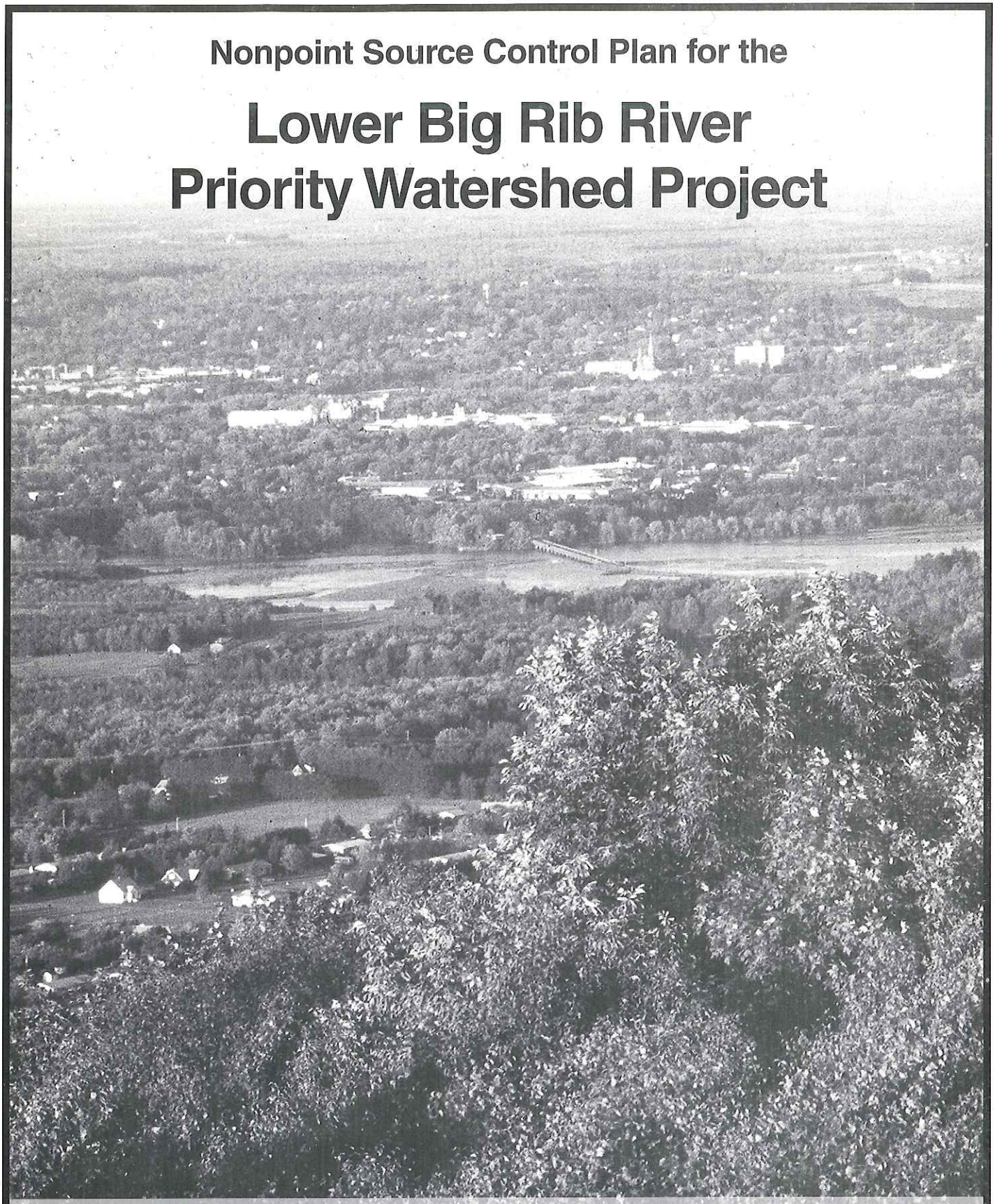
Nonpoint Source Control Plan for the

Lower Big Rib 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 Marathon County Land Conservation Department.

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

The Wisconsin Nonpoint Source Water Pollution Abatement Program

Plan Approved December 1998

This Plan Was Cooperatively Prepared By:

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

Publication WT-539-00
November 2000

For copies of this document, please contact:

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July 24, 1998

Mr. Richard Scheuer
M333 E. McMillan Street
Marshfield, WI 54449

Subject: Lower Big Rib River Priority Watershed Plan

Dear Mr. Scheuer:

I am pleased to approve the Lower Big Rib River Priority Watershed Plan prepared through the Wisconsin Nonpoint Source Pollution Abatement Program. This plan meets the intent and conditions of s. 281.65, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. This plan has been reviewed by the Department of Agriculture, Trade and Consumer Protection and was approved by the State Land and Water Conservation Board on August 3, 1998. I am also approving this plan as an amendment to the Upper Wisconsin Central Sub-basin Areawide Water Quality Management Plan.

I recognize that adequate funding for program implementation has been a concern for several grantees. As we continue to work out these issues, please be assured that agency staff recognize the need for flexibility during this time of change and transition. They are prepared to grant any necessary exemptions or a variance, as appropriate, to the six month deadline for the start of the notification process for critical sites specified in NR 120.09(1), Wis. Adm. Code.

I would like to express the Department's appreciation to the Marathon County Land Conservation Department Staff that participated in preparing this plan. The implementation of the Lower Big Rib River Priority Watershed Project will greatly enhance the regional water quality and set a standard for future projects selected as part of the Wisconsin Nonpoint Source Pollution Abatement Program.

Sincerely,

George — a great project, congratulations

George E. Meyer
Secretary

cc: Ben Brancel, DATCP
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COUNTY CLERK
NAN KOTTKE
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RECEIVED
JAN - 7 2000
BUREAU OF
WATERSHED MANAGEMENT

May 1, 1998

Dean Kaatz
County Conservationist
210 River Drive
Wausau, WI 54403

Dear Dean:

Attached is a certified copy of Marathon County Resolution #R-34-98, approving the Nonpoint Source Control Plan for the Lower Big Rib River Priority Watershed Project.

This Resolution was adopted by the Marathon County Board of Supervisors at their Adjourned Organizational meeting which was held April 23, 1998.

Yours truly,

Nan

Nan Kottke
Marathon County Clerk

kdk

STATE OF WISCONSIN)
)SS.
COUNTY OF MARATHON)

I, Nan Kottke, County Clerk in and for Marathon County, Wisconsin, hereby certify that the attached Resolution #R-34-98 was adopted by the Marathon County Board of Supervisors at their Adjourned Organizational meeting which was held April 23, 1998.

Nan Kottke

SEAL

Nan Kottke
Marathon County Clerk

RESOLUTION R- 34 -98

APPROVING THE NONPOINT SOURCE CONTROL PLAN FOR THE LOWER BIG RIB RIVER PRIORITY WATERSHED PROJECT

WHEREAS, the Lower Big Rib River Watershed was designated by the Department of Natural Resources in 1996 under the Wisconsin Nonpoint Source Water Pollution Abatement Program pursuant to § 281.65(4), Stats; and

WHEREAS, the Marathon County Land Conservation Department in cooperation with the Department of Natural Resources and the Department of Agriculture, Trade and Consumer Protection conducted a detailed inventory of the land use within the watershed in 1996 and 1997; and

WHEREAS, a number of public informational meetings have been conducted throughout the watershed and an official public hearing was conducted on April 16, 1998; and

WHEREAS, the inventory and public comment have resulted in the development of the Nonpoint Source Control Plan for the Lower Big Rib River Priority Watershed Project, a summary of which is attached; and

WHEREAS, § NR 120.08(2)(d), Wis. Admin. Code, requires county approval of the plan as a prerequisite to application for cost sharing grants for landowners in the watershed area.

NOW, THEREFORE, BE IT RESOLVED that the Board of Supervisors of the County of Marathon does hereby ordain as follows: That the Nonpoint Source Control Plan for the Lower Big Rib River Priority Watershed Project is approved.

Dated this 23 **day of** April, **1998.**

LAND CONSERVATION COMMITTEE

Richard Scherer

Leo Martin

Frank Fabro

Walter Tomczak

Fiscal Impact Estimate: County approval of the plan is necessary to be eligible for nonpoint source grants from the state, which provides cost sharing to landowners.

SMC:cmk
Attachment
a:\cobd#3/watershed.res

Table of Contents

Page

Watershed Plan Organization Information ..... Inside Front Cover
Watershed Plan Credits ii
Letters of Approval and Resolution iii

LIST OF ACRONYMS xi

CHAPTER ONE: Project Summary 1
- Objectives and Recommendations 2
- Easements 3
- Planning and Implementation 4
- Watershed Information 5
- Wisconsin Nonpoint Source Water Pollution Abatement Program 9
- Nonpoint Source Control Plan 9

CHAPTER TWO: Watershed Conditions 11
- Subwatershed Descriptions 11
- Surface Water and Recreational Resources 20
- Watershed Lakes 23
- Wetlands 24
- Surface Water Classification 24
- Groundwater Resources 25
- Private Well Construction 29
- Municipal Water Supplies 30
- Climate and Precipitation 31
- Topography 31
- Geology 31
- Soils 32

CHAPTER THREE: Pollution Sources and Management Strategies 37
- Management Categories 37
- Groundwater Protection 38
- Rural Nonpoint Pollutants and Management Strategies 39
- Barnyard Runoff 39
- Eligibility 40
- Nutrient and Pest Management 43
- Farm Practices Inventory Survey Results 43
- Eligibility 46
- Upland Sediment 47
- Streambank Erosion 50
- Gully Erosion 54
- Streambank Trampling 55

Page
Milkhouse Waste 55
Wetland Restoration 56
Urban Nonpoint Pollutant Management Strategy 57
Urban Planning Process 58
Urban Stormwater Infiltration Practices 59
Urban Stormwater Wet Detention Practices 59
Urban Streambank Erosion Control Practices 61
Urban Shoreline Erosion 61
Model Ordinances 61
Land Easements 63
Land Acquisition 64
Other Pollution Sources 64
Municipal and Industrial Point Source Pollution 65

CHAPTER FOUR: Implementation 67
Rural Best Management Practices 67
Interim Best Management Practices 67
Practices, Sources, and Activities Not Cost-Shared 70
Cost Containment 71
Critical Site Appeals Process 73
Urban Nonpoint Source Control 74
Secondary Elements of the Urban Management Program 74
Rural BMP Cost Sharing and Land Costs 76
Budget and Staff Support 81
Grant Disbursement and Project Management Schedule 81

CHAPTER FIVE: Information and Education 85
Educational Activities 1996 to Present 85
Farm Practices Inventory 86
Audiences 87
Delivery Team 87
Goals and Objectives 87
Public Awareness 88
Agricultural Erosion Controls 89
Agricultural Nutrient and Manure Management 89
Groundwater Protection 91
Urban, Rural Non-farm, and Riparian Land Management 92
Wetland Restoration 93

CHAPTER SIX: Project Evaluation 101
Administrative Review 101
Progress Reporting 101
Financial Expenditures 103
Nonpoint Source Pollutant Load Reduction 103
Interim BMPs 105
Water Resource Monitoring 105
Final Report 107

Tables

Page

Table 1-1 Summary of Land Uses in the Lower Big Rib River Watershed 6
Table 2-1 Surface Water Resource Conditions, Problems, and Nonpoint Pollution Sources in the Lower Big Rib River Watershed 26
Table 2-2 Nitrate and Triazine Well Sampling Results for the Lower Big Rib River Watershed 28
Table 3-1 Barnyard Inventory and Eligibility Criteria.....42
Table 3-2 Phosphorus Reduction from Barnyards (Goal: 50 Percent Reduction) 33
Table 3-3 Manure Storage Inventory and Eligibility Criteria 47
Table 3-4 Cropland Sediment Inventory (Goal: 25 Percent Reduction) 49
Table 3-5 Cropland Sediment Goals Based on 23 Percent Inventoried Cropland 49
Table 3-6 Upland Sediment Loading by Land Use: Lower Big Rib Watershed 52
Table 3-7 Streambank Erosion Cost-Share Eligibility 52
Table 3-8 Streambank Inventoried Results by Subwatershed: Streambank Erosion and Degraded Habitat.....53
Table 3-9 Streambank Inventory Results by Stream: Streambank Erosion and Degraded Habitat.....54
Table 3-10 Gully Inventory Results.....54
Table 3-11 Trampled Streambank Inventory Results 55
Table 3-12 Milkhouse Waste Inventory Results.....56
Table 3-13 Pollutant Reduction Percentages.....60
Table 4-1 State Cost-Share Rates for Rural Best Management Practices 68
Table 4-2a Estimated Rural Cost-Share Analysis and Budget Breakdown: Upland Sediment Control (BMPs).....77
Table 4-2b Estimated Rural Cost-Share Analysis and Budget Breakdown: Barnyard Runoff Control/Manure Storage (BMPs) 78
Table 4-2c Estimated Rural Cost-Share Analysis and Budget Breakdown: Streambank Erosion Control (BMPs).....79
Table 4-2d Estimated Rural Cost-Share Analysis and Budget Breakdown for Ginseng Production 79
Table 4-2e Estimated Rural Cost-Share Analysis and Budget Breakdown: Miscellaneous BMPs 80
Table 4-2f Estimated Rural Cost-Share Analysis and Budget Breakdown: Land Acquisitions and Easements.....80
Table 4-3 Estimated Staff Hours Required for 10-year Implementation Period 82
Table 4-4 Lower Big Rib River Priority Watershed Project Cost Estimates 83
Table 5-1 Nitrogen and Phosphorus Application Rates 86
Table 5-2 Phosphorus Application Rates in Pounds/Acre by Subwatershed 90
Table 5-3 Nitrogen Application Rate by Pounds/Acre by Subwatershed 91
Table 5-4a Watershed Plan Information and Education Activities: Sediment and Nutrient Management 94
Table 5-4b Watershed Plan Information and Education Activities: Groundwater Protection 96

Page

Table 5-4c Watershed Plan Information and Education Activities: Urban, Rural Non-farm, and Riparian Land Management/Phosphorus and Sediment Reduction 97
Table 5-4d Watershed Plan Information and Education Activities: Wetland Restoration....98
Table 5-5 Information and Education Budget and Staff Hours....99

Figures

Figure 3-1 Farmers Crediting for Manure 44
Figure 3-2 Farmers Crediting for Legumes....45

Maps

Map 1-1 Lower Big Rib River Watershed 7
Map 2-1 Rib Falls (RF) Subwatershed 13
Map 2-2 Edgar (ED) Subwatershed....15
Map 2-3 Marathon (MA) Subwatershed....17
Map 2-4 Kennedy Creek (KC) Subwatershed 19
Map 2-5 Lake Wausau (LW) Subwatershed 21
Map 2-6 Lower Rib River Watershed Soil Association Map....35
Map 3-1 Nitrate Sample Results....41

Appendices

APPENDIX A: Rural NPS Best Management Practices.... 109
APPENDIX B: Marathon County Animal Waste and Manure Management Ordinance.... 113
APPENDIX C: Interim Best Management Practices 125
APPENDIX D: Glossary 131

BIBLIOGRAPHY 143

List of Acronyms

ACP	Agricultural Conservation Program
BARNY	Barnyard Nutrient Analysis Model
BIM-GEO	DNR Bureau of Information Management-Geographical Unit
BMP	Best Management Practice
CAC	Citizen Advisory Committee
CFSA	Consolidated Farm Services Agency (U.S. Department of Agriculture)
COD	Chemical Oxygen Demand
CRP	Federal Cropland Reserve Program
CSA	Cost-Share Agreement
DATCP	Wisconsin Department of Agriculture, Trade and Consumer Protection
DILHR	Department of Industry, Labor and Human Relations
DNR	Wisconsin Department of Natural Resources
FFA	Future Farmers of America
FOCS	Field Offices Computing System
FPP	Wisconsin Farmland Protection Program
FSA	Food Security Act
GW	Groundwater
LCC	Land Conservation Committee
LCD	Land Conservation Department
LWCB	Land and Water Conservation Board
NPM	Nutrient and Pest Management
NRCS	Natural Resource Conservation Service
SHS	Wisconsin State Historical Society
SIP	Stewardship Incentive Program
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UWEX	University of Wisconsin-Extension
WGNHS	Wisconsin Geological and Natural History Survey
WINHUSLE	Wisconsin Nonpoint Hydrogeomorphic Universal Soil Loss Equation
WPDES	Wisconsin Pollutant Discharge Elimination System [permit system]
WUWN	Wisconsin Unique Well Number assigned to well sample sites

CHAPTER ONE
Project Summary

The Lower Big Rib River and its tributaries are not reaching highest potential uses because of nonpoint pollution sources (also referred to as runoff pollution or NPS), low baseflow conditions, and the resulting low levels of dissolved oxygen. Runoff from barnyards and other confined livestock areas and agricultural practices are the major sources of water pollution in the Lower Big River Watershed. This report summarizes the nonpoint pollution control plan for the Lower Big Rib River Priority Watershed and will guide implementation of best management practices during the next 10 years.

The 137-square-mile watershed, part of the Upper Wisconsin River Basin, was designated a priority watershed in 1995. This designation allows certain landowners in the watershed to be eligible for nutrient management plan (NMP) cost sharing. NPS pollution in the watershed include agricultural lands, livestock wastes, and new development.

The main branch of the Lower Big Rib River contributes roughly 70 percent of all streambank erosion in the watershed. A gully erosion inventory of 17 sites estimated 148 tons of sediment enters the Lower Big Rib River and its tributaries annually.

Nonpoint source pollution cannot easily be traced to a single point of origin, such as a point source effluent discharge from an industrial or municipal wastewater treatment facility. Nonpoint source pollution occurs when rainwater or melting snow flows across land picking up soil particles, organic wastes, fertilizer or other pollutants and carries them to surface water, groundwater, or both. These soil particles and organic wastes contain phosphorus and nitrogen, the same compounds found in commercial fertilizers. Soil particles become sediment in the river channel and receiving waters leading to a general decrease in water quality.

The quality and quantity of groundwater in the watershed is generally considered poor. Individual well yields are generally low to inadequate. A sample of 76 wells analyzed for nitrate indicated 29 percent exceeded the Enforcement Standard (ES) and 46 percent exceeded the Preventive Action Limit (PAL). Ten (10) samples exceeded the PAL for atrazine. Water quality data from township wells within the watershed (from 1993 through 1997) indicated 21 percent of 2,118 wells sampled were positive for coliform bacteria and considered unsafe as a potable water supply. (Chapter Two provides detailed information on this topic.)

The Wisconsin Legislature created the 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 pollution sources.

The *primary goal of the Lower Big Rib River Watershed Plan is to enhance and protect surface and groundwater quality by reducing nonpoint sources of pollution.*

Other related goals of the plan include the following.

Information and education. Improve, protect, and enhance water quality by maximizing landowner participation in the Lower Big Rib River Priority Watershed Project.

Agricultural erosion control. Reduce agricultural nutrient and sediment runoff.

Urban, rural non-farm, and riparian land management. Increase awareness and implementation of urban and rural NPS best management practices (BMPs).

Groundwater protection. Increase landowner understanding of the direct relationship between land use and water quality.

Attaining these goals will occur, in part, through sediment and phosphorus load reductions, wetland restoration, and groundwater protection.

The biological use classifications of affected tributaries are not expected to change because of this plan. Increasing baseflow, reducing sediment and nutrient loads, and increasing dissolved oxygen levels will enhance the water quality of the Lower Big Rib River Watershed including the lower segment of the Big Rib River and Lake Wausau. Stabilization of streambanks and the resulting reduction of tributary sediment loads will help mitigate sedimentation of riffles and pools, improve fishery habitat and the general aesthetics of the watershed. Reducing the nutrient load to the Big Rib River and Lake Wausau will also help reduce algae blooms and lower turbidity.

Objectives and Recommendations

Plan objectives and recommendations are listed below. Detailed water quality assessment information can be found in the Lower Big Rib River Watershed Project Appraisal report (Jim Klosiewski, 1996) available through the DNR's regional office in Rhinelander.

Sediment objective. Reduce overall erosion in the watershed by 25 percent by implementing the following reductions.

- Sediment reaching streams from cropland: 25 percent.
- Streambank erosion from tributaries to the Lower Big Rib River: 20 percent.
- Urban sediment load to the watershed: 50 percent.
- Sediment load from gullies to streams: 25 percent.

Phosphorus objective. Reduce overall phosphorus (P) load by 30 percent. Recommendations include reducing P by the following percentages.

- From barnyards: 50 percent.
- From land spread with manure: 50 percent.
- From streambank erosion of tributaries: 20 percent.

- From cropland sediment: 25 percent.
- From urban areas: 50 percent.
- From gully sediment: 25 percent.

Groundwater protection objective. Reduce concentrations of nitrogen and other pollutants in groundwater. Groundwater is the sole source of drinking water in the Lower Rib River Priority Watershed. Recommendations include the following.

- Provide nutrient and pest management cost sharing funds to eligible farmers in the watershed.
- Develop a wellhead protection plan in the Village of Edgar.
- Develop and implement of a comprehensive wellhead protection in the Village of Marathon City as a condition to participate in the Lower Rib River Priority Watershed Project.
- Implement the City of Wausau wellhead protection plan.
- Implement recommendations in the Marathon County groundwater protection plan.
- Monitor and evaluate groundwater quality in areas where pesticides are used in the production of ginseng.
- Abandon unused and unsafe wells in the watershed.

Biological uses objective. Enhance existing biological uses of all streams in the watershed by improving water quality and aquatic habitat. It is recommended efforts continue to accomplish the following.

- Reduce sediment and phosphorus loads.
- Reduce or eliminate livestock access to streams.
- Maintain existing, and develop new, woodland and grassland corridors adjacent to tributaries and streams (to provide wildlife habitat, canopy, bank stabilization, and sediment retention).

Wetlands objective. Restore as many degraded and converted wetlands in the watershed as possible by encouraging more wetland owners to enhance, restore, and protect wetlands on their property. Site-specific restoration recommendations will be developed as this plan is implemented.

Easements

Easements are an important tool used to support BMPs, enhance landowner cooperation, and compensate landowners for loss or altered use of their property. Easements should be used to exclude livestock from grazed wetlands and along eroding streambanks within the watershed. Easements are strongly recommended under the following circumstances.

- Where wetlands are grazed.
- When livestock density creates large areas of unvegetated soil within 60 feet of perennial streams or intermittent streams.
- Where streambanks are severely trampled and eroded.
- Where channel erosion, exacerbated by livestock grazing, creates unvegetated streambanks two (2) or more feet in height.

- Where row cropping is occurring within 60 feet or less of streams (perennial and intermittent).
- Where row cropping is practiced on slopes greater than 12 percent.
- Where a barnyard or animal feedlot is located within the flood plain and permanent easement is the least-cost alternative to provide adequate pollution reduction.
- When engineering options require intensive management to continue providing adequate pollution reduction.
- Where surrounding land use is largely agricultural and is expected to remain agricultural for two (2) or more decades.

Planning and Implementation

The planning phase of the Lower Big Rib River project began in 1996. The following information gathering and evaluation activities were completed during this phase.

- Assessment of conditions and uses of groundwater, streams and lakes.
- Inventory of land use types and nonpoint pollution sources.
- Evaluation of the types and severity of other factors affecting water quality including discharges from municipal wastewater treatment plants and natural or endemic stream conditions as part of ongoing integrated resource management planning efforts in the Upper Wisconsin River Basin.
- Determination of nonpoint source controls and other necessary measures to improve and protect water quality in the watershed.
- Preparation of plan with local involvement and support.

The implementation phase of the Lower Big Rib River Priority Watershed Project will begin following a review of the draft priority watershed plan, a public hearing, and approval by the DNR the Marathon County Board of Supervisors, and the county Land and Water Conservation Board (LWCB).

The implementation phase of the plan includes the following.

The DNR enters into local assistance agreements, including financial support, with municipalities having implementation responsibilities identified in the plan.

The Marathon County Land Conservation Department (LCD) contacts rural landowners interested in installing best management practices recommended in the plan.

Rural landowners sign county cost-share agreements outlining the practices, costs, cost-share amounts, and an implementation schedule. Practices are scheduled for installation after an agreement is signed and must be maintained for at least 10 years; easements are perpetual.

Municipalities and the DNR sign agreements for installing urban BMPs. BMP agreements are also entered into between local governments and private landowners.

Watershed Information

The Lower Big Rib River Watershed lies within Marathon County and joins the Wisconsin River in the City of Wausau (Map 1-1). Incorporated areas in the watershed include the City of Wausau and the Villages of Edgar and Marathon. Public lands within the watershed include Marathon, Rib Falls, and Sunny Vale County Parks, and part of Rib Mountain State Park.

The Lower Big Rib River Watershed population is estimated at 17,300 persons. Most of the watershed population lives in the incorporated areas of Wausau, Marathon and Edgar. With the exception of the Towns of Cassel and Rietbrock, regional trends indicate municipal populations will continue to grow.

Most of the watershed is rural with agriculture comprising an estimated 51 percent of total land use. Woodlands cover 25 percent of the land area; developed land uses occupy 5 percent of the watershed (Table 1-1).

