure 3-2 illustrates the potential algae reduction in the reservoir from controlling point and nonpoint sources in the upper watershed. Research suggests that 80 percent of the total phosphorus for the reservoir is contributed from the Upper Big Eau Pleine watershed which makes up 62 percent of the entire watershed area.

The remaining 20 percent of the phosphorus load is contributed from the Lower Big Eau Pleine watershed which makes up 38 percent of the entire watershed area. (Vennie, 1987)

Update on Status of the Upper Big Eau Pleine River Watershed Project

The Upper Big Eau Pleine River Project was selected in 1984. The primary objective of this project has been to reduce pollutant delivery to the Big Eau Pleine Reservoir. The cost-share sign up period ended in 1990, and implementation is scheduled to end in 1995. After completing the practices currently under agreement, the following results will be realized:

- Reduction of barnyard runoff phosphorus by 28 percent throughout the watershed. (goal was 70 percent reduction)
- Reduction of critical lands used for winterspreading reduced by 37 percent throughout the watershed (goal was 70 percent reduction)
- Reduction of soil loss by 6 percent throughout the watershed (goal was 28 percent reduction)

NOTE: The state and federal rural land conservation practices are not taken into account in the above results.

It is too soon for the Big Eau Pleine Reservoir to show a response to land management improvements installed through the Upper Big Eau Pleine River Watershed project.

Tributary Descriptions

Unnamed Creek (T26N, R5E, Sec 4, NENW): This unnamed creek drains directly to the Eau pleine Reservoir and is two miles long. A habitat evaluation below South Twin Creek Road indicated fair habitat. The creek flows through a protected corridor of hemlock, birch, and maple, but suffers from streambank erosion, stream scouring, and heavy deposits of fine material and bar development.

Unnamed Creek (T26N, R6E, Sec 6, NENW): This creek also drains directly to the reservoir and has a length of two miles. A habitat evaluation conducted below Moon Road indicated fair to poor habitat. Streambank pasturing is destroying streambanks and increasing stream turbidity. Heavy deposits of fine material increase bar development.

Figure 3-1. Phosphorus Loading from the Upper Big Eau Pleine River Watershed

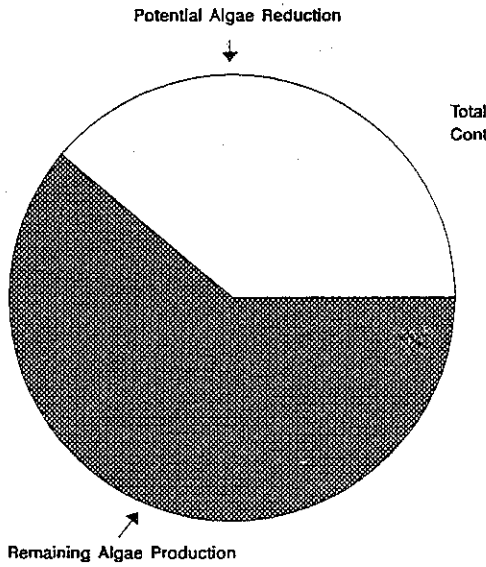
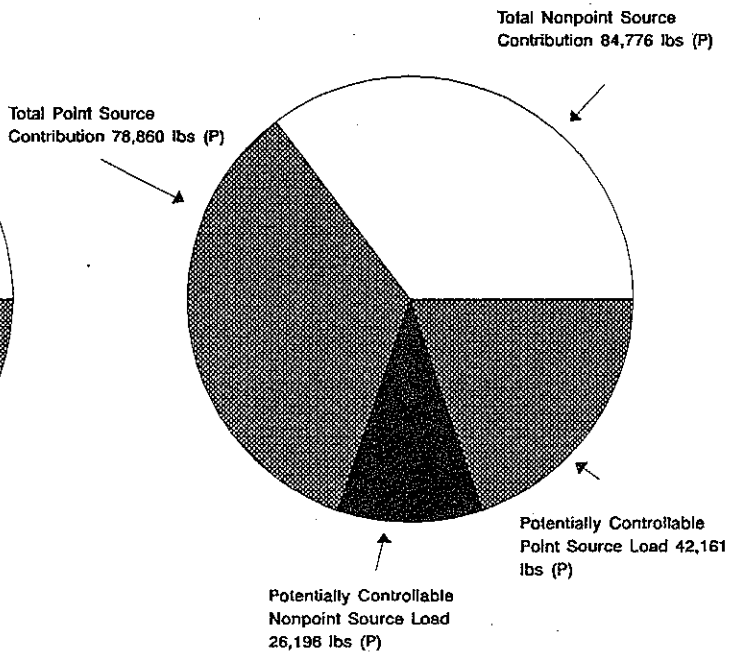


Figure 3-2. Potential Algae Reduction in the Big Eau Pleine River Reservoir



Source: Nonpoint Source and Land Management Section, Water Resources Management Bureau, WDNR.

Water Resource Objectives

Big Eau Pleine Reservoir

1. Improve the warm water sport fishery:
   - reduce organic, nutrient and sediment loading. This will help reduce winter oxygen demand, and reduce winterkill potential.
2. Improve the water quality, aesthetic value, and wildlife value of the flowage:
   - reduce nutrient loading especially phosphorus. This will reduce odor and turbidity caused by algae blooms;
   - reduce shoreline erosion at critical areas; and
   - reduce organic and sediment loading.
3. Improve boating and swimming opportunities:
   - reduce algae bloom (magnitude and frequency); and
   - reduce bacteria levels at Big Eau Pleine Park.

Unnamed Creek (T26N, R5E, SEC 4, NENW)

1. Protect or maintain water quality and wildlife value:
   - protect the natural woodland corridor that exists below Twin Creek Road.

Unnamed Creek (T26N, R6E, SEC 6, NENW)

1. Improve fish habitat and water quality:
   - keep cattle out of the stream
2. Improve water quality in the Big Eau Pleine Reservoir:
   - reduce sediment and nutrient delivery.

Big Eau Pleine River Subwatershed (RI)

Subwatershed Description

The riverine portion of the Big Eau Pleine River that lies within the Lower Big Eau Pleine Priority Watershed begins at the SW¼ of the SW¼ section 25, T27N, R04E and ends at Hwy 97 Bridge in Stratford (8.0 river miles). If you include the reservoir, 21.0 of the total 43.0 Big Eau Pleine river miles lies within the lower watershed. The Big Eau Pleine River Subwatershed drains 12,338 acres, or 13 percent of the total watershed. (See Map 3-2)

The United States Geological Survey (USGS) has maintained a gauging station at Highway 97 since 1916. The records from this gauging station clearly demonstrate the large variability in stream flow of the entire Big Eau Pleine River Watershed. In 58 years of record the average discharge has been 176 cubic feet per second (cfs). The discharge has ranged from 0 to 41,000 cubic feet per second.

Water Quality Conditions

The Lower Big Eau Pleine River has a warm water sport fishery consisting of Smallmouth Bass, Walleye, Northern Pike, Black Crappie, Bluegill, Green Sunfish and Yellow Perch. Bacteria levels in the river can be high (exceeds the 400 colonies/100 ml state standard). This indicates organic loading from livestock and other waste or point source discharges including septic systems which are discharging to road ditches in violation of state rules.

Benthic (bottom dwelling) macroinvertebrates samples were collected from two sites in this segment. The species collected indicate good water quality at Hwy 97 (1986) and fair water quality below the Stratford tributary (1981). This indicates that the Stratford Municipal Waste Water Treatment Plant (MWWTP) may have been the source of the organic enrichment. The Stratford Wastewater Treatment Plant was substantially upgraded in 1988 which has improved the quality of the wastewater discharge to the Big Eau Pleine River.

Nonpoint Source Pollutants

- The Lower Big Eau Pleine River subwatershed contains 30 animal lots which contribute 1492 pounds of phosphorus, annually. This represents 15 percent of the phosphorus for the entire watershed.

- The upland sediment delivery in the Big Eau Pleine River subwatershed is 2636 tons, annually, or 11 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 79 percent of the load.

- Sixty-four percent of the sediment delivered from streambanks in the watershed comes from the Big Eau Pleine River subwatershed.

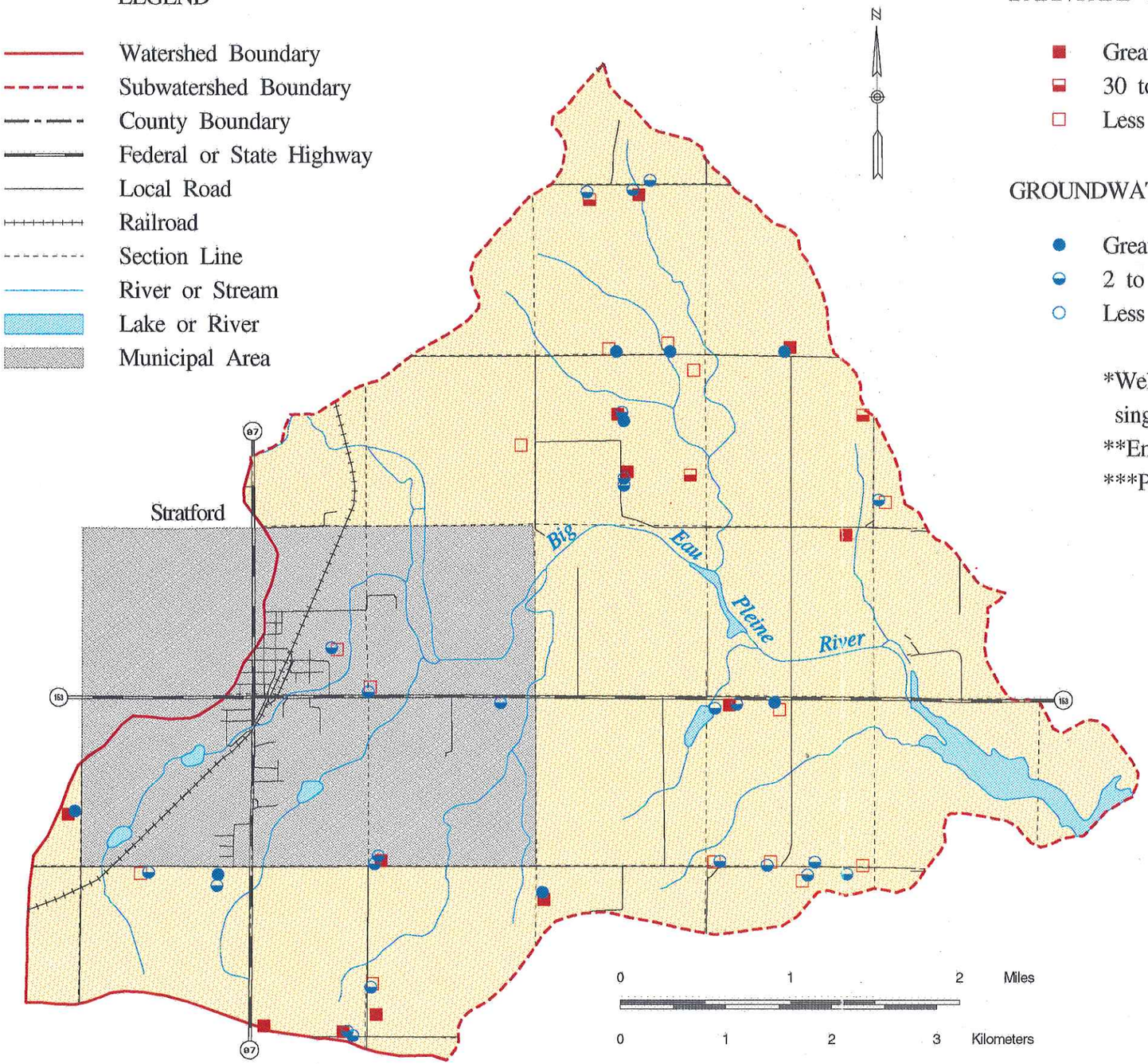
Water resources problems in the Big Eau Pleine River include rapid fluctuating water levels, streambank erosion, sediment and nutrient loading. Marathon County project staff (1991) reported a significant amount of erosion on the river between Stratford (Hwy 97) and Hwy 153. The USGS reported an average annual sediment yield of 33 tons per square mile at the Hwy 97 gauging station, which is high compared to forested watersheds (10 tons per sq mile). Both nonpoint source runoff and point source dischargers (both upper and lower watersheds) contribute nutrients to the river.

As a secondary benefit, installing best management practices should also reduce the severity of overland runoff and fluctuating water levels.

Map 3 – 2 Lower Big Eau Pleine Subwatershed

LEGEND

- Watershed Boundary
- Subwatershed Boundary
- County Boundary
- Federal or State Highway
- Local Road
- Railroad
- Section Line
- River or Stream
- Lake or River
- Municipal Area



BARNYARD RUNOFF (Phosphorus Loading) *

- Greater than 40 lbs.
- 30 to 40 lbs.
- Less than 30 lbs.

GROUNDWATER NITRATE LEVELS *

- Greater than 10 mg/liter (ES)**
- 2 to 10 mg/liter (exceeds PAL)***
- Less than 2 mg/liter

*Well and Barnyard results based on single inventory during Spring, 1992
**Enforcement Standard
***Preventative Action Limit

Study Area

Lower Big Eau Pleine Watershed

Wisconsin Department of Natural Resources
BIM-GEO Services Section
June 1993

Water Resource Objectives

Big Eau Pleine River

1. Meet recreational use standards:
   - reduce the periodic high bacterial levels to less than 400 colonies/100 ml
2. Improve water quality:
   - reduce nutrient, sediment and organic matter delivery to the river and Big Eau Pleine Reservoir
   - stabilize streambanks at critical locations to reduce instream sedimentation
3. Improve warm water fishery habitat (increase game fish and intolerant specie numbers) in the Big Eau Pleine River:
   - reduce sediment, nutrient and organic loading from watershed streams

Freeman Creek Subwatershed (UF, LF)

Subwatershed Description

The Freeman Creek Subwatershed is 26.5 square miles and is located in the northeastern portion of the watershed. Perennial streams in the subwatershed include Freeman Creek and five unnamed creeks. Portions of Freeman Creek make up the only cold water segment in the watershed. This subwatershed should be a high priority due to the valuable trout fishery that exists.

Hardwood and wetland corridors occur at some locations of Freeman Creek. These are valuable for wildlife and filter out sediments and nutrients before they reach Freeman Creek. The Freeman Creek subwatershed drains an area of 13,004 acres, or 14 percent of the total watershed area. (See Maps 3-3 and 3-4)

Water Quality Conditions

Freeman Creek is seven miles long. It is currently classified as a warm water sport fish and Class II and III brook and brown trout fishery (brown trout are only found below HWY 153). Habitat evaluations were conducted at ten locations on Freeman Creek.

Nonpoint Sources

- The Upper and Lower Freeman Creek subwatersheds contain 19 animal lots which contribute 858 pounds of phosphorus, annually. This represents 9 percent of the phosphorus load of the entire watershed.

- Upland sediment delivery in the Freeman Creek subwatershed is 3104 tons/year, or 13 percent of the entire watershed load. Cropland is the major source of sediment in this subwatershed, contributing 73 percent of the load.

- Streambank erosion contributes 92 tons of sediment, annually. This is 11 percent of the total streambank erosion in the watershed.

Water resource problems include flooding (rapidly fluctuating water levels), streambank erosion, streambank pasturing, organic loading (cattle manure) from barnyards and cropland runoff. This results in stream scouring (shifting bottom), filling of pools with sediment and increased algae growth, all of which are detrimental to fish habitat.

Another water resource problem is the Grus quarry mining in the subwatershed. Pit de-watering discharges sediment laden water to Freeman Creek (Zmuda 1991). Suspended solids/total solids sampling conducted in the summer of 1991 indicate a rise in levels below rotten granite operations during both low flow and runoff event conditions (Kreitlow 1992). This is supported by the DNR data (Hubbard 1989) in 1988, which also showed an increase in suspended solids below these non-metallic mining sites.

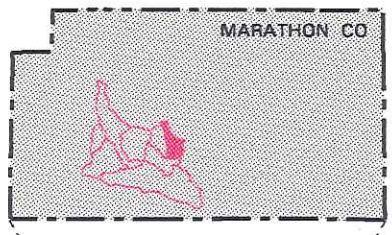
Sediment traps were also placed in Freeman Creek at three locations for one month (June 26 - July 26). One site (Spring Brook Road) was above the granite excavations (control site) and two (Burma Road and Hwy 153) were below. The purpose of this sampling was to determine if sediments from granite operators (runoff or discharge outfalls) are being deposited in pools. Results indicate that more sediment was deposited in the traps below the granite operations (1¼ inches vs ¼ inch) than above. Whether or not this increased deposition is due to the rotten granite operations or increased watershed size (drainage area) is unknown. Sediments deposited in the traps was a fine silty clay.

A continuous temperature dissolved oxygen monitor was also placed in Freeman Creek between Halder Bridge and HWY 153 for 14 days (July 3 - July 17). The average temperatures ranged between 66 - 68° F but reached 77° F on July 6, and 73.4° F on July 11. Seventy-seven degrees is the upper lethal limit for brook trout. Dissolved oxygen values were above 5.0 mg/l most of the time. On two occasions (July 7 and 12) the D.O. values were 4.6 mg/l. The high temperatures may be a result of the discharge of warm water from pit de-watering operations during low flows.

Macroinvertebrate sampling was conducted in May of 1991, and September of 1990. These results show excellent and good water quality. They indicate the grus operations have a slight impact on water quality. In the vicinity of the grus operations the HBI indicates good water quality. But above Spring Brook road and below Sugar Bush road the results indicate excellent water quality. See page 86 for information on regulation of grus operations.

Map 3 - 3 Upper Freeman Creek Subwatershed

Study Area



Lower Big Eau Pleine Watershed

BARNYARD RUNOFF (Phosphorus Loading)*

- Greater than 40 lbs.
- 30 to 40 lbs.
- Less than 30 lbs.

GROUNDWATER NITRATE LEVELS*

- Greater than 10 mg/liter (ES)**
- 2 to 10 mg/liter (exceeds PAL)***
- Less than 2 mg/liter

*Well and Barnyard results based on single inventory during Spring, 1992
**Enforcement Standard
***Preventative Action Limit

LEGEND

- Pit Dewatering Site
- Watershed Boundary
- Subwatershed Boundary
- County Boundary
- Federal or State Highway
- Local Road
- Railroad
- Section Line
- River or Stream
- Lake or River
- Municipal Area

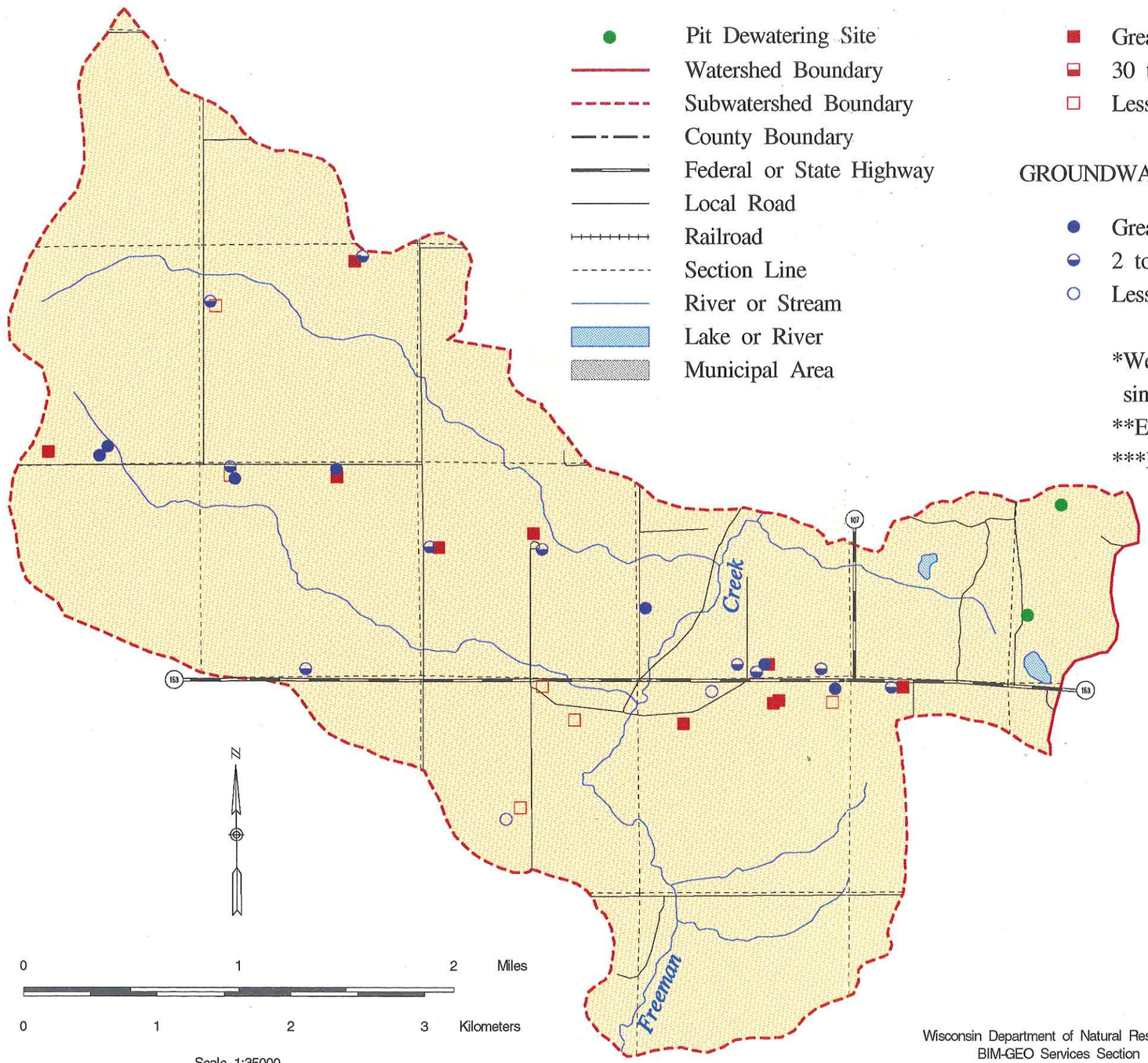
0 0.5 1 Miles

0 0.5 1 1.5 Kilometers

Scale 1:35000

Wisconsin Department of Natural Resources
BIM-GEO Services Section
June 1993

Map 3 – 4 Lower Freeman Creek Subwatershed



LEGEND

- Pit Dewatering Site
- Watershed Boundary
- Subwatershed Boundary
- County Boundary
- Federal or State Highway
- Local Road
- Railroad
- Section Line
- River or Stream
- Lake or River
- Municipal Area

BARNYARD RUNOFF (Phosphorus Loading) *

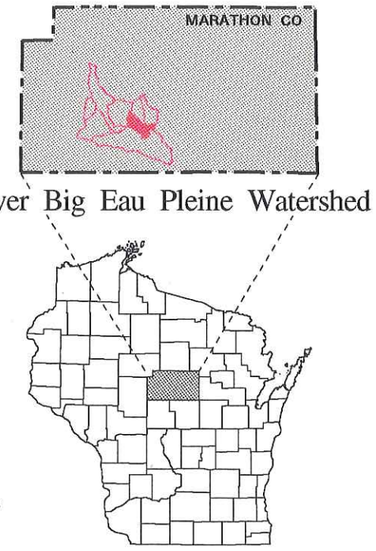
- Greater than 40 lbs.
- 30 to 40 lbs.
- Less than 30 lbs.