Marathon County ranks first statewide in the number of farms, milk production, barley and ginseng. Dairy farming is an important business within the watershed. The average size dairy farm is this area is about 171 acres. The county ranks second in the state in production of alfalfa hay, oats, and corn silage (*Wisconsin Agriculture Statistics*, 1997).

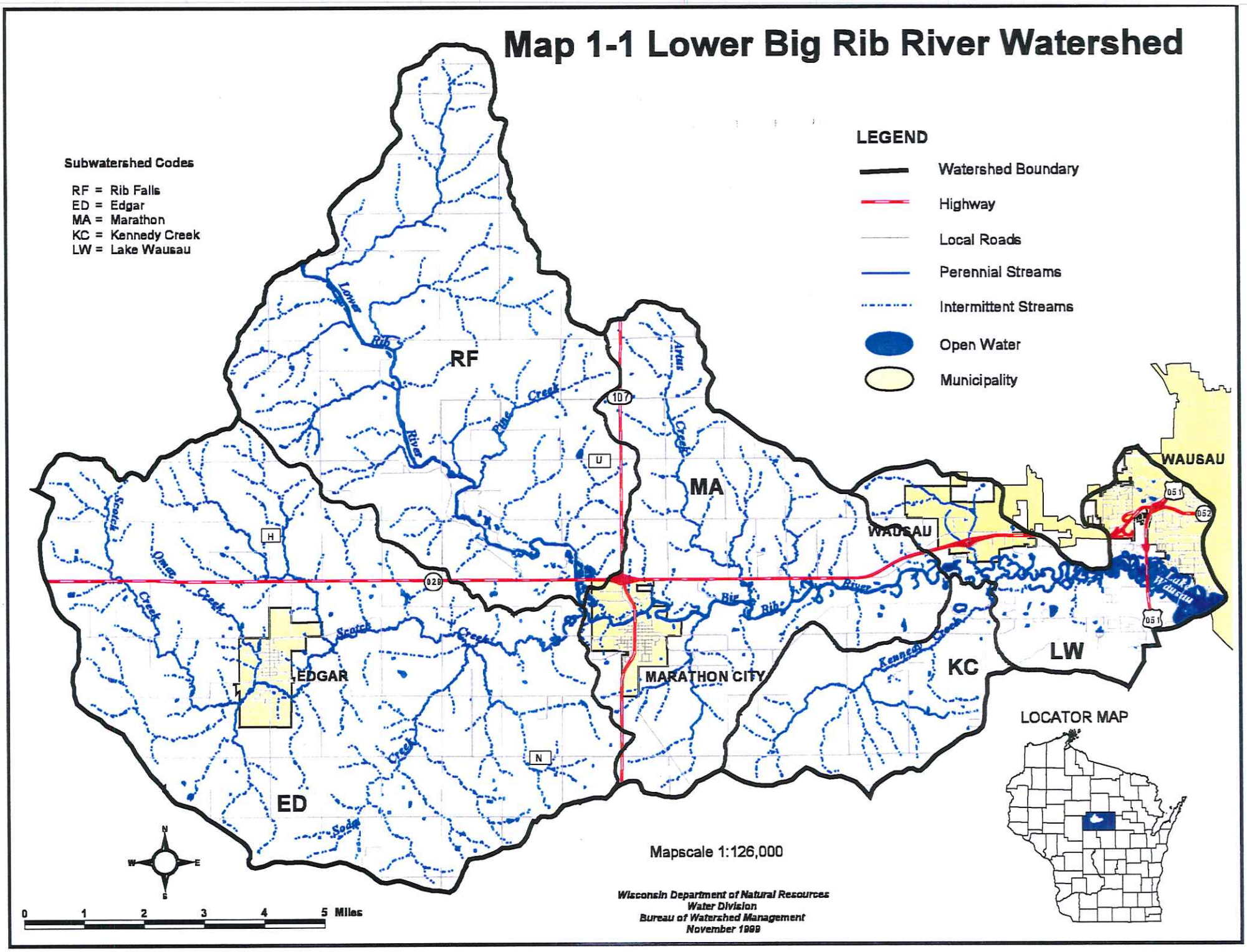
Table 1-1 Summary of Land Uses in the Lower Big Rib River Watershed

Land Uses	Acres[1]	Percent
Agricultural		
Pasture	2,783	3
Cropland	40,028	48
Farmstead/Residential	2,749	3
Mining	985	1
Surface Water	1,295	1
Urban	4,076	5
Wetland/Floodplain[2]	11,679	14
Woodland	20,708	25
Total	84,303	100

[1]This table is based on erosion transport model data.
[2]The estimates are of actual wetland acres, not cropped wet fields.

Source: Wisconsin Department of Natural Resources and the Marathon County Land Conservation Department

Map 1-1 Lower Big Rib River Watershed



Wisconsin Nonpoint Source Water Pollution Abatement Program

The DNR administers the program in cooperation with the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP). The state is divided into 333 discrete hydrologic units called watersheds. Watersheds are assessed as part of a comprehensive water quality basin planning program. Watersheds exhibiting significant NPS problems have been designated as priority watersheds. Local governments and private landowners in priority watersheds are eligible for financial assistance to reduce nonpoint sources of pollution. Since 1978, a total of 86 watersheds have been selected for funding as part of this program; plans for these high-ranking watersheds must be completed by the year 2015.

Priority watershed plans are cooperatively developed by the DNR, DATCP, local units of government, and citizens. Project staff evaluate water quality conditions, inventory land uses, and assess nonpoint sources of pollution throughout the watershed. Priority watershed plans identify BMPs to address identified problems.

After state and local approvals are obtained, local units of government begin the implementation process. Water quality improvements are achieved through mandatory and voluntary implementation of nonpoint source control BMPs, which includes adoption of applicable 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 and installation of BMPs. State level cost-share assistance is available to help offset costs associated with installing these practices. Eligible landowners and municipalities are contacted to determine their interest in installing BMPs identified in the plan. Cost-share agreements list practices, costs, cost-share amounts, and an implementation schedule.

Informational and educational activities are developed to encourage participation. Throughout the 10-year project, the DNR and DATCP monitor the process.

Nonpoint Source Control Plan

The Lower Big Rib River Priority Watershed Plan was prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program, s. 281.20 and s. 281.65, Wis. Stats., and ch. NR 120, Wis. Admin. Code. The plan was prepared through the cooperative efforts of the DNR, DATCP, and the Marathon County LCD, the Villages of Edgar and Marathon, the City of Wausau, and the Lower Big Rib River Watershed Advisory Committee.

This watershed plan is the basis for the DNR to enter into cost-share agreements and local assistance grants with agencies responsible for project implementation. This plan does not, in any way, preclude the use of normal regulatory procedures developed by local, state, or federal governments to protect the environment. All local, state, and federal permit procedures must be followed.

This watershed plan does not preclude the DNR from using its authority under Chapters 280 to

300, Wis. Stats, to regulate significant nonpoint pollution sources in the project area. This priority watershed plan was approved by the DNR following approvals by the Marathon County Board of Supervisors and the county LCWD.

Amendments to the plan. Amendments and substantive changes to the watershed plan can be made, under a process outlined in ch. NR 120.08(4), Wis. Adm. Code. The DNR will make a determination with local sponsors if a proposed change will require a formal plan amendment.

Relationship of the Nonpoint Source Control Plan to the Stormwater Discharge Permit Program. Wisconsin's Pollution Discharge Elimination System (WPDES) Stormwater Permit Program is administered by the DNR's Bureau of Watershed Management under s. 283.33 Wis. Stats. This program is separate from the Nonpoint Source Program and applies to certain classes of dischargers statewide as identified in ch. NR 216, Wis. Adm. Code. In cases where the programs overlap, implementation grants may apply only to activities identified in the watershed plan. Practices to control construction site erosion and stormwater runoff from new development are not eligible for cost sharing. In industrial areas cost sharing is available in non-industrial parts of facilities where a problem has also been identified in the priority watershed plan (ch. NR 120.17, Wis. Adm. Code).

CHAPTER TWO
Watershed Conditions

This chapter discusses the subwatersheds, physical characteristics, existing conditions, and nonpoint pollution sources in the Lower Big Rib River priority watershed.
Monitoring activities to appraise the surface water resources in the watershed was initiated in May 1996 and completed in October 1996. Following is a summary of methods used to collect information for the appraisal.

Subwatershed Descriptions

This section describes the physical and water quality conditions for each subwatershed in the Lower Big Rib River Priority Watershed Project. Discussion of each subwatershed is broken into three parts: a general description, water quality conditions, and the nonpoint source pollutants impairing the subwatershed. Subwatershed objectives are uniform throughout the project and are listed at the end of the section. A more detailed description of each watershed can be found in the water quality appraisal report (Jim Klosiewski 1996, available through DNR's Northern Region Co-Headquarters office in Rhinelander).

Stream habitat evaluations were conducted at 21 locations using a modified version of stream habitat evaluation guidelines developed by Ball (1985). These evaluations were used to assess physical factors that may limit the quantity and quality of aquatic life. Aquatic macro invertebrates were collected at 8 sites using a D-frame net and methods outlined by Hilsenhoff (1977 and 1982). Results are reported using the Hilsenhoff Biotic Index (HBI) which provides a relative measure of organic loading to a stream. Hourly dissolved oxygen and temperature monitoring was conducted in three to seven day periods in July and August throughout the watershed to better understand these conditions within the watershed streams. Surface water grab samples were collected at two sites during runoff event and nonevent periods in 1996. Existing data from 1991 and 1992 was also used. Constituents were sampled for biochemical oxygen demand (BOD 5 Day), ammonia-N, nitrate plus nitrite-N, total Kjeldahl nitrogen, total phosphorus, total solids, total suspended solids and fecal coliform bacteria.

Subwatersheds in the Lower Big Rib River Watershed:

Rib Falls	(RF)
Edgar	(ED)
Marathon	(MA)
Kennedy Creek	(KC)
Lake Wausau	(LW)

Rib Falls Subwatershed (RF)

Description. The Rib Falls subwatershed is approximately 36.5 square miles in size and includes the Big Rib River, Einert and Pine Creeks and Creeks 8-15, 16-6 and 16-12 (see Map 2-1).

Water Resources Conditions. That portion of the **Big Rib River** included in this subwatershed flows for 10.4 miles and extends from just below the confluence with Black Creek in the northwest part of the county to the confluence with Scotch Creek. This stretch of the river supports a warm water sports fishery with small-mouth bass, walleye, northern pike being common and some muskellunge present, in addition to forage/minnow species.

Above the Town of Rib Falls the river appears to be undergoing long term bank erosion resulting from natural processes. Bar development appears to occur as the result of major episodes rather than on an annual basis. The downstream reaches are seeing higher rates of bank erosion (Bryan, Simon, Walker). It's thought that the falls at Rib Falls have acted as a natural barrier to the effects of past in-stream mining by preventing head cutting. Historic in-stream nonmetallic mining operations have had a negative impact on the river downstream of Rib Falls.

The Big Rib River's aquatic habitat is limited due to sedimentation, removal of stream substrate by past gravel mining and present low baseflow conditions. Excess nutrient delivery to the river is also a problem. Total phosphorus levels ranging from .06 to 0.25 mg/l (milligrams per liter) were recorded on three separate occasions during 1992. Levels greater than .05 mg/l are considered high for rivers that enter lakes or impoundments, such as Lake Wausau. Levels greater than 0.1 mg/l are able to support nuisance algae or aquatic plant growth in a river system.

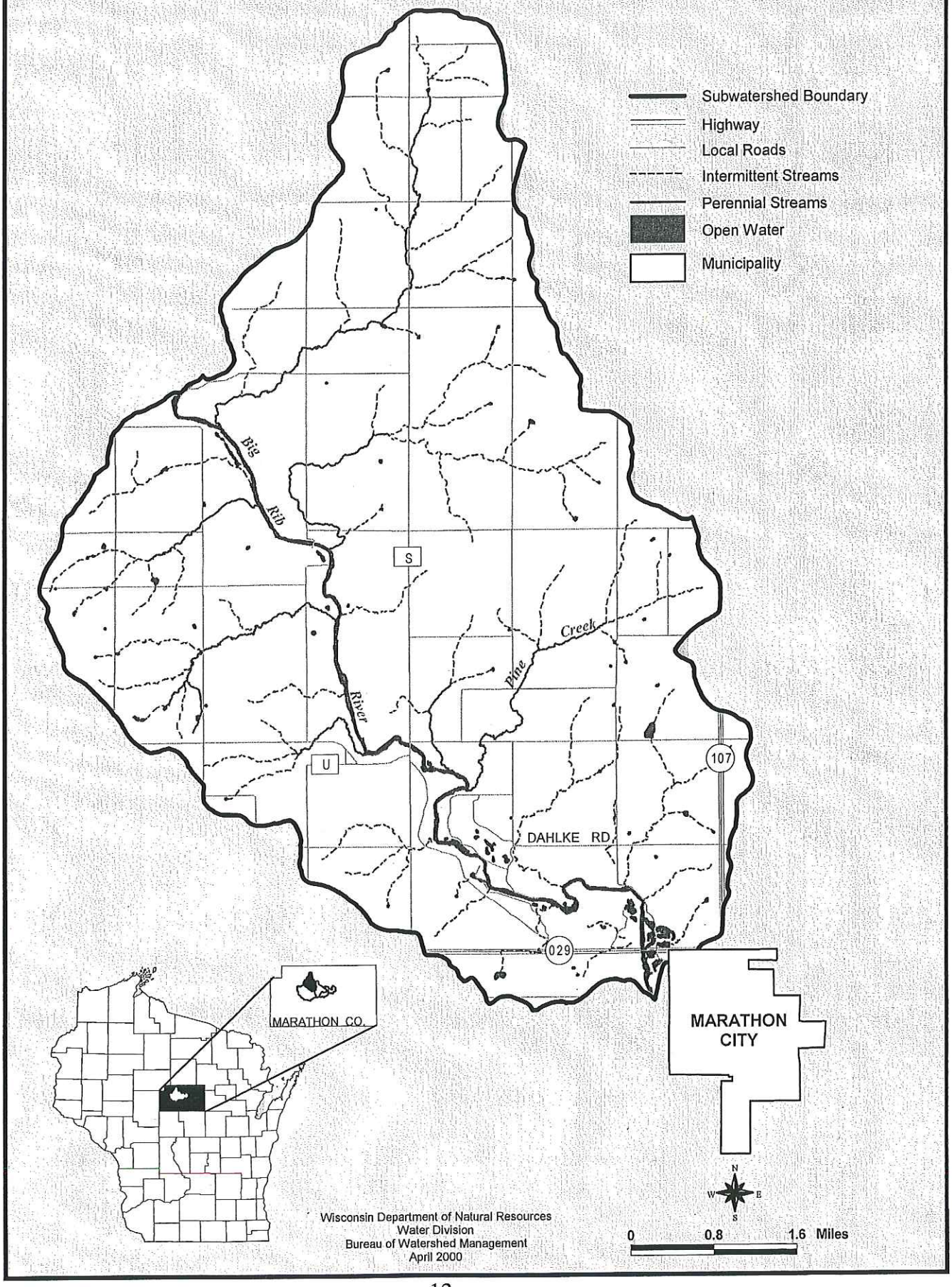
Einert Creek is a five-mile-long, medium hard water stream having neutral, light brown water. This tributary to the Big Rib River supports a warm water forage fishery. Minnows appear to be the dominant fish within the creek, but runs of larger fish such as white suckers were observed during spring high flows. Game fish may also travel upstream during spring searching for spawning areas, but baseflow conditions are inadequate in much of the stream during summer months to support a sport fishery.

Stream habitat ratings conducted at four sites range from "fair" to "poor" due to sedimentation and poor depth. A HBI conducted below 24th Street West ranked "very good" indicating minimal organic loading for that stretch of stream. Excess levels of total phosphorus were recorded.

Surface water resource problems include bank erosion due to the flashy nature of the stream and livestock bank trampling, low baseflow conditions, sedimentation and nutrient enrichment.

Pine Creek is a 3-mile-long, medium hard water, slightly acidic tributary of the Big Rib River. The stream supports a warm water forage fishery with minnows being dominant. Aquatic habitat rated "fair" due to poor water depth. The HBI conducted above CTH-U ranked "very good", indicating very little organic loading in that stretch of stream. Stream substrate includes areas of fractured rock to silty clay.

Map 2-1 Rib Falls (RF) Subwatershed



Pine Creek is limited by flashy water conditions, nutrient enrichment, sedimentation, streambank pasturing and barnyard runoff.

Edgar Subwatershed (ED)

Description. The Edgar subwatershed is approximately 47 square miles in surface area and is located in the southwestern portion of the watershed. Perennial streams in the subwatershed include Pet Brook, Omar, Scotch, and Soda Creeks and Creek 10-2 (see Map 2-2).

Water Resources Conditions. Omar Creek is a 3-mile tributary to Scotch Creek. The existing biological use is designated warm water forage fishery dominated by minnow species. The aquatic life habitat rating is "poor". The HBI index ranked "fairly poor", indicating significant organic pollution. The lower portion of the stream contains thick deposits of sand and mucky silt. Heavy growths of macrophytes and algae are also found in this area.

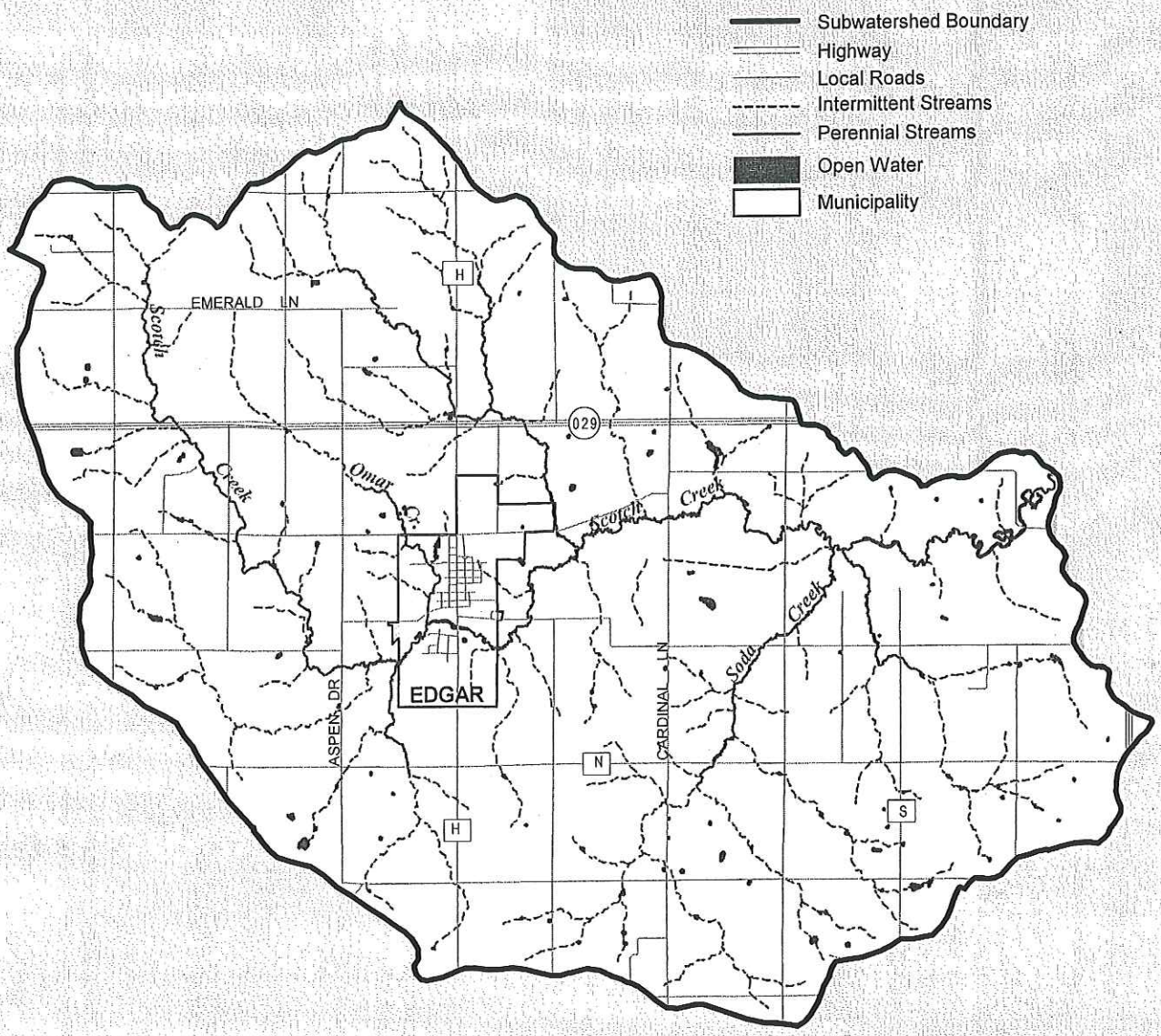
Omar Creek is being affected by nutrient enrichment, organic pollution, sedimentation, stormwater runoff from the Village of Edgar and flashy flow conditions.

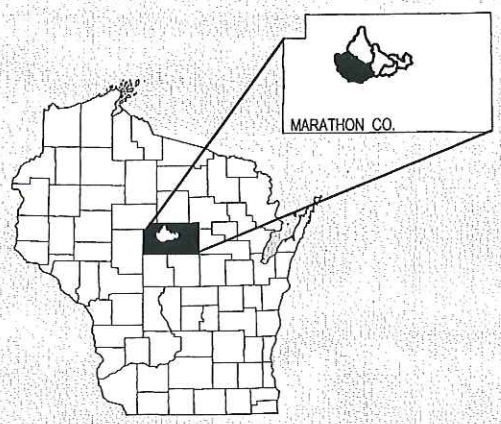
Pet Brook is a 3-mile-long tributary to Scotch Creek. The fishery of Pet Brook is limited to a warm water forage fishery. Aquatic life habitat ratings conducted at two sites rank "poor". The streambanks are severely grazed in areas, filamentous algae is common, and phosphorus was recorded in excess amounts. Flashy flow conditions, sedimentation and loose sand substrate are also a problem affecting aquatic habitat.

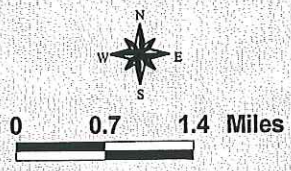
Scotch Creek is 18 miles long and is the largest tributary to the Big Rib River. The first 3.8 miles upstream from its mouth are classified as a warm water sport fishery with small-mouth bass and northern pike present. From 3.8-10 miles upstream, the creek is classified as a limited forage fishery. The classification for the remaining eight miles is unknown. Minnow species were observed during the habitat investigation. The HBI rating for the stretch of stream above 4th St. West is "good", indicating some organic loading, while the habitat evaluations ranked "fair" to "poor" for aquatic habitat. Very high levels of total phosphorus were recorded on three occasions, averaging 0.2 mg/l. It is estimated that the Village of Edgar Wastewater Treatment Plant (WWTP) will reduce its annual total phosphorus discharge to Scotch Creek from approximately 2,189 to 884 pounds, a (40 percent) reduction, by October, 1999. This reduction will help improve stream conditions.

Stream fecal coliform bacteria levels recorded during a rain event on August 7,1996 were approximately 1,300 times higher than levels recorded in a non-event sampling on September 18, 1996. This level of 93,000 colonies per 100 ml (milliliters) exceeds the state water quality standard of 400 colonies per 100 milliliters. (The count may not exceed 200/100 ml as a geometric mean based on not less than 5 samples per month, nor exceed 400/100 ml in more than 10 percent of all samples during any month. Our results are based on one sample in a month, multiple samples may be more useful.) Swimming should be avoided during exceeded levels.

Map 2-2 Edgar (ED) Subwatershed







Wisconsin Department of Natural Resources
Water Division
Bureau of Watershed Management
April 2000

Water resource problems include flashy stream conditions, severe flooding, sedimentation, low dissolved oxygen conditions, bacterial problems, organic pollution and excess nutrient loading from agricultural practices, and the Village of Edgar WWTP.

Soda Creek is a 5-mile tributary of Scotch Creek. The stream is limited to a warm-water forage fishery. The only fish species observed during habitat investigations were unidentified minnows. High levels of total phosphorus were recorded on two occasions, averaging 0.19 mg/l. The stream HBI was "fair", indicating fairly significant organic loading. Aquatic life habitat is limited due to the flashy nature of the stream and shifting sand substrate. Soda Creek is being impacted by low baseflow conditions, sedimentation, organic loading and excessive nutrient enrichment.

Creek 10-2 is 1.6 mile long tributary to Scotch Creek. The classification of this stream is unknown. Minnows are thought to be the dominant fish type.

The streambanks are severely grazed in areas causing bank erosion, also, sedimentation, excessive nutrient enrichment and impounding east of Partridge Lane are affecting water quality.

Marathon Subwatershed (MA)

Description. The Marathon subwatershed is approximately 24.5 square miles in size and is located in the east central portion of the Lower Big Rib River watershed. Perennial streams within the subwatershed include Artus Creek, Creek 5-7, Creek 5-14 and a portion of the Big Rib River (see Map 2-3).

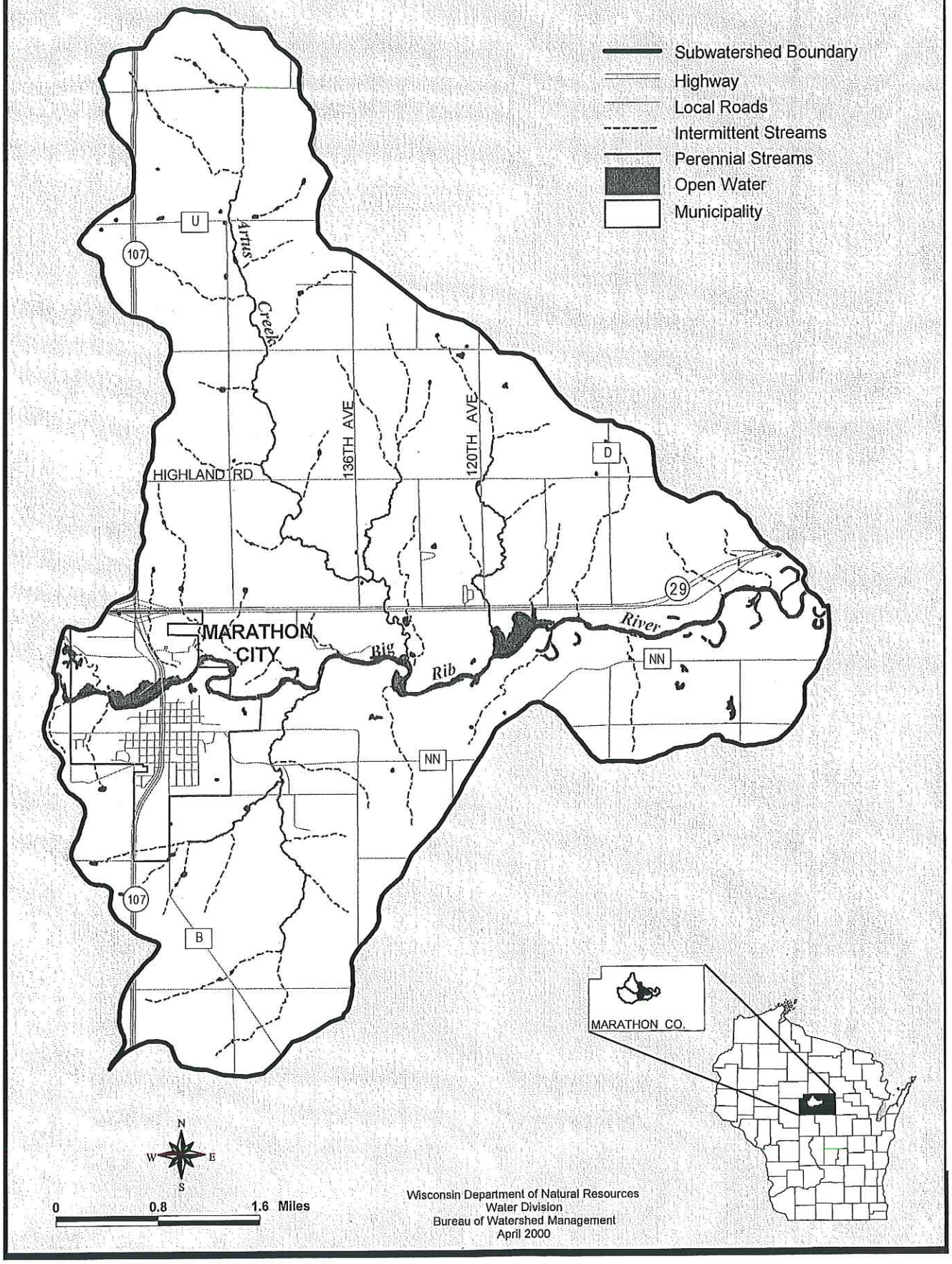
Water Resources Conditions. The **Big Rib River** flows 10.0 miles within this subwatershed and is managed as a warm water sport fishery. Fish species include, walleye, small-mouth bass, northern pike, and muskellunge.

Habitat in the upper portion of this stretch of the river has been seriously impacted by past in-stream gravel mining activities and the river is still in a state of recovery. It is unknown how long it will take the river to "naturalize" itself. Sedimentation, mainly sand has filled in riffle and pool areas, and bank erosion is very serious in areas. The flashy nature of the Big Rib River is a contributor to these problems.

Nutrient delivery to the river was high on three separate sampling events in 1992, with total phosphorus levels ranging from .08 to 0.24 mg/l. It is estimated that the Village of Marathon City WWTP will reduce its annual total phosphorus discharge to the Big Rib River from approximately 4,362 to 776 pounds, a (82 percent) reduction, by April 2000. This reduction combined with other improvements in the watershed will benefit stream water quality, fish and other aquatic life conditions.

Artus Creek is a small seven mile long tributary to the Big Rib River and is classified as a warm water forage fishery. Aquatic habitat assessments and macro invertebrate samples indicate "fair" to "good" aquatic life habitat and "very good" water quality with possible slight organic pollution.

Map 2-3 Marathon (MA) Subwatershed



Problems limiting Artus Creek include, low baseflow conditions, streambank pasturing, bank erosion, bacterial excesses, sedimentation and nutrient enrichment. Total phosphorus samples collected on four occasions range from .04 to 0.282 mg/l. Fecal coliform bacteria samples collected during non-event and event related weather patterns reveal levels increased from 70 to 320,000 colonies per 100 ml (400 colonies per 100 ml is the state standard).

Creeks 3-7 and 5-14 are small feeder streams to the Big Rib River. Creek 5-7 is classified limited aquatic life above STH 29 and limited forage fish below to its mouth. The classification of Creek 5-14 is unknown. Due to their small size and shallow depths these streams were not investigated for the appraisal process. Aquatic habitat surveys conducted on Creek 5-7 in 1986 rated the stream "fair" to "poor".

Kennedy Creek Subwatershed (KC)

Description. The **Kennedy Creek** Subwatershed is approximately 9.5 square miles in surface area. Kennedy Creek, which is classified as a warm water forage fishery is the only perennial stream located within the watershed. Minnow species were the only fish observed while conducting habitat assessments (see Map 2-4).

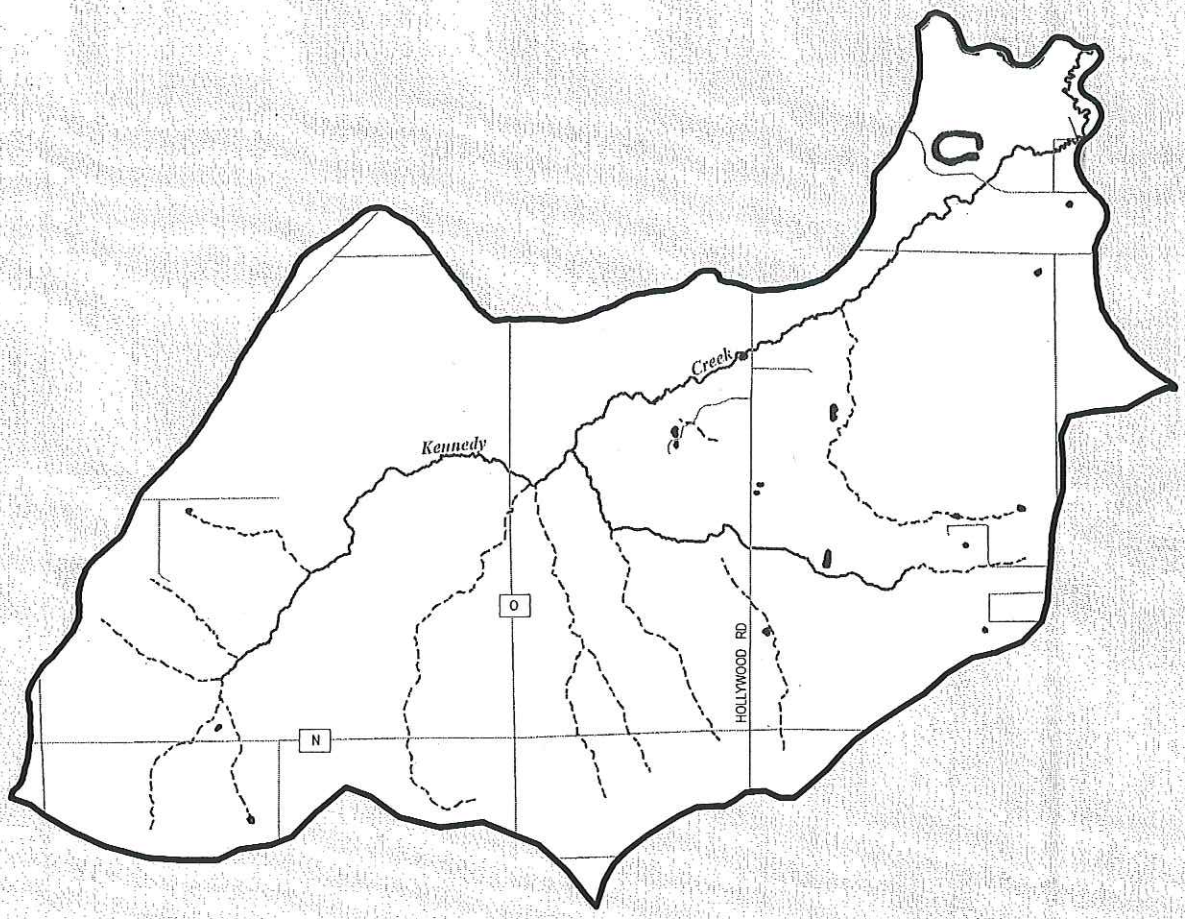
Water Resources Conditions. Habitat ratings of Kennedy Creek range from "fair" to "poor" while the macro invertebrate sample indicates "very good" water quality with possible slight organic pollution. The substrate of the lower reaches of the stream consists mainly of shifting sand. It is believed that much of this sedimentation is of natural origin from the streambed itself. Total phosphorus levels recorded on three separate occasions in 1991 and 1992 range from .09 to 0.12 mg/l, indicating nutrient enrichment of the stream.

Factors affecting Kennedy Creek include, flashy stream conditions, low baseflow conditions, sedimentation of riffles, deposition of pools and nutrient enrichment.

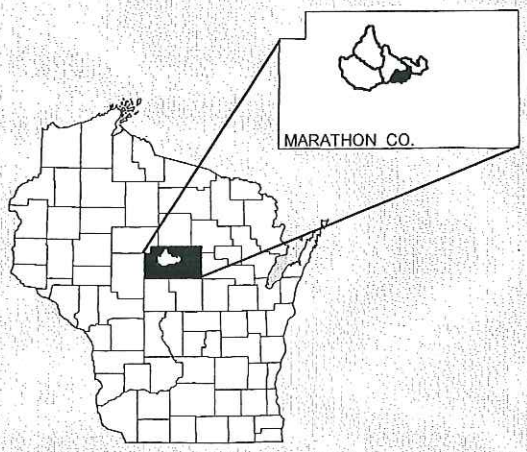
Lake Wausau Subwatershed (LW)

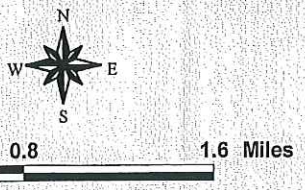
Description. The Lake Wausau Subwatershed is approximately 12.5 square miles in surface area and is located in the southeastern portion of the watershed. The Big Rib River and a portion of Lake Wausau are the only major perennial waters located in the subwatershed. The Big Rib flows 4.5 miles before emptying into Lake Wausau. Muskellunge, small-mouth bass, walleye and largemouth bass fishing are very popular in the lower stretch of the river near the STH-51 bridge. This section of the river is characterized by oxbow lakes, meander scars and backwater sloughs. The river bottom system may provide some of the best aquatic and terrestrial wildlife habitat in all of Marathon County. It's probable that the wood turtle (threatened species) may exist in this section of river because of the availability of the turtles preferred habitat of exposed sand formations for nesting, The newer the formation the better. On the other hand, water turbidity may negatively affect the turtles survival (see Map 2-5).

Map 2-4 Kennedy Creek (KC) Subwatershed



Subwatershed Boundary
Local Roads
Intermittent Streams
Perennial Streams





Wisconsin Department of Natural Resources
Water Division
Bureau of Watershed Mangement
April 2000

The Lake Wausau Subwatershed has the largest urban component association in the Lower Big Rib River Watershed. Nonpoint source pollution from urbanized areas can cause significant water quality problems including toxic pollution, flooding, sedimentation and habitat destruction. The Watershed Plan will address the urban component of the project.

Water Resources Conditions. Phosphorus samples collected in 1992 show levels ranging from .06 to 0.2 mg/l. Aquatic life habitat is "poor" due to sedimentation of riffle areas and shifting sand bottoms.

It is apparent that the lower section of the **Big Rib River** and **Lake Wausau** are being affected by problems in the watershed. During spring runoff and rain events, the river runs chocolate brown due to sediment delivery from upstream. This portion of the river acts as a sediment trap and nutrient sink. Aquatic life habitat is affected due to sedimentation of riffle areas and deposition in pools with fine sand and silt. Shifting sandbars are also found in this area. Nuisance algae blooms are common during summer months. Here, stream flow flashiness as throughout the watershed is also a problem.

Other potential impacts to the resource include heavy boating use from Sunnyvale Park to Lake Wausau. This recreational activity can create enough wave action to cause erosion and resuspension of sediments.

Surface Water and Recreational Resources

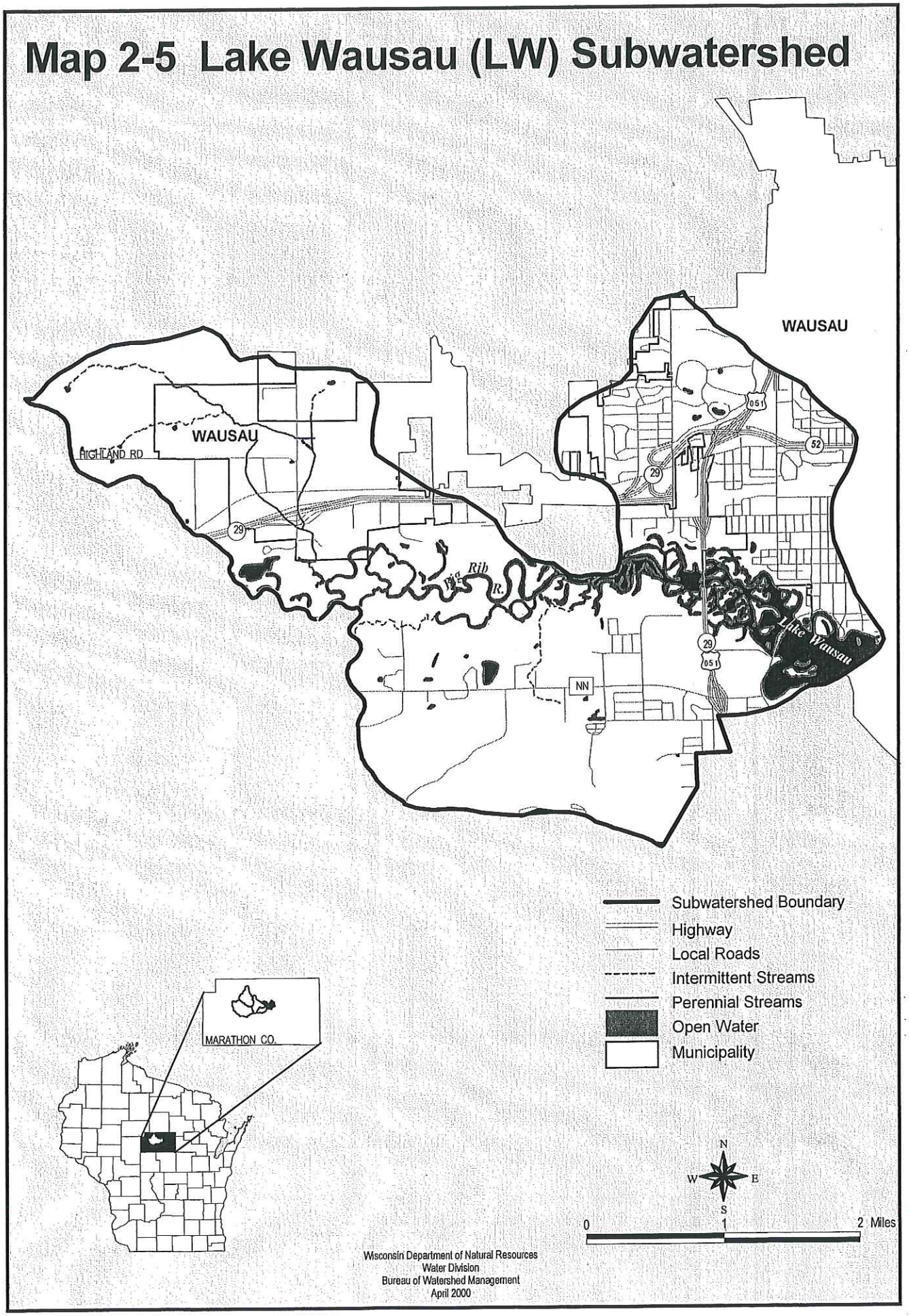
The Lower Big Rib River and other streams in the watershed are not reaching their highest potential uses because of pollution from nonpoint sources and low baseflow condition. Eroding croplands and streambanks and improperly managed livestock operations are the major sources of nonpoint pollution in the watershed. Primary causes of streambank erosion are the result of a livestock grazing of streambanks, historic in-stream sand and gravel mining, and high flows during spring runoff events. It is common to observe scarring on trees 5 feet above base flow water levels in some streams. Severe streambank erosion leads to deposition in pools, filling-in of spawning substrate, and elimination of streambank cover.

Improved water quality will enhance the wildlife and fishery in the watershed. The riparian corridor of habitat formed by the Big Rib River and its tributaries are highly significant for wildlife. The diversity of habitat, ranging from lowland forest and hemlock glen to open wet meadow, offers tremendous opportunities for wildlife management and surface water quality improvement.

Elevated levels of mercury in walleye triggered a fish consumption advisory in the Big Rib River from the Village of Marathon City downstream to County Road N. (More detailed fish consumption advisory information is available from the DNR.)

Water quality, as measured by dissolved oxygen and aquatic insect indices, appears to be relatively good in the main tributaries. But Scotch Creek exhibits low diurnal dissolved oxygen

Map 2-5 Lake Wausau (LW) Subwatershed



conditions and some streams show evidence of organic pollution. The primary source of this loading is livestock waste from barnyards, feedlots, and field spread manure. Animal waste is also a source of non-ionized ammonia, which is toxic to aquatic organisms.

Wildlife is a valuable resource in the watershed, particularly in lower segments where habitat supports a wide variety of mammals, reptiles, amphibians, and birds. These areas includes a maze of sloughs and oxbows, lowland hardwoods, and small open wetlands. Tributary streams offer additional habitat corridors branching off of the main river system. Northern hemlock is found along many sections of the system, adding important permanent cover and diversity. Upstream, the riparian corridor narrows, and wildlife habitat is more fragmented. Agricultural activities, mining (sand and gravel), and residential and commercial impacts on water quality are more prevalent in this portion of the watershed.

Gravel mining has had a negative impact on the fish community and fish habitat of the Big Rib River (Kanehl and Lyons, 1992). Gravel mining operations (both in-stream and floodplain excavations) can affect the physical nature of a stream. Stream channels may be modified, flow patterns and bedload transport may be altered, and head cutting (the erosion of the stream bed and streambank upstream from the point of a dredged area) can increase. Fish, aquatic invertebrate, and plant communities can be altered by gravel mining operations, both in density and diversity by alterations in channels, streambanks, water quality, and by the outright elimination of habitat.

Sedimentation of riffle areas also impairs fish reproduction by limiting spawning habitat and reducing inter-gravel flow necessary to maintain proper dissolved oxygen and temperature conditions for eggs. Sedimentation also impairs habitat for macro-invertebrates and organisms important for a healthy fishery. The filling-in of pools also reduces the amount of available cover for juvenile and adult fish.

Sedimentation, elimination of habitat, and direct physical removal of stream bottom substrate caused by gravel mining operations are also devastating to mussel populations. A 1981 study identified the effects of in-stream dredging and gravel processing operations on mussel populations in the Osage River, Missouri. No living mussels were found in the in-stream dredged area 15 years after dredging. Re-colonization was prevented by the elimination of habitat, destabilization of bottom substrates, and the creation of deep pools. Disruption in the life cycle of mussels also may have been caused by changes in fish populations as a result from dredging. Mussel larvae depend on fish as hosts to complete their life cycle. Slower growth rates of mussels could occur downstream from gravel dredging and washing sites due to very high turbidity (Kanehl and Lyons, 1992).

The Lower Big Rib River Watershed is characterized by a well-developed system of intermittent ephemeral (seasonal) and perennial (present all year) streams. There are nine (9) named perennial streams in the watershed, with a combined length of about 85 miles. These streams support warm water fish communities and maintain at least a small, continuous flow throughout the year. The Big Rib River is the predominant surface water feature. The portion of the river within the watershed begins just below the confluence with Black Creek, in northwestern Marathon County, and flows southeasterly approximately 24.4 miles. At that point, it enters Lake Wausau, a 1,918 acre impoundment formed by the Big Rib, Eau Claire and Wisconsin Rivers. Other primary streams in the watershed are Einert, Pine, Omar, Scotch, Soda, Artus, and Kennedy Creeks, and

Pet Brook. Only the Big Rib River and a 3.8 mile stretch of Scotch Creek from the mouth upstream, support a warm water sport fishery. The remaining streams support limited aquatic life, warm water forage, and limited forage fish communities.

Smaller tributaries, including 54 miles of unnamed streams within the watershed, are only known to support forage/minnow communities because of the flashy nature of the systems. Flashy systems have high rates of runoff for short periods during rain events but low sustained base flows and, in some cases, dry stream beds. Human activity in the watershed, particularly land clearing and wetland draining, have contributed to low baseflow conditions.

Eleven (11) species of freshwater mussels were identified in the lower stretch of the Big Rib River in a non-scientific survey. This number shows a fair amount of diversity. Three (3) of these mussels, the black sandshell, fluted shell, and elktoe, are indicators of good water quality. These mussels are on the state watch list (which identifies species of special concern), with the Elktoe being an uncommon species. Although these mussels may indicate good water quality, it is believed their preferred habitat (gravel and cobble with good water flow) has been greatly impacted in the lower Big Rib River, and that has restricted populations to isolated areas (D. Heath, personal communication). Historic and present-day land use practices, including mining, have contributed to the loss of habitat.

Considering this and the fact that there is no documentation on the mussel community in the Big Rib River system, it is recommended a qualitative and quantitative study of the freshwater mussel population in the Big Rib River be conducted by the DNR Bureau of Endangered Resources.

Watershed Lakes

Lake Wausau is the third largest water body in the county, covers about 1,918 acres in surface area, and receives the entire drainage of the Lower Big Rib River watershed. The lake supports a variety of recreational activities, including boating and year-round fishing. The lake has a history of water quality problems including, eutrophication, algae blooms, excess levels of sediment, nutrients, and organic matter.

The convergence of the Lower Big Rib River and Lake Wausau provides a unique area for a diverse fishery, migratory birds, and other wildlife, including loons, herons and trumpeter swans. The most popular activities on the Big Rib River and Lake Wausau are fishing, boating, and hunting. This area includes many shallow bays and sloughs that provide spawning habitat for game fish, including muskellunge.

Accumulation of tributary runoff is degrading Lake Wausau and the Big Rib River. Because of the flashy nature of the streams, much of the organic material, nutrients, and sediments are flushed from the tributaries to the receiving waters. Excess nutrient and sediment loading from small tributaries within the watershed contribute to nuisance algae blooms on the lower end of the Big Rib River and Lake Wausau. Deposition of these loads in pools and riffles contributes to degradation of fish habitat. After large runoff events, the Big Rib River becomes turbid and dark brown.

Wetlands

Wetlands are valuable natural resources. Floodplain wetlands support fur-bearers and waterfowl populations and may provide seasonal habitat for sport fish. Extensive wetlands along the riparian corridor of all streams in the Lower Big Rib River provide wildlife habitat, fish spawning and rearing areas, recreation, storage of runoff and flood flows, and scouring of pollutants.

Within the watershed, wetlands are generally of a semi-permanent nature, with few areas holding standing water throughout the year. Amphibians and reptiles benefit from the ephemeral nature of many of these areas. These wetlands serve to filter sediments and nutrients moving from upland fields toward individual streams. Unmanaged grazing disrupts this function, greatly reducing the effectiveness of these areas. Although an official wetland inventory has not been conducted in the Lower Big Rib River Watershed, restorations of wetlands will be eligible for cost sharing.

Surface Water Classification

Included in this report are the classifications used for Wisconsin's waters and the surface water resources in the watershed. Surface water quality standards and criteria are considered necessary to support biological uses. Water quality standards for biological uses are contained in ch. NR 102, ch. NR 104, and ch. NR 105, Wis. Admin. Code.

Biological Stream Use. Wisconsin streams are classified according to biological uses attainable for each stream. The classifications are listed in water quality management plans by sub-watershed and stream.