GROUNDWATER NITRATE LEVELS *

- Greater than 10 mg/liter (ES)**
- 2 to 10 mg/liter (exceeds PAL)***
- Less than 2 mg/liter

*Well and Barnyard results based on single inventory during Spring, 1992
**Enforcement Standard
***Preventative Action Limit

Study Area



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Tributary Descriptions

Unnamed Creek (T27N, R05E, S26, NE, NE) flows for 3 miles and enters Freeman Creek at the town of Halder. It is classified as a cold water trout fishery. A 1991 fish survey found 18 yellow perch (<3.0 - 4.4 inches) but no trout. Ten forage species were found including the redside dace.

Habitat evaluations were conducted at three locations. All three scores were in the fair category. Water resource problems include streambank pasturing and nutrient/organic loading. Filamentous algae was abundant below a streambank pastured area below Hilltop Road.

Unnamed Creek (T27N, R05E, S24, SE, NW) flows for 2 miles and enters Freeman Creek in the SE¼, NW¼ of section 24. Its biological use was unknown prior to the 1991 fish survey, which revealed a warm water forage fishery. Three young of the year yellow perch were found plus 11 forage species. No trout were found.

Stream habitat evaluations were conducted at three locations above Maple Leaf road. Scores ranged from good to fair (135 - 195). The first reach was alder choked, filled with sediment, and provided poor habitat. The second reach flowed through a hardwood corridor which served as a buffer (T27N, R05E, Sec. 19, SE,NE). Stream habitat improved in this section. The third reach flowed through a grassland/meadow/agricultural area. Filamentous algae was common. Cattle have access to this section.

Unnamed Creek (T27N, R05E, S24, SW, NE) flows for one mile and enters Freeman Creek in section 24. It is classified as a cold water trout fishery. A fish survey conducted in 1987 found 22 Brook Trout (2.5 - 8.0 inches).

Habitat evaluations were conducted at three locations above and below Hwy 107. Above Hwy 107 the stream is undisturbed (little pollution), (T27N, R06E, Sec. 19, SW¼). The spring area in the headwaters is relatively unimpacted. Habitat was good to fair. The first section below 107 (T27N, R05E, Sec. 24, NE,SW) was well protected until the first fence line (score 144). Below this fence line to Freeman Creek (second reach - score 195) the habitat was fair to poor because of severe streambank pasturing and cropland runoff.

Water Resource Goals and Objectives

Freeman Creek

Improve fish habitat and water quality:

- keep cattle out of Freeman Creek (this will reduce instream sedimentation and organic nutrient loading) by fencing
- reduce sediment loading (overland runoff) from granite operations by reclaiming the sites
- reduce point source loads (pit de-watering), (this will reduce filling in of pools through a general permit from Bureau of Wastewater)
- preserve existing wetland and woodland corridors that serve as buffers and filter pollutants
- control runoff from the land to reduce the severity of flooding and transport of nutrients to Freeman Creek. This would also reduce streambank erosion.

Integrated Resource Management Goals and Objectives

Maintain wildlife habitat:

- preserve the wetland and woodland corridors exist on portions of Freeman Creek. (Locations indicated in narrative)

Implementing the above practices should help protect the redside dace population and current species diversity.

Tributaries

Unnamed Creek (T27N, R05E, S26, NE, NE)

Improve fish habitat and water quality:

- reduce instream sedimentation and organic/nutrient loading by keeping cattle out of the creek (This will reduce instream sedimentation and organic/nutrient loading).

Implementing the above practices should help protect the Redside Dace population that exists in the creek.

Unnamed Creek (T27N, R05E, S24, SE, NW)

Improve fish habitat and water quality:

- reduce sediment/nutrient and organic loading by keeping cattle out of the creek in the upper reach
- preserve the wooded corridor west of Maple Leaf Road (T27N, R06E, Sec. 19, SW¼). This corridor protects the creek and provides wildlife habitat.

Unnamed Creek (T27N, R05E, S24, SW, NE)

Improve fish/wildlife habitat and water quality:

- reduce instream sedimentation, organic/nutrient loading by keeping cattle out of the creek
- preserve the section of creek east of Hwy 107, it is well protected by hardwood wetland corridor
- reduce cropland runoff (nutrient loading).

Burns Creek Subwatershed (BC)

Subwatershed Description

The Burns Creek Subwatershed is 7.66 square miles. Burns Creek is the only perennial stream in the subwatershed. Burns Creek is five miles long and flows into Freeman Creek in section 24, T27N, R5E. Burns Creek drains an area of 4,950 acres, or five percent of the total watershed area. (See Map 3-5)

Water Resource Conditions

Burns Creek's current biological use is a warm water forage fishery. A 1976 and 1987 survey found 13 forage species including the redside dace. Habitat evaluations conducted at two locations indicate fair habitat.

A valuable wetland complex exists above Hwy P (T28N, R05E, Sec. 34, SE¼). It serves to filter out sediment/nutrients. It also provides valuable wildlife habitat and should be preserved.

Macroinvertebrate sampling conducted in 1990 Below Maple Leaf road indicated good water quality (some organic pollution).

Nonpoint Sources

- Burns Creek has 11 animal lots which contribute 384 pounds of phosphorus, annually. This is four percent of the total watershed phosphorus load.

- Upland sediment contributes 1379 tons annually, which is six percent of the entire watershed sediment load. Cropland is the major contributor in this subwatershed, with 83 percent of the total load.

- Streambank erosion in Burns Creek contributes 38 tons of sediment, annually. This is five percent of the total sediment in the watershed.

Water resource problems include streambank pasturing, streambank erosion, cropland erosion and flashy flow conditions. Bacteria levels can be high (1100/100 ml), indicating organic loading. Nutrients are also causing abundant filamentous algae growth.

Water Resource Goals and Objectives

Burns Creek

Improve fish habitat and water quality:

- fence out cattle (This will also reduce nutrient & sediment loading)
- reduce cropland runoff (nutrient & sediment loading)
- protect existing wetland corridor above Hwy P.

Integrated Resource Management Goals and Objectives

Maintain existing wildlife habitat:

- preserve existing wetland corridor above Hwy P.

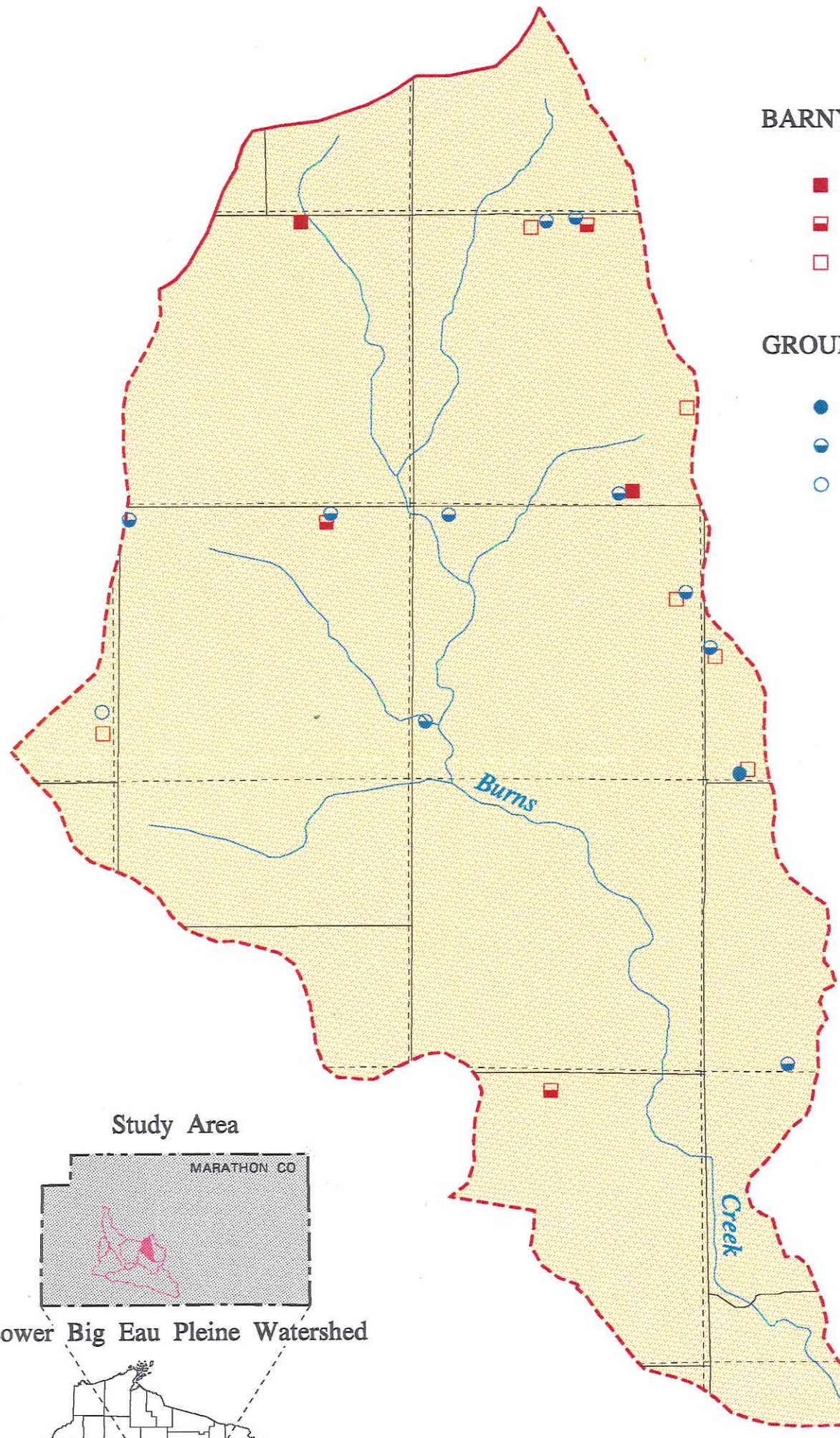
Implementing the above practices should help protect the redside dace population and current species diversity.

Rocky Run Subwatershed (RR)

Subwatershed Description

The Rocky Run subwatershed drains an area of 10,419 acres or 11 percent of the total watershed area and flows into Fenwood Creek in Section 24, T27N, R4E. Perennial streams in the subwatershed include Rocky Run and two unnamed creeks. Rocky Run Creek is six miles long. (See Map 3-6)

Map 3 - 5 Burns Creek Subwatershed



BARNYARD RUNOFF (Phosphorus Loading)*

- Greater than 40 lbs.
- 30 to 40 lbs.
- Less than 30 lbs.

GROUNDWATER NITRATE LEVELS*

- Greater than 10 mg/liter (ES)**
- 2 to 10 mg/liter (exceeds PAL)***
- Less than 2 mg/liter

*Well and Barnyard results based on single inventory during Spring, 1992
**Enforcement Standard
***Preventative Action Limit

LEGEND

- Watershed Boundary
- Subwatershed Boundary
- County Boundary
- Federal or State Highway
- Local Road
- Railroad
- Section Line
- River or Stream
- Lake or River
- Municipal Area

Study Area

Lower Big Eau Pleine Watershed

0 0.5 1 Miles

0 0.5 1 1.5 Kilometers

Scale 1:30000

N

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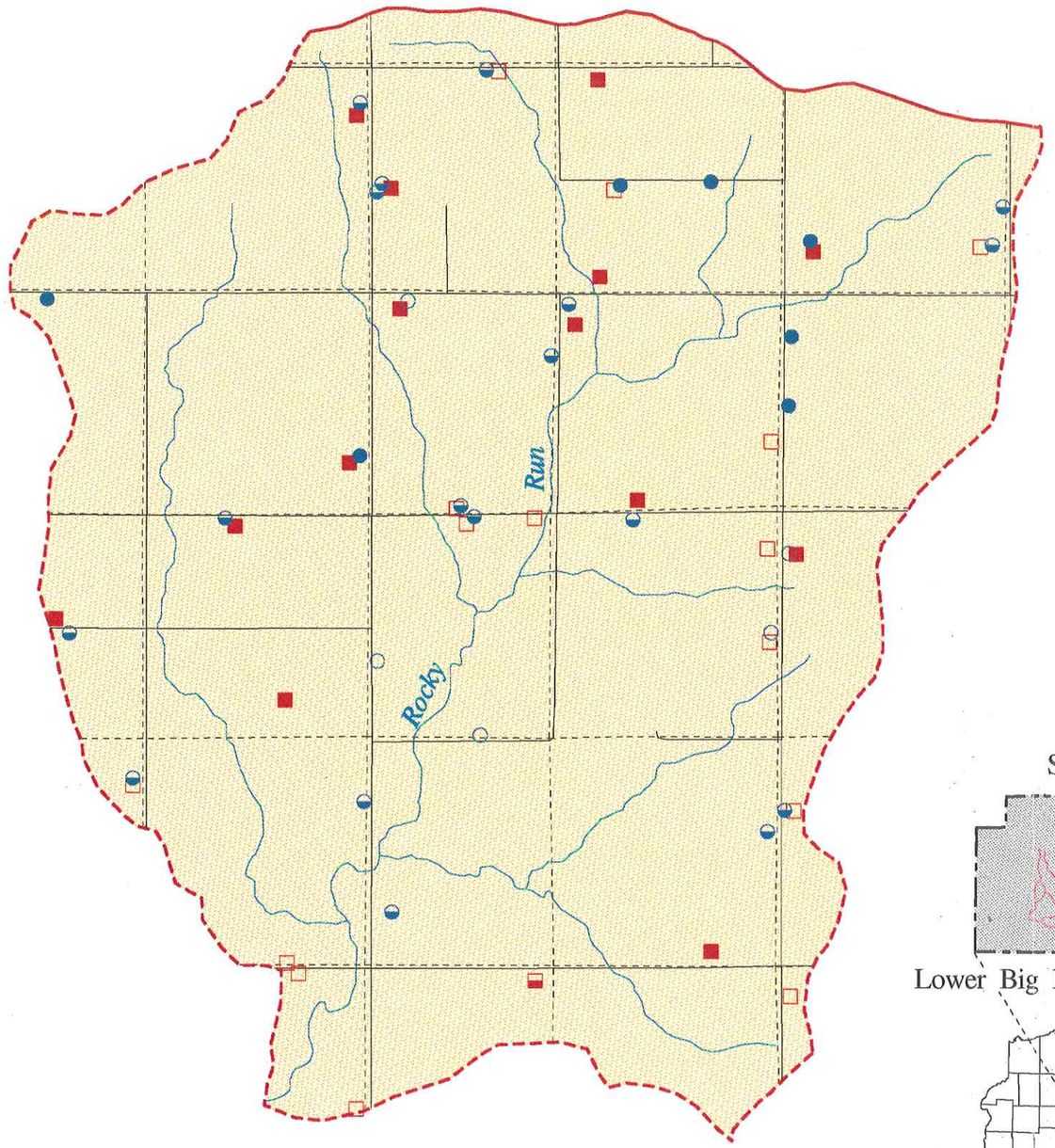
June 1993

Map 3 – 6 Rocky Run Subwatershed



0 1 2 Miles

0 1 2 3 Kilometers

Scale 1:40000

BARNYARD RUNOFF (Phosphorus Loading) *

- Greater than 40 lbs.
- 30 to 40 lbs.
- Less than 30 lbs.

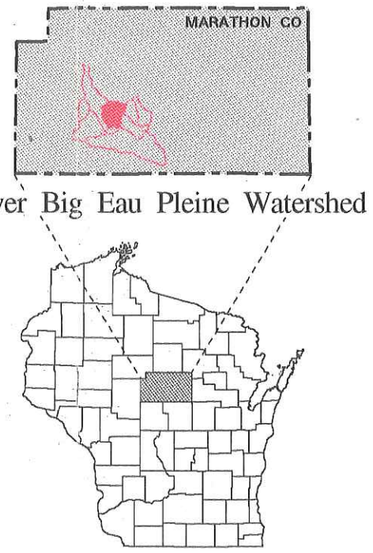
GROUNDWATER NITRATE LEVELS *

- Greater than 10 mg/liter (ES)**
- 2 to 10 mg/liter (exceeds PAL)***
- Less than 2 mg/liter

*Well and Barnyard results based on single inventory during Spring, 1992
**Enforcement Standard
***Preventative Action Limit

N

Study Area



LEGEND

- Watershed Boundary
- Subwatershed Boundary
- County Boundary
- Federal or State Highway
- Local Road
- Railroad
- Section Line
- River or Stream
- Lake or River
- Municipal Area

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Water Quality Conditions

The current biological use of Rocky Run Creek is unknown, but it probably supports a warm water forage fishery.

Stream habitat evaluations were conducted at four locations on Rocky Run Creek. Above the 2nd Still Hill Bridge crossing the habitat was fair. This site is heavily pastured and streambank erosion is severe at certain locations. Stream flows fluctuate dramatically. During a runoff event in July peak bacteria levels were 110,000/100 ml, total solids were 224 mg/l, and total phosphorus levels were 610 μg/l or 0.61 mg/l. Below the 2nd Still Hill Road to Holstein road, habitat improved although it was still fair. The stream was well buffered (hardwoods) with little streambank erosion and no evidence of streambank pasturing. Above the first Still Hill Road, the stream had two distinct reaches. Directly above Still Hill Road the habitat is fair. Streambank pasturing occurs with moderate erosion evident. Filamentous algae is dense. This section of stream is bordered by grasses, willows and wetland. Above this section the creek flows through a well buffered hardwood stand (T27N, R05E, Sec. 7, NE,SW). Stream habitat was rated good.

Macroinvertebrate sampling at Fairview and Cty H in 1990 showed good water quality (some organic pollution).

Nonpoint Source Pollutants

- The Rocky Run subwatershed has 32 barnyards that contribute a total of 1839 pounds of phosphorus, annually. This is 19 percent of the total phosphorus load for the watershed.

- The subwatershed delivers 2224 tons of upland sediment annually, which is nine percent of the entire watershed sediment load. Cropland is the major contributor of sediment in this subwatershed, with 82 percent of the total subwatershed load.

- Streambank erosion produces just two tons of sediment annually, which is less than one percent of the total sediment load.

Fenwood Creek Subwatershed (FC)

The Fenwood Creek Subwatershed drains an area of 15,125 acres or 17 percent of the total watershed area. Perennial streams include Fenwood Creek and an unnamed creek (T27N,R4E,S3,NE,NW). Fenwood Creek is 17.0 miles long and flows into the Big Eau Pleine River in section 25, T27N, R4E. (See Map 3-7)

Water Resource Goals and Objectives

Rocky Run Creek

1. Improve or protect fish habitat and water quality:
   - fence out cattle at selected locations on Rocky Run
   - reduce sediment, organic/nutrient loading to Rocky Run particularly above the second Still Hill Road crossing
   - maintain or preserve wooded corridors to protect fish habitat (T27N, R05E, Sec. 7, NE,SW)
2. Stabilize streamflows:
   - control overland runoff, particularly above 2nd Still Hill Road.