> **Warm water sport fish communities (WWSF)** 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.
>
> **Warm water forage fish communities (WWFF)** include surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.
>
> **Limited forage fish communities (LFF)** in intermediate surface waters include surface waters of limited capacity and naturally poor water quality or habitat. These surface waters are capable of supporting only a limited community of forage fish and other aquatic life.
>
> **Limited aquatic life communities (LAL)** in marginal surface waters include surface waters of severely limited capacity and naturally poor water quality or habitat. These surface waters are capable of supporting only a limited community of aquatic life.

Table 2-1. provides a summary of perennial streams in each subwatershed, including physical characteristics, biological use classifications, aquatic habitat and macro invertebrate assessments, limiting factors, and potential nonpoint pollution sources.

Groundwater Resources

Groundwater is the sole source of drinking water in the watershed. Individual well yields are generally low to inadequate because of low aquifer yields. It is not uncommon for single farms and families to use several wells.

Groundwater is stored in porous spaces and cracks within subsurface soil and rock layers called aquifers. Aquifers are unconsolidated materials and rock layers saturated with water, which is extracted and used as a water supply. Aquifers discharge groundwater to lakes, streams and wetlands. The uppermost part of the aquifer is called the water table.

Principal aquifers within the watershed are the Shallow Sand, the Gravel, and the Crystalline Granite Bedrock. In most of the watershed, the granite bedrock aquifer is covered by clay outwash deposits. The Shallow Sand and Gravel Aquifers are preferred drinking water sources. These aquifers exist primarily in the far eastern portion of the watershed and intermittently along river channels.

Groundwater flows from recharge areas such as hills and exposed bedrock to discharge areas such as lakes, rivers and wetlands. In this watershed, groundwater flow is local and follows topography with groundwater discharging into the Big Rib River and Lake Wausau (Kendy, 1988). The time between groundwater recharge and discharge is relatively short. Regional groundwater flow in western Marathon County is southeast toward the Wisconsin River (Bell, 1974).

Nitrates. As part of the watershed's *Water Quality Appraisal Report*, private well samples were collected and analyzed for nitrate (NO_3) plus nitrite (NO_2). Analytical results are summarized in Table 2-2. Samples analyzed for NO_3 plus NO_2 showed concentrations ranging from no detection to 25 parts per million or milligrams per liter (mg/L). The groundwater enforcement standard (ES) for nitrate is 10 mg/L. NO_3 plus NO_2 concentrations above 2 mg/L exceed the state's preventive action limit (PAL).

Table 2-1 Surface Water Resource Conditions, Problems, and Nonpoint Pollution Sources in the Lower Big Rib River Watershed

Sub-watershed	Stream Name	Length (Miles)	Biological Use[1] (Miles)	Habitat Rating[2]	Biotic Index Rating	Problems/ Limiting Factors[4]	Observed or Potential Sources[5]
Rib Falls	Big Rib River	10.4	WWSF / 10.4	Good to Fair	-----	HAB, SD, NU, FL	NMM, CL, SB
	Einert Creek	5	WWFF / 5.0	Fair to Poor	Very Good	HAB, SD, NU, FL	SBP, SB, CL
	Pine Creek	3	WWFF/ 3.0	Fair	Very Good	HAB, SD, NU, FL	SBP, SB, BY, CL
	Creeks 8-15, 16-6	1.4, 0.5	UNK	-----	-----	HAB, SD, NU, FL	SBP, SB, CL
	Creek 16-12	1.6	UNK	-----	-----	HAB, SD, NU, FL	SBP, SB, CL
Edgar	Omar Creek	3	WWFF/3	Poor	Fairly Poor	HAB, SD, NU, FL	SB, CL, URB
	Pet Brook	3	WWFF/3	Poor	-----	HAB, SD, NU, FL	SB, SBP, CL
	Scotch Creek	0-3.8	WWSF/3.8	Fair to Poor	Good	HAB, SD, NU	SB, CL
		3.8-10.0	WWFF/6.2	-----	-----	FLOW, DO	SB, CL
		10.0-18.0	UNK/8	-----	-----	HAB, SD, NU, FL	SB, CL, URB, PSM
	Soda Creek	5	WWFF/5	Fair	Fair	HAB, SD, NU, FL	SB, CL
	Creek 10-2	1.6	UNK/1.6	Poor	Poor	HAB, SD, NU, FL	SB, SBP, CL, DAM
Marathon	Big Rib River	10	WWSF/10	Good	-----	HAB, SD, NU, FL	NMM, CL, SB,
	Artus Creek	7	WWFF/7	Good to	Very Good	HAB, SD, NU, FL	URB, PSM
	Creek 3-7	0-0.75	LFF/0.75	Poor	-----	HAB, SD, NU	SB, SBP, CL
		0.75-1.8	LAL/1.05	-----		HAB, SD, NU	SB, CL
	Creek 5-14	2.9	UNK/2.9	-----	-----	HAB, SD	CL
Kennedy Creek	Kennedy Creek	7	WWFF/7	Fair to Poor	Very Good	HAB, SD, NU, FL	SB, CL, SBP
Lake Wausau	Big Rib River	4.5	WWSF/4.5	Fair	-----	HAB, SD, NU, FL	URB

Table 2-1 Legend

[1] **Biological Use** (existing and potential). This column indicates the existing and potential biological use supported by the stream as defined in ch. NR 102 (04)(3), Wis. Adm. Code, under fish and aquatic life uses. (Biological Stream classification will not change because of the priority watershed project, but water quality and aquatic habitat will be enhanced)

WWSF - warm water sport fish communities
WWFF - Warm water forage fish communities
LFF - limited forage fishery (intermediate surface waters)
LAL - limited aquatic life
UNK - unknown

[2] **Habitat Rating.** This column indicates the relative quality and quantity of aquatic life habitat in the stream.

[3] **Biotic Index Rating.** This column indicates water quality condition based on Hilsenhoff Biotic Index which uses macro invertebrates as an indicator of organic pollution.

[4] **Limiting Factors**

HAB - Habitat (lack of cover, sedimentation scouring etc.).
SD - Sedimentation (filling in of pools).
FL - Flooding or fluctuating water levels (flashiness).
NU - Nutrient enrichment.
DO - Dissolved Oxygen (low conditions).

[5] **Observed or Potential Sources**

CL - Cropland erosion.
SB - Streambank erosion.
SBP - Streambank pasturing.
BY - Barnyard or exercise lot runoff.
PSM - Point source, municipal treatment plant discharge.
NMM - Non-metallic mining (rotten granite/gravel).
URB - Urban runoff.

Table 2-2 Nitrate and Triazine Well Sampling for the Lower Big Rib River Watershed

Subwatershed	Nitrate				Triazine		
	Less than 2.0 mg/l NO_3	Between 2.0 and 6.0 mg/l NO_3	Between 6.0 and 10.0 mg/l NO_3	Greater than 10.0 mg/l NO_3	Less than 0.3 ppb	Between 0.3-3.0 ppb	Greater than 3.0 ppb
Edgar	11 (27%)	7 (17%)	10 (24%)	13 (32%)	36 (88%)	5 (12%)	0 (0%)
Kennedy Creek	3 (75%)	0 (0%)	0 (0%)	1 (25%)	3 (75%)	1 (25%)	0 (0%)
Marathon	2 (13%)	1 (7%)	7 (47%)	5 (33%)	12 (80%)	3 (20%)	0 (0%)
Rib Falls	3 (19%)	4 (25%)	6 (37%)	3 (19%)	15 (94%)	1 (6%)	0 (0%)
Lake Wausau	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Totals	19 (25%)	12 (16%)	23 (30%)	22 (29%)	66 (87%)	10 (13%)	0 (0%)

A total of 76 well samples were analyzed for nitrate, with 22 samples (29 percent) exceeding the enforcement standard (ES) of 10 mg/L. A total of 35 samples (46 percent) had levels less than the ES but greater than the PAL, and 19 samples (25 percent) had levels of nitrate less than the PAL. The lowest concentration was not detectable, and the highest was 25 mg/L. These results, along with the atrazine results, indicate current land use activities are affecting groundwater quality.

Atrazine. The State Laboratory of Hygiene analyzed a total of 76 samples for the presence of atrazine using the triazine screen method. Results ranged from no detection to 1.3 parts per billion (ppb) triazine. None of the samples analyzed by the state lab exceeded the ES of 3 ppb atrazine plus metabolites (breakdown components). A total of 10 samples (13 percent) exceeded the PAL of 0.3 ppb, and 23 samples (30 percent) had detectable levels. A total of 43 samples (57 percent) had no detectable levels of triazine.

A recent study by DATCP revealed that while the triazine screen may give an accurate appraisal of atrazine levels in private wells, detectable levels of the metabolites were not as conclusive. (Metabolites are thought to have the same adverse health effects as atrazine.) The study showed samples analyzed with the triazine screen method could indicate a no detectable level of atrazine

while exceeding the ES for atrazine metabolites. A follow-up sample should be analyzed for atrazine metabolites using gas chromatography.

Coliform bacteria. Water quality data from township wells within the watershed (1993-1997) indicated 21 percent of 2,118 wells sampled were positive for coliform bacteria and considered unsafe as a potable water supply. (Coliform bacteria is used as an indicator of pathogenic organisms in drinking water.)

Several factors can increase the occurrence of these bacteria in drinking water. Pathogenic organisms in groundwater are sometimes associated with septic systems, land spreading of manure, or up-gradient barnyards. Other sources of contamination include inadequately constructed wells, short-cased or dug wells, and wells located downslope from a contamination source. In bedrock formations, drilled wells frequently contain an in adequate amount of casing.

Ginseng production effects. Ginseng production has increased rapidly in Marathon County during the last decade. Ginseng is susceptible to a variety of insect and fungus and requires frequent applications of pesticide. DATCP is funding a study by the University of Wisconsin-Stevens Point to assess groundwater contamination from pesticides used in growing ginseng. A previously proposed water quality assessment of ginseng operations in the watershed was shelved because of data collection problems.

Volatile Organic Compounds. Volatile organic compounds from leaking underground gasoline or other fuel storage tanks and chemical spills can contaminate nearby groundwater and potable water supplies. After contamination has occurred these compounds are difficult to remove. New wells must be drilled in a different aquifer or in an up-gradient that is uncontaminated portion of the existing aquifer.

Private Well Construction

Well construction is regulated by the type of geologic formation encountered during drilling. Chapter NR 812, Wis. Adm. Code, specifies the allowable construction and minimum standards for well construction.

Over the years, many wells have been constructed with less than the minimum amount of well casing and/or well casings not properly installed. Crystalline bedrock is encountered in most of the wells within the watershed at a depth of less than 40 feet. Code regulations require these wells to be constructed with an upper-enlarged drill hole to the 40-foot depth with a cement grout well casing in place prior to drilling the lower drill hole.

Many water supply wells within the watershed are constructed according to the minimum standards contained in the State Well Code at the time of construction. Many existing wells, (constructed prior to 1936) were required by law to be brought into compliance with the code when it was adopted or properly sealed (abandoned). But many wells were not brought into compliance with those standards. In addition, a significant number of wells are not properly maintained. Wells not properly sealed are conduits for groundwater contamination. One improperly constructed or sealed well can contaminate a large quantity of groundwater. Dug wells

can allow contaminated surface water to reach the lower parts of the aquifer, rendering the water unfit for human consumption.

Since 1936, Wisconsin has required well drillers to document geological formations encountered during well construction. Soil and rock layer information, recorded on well construction reports, provides an important groundwater data base throughout the state. Private well owners, realtors, well drillers and pump installers, and local government agencies collect water samples from private wells. The water samples are analyzed by the Marathon County Health Department Laboratory for the presence of coliform bacteria and for nitrate and nitrite concentration.

Municipal Water Supplies

Most municipal well water comes from the sand and gravel aquifer. Traveling west within the watershed, glacial material becomes thinner, and the weathered granite bedrock aquifer is the primary source of water. The municipalities of Edgar, Marathon City, Rib Mountain, and Wausau have public water supply systems, but only the Town of Rib Mountain has a wellhead protection plan.

The **Village of Edgar** has five (5) active wells, all of which draw water from the Precambrian granite aquifer. The original water works for the village began operation in 1939. Well 1 consisted of a 50-foot deep gravel-packed well. Wells 2, 3, 4, 5 and 6 were also installed in gravel but have since been abandoned. The active wells (Wells 1, 7, 8, 9, and 10) range in depth from 205 feet (Well 7) to 400 feet deep (Wells 8 and 10). During high water, water samples from Well 9 were found to contain bacteria. The DNR has suggested radon removal, but the law does not mandate it. Areas suitable for development of municipal wells near the Village of Edgar are limited. A wellhead protection program, with emphasis on the well abandonment program, would be the best means of protecting the existing water supply. A wellhead protection plan was started with the Wisconsin Rural Water Association, but the Village of Edgar has not adopted it.

The **Village of Marathon City** has three (3) wells that draw water from the glacially deposited sand and gravel aquifer. All 3 active wells are within the 100-year flood plain of the Big Rib River. The original waterworks operation for the village began in 1936. Well 1 was drilled in 1936, is 86 feet deep, and was rehabilitated in 1993 (Falkowski, 1993). Well 2 was abandoned because of positive bacteria analyses. Well 3, constructed in 1961, is 82 feet deep. Well 4, installed in 1993, is 90 feet deep. The Village of Marathon City has a well abandonment ordinance but no wellhead protection plan. The vulnerability of the aquifer is evidenced by the history of bacteriological and volatile organic problems. Extensive investigations have shown the area where the existing wells are located may be the only site in the area suitable for municipal supply. A wellhead protection program would help protect the existing wells from further contamination.

The **City of Wausau** has a well abandonment ordinance and is currently working on a wellhead protection plan and ordinance. The city has five (5) active and two (2) standby wells that draw water from the glacially deposited sand and gravel aquifer. The City of Wausau is located in a buried bedrock valley where well depths range from 90 to 160 feet. River erosion carved the granite bedrock, and the valley was filled with permeable sand and gravel during glacial melting,

which created a relatively small pocket of readily available groundwater. Because the Precambrian granite underlying the sand and gravel is impermeable, water supplies for the city are limited to the sediment layer.

The original waterworks for the City of Wausau began operation in 1885 with construction of a dug well 40 feet in diameter and 32 feet deep. Between 1906 and 1924, a total of 15 additional wells were drilled. In 1984, air strippers were installed to remove volatile organic compounds from city wells.

Climate and Precipitation

The frequency, duration, and amount of precipitation influences surface and groundwater quality and quantity, soil moisture, runoff characteristics, and the physical condition of waterways. The Lower Big Rib River Watershed is in the continental zone. It is characterized by relatively long, cold and snowy winters and summers that are mostly warm, with periods of hot humid conditions.

Mean annual precipitation for the region is about 32 inches of rain and melted snow, the majority falling as thunderstorms during the growing season (May-September). Most water runoff occurs during snow melts 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 Rib River Watershed is within the Western Plain's region. This region is a flat-to-gently-rolling area with rich soils and is the county's major agricultural district. Elevation ranges from 1,940 feet above sea level at the top of Rib Mountain to about 1,161 feet above sea level where the Big Rib River converges with the Wisconsin River. The Lower Big Rib River includes well-dissected valleys, with relatively high local relief.

Geology

The Lower Big Rib River Watershed lies primarily within the southern portion of the Canadian Precambrian shield and consists of granite and undifferentiated igneous and metamorphic rocks. These formations are estimated to be 5,000 to 15,000 feet in thickness. In the most recent glacial advance, the Green Bay Lobe on the continental glacier covered the southwestern corner of the county; this part of the watershed contains most of the natural lakes. Older drift from previous glaciers cover the balance of the county consisting of ground moraine and unpitted outwash. Most of the watershed was not covered by the most recent glacial advance; consequently, there are no natural lakes typical of glaciated areas.

In the eastern part of the watershed, the topography is more striking as a result of erosion by the Wisconsin River. Crystalline rock outcroppings of Precambrian age protrude through glacially deposited clay, silt, sand and gravel. This crystalline rock is made up mostly of granites and meta-volcanics. Rib Mountain, a piedmont composed of quartzite, borders the watershed to the south and is the highest point in the watershed.

East of the Village of Edgar, glacial material overlies Precambrian rock. The glacial material is predominantly sediment derived from the weathering of younger Cambrian and Precambrian age rock. This sediment is typically about 6 feet thick, with numerous exposures of the crystalline bedrock. Near Edgar, the topography consists of broad uplands with deeply incised valleys. This area has approximately 3 feet of windblown sediments (loess) overlying glacial till.

Soils

Soils in the Lower Big Rib River Watershed can be divided into three groups (Map 2-6). and include soils underlain by loamy glacial till sandy or loamy glacial till, residuum, or bedrock. silty, loamy, or sandy alluvial, lucustrine, or outwash deposits. (Additional soil information is available from the Soil Survey of Marathon County.)

Areas Dominated by Soils Underlain by Glacial Till. Two soil associations formed primarily in glacial till are Magnor-Cable and Withee-Marshfied.

> **Magnor-Cable** soil terrain is described as deep, nearly level and gently sloping, somewhat poorly drained to very poorly drained, stony and silty soils on ground moraines.
>
> **Withee-Marshfield** soil terrain is described as deep, nearly level and gently sloping, somewhat poorly drained and poorly drained, silty soils on ground moraines.

These soils, which make up 19 percent of the land area in the watershed, are found along the western and northern edges of the watershed. Slopes on these soils generally range from 2 to 4 percent. Low permeability and infiltration of Magnor, Withee, and Marshfield soils limit crop choices. Excessive water contributes to yield loss and delays in field preparation, planting and harvesting.

Rainfall infiltration is slow due to the silty and claylike nature of these soils. Slow infiltration contributes to sediment erosion loads reaching nearby streams. The availability and content of clay on these soils makes them suitable for installing manure storage facilities.

Because of excessive wetness and an abundance of stones, cable soils are generally unsuitable as cropland. These soils support woodlands and wetland wildlife habitats. Because of wetness and slow permeability, ponding, and seasonal high water table, these soils are also poorly suited as septic tank absorption fields.

Areas Dominated by Soils Underlain by Glacial Till, Residuum, or Bedrock. Three soil associations underlain by glacial till, residuum, and bedrock occur throughout the watershed.

> **Marathon-Mylrea-Moberg Association,** deep, nearly level to moderately steep, well drained, somewhat poorly drained, and somewhat excessively drained, stony, gravelly, and silty soils on upland and ground moraines.

Fenwood-Rietbrock-Rozellville Association, deep, nearly level to steep, well drained and somewhat poorly drained, stony and silty soils on ground moraines and bedrock-controlled uplands.

Meadland-Mosinee-Dancy Association, deep, nearly level to moderately steep, somewhat poorly drained, well drained, and poorly drained, stony and loamy soils on ground moraines and bedrock-controlled uplands.

Uses and Limitations. These soils make up 61 percent of the land area, are found centrally throughout the watershed, and are primarily used for cropland, woodland, pasture, and wildlife habitat. The main concerns in managing Fenwood-Rozellville soils are controlling soil erosion and maintaining tilth.

Slopes of these soils typically range from 2 to 20 percent in the watershed. The well-drained nature of these soils, the erosion hazard on steeper slopes, and the need to maintain tilth lends itself to applying conservation practices. Applicable conservation practices in these soils include reduced tillage, contour farming, contour strip cropping, and/or diversions. Manure storage facilities installed in these soils are generally vertical concrete structures, concrete-lined earth storage, pre-approved manufactured structures, or are clay lined with suitable material brought in from another site.

Because of the depth to bedrock and because of their moderate permeability, these soils are moderately suited for septic tank absorption. Depth to bedrock is the main concern for Rietbrock soils. Because of the relatively shallow depth to bedrock and the fractures and crevices in the bedrock, groundwater is at risk of contamination from septic effluent, commercial fertilizers, leaking petroleum tanks, animal waste, and other potentially hazardous materials. Elevated levels of nitrates are also a concern in these soil types of soil and terrain. Well water analyses for nitrate indicates most of the wells exceeding 10 ppm are located in these soil types. In addition, many wells with nitrate levels between 2 and 10 ppm are also in these soils.

Maintaining tilth and organic matter are the main concerns for the moderately to rapid permeable soils of the Marathon, Moberg, and Mosinee soils. These soils have a slight to moderate potential for soil erosion. Slopes in these soils within the watershed generally range from 2-15 percent. The well drained to somewhat excessively drained nature of these soils support use of conservation tillage to prevent soil loss and to conserve soil moisture. These soils are not suitable for installing on-site earthen manure storage facilities. Storage facilities installed need to be concrete lined, manufactured, or clay lined with suitable material brought in from another site. Marathon and Mosinee soils are suited for septic tank absorption fields, although steepness of the slope may affect their suitability. Moberg soils have poor filtering and attenuation capabilities because of the extremely gravelly and loamy coarse sands found in the subsoil. Groundwater in these soil types are at risk of contamination from septic effluent, commercial fertilizers, leaking petroleum tanks, animal waste, and other potentially hazardous materials. Marathon and Moberg soils are also a source of rotten granite.

The main concern for Meadland, Dancy, and Mylrea soils is controlling soil wetness. Often undrained areas of these soils are not suited for cropland. Because of a high groundwater table, ponding, slow permeability, and poor filtering capabilities, these soils are poorly suited for septic

tank absorption fields and manure storage facilities. These soils would be suitable for wetland or woodland wildlife development.

Areas Dominated by Soils Underlain by Alluvial, Lucustrine, or Outwash Deposits. Two soil associations underlain by alluvial, lucustrine, or outwash deposits occur throughout the watershed.

> **Mahtomedi-Fordum-Sturgeon Association,** deep, nearly level to very steep, excessively drained, moderately well drained, poorly drained, very poorly drained, and somewhat poorly drained, sandy and silty soils on steam terraces, outwash plains, and flood plains.
>
> **Chetek-Rosholt-Oesterle Association,** deep, nearly level to steep, somewhat excessively drained, well drained, and somewhat poorly drained, loamy and silty soils on outwash plains and stream terraces.

Uses and Limitations. The major soils in these associations are used for cropland, woodland, wildlife habitat, pasture and building sites and make up about 20 percent of the land area in the watershed. These soils are found on the floodplain of the larger streams in the watershed.

Low water holding capacity is the primary concern in managing Mahtomedi, Chetek, and Rosholt soils. Cultivated land on these soils is subject to wind erosion. Proper management of crop residue and green manure crop, and installing windbreaks reduces the hazard of losing soil, increases organic matter, and helps conserve soil moisture. Because of its sandy nature and poor attenuation properties, these soils are a poor filter for septic tank absorption fields and pose as a potential medium for ground water contamination. Manure storage structures installed in these soils must be built liquid tight to ensure the protection of ground water.

Wetness, a seasonal high ground water table, and/or flooding are the main management concerns for the Sturgeon, Fordum, and Oesterle soils. These soils are mostly suited for woodlands or wildlife habitats. Oesterle soils can be used for cropland if excessive water is adequately drained. These three soil types are poorly suited for septic tank absorption fields.