Water Resource Conditions

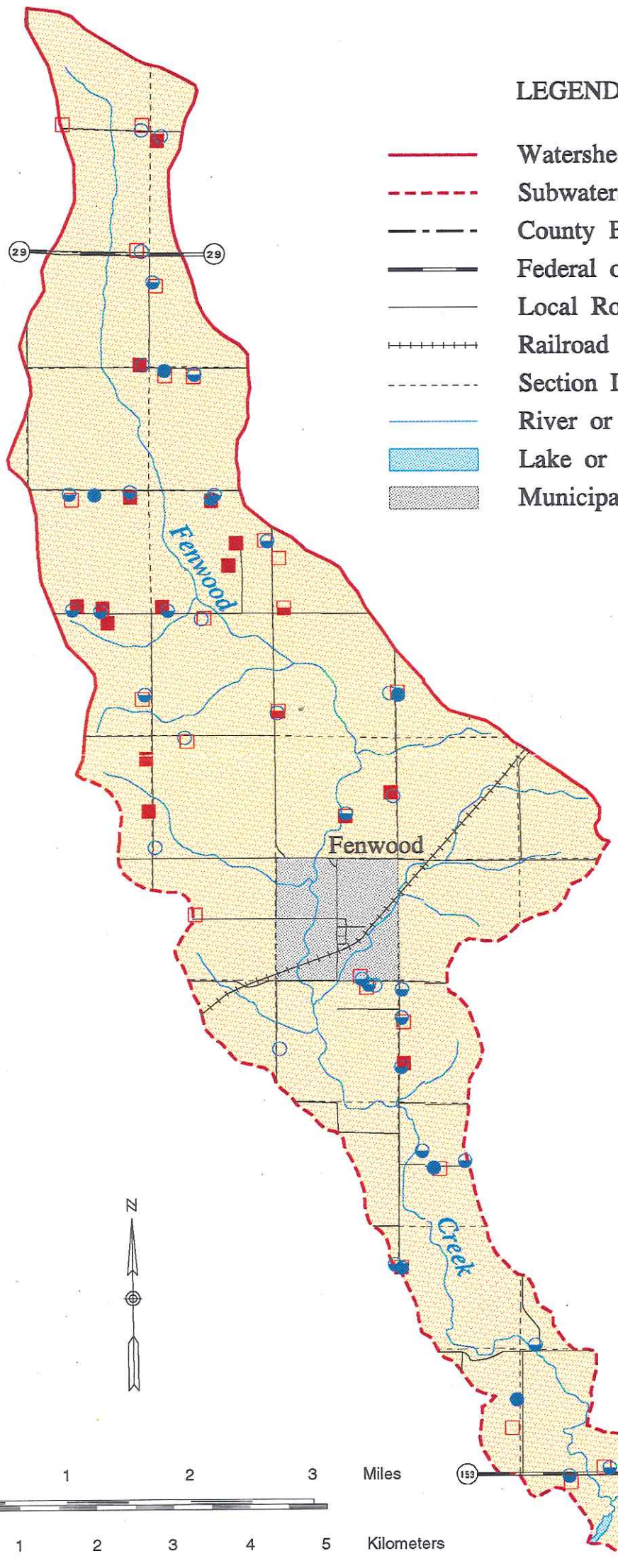
Fenwood Creek's current biological use is a warm water forage and limited forage fishery. A survey conducted in 1976 found nine forage species and no game fish.

Stream habitat evaluations were conducted at three locations on Fenwood Creek. Habitat was poor below Blackberry Road to Leroy Street and above Hwy N Bridge. Because of the flashy flow conditions, streambank erosion is common and fills pools with sediment. Isolated pools (fish stranding) also occur. Streambank pasturing occurs below Leroy Street. Filamentous algae was dense at both these locations. Above Schnelle Road to Cty Hwy M the stream habitat was fair. Again flow appears to be the limiting factor. Filamentous algae were abundant.

During runoff events (March 13, 1990 & July 17, 1991) nutrient levels were high (range 480-880 mg/l Total Phosphorus). Mean fecal coliform bacteria counts were also high during these events (40,000/100 ml at Fairview Road).

Macroinvertebrate sampling was conducted on Fenwood Creek at six locations during the spring of 89 and fall of 90. Biotic index scores indicated very good (slight organic pollution) water quality below Fairview Road. Good water quality (some organic pollution) above Hwy 153, below Schnelle Road, above Cty Hwy M (T27N,R4E,Section 10,NENE); Fair water quality (fairly significant organic pollution) above Hwy M (T28N,R4E, Section 21, NENE) and down stream of Hwy P (T27N, R4E, Section 3 NWNW). In this case nonpoint source runoff appears to be the source of organic pollution because the sites with fair water quality are above the village of Fenwood sewage treatment plant outfall.

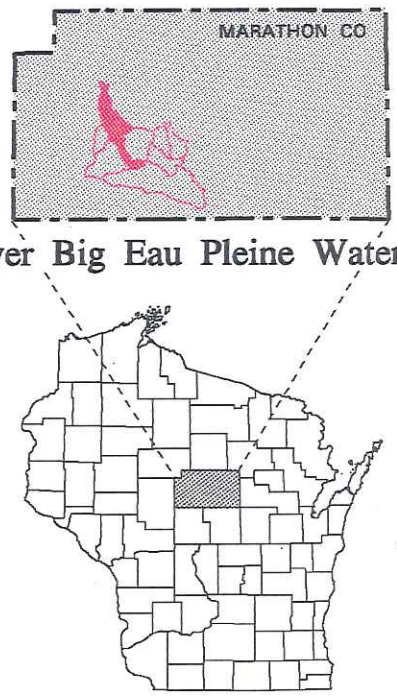
Map 3 - 7 Fenwood Creek Subwatershed



LEGEND

- Watershed Boundary
- Subwatershed Boundary
- County Boundary
- Federal or State Highway
- Local Road
- Railroad
- Section Line
- River or Stream
- Lake or River
- Municipal Area

Study Area



BARNYARD RUNOFF (Phosphorus Loading)*

- ■ Greater than 40 lbs.
- ▬ 30 to 40 lbs.
- □ Less than 30 lbs.

GROUNDWATER NITRATE LEVELS*

- ● Greater than 10 mg/liter (ES)**
- ◒ 2 to 10 mg/liter (exceeds PAL)***
- ○ Less than 2 mg/liter

*Well and Barnyard results based on single inventory during Spring, 1992

**Enforcement Standard

***Preventative Action Limit

N

0 1 2 3 Miles

0 1 2 3 4 5 Kilometers

Scale 1:70000

Wisconsin Department of Natural Resources
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June 1993

Nonpoint Sources

- The Fenwood Creek subwatershed has 44 barnyards which contribute 1865 pounds annually. This is 19 percent of the total phosphorus load in the entire watershed.

- Upland sediment erosion in Fenwood Creek is 5037 tons annually, which is 21 percent of the sediment load from the entire watershed. In the Fenwood Creek subwatershed, cropland is the major sediment source contributing 82 percent of the total load.

- Streambank erosion contributes 157 tons of sediment annually, which is 19 percent of the total streambank erosion load.

Streambank erosion inventories were conducted by Marathon County Land Conservation staff on Fenwood Creek from the headwaters down to the Big Eau Pleine River. Streambank pasturing was severe at some locations in Upper and Lower Fenwood Creek. Streambank erosion was evident throughout Fenwood Creek, with some sites needing rip-rap. High bacteria levels and organic pollution have been identified as nonpoint sources.

Water Resource Goals and Objectives

Fenwood Creek

Improve water quality and fish habitat in Fenwood Creek.

- Reduce sediment and organic/nutrient loading

- Fence cattle out of the creek and rip-rap severely eroded streambanks

As a secondary benefit, installation of best management practices should also control the severity of overland runoff and fluctuating water levels.

Rock Creek Subwatershed (RC)

Subwatershed Description

The Rock Creek Subwatershed drains an area of 4012 acres or four percent of the total watershed area. Rock Creek is the only perennial stream. Rock Creek is five miles long and flows into the Big Eau Pleine River near Stratford (T27N, R4E, Section 18). (See Map 3-8)

Water Resource Conditions

Rock Creek's current biological use is a warm water forage fishery. A survey conducted in July of 1991, found 16 forage species including the redside dace.

Stream habitat evaluations were conducted at two locations on Rock Creek , one above Rock Road and the other above Big Rapids Road. Stream habitat was rated fair at both these locations. There was no significant streambank erosion or any streambank pasturing at these sites. The stream is protected by a dense corridor of vegetation. Filamentous algae was abundant.

Macroinvertebrate sampling was conducted below Rock Road in the fall of 1990 and above in the spring of 1991. Results indicate good water quality.

Nonpoint Source Pollutants

- There are 19 barnyards in the Rock Creek subwatershed, which contribute 1015 pounds of phosphorus annually. This is 10 percent of the total watershed-wide phosphorus load.

- Upland sediment contributes 1032 tons of sediment annually, which is four percent of the watershed-wide sediment load. Cropland is the major contributor of sediment in this subwatershed, producing 78 percent of the total load.

Streambank inventories showed that streambank pasturing is a problem, particularly in the upper reaches above and below Hwy P. Dense algae mats are also present in the creek. Streambank erosion is a problem in Lower Rock Creek near the confluence with the Big Eau Pleine River. Most of this is caused by the force of the water during high flow conditions.

Water Resource Goals and Objectives

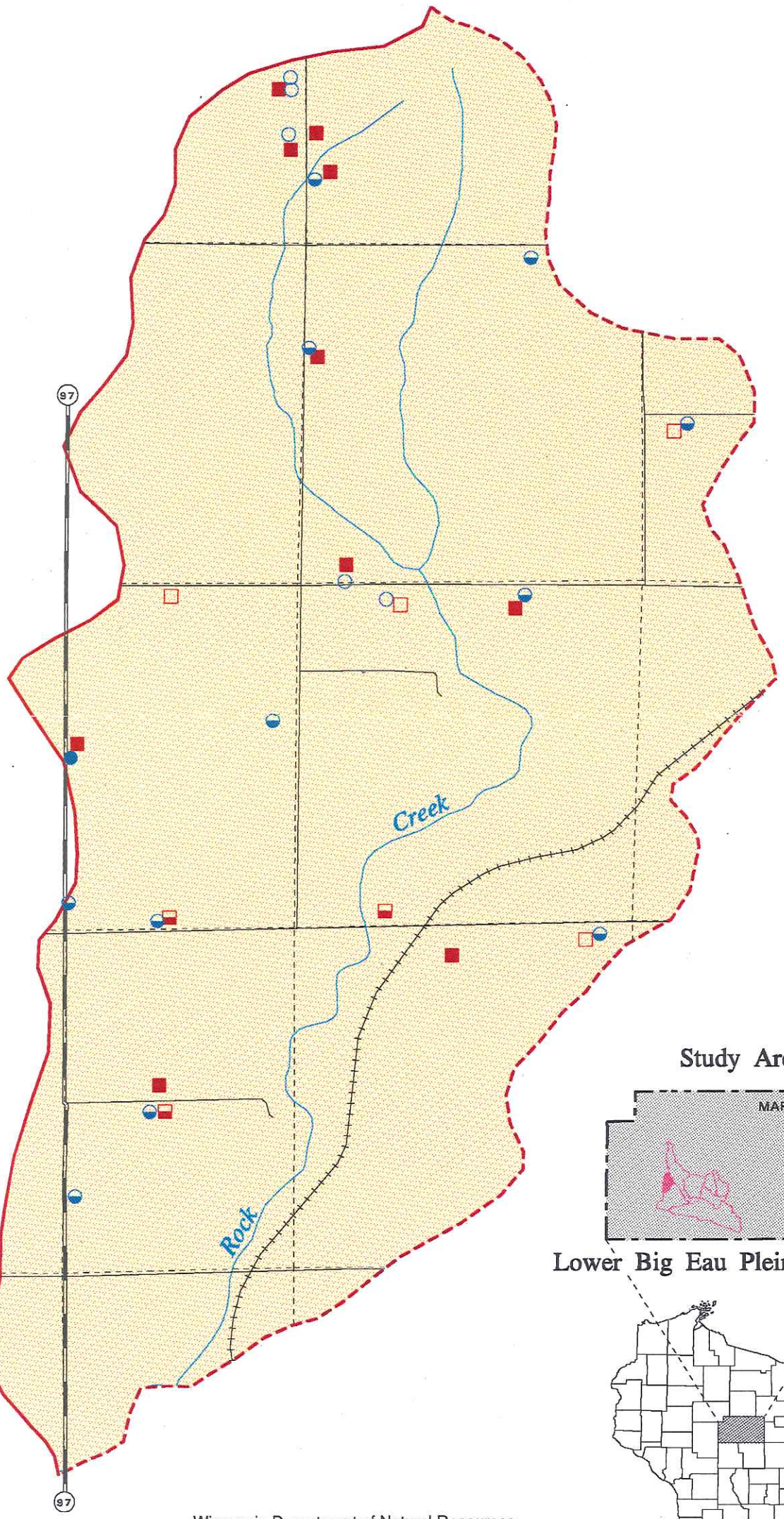
Rock Creek

Improve fish habitat and water quality.

- Fence out cattle
- reduce sediment and nutrient loading (reduce algae & improve fish habitat)
- reduce sediment delivery in the Lower Rock Creek by rip-raping banks

Implementing the above practices should help protect the redside dace population.

Map 3 - 8 Rock Creek Subwatershed



BARNYARD RUNOFF (Phosphorus Loading)*

- Greater than 40 lbs.
- 30 to 40 lbs.
- Less than 30 lbs.

GROUNDWATER NITRATE LEVELS*

- Greater than 10 mg/liter (ES)**
- 2 to 10 mg/liter (exceeds PAL)***
- Less than 2 mg/liter

*Well and Barnyard results based on single inventory during Spring, 1992
**Enforcement Standard
***Preventative Action Limit

LEGEND

- Watershed Boundary
- Subwatershed Boundary
- County Boundary
- Federal or State Highway
- Local Road
- Railroad
- Section Line
- River or Stream
- Lake or River
- Municipal Area

Study Area

Lower Big Eau Pleine Watershed

N

0 0.5 1 Miles

0 0.5 1 1.5 Kilometers

Scale 1:25000

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June 1993

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 Lower Big Eau Pleine River Watershed. Livestock operations comprised of 208 animal lots are a source of 9,873 pounds of phosphorus per year (Table 3-3). Most oxygen-demanding pollutants and nutrients associated with these operations drain via concentrated flow to creeks and wetlands.

Table 3-3. Barnyard Inventory Results: Lower Big Eau Pleine River Watershed

Subwatershed	Number of Barnyards	Total Phosphorous* (lbs)	Percent Watershed P Load
Upper Freeman	2	6	>1
Lower Freeman	17	852	9
Rock Creek	19	1,015	10
Burns Creek	11	384	4
Rock Run	32	1,839	19
Eau Pleine Reservoir	53	2,420	24
Fenwood Creek	44	1,865	19
Eau Pleine River	30	1,492	15
Internally Drained Areas	2		
Totals	208	9,873	100

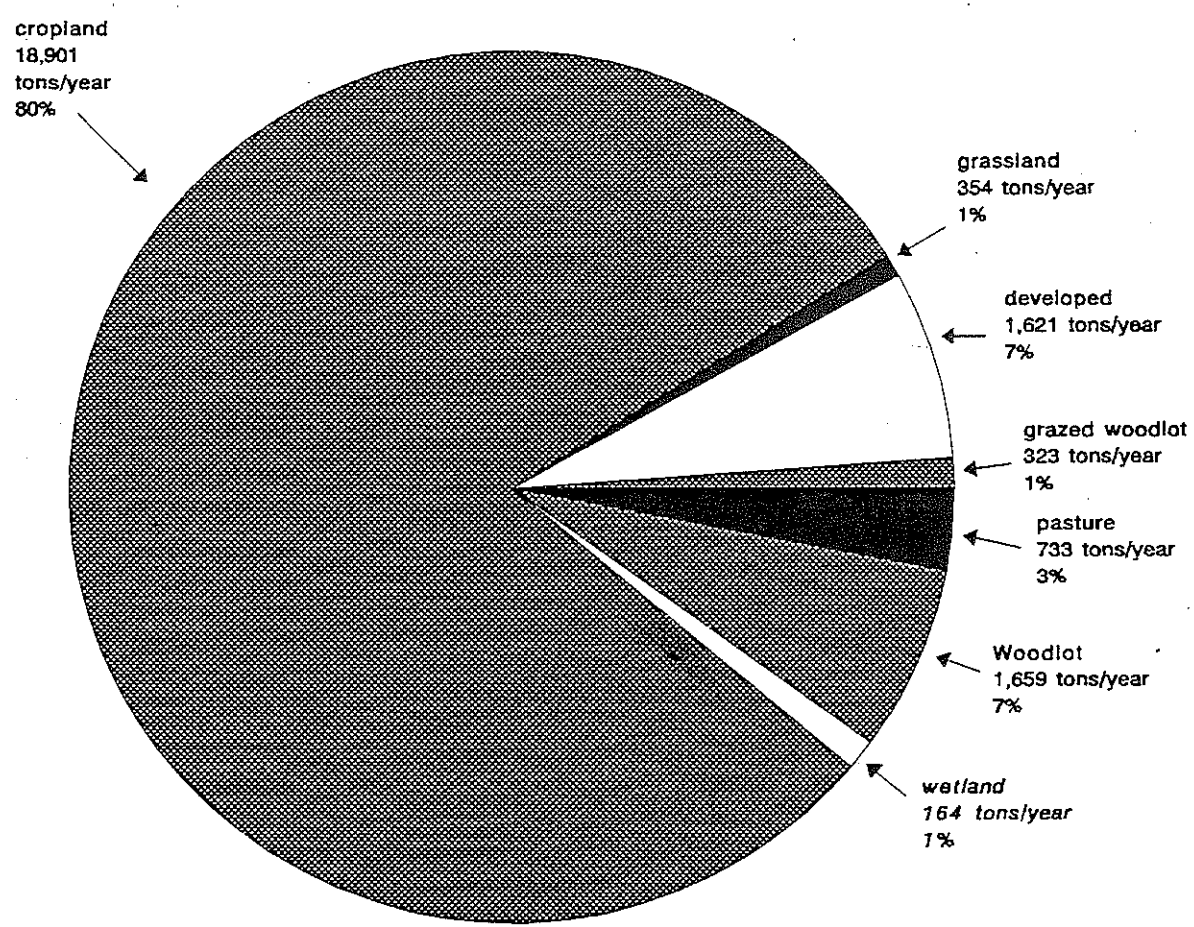
* Based on Annual Phosphorus Loads
Sources: Marathon County LCD, DNR, and DATCP

Upland Sediment

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

Upland sediment sources were evaluated through subarea sampling and extrapolation for the entire watershed (139 square miles). The results of this inventory are summarized in Table 3-4. An estimated 18,901 tons of soil per year are delivered to wetlands or streams in the

Figure 3-3. Summary of Upland Sediment Loading by Landuse: All Subwatersheds



Source: Department of Natural Resources

Table 3-4. Summary of Upland Sediment Loading By Land Use: Lower Big Eau Pleine River Watershed

Subwatershed		Cropland	Developed	Grassland	Pasture	Gr. Woodlot	Woodlot	Wetland	Totals
Burns Creek	Acres	3,020	137	198	33	0	1,417	145	4,950
	Sediment	1,140	69	10	6	0	143	10	1,379
Fenwood Creek	Acres	9,269	414	900	909	199	3,235	199	15,125
	Sediment	4,118	315	55	184	84	272	10	5,037
Lower Freeman	Acres	3,802	245	501	905	184	1,184	178	6,999
	Sediment	1,302	188	19	170	55	96	11	1,840
Rock Creek	Acres	2,648	168	464	144	0	548	40	4,012
	Sediment	804	123	22	31	0	50	2	1,032
Big Eau Pleine Reservoir	Acres	16,234	1,283	3,141	1,168	389	7,754	1,709	31,,678
	Sediment	6,693	485	135	195	129	616	88	8,342
Big Eau Pleine River	Acres	6,731	292	1,458	630	0	2,996	231	12,338
	Sediment	2,070	217	54	87	0	195	13	2,636
Rocky Run	Acres	6,693	201	1,003	48	95	2,116	263	10,419
	Sediment	1,822	93	54	9	30	198	18	2,224
Upper Freeman	Acres	2,814	207	218	253	136	2,168	209	6,005
	Sediment	952	131	5	50	25	89	11	1,264
Totals	Acres	51,211	2,947	7,883	4,090	1,003	21,418	2,974	91,526
	Sediment	18,901	1,621	354	733	323	1,659	164	23,755

* Sediment is reported in tons/year
** Data was extrapolated from subarea sampling.

watershed from croplands. An additional 3069 tons/year are delivered from grassland, pastures, and woodlots. Uplands are the source of 95 percent of the sediment delivered to surface waters. Figure 3-3 summarizes upland sediment loading by land use for all subwatersheds.

Streambank Erosion

Streambank erosion contributes just three percent of the total sediment to surface waters in the Lower Big Eau Pleine River Watershed. Approximately 49 miles of streams were evaluated. Significant erosion has occurred and/or aquatic habitat and water quality were degraded along approximately six miles of streambank. An estimated 830 tons of sediment are eroding into streams annually. See Table 3-5 for streambank inventory results.

Shoreline Erosion

While shoreline erosion on the Eau Pleine Reservoir is essentially a natural process caused by wind and wave action, it may be affected by water level fluctuations, human trampling, and shoreline land use practices. A shoreline erosion inventory was done during the fall of 1991. See Appendix A for inventory methods. The inventory showed that 1,092 feet of shoreline had severe erosion and 13,388 had moderate erosion. Shoreline erosion is estimated to contribute 530 tons annually to the reservoir, which is two percent of the total sediment delivered to surface waters. Inventory results were compared to the detailed inventory done by the Wisconsin Valley Improvement Company and findings were identical. See Table 3-6 for inventory results. While the inventory does not identify shoreline erosion as a major sediment problem, there may be areas with severe erosion that effects shoreline habitat.

Winter-Spreading of Manure

An inventory was done to classify all fields as suitable or unsuitable for winterspreading of manure for each farm in the Upper Big Eau Pleine Watershed. Fields were designated as unsuitable for winterspreading if they 1) contained significant surface water drainage-ways, 2) had slopes greater than four percent, 3) were within 200 feet of surface water, or 4) were flood prone (as determined by soil type). Because the upland inventory was done on a sub-sample basis, for the Lower Big Eau Pleine River Watershed, a complete inventory of critical acres spread with manure during the winter is not available. Therefore, this inventory will be done for the Lower Big Eau Pleine River landowners at the time of a farm visit.