Map 2-6 Lower Rib River Watershed Soil Association

Soil Legend

Areas Dominated by Soils Underlain by Glacial Till

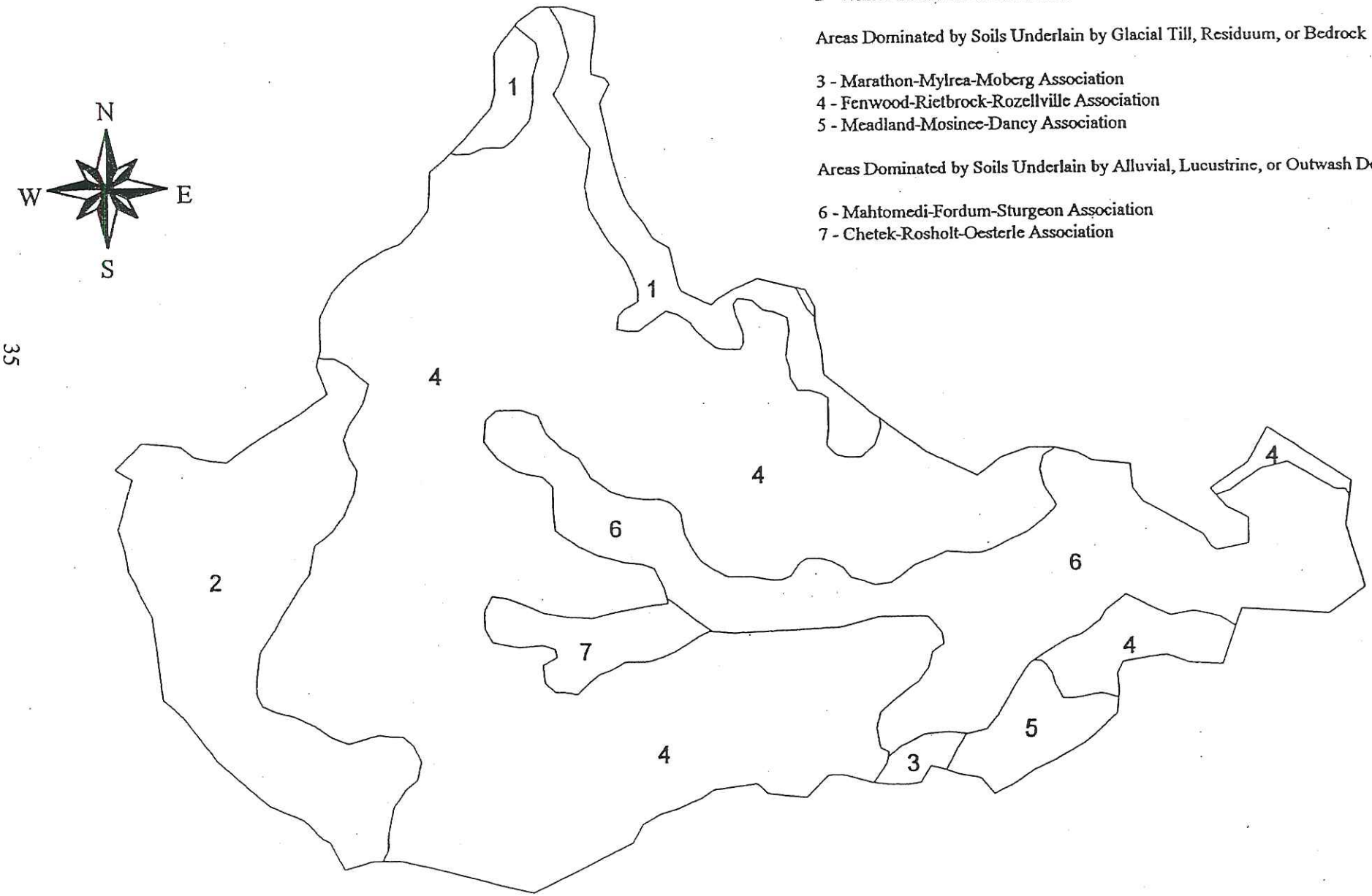
1 - Magnor-Cable Association
2 - Withee-Marshfield Association

Areas Dominated by Soils Underlain by Glacial Till, Residuum, or Bedrock

3 - Marathon-Mylrea-Moberg Association
4 - Fenwood-Rietbrock-Rozellville Association
5 - Meadland-Mosinee-Dancy Association

Areas Dominated by Soils Underlain by Alluvial, Lucustrine, or Outwash Deposites

6 - Mahtomedi-Fordum-Sturgeon Association
7 - Chetek-Rosholt-Oesterle Association



CHAPTER THREE
Pollution Sources and Management Strategies

This chapter identifies management categories, groundwater pollution sources and management strategy, rural nonpoint pollution sources and management strategy, urban nonpoint pollution sources and management strategy, and other pollution sources for the watershed.

Management Categories

Management categories define which nonpoint source best management practices (BMPs) are eligible for financial assistance. Specific sites or areas within the watershed will be designated as Critical, Eligible I, and Eligible II. Management category eligibility criteria are expressed in terms of tons of sediment and/or pounds of phosphorus delivered within the watershed. Sites will be inventoried and prioritized based on the amount of runoff. Landowners making significant changes to their operations will have their eligibility re-evaluated.

The Marathon County Land Conservation Department (LCD) will help landowners apply for BMPs. Eligible practices range from alterations in farm management (e.g., changes in manure-spreading and crop rotations) to engineered structures (e.g., diversions, sediment basins, and manure storage facilities).

Critical Management Category. For sites that have been designated as Critical, controlling the pollution source becomes essential to meeting the plan's water quality objectives. Nonpoint pollution sources included in this category contribute a significant amount runoff pollution to surface waters. Landowners with Critical sites are required by law to reduce the pollutant load to an acceptable level. The Critical management category applies to barnyards/feedlots, cropland erosion, and trampled streambanks.

Eligible I Management Category. Sites in this category are eligible for technical and cost-share assistance but are not considered as critical for obtaining water quality objectives. This category applies to all nonpoint sources of pollution except streambank erosion.

Eligible II Management Category. Nonpoint sources of pollution in this category collectively contribute less of the pollutant load than those in the Eligible I Management Category. These nonpoint sources are eligible for funding and technical assistance under the priority watershed project.

Ineligible Management Category. Sites that do not contribute significant amounts of nonpoint source pollution are not eligible for funding through the priority watershed project. Other DNR programs, including wildlife and fisheries management, along with other state and federal programs, may be able to provide assistance as part of an integrated resource management plan.

Groundwater Protection

Groundwater quality in the Lower Big Rib River Watershed is generally considered poor. As a part of the water quality inventory, 76 private well samples were collected and analyzed for nitrates and triazines. Results of the inventory (Tables 2-1 and 2-2) indicated 29 percent of the wells sampled were above the Enforcement Standard (ES) of 10 ppm; 46 percent of the samples were within the Preventative Action Limit (PAL) of 2-10 ppm. Nitrate concentrations ranged from 25 ppm to not detectable.

The results of triazine tests indicated none of the wells sampled was above the ES of 3 parts per billion (ppb) for triazine, and 13 percent of the wells sampled were within the PAL range of 0.3 ppb-3 ppb. Samples analyzed for triazines indicated concentrations ranging from non-detectable to 1.3 ppb.

Land uses and/or management practices elevating nitrate and pesticide concentrations in groundwater include the following.

- Poor manure and nutrient management practices.
- Increased pesticide use and amounts, and poor disposal practices.
- Poorly sited and/or constructed and mismanaged manure storage facilities.
- Improperly abandoned wells.

Groundwater Management Strategies. Implementation of nutrient and nest management plans are important tools to protect groundwater from elevated nitrogen levels and pesticide contamination. Landowners within the project area are eligible for cost sharing to developed nutrient management and integrated pest management plans. These plans are developed by private crop consultants and reviewed by the Marathon County LCD.

Groundwater will also be protected by enforcement of Marathon County's Animal Waste and Manure Management Code. This ordinance requires idle or malfunctioning storage facilities posing a threat to groundwater "...shall be abandoned and/or repaired to a condition meeting the Technical Standards of the Marathon County LCD."

A third opportunity to protect groundwater is through identification and proper abandonment of wells. Wells provide a direct conduit for pollutants to reach groundwater. Preventing well contamination and sealing abandoned wells are important steps for protecting groundwater. If not properly sealed, abandoned wells can directly channel contaminated surface water or shallow groundwater into deeper drinking water aquifers. Information on the proper abandonment procedures and cost sharing will be provided to landowners when abandoned wells are located.

Marathon County has developed a permanent Clean Sweep site in the Village of Schofield, where residents can bring unwanted hazardous material such as outdated products or unlabeled pesticide containers. Marathon County received funding in 1998 for an agricultural Clean Sweep program. The Marathon County LCD will use landowner educational materials to support groundwater protection measures.

Rural Nonpoint Pollutants and Management Strategies

Pollutants carried in rural runoff include sediment, nutrients, oxygen-demanding substances, pesticides, and bacteria. These pollutants degrade water quality and impair recreational and biological uses. Principal rural nonpoint sources of pollution in the Lower Big Rib River Watershed include the following.

- Runoff from barnyards and livestock feeding and pasturing areas.
- Runoff from land spread with manure on high-hazard acres in winter.
- Discharges from milk houses.
- Runoff from cropland.
- Sediment from stream banks and gullies.
- Trampling of stream banks and loss of riparian buffers.

Agency staff will also enforce the four (4) Animal Waste Advisory Committee (AWAC) prohibitions.

- No overflow of manure storage structures
- No unconfined manure stacking (piling) within 300 feet of a stream (including any intermittent stream identified on a USGS 7.5 minute topographic map), 1,000 feet around a lake, and in site specific areas susceptible to groundwater contamination (Water Quality Management Areas).
- No direct runoff from feedlots or stored manure.
- No unlimited livestock access to waters of the state where high concentrations of animals prevent maintenance of adequate sod cover.

Barnyard Runoff

Runoff from barnyards and other confined livestock areas are a major source of water pollution in the watershed. Barnyard runoff is detrimental because of its high phosphorus and biochemical oxygen demand (BOD), organic matter, bacteria, and ammonia. BOD is a measurement of the oxygen consumed as part of the biological process converting organic matter into water. The higher the BOD, the greater the degree of pollution. Using the BARNY model to measure runoff, 204 barnyards are a source of 10,000 pounds of phosphorus (Table 3-1) and 679,707 ppm BOD per year.

Excessive plant growth, stimulated by nitrogen and phosphorus in runoff, degrades water quality. Most of the oxygen-demanding pollutants and nutrients associated with barnyards and confined livestock areas drain concentrated flows to streams and wetlands. When organic matter reaches surface water, dissolved oxygen is depleted by organisms decomposing the organic material. As part of photosynthesis and respiration, dense aquatic plant growth causes severe oxygen fluctuations that stress aquatic life. The presence of bacteria and pathogens from organic material

also poses a human health hazard, since the water is unfit and not safe for consumption or recreational uses.

Eligibility

The objective for barnyard runoff control is to reduce phosphorus loading to streams by 50 percent. Barnyard sites contributing a phosphorus load greater than 175 pounds are designated as critical sites. Landowners with a barnyard designated as a critical site are eligible for a complete barnyard system. Full systems cost shared must meet a minimum performance standard of 20 pounds of annual phosphorus runoff. Landowners may address the runoff problem without cost share assistance; however, they must meet a minimum performance standard of 70 pounds of phosphorus runoff annually. The system must be approved by the Marathon County LCD.

Barnyard sites contributing between 70 and 175 pounds of phosphorus annually are eligible for cost sharing for full barnyard runoff systems. A full barnyard system includes, but is not limited to, a sediment basin, a filter strip, and tributary reduction practices. The lowest-cost solution is always endorsed. Barnyards contributing between 20 and 70 pounds of phosphorus annually are eligible for funding of tributary reduction practices and/or buffer installation.

Landowners receiving cost-share funds for barnyard runoff control systems are required to prepare a nutrient management plan (NMP), according to the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Standard 590. Cost sharing is available for eligible practice, including the development of the NMP, soil and manure testing, spreader calibration, crop scouting, and other planning costs. A soil conservation plan is necessary for the development of an NMP. These plans are developed by the Marathon County LCD, the landowner, and the crop consultant.

Map 3-1 Nitrate Sample Results

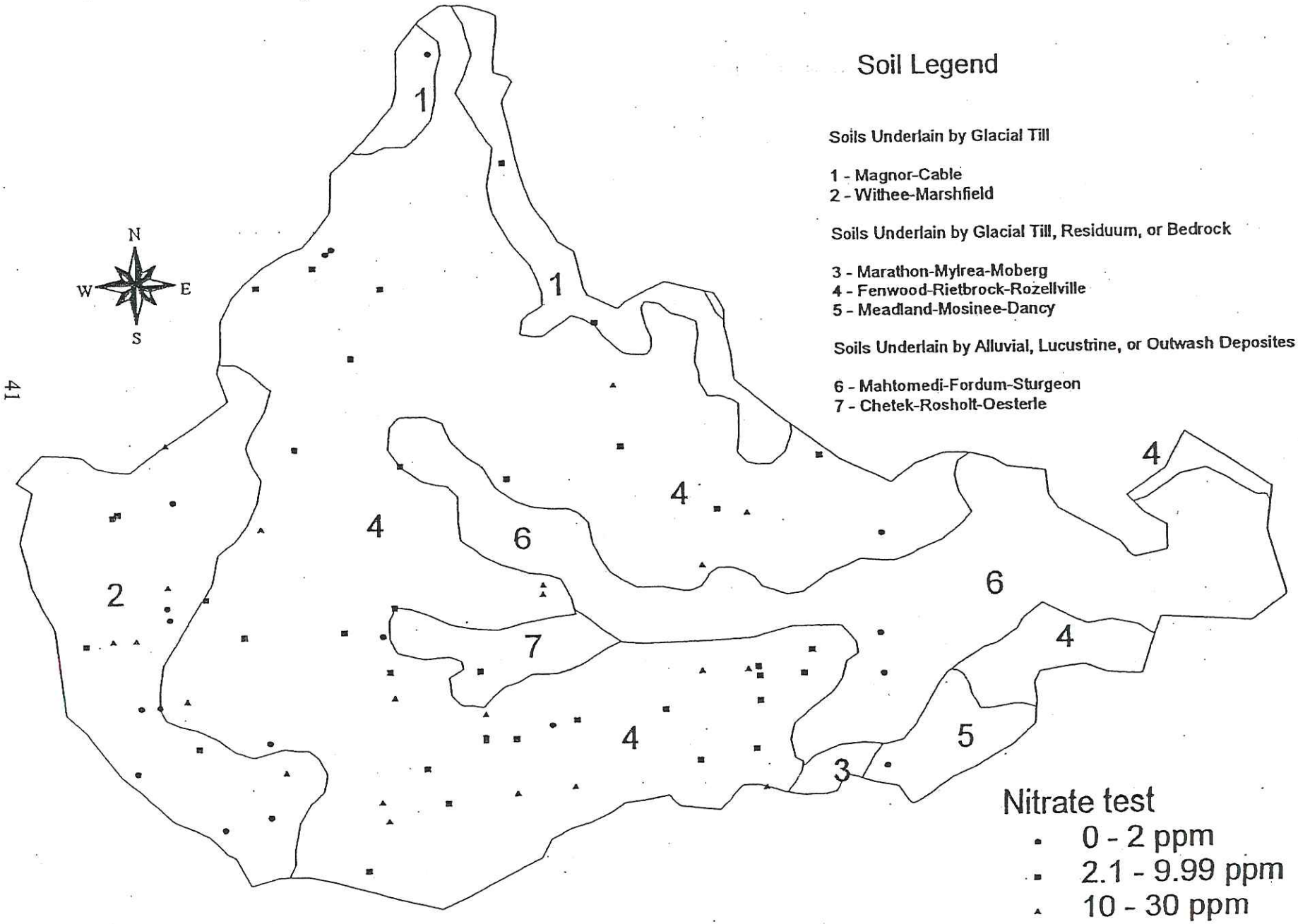


Table 3-1 Barnyard Inventory and Eligibility Criteria

Management Category	Amount of Phosphorus Per Barnyard (lbs)	# of Barnyards
Critical Sites	> 175	9
Eligible for Full Barnyard Systems	70 – 175	32
Eligible for Tributary Reduction and/or Buffers	20 – 70	80
Ineligible	0 – 20	83
Total	10,000	204

Table 3-2 Phosphorus Reduction from Barnyards (Goal: 50 Percent Reduction)

Management Category	Phosphorus Reduction (lbs/yr)	% Reduction	% of Goal
Critical	2020	20%	40%
Eligible II	5100	51%	10%
Total	7120	71%	50%

Nutrient and Pest Management

All cropland (a total of 40,024 acres) in the Lower Big Rib River Watershed will be eligible for NPM cost sharing. A total of 193 landowners in the watershed were inventoried using the Nutrient Rating Guide. The landowners produced an estimated 10,120 pounds of phosphorus runoff within the watershed. Staff will use the Nutrient Rating Guide inventory to prioritize nutrient management sites and contact landowners.

Pest management will be addressed through the NRCS Pest Management Standard 595. Nutrient and pest management plans will be developed by private consultants and cooperatives. Eligible landowners may apply for cost sharing for up to 3 years to cover half of the planning fees. Marathon County Land Conservation Department (LCD) staff will prepare soil conservation plans and materials for the nutrient and/or pest management plan. Final plans are reviewed by department staff.

Implementation of nutrient management plans are expected to reduce phosphorus runoff by about 40 percent, according to the Nutrient Rating Guide. Marathon County LCD staff will use this guide to quantify decreased phosphorus loads from participating farms. Services contracts developed for nutrient and pest management consulting must include a provision for reporting required information, including application rates, to the Marathon County LCD.

Farm Practices Inventory Survey Results

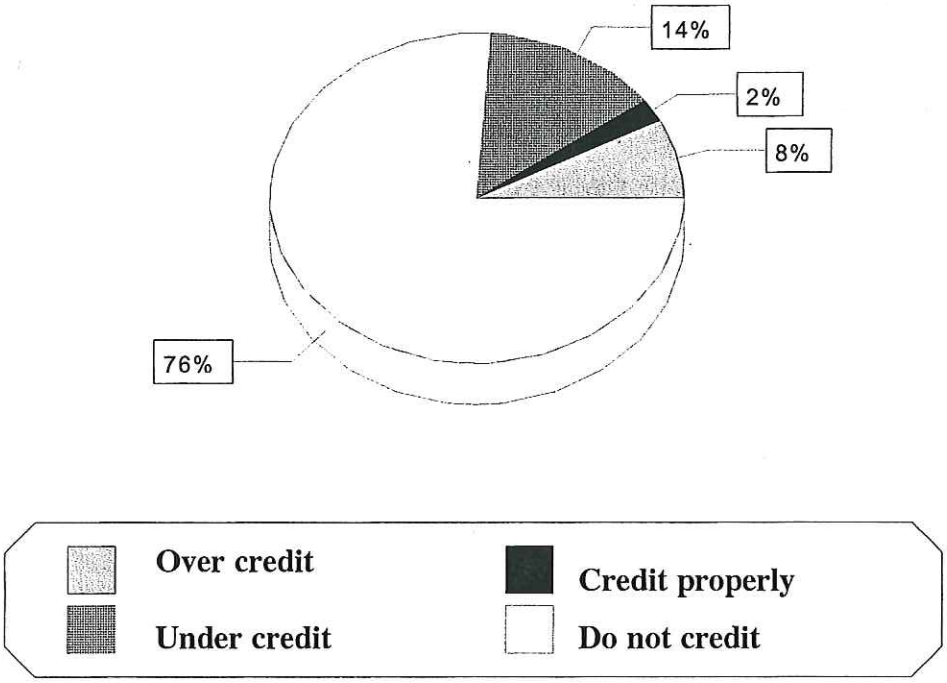
In 1996-1997, the University of Wisconsin-Extension Environmental Resources Center assisted the Marathon County LCD in developing and conducting a Farm Practices Inventory (FPI). The inventory included a survey of agricultural landowners to provide information on the needs, attitudes, behavior, and nutrient and pest management practices in the watershed.

Farmers in the Lower Big Rib River area currently apply nutrients in excess of UW-Extension recommendations of 120 pounds nitrogen and 45 pounds of phosphorus per acre of corn. Nitrogen application rates in the watershed ranged from 8 to 456 pounds per acre and phosphorus rates ranged from 2 to 319 pounds per acre. Based on the FPI survey results, the average phosphorus application rate exceeded UW-Extension recommendations by 109 percent; nitrogen application rates exceeded the optimal rate by 30 percent.

The amount of phosphorous and nitrogen applied to fields includes manure applications, legume credits, and commercial fertilizers. Excessive application results in part from the lack of proper nutrient crediting of manure application and plowing of legumes (within 10 percent of UW-Extension recommendations).

Manure Crediting. Manure contributes significant amounts of nitrogen and phosphorus to soil, decreasing the need for commercial fertilizer. But over-fertilization often occurs when manure nutrients are not credited. Manure rates for the Lower Big Rib watershed were determined by asking farmers to identify the type of manure, the size of their manure spreader, the number of loads applied to the most productive corn field, and the size of the field. Nitrogen credits were calculated from University of Wisconsin recommendations based on animal type and method of application (liquid or solid). Farmers were asked if they credit nitrogen from manure, and if so, the amount of the credit. Figure 3-1 below indicates 90 percent of landowners either under-credit or do not credit nitrogen and phosphorus applied farm manure.

Figure 3-1 Farmers Crediting for Manure (79 Farms Inventoried)

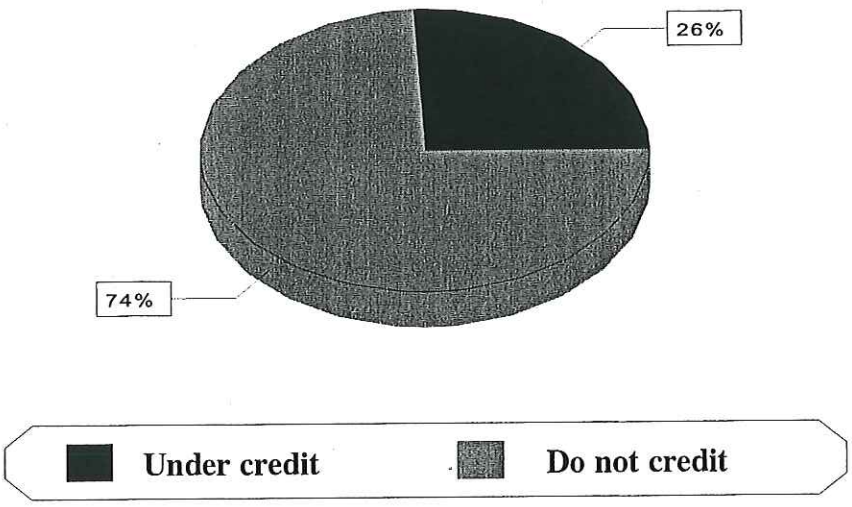


Legume Crediting. The proper crediting of nitrogen from legumes is another critical issue of nutrient management. Legumes like alfalfa, clover, soybeans, and peas can convert atmospheric nitrogen into a form used by plants. Up to 160 units (pounds) of nitrogen per acre of legumes may be available to the succeeding crop. Conservative values of 130 units for alfalfa, 104 units for clover, 35 units for soybeans, and 20 units of available nitrogen from peas were used to determine legume nitrogen credits. Only 27 of the 93 farmers surveyed included legumes in their rotation in 1995 (the year before their 1996 corn crop), and all 27 of these farmers planted alfalfa. No other legumes were planted. While numbers will vary depending on rotation, they are presumably representative.

Farmers were asked to identify the rotation on the most productive corn field. A nitrogen credit was assigned based on the type of legume crop grown in 1995. Only first year legume credits were calculated although university research has shown there is still a substantial amount of nitrogen released from decaying legume residues in the second year following the legume crop in non-sandy soils. As with manure crediting, asking farmers if they credit only partially explains legume management in the Lower Rib River Watershed. The accuracy of crediting was determined by comparing claimed credit versus a conservative estimate of the actual nitrogen credit.

Figure 3-2 indicates all inventoried landowners under-credit or do not credit for legume plow down.

Figure 3-2 Farmers Crediting for Legumes (72 Farms Inventoried)



Manure Storage. Groundwater, surface water, and aquatic life are at risk when manure storage facilities are improperly located, designed, constructed and/or managed. Marathon County adopted a manure storage ordinance (Appendix A) to prevent groundwater and surface water pollution by requiring proper design, construction, location, and management of permitted facilities. Manure storage ordinances must meet the guidelines adopted by the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) and cite applicable NRCS construction, management, repair and modification standards.

Eligibility

An operation is eligible for cost sharing for a storage facility to manage manure during periods of snow-covered, frozen and/or saturated conditions as a way of protecting water quality. All landowners having a potential need for manure storage were evaluated for eligibility using the Manure Storage Rating Guide (MSRG) as developed by Bob Wilson of the NRCS. Based on the MSRG, winter spreading and lack of NMP contributes 23,000 pounds of phosphorus annually to the Lower Big Rib River. (The inventory rating, phosphorus load, and acres deficit will be used as a preliminary nutrient management plan to determine storage needs and sufficient land spreading acreage.)

Rating. An MSRG rating given to an operation is an indication of how much phosphorus is getting into surface waters as a result of a landowner's manure spreading practices. The rating is based on the pounds of phosphorus that could be saved by proper nutrient management and no winter spreading and the percentage of high hazard fields.

Phosphorus Load. This is determined from the amount of manure spread, and the land and spreading conditions.

Acreage Deficiency. This is the number of acres needed for spreading manure produced in the winter, minus the acres that are suitable for winter spreading. The MSRG breaks down the total phosphorus load into two categories: phosphorus from runoff of manure spread on frozen or snow-covered ground, which constitutes 12,848 pounds of phosphorus or 56 percent of the total; and phosphorus from manure not applied in accordance with the management plan, which constitutes 10,152 pounds of phosphorus or 44 percent of the total.

The total reduction goal for manure storage is 50 percent or 11,500 pounds of the annual phosphorous load. This goal was determined by looking at the two (2) MSRG categories individually. Marathon County LCD staff estimated a reduction of 4,000 pounds of phosphorus annually would occur if 25 percent of landowners in the midrange for phosphorus contribution implemented an NMP. To achieve the goal, phosphorus lost from spreading manure on frozen or snow-covered ground would have to be reduced by 7,500 pounds per year.

As part of this initiative, eligibility and cost sharing for manure storage are broken into two categories. Eligible I sites are sites with existing malfunctioning manure storage facilities or have a rating greater than 35 (as defined by the county's Animal Waste and Manure Management

Code). About 50 landowners have a rating greater than 35 and approximately 20 landowners have existing facilities that are, or are close to, malfunctioning. Landowners with a malfunctioning facility are also eligible for cost sharing to abandon an existing facility. The maximum cost-share rate for manure storage in this category is $35,000. Eligible II sites have a rating of 25-35. A total of 58 landowners are in this category. The maximum cost-share rate for manure storage facilities in this category is $20,000.

Development of nutrient management is a requirement to receive cost-share funds for manure storage practices and a requirement of Marathon County's manure storage ordinance. The MSRG and the management plan must also demonstrate that the proper use of manure can be achieved following adoption of the intended storage practice. If a landowner is unable to use manure according to the management plan, the landowner will be ineligible for storage funds unless other arrangements, such as bartering, can be made to accommodate all of the nutrients.