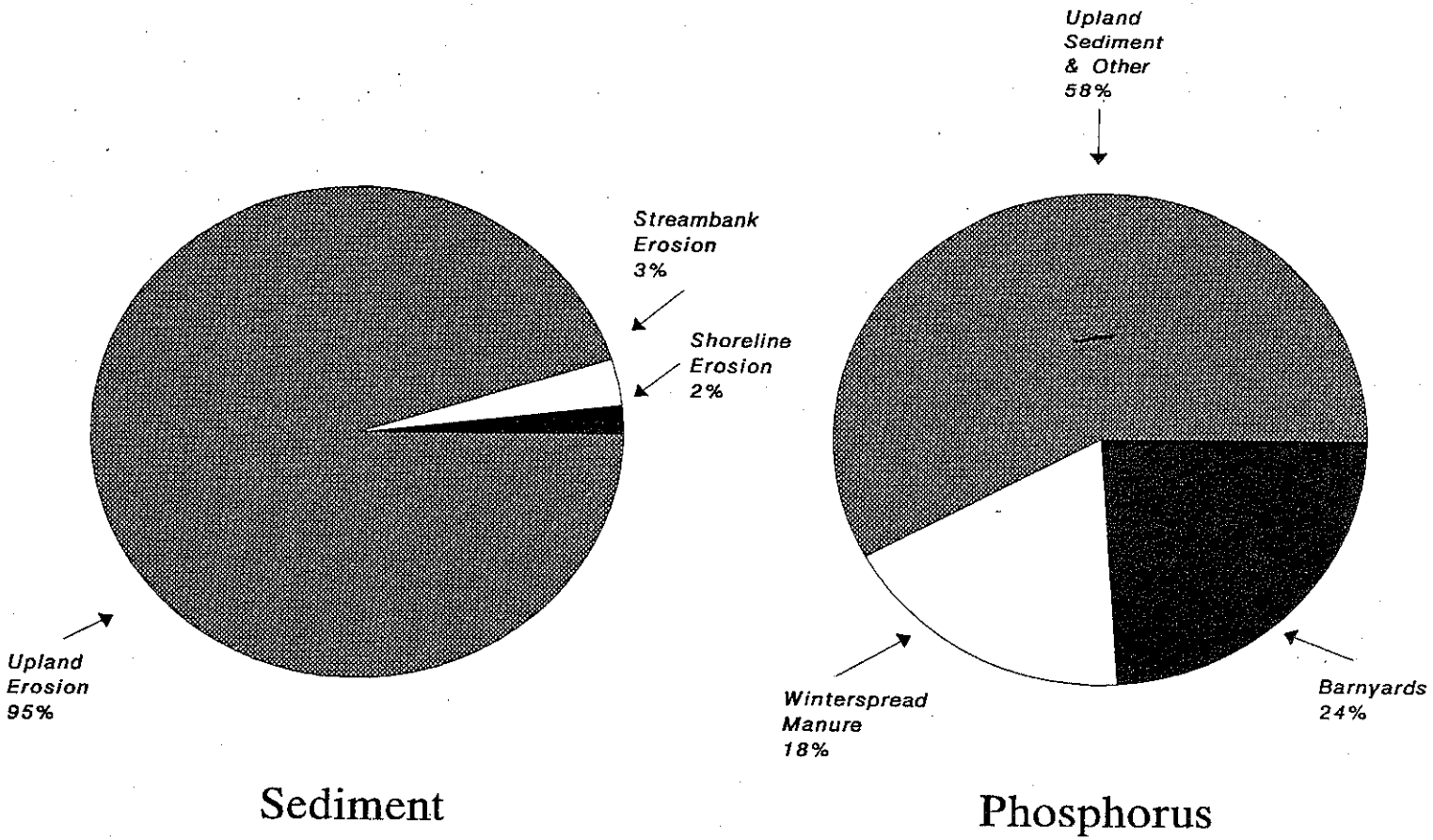
The Upper Big Eau Pleine River watershed is adjacent to the Lower Big Eau Pleine River watershed. The two watersheds have similar land areas, topography and land use patterns. See Figure 3-4 for summary of nonpoint sources of sediment and phosphorus in the Lower Big Eau Pleine River watershed.

Table 3-5. Streambank Inventory Results; Lower Big Eau Pleine River Watershed Streambank Erosion and Habitat Degraded

Subwatershed	Inventoried Streambank Length (feet)	Eroded Sites (feet)	Trampled Sites (feet)	Slumped Sites (feet)	Cattle Access (feet)	Total Sediment Loss Tons/Year	% Bank Degraded From E,T,S	% of Total Bank Erosion in Watershed	Subshed Rank for Bank Erosion	Subshed Rank for Cattle Access
Fenwood Creek	168,148	2,305	5,525	1,760	10,320	156.5	5.7	18.9	2	1
Rocky Run Creek	90,539	85	3,580	125	2,215	1.6	4.2	0.2	6	3
Rock Creek	37.016	493	1,357	98	1,497	13.6	5.3	1.6	5	4
Upper Freeman Creek	41,230	80	-	-	-	0.9	0.2	0.1	7	6
Lower Freeman Creek	47,630	3,617	1,620	295	3,220	91.07	11.6	11.0	3	2
Burns Creek	43,434	392	174	-	315	37.5	1.3	4.5	4	5
Big Eau Pleine	82,350	6,435	-	1,785	-	528.6	10.0	63.7	1	6
Totals	520,752	13,407	12,256	5,063	17,567	829.77	5.8%	100%		

Source: Marathon County LCD

Figure 3-4. Nonpoint Sources of Sediment and Phosphorus: Lower Big Eau Pleine River Watershed



Sources:
Sediment data was taken directly from nonpoint source inventory.
Phosphorus proportions were based on research by Moore, 1979.

Table 3-6. Shoreline Erosion Inventory Results: Big Eau Pleine Reservoir (Fall, 1991)

Erosion Level	Feet	Miles	% of Total Shoreline	Total Sediment Loss (tons/year)
Severe erosion	1,092	0.2	0.3%	147
Moderate erosion	13,388	2.5	3.2%	181
Mild erosion	54,788	10.4	13.2%	185
Totals	69,268	13.1	16.7	513

Polluatant Reduction Goals

Pollutant load reductions are developed according to activities needed to achieve the water quality objectives. Here is a summary of reductions to be targeted for the entire watershed.

Sediment Goal: Reduce overall sediment delivered by 35 percent. To meet this goal, the following is needed:

- Thirty-three percent reduction in sediment reaching streams from agricultural uplands in all subwatersheds.
- Forty-five percent reduction in streambank sediment delivered to all streams and a 25 percent overall repair of streambank habitat in all subwatersheds.
- Sixty percent reduction in shoreline sediment delivered to the reservoir.

Phosphorus Goal: Reduce overall phosphorus load by 50 percent. To meet this goal, the following is needed:

- Seventy percent reduction in organic pollutants from barnyards in all subwatersheds.
- Fifty percent reduction in organic pollutants from winterspread manure on "unsuitable" acres in all subwatersheds.
- Achievement of the sediment goal above.

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

Algae Concentration Goal: Reduce algae concentration in the Eau Pleine Reservoir by 57 percent.

- A combined 50 percent reduction in phosphorus from both the Upper and Lower Big Eau Pleine River watersheds will result in a 57 percent reduction in algae concentration in the Eau Pleine Reservoir.

While the Lower Big Eau Pleine River Watershed has planned for a 50 percent overall reduction in phosphorus, work in the Upper Big Eau Pleine watershed is critical to achieve this goal.

Other Pollution Sources

This section describes pollution sources that impact water quality in the Lower Big Eau Pleine River watershed, but are beyond the scope of this project. Control of these pollution sources occurs through other state and county regulatory programs, as described below.

Municipal and Industrial Point Sources of Pollution

Discharges of wastewater from permitted municipal and industrial sources are important considerations for improving and protecting surface water resources. The villages of Fenwood and Stratford have municipal wastewater treatment plants that discharge to surface water. Chapter 147, Wis. Stats., requires any person discharging pollutants into the waters of the state to obtain a Wisconsin Discharge Elimination System (WPDES) Permit.

Village of Fenwood Waste Water Treatment Plant

The village of Fenwood WWTP discharges to Fenwood Creek. Treatment of wastewater is through a stabilization pond system, built in 1977. The system is presently operating over its design capacity and has had problems with leakage to groundwater. The system was designed to serve 167 people in 1985.

Village of Stratford Waste Water Treatment Plant

The village of Stratford WWTP discharges to an unnamed tributary of the Big Eau Pleine River. The treatment system was upgraded in 1988 and is operating well within its design capacity. The system uses an activated sludge-extended aeration treatment system. The system was designed to serve 1,873 people in 2010.

Refer to the Upper Wisconsin River (Central Sub-basin) Areawide Water Quality Management Plan for additional details on municipal and industrial pollution sources.

Status of the NR 217, the Point Source Phosphorus Effluent Limitation Rule

The Phosphorus Rule was passed in June, 1992 by the DNR Board. It is expected to be approved by the legislature in fall, 1992. The rule will require both municipal and industrial

point sources with surface water discharge points to remove phosphorus from their effluents to 1.0 ppm. Industries that generate 60 pounds of phosphorus per month and municipalities that generate 150 pounds per month must comply. It will take 3-8 years before all facilities are on line. Implementing this rule should reduce the phosphorus load from the point sources in the Upper Big Eau Pleine River Watershed by 87 percent. The Stratford wastewater treatment plant (Lower Big Eau Pleine River Watershed) generated less than the required 150 pounds per month, so it will not be covered under NR 217.

Failing Septic Systems

Septic systems consist of a septic tank and a soil absorption field. Septic systems fail due to soil type, location of system, poor design or maintenance. Generally, in the Lower Big Eau Pleine River watershed, the majority of soils are not suitable for conventional septic tank soil absorption systems. The dense glacial tills associated with the Withee Soils of the watershed do not accept enough moisture for an effective absorption system. As a result, throughout the watershed there are many surface discharge systems where soil absorption systems have failed. This presents a surface water quality problem. Landspreading of septage waste during the winter months can also create surface water quality problems.

Septic systems located in areas of the watershed with the Fenwood Rozellville soil series risk groundwater contamination problems due to the characteristic fractured bedrock and the short depth to bedrock. Pollutants from septic system discharges are nitrates, bacteria, viruses and hazardous materials from household products.

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

Solid Waste Disposal Sites

The Midstate Landfill is located in the Cleveland Township, T27N-R4E, SEC 4SW. The landfill opened in 1970 and stopped operations in 1979. It is a designated superfund site and is presently in the design phase of clean-up. Groundwater contamination problems exist at the site. Monitoring wells are exceeding state and federal groundwater standards.

However, private water supplies do not reveal any contamination. There are no active landfill sites in the Lower Big Eau Pleine River watershed.

Petroleum Storage: Leaking Underground Storage Tank (LUST) Sites

The Wisconsin Remedial Response Site Evaluation Report (PUBL-SW-144-91) lists the sites identified through the LUST program. There are six sites listed within the watershed. One well known site is in the town of Halder. The Halder site has shown extensive groundwater contamination by volatile organic compounds. At the present phase of clean-up, there is a state funded investigation to determine who the potentially responsible parties are. The Halder Farmers Coop is currently doing some clean up work.

The remaining five sites are listed under Table 2-5c in Chapter 2 with locations, project status, and substances found.

Other Contaminated Sites

The Wisconsin Remedial Response Site Evaluation Report also has the Inventory of Sites or Facilities Which May Cause or Threaten to Cause Environmental Pollution and the Spills Program List which includes sites or facilities identified under the Hazardous Substance Spill Law. See Table 2-5d for list of spill sites.

Grus Mining

There is extensive mining of grus in the Lower Big Eau Pleine River watershed. Grus is granite that has weathered to a poorly sorted, clayey residuum. Grus is often used for roads and other construction activity. The residuum is recognized by its high silt and clay content and low sand content, and by its stratigraphic position directly over unweathered bedrock. The Water Resources Appraisal Group raised concerns about the impacts of grus mining on the water quality of Freeman Creek, a Class II brook trout stream in the watershed. Several grus operations are located in the drainage area of Freeman Creek, some of which actually de-water their pits directly to Freeman Creek. Concerns were raised about the effects of the highly colloidal solids found coming from pit de-watering pipes, and discharging into Freeman Creek. Some operations installed detention basins designed to let the suspended solids settle out. Concern was also raised over the potential impacts of increased water temperatures on trout populations.

To address these concerns, the three grus operators in the Freeman Creek subwatershed were issued a Wisconsin Pollution Discharge Elimination System (WPDES) permit application in July 1992 for their pit de-watering discharges. The permit will come under a general permit for sand, gravel, dimension stone, or crushed stone operations. In order for operators to comply with conditions of the permit, an effective technical design needs development (*i.e.* a detention basin with a retention time long enough to settle out fine colloidal materials, an infiltration trench so the pits do not have to be de-watered to surface water, or another appropriate design)

The Nonpoint Source Program can provide some funds for technical assistance to develop an effective design to control this source to Freeman Creek. Funding will be available through the Local Assistance Grant and will be available for engineering design assistance only.

Land Application of Municipal and Industrial Wastes

Sludge is an organic, non-sterile, by-product of treated wastewater, composed mostly of water (up to 99 percent). The re-use of sludge through land application is considered a beneficial recycling of nutrients and a valuable soil conditioner. Use of sludge in this manner is also considered the most cost effective means for the treatment facility to dispose of the material.

Land application of municipal and industrial sludge is regulated under NR 204 and NR 214 respectively. They require a WPDES permit, site criteria, minimum distances from wells, application rates to ensure that environmental and public health concerns such as proper soil types, depth to groundwater, distance from surface water. The crop grown on sludge amended fields is considered when the DNR approves fields for sludge application.

There are four sites in the Lower Big Eau Pleine River watershed that accept and spread municipal sludge on a total of 100 acres. There are twenty-six sites in the watershed that accept and spread industrial sludge on a total of 1696 acres. Industrial sludge is primarily cheese and meat packing factory waste.

CHAPTER FOUR
Recommended Management Actions: Control Needs and Eligibility for Cost-Share Funding

Introduction

This chapter describes the management actions developed to meet the pollution reduction goals established during the water resource appraisal process. Also, this chapter describes the criteria which determine the eligibility of each pollutant source for cost-share funding through the nonpoint source program.

Management Categories

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

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

Management Category I

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

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

Management Category II

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

Management Category III

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

Conclusions from the *Lower Big Eau Pleine River Water Resources Appraisal Report* (Kreitlow, 1992) indicate that the control of barnyard runoff is critical to the success of this project. While reducing sediment from all sources is a goal of the project, phosphorus reduction will be the primary objective of this project.

Criteria for Eligibility and Management Category Designation

Croplands And Other Upland Sediment Sources

Upland Erosion

Upland erosion represents 95 percent (23,754 tons) of the total sediment load to streams in the watershed. A 33 percent reduction in sediment from eroding fields is targeted for agricultural lands. This translates into bringing all lands that are contributing sediment to

streams at a rate greater than 0.4 tons/acre/year down to 0.2 tons/acre/year. To be in Category I, landowners' fields must be contributing more than 0.4 tons/acre/year of sediment. The average sediment delivery rate for all subwatersheds is 0.15 tons/acre/year. This category will control an estimated 16,379 "critical" acres of cropland, 31 percent of the upland sediment load (7,421 tons) of the watershed.

An additional nine percent of the sediment load delivered to the stream will be controlled through Category II, which includes an estimated 18,262 critical acres, controlling 1834 tons. Category II includes those landowners with fields delivering sediment at a rate between 0.2 and 0.4 tons/acre/year. See Table 4-1.

For practical purposes, all fields delivering more than 0.4 tons/acre/year of sediment will be combined for each landowner. This figure will be the total amount of sediment which must be controlled on the farm in order to receive cost-share funds from the watershed project. A landowner may be able to meet the overall sediment reduction goal for his/her farm by applying controls to field with sediment deliver rates *below* the identified target control level of 0.4 tons/acre/year. The best way to meet the individual's sediment reduction goals will be determined during the farm planning process. County staff will focus first on obtaining sediment control from Category I fields.

Table 4-1. Upland Sediment Erosion Eligibility Criteria in the Lower Big Eau Pleine River Watershed

Upland Erosion			
Management Category Control	Eligibility Criteria Sediment Delivery (tons/acre/year)	Soil/Loss (tons/acre/year)	Percent Control
I	above 0.4	7,421	31%
II	between 0.4 and 0.2	1,834	9%
III	at or below 0.2	___	___

*The average sediment delivery rate of all subwatersheds is 0.15 tons/acre/year

Source: DNR

Gully Erosion

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

See Table 4-2 for Rural Uplands Targeted for Sediment Control

Animal Lot Runoff

A high level of control of animal lot runoff is required in order to achieve the water quality objectives in the Lower Big Eau Pleine River project. A 70 percent reduction of organic loading is necessary in all subwatersheds to meet stated objectives. Category I landowners are those whose operations produce over 40 pounds of phosphorus, annually. These landowners will need to reduce loads down to 20 pounds or less in order to reach water quality goals. Ninety-one landowners fall into this category, yielding 73 percent control.

Category II landowners are those whose operations produce between 40 and 30 pounds of phosphorous annually. These landowners also need to reduce this load to 20 pounds or less to be eligible for cost sharing. Twenty-two barnyards fall into this category, yielding five percent control. See Table 4-3.

Landowners receiving cost sharing for animal lot runoff are required to do a nutrient management plan for their operation.

Table 4-2. Rural Uplands Targeted for Sediment Control

Subwatershed	Total Load (tons/yr)	Management Category I			Management Category II			Estimated Control** (%)
		Acres	Control (tons/yr)	Control (%)	Acres	Control (tons/yr)	Control (%)	
Burns Creek	1,379	1502	433	31	963	100	7	35
Fenwood Creek	5,037	4125	2050	41	2841	242	6	44
Lower Freeman	1,840	1209	595	32	605	52	3	34
Rock Creek	1,032	580	161	16	1184	132	13	23
LBEP Reservoir	8,342	4808	3153	38	5914	603	7	42
LBEP River	2,636	1654	539	20	2685	306	12	26
Rocky Run	2,224	978	290	13	3140	274	12	19
Upper Freeman	1,264	524	201	16	930	124	10	21
Totals	23,754	16,379	7421	31	18,262	1,834	9	35

** The estimated control is assumed to be one half of the Category II fields and all of the Category I fields.

Table 4-3. Animal Lot Runoff Eligibility Criteria

Management Category	Phosphorus Load per Barnyard	Number of Barnyards	Phosphorus Reduction
I	greater than 40 lbs	91	73%
II	between 40 & 30 lbs	22	5%
III	less than 30 lbs	95	-

Internally Drained Animal Lots

Just three internally drained yards were identified in the Lower Big Eau Pleine River watershed. Eligibility for internally drained animal lots will be based on the same phosphorus loading and design target criteria as lots that drain to surface water. Based on this criteria, it is estimated that one animal lot meets Category I criteria and one lot meets Category II criteria. Where county project managers are uncertain for the potential impact to groundwater caused by an internally drained lot, field investigations may be conducted jointly by the county project staff, water resource management investigators from the DNR North Central District Office, and staff from the DATCP.

Table 4-4. Barnyards Targeted for Runoff Control

Subwatershed	Total Phos. (lbs)	Management Category I			Management Category II			Management Category III (yards)
		Yards (#)	Control (lbs)	Control (%)	Yards (#)	Control (lbs)	Control (%)	
Burns Creek	385	3	227	59	3	109	28	5
Fenwood Creek	1865	17	1478	79	4	149	8	23
Lake Freeman	852	8	719	84	1	34	4	8
Rock Creek	1015	10	850	84	3	108	11	6
LBEP Reservoir	2420	25	1960	81	7	239	10	21
LBEP River	1492	12	1206	81	3	100	7	15
Rocky Run	1839	16	1538	84	4	124	7	12
U. Freeman	6	0	0	0	0	0	0	2
Totals	9,874	91	7,978	69	25	863	9	92

Abandonment of Leaking and Improperly Sited Manure Storage Systems

The proper abandonment of leaking and improperly sited manure storage systems will be an eligible practice in the Lower Big Eau Pleine River watershed if the storage facility exhibits a high likelihood for a water quality problem. The criteria and conditions where this practice applies are outlined in a separate proposal (available from the Marathon County LCD or DNR) for this alternative best management practice. In the Lower Big Eau Pleine River watershed, up to 18 manure storage systems may be eligible for proper abandonment.

Manure Spreading Runoff and Manure Storage Facilities

The upland inventory for the Lower Big Eau Pleine watershed was done on a sub-sample basis. Because of this a complete inventory of manure spreading practices is not available. Therefore, nutrient management cost-share eligibility criteria for this plan will be based on eligibility criteria in the Upper Big Eau Pleine plan, written in 1987. The Upper Big Eau Pleine watershed is directly upstream from the Lower Big Eau Pleine watershed and is largely in Marathon County. The two watersheds have similar areas, topography and land use.

An inventory was done to classify all fields as suitable or unsuitable for winterspreading of manure for each farm in the Upper Big Eau Pleine Watershed. Fields were designated as unsuitable for winterspreading if they 1) contained significant surface water drainage-ways, 2) had slopes >4 percent, 3) were within 200' of surface water, or 4) were flood prone (as determined by soil type). This inventory will be done for the Lower Big Eau Pleine Watershed at the time of the farm visit. The same category criteria used in the Upper Big Eau Pleine will be used for this project.

Operations determined to have greater than 16 acres of cropland identified as "unsuitable" for winterspreading shall develop and agree to implement a nutrient management plan (SCS Std. 590) in order to participate in the program (Category I). This comprises approximately 45 farms. Category II operations (approximately 12) are those with 11 to 15 critical acres.