Storage facility cost sharing will be based on the least-cost facility meeting storage capacity and NRCS Standard 313 or 425. Additional options for managing manure, without cost share assistance, include manure stacks (according to Standard 312); reduction in the number of animals; rental of additional lands; or, if in compliance with the NMP, hauling manure for use at a neighboring farm.

Table 3-3 Manure Storage Inventory and Eligibility Criteria

Management Category	# of Landowners	Rating	Total Inventoried Phosphorus (lbs/yr)
Eligible I	50	Greater than 35	11,609
Eligible II	58	35 – 25	6,319
Ineligible	85	Less than 25	5,072

Upland Sediment

Area agricultural practices have caused eroding soil to reach streams, ponds, and wetlands in the Lower Big Rib River watershed. Upland sediment sources have been evaluated through sub-area sampling and has been extrapolated for the entire watershed (84,306 acres or 133 square miles). At the time this plan was drafted, 23 percent of the land area had been inventoried. Soil erosion was calculated using the Universal Soil Loss Equation (USLE). Sediment delivery was calculated using USLE and hydrology information in the Field Offices Computing System Sediment Transfer Model (based on the Universal Soil Loss Equation. Uplands include cropland, farmsteads, rural residential land, natural areas, pastures, mining land, wood lots, and urban land. Sediment load reduction and soil loss from cropland will be reduced using changes in rotation, contour farming, high residue management, cropland protection cover, critical area stabilization and riparian buffers.

An estimated 15,625 tons of soil per year are delivered to wetlands or streams in the watershed from 40,024 acres of cropland. An additional 992 tons per year are delivered from 40,559 acres of farmstead and residential land, natural areas, pastures, gullies and mining. Urban land (3,723

acres) delivers and estimated 1,775 tons per year. A 25-percent reduction goal was set for sediment delivered from cropland (Table 3-4). The average sediment delivery rate in the watershed is 800 pounds per acre per year. All fields contributing more than 200 pounds of sediment per acre per year per year will be eligible for cost sharing for cropland practices.

Cropland fields delivering sediment to surface water at a rate greater than 1,000 pounds per acre per year and that have a soil loss rate greater than T or the tolerable soil loss based on the USLE, will be targeted as critical sites. Approximately 4,050 acres, or 10 percent of the cropland, meets critical site criteria. All critical-site cropland fields will need to get down to T minus 1 or less or have a sediment delivery rate of 1,000 pounds per acre per year or less. This will reduce sediment delivery to streams by approximately 2,130 tons per year, about 55 percent of the total cropland goal.

Landowners with cropland fields delivering the highest sediment to the stream will receive an initial critical site notification. These highest-ranked fields have a sediment delivery rate of greater than 1.3 tons per acre per year and a soil loss greater than T. Reducing sediment delivery 1,000 pounds per acre per year. or soil loss down to T minus 1, will reduce total sediment delivery by approximately 1,007 tons per year, or 26 percent of the goal. Approximately 117 fields, or 1,690 acres (4 percent of the total cropland), will be identified initially as critical sites.

At the end of the fifth year of project implementation, the Marathon County LCD, DNR regional office staff, and DATCP will evaluate the progress of the Lower Big Rib River Watershed Plan in reducing upland sediment loads. If acceptable progress has been made by the end of the fifth year of implementation, the remaining critical sites not notified by letter will be reclassified as Eligible II. These sites deliver sediment at a rate between 1,000 pounds and 1.4 tons per acre per year and have a soil loss of greater than T. An estimated 426 fields or 2,360 acres (6 percent) of cropland in the watershed will fall into this category. Reducing sediment delivery in these fields to a rate of 1,000 tons per acre per year or T minus1 is expected to reduce the sediment load by approximately 1,123 tons per year, or 29 percent of the goal. If acceptable progress is not achieved, those fields with a sediment delivery of greater than 1,000 pounds per acre per year but less than 1.4 tons per acre per year and a soil loss greater than T will be identified as critical sites. Critical site owners will be contacted and verified according to schedules set by the project review team.

Acceptable progress is defined as achieving 60 percent of the total cropland sediment reduction goal (2,345 tons per acre per year) as part of signed cost share agreements by end of the fifth year. The critical site verification contact strategy will focus on the development of cost share agreements with landowners having cropland fields meeting critical site criteria.

Table 3-4 Cropland Sediment Inventory (Goal: 25 Percent Reduction)

Sub-watershed	Area (Acres)	Sediment Delivery (tons/yr)	Sub-watershed Contribution	25% Sediment Reduction (tons)	Planned Sediment Load (tons/yr)
Edgar (ED)	18,436	8,249	53	2,063	6,186
Rib Falls (RF)	11,715	4,349	28	1,087	3,262
Marathon (MA)	7,978	2,505	16	626	1,879
Kennedy Creek (KC)	1,895	522	3	131	391
Total	40,024	15,625	100	3,907	11,718

Table 3-5 Cropland Sediment Goals Based on 23 percent of Inventoried Cropland

Category	Sediment Delivery and Soil Loss (tons/ac/yr)	Number of Tracts	Fields	Acres	Sediment Reduction (tons/yr)
Highest Critical	Greater than 1.3 and greater than T	65	117	1,690	1,007
Critical	Greater than 0.5 but less than or equal to 1.3, and greater than T	148	426	2,360	1,123
Eligible II	Greater than 0.1 but less than or equal to 0.5	655	1,953	23,921	1,777
Ineligible	Less than or equal to 0.1	213	630	12,050	---

Ginseng. In addition to traditional crops of corn, soybeans, small grains, alfalfa, and red clover, ginseng is also grown in the watershed. Ginseng has been grown in Marathon County since the early 1900s. It is a high-value root crop used for medicinal purposes. In 1990, there were about 855 acres of ginseng in the Lower Big Rib River Watershed area, about 2 percent of the total crop land.

Little erosion occurs in ginseng gardens after they have been planted and mulched, but there can be significant soil loss the year before planting, after harvesting, and from areas leading to the ginseng gardens. Significant sediment loads from washing harvested roots also can degrade adjacent streams and wetlands.

Understanding some basic traditional management is necessary in order to understand the need for ginseng BMPs. Ginseng is usually planted on fields coming out of hay. The field is plowed in the fall and left fallow for a year. It may be tilled several more times to reduce the number of pathogens by solar sterilization.

Ginseng is planted in ridges to allow water to rapidly run off to reduce the potential for disease. Ginseng is heavily mulched and covered with a wood lathe or plastic roof for shade. The area immediately adjacent to the garden is left bare to prevent the spread of diseases and weeds. After a 3- to 5- year period, ginseng roots are harvested and washed, typically near a water source. The following year, the field is planted with a row crop to loosen the soil.

The average size of ginseng gardens has continued to increase. As a result, large hillsides may be open during part of the year. Through the use of planning, the development of interim BMPs, and the use of existing BMPs (see Appendix B), the amount of sediment and nutrient runoff can be reduced.

Streambank Erosion

Management efforts in the Lower Big River Watershed should focus on specific streambank erosion control practices. Efforts to decrease sediment loads and streambank erosion through the use of upland BMPs, wetland restoration, and riparian buffers will be most cost effective and beneficial to the resource.

Tributary streambanks contributing more than 1 ton of sediment per year to the Lower Big Rib River are eligible for cost sharing. If an on-site evaluation of an eroding streambank leads local LCD staff to conclude that installation of practices to correct the problem would not be cost effective, that site will be deemed ineligible. Generally, streambank sites located within woodland or wetland areas are not accessible and the installation of practices is not cost effective.

Streambank erosion along the tributaries differs from erosion along the main branch of the river. Streams carrying high sediment loads cause more bank erosion than streams without a heavy sediment load. Tributary erosion sites, often located adjacent to more accessible land, are created by actions and the pressures people place on the resource. These sites often include finer silt and clay particles, which have a high affinity for phosphorus and a high rate of suspension. Together, these factors create a brownish color in the water column and a degradation of aquatic habitat

from sediment deposition in pools and riffle. Since many of these sites are small and have low banks, installation of BMPs are typically more cost effective and should be the focus restoration efforts.

The main branch of the Lower Big Rib River generates 70 percent of all streambank erosion in the watershed. But correction of the erosion along the main branch presents several challenges. The majority of the erosion sites on the main branch of the Big Rib River are located in very broad, naturally meandering flood plains. Often, the sites are inaccessible because of heavily wooded areas or adjacent wetlands. Many of the sites consist of long, steep banks, which make installation of BMPs cost-prohibitive. Additionally, most sites consist of banks with soils of clean sand and gravel, with little capacity to absorb phosphorous.

Approximately 110 miles of streambank have been evaluated for erosion. An estimated 4,100 tons of sediment erode into these streams annually. This represents 18 percent of the total sediment load to surface water in the Lower Big Rib River Watershed (Tables 3-6, 3-8). The sediment load received from banks along the main branch of the Big Rib River contribute an estimated 2,900 tons annually. The remaining 1,200 tons is from erosion of tributary banks. Streambank cost-share eligibility information is listed in Table 3-7. Streambank erosion and degraded habitat inventory data is listed by stream in Table 3-9.

Table 3-6 Upland Sediment Loading by Land Use: Lower Big Rib Watershed [1]

Sub-watershed		Cropland	Gully	Farmstead/ Residential	Natural Area	Pasture	Woodlot	Mining	Urban	Totals
Edgar	**Acres**	**18,435**	**1**	**1,010**	**3,641**	**1,395**	**5,854**	**0.00**	**260**	**30,597**
	Sediment [2]	8,249	46	201	27	50	42	0.00	76	8,691
Rib Falls	**Acres**	**11,715**	**1**	**996**	**1,936**	**942**	**6,957**	**857**	**0.00**	**23,404**
	Sediment	4,349	37	131	10	41	36	30	0.00	4,634
Marathon	**Acres**	**7,978**	**1**	**579**	**2,440**	**419**	**4,380**	**128**	**435**	**16,360**
	Sediment	2,505	65	64	16	15	18	2	161	2,876
Kennedy Creek	**Acres**	**1,895**	**0**	**167**	**439**	**26**	**3,513**	**0.00**	**0.00**	**6,040**
	Sediment	522	0	12	1	1	6	0.00	0.00	542
Lake Wausau	**Acres**	**0.00**	**0.00**	**0.00**	**4,877**	**0.00**	**0.00**	**0.00**	**3,028**	**7,905**
	Sediment	0.00	0.00	0.00	112	0.00	0.00	0.00	1,538	1,650
Totals	**Acres**	**40,021 (47%)**	**3 (1%)**	**2,752 (3%)**	**13,333 (16%)**	**2,782 (3%)**	**20,704 (25%)**	**985 (1%)**	**3,723 (4%)**	**84,306**
	Sediment	15,625 (85%)	148 (0.8%)	408 (2.2%)	166 (0.9%)	107 (0.6%)	102 (0.6%)	62 (0.3%)	1,775 (9.6%)	18,393

[1] Data was extrapolated from sub-area sampling.
[2] Sediment is reported in tons/year.

Table 3-7 Streambank Erosion Cost-Share Eligibility

Management Category	Number of Sites	Soil Loss (tons/yr)
Eligible II (Greater than 1 ton soil loss per year)	125	1160
Ineligible (Less than 1 ton soil loss per year)	55	40

Table 3-8 Streambank Inventory Results by Subwatershed: Streambank Erosion and Degraded Habitat

Sub-watershed	Inventoried Streambank Length (feet)	Eroded Sites (feet)	Trampled Sites (feet)	Slumped Sites (feet)	Cattle Access (feet)	Total Sediment Loss (tons/yr)	% Bank Degradation from Erosion, Trampling, and Slumping	Eroded Stream Bank (% of total length)	Bank Erosion Rank	Cattle Access Rank
Edgar (ED)	138,508	16,745	560	4,255	13,223	862	16	36	2	1
Rib Falls (RF)	159,728	5,213	3,625	275	5,080	675	6	11	3	3
Marathon (MA)	160,862	21,401	5,086	3,290	10,230	2,283	18	46	1	2
Kennedy Creek (KC)	64,745	1,543	0	495	0	48	3	3	5	4
Lake Wausau (LW)	52,818	1,800	0	0	0	237	4	4	4	4
TOTALS	**576,661**	**46,702**	**9,271**	**8,315**	**28,533**	**4,105**	**11**	**100%**	---	---

Table 3-9 Streambank Inventory Results by Stream: Streambank Erosion and Degraded Habitat (Source: Marathon County LCD)

Stream Name	Inventoried Stream-bank Length (feet)	Eroded Sites (feet)	Tram-pled Sites (feet)	Slumped Sites (feet)	Cattle Access (feet)	Total Sed. Loss Ton/yr	% Bank Degraded From E,T,S	% of Bank Erosion to Stream Length	Bank Erosion Rank	Cattle Access Rank
Artus Creek	56,230	6,851	5,086	1,290	10,230	237	24	15	3	1
Einert Creek	51,274	823	3,625	75	5,080	23	9	2	6	4
Kennedy Creek	64,745	1,543	0.00	495	0.00	48	3	3	5	5
Rib River	265,904	20,740	0.00	2,200	0.00	2,935	9	44	1	5
Scotch Creek	110,932	9,926	560	4,110	7,073	669	13	21	2	2
Soda Creek	27,576	6,819	0.00	145	6,150	193	25	15	4	3
TOTALS	576,661	46,702	9,271	8,315	28,533	4,105	11	100%	---	---

Gully Erosion

A gully erosion inventory of 17 sites found 148 tons of sediment delivered to the tributaries and main stem of the Lower Big Rib River annually. All actively eroding gullies are eligible for cost sharing.

Table 3-10 Gully Inventory Results (Number of Sites)

Management Category	**Pollution Risk from Sediment Delivery (tons/yr)**		
	Low (< 5 tons)	Medium (5-20 tons)	High (> 20 tons)
Eligible II	10	5	2

Streambank Trampling

Trampled streambank sites will be addressed through the use of shoreline and streambank protection, vegetative riparian buffers, easements or shoreline buffer BMPs. County staff conducted an inventory of trampled streambanks. Sites were categorized as having severe, medium, or slight impact from trampling (Table 3-11). Severely trampled sites are designated as Critical. A total of 12 landowners, and 16,563 feet of streambank, fall into this category. Eligible area streambanks are sites with moderate or slight impact from livestock. A total of 30 landowners are in this category.

Livestock trampling can have damaging effects on streambanks, including habitat destruction, reduced filtering capability, and streambank erosion. Manure in streams contributes excessive phosphorus and bacterial pollutants. Trampling destroys overhanging vegetation, which provides important fish habitat and cover, insect habitat, and shade to maintain cooler water temperatures. Trampling also decreases stream depth by breaking down natural banks leading to higher water temperatures and lower levels of dissolved oxygen.

Table 3-11 Trampled Streambank Inventory Results

Management Category	Inventoried Impact	Number of Sites	Total Length
Critical	Severe	12	16,563
Eligible II	Moderate	17	20,715
Eligible II	Slight	13	21,507

Milkhouse Waste

The pollution risk from 130 milking operations in the watershed were assessed and categorized as high, medium, or low. Results of the inventory categorized 42 operations in the high pollution risk management category, 21 in the medium pollution risk management category, and 67 in the low pollution risk management category (Table 3-12). None of the sites was identified as critical. Systems rated high or medium are eligible for cost sharing to implement pollution reduction practices.

Wastewater from milking systems contains waste milk, detergents, sanitizers, and organic solids that can pollute surface water and cause disposal system failure. Waste milk consumes large quantities of oxygen during its breakdown and can plug filter beds and absorption fields. Streams and lakes low in oxygen cannot support fish or other aquatic life.

Table 3-12 Milkhouse Waste Inventory Results (Number of Milkhouse Waste Systems)

Management Category	Pollution Risk		
	Low	Medium	High
Eligible II	67	21	42

Wetland Restoration

A goal of this plan is to restore as many inventoried and eligible wetland sites in the watershed as possible. Most of inventoried wetlands are between 0.5 to 10 acres. Cost share eligibility for wetland restoration are divided into two categories: Eligible I and Eligible II.

Eligible I. Eligible I restoration sites provide at least one (1) of the water quality benefits as described below in addition to providing essential habitat for fish, waterfowl, animals, and plants, (including endangered species).

- *Cultivated hydric soils with a tile or open channel drainage system discharging to a stream or tributary.* Wetland restorations reduce the amount of nutrients and pesticides draining to a water resource by establishing permanent vegetation and altering the drainage system.
- *Pastured wetlands adjacent to streams or tributaries.* Eliminating livestock grazing in wetlands will reduce the organic and sediment loading to wetlands and adjacent water resources and reduce the direct damage to the wetland from the livestock. Fencing livestock out of wetlands will control pollutant loadings and help to restore damaged sites.
- *Wetlands adjacent to fields identified as significant upland sediment sources.* Restoration of wetlands in this type of situation could help to create a wetland filter to reduce pollutants from an up-slope field and reduce the volume and velocity of water flowing from an up-slope wetland to a critical down-slope field.
- *Wetlands providing water quality improvements through infiltration.* Water stored in wetlands is filtered as it recharges to groundwater and increases base flow in streams.

Priority will be given to previously converted and farmed wetlands. *Prior converted* wetlands are those that have been drained, dredged, filled, leveled, or otherwise manipulated (including removal of woody vegetation) for agricultural purposes prior to December 23, 1985. *Farmed wetlands* include potholes and seasonally flooded or ponded wetlands not fully converted prior to December 1985. Farmed wetlands are cropped in dry years.

Eligible II Restorations. Eligible II restorations sites include sites not meeting the definition of an Eligible I site yet offer significant water quality benefits. These benefits could include providing storage and filtering of storm event runoff and flood flows improving water quality and watershed hydrology.

Ineligible Restorations. Ineligible sites include those where existing physical characteristics or conditions are not environmentally viable or economically feasible to support restoration.

Cost Sharing. Eligibility for wetland restoration cost sharing are dependent on the effectiveness of a proposed restoration as determined by project staff considering sediment and nutrient filtering, flood and stormwater attenuation and storage area, and infiltration. Secondary benefits considered include enhancement of essential habitat for fish, wildlife and plant life, including rare and endangered species. At a minimum, all upland fields draining to a wetland must have a sediment delivery rate less than or equal to 1,400 pounds per acre per year.

Wetland Restoration Permits. Wetland restorations must in accordance with NRCS standard 657. Marathon County LCD staff will assist landowners in plan development and obtaining permits. The Wisconsin Department of Natural Resources, the U.S. Fish and Wildlife Service, the Wisconsin Waterfowl Association, and wetland restoration experts will assist the county LCD develop plans and obtain permits. Depending on the site, permits may be needed from three levels of government.

- Federal (Army Corps of Engineers) Clean Water Act s. 404. Prior converted wetlands are exempt from this permit.
- State (DNR) Clean Water Act s. 401 Water Quality Certification, Chapters 30 and 31, Wis. Stats.
- Local (county or municipal zoning office).

Wetland restorations may include plugging or breaking up of existing tile drainage systems, the plugging of an open-channel drainage system, other methods of restoring the predevelopment water levels, and fencing of wetlands to exclude livestock.

Wetlands are an important part of our ecosystem, serving as primary conduits for rain water flowing to lakes and streams. Wetlands purify water by removing, retaining, and transforming nutrients, processing wastes, and trapping sediment. Wetlands help control erosion during floods and are an important part of the food chain. Restoration of wetlands helps reduce runoff pollution and may increase stream base flows. BMPs such as conservation tillage, riparian buffers, and changes in crop rotation are also an important part of infiltration process.

Wetlands vary from sites with seasonally saturated soil conditions to sites with year-round standing water. Some of the diverse types of vegetation found in wetlands include pond lilies, cattails, rush, black ash, and willow. Prior to European settlement, Wisconsin had an estimated 10 million acres of wetlands. Today, slightly more than 5.3 million acres remain. Many thousands of predevelopment wetlands have been converted to cropland; thousands more have been filled for highways and urban development.

Urban Nonpoint Source Pollutant Management Strategy

Urban runoff can negatively affect stream flow, habitat, water quality, bottom sediment quality, and stream biology. As pavement and rooftops prevent rainwater and snow melt from soaking into the ground, surface water runoff increases. Urban development and increased runoff creates higher streams crests. Reduced groundwater recharge and dry-weather stream flows may fall

below minimum levels needed to sustain fish and aquatic life. Research indicates stream quality begins to degrade when 8 to 12 percent of the land within an urban watershed becomes impervious to infiltration.

Pollutants carried in urban stormwater runoff include some of the same pollutants associated with rural nonpoint source runoff: sediment, nutrients, oxygen-demanding organic materials, bacteria, and pesticides. Other pollutants, many of which are potentially toxic, are transmitted to surface and groundwater primarily by urban runoff. These include heavy metals (lead, zinc, chromium, copper, cadmium and arsenic) and a wide range of hazardous organic compounds. Urbanization also causes destructive hydrologic changes in streams by reducing groundwater recharge and increasing the volume and peak of stream flow during storms. This results in flashy streams which destroy stable habitat for aquatic life and often necessitates the conversion of natural streams into stormwater conveyance channels to reduce flood damages.

Urban Planning Process

The purpose of the urban component of the plan is, in part, to identify and implement a stormwater management strategy. The urban component characterizes the quantity and quality of urban stormwater runoff and assess the impact on water resources. It identifies and evaluates various strategies required for achieving effective stormwater management and document state and local policies and procedures required to meet stormwater management goals.

Urban Best Management Practices. Four (4) general classes of management practices are used to reduce water quality problems caused by urban stormwater runoff.

- Nonpoint source pollutant reduction practices.
- Stormwater infiltration practices.
- Stormwater wet detention practices.
- Streambank erosion control practices.

Urban Nonpoint Source Pollutant Reduction Practices. Urban nonpoint source pollutant reduction practices are intended to eliminate or reduce the generation of urban pollutants as close to the source as possible. Urban nonpoint source controls in commercial and residential areas are often nonstructural and rely on changes in products and life styles. Reducing the amount of automobile traffic and prohibiting the use of certain types of products in environmentally sensitive areas are examples of preventive urban pollution controls practices. Source-area controls such as pet waste programs and the judicious use of lawn and garden products rely on better housekeeping practices and can be enacted locally. These types of inexpensive controls are an important component of stormwater management. Information and education efforts are also an important part of an urban management strategy.

Urban nonpoint source pollutant reduction components for the Lower Big Rib River Watershed include the following.

- Removing pet waste from lawns, sidewalks, and streets to reduce bacterial contamination of urban runoff.
- Managing the timing, amount, and type of fertilizer and pesticide applications to lawns and gardens.

- Keeping automobile waste fluids out of stormsewer systems.
- Removing leaves and debris from streets and parking lot surfaces through street sweeping and leaf collection programs.
- Basing land use zoning, in part, on site suitability for stormwater management practices to meet water quality habitat and flood related objectives.
- Preventing construction site erosion.
- Limiting the use of street de-icing compounds.

Urban Stormwater Infiltration Practices

The volume of urban runoff transporting pollutants to surface waters during a rain storm is directly related to the amount of impervious urban area. Impervious areas include rooftops, parking lots, streets, sidewalks and areas draining directly to stormsewers, pipes, and concrete channels. Commercial parking lots and residential streets rapidly deliver high concentrations of sediment containing lead, asbestos, cadmium to streams with little or no pretreatment and filtering.

Reducing pollutant transport to surface waters includes reducing the amount of urban stormwater reaching streams by increasing soil infiltration. Because of potential groundwater contamination site assessments must be completed before designing infiltration systems. Where needed, infiltration can be used to augment wet detention ponds. Practices promoting infiltration include use of porous pavements, grassed swales, infiltration basins, and trenches. These practices are generally most applicable to small source areas such as rooftops and parking lots. Grassed swale drainage systems reduce runoff and erosion; sod vegetation serves to remove pollutants.

Stormwater infiltration on a suitable site can effectively reduce nonpoint pollution. In addition, infiltration can help stabilize the hydrology of small urban streams by replenishing groundwater, much of which is ultimately discharged to surface water. Infiltration can reduce bank erosion and the need for expensive, highly engineered drainage structures such as concrete lined channels. Infiltration practices can be used with wet detention ponds to supplement pollutant removal effectiveness or reduce pond size.

An infiltration basin designed with pretreatment and a two year storm event can provide significant pollutant removal rates (Table 3-13). Infiltration basins should be designed to improve water quality for a 1.5 inch rain event. Pretreatment and detention areas, at a minimum, should be designed for a two year event. All flows greater than a 2- to 10-year storm event should be bypassed around the infiltration basin by a separate pipe or emergency overflow device sized for a 100-year storm.

Urban Stormwater Wet Detention Practices

Wet detention ponds are effective at controlling particulate pollutants and should be designed to control peak flow discharges. Wet detention ponds are helpful in controlling pollution, floods, and erosion. When compared to other stormwater management practices wet detention basins generally requires less land area to install, are less susceptible to failure, and require less maintenance than wetlands and infiltration practices. However, wet detention basins and extended

detention basins are typically less effective in removing pollutants such as zinc, petroleum, phosphorus, or nitrogen when compared to other practices. Specifically, detention ponds are not very effective in removing fine silts, clays, or colloidal materials without being prohibitively large; wetlands and infiltration practices are considered more effective for this type of pollutant removal. Table 3-13 includes pollutant reduction percentages for basins, wetlands, and infiltration.