Operations shall be designated as Category II for cost sharing for manure storage practices if the manure management plan indicates that adequate spreading sites do exist for manure utilization but, in accordance to 590 specifications, there is a deficit of required acreage suitable for spreading during the winter. Operations with a deficit of 20 percent or more shall be Category I for manure storage practices. These categories apply to any operation where a nutrient management plan is developed, including nutrient management plans done for manure runoff systems (barnyards).

Storage facility alternatives for which an operation is eligible will be determined to be the least cost system which will satisfy the specification in 590. These options may include manure stacks (in accordance with Std. 312), short term storage (capacity for 30 to 100 days production), and long-term storage (capacity for up to 210 days production).

Landowners receiving cost-sharing funds for storage practices or nutrient management are required to adopt a nutrient management plan (Std. 590). Additionally, manure removed from cost-shared storage facilities shall not be spread on frozen, snowcovered, or saturated ground.

Nutrient and Pesticide Management

Nutrient and pesticide management activities in the Lower Big Eau Pleine River watershed will focus on two areas. The first activity is completing up to approximately 60 nutrient management plans for landowners winterspreading manure on unsuitable acres and the nutrient (waste) management plans done for landowners receiving cost sharing for annual lot runoff systems (barnyards).

In addition, the Marathon County LCD anticipates working with three ginseng growers to install spill control basins where pesticide mixing and loading occurs. County staff will work with the growers on nutrient and pesticide management for their ginseng acreage and other crops they manage.

The Marathon County staff will evaluate operations for eligibility for practices on an as-needed basis. DNR approval is needed before any cost-share agreement is signed. Cost-sharing is available to eligible landowners for soil and manure testing, crop scouting, and nutrient and pesticide management planning.

Streambanks

Streambank Erosion

Streambanks contribute three percent of the overall sediment delivered to streams in the watershed. Category I participants will be those with identified severe erosion sites with a lateral recession rate of greater than 0.5 feet/year. County staff will evaluate site accessibility/feasibility on Category I sites. NOTE: No severe erosion sites were found during the streambank inventory. If severe sites are found during the implementation of the project the Category I criteria will be used to determine eligibility.

Category II participants are also eligible for streambank erosion control practices. Eligible streambanks are those with identified moderate lateral recession rates of between 0.1 and 0.5 feet per year.

Category III streambanks are those with slight erosion and lateral recession rates between 0.01 and 0.1 feet per year.

Livestock Access

Category I (essential) streambanks include trampled sites over 200 feet per property owned. Fifteen landowners on perianal streams fall into this category. Category II (eligible) streambanks are all other sites, less than 200 feet per property owned. Five landowners on perianal streams are in this category. Additional sites on intermittent streams which meet the criteria above may be identified.

Access restrictions will be outlined in a grazing management plan, which county staff will develop, and may include fencing, allowing the cattle access to the stream only during limited times of the year, or limiting herd size. The timing and period of access allowed is determined by the county LCD with agreement from the DNR and the DATCP. Participating landowners will develop these grazing management plans as part of the cost-share agreement.

The purpose of the grazing management plan is to protect and stabilize areas immediately adjacent to streams. County staff will use their discretion concerning cost effectiveness and feasibility when applying best management practices to protect and stabilize agriculturally affected streambanks. See Table 4-5 for streambank eligibility criteria and Table 4-6 for additional information on streambank eligibility.

Table 4-5. Streambank Eligibility Criteria for the Lower Big Eau Pleine River Watershed

Management Category	Criteria
Streambank Erosion	
I	Streambanks with a lateral recession rate of greater than 0.5 feet/year
II	Streambanks with a lateral recession rate of between 0.1 and 0.5 feet/year.
III	Streambanks with a lateral recession rate of between 0.01 and 0.1 feet/year.
Streambank Habitat	
I	Trampled sites over 200 feet/landowner.
II	All livestock access sites.

Sources: Marathon County LCD, DNR, DATCP

Table 4-6. Streambank Erosion Eligibility for the Lower Big Eau Pleine Watershed**

Subwatershed	# of Landowners and Length						# of Landowners with Cattle Access & Length*	
	Slight	Feet	Moderate	Feet	Severe	Feet	Cattle Access	Feet
Fenwood Creek	3	290	13	5615	0	0	9	7,365
Burns Creek	0	0	3	395	0	0	2	285
Rock Creek	0	0	7	493	0	0	3	1,367
Rocky Run Creek	0	0	2	85	0	0	3	3,705
Upper Freeman Creek	1	35	1	45	0	0	0	0
Lower Freeman Creek	7	1,330	10	3,007	0	0	3	2,880
Big Eau Pleine River	1	20	15	6,415	0	0	0	0
Totals	12	1,675	51	16,055	0	0	20	15,602

* These numbers represent cattle access to mainstream perennial streams - does not include intermittent streams being pastured.

** Does not include shoreline erosion for Big Eau Pleine Reservoir. There was a separate inventory completed on the Reservoir.

Shoreline Erosion

Shoreline erosion on the Big Eau Pleine Reservoir contributes 2 percent of the overall sediment delivered in the watershed. In the fall of 1991, the entire shoreline of the reservoir was inventoried. Inventory methods are outlined in Appendix A.

Category I sites for shoreline erosion are those with severe erosion. Severe sites are defined as having banks averaging six feet in height, with a lateral recession rate of 0.5 feet per year.

Category II sites are those with moderate erosion. Moderate sites are defined as having banks averaging three feet in height, with a lateral recession rate of 0.1 feet per year. Category III sites are those with mild erosion. Mild erosion sites are defined as having an average bank height of 1.5 feet, with lateral recession rates of 0.05 feet per year. See Table 4-7 for eligibility criteria.

Sediment Management Strategy

See Table 4-8 for the management strategy for sediment.

Table 4-7. Shoreline Erosion Eligibility Criteria: Lower Big Eau Pleine Reservoir

Category	Erosion Level	Length of Shoreline (ft)	Soil Loss (tons/year)	Number of Landowners	Percent Control
I	severe	1,092	147	5	29
II	moderate	13,388	181	17	35
III	mild	54,788	185	33	36
	Totals	69,268 ft	513 t/yr	55	100%

Phosphorus Management Strategy

See Table 4-9 for the management strategy for phosphorus.

Wetland Restoration

There will be no Category I for wetland restoration. All inventoried wetlands (585 sites) will be Category II (eligible) for restoration if the sites meet the criteria. The targeted goal is to restore 10 percent (60 sites) of the wetlands sites inventoried. See Chapter 2, Table 2-3 for wetland inventory details.

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

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

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

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

2. Pastured wetlands riparian to streams, or tributaries

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

Table 4-8. Management Strategy for Sediment: All Sources Category I

Subwatershed	Annual Cropland Sediment (tons)	%	Annual Shoreline Sediment (tons)	%	Annual Streambank Sediment (tons)	%	Annual[1] Other Sediment (tons)	%	Total Annual Subwatershed Sediment (tons)	%
Burns Creek	1,140	81	-	0	38	3	238	17	1416	5
Fenwood Creek	4,118	79	-	0	157	3	920	18	5195	21
Lower Freeman	1,302	67	-	0	91	5	539	28	1932	8
Rock Creek	804	77	-	0	14	1	228	22	1046	4
LBEP Reservoir	6,693	76	513	6	-	-	1648	19	8854	35
LBEP River	2,070	65	-	0	529	17	566	18	3165	13
Rocky Run	1,822	82	-	0	2	1	402	18	2226	9
Upper Freeman	952	75	-	0	1	1	311	25	1264	5
Watershed Totals	18,901	75%	513	2%	832	3%	4852	20%	25,098	100%

Subwatershed	Sediment Control Planned: Cropland (tons)	%	Sediment[2] Control Planned: Streambanks (tons)	%	Sediment Control Planned: Shoreline (tons)	%	Total Sediment Control Planned (tons)	%
Burns Creek	483	34	19	1	-	0	502	35
Fenwood Creek	2171	42	79	2	-	0	2250	43
Lower Freeman	621	32	46	2	-	0	667	35
Rock Creek	227	22	7	1	-	0	234	22
LBEP Reservoir	3455	39	-	0	330	4	3785	43
LBEP River	692	22	265	3	-	0	957	30
Rocky Run	427	19	1	0	-	0	428	19
Upper Freeman	263	21	0.5	0	-	0	264	21
Watershed Totals	8339	33%	418	2%	330	1%	9087	36%

1 Includes: developed areas, grassland, pasture, woodlots, wetlands
2 NOTE: No severe erosion sites (Category I) were found during the inventory. See Table 4-6
3 Control planned is estimated to be half of Category II tons and all of Category I tons.

Table 4-9. Management Strategy for Phosphorus: All Sources

Subwatershed	Annual P Loading Barnyards (lbs)	%	Annual P Loading[1] Cropland (lbs)	%	Annual P Loading[1] Shoreline (lbs)	%	Annual (P)[1] Loading Streambanks (lbs)	%	Annual P Loading Other (lbs)[3]	%	Total P Loading (lbs)[2]	%
Burns Creek	385	17	1,414	64	0	0	47	2	356	16	2,202	6
Fenwood Creek	1,865	22	5,106	61	0	0	195	2	1,211	14	8,377	20
Lower Freeman	852	27	1,614	51	0	0	113	4	570	18	3,149	7
Rock Creek	1,015	44	997	43	0	0	17	1	285	12	2,314	5
LBEP Reservoir	2,420	17	8,299	60	636	5	0	0	2,493	18	13,848	33
LBEP River	1,492	26	2,567	46	0	0	656	12	926	16	5,641	13
Rocky Run	1,839	38	2,259	46	0	0	2	0	784	16	4,884	12
Upper Freeman	6	0	1,180	70	0	0	1	0	499	8	1,686	4
Watershed Totals	9,874	23	23,437	56	636	2	1,032	2	7,123	17	42,102	100

Subwatershed	P Control Planned Barnyards	%	P Control Planned Croplands	%	P Control Planned Shoreline	%	P Control Planned Streambanks	%	Total Planned P Control*	%
Burns Creek	282	13	599	27	-	0	24	1	905	41
Fenwood Creek	1553	19	2,692	32	-	0	98	1	4343	52
Lower Freeman	736	23	770	24	-	0	57	2	1563	50
Rock Creek	904	39	281	12	-	0	9	0.4	1194	52
LBEP Reservoir	2080	15	4,284	31	409	3	-	0	6773	49
LBEP River	1256	22	858	15	-	0	329	6	2443	43
Rocky Run	1600	33	529	11	-	0	1	0	2130	44
Upper Freeman	0	0	326	19	-	0	1	0	327	19
Watershed Totals	8411	20	10,340	25	409	1	518	1	19,678	47

1 Assumes 1.24 lbs P/1 ton sediment
2 Assumes 0.46 lbs P/acre loading from all sources (Green Bay Remedial Action Plan, 1987)
3 Includes developed areas, woodlots, wetlands, grasslands, pastures.
4 Control planned is estimated to be half of Category II pounds and all of Category I pounds.

* NOTE: Half of the annual phosphorus loading from "other sources" was estimated to be from winterspread manure (3,562 lbs.). The plan calls for a 50 percent reduction in phosphorus from winterspread manure, or 1,781 lbs. This reduction yields an additional overall reduction in phosphorus of 5 percent resulting in an overall planned phosphorus control of 51 percent.

3. Prior converted wetlands downslope or upslope from fields identified as Management Category I upland sediment sources through the WIN (sediment-phosphorous yield computer model) model.

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

   a. 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.

   b. Wetland restoration costs must be the *least-cost* practice to reach sediment reduction goals. Within the Upper and Lower Freeman Creek Subwatersheds wetland restorations of eligible prior converted wetlands will be considered over lower cost practices to control nonpoint source pollutants. The cold water streams of these subwatersheds are high priority water resources.

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

Land Easements

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

- Shoreline Buffers
- Critical Area Stabilization
- Wetland Restoration

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

Situations encountered when determining the use of easements are:

- Critical lands throughout the watershed where permanent vegetative cover provides a cost effective means of controlling a nonpoint source. There may be situations where taking cropland out of production and providing an easement with permanent vegetative cover is less costly than constructing a terrace, an agricultural sediment basin, or other high cost control measures.

- Shoreline buffers throughout the watershed where permanent vegetative cover provides cost effective pollution control when compared to other control measures. For example, if shoreline easement costs are similar or lower than practices such as reduced tillage, crop rotation changes, contour strips, etc.

- Cold water aquatic communities (trout) are limited within the Lower Big Eau Pleine watershed and in central Marathon County. Freeman Creek and two unnamed cold water streams are therefore designated as high priority water resources where easements will be considered over lower cost practices to control nonpoint source pollutants.

- Wetland restorations to control either livestock grazing within wetlands riparian to lakes, streams, or tributaries, and restorations of prior converted wetlands down slope or up slope from fields identified as critical upland sediment sources through the WIN model. Secondary benefits may include enhancement of fish and/or wildlife habitat.

Ordinances

Animal Waste Storage Ordinance

Marathon County has an animal waste storage ordinance, which presently applies only to earthen pits. The ordinance is in the process of being revised to encompass all pits, both earthen and concrete. The revised ordinance is scheduled to be presented to the Land Conservation Committee at the November, 1992 meeting. Changes to the ordinance will be determined by the LCC. The new ordinance, if approved, could go into effect in time for the 1993 construction season.

Construction Site Erosion Control Ordinance

The significance of nonpoint source pollution from construction site erosion in the Lower Big Eau Pleine River watershed has been researched. Data was collected on the number of building permits issued per year. The number of permits issued in the watershed area is low. Population trends over the past decade were reviewed and the population in the majority of towns has increased just slightly (2-10 percent) over the past decade. The only exception is the village of Fenwood which has increased population at a rate of 23 percent over the last

decade. In light of this information, the DNR, strongly suggests that Marathon County pass an ordinance for preventative reasons. However, review of existing data reveals that construction sites do not represent a significant pollutant source in the project area at this time to warrant requiring an ordinance for grant eligibility.

The DNR will require the county to submit an annual review of building permits and population trends. If these data indicate water quality impacts have the potential to interfere with the goals of this plan, a construction site erosion control ordinance will be required at that time.

The DNR suggests that the Wisconsin Construction Site Erosion Best Management Handbook (DNR Publication WR-222-89) be used as a reference for any development that occurs in the Lower Big Eau Pleine River Project.

CHAPTER FIVE
Local Government's Implementation Program

Introduction

This chapter identifies the means for implementing the rural management actions for nonpoint source pollution control described in the previous chapter. The following chapter details the information and education strategy to be implemented. The success of this priority watershed project depends on the aggressive implementation of these nonpoint source pollution control strategies.

More specifically this chapter identifies:

- The agencies and units of government responsible for carrying out the identified tasks
- The best management practices necessary to control pollutants on the critical sites identified in Chapter 4
- The cost-share budget
- The cost containment policies
- The cost-share agreement reimbursement procedures including administrative procedures for carrying out the project
- Staffing needs including total hours per year and number of staff to be hired
- Schedules for implementing the project
- The involvement of other programs

The project budget includes the expense for cost sharing, 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 which reduce nonpoint sources of water pollution and protect and enhance fish, wildlife and other resources. Land owners and land operators in the Lower Big Eau Pleine Watershed eligible for cost-share assistance through the priority

watershed program include: 1) individuals, 2) Marathon County, 3) other governmental units described in NR 120.02(19), 4) corporations, and 5) the State of Wisconsin.

Marathon County

Marathon County is the primary unit of government responsible for implementing this plan in rural areas. The Marathon County Land Conservation Committee (LCC) will act for the respective County Board, 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 part 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 (Catagory I) within one year of signing the nonpoint source grant agreement. The county's strategies for contacting landowners are included in this chapter.
- Develop farm conservation plans consistent with the needs of the project.
- 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.
- For lands the county owns or operates, enter into cost-share agreements with DNR 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 the rates consistent with administrative rules and established in this plan.
- Prepare and submit annual work plans for activities necessary to implement the project. The Marathon 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 nonpoint source inventory changes, and quantifying pollutant load reductions from installed BMPs.
- Participate in the annual watershed project review meeting.
- Conduct the I&E activities identified in this plan for which they are responsible.

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 is 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 county 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 the participating landowners for installing BMPs. The DNR provides guidance when questions arise concerning the conformance of proposed activities with the statutes, administrative rules, and the watershed plan.

Financial Support

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

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

Project Evaluation

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

Technical Assistance

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

Other Responsibilities:

- The appropriate 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.

- Assisting 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 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 pest management.
- Assist the counties to carry out the information and education activities or tasks 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 concerning application of these practices.
- Assist county staff to evaluate the site specific practicality of implementing rural best management practices.

Other Agencies

The Lower Big Eau Pleine 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. The local SCS personnel will work with the county staff to provide assistance with technical work when requested by the Land Conservation Committee and if SCS staff time is available. Personnel from the Area SCS office will provide staff

training and engineering assistance for best management practices. Efforts will be made by DATCP to assist SCS to coordinate the Lower Big Eau Pleine 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 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 aimed at the stabilization of the prices paid producers for agricultural products and administers federal funds for rural soil and water and other resource conservation activities. The Agricultural Conservation Program (ACP) which is administered by ASCS will, to the extent possible, be coordinated with the Lower Big Eau Pleine Priority Watershed Project. In addition other conservation incentives such as the Conservation Reserve Program (CRP) will be used whenever possible to control critical nonpoint sources of pollution.

Agricultural Best Management Practices (BMPs)

BMPs Eligible for Cost Sharing and Their Rates

Best management practices are those practices identified in NR 120 which are determined in this watershed plan to be the most effective controls of the nonpoint sources of pollution. The practices eligible for cost sharing under the Lower Big Eau Pleine 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. Generally these practices 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.

Table 5-1. State Cost-share Percent Rates for BMPs[1]

BMP	State Cost-share Rate
Field Diversions and Terraces	70%
Grassed Waterways	70%
Critical Area Stabilization	70%[2]
Shoreline Buffers	70%[2]
Wetland Restoration	70%[2]
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Shoreline and Streambank Stabilization	70%[3]
Barnyard Runoff Management	70%
Animal Lot Relocation	70%
Manure Storage Facilities	70%[4]
Nutrient and Pesticide Management	50%[5]

1. See Table 5-2 for BMPs cost-shared at a flat rate.
2. Easements may be entered into with landowners identified in the watershed plan in conjunction with these BMPs. See Chapter Four for an explanation of where easements may apply.
3. Pasture pumps are an eligible component to this BMP.
4. Maximum cost-share amount is $20,000.
5 Spill control basins have a state cost-share rate of 70 percent.

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

BMP	Flat Rate
Contour Farming	$ 6.00/ac*
Contour or Field Strip Cropping	$ 10.00/ac*
Reduced Tillage	$ 10.00/ac
Streambank Fencing/Woodland Fencing	
Temporary	$ 8.00/rod
Permanent	$ 16.00/rod

*Wildlife habitat restoration components of this practice are cost-shared at 70 percent.

The following is a brief description of some of the most commonly used BMPs included in Table 5-1 and 5-2. A more detailed description of these practices can be found in NR 120.14. Refer to Alternative BMP proposals (available from County LCD or DNR) for details on criteria and conditions for use of these practices.

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 then one primary tillage pass in the fall or spring and no more than two 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.

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.

Shoreline and Streambank Stabilization: The stabilization and protection of stream and lake banks against erosion and the protection of fish habitat and water quality from livestock access. This practice includes streambank rip-rap, streambank sloping and seeding, stream crossings, watering ramps, streambank fencing and fish habitat structures. This practice may also include plans and practices to manage or exclude 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 water from areas it is in excess or is doing damage 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 for the storage of manure for a period of time that is needed to reduce the impact of manure as a nonpoint source of pollution. Livestock operations where this practice applies are those where manure is winterspread 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 eroded from critical agricultural fields and other pollutants to surface waters and wetlands.

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

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

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

Pesticide Management: The management of the handling, disposal and application of pesticides including the rate, method and timing of application to minimize the amount of pesticides entering surface and groundwater. Structural practices such as spill control basins will be eligible for cost sharing under some conditions.

Spring Development: Improving springs and seeps by excavating, cleaning, capping, or providing collection and storage facilities in order to provide a watering area for livestock and restrict their access to the total spring area to reduce damage to the wet area and improve water quality.

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

Construction Erosion Control: during best management practice installation.

Alternative Best management Practices

- Abandonment of leaking and improperly sited manure storage systems. Proper abandonment of leaking and improperly sited manure storage systems will aid in protection of water resources from contamination by animal waste. The practice

includes proper removal and disposal of wastes, liner materials, and saturated soil as well as shaping, filling, and seeding of the area.

- 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 wile enhancing a dense, stable vegetative cover. Practice will be limited to one trial in the watershed which will then be evaluated before potentially expanding use.

BMPs Not Cost-shared

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

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

Activities and Sources of Pollution Not Eligible For Cost-share Assistance

Priority watershed cost-share funds cannot be used to control sources of pollution and land management activities specifically listed in NR 120.10(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 which have drainage of land or clearing of land as the primary objective.
- Practices already installed,with the exception of repairs to the practices which were rendered ineffective due to circumstances beyond the control of the landowner.
- Activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) Program or covered in other ways by Chapter 147 of Wis. Stats. (including

livestock operations with more than 1,000 animal units, or livestock operations issued a notice of discharge under ch. NR 243).

- Septic system controls or maintenance.
- Dredging activities.
- Silvicultural activities.
- Bulk storage of fertilizers and pesticides.
- Activities and structures intended primarily for flood control.
- Practices required to control sources which were adequately controlled at the time the cost-share agreement was signed, with the exception of those that occur beyond the control of the landowner,
- Other practices or activities determined by DNR not to meet the objectives of the program.

Cost-Share Budget

Costs of Installing BMPs

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

The capital cost of installing the BMPs is approximately $4.8 million, assuming 100 percent participation.

- State funds necessary to cost-share this level of control would be about $3.2 million.
- The local share provided by landowners and other cost-share recipients would be about $1.5 million.

At a 75 percent level of participation, the state funds needed to cover capital installation would be about $2.4 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 percent participation, the estimated purchase price of easements on eligible lands would be $50,000. At 75 percent 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.

Cost Containment

Cost Containment Procedures

Chapter NR 120 requires that cost containment procedures be identified in this plan.

Cost-share payments will be based on actual installation costs. If actual installation costs exceed the amount of cost sharing determined by the bidding, range of costs and average cost methods the amount paid the grantee may be increased with the approval of the appropriate land conservation committee. Appropriate documentation regarding the need for changes will be submitted to DNR. The cost containment procedures to be used by Marathon County are described in the county's bidding procedure. Copies of the bidding procedure can be obtained from the county LCD. If these procedures change, they are subject to approval by DATCP and DNR.

Bids and Average Costs

Conservation practices estimated to cost in excess of $5,000 are to be bid according to Marathon County LCD bidding procedure. Conservation practices estimated to cost less than $5,000 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.

Table 5-3. Cost-share Budget Needs for Rural Management Practices in Marathon County

Management Needs BMPs	Number	Cost/Unit	Total Cost[1]	100% Participation		75% Participation	
				State Share	Local Share	State Share	Local Share
Upland NPS Control							
Change in Crop Rotation	12,000 ac	$ NA[2]	$ 0	$ 0	$ 0	$ 0	$ 0
Contour Cropping	11,000 ac	6	66,000	66,000	[3]	49,500	[3]
Contour Strip Cropping	3,000 ac	10	30,000	30,000	[3]	22,500	[3]
Reduced Tillage[4]	2,000 ac	10	20,000	20,000	[3]	15,000	[3]
Critical Area Stabilization							
Shaping and Seeding	100 ac	300	30,000	21,000	9,000	15,750	6,750
Tree Planting	25 ac	150	3,750	3,750	[3]	2,813	[3]
Grass Waterways	50 ac	1,000	50,000	35,000	15,000	26,250	11,250
Agricultural Sediment Basin	10 ea	3,000	30,000	21,000	9,000	15,750	6,750
Nutrient and Pest Mgmt.[6]	15,300 ac	25	382,500	191,250	191,250	143,438	143,438
Shoreline Buffers	100 ac	250	25,000	17,500	7,500	13,125	5,625
Wetland Restoration	50 ea	2,000	100,000	70,000	30,000	52,500	22,500
Livestock Woodlot Exclusion	1,000 rods	16	16,000	11,200	4,800	8,400	3,600
Spill Control Basins	3 ea	15,000	45,000	31,500	13,500	23,625	10,125
Animal Waste Management							
Barnyard Runoff Control							
Complete System	91 ea	16,000	1,456,000	1,019,200	436,800	764,400	327,600
Roof Gutters	115 ea	1,500	172,500	120,750	51,750	90,563	38,813
Clean Water Diversion	85 ea	2,500	212,500	148,750	63,750	111,563	47,813

Table 5-3. Cost-share Budget Needs for Rural Management Practices in Marathon County

Management Needs BMPs	Number	Cost/Unit	Total Cost[1]	100% Participation		75% Participation	
				State Share	Local Share	State Share	Local Share
Manure Storage Facility[5]	57 ea	$25,000	$1,425,000	$997,500	$427,500	$748,125	$320,625
Abandoned/Improperly Sited Manure Storage Systems	18 ea	25,000	450,000	225,000	225,000	168,750	168,750
Streambank Erosion Control							
Shape and Seeding	20,000 ft	4	80,000	56,000	24,000	42,000	18,000
Fencing	2,000 rods	16	32,000	32,000	[3]	24,000	[3]
Rip-Rap	2,000 ft	20	40,000	28,000	12,000	21,000	9,000
Crossing/Watering Ramp	25 ea	2,000	50,000	35,000	15,000	26,250	11,250
Fish Structures	25 ea	500	12,500	8,750	3,750	6,563	2,813
Remote Watering Systems	10 ea	1,000	10,000	0	0	0	0
Subtotal			$4,738,750	$3,189,150	$1,539,600	$2,391,865	$543,152
Easements	100 ac	500	50,000	50,000	0	37,500	0
Totals			$4,788,750	$3,239,150	$1,539,600	$2,429,365	$543,152

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, including no-till, on rotations including hay
5. Maximum cost-share is $20,000
6. Represents costs per acre over 3-year period. Cost-share is 50 percent.

Source: WI DNR; WI DATCP; and the LCD of Marathon County

Cost-Share Agreement Reimbursement Procedures

Nonpoint Source Grant Agreement and Administration

General Information

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

A portion of the Nonpoint Source Grant is forwarded to Marathon 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

Counties are required by NR 120 to maintain a financial management system that accurately tracks the disbursement of all funds used for the Lower Big Eau Pleine Watershed Project. The records of all watershed transactions must be retained for three 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 a percent of the costs of installing BMPs to meet the project objectives. Landowners have three years after formal approval of the watershed plan to enter into cost-share agreements. Practices included on cost-share agreements must be installed within the schedule agreed to on the cost-share agreement. Unless otherwise approved, the schedule of installing BMPs will be within five years of signing of the cost-share agreement. Practices must be maintained for a minimum of ten years from the date of installing the final practice included in the cost-share agreement.

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, the timetable for installation, and number of years the practice must be maintained. The agreements also identify and provide information on practices not cost-shared through the nonpoint program but that are essential to controlling pollution sources (such as crop rotations). These items will be completely listed in the conservation plan and the conservation plan is tied to the CSA via addendum 2 of the CSA. Once it is signed by both parties, they are legally bound to carry out the provisions in it.

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

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

The cost-share agreement binds the 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.

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

Landowner Contact Strategy

The following procedure will be used to make landowner contacts.

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

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

- 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.

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

Procedure for Developing a Cost-share Agreement

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

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

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

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

1. Landowner and county staff meet to discus 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. A farm conservation plan is prepared by the county.

4. The landowner agrees with the plan, a Cost-share Agreement is prepared and both documents are signed by the landowner and the county. A copy of the Cost-share Agreement (CSA) is sent to the DNR North Central District Nonpoint Source Coordinator and a copy given to the landowner along with a CAMPS report for eligibility and pollutant load tracking. The CSA will be recorded by the county with the County Register of Deeds.

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

6. 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. Checks are issued by the county to the respective landowners and project ledgers are updated.

13. The county records the check amount, number, and date.

14. DNR reimburses the county for expended cost-share funds.

Identifying Wildlife and Fishery Needs

The Marathon County staff will consult with DNR's North Central 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 installation of agricultural BMPs.

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

- Identifying streambank protection practices that benefit fish and wildlife.

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

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

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

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

Submittal to the DNR

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

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

Local Assistance Grant Agreement Administration

General Information

The Local Assistance Grant Agreement (LAGA) is a grant from the DNR to Marathon County for supporting their staffing and support costs 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

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

Fiscal Management Procedures, Reporting Requirements

Marathon County is required by NR 120 to maintain a financial management system that accurately tracks the disbursement of all funds used for the Lower Big Eau Pleine Watershed Project. The records of all watershed transactions must be retained for three years after the date of final project settlement. A more detailed description of the fiscal management procedures can be found in NR 120.25 and NR 120.26.

NR 120 requires quarterly reports to DATCP from each county in accordance with s. Ag. 166.40(4) accounting for staff time, expenditures, and accomplishments regarding activities funded through the watershed project. Reimbursement requests are sent to the DNR Bureau of Community Assistance and may be included with the submittal of the quarterly project reports.

Budget and Staffing Needs

This section estimates the funding and staffing required to provide technical assistance for the rural portion of this project. These estimates are based on needs identified for Marathon County.

Staff Needs

Table 5-4 lists the total estimated staff needed to implement the project in Marathon County. Figures are provided for both the 50 percent and 75 percent levels of participation. A total of about 45,048 staff hours are required in Marathon County to implement this plan at a 75 percent landowner participation rate. This includes 1,748 staff hours to carry out the information and education program.

Current Workload Analysis shows 3.5 employees in Marathon County working on the Lower Big Eau Pleine 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.

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

Activity	Project Years When Work Will Be Done	MARATHON COUNTY	
		75% Landowner Participation (Staff Hours)	50% Landowner Participation (Staff Hours)
Project & Financial Mgmt.	1-8	6,400	6,400
Information & Education Program	1-8	1,748	1,748
Pre-Contact Office Inventory; Landowner Contacts, & Progress Tracking	1-3	1,200	800
Conservation Planning & Cost-share Agreement Development	1-3	6,000	4,000
Plan Revisions and Monitoring	1-8	3,000	2,000
Practice Design & Installation	1-8		
Upland Sediment Control		4,000	3,000
Animal Waste Management		19,180	12,780
Streambank Erosion Control		2,000	1,400
Training	1-8	1,520	1,520
Total LCD Workload		45,048	33,648
Estimated Staff Required for Years 1-3		3.5 per year	2.5 per year
Hours/Year		7,214 per year	5,289 per year
Estimated Staff Required for Years 4-8		2.3 per year	1.7 per year
Hours/Year		4,681 per year	3,556 per year

Source: WI DNR; WI DATCP and LCD of Marathon County

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

Item	Costs (State Share)
Cost-share funds: Practices	$2,391,865
Cost-share funds: Easements	$37,500
Local Assistance Staff Support*	$824,800
Information/Education Direct	$10,170
Other Direct (travel, supplies, etc.)	$108,208
Engineering Assistance**	$0
Totals	$3,372,543

* Salary + benefits

** Currently engineering duties are completed by the SCS Area Engineer SCS area engineer. Due to increasing workload on the area engineer, future arrangements may have to be made to acquire adequate engineering services at substantial cost.

Source: WI DNR; WI DATCP and LCD of Marathon County

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

Item	Project Year			
	1	2	3	3 - 8
Cost-Share Funds: Practices	$717,559	$717,559	$956,746	$0
Cost-Share Funds: Easements	12,500	12,500	12,500	0
Local Assistance Staff Support	94,500	98,800	103,100	515,500
Information/Education: Direct	1,920	1,650	1,600	5,000
Other Direct:	13,526	13,526	13,526	67,630
Totals	$840,005	$844,035	$1,087,472	$588,130

Source: WI DNR; WI DATCP; and the LCD of Marathon County

Staffing Costs

The estimated cost for staff at the 75 percent participation rate (see Table 5-5) is approximately $824,800 in Marathon County. All of these costs, with the exception of some direct cost items, would be paid for by the state.

Implementation Schedule

Grant Disbursement and Project Management Schedule

Implementation may begin upon approval of this watershed plan by the Marathon County Board, 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 year period.

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

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

Total Project Cost

The total state funding required to meet the rural nonpoint source pollution control needs at a 75 percent 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 $3.0 million.

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

Involvement of Other Programs

Coordination With State and Federal Conservation Compliance Programs

The Lower Big Eau Pleine 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 Marathon County and the SCS office to identify landowners within the watershed that are subject to the compliance provisions of FPP and FSA (total of 19 landowners in the Lower Big Eau Pleine River Watershed). Conservation Farm Plans were completed for 1,050 landowners in Marathon County FSA on July 1, 1992. Because of the large number of landowners, there remains a number of HEL determinations to be completed.

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 and 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 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 using low cost practices.

CHAPTER SIX
Information and Education Program

Objective

The objective of the Information and Education (I & E) program is to improve water quality by maximizing landowner participation in the Lower Big Eau Pleine Priority Watershed Project.

Goals of the Program

To achieve its objective of cleaner water, the I & E program has been structured around the following goals:

- Increased awareness, understanding and appreciation of the water resources in the Lower Big Eau Pleine Priority Watershed.
- Increased understanding of the principles of water pollution, especially nonpoint source water pollution as experienced in the Lower Big Eau Pleine Priority Watershed.
- Increased awareness and understanding of BMPs being promoted through the Lower Big Eau Pleine Priority Watershed Project, including how these practices can lead to cleaner water and improved farm management.
- Increased awareness and understanding of the purpose, operation and benefits of the Lower Big Eau Pleine Priority Watershed Project.

The program activities described later in this chapter identify which of these four goals are targeted for each individual activity.

Audience

The primary audience of the I & E Program are Priority Watershed landowners who have been classified as eligible for project participation. Secondary audiences are priority

watershed landowners that are not eligible for project participation, suppliers of services to the priority watershed, interest groups, and the general public.

Delivery Team

The Marathon County LCD will take the lead responsibility for the delivery of the I & E Program, with the University of Wisconsin Cooperative Extension (UWEX), the DNR and DATCP providing supporting assistance.

Activities

Newsletters

Newsletters will be a major component of the project's I & E strategy. During the sign-up period, newsletters will focus on program participation, BMPs and the benefits from the installation of practices. Newsletters will be sent to all landowners in the watershed from an existing mailing list which includes owners of 10 or more acres. During the implementation period, newsletters will emphasize the operation and maintenance of BMPs, the water quality improvements realized through BMP installation and overall watershed progress. Three newsletters per year will be sent out during project sign-up. After project sign-up and to the end of the project, two newsletters per year will be prepared. Newsletters will be the responsibility of the Marathon County LCD.

News Releases

News releases will be sent to local newspapers. Topics of the news releases will include:

- Description of the water resources and impact of nonpoint source pollution in the watershed.
- Current status of watershed project progress.
- Success stories of improved water quality.
- Invitations to project tours.
- Pollution awareness and benefits of BMP installation.

The news releases will be the responsibility of the Marathon County LCD. Two releases per year will be scheduled during project sign-up and one release per year during implementation.

Public Informational Meetings and Presentations

A public meeting, during each of the three years of the project sign-up, will be held by the Marathon County LCD. All landowners eligible for practice cost sharing will be invited to the meetings. This will provide an opportunity to answer any questions and convince landowners to participate. Topics that will be covered at these meetings will be:

- The explanation of nonpoint source pollution and detailed explanations of BMPs needed to reduce pollution problems. These meetings will cover practices and what goes into them in detail.
- Program overview, including project sign-up, practice design installation, and payment procedure.
- Goals and objectives of the watershed plan.
- Administrative rules for the watershed project, including eligibility and cost sharing.

Demonstration Tours

Six sites have been selected for demonstrations, three for barnyards, one for streambank fencing and watering, and two for of wetland restorations. Construction of these should be completed in the Fall of 1992 or early Summer of 1993. Tours of these BMP demonstrations will allow landowners to observe BMPs first hand with watershed project staff present to answer questions. Meeting farmers that have installed these BMPs will encourage landowners attending the tour to participate with the project. Two formal well publicized tours will be held. One tour will be at the beginning of the project sign-up and the other at the end of the second year of sign-up. Landowners of previous demonstration projects have been willing to allow visitors to come on their farm and look at the BMP at other times than tours. The tours will be conducted by the Marathon County LCD.

Demonstration Farm Video

A video tape is being produced to show the before and after conditions of BMPs on the Demonstration farms. This tape will be shown at the tours and at meetings. It is being produced by Northcentral Technical College. Many times people are not aware of what the demonstration farm looked like before the BMPs were installed. This video will help show what can be done with a site. The video will be finished when the demonstration projects are completed.

Demonstration Farm Fact Sheet

A fact sheet will be prepared for each barnyard demonstration. It will include the before and after photos, a project explanation, an outline of costs, and the cost sharing breakdown. This will be done when the practice is completed and the necessary information is available. This will be completed by the Marathon County LCD.

Project Display

A project display that was originally made for the Upper Big Eau Pleine Watershed Project, has been converted for use in the Lower Big Eau Pleine. This display can be used in banks, schools and co-ops and will highlight area nonpoint source pollution problems and solutions during the beginning of the project sign-up. The display will be used and taken care of by the Marathon County LCD.

Slide Presentation

A slide presentation on nonpoint pollution will be created. The presentation will be used at meetings and talks given to school groups and service organizations. The slide presentation will be completed by the Fall of 1992 by the Marathon County LCD.

Summary of completed I&E Tasks

Several items of the I & E strategy have been completed previous to the implementation stage of the project. They were paid for with previous grants. They are as follows:

- Watershed Boundary signs (5).
- Information Packets (3) containing activities for farmers, homeowners and community residents for the improvement of local water resources.
- Project display cases (4) at the boat landings in the Big Eau Pleine Park to educate the recreational users of the Reservoir.
- Construction site project signs for display during BMP construction.
- Promotional baseball style caps with project logo to be given to project participants.
- Project brochures explaining the project, its goals, timetable, etc.

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

Activity	Total Number	Total Direct Costs	Required Staff Hours	
			Years 1-3	Years 4-8
Newsletters	19	$ 9,500.00	540	600
News Releases	11	0	48	40
Public Meetings	3	300.00	80	0
Demonstration Tours	2	100.00	120	0
Demonstration Farm Video	1	50.00	50	0
Demonstration Farm Fact Sheet	6	200.00	100	0
Project Display	1	0	50	0
Slide Presentation	1	20.00	80	40
Totals		$10,170.00	1,068	6,80

CHAPTER SEVEN
Integrated Resource Management Program

Introduction

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

Fisheries

Watershed best management practices (BMPs), such as streambank protection, shoreline buffer strips, and easements, should be implemented in such a way that will enhance fishery management goals. Specifically, all streambank protection BMPs should be installed in such a way that fisheries habitat is enhanced. Large diameter-sized rock should be used below the water line. Rock riprap should be installed and sized so that the placement and size of rock will positively benefit trout habitat. The fishery manager should be consulted for input in the design of each streambank protection BMP.

Wetland Restoration

Significant amounts of restorable wetland areas exist in this watershed. This is especially so for the floodplain areas along the main stem of the Big Eau Pleine River and Fenwood Creek. The general guidelines for wetland restoration, easement acquisition, and shoreline buffers to protect existing wetlands should be followed. Wetlands that are important wildlife habitats will be identified by the U.S. Fish and Wildlife Service in consultation with the DNR private lands manager. Shoreline buffer easements may be acquired adjacent to these wetlands to better protect them from sedimentation and other nonpoint source pollution.

These wetlands (existing and restorable) were identified in the wetlands inventory conducted by the Marathon County LCD. In addition to the normal priority watershed funding, additional cost-sharing may be available to provide for a 100 percent payment for installation of the BMP. This additional funding may be available through the DNR district private lands manager, and/or the U.S. Fish and Wildlife Service. Eligibility for this additional funding would be determined by the DNR's private lands manager or the district nonpoint source coordinator.

Riparian Zones

Where possible, riparian zones along creeks should be protected with fencing to protect them from livestock grazing and trampling. These can be acquired through easements so that they receive lasting protection. These areas are important wildlife habitats, particularly for wood ducks.

Stewardship

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

Freeman Creek is the eligible stream in the watershed. Additional streams should be nominated when the nomination period is reopened.

Endangered Resources

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

Cultural Resources

Procedures for coordination with state and federal historic preservation laws are outlined in Chapter 2. The five known archaeological sites within the Lower Big Eau Pleine River watershed will need special consideration when structural best management practices are being considered. Settling basins, manure storage structures, and streambank or shoreline shaping and riprapping are likely practices that may impact archaeological sites.

Coordination With State and Federal Conservation Programs

The Lower Big Eau Pleine 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.

Coordination With the Big Eau Pleine Citizens Organization (BEPCO)

BEPCO is a citizens organization who's main concerns are for the quantity and quality of water in the Big Eau Pleine Reservoir.

Lower Big Eau Pleine River Project staff will continue to update BEPCO on the status of the watershed projects, through attendance at board meetings and public meetings. Fact sheets and other educational materials aimed at landowners around the reservoir will be distributed to BEPCO representatives. An active member of BEPCO serves on the Lower Big Eau Pleine River Citizens Committee.

Coordination With the Wisconsin Valley Improvement Company (WVIC)

Coordination between WVIC and the Lower Big Eau Pleine River Watershed project is mainly in three areas:

1. WVIC staff does comprehensive water quality monitoring on the Big Eau Pleine Reservoir. Data collected is available for use by watershed project staff.

2. WVIC and the Marathon County Parks and Recreation Department cooperatively operate and maintain the aerators in the Big Eau Pleine Reservoir.

3. WVIC staff conducts fish studies and monitors shoreline erosion on the Big Eau Pleine Reservoir.

A representative from the Environmental Department of WVIC is on the Lower Big Eau Pleine River Citizens Advisory Committee. The Lower Big Eau Pleine River Project staff will continue to work cooperatively with and share information with the WVIC.

CHAPTER EIGHT
Project Evaluation

Introduction

This chapter briefly summarizes the plan for monitoring the progress and evaluating the effectiveness of the Lower Big Eau Pleine River Priority Watershed Project. The evaluation strategy includes these components:

- Administrative review
- Pollution reduction evaluation

Information on these components will be collected by the Marathon County LCD and reported on a regular basis to the DNR and the DATCP. Additional information on the numbers and types of practices on cost-share agreements; funds encumbered on cost-share agreements, and funds expended will be provided by the DNR's Bureau of Community Assistance.

Administrative Review

The first component, the administrative review, will focus on the progress of Marathon County in implementing the project. The project will be evaluated with respect to accomplishments, financial expenditures, and staff time spent on project activities.

1. Accomplishment Reporting: The Computer Assisted Management and Planning System, called CAMPS, is a computer data management system that has been developed by the U.S. Soil Conservation Service (SCS). The SCS, the DNR and the DATCP use CAMPS to meet the accomplishment reporting requirements of all three agencies. The Marathon County LCD will use CAMPS to collect data for administrative accomplishments, and will provide the information to the DNR and the DATCP for program evaluation.