Safety is also a concern in use the of wet detention basins. Precautions are required to discourage swimming and entry into the pool area. Incorporating features such as safety shelves into the design will decrease but not eliminate the risk of injury and drowning. Provisions must also be made to dredge, test, and properly dispose of sediment on a regular basis. Dredging should occur at least once every five years and not be delayed beyond ten years. Due to basin design complexity planners should make use of computerized models. Several models are currently available to size and design appropriate detention ponds; developers should check with the reviewing agency to determine which models are most appropriate. Wet detention ponds must be lined in areas where potential groundwater contamination is a concern.

Table 3-13 Pollutant Reduction Percentages

Pollutant	Basin	Wetland	Infiltration
Suspended Solids	70-95	75-98	75-99
Total Phosphorus	40-70	40-80	50-75
Nitrogen	60-90	40-95	45-70
COD	20-55	-----	-----
Lead	70-90	50-95	95-99
Iron	43-92	-----	-----
Zinc	40-80	65-80	-----
Oxygen Demand	50-90	-----	70-90
Copper	60-80	60-80	-----

Urban Streambank Erosion Control Practices

Streambank erosion is primarily caused by the channeling of waterways, by upstream modifications, and by the changing stream hydrology which, in this case, is characterized as "flashy" or having increasing volumes and peak flows. These characteristics expose and erode streambanks, and destroy natural conditions required for healthy aquatic communities. During heavy rainfall events, channel scouring displaces in-stream cover such as rocks and logs, resulting in loss of aquatic biota.

Use of streambank stabilization techniques and upstream detention practices help reduce sediment erosion. Management criteria developed for eroding streambanks are based primarily on the rate at which sediment is released into streams by the cutting action of stream flows. Secondary considerations include stream channel obstructions and riparian habitat degradation.

Options to control streambank erosion include controls such as rock riprap, streambank shaping and seeding, fiber rolls, and bioengineering techniques. Less intrusive measures such as brush cutting to increase light penetration and vegetation establishment may also be effective. In each situation, site disturbance and resulting benefits must be evaluated against each other. For example, if concrete channels, dams and other in-stream structures deteriorate or are removed, newly exposed streambanks may begin to erode protected areas.

Easements are also a viable alternative for controlling urban streambank erosion. Communities are encouraged to develop riparian vegetated corridors following the management considerations identified in Appendix A. When properly managed, vegetated riparian buffers provide valuable habitat for wildlife (such as grassland birds, waterfowl, amphibians, reptiles, and small mammals.) Riparian buffers also function as a filter to delay, absorb, or purify contaminated runoff before it enters surface water.

Depending on the severity of the erosion and the cost effectiveness of the BMP, streambank erosion within developed areas may be eligible for cost sharing. Streambank erosion control criteria developed for rural areas (identified earlier in this chapter) also apply to urban and developing areas.

Urban Shoreline Erosion

A detailed shoreline erosion inventory was not conducted on Lake Wausau. The Marathon County LCD found the lake had sufficient armoring installed or had the necessary vegetative cover to protect the lakeshore from further erosion. Should this situation change, the availability of cost-share funding will be reconsidered, taking into consideration severity of the erosion, cost effectiveness of the erosion control practice, and the resulting water quality benefits.

Model Ordinances

Model ordinances provide a framework for local governments to develop their own ordinances. Models ordinances are available for construction site erosion, stormwater management zoning, agricultural shoreland management, and manure storage. Stormwater management, zoning, and

wellhead protection model ordinance information is available from the DNR at (608) 267-2800. (Model ordinances are included in Appendix E.)

Wellhead Protection Ordinance. The federal Safe Drinking Water Act (SDWA) was enacted in 1974 to provide safe public drinking water and to protect the sources of drinking water from contamination. The U.S. Environmental Protection Agency (EPA) is responsible for administration of the SDWA. In 1986, amendments to the SDWA strengthened groundwater protection by requiring states to develop and implement state wellhead protection programs. The purpose of the state wellhead protection program is to protect public water supply wells and recharge areas from contamination and to encourage development of emergency contingency plans.

The DNR has been designated as the lead agency for developing and implementing the Wisconsin wellhead protection program (WHPP). The goal of this program is to minimize the concentration of polluting substances in groundwater and to provide adequate public health safeguards. Chapter NR 811, Wis. Admin. Code, requires a WHPP plan be developed for any municipal water supply developed after May 1, 1992. Plans must be approved by the DNR.

The following is a list of WHPP requirements from s. NR 811.16(5) Wis. Adm. Code.

- Identification of the recharge area and the zone of influence for the proposed well.
- Identification of the groundwater flow.
- Establishment of a wellhead protection area (WHPA) for the proposed well. The WHPA shall encompass, at a minimum, that portion of the recharge area equivalent to a five-year time travel to the well. The WHPA may be determined by a hydrogeologic investigation.
- An inventory of existing potential sources of contamination within a one-half mile radius of the well and an assessment of existing potential sources of contamination within the recharge area of the well.
- A public education program for wellhead protection.
- A water conservation program.
- A contingency plan for providing safe water in the event of any contamination incident.
- A management plan, based on the assessment of alternatives for addressing potential sources of contamination, describing the local ordinances, zoning requirements, monitoring program and other local initiatives proposed for the delineated WHPA. At a minimum, the management plan must address maintaining the separation distances established in the well siting portion of s. 811.16(4) Wis. Adm. Code.

In 1984, the Town of Rib Mountain implemented a wellhead protection plan (WPP) and ordinance. This was among the first plans and ordinances adopted in Wisconsin. The town's plan and ordinance were amended in 1995 to expand the protection area and to identify additional land use activities as potential hazards within the groundwater recharge area.

In 1988, the City of Wausau developed and implemented a WPP and ordinance to protect all municipal wells within the Lower Rib River Watershed.

In conjunction with the Wisconsin Rural Water Association, the Village of Edgar began, but did not complete, development of a WPP. Because the quantity of a potable groundwater supply is

somewhat limited, the village is encouraged to develop and implement a WPP and ordinance, as well as a well abandonment program.

The Village of Marathon City has not developed a WPP. Marathon City has three (3) existing municipal wells serving a residential population of 1,600-plus. All wells are located within the 100-year floodplain and are the only source of groundwater for village residents. Because of their location, the wells are particularly susceptible to contamination during high peak flows. And because of limited potable water supplies in the immediate area the DNR believes it is imperative the Village of Marathon implement water supply protection efforts. As a condition to participating in the Lower Big Rib River Priority Watershed Project, the Village of Marathon City will be required to develop and implement a comprehensive WPP and ordinance. The wellhead protection ordinance should include mandatory land use protection, including use of applicable planning and zoning permits.

Land Easements

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

- Shoreline buffers (vegetative areas which minimize nonpoint source impacts and other direct impacts to streams).
- Critical area stabilization (stabilization efforts needed on sites that either erode at an excessive rate, or have high sediment delivery rates to surface water).
- Wetland restoration (areas where wetlands are intentionally restored or enhanced in order to improve ecological functions, such as natural filters of surface water).

Easements may also be considered for protecting municipal well heads if it can be established that vegetative cover will correct an existing threat to groundwater quality. Although easements are not considered a best management practice, they can help achieve desired levels of nonpoint source pollution control in certain conditions. Easements are used to support BMPs, enhance landowner cooperation, and more accurately compensate landowners for loss or altered usage of property. There are a number of benefits of using easements in conjunction with a management practice.

- Riparian easements can provide fish and wildlife habitats along with mitigating pollution.
- Easements are generally perpetual (BMPs may not be perpetual).
- Easements may allow limited public access, however, the primary purpose must be for water quality improvement.

Easements should be used to exclude livestock from grazed wetlands or along eroding streambanks within the watershed. Easements are strongly recommended whenever wetlands are grazed, where livestock density creates large areas of unvegetated soil within 60 feet of streams or intermittent streams, where streambanks are severely trampled and eroded, and/or where channel erosion, exacerbated by livestock grazing, creates unvegetated streambanks two or more feet in height

Easements are strongly recommended whenever elimination of row cropping and the establishment of permanent vegetative cover will stabilize a critical area, under the following circumstances.

- When row cropping is occurring within 60 feet or less of streams or intermittent streams.
- When row cropping is practiced on slopes greater than 12 percent, and to support eligible wetland restorations.
- When a barnyard or animal feedlot is located within the flood plain and a permanent easement is the least-cost alternative to provide adequate pollution reduction, a permanent easement provides a greater level of pollution reduction than on-site engineering options at a price that is cost-effective.

Easements are strongly recommended whenever engineering options require intensive management to continue providing adequate pollution reduction and/or surrounding land use is largely agricultural and expected to remain agricultural for two (2) or more decades.

Land Acquisition

Governmental units, within the Lower Big Rib River Watershed Project area, including lake protection and rehabilitation districts, are eligible for nonpoint source grants to supplement land purchases. The goal of such land acquisition in the project area is approximately 25 acres but may increase after additional inventories and land acquisition strategies are developed.

Eligibility Criteria. Eligibility for land acquisition must meet one (1) of the following criteria.

- Only lands in the environmental corridors of the watershed project area will be eligible for land acquisition grants.
- Any cropland proposed for acquisition must have sediment delivery levels above the criteria for eligible as specified in the sediment delivery section of the plan.
- The acquisition of property must provide for protection or improvement of water quality.
- The acquisition of property must provide for protection or improvement of other aspects of the natural ecosystem such as fish, wildlife, wetlands, or natural beauty.
- The acquisition of property must compliment other watershed management efforts.

Other Pollution Sources

Sand and Gravel Mining Sediment Investigation. The Marathon County LCD conducted an on-site investigation of the four (4) active sand and gravel mining sites in the watershed. Because of the internal drainage characteristics of these soils and water quality management planning at these sites, Marathon County LCD staff believe there is little sediment erosion to surface waters.

But it is possible for sediment from sand and gravel mining activity to reach the Lower Big Rib River from a number of sources. One source is from erosion of spoil piles. The potential for sedimentation from these piles is very slight. In almost all cases, the sediment was contained by using earthen berms and silt fences or by routing water back into the low area of the mine to be internally drained. Another potential source of sedimentation occurs when the Big Rib River

floods over its banks and into mining operations. The amount of sediment delivered during these events is unknown. It is probable low-lying mining areas function as settling basins, removing sediment from the water column.

Yet another potential source of sediment is from access road erosion. Wherever possible, water from access roads is diverted back into and drained within the mine. The amount of sediment delivered from access roads is probably small, since they make up a small portion of total land use in the watershed.

Washing and separating of mined materials are handled differently by the different companies. Rietbrock Ready Mix, Morgan Sand & Gravel, and County Concrete all have a series of settling ponds to capture wash water. The pond systems have no outlet, and the water for washing and separating is recycled. Peterson Sand & Gravel washes their materials in the bottom of the mine, internally draining the water to minimize sediment runoff.

Although sand and gravel mining in the flood plain of the Big Rib River may be a small contributor of sediment, it could have other detrimental impacts. Natural meandering could eventually cause the river to enter an existing or previously mined area and degrade the ecological system. Further loss of habitat for insects, fish, and other aquatic species from the sedimentation of the gravel substrate is a also major concern. Sediment transported downstream from flooded mine sites or de-watering operations could reduce or eliminate preferred habitat for aquatic life. While the current amount of sediment deposited within streams from mining operations is insignificant, the potential for future water quality degradation from mining operations will continue. The Marathon County Zoning Department should continue to implement the Non-Metallic Mining Ordinance and monitor past, present, and future mining operations.

Municipal and Industrial Point Source Pollution

This section describes specific pollution sources affecting water quality in the Lower Big Rib River Watershed that are beyond the scope of this project. Control of these pollution sources occurs through non-DNR state and county regulatory programs.

Cassel Garden Farmers Co-op Cheese Company manufactures 24,000 pounds of cheese per day from 240,000 pounds of raw milk. It produces approximately 3,800 gallons per day of wash water discharged to a two-cell ridge-and-furrow system with a combined loading capacity of 5,000 gallons per day. The cells are used on an alternating 3-month basis to permit proper maintenance. Sludge is removed as required and spread on agricultural land. Excess whey is trucked to Mid-Whey Powder Company in Edgar.

Mid-Whey Powder discharges its effluent to Scotch Creek. Treatment of wastewater from the initial condensation process is through a two-cell, 10 aerator lagoon treatment system prior to discharged in Scotch Creek. At certain times of the year, the wastewater may be spray irrigated on cropped fields rather than being discharged to Scotch Creek.

Wash water used to clean storage tanks, the condenser, the dryer as well as whey received in excess of plant capacity is field spread. The amount field spread from these processes averages

10,000 gallons per day once per week during 3 months of the year. (Refer to the Upper Wisconsin River (Central Sub-basin) Area wide Water Quality Management Plan for additional details on municipal and industrial pollution sources.)

Failing Septic Systems are potential contributors to point pollution problems in the area. A septic system consists of a tank and a soil absorption field. Septic systems fail due to soil type, location of system, poor design, or maintenance. In general, the majority of soils in the Lower Big Rib River watershed are not suitable for conventional septic tank soil absorption systems. Dense glacial tills associated with the Withee soils of the watershed have too low of infiltration rates for an effective absorption system. As a result, there are surface discharge systems where soil absorption systems have failed creating 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 shallow depth to bedrock. Pollutants discharged from septic systems 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 for eligible homeowners and small business operations to offset the cost of replacing failing septic systems. The grant program applies to principal residences and small businesses built prior to July 1, 1978, and is subject to income and size restrictions. Seasonal homes are not eligible for participation in this program. The program is administered by the Marathon County Zoning Department. Interested individuals should contact the county zoning department for more information.

CHAPTER FOUR
Implementation

This chapter describes implementation of nonpoint source pollution (NSP) management actions. The success of this priority watershed project is, in part, dependent on the aggressive implementation of the identified NSP control strategies. This chapter identifies best management practices (BMPs) needed to control nonpoint sources of pollution, Cost containment policies, cost share agreement procedures, implementation schedules, critical site designation and notification, and budget estimates.

Rural Best Management Practices

Nonpoint source pollution BMPs must meet design and installation requirements listed in ch. NR 120, Wis. Adm. Code. These requirements generally follow standard specifications included in the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Field Office Technical Guide. In some cases additional specifications may apply. The applicable BMP specifications are listed in s. NR 120.14, Wis. Admin. Code. State-funded cost-sharing rates for rural BMPs are listed in Table 4-1, as well as in Appendix A.

Every effort should be made during the planning, design, and installation of BMPs to prevent or minimize the loss of existing wildlife habitat. If installation of a BMP destroys significant wildlife habitat, ch. NR 120, Wis. Admin. Code, requires development of new habitat to offset the lost area. A Wisconsin Department of Natural Resources (DNR) regional wildlife specialist or a designee will assist the Marathon County Land Conservation Department (LCD) in assessing and replacing lost habitat. Wildlife habitat restoration practices are cost-shared at 70 percent.

Interim Best Management Practices

Under some circumstances, practices may be recommended that are not included on the BMP list. Section NR 120.15, Wis. Admin. Code, provides for alternative practices where necessary to meet the water resource objectives identified in the watershed plan. The DNR may identify in the nonpoint source grant agreement the design criteria, design standards, and design specifications where appropriate, the cost-share conditions, and the cost-share rates for each alternative BMP.

Table 4-1 State Cost-Share Rates for Rural Best Management Practices

Best Management Practice	State Cost-Share Rate
Contour Farming	$ 9.00/acre[1]
Contour Strip Cropping	$13.50/acre[1]
Field Strip Cropping	$ 7.50/acre[1]
High Residue Management	$ 8.50/acre[2]
Vegetated Riparian Buffer Strip	$100.00/acre[3,4]
Cropland Protection Cover	$25.00/acre[5]
Nutrient Management	50 percent
Pesticide Management	50 percent
Pesticide Handling Spill Control Basins	70 percent
Livestock Fencing	50 percent
Intensive Grazing Management	50 percent[6]
Manure Storage Facilities	70 percent[7]
Manure Storage Facility Abandonment	70 percent
Field Diversions and Terraces	70 percent
Grassed Waterways	70 percent
Critical Area Stabilization	70 percent[8]
Grade Stabilization Structures	70 percent
Agricultural Sediment Basins	70 percent[8]
Shoreline and Streambank Stabilization	70 percent[8]
Shoreline Buffers	70 percent[8]
Wetland Restoration	70 percent[8]
Barnyard Runoff Management	70 percent
Barnyard Relocation or Abandonment	-----
Roofs for Barnyard Runoff Management and Manure Storage Facilities	70 percent

Table 4-1 Continued

Best Management Practice	State Cost-Share Rate
Structural Urban BMPs	70 percent[9]
Milking Center Waste Control	70 percent
Cattle Mounds	70 percent
Well Abandonment	70 percent
Land Acquisition	50 percent[10]
Lake Sediment Treatment	70 percent
Ginseng Management & Planning	50 percent[11]

[1]Wildlife habitat restoration components of this practice are cost shared at 70 percent.
[2]Cost-shared up to 6 years.
[3]Cost-shared up to 5 years.
[4]Cost-share payment per acre is an interim BMP. Eligibility is pending approval.
[5]Cost-shared up to 3 years.
[6]To a maximum of $2,000 per watering system.
[7]Eligible I: Manure storage is cost-shared at 70 percent for the first $20,000 of cost and at 50 percent for the remaining cost, not to exceed $35,000. Eligible II: Manure storage is cost-shared at 70 percent for the first $20,000 of cost and at 50 percent for the remaining cost, not to exceed $20,000
[8]Easements may be entered into with landowners identified in the watershed plan in conjunction with these BMPs.
[9]The maximum cost-share rate for stormsewer rerouting and removal of structures necessary to install structural urban BMPs is 50 percent.
[10]Cost sharing is available to acquire land for the construction of an urban structural practice or to acquire land which is contributing or will contribute nonpoint source pollution.
[11]Cost sharing is 50 percent to a maximum of $200 per field.

Riparian Buffer Strips. Riparian buffer strips are an interim BMP for the Branch River watershed. If cost sharing per acre is approved by the DNR for all projects, riparian buffer strips will be an eligible practice in the Lower Big Rib River project. Riparian buffers are permanently vegetated areas designed and constructed to function as a filter to delay, absorb, or purify contaminated runoff before it enters a stream or wetland.

Ginseng Management and Planning. Ginseng management and planning includes development and implementation of a plan for garden preparation and development and root washing that will reduce sediment delivery to streams. This interim BMP will utilize existing practices such as critical area seeding, cropland protection cover, and concrete spreading pads in combination with grass filter strips or dry agricultural sediment basins to reduce sediment delivery to streams.

Practices, Sources, and Activities Not Cost-Shared

The following practices, sources, or activities are *not* eligible for cost-share assistance.

- BMP installation, operation, or maintenance started prior to the signing of the cost-share agreement.
- Activities covered by the Wisconsin Pollutant Discharge Elimination System (WPDES) permit program including those identified in ch. NR 200 through ch. NR 299, Wis. Admin. Code (except as provided in sub. (1) (g)).
- Activities required as part or as a condition of a license for a solid waste management plan.
- Activities funded through state or federal grants for wastewater treatment plants.
- Active mining operations.
- Pollutant control measures needed during building and utility construction, as well as stormwater management practices for new development.
- Pollutant control measures needed during construction of highways and bridges.
- The planting, growing, and harvesting of trees associated with silviculture, except as necessary for site stabilization.
- Small-scale on-site human domestic waste facility construction.
- Dredging of harbors, lakes, rivers, and ditches.
- Dams, pipes, conveyance systems, and detention basins intended solely for flood control.
- The operation and maintenance of cost-shared practices.
- Practices normally and routinely used in growing crops.
- Practices whose purpose is to accelerate or increase land drainage, except where drainage is required as a component of a BMP.
- Practices to control spills from commercial bulk storage of pesticides, fertilizers, petroleum, and similar materials required by ch. ATCP 32 and ch. ATCP 33, Wis. Admin. Codes, or other administrative rules.
- Practices needed to control sources that were adequately managed for the specific land use at the time of cost-share agreement signing.
- Practices to be fully funded through other programs.
- Practices previously installed and necessary to support cost-shared practices.
- Changes in crop rotation.
- Minimum levels of street sweeping and leaf collection.
- Changes in location of unconfined manure stacks involving no capital cost.
- Non-stationary manure-spreading equipment.
- Practices needed for land use changes during the cost-share agreement period.
- Other practices the DNR determines are not necessary to achieve the objectives of the watershed project.

Cost-Share Agreements. Cost-share funds are available to landowners and local units of government for a percent of BMP implementation costs. Funding is distributed by the county LCD from a nonpoint source grant provided by the DNR. Cost-share agreements are binding contracts between landowners and the county LCD and are filed as part of the property deed. The county LCD receives additional grant money from the DNR to support staff and other administrative responsibilities.

The cost-share agreement sign-up period is for 9 years following formal approval of the watershed plan. After notification is received, critical-site landowners have up to 3 years to sign a cost-share agreement. This is a longer sign-up period than is usually allowed for voluntary agreements. Agreements may be amended throughout the project period. The DNR may grant an extension request to the cost-share sign-up period if the extension results in a significant pollution load reduction.

Practices included in cost-share agreements must be installed as scheduled and be maintained by the owner for a minimum of 10 years from the date of installing the final practice listed within the agreement. Exceptions to this provision include practices applicable to high residue management, nutrient management, pest management, cropland protection cover, and critical-area seeding when it is part of an interim ginseng BMP. County LCD staff are responsible for enforcing compliance of cost-share agreements. The county LCD staff will monitor practices installed through the watershed project, in conjunction with other state and federal conservation compliance programs. Practices should be monitored every 4 years, or more frequently if necessary, to ensure installed BMPs are appropriately implemented, operated, and maintained. Proper operation and maintenance of BMPs provides cost-effective management of pollution sources.

Local, state, or federal permits may be needed prior to installation of some BMPs. Areas in which a permit is generally required include zoned wetlands and the shoreline areas of lakes and streams. These permits are needed whether or not the activity is a part of the watershed project. The cost-share recipient is responsible for acquiring the appropriate permit(s) prior to installation of the BMP(s).

Cost Containment

Chapter NR 120, Wis. Admin. Code, requires this plan to include BMP cost containment procedures. The bidding procedure, average cost, and flat-rate lists can be obtained from the Marathon County LCD.

Cost-share payments will be based on actual installation costs. If actual installation costs exceed estimated costs, reimbursement amounts may be increased, on approval by the Marathon County Land Conservation Committee. Documentation of any additional costs must be sent to the DNR.

Bidding. Conservation practices estimated to cost more than $5,000 must follow the Marathon County LCD bidding procedure. The cost share payment is based on the lowest bid.

Average Costs. Based on past cost information, the county LCD determines an average cost per unit of material and labor for the installation of BMPs; these costs may not be exceeded.

Flat Rate. BMPs that are cost-shared based on flat rates are detailed in Table 3-2. The rates shown are the state's share of installation costs.

Maximum Cost-Share Limit. The DNR or the county LCD has established maximum cost-share rate limits, as detailed in Table 3-3.

Other Containment Procedures. Payments for in-kind services will be based on county guidelines and rates. Landowners wanting to install a BMP using their own labor, material, and equipment will receive cost sharing based on average costs.

Implementation Schedule. During the first 2 years of the implementation period, all landowners with sites defined as eligible or critical nonpoint sources will receive correspondence from the county LCD explaining the project and how they can become involved. Marathon County LCD staff will continue to make contacts with eligible landowners until they have made a decision on whether to participate in the program. All contacts will be made in person unless the landowner has shown no interest in program participation. Marathon County staff will contact all eligible landowners who have not signed cost-share agreements by personal letter 6 months before the end of the cost-share sign-up period to encourage participation.

Critical Site Notification Process. Following written notification of plan approval from the DNR, a variance to s. NR 120.09, Wis. Admin. Code, until the nonpoint grant is received will be requested. This variance will allow county LCD staff sufficient time to complete a cropland inventory. This inventory allow all of the highest-ranked critical sites to be verified and to receive simultaneous notification. This will also make administration easier.

The variance will also provide critical-site landowners an opportunity to sign cost-share agreements voluntarily, prior to receiving critical-site notification. Voluntary participation is very important to the success of the Lower Big Rib River Watershed project and will provide landowners with a sense of ownership in this important effort.

At the end of the verification period, the Marathon County LCD sends a report to the DNR indicating whether each site meets the critical sites criteria or if the site has changed status according to s. NR 120.09(6), Wis. Admin. Code. Documentation of site visits and additional information will be maintained at the Marathon County LCD office and will be available for inspection.

Following receipt of the verification report, the DNR has 60 days to send critical-site notification letters to landowners. If a landowner signs a cost-share agreement covering all identified critical sites, and if the landowner continues to comply with annual progress and implementation schedules, the notification letter will be postponed. If the landowner fails to comply with the schedules, the DNR will send the notification letter.

At the time of notification, critical sites landowners have 3 years to sign a cost-share agreement at the rates given in ch. NR 120, Wis. Admin. Code. The notification schedule may be modified and revised at the annual watershed review meeting. After 3 years, the available cost-share rates are reduced by 50 percent.