   The Marathon County LCD will provide the following data to the DNR and the DATCP every quarter:

   - Number of personal contacts made with landowners
   - Completed information and education activities

- Number of farm conservation plans prepared for the project
- Number of cost-share agreements signed
- Number of farm conservation plan and cost-share agreement status reviews completed
- Number of farms and acres of cropland checked for proper maintenance of BMPs

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

2. Financial Expenditures:

Marathon County will provide the following financial data to the DNR and the DATCP every quarter:

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

Marathon 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

3. Time Spent On Project Activities: Marathon 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. Key sources were identified for estimating changes in pollutant loads that reach creeks in the Lower Big Eau Pleine River Watershed; upland sediment, and runoff from barnyards and fields spread with manure, and streambank/shoreline erosion.

As described in Chapter 3, this plan calls for the following pollutant reductions for all subwatersheds:

- 45 percent reduction in upland sediment delivered to streams
- 70 percent reduction in phosphorus from barnyard runoff
- 50 percent reduction of critical acres winterspread with manure
- 40 percent reduction in sediment delivered to streams from streambanks and 25 percent overall repair of bank habitat
- Restoration of 10 percent of degraded or prior converted wetlands

Streambanks

Marathon 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 the time of contact, and changes in erosion levels estimated after installing BMPs.

Upland Sediment Sources

Marathon County will use the WIN (Wisconsin Nonpoint Source) model to estimate sediment reductions due to changes in cropping practices. The counties will use CAMPS to provide data for the WIN model on a quarterly basis, as described above.

Barnyard Runoff

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

If CAMPS is replaced, the replacement system will be used for all project tracking.

CHAPTER NINE
Watershed Resources Evaluation Monitoring

Introduction

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 best management practices 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 the implementation of BMPs needed, and their effectiveness in reducing the problems that contribute to the non-attainment of water quality objectives at specific sites.
- Evaluate the priority watershed plans applicability to the management of water resources, and the attainment of water quality standards and beneficial uses.

Program Organization

1. Evaluation monitoring activities in priority watersheds will be planned and conducted according to monitoring program guidance in the Bureau of Water Resources, Surface Water Monitoring Strategy.

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

2. 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 the program evaluation monitoring goal and objectives.

3. Evaluation monitoring need not be conducted in each priority watershed.

Site Selection Criteria

The following criteria are suggested for site selection in agricultural watersheds to be intensively evaluated as part of basin assessments, or as special projects:

Location

- Where BMPs are planned but yet to be 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 cost-share agreements have been signed. Extra effort should be made to achieve full participation by all land owners
- Where sites are not meeting attainable uses and have a high potential to improve following management of 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 due to 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 cfs.
- Watersheds should be manageable with areas of 5 to 50 square miles.

Water Quality

- Suspected or known water quality problems should be caused by manageable nonpoint sources should not be present or not significant
- 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 conducting 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. And, county staffs should be contacted to determine the potential for land owner 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 Bureau 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 guidance for developing monitoring plans. Any option, or a combination of options, may be used for evaluating priority watershed projects.

Basin Assessment Approach

1. Select specific sites in priority watersheds that meet site selection criteria, including at least on 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 would 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

3. 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.

Watershed Evaluation

Evaluation monitoring will be conducted during the eight year implementation phase and will continue for an additional two years. Thus evaluation monitoring activities will not be completed until 2002.

North Central District staff recommends a 5-year basin assessment approach, (with exception of the Big Eau Pleine Reservoir, which will continue to be monitored as described in the Upper Big Eau Pleine River Priority Watershed Plan (Publication WR-197-87). If time and manpower are available and if it is approved in the district surface water monitoring plan, a special project monitoring approach will also be considered at selected sites which meet the site selection criteria.

Basin Assessment Approach

- Watershed Streams (excluding Big Eau Pleine Reservoir)

  North Central District Staff will conduct or repeat appraisal type monitoring at the same sites that were monitored in 1990-91 as part of the Appraisal Monitoring Plan/Report (Kreitlow, 1990 and 1991). Monitoring will follow the five year basin assessment schedule and will include the same types of monitoring outlined in the Lower Big Eau Pleine Appraisal Report (Kreitlow, 1991). This monitoring approach should detect habitat and surface water quality improvements, especially where they are significant. Monitoring will occur only in subwatersheds where significant BMP Installation has occurred.

- Big Eau Pleine Reservoir

  Monitoring of the Reservoir will continue as described in the Upper Big Eau Pleine Priority Watershed Plan (Chapter 9, Evaluation Plan). Since both the Upper and Lower Priority Watershed Projects have a common goal of improving water quality and recreational uses in the reservoir, the monitoring will be extended beyond 1997 through the year 2002 to evaluate improvement as a result of this Watershed Project. The frequency of monitoring beyond 1997 may be adjusted depending on the interpretation of water quality data being collected. The reader is referred to the Nonpoint Source Control Plan for the Upper Big Eau Pleine River Priority Watershed Project (Publication WR-197-87) for a complete description of the monitoring activities that are and will continue to take place.

Special Projects Approach (optional)

North Central district staff proposes more intensive/frequent monitoring at selected sites. Again this is optional and its implementation is based on available manpower and approval in the districts surface water monitoring plan. Sites where this type of monitoring may take place include:

- Rocky Run Creek above the second Still Hill Road crossing (T27N,R5E,Section 5)
- Burns Creek between Maple Leaf and Briarwood Roads), (T27N,R5E,Section 14)
- A reference site, where few, if any management practices are implemented, will be selected within the Little Eau Pleine River Watershed or Lower Rib River Watershed. (Note: This site will have similar characteristics as one of the above sites.)

These stream reaches will be evaluated using a combination of two methods.

1) **In-stream fish habitat** will be monitored using a technique developed by Simonson and Lyons (Evaluation Monitoring of Stream Habitat During Priority Watershed Projects, Draft, Tim Simonson, John Lyous, 1992). This method measures the physical characteristics of a stream before and after best management practices are installed and therefore should show improvements in stream habitat.

2) **Changes or improvements in fish communities** will be monitored using the Index of Biotic Integrity (IBI), a technique developed by Karr, but adapted to warm-water streams of Wisconsin by Lyons (1992). The IBI is a bio-assessment/bio-monitoring technique that allows attributes of fish communities to be used to assess biotic integrity and environmental quality of streams and rivers (Lyons, 1992). IBI scores are calculated and range from excellent to very poor. (See Table 9-1) Again this technique assumes that improvement in fish habitat and water quality brought about by improved watershed management, will cause changes in fish communities.

It is proposed that each site will be monitored on an annual basis prior to and after installation of management practices. The reference site will be evaluated to account for natural variation.

Table 9-1. Guidelines for interpreting overall IBI scores (modified from Karr et al. 1986)

Overall IBI Score	Biotic Integrity Rating	Fish Community Attributes
100-65	Excellent	Comparable to the best situations with minimal human disturbance; all regionally expected species for habitat and stream size, including the most intolerant forms, are present with a full array of age and size classes; balanced trophic structure.
64-50	Good	Species richness somewhat below expectation, especially due to the loss of the most intolerant forms; some species, especially top carnivores, are present with less than optimal abundances or size/age distributions; trophic structure shows some signs of imbalance.
49-30	Fair	Signs of additional deterioration include decreased species richness, loss of intolerant forms, reduction in simple lithophils, increased abundance of tolerant species, and/or highly skewed trophic structure (e.g., increasing frequency of omnivores and decreased frequency of more specialized feeders); older age classes of top carnivores rare or absent.
29-20	Poor	Relatively few species; dominated by omnivores, tolerant forms, and habitat generalists; few or no top carnivores or simple lithophilous spawners; growth rates and condition factors sometimes depressed; hybrids sometimes common.
19-0	Very Poor	Very few species present, mostly exotics or tolerant forms of hybrids; few large or old fish; DELT fish (fish with deformities, eroded fins, lesions, or tumors) sometimes common.
No score	Very Poor	Thorough sampling finds few or no fish; impossible to calculate IBI.

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APPENDIX A
Water Quality Assessment Methods

Introduction

Part of the Lower Big Eau Pleine River Priority Watershed Project's planning process was to determine the current water quality and water use conditions of the ground and surface water resources in the project area. Then an assessment was made of the potential changes in water quality and use that might be expected as a result of the control of nonpoint source pollutants.

The assessment was made based on many sources of information including: chemical and biological water quality data from the DNR files, the *Surface Water Resources of Marathon* county publication; and input from the county LCD staff, the DNR fish managers, and the DNR water quality specialists. Two of the tools used in this assessment are discussed in more detail below.

Biotic Index

The type of insects found living on rocks and in other habitats in a stream reflects the water conditions of that stream. Certain species of insects will tolerate only unpolluted waters while others are able to survive various degrees of water pollution. The term pollution in this discussion refers to organic material in the water. Two ways organic pollutants affect water quality are that the organic material adds nutrients to the water which may result in nuisance growth of algae or weeds, and the bacterial breakdown of the organic material can deplete water of its dissolved oxygen, which is required for fish survival.

The Hilsenhoff Biotic Index, or HBI (Hilsenhoff, 1982) was developed in Wisconsin and indicates the degree of organic pollution in a stream by the types of insects living in the stream. Organic pollution tolerance values are assigned to various species of insects. The scale of the values is zero to 10, with zero being the least tolerant (that is, insects least tolerant to organic pollution in the stream). The number and types of insects found at a stream site are used to calculate an HBI value between zero and five for the stream. Qualitative descriptions of water quality for the index values are given in Table A-1.

Table A-1. Qualitative Descriptions for the Biotic Index

HBI Range	Water Quality	Degree of Organic Pollution
0.00 - 3.50	Excellent	No organic pollution
3.51 - 4.50	Very Good	Possible slight organic pollution
4.51 - 5.50	Good	Some organic pollution
5.51 - 6.50	Fair	Significant organic pollution
6.51 - 8.50	Poor	Very significant organic pollution
8.51 - 10.00	Very Poor	Severe organic pollution

Source: Hilsenhoff 1987

Stream Fishery Habitat Assessment

In order to determine the present and potential future fishery uses of the streams, a procedure developed by Joe Ball of the DNR was used. This procedure is described in Stream Classification Guidelines for Wisconsin (Ball, 1982). The system uses an inventory of the stream's physical fish habitat conditions (such as stream flow, bed type, amount of riffles and pools, and streambank conditions) along with other parameters (water quality, water temperature, pH [degree of acidity or alkalinity], and current stream biotic conditions) to classify the present fishery use of the stream.

This information is modified to simulate the conditions that may be present as a result of a successful nonpoint source control project in the watershed. This second step indicates what may be expected in the fishery with successful nonpoint source controls.

Table A-2 indicates the general conditions that need to be present in order for a stream to support various fishery types.

Groundwater Sampling

Nitrate is one of the oldest contaminants known in Wisconsin groundwater. Nitrate is water soluble and moves easily through soil. It does not naturally occur in soil minerals or groundwater. Any elevated levels are due to human activities. Sources of nitrate in groundwater include fertilizers, animal waste, septic systems, and land disposal of nitrogen-containing waste in amounts that exceed the ability of plants to use it quickly.

Table A-2. Physical and Chemical Guidelines for Aquatic Life Use

Parameter A	Use Class and Criteria			
	B	C	D	E
Flow (cfs)(1)	>.5	>3	>.2	>.0
Water Quality Dissolved Oxygen (mg/l) (2)(3)	>4	>3	>3	>1
Temperature (Deg.F)(3)	<75	<86	<86	<90
pH (3) 5-9.5	5-10.5	5-10.5	4-11	4-11
Toxics (4) acute	<acute	<acute	acute	>acute
Habitat Rating (1)	<144	<144	<144	>200

1 Wisconsin DNR
2 U.S. EPA (1977)
3 Alabaster and Lloyd (1980)
4 U.S. EPA (1980)

"<" means "less than"
">" means "greater than"

Use Classes
A: Cold Water Sport Fishery
B: Warm Water Sport Fishery
C: Valuable Tolerant Forage Fishery
D: Rough Fish
E: No Fishery

Source: DNR Technical Bulletin (Unpublished) (Ball, 1982).

Wetland Inventory Methods

Wetlands within the watershed were inventoried using Soil Conservation Service wetland maps and DNR Wetland Inventory Maps. Not all wetlands were inventoried because primary interest lies in areas that affect water quality within the watershed. Wetlands that are presently in, or have been in the past, degraded through drainage, grazing, cropping, or other activities causing water storage loss, build up of sediments, and damage to vegetation. All wetlands from the Wisconsin wetland inventory maps, classified with modifiers of a (abandoned farmland), f (farmed in dry years), g (grazed wetland), v (vegetation recently removed), and x (excavated wetland) were inventoried. All wetlands classified as PC (prior converted) and CW (converted wetland) on the SCS maps were also inventoried. In addition, agricultural lands that were also defined by the SCS as being W (wetland) and NI (not inventoried) were cross referenced with the Wisconsin Wetland Inventory to insure complete coverage.

The inventory for each qualifying wetland consisted of gathering information on location (legal description), landowner, acreage, reference to natural Heritage Inventory, and sub-watershed within which it was located. In addition, each wetland was given a unique identifying number for future reference. Acreage of each wetland was determined by using

either a dot grid or a planimeter. A total of 585 wetland sites were inventoried using this procedure accounting for a total of 4393 acres.

If time permits, a field check will be undertaken to determine the accuracy of the inventory effort. Additional areas overlooked in, or occurring since, the formal Wisconsin and SCS wetland mapping process will be included in this inventory.

Activities in relation to these wetlands will depend on landowner participation and the importance of the particular wetland to the overall watershed program. Wildlife considerations and enhancement opportunities will also be a major factor in determining which wetlands are a high priority. Restoration and enhancement will be funded through Nonpoint Source BMPs and other applicable wetland oriented federal and state programs.

Important wetlands as well as wetland and upland wildlife habitats that are not considered in this process will be logged and may necessitate special landowner contact to relate the importance of these areas to the watershed and the wildlife resource.

Summary

The biotic index and the stream habitat assessment are both important tools for helping to establish water quality and water use objectives in the watershed project. Although no water quality assessment tool can predict with 100 percent accuracy the changes in water quality and water use, these tools can be useful in appraising the current and potential future conditions of the water resources in the watershed project area.

Pollutant Source Assessment Methods

Introduction

Another part of the watershed planning process was collecting information on the various nonpoint sources of pollutants in the watershed. The collection of data was conducted under the supervision of the Marathon County LCD with funding support from the DNR. The LCD hired staff to gather the actual field data. The LCD reviewed and approved the quality of this data. Then the LCD sent the data to the DNR for analysis. The inventory methods used for each nonpoint pollutant source are described below.

Before the inventories were conducted, the watershed was divided into eight subwatersheds. The divisions were based on individual water resources which could be protected or improved by controlling nonpoint sources of pollutants. All inventory data was organized by subwatershed. With this information, objectives could be set for each water body. In addition, the corresponding reduction in pollutants needed to meet the objectives could be determined.

Upland Sediment Inventory Methods

Upland erosion is of concern because it can be a major contributor of sediment to the water resources of a watershed. Sediment in streams and lakes adversely affects the water resources in many ways. Suspended sediment makes it difficult for fish to feed, and it abrades fish gills, making the fish more susceptible to disease. Suspended sediment also causes the water to be warmer in the summer, and warm water cannot hold as much oxygen as cold water. Sediment that settles out fills up pools in streams and destroys fish habitat. Soil from cropland entering the water also contains nutrients and pesticides, which increases the algae and weed growth in lakes and harms the aquatic life of a water body.

An upland sediment source for this project is defined as the sheet and rill erosion from land areas. This erosion is commonly measured by sediment delivery in tons per acre per year. This sediment results from the overland flow of water on fields. It does not include the gully and streambank erosion, both of which also contribute sediment to the surface waters.

The evaluation for this project quantified upland erosion and estimated the amount of eroded sediment that reaches surface waters. Cropland, pastures, grasslands, woodlands and other open non-urban land uses were investigated. Individual parcels were identified on aerial photographs. Parcel boundaries were based on the slope, cropping pattern or predominant vegetation, property boundaries, and drainage characteristics.

The inventory was conducted on a subsample of the 139 square mile watershed, using existing data and field investigations. Existing data sources included site specific farm conservation plans, aerial photographs, U.S. Geological Survey 1"=2,000' scale quadrangle maps, and the county's soil survey. The information obtained for each parcel included size, soil type and its ability to erode, 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 Model, also called WIN (Baun, 1988). This analytical tool was developed by the Wisconsin Nonpoint Source Water Pollution Abatement Program to assess the pollution potential from eroding uplands. The WIN model calculates the average annual quantity of eroded soil that reaches surface waters by determining the soil loss and routing the runoff originating on each parcel under a "typical" year of precipitation. The parcels are ranked according to their potential to contribute sediment to surface waters.

Streambank Erosion Survey

Streambank erosion is the bank failure along channels caused by the cutting action of water on the banks. This erosion is important because of its direct impact on fish habitats like bank shade and cover in addition to the impact of the sediment filling up the stream's pools. Streambank erosion is a natural process but is often accelerated by cultural activities such as grazing cattle.

The inventory method used to evaluate streambank erosion was a modification of the Phase II of the Land Inventory Monitoring process (SCS). The main channels of all streams, were assessed with this method. For each erosion site, the method estimates the volume and the tons of sediment lost on a yearly average. This was done through measuring the length, height, and recessional rate of each erosion site. Recession rates were determined based upon the physical characteristics of the eroded site. The volume of sediment was then multiplied by the density of the sediment to obtain the tons of soil loss from the site. Along with this data, information on the location, landowner identification, and cattle access was collected for each site. Field personnel collected this information by walking the streams. Each erosion site was mapped on ASCS eight-inch-to-the-mile air photos.

Shoreline Erosion Inventory Methods

The Big Eau Pleine Reservoir was inventoried by Marathon County and DNR staff for shoreline erosion during the fall of 1991. An earlier survey done by the Wisconsin Valley Improvement Company served as a guide. The entire reservoir was covered with the exception of from Highway S to Spindler's Bridge or from Highway O down to the dam. Watershed project staff found that identified erosion sites were almost identical to sites listed on WVIC's Big Eau Pleine Reservoir Erosion Map. Sites were evaluated and placed into three categories: mild, moderate, and severe. Data on bank height and lateral recession was collected on each site and the streambank erosion spreadsheet program was used to calculate tons of sediment eroding annually from each site.

Barnyard Runoff Inventory Methods

Dairy operations are the major farm operation in the Lower Big Eau Pleine River Watershed. All barnyards were inventoried to determine the impact of barnyard runoff on water quality. Barnyard runoff carries manure to the streams and ponds of the watershed.

Manure contains several components that adversely affect water quality and aquatic life. Manure contains nitrogen in the form of ammonia. In high concentrations ammonia can be toxic to fish and other aquatic life. When manure enters a water system the breakdown of the organic matter depletes oxygen which fish and other organisms require to survive. Also, the nutrients in manure (including nitrogen and phosphorus) will promote nuisance algae and weed growth in the streams and ponds. Finally, bacteria found in livestock manure is harmful to other livestock drinking the water, and humans using the water for recreation.

The United States Department of Agriculture-Agriculture Research Service developed a computer model to estimate the amount of pollutants coming from a barnyard as a result of a rainstorm. This model was modified by the Wisconsin DNR's Nonpoint Source and Land Management Section. The model has been used to indicate which barnyards within a watershed have the greatest potential to affect water quality from rainfall runoff that washes through a barnyard. The model does not assess manure storage needs or the impact from manure runoff from spread fields, it only assesses the barnyard runoff pollutant quantities.

The information needed to run this model was collected on all of the barnyards in the Lower Big Eau Pleine River Watershed. The data that this model requires includes: the types and numbers of livestock, the size of the yard, the physical characteristics of the area which contributes surface runoff waters to the yard, and the physical characteristics of the area through which the runoff waters leaving the barnyard flow before becoming channelized. A rainfall amount is assigned to the model. The 10-year, 24-hour rain event (4.2 inches) was selected.

With this information, the model calculates the pounds of phosphorus and the pounds of Chemical Oxygen Demand (COD) for each barnyard as a result of the selected rainfall event. COD is a measure of the amount of organic material in the barnyard runoff.

Manure Spreading Runoff

The disposal of livestock wastes on land is a concern for water quality when manure is spread on frozen land with steep slopes or on land in a floodplain. Under these conditions, the spread manure runs off with melting snow or winter rain and enters the streams and lakes of the watershed. The impacts from this runoff are the same as those mentioned in the barnyard runoff discussion.

A complete inventory of winterspread manure was not done for this project. See Chapter 4 for a description of the eligibility criteria.

Point Sources of Pollution

Unlike the activities mentioned above, the point sources of pollution in Wisconsin are regulated by law. For each municipal or industrial wastewater discharge or landfill, the DNR issues a permit which controls the activities and the effluent from each site. The point sources have been the most significant, and the most obvious, sources of water quality impairment in the past. With the large scale effort and funding directed at clean-up of point source pollution in the past 20 years, the water quality impacts from these sources in the watershed were minimized.

As mentioned above, each municipal or industrial discharger or landfill has a permit from the DNR. These permits are reviewed to determine how well the facility is meeting its requirements. If a facility is not in compliance, there are regulatory measures which are employed to insure that these point sources do not compromise the control of the nonpoint sources of pollutants.

Chapter 3 provides details of point sources of pollution in the Lower Big Eau Pleine River watershed.

APPENDIX B
Glossary

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

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

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

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

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

ANAEROBIC:
Without oxygen.

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

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

ANTIDEGRADATION:

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

AVAILABILITY:

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

BACTERIA:

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

BASIN PLAN:

See "Areawide Water Quality Management Plan."

BENTHIC ORGANISMS (BENTHOS):

Organisms living in or on the bottom of a lake or stream.

BEST MANAGEMENT PRACTICE (BMP):

The most effective, practical measures to control nonpoint sources of pollutants that runoff from land surfaces.

BIOACCUMULATION:

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

BIOASSAY STUDY:

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

BIOCHEMICAL OXYGEN DEMAND (BOD):

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

BIODEGRADABLE:

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

BIOTA:
All living organisms that exist in an area.

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

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

CARCINOGENIC:
A chemical capable of causing cancer.

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

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

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

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

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

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

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

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

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

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

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

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

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

CRITERIA:
See water quality standard criteria.

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

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

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

DISSOLVED OXYGEN (DO):
Oxygen dissolved in water. Low levels of dissolved oxygen cause bad smelling water and threaten fish survival. Low levels of dissolved oxygen often result from inadequate

wastewater treatment. The Department of Natural Resources considers 5 ppm DO necessary for fish and aquatic life.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

GREEN STRIPS:
See buffer strip.

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

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

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

HERBICIDE:

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

HYDROCARBONS:

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

INCINERATOR:

A furnace designed to burn wastes.

INFLUENT:

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

IN-PLACE POLLUTION:

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

INTERNATIONAL JOINT COMMISSION (IJC):

An agency formed by the United States and Canada to guide management of the Great Lakes and resolve border issues.

ISOROPYLBIPHENYL:

A chemical compound used as a substitute for PCB.

LANDFILL:

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

LC-1:

The concentration that results in 1 percent mortality of the test animal populations exposed to the contaminant.

LC_{50}:

Lethal concentration for 50 percent of the test population exposed to a toxicant substance.

LD_{50}:

Lethal dose for 50 percent of the test population exposed to a toxicant substance.

LEACHATE:

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

LOAD:

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

MACROPHYTE:

A rooted aquatic plant.

MASS:

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

MASS BALANCE:

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

MESOTROPHIC:

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

MILLIGRAMS PER LITER (mg/1):

A measure of the concentration of substance in water. For most pollution measurement this is the equivalent of "parts per million".

MITIGATION:

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

MIXING ZONE:

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

NONPOINT SOURCE POLLUTION (NSP):

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

NPS:

See nonpoint source pollution.

OLIGOTROPHIC:

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

OUTFALL:

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

PATHOGEN:

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

PELAGIC:

Referring to open water portion of a lake.

PESTICIDE:

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

PH:

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

PHENOLS:

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

PHOSPHORUS:

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

PLANKTON:

Tiny plants and animals that live in water.

POINT SOURCES:

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

POLLUTION:

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

POLYCHLORINATED BIPHENYLS(PCBs):

A group of 209 compounds, PCBs have been manufactured since 1929 for such common uses as electrical insulation and heating/cooling equipment, because they resist wear and chemical breakdown. Although banned in 1979 because of their toxicity, they have been

detected on air, land and water. Recent surveys found PCBs in every section of the country, even those remote from PCB manufacturers.

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

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

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

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

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

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

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

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

RAP:
See Remedial Action Plan.

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

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

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

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA):
This federal law amends the Solid Waste Disposal Act of 1965 and expands on the Resource Recovery Act of 1970 to provide a program that regulates hazardous wastes, to eliminate open dumping and to promote solid waste management programs.

RETRO-FIT:
The placement of an urban structural practice in an existing urban area, which may involve rerouting existing storm sewers and/or relocating existing buildings or other structures.

RIPARIAN:
Belonging or relating to the bank of a lake, river or stream.

RIPRAP:
Broken rock, cobbles, or boulders placed on the bank of a stream to protect it against erosion.

RULE:
Refers to Wisconsin administrative rules. See Wisconsin Administrative Code.

RUNOFF:
Water from rain, snow melt, or irrigation that flows over the ground surface and returns to streams. Runoff can collect pollutants from air or land and carry them to receiving waters.

SECONDARY IMPACTS:
The indirect effects that an action can have on the health of the ecosystem or the economy.

SECONDARY TREATMENT:
Two-stage wastewater treatment that allows the coarse particles to settle out, as in primary treatment, followed by biological breakdowns of the remaining impurities. Secondary treatment commonly removes 90 percent of the impurities. Sometimes "secondary treatment" refers simply to the biological part of the treatment process.

SEDIMENT:
Soil particles suspended in and carried by water as a result of erosion.

SEICHES:
Changes in water levels due to the tipping of water in an elongated lake basin whereby water is raised in one end of the basin and lowered in the other.

SEPTIC SYSTEM:
Sewage treatment and disposal for homes not connected to sewer lines. Usually the system includes a tank and drain field. Solids settle to the bottom of the tank. Liquid percolates through the drain field.

SLUDGE:
A byproduct of wastewater treatment; waste solids suspended in water.

SOLID WASTE:
Unwanted or discharged material with insufficient liquid to be free flowing.

STANDARDS:
See water quality standards.

STORM SEWERS:
A system of sewers that collect and transport rain and snow runoff. In areas that have separated sewers, such stormwater is not mixed with sanitary sewage.

SUPERFUND:
A federal program that provides for cleanup of major hazardous landfills and land disposal areas.

SUSPENDED SOLIDS (SS):
Small particles of solid pollutants suspended in water.

SYNERGISM:
The total effect is greater than the sum of the individual effects. For example, the characteristic property of a mixture of toxicants that exhibits a greater-than-additive cumulative toxic effect.

TACs:
Technical advisory committees that assisted in the development of the Remedial Action Plan.

TERTIARY TREATMENT:
See advanced wastewater treatment.

TOP-DOWN MANAGEMENT:
A management theory that uses biomanipulation, specifically the stocking of predator species of fish to improve water quality.

TOTAL MAXIMUM DAILY LOADS:

The maximum amount of a pollutant that can be discharged into a stream without causing a violation of water quality standards.

TOXIC:

An adjective that describes a substance which is poisonous, or can kill or injure a person or plants and animals upon direct contact or long-term exposure. (Also, see toxic substance.)

TOXIC SUBSTANCE:

A chemical or mixture of chemicals which, through sufficient exposure, or ingestion, inhalation of assimilation by an organism, either directly from the environment or indirectly by ingestion through the food chain, will, on the basis of available information cause death, disease, behavioral or immunologic abnormalities, cancer, genetic mutations, or development of physiological malfunctions, including malfunctions in reproduction or physical deformations, in organisms or their offspring.

TOXICANT:

See toxic substance.

TOXICITY:

The degree of danger posed by a toxic substance to animal or plant life. Also see acute toxicity, chronic toxicity and additivity.

TOXICITY REDUCTION EVALUATION:

A requirement for a discharger that the causes of toxicity in an effluent be determined and measures taken to eliminate the toxicity. The measures may be treatment, product substitution, chemical use reduction or other actions that will achieve the desired result.

TREATMENT PLANT:

See wastewater treatment plant.

TROPHIC STATUS:

The level of growth or productivity of a lake as measured by phosphorus content, algae abundance, and depth of light penetration.

TURBIDITY:

Lack of water clarity. Turbidity is usually closely related to the amount of suspended solids in water.

UNIVERSITY OF WISCONSIN-EXTENSION (UWEX):

A special outreach, education branch of the state university system.

VARIANCE:

Government permission for a delay or exception in the application of a given law, ordinance or regulation. Also, see water quality standard variance.

VOLATILE:
Any substance that evaporates at a low temperature.

WASTELOAD ALLOCATION:
Division of the amount of waste a stream can assimilate among the various dischargers to the stream. This limits the amount (in pounds) of chemical or biological constituent discharged from a wastewater treatment plant to a water body.

WASTEWATER:
Water that has become contaminated as a byproduct of some human activity. Wastewater includes sewage, washwater and the water-borne wastes of industrial processes.

WASTE:
Unwanted materials left over from manufacturing processes, refuse from places of human habitation or animal habitation.

WASTEWATER TREATMENT PLANT:
A facility for purifying wastewater. Modern wastewater treatment plants are capable of removing 95 percent of organic pollutants.

WATER QUALITY AGREEMENT:
The Great Lakes Water Quality agreement was initially signed by Canada and the United States in 1972 and was subsequently revised in 1978 and 1987. It proves guidance for the management of water quality, specifically phosphorus and toxics, in the Great Lakes.

WATER QUALITY LIMITED SEGMENT:
A section of river where water quality standards will not be met if only categorical effluent standards are met.

WATER QUALITY CRITERIA:
A measure of the physical, chemical or biological characteristics of a water body necessary to protect and maintain different water uses (fish and aquatic life, swimming, etc.).

WATER QUALITY STANDARDS:
The legal basis and determination of the use of a water body and the water quality criteria, physical, chemical, or biological characteristics of a water body, that must be met to make it suitable for the specified use.

WATER QUALITY STANDARD VARIANCE:
When natural conditions of a water body preclude meeting all conditions necessary to maintain full fish and aquatic life and swimming, a variance may be granted.

WATERSHED:
The land area that drains into a lake or river.

WETLANDS:

Areas that are inundates or saturated by surface or groundwater at a frequency and duration sufficient to support a variety of vegetative or aquatic life. Wetland vegetation requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas.

WISCONSIN ADMINISTRATIVE CODE:

The set of rules written and used by state agencies to implement state statutes. Administrative codes are subject to public hearing and have the force of law.

WISCONSIN FUND:

A state program that helps pay the cost of reducing water pollution. Funding for the program comes from general revenues and bonds and is based on a percentage of the state's taxable property value. The Wisconsin Fund includes these programs:

Point Source Water Pollution Abatement Grant Program - Provides grants for 60 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, onsite 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

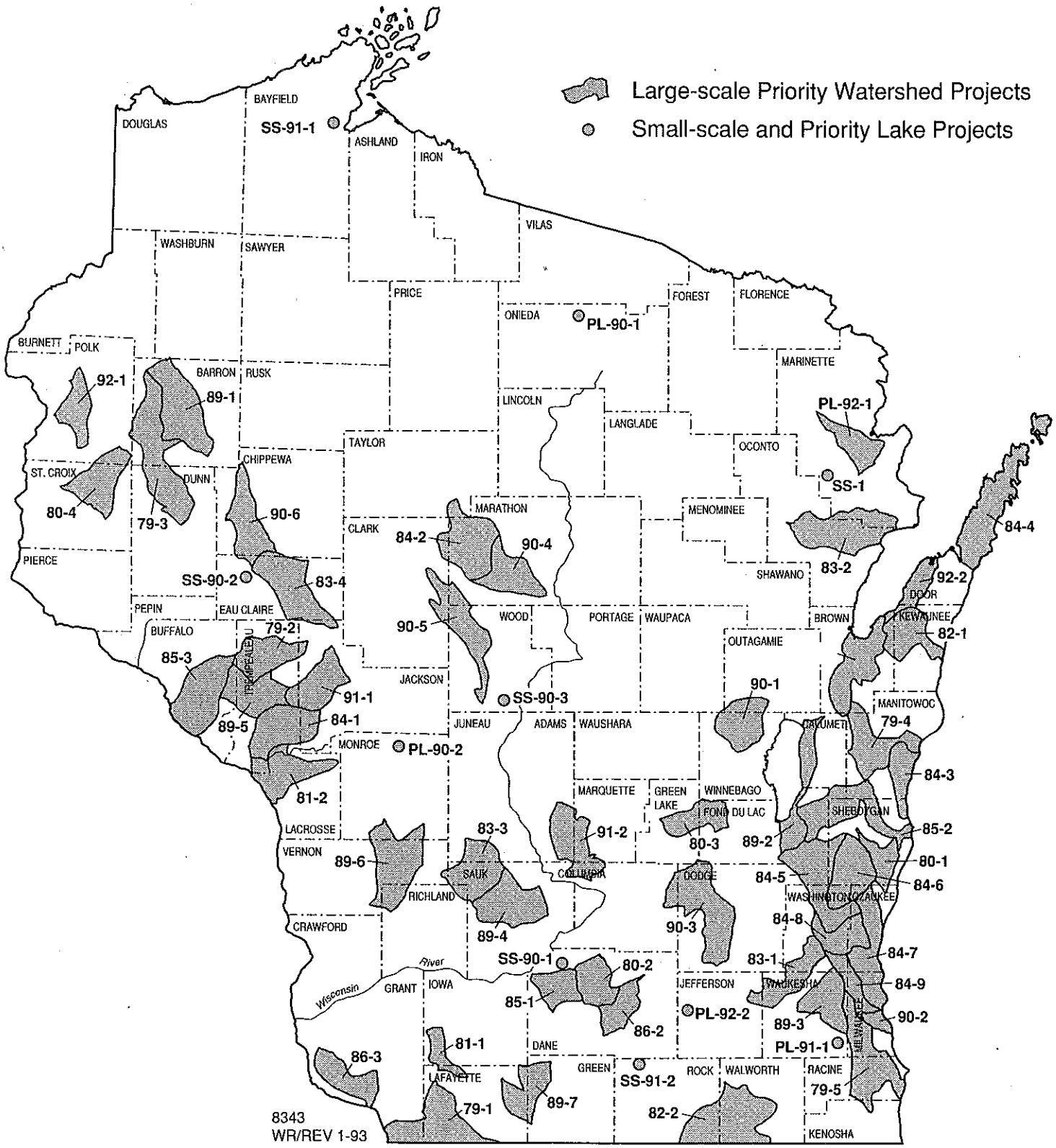
Map Number	Large-scale Priority Watershed Project	County(ies)	Year Project Selected
79-1	Galena River*	Grant, Lafayette	1979
79-2	Elk Creek*	Trempealeau	1979
79-3	Hay River*	Barron, Dunn	1979
79-4	Lower Manitowoc River*	Manitowoc, Brown	1979
79-5	Root River*	Racine, Milwaukee, Waukesha	1979
80-1	Onion 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

Map Number	Small-scale Priority Watershed Project	County(ies)	Year Project Selected
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

Map Number	Priority Lake Project	County(ies)	Year Project Selected
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



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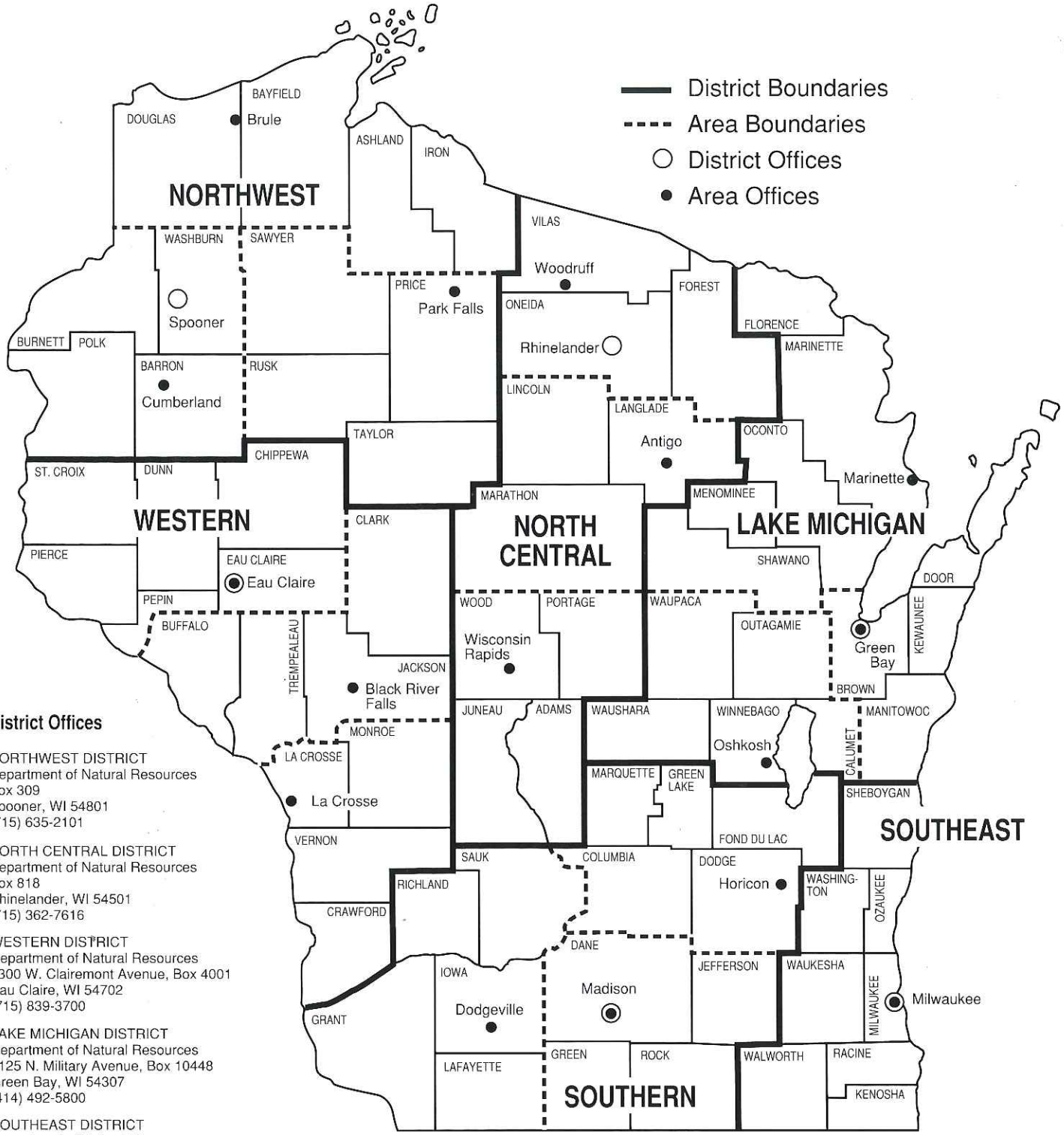
DNR Field Districts and Areas



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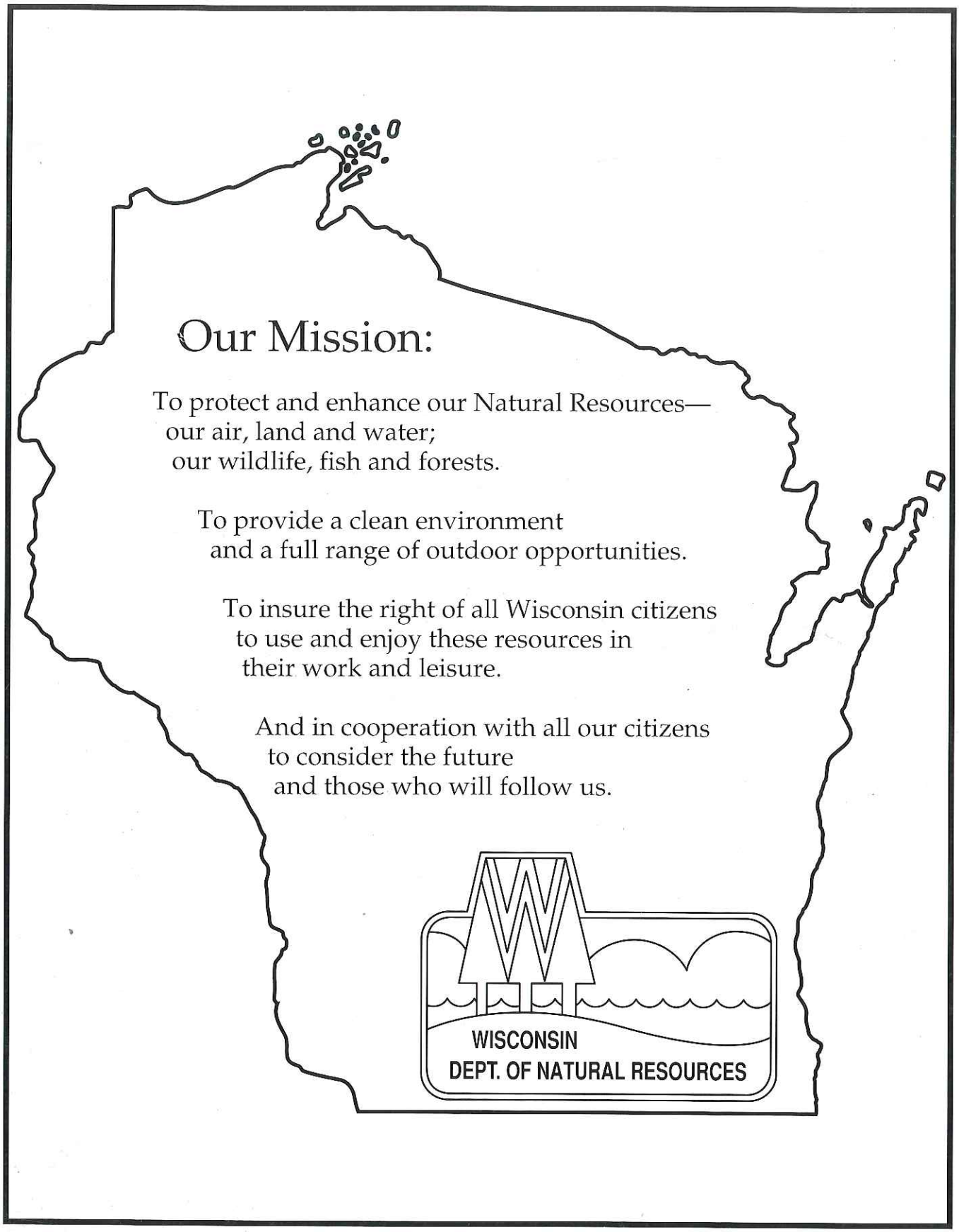

Our Mission:

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

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

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

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

WISCONSIN
DEPT. OF NATURAL RESOURCES