During the fifth year of project implementation, the Lower Big Rib River Watershed will be evaluated for progress on reducing upland sediment delivery. If acceptable progress has been made, the remaining critical sites will be reclassified as Eligible II. Acceptable progress is defined as 60 percent of the projects' total cropland sediment reduction objective on signed cost-share agreements by the end of the fifth year. New sites, which may qualify as critical, will be verified and disclosed to the DNR in an annual report.

Critical Site Appeals Process

The owner or operator of a site designated as critical may appeal the designation to the Marathon County Land Conservation Committee. The appeal must be in writing and come from the site owner or operator (referred to as the appellant). The appeal request must be received by the land conservation committee within 60 days of receiving the notification letter. The land conservation committee then holds an informal hearing. Within 60 days of the hearing, the DNR must submit a report and recommendation to the committee.

The county land conservation committee shall provide the appellant with a reasonable notice of the hearing, which is regarded as informal, hold the hearing, as an informal hearing. s. 68.11(2), Wis. Stats., does not apply to this hearing as this language describes the conduct of a formal hearing, and hold the hearing in a place that is convenient for the appellant.

The appellant and project staff will present information about the site so that county LCC members can make a decision. Representatives of the DNR and the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP) may attend the hearing. The DNR is required to submit a report and recommendation to the county land conservation committee within 60 days after the hearing. DATCP has the option to submit a report and recommendation within 60 days.

The land conservation committee shall provide a decision, in writing, within 45 days of receiving the DNR and DATCP reports and recommendations, receiving the notification by the DNR and DATCP that no report or recommendations would be submitted, or at the conclusion of the 60-day period following the hearing.

The county land conservation committee may support or overturn the designation of a site as critical. To make its decision, the county committee shall consider whether the critical-site designation is consistent with criteria established in the project's priority watershed plan. The committee shall also consider whether governmental representatives erred in their verification of the site conditions or management. Loss of profit from a site is not grounds for an appeal. Violations by or appeals granted to other appellants also shall not justify an appeal.

The owner or operator of a site designated as a critical site can request a review of the county land conservation committee decision by filing a written request with the Marathon County Land and Water Conservation Board (LWCB) within 60 days after receiving the decision of the committee.

The owner or operator of a site designated as a critical site can request a contested case hearing under ch. 227, Wis. Stats, to review the decision of the Marathon County LWCB by filing a written request with the DNR within 60 days after receiving an adverse decision by the LWCB.

Urban Nonpoint Source Control

The following information provides guidance on how the urban NPS controls will be implemented, including core and segmented activities as well as eligibility for financial assistance.

The core elements of the urban program are basic measures that can be implemented without further study. Adoption of these measures by a participating municipality is the first step in the implementation process. This show of commitment by a community is required in order to receive financial assistance through the watershed program. It is required only where the municipality receives funds for its own use (such as a municipality owning, installing, and operating a management practice); it does not apply to instances where a municipality acts as a grantor, passing cost-share funds through to private landowners. Individual landowners within the municipality may receive funds before the municipality has agreed to implement core program elements.

Core program elements include the following.

- **The development, adoption, and enforcement a construction erosion control ordinance.** The ordinance should cover clearing, grading, and excavation conducted prior to issuance of a building permit. The municipal government unit must also commit to enforcing the erosion control provision of the Uniform Dwelling Code.

- **The development and implementation a community specific program of urban housekeeping practices to reduce urban NPS pollution.** This includes a regular program to sweep municipal streets at least twice each year in the spring and fall, as well as a fall leaf collection. Other practices might include regulating disposal of pet wastes, changing the timing and scheduling of leaf collection, or other strategies to reduce polluted runoff.

- **Assisting the Marathon County LCD with the implementation of an information and education program for urban pollution prevention practices** by handing out educational materials and assisting in the coordination of local events.

- **Establishment and enforcement of maintenance requirements for municipally owned vegetated riparian buffers.**

Secondary Elements of the Urban Management Program

Secondary elements of the urban NPS plan may require further study or site-specific investigations prior to implementation. Recommendations not included in the core-element description are

considered secondary elements. Examples of secondary elements include construction of a wet detention pond to capture runoff from an industrial park, erosion control or infiltration devices at stormsewer outlets, and the development of a stormwater plan and ordinance. Detailed engineering studies will be required for some of these practices.

Municipalities may implement secondary activities any time after expressing a commitment to implement all of the core activities listed in this chapter. Cost sharing will be available throughout the implementation period of the project. Costs of implementing this portion of the urban management program will require municipalities to budget expenditures over the course of several years. BMPs implemented under this portion of the program will likely include detention ponds, infiltration and filtration devices, and other structural means for reducing pollution. Secondary program activities may include stormwater management planning and stormwater ordinance development.

Secondary activities include engineering studies and other site-specific assessments for existing and new development. The results of such assessments will determine the best (as well as the most economical) means for reducing pollutant sources in a community.

The basic elements of the secondary program can include the following.

- Conducting detailed engineering studies to determine the best means to implement community specific NPS control measures in develop areas.
- Designing and installing structural urban BMPs with completed engineering studies.
- Developing management plans for planned urban development.
- Developing, adopting, and enforcing a stormwater management ordinance consistent with the state model ordinance.
- Conducting detailed financing and implementation studies in each community (as needed).
- Establishing and maintaining vegetative buffers on privately owned land along streams and riparian wetlands.
- Continuing the development of long-range land use plans that focus on water quality.

Urban Roles and Responsibilities. In order to receive technical and financial assistance, communities must commit to implement the core program. To implement the core program each municipality should do the following.

- Identify in writing an authorized representative for the local unit of government.
- Adopt a construction site ordinance, develop administrative procedures, and determine staffing requirements to enforce a construction erosion control ordinance in the municipality within 2 years of implementation.
- Develop and implement a community specific program of urban housekeeping practices to reduce urban nonpoint pollution. The content of the community-specific program and a schedule for implementation will be negotiated by the DNR and the local unit of government.
- Prepare and submit annual work plans for staff and an annual plan of activities.
- Apply for local assistance grants from the DNR to support core activities
- Implement an information and education strategy consistent with this plan.
- Prepare and submit tracking reports to the DNR.

- Participate in annual watershed project review meetings.

Department of Natural Resources Responsibilities. The DNR is assigned the overall administrative responsibility for the priority watershed program by statute. This includes providing financial support for local staff and installation of management practices, assisting local units of government to integrate wildlife and fish management concerns into selection and design of BMPs, and conducting project evaluation activities. The Department will also provide assistance in development of ordinances and other project implementation activities, review designs for urban BMPs, and approve stormwater management plans.

Marathon County LCD Responsibilities. The county LCD will be responsible for assisting municipalities in the development of construction site erosion control and stormwater management ordinances, developing and implementing the recommended information and educational program outlined in this plan, and providing assistance in the development of grant applications, cost-share agreements, project schedules, and progress tracking.

Landowners and Land Operators. In some situations, private landowners will install BMPs on their property. Those landowners can be important participants in the urban implementation strategy. Eligible landowners can participate in the project by signing cost-share agreements with local units of government.

Rural BMP Cost Sharing and Land Costs

The total estimated cost of installing rural BMP practices in the watershed is approximately $6.5 million. The state's cost-sharing contribution would be approximately $4.3 million, and the local share of approximately $2.2 million coming from landowners and other cost-share recipients. Marathon County will pay the entire cost for easements ($100,000 total expenditure) and cover 50 percent of the cost of land acquisitions ($25,000 total expenditure). Budgeting specifics can be found in Table 4-2 and in Chapter Three.

Table 4-2a Estimated Rural Cost-Share Analysis and Budget Breakdown for Upland Sediment Control

Best Management Practices	Number		Cost/ Unit	Total Cost	State Share	Local Share
Change in Crop Rotation	10,000	acres	NA	**0**	0	See Details [1]
Contour Cropping	2,500	acres	9	**22,500**	22,500	See Details [1]
Contour Strip Cropping	200	acres	13.5	**2,700**	2,700	See Details [1]
High Residue Management	10,000	acres	18.5	**1,110,000** [2]	1,110,000	See Details [1]
Cropland Protection Cover [5] (Green Manure)	2,500	acres	25	**187,500** [3]	187,500	See Details [1]
Intensive Grazing Management (Rotational Grazing)	20	each	4,000	**80,000**	40,000	40,000
Critical Area Stabilization	300	acres	800	**240,000**	168,000	72,000
Grass Waterways	20	acres	3,000	**60,000**	42,000	18,000
Field Diversions and Terraces	1,000	feet	3	**3,000**	2,100	900
Grade Stabilization	4	each	4,000	**16,000**	11,200	4,800
Agricultural Sediment Basin	1	each	10,000	**10,000**	7,000	3,000
Shoreline Buffers	20	acres	400	**8,000**	5,600	2,400
Nutrient Management	15,000	acres	6	**270,000** [3]	135,000	135,000
Nutrient and Pest Management	5,000	acres	10	**150,000** [3]	75,000	75,000
Spill Control Basin	5	each	10,000	**50,000**	35,000	15,000
Wetland Restoration	40	each	2,000	**80,000**	56,000	24,000
Vegetated Riparian Buffers	20	acres	100	**10,000** [4]	10,000	See Details [1]
Livestock Exclusion, Woods	10,000	feet	1	**10,000**	5,000	5,000
Upland subtotal				**2,309,700**	**1,914,600**	**395,100**

Table 4-2b Estimated Rural Cost-Share Analysis and Budget Breakdown for Barnyard Runoff Control / Manure Storage

Best Management Practices	Number	Cost/ Unit	Total Cost	State Share	Local Share
Filter Walls and Strips	28 each	25,000	**700,000**	490,000	210,000
Roof Gutters	60 each	1,500	**90,000**	63,000	27,000
Clean Water Diversion	60 each	2,500	**150,000**	105,000	45,000
Roofs	1 each	25,000	**25,000**	17,500	7,500
Barnyard Abandonment or Relocation	1 each	60,000	**60,000**	42,000	18,000
Manure Storage Facility [6]	25 each	52,000	**1,300,000**	750,000	550,000
Manure Storage Facility [7]	20 each	52,000	**1,040,000**	400,000	640,000
Manure Storage Facility Abandonment	15 each	10,000	**150,000**	105,000	45,000
Cattle Mounds	20 each	1,500	**30,000**	21,000	9,000
Milking Center Waste Control	20 each	7,000	**140,000**	98,000	42,000
Barnyard subtotal			**3,685,000**	**2,091,500**	**1,593,500**

Table 4-2c Estimated Rural Cost-Share Analysis and Budget Breakdown for Streambank Erosion Control

Best Management Practices	Number		Cost/ Unit	Total Cost	State Share	Local Share
Shape and Seeding	16,000	feet	10	**160,000**	112,000	48,000
Fencing	35,000	feet	1	**35,000**	17,500	17,500
Rock Riprap	100	feet	30	**3,000**	2,100	900
Bio-Bank Stabilization	50	feet	25	**1,250**	875	375
Crossing	30	each	2,000	**60,000**	42,000	18,000
Remote Watering Systems	15	each	2,000	**30,000**	21,000	9,000
Streambank subtotal				**289,250**	**195,475**	**93,775**

Table 4-2d Estimated Rural Cost-Share Analysis and Budget Breakdown for Ginseng Production

Best Management Practices	Number		Cost/ Unit	Total Cost	State Share	Local Share
Field Management Plan	30	each	400	12,000	6,000	6,000
Water Pumping System	15	each	1,200	18,000	12,600	5,400
Ginseng subtotal				**30,000**	**18,600**	**11,400**

Table 4-2e Estimated Rural Cost-Share Analysis and Budget Breakdown for Miscellaneous Best Management Practices

Miscellaneous BMPs	Number	Cost/ Unit	Total Cost	State Share	Local Share
Well Abandonment	50 each	700	35,000	24,500	10,500
Miscellaneous BMPs subtotal			**35,000**	**24,500**	**10,500**
Grand Total (All BMPs)			**6,348,950**	**4,244,675**	**2,104,275**

Table 4-2f Estimated Rural Cost-Share Analysis and Budget Breakdown for Land Acquisitions and Easements

Land Acquisitions and Easements	Number	Cost/ Unit	Total Cost	State Share	Local Share
Land Acquisitions	25 acres	2,000	100,000	50,000	50,000
Easements	25 acres	1,000	25,000	25,000	0
Land Acquisition and Easement subtotal			**125,000**	**75,000**	**50,000**

Table 4-2a through 4-2f Details

[1] Local share consists of labor and equipment costs. Also see flat rates in Table 3-1.
[2] High residue management may be cost shared per acre over a 6- year period. Total cost shown represents 6 times the estimated cost per year as an average.
[3] Cropland protection cover and nutrient and pest management may be cost-shared per acre over a 3- year period. Total cost shown is 3 times the estimated cost per year.
[4] Vegetated riparian buffer strips are cost-shared per acre over a 5- year period. Total cost shown represents 5 times the estimated cost per year.
[5] This practice may not be cost-shared on the same field in the same calendar year as high residue management.
[6] Manure storage is cost shared at 70 percent for the first $20,000 of cost and at 50 percent for the remaining cost, not to exceed $35,000.
[7] Manure storage is cost-shared at 70 percent for the first $20,000 of cost and at 50 percent for the remaining cost, not to exceed $20,000.

Source: Wisconsin DNR, DATCP, and Marathon County LCD

Budget and Staff Support

Rural Projects. The state funding estimate for this project is roughly $7 million (Table 4-3). The estimated cost to landowners and other participants is roughly $2.7 million for a total project cost of approximately $ 9.7 million. This figure includes capital costs, staff support, easements, and land acquisition. This estimate is based on 1999 projections developed by agency planners and local staff. Historically, actual project expenditures are less than the estimated costs due to lower participation rates, support costs, and cost-sharing expenditures.

Urban Projects. Funding for local implementation is supported through a local assistance grant from the DNR. Activities eligible include development and implementation of a construction site erosion control ordinance, development of a stormwater ordinance, and design of stormwater management practices. It is estimated $525,000 in state funds and $525,000 in local funds will be needed to implement the urban plan recommendations. (See Table 3-2 for a description of how these costs were estimated.)

Grant Disbursement and Project Management Schedule

Implementation of this priority watershed project shall begin once the plan is approved and the DNR has been notified in writing. The plan must be approved by the DNR, the Marathon County Board, and the Wisconsin Land and Water Conservation Board.

The project implementation period is 10 years. During the first 9 years of implementation, cost-share agreements with eligible landowners may be signed. Practices listed on any cost-sharing agreement must be installed before the end of the implementation phase. The implementation phase of this project is scheduled to conclude in 2008.

The initial NPS grant will cover the cost of practices over the entire 10- year implementation phase. This grant may be amended to reflect changes needed for time of performance, funding levels, or scope of work.

Local assistance grants will be disbursed annually to Marathon County to cover the costs of personnel, operating expenses, and equipment. The DNR will evaluate an annual workload analysis and grant application submitted by Marathon County.

Table 4-3 Estimated Staff Hours Required for 10-year Implementation Period

Activity	Staff Hours
Project and Financial Management	3,000
Information and Education Program (10 years)	18,350
Inventory and Planning[1]	15,190
Practice Design and Installation	18,290
Upland Sediment Control	-----
Barnyard Runoff Control and Manure Storage	11,285
Streambank Erosion Control	4,510
Miscellaneous	500
Easements and Land Acquisition	1,250
Urban	1,000
Monitoring BMP Operation and Maintenance	1,440
Training	3,376
Leave	12,660
Total	**90,851**
Estimated Hours Per Year	**9,085**
Estimated Staff Required Per Year	**4**

Source: DNR, DATCP, and Marathon County Land Conservation Department

[1]Inventory and planning includes: inventory, critical site verification, landowner contacts, conservation planning and plan revisions, cost-share agreement development, and amendment, and progress tracking.

Table 4-4 Lower Big Rib River Priority Watershed Project Cost Estimates

Item	State Share
Cost Share Funds	$4,276,175
Easements and Land Acquisition	$75,000
Local Assistance Staff Funding (based on projected 1999 salaries)	$2,000,228
Information and Education Direct	$42,300
Other Direct (travel, supplies, etc.)	$75,000
Urban	$525,000
Total	**$6,993,703**

Source: DNR, DATCP, and the Marathon County Land Conservation Department

CHAPTER FIVE
Information and Education

Local groundwater and surface water problems have been identified In the Lower Big Rib River Watershed, although they are not always visible to the casual observer or watershed resident. The information and education goal of this project is to improve, protect, and enhance water quality by maximizing landowner participation in the Lower Big Rib River Priority Watershed Project. Increased awareness of water pollution sources and problems is critical to the success of this plan. Information and education objectives include the following.

- Creating awareness of how land uses affect water quality.
- Increasing appreciation of water resources.
- Creating a feeling of ownership within the watershed.

The information and education work group will evaluate and update an annual work plan. The work plan should include an outline of proposed educational strategies and activities for the watershed educator to follow. Specific topics will be addressed on a priority basis as decided by the watershed work group. (An outline of general educational activities is provided at the end of this chapter.)

Educational Activities 1996 to Present

A number of information and education activities detailed in this chapter have already been undertaken during the planning phase of this project. Funding for these activities came from a grant for a half-time watershed educator position, an operating budget for the position, and previous watershed grant money. Among the activities that have already been accomplished are the following.

- Formation, education, and maintenance of Citizen's Advisory Committee to elicit input from watershed stakeholders.
- Conservation tillage walk events hosted by the University of Wisconsin-Extension, local cooperatives, the Forage Council, and Marathon County Land Conservation Department (LCD) to promote the use of high residue farming methods.
- A grazing demonstration in conjunction with Central Wisconsin Grazing Network.
- A pasture walk to promote grazing as viable dairy farming option and clean water best management practice (BMP) in the watershed.
- Three (3) watershed newsletters explaining watersheds, introducing and promoting 2 of the clean water BMPs (conservation tillage and managed grazing), local water quality information, results of the Farm Practices Inventory and the Urban Telephone Survey results, and watershed project updates.
- A Lower Rib River Watershed brochure.

- A watershed display and literature at Marathon County Fair, a Forage Council meeting, and the Graziers' Network meeting
- A mailing to teachers in watershed that included teaching supplements, an offer of assistance with watershed-based curriculum planning, interactive presentations, and an offer to speak to classes.
- Watershed presentations at 2 schools.
- A storm drain stenciling project in Wausau.

Farm Practices Inventory

The framework for this chapter comes largely from the 1996 FPI survey and a telephone survey (Table 5-1) conducted by the UW-Extension Environmental Resources Center. The FPI survey provided baseline information concerning needs, attitudes, behavior, and practices of agricultural landowners as they relate to nutrient and pest management. This assessment helped watershed staff identify and address potential obstacles and barriers to adopting BMPs.

Because of the large number of dairy farms in the watershed, the FPI was conducted with dairy farmers. A total of 50 percent of the targeted audience participated, representing nearly half of the 40,000 acres cropped in the watershed. Roughly 56 percent of the respondents indicated they applied nitrogen in excess of rates recommended by UW-Extension staff. About 90 percent of farmers surveyed applied excessive amounts of phosphorous.

Table 5-1 Nitrogen and Phosphorus Application Rates

Nutrients	UW-Extension Recommendations (pounds/acre)	Current Landowner Applications (pounds/acre)	Surplus Nutrients (pounds/acre)
Nitrogen	120	170	50
Phosphorous	40	108	68

The University of Wisconsin-Madison Survey Research Lab conducted a telephone survey with part of the urban watershed residents. This survey collected information on awareness of and concern for local water quality problems.

Audiences

The primary audience of the information and education program are the priority watershed landowners who have been classified as critical and are eligible to participate. A secondary audience includes priority watershed landowners not eligible for cost sharing, suppliers of services, residents, interest groups, and the general public. Included in this audience are the following.

- **Agricultural producers** (including livestock and non-irrigated cash crops), and agricultural support persons (cooperatives, custom workers).
- **Rural non-farm landowners** who live outside city limits and subdivisions, do not produce crops, dairy, or livestock, and/or those who do not live on or adjacent to a lake, river or stream.
- **Riparian landowners** living on, or adjacent to, a lake, river, or stream.
- **Urban landowners** within the city limits and/or residential subdivisions, public officials, builders and developers.

Delivery Team

The UW-Extension watershed educator, along with Marathon County land conservation staff, will take the lead responsibility for the delivery of the information and education program with support from the University of Wisconsin-Cooperative Extension, the Wisconsin Department of Natural Resources (DNR) and the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP). The Marathon County LCD will also work with, and seek support from, the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS), farm service agencies, local governments, environmental and sporting organizations, lake associations, community, civic, and youth groups, and local business and industry.

Goals and Objectives

Educational priorities and delivery methods will be determined annually by the watershed work group and Information and Education Committee. A number of different educational materials, methods and activities will be used to accomplish the goals and objectives, including the following.

- Demonstration tours and field days.
- One-on-one visit with farmers.
- Watershed tours.
- Monitoring projects.
- News letters and news releases.
- Public meetings and/or public speaking
- Displays and fact sheets.

Demonstrations are a low-cost and highly effective method to provide landowner information and to generate support for implementing land use practices protective of water resources. Important practices to demonstrate in this project include: nutrient management (urban and rural), conservation tillage, managed grazing, wetland enhancement and restoration, well protection and abandonment, stormwater management, and construction site erosion control.

Watershed educational goals are divided into six (6) subject areas:

- Public awareness.
- Agricultural land erosion control.
- Agricultural nutrient and manure management.
- Groundwater protection.
- Urban/rural non-farm/riparian land management.
- Wetland restoration.

Public Awareness

Goal: Increase public awareness and support for the watershed plan.

An urban telephone survey conducted during the summer of 1997 provided information on how urban residents of the Lower Big Rib River Watershed perceive local water quality. Questions measured concern about water pollution in the area and tested their knowledge and perceptions on what contributes to local water pollution. The majority surveyed indicated local waters are "slightly" or "somewhat" polluted, and most respondents were moderately to greatly concerned about preventing further degradation of local water quality. Of those who had waterways on or adjacent to their land, almost 70 percent were greatly concerned about protecting water quality. The survey asked residents what they thought contributed the most to water pollution. Respondents indicated they thought road salt and farm pesticides were the major contributors, with runoff from barnyards a close third.

Watershed educational activities should include the following.

- Monthly watershed/water quality news releases to local and agricultural newspapers.
- Storm drain stenciling/youth water education.
- A student/citizen water quality monitoring project.
- Public speaking (youth/civic/business groups/town meetings).
- Displays (events/public buildings).
- "Be Wisconsin Waterwise" placemats in local restaurants.
- Watershed demonstration signs.
- Watershed signs at boat landings.
- Newsletters.
- Direct mail.
- Public television (e.g., a program on water and water quality).
- Radio (e.g., water quality public service announcements).
- A river clean-up.
- Walk (or canoe) your watershed event/watershed tours.

Agricultural Erosion Control

Goal: Reduce nutrient and sediment runoff from agricultural operations through increased use of best management practices.

Agricultural land uses contribute excessive nutrients and sediments to surface waters. Data from the FPI survey supports the need for specific behavior changes in nutrient management.

Objectives for this goal include the following.

- Over the course of the watershed project, increase use of agricultural BMPs (conservation tillage, crop rotation, contour farming and/or buffers) from 25 percent to 35 percent.
- Increase the number of livestock owners who restrict animal access to streams in the critical and eligible landowner categories.
- Increase the participation of livestock farmers who use management-intensive grazing techniques.
- Increase the number of ginseng farmers who understand, support, and implement water quality protecting BMPs.

Listed below are the recommended activities applicable to sediment reduction education in the watershed.

- One-to-one visits from watershed staff.
- Newsletter article(s)/direct mailing(s).
- Collaborative conservation tillage walks (UW-Extension, local cooperatives, LCD, and Forage Council).
- Collaborative conservation tillage demonstrations (involving the same partners listed above).
- News articles/feature stories.
- Partner with local crop consultants, UW-Extension crops and forage agent, and the Wisconsin Ginseng Growers Association to encourage use of ginseng BMPs.
- Help promote grazing initiative/network activities.
- Grazing demonstration collaboration with grazing network/coordinator.
- Presentations on the goals of the watershed and ginseng BMPs to the Wisconsin Ginseng Association.

Agricultural Nutrient and Manure Management

Goal: Reduce nutrient loads from farming activities through implementation of best management practices.

Information about fertilizer application rates and manure management practices was gathered as the FPI survey. Data indicated about 56 percent of landowners over-apply nitrogen, and about 90 percent of landowners over apply phosphorous. (The word "over-apply" in reference to nitrogen applications here means "over the UW-Extension recommended rates," for phosphorous it means "over crop removal rates".)

Among the objectives of this goal are the following.

- A total of 75 percent of dairy farmers in the watershed understanding the economic and environmental benefits of following a nutrient management plan and at least 50 percent successfully implementing such a plan on their farms.
- Increasing the understanding among dairy and livestock farmers of the importance of manure testing as part of a 590 plan. Additionally, 30 percent of dairy and livestock farmers will have manure tested for N and P and use this information to determine appropriate application levels.
- Increasing dairy farmer understanding of the importance of maintaining barnyards, rain gutters, and water diversion channels to protect water quality.
- Increasing the number of dairy and livestock farmers who are able to list the 4 Animal Waste Advisory Committee (AWAC) prohibitions.

Table 5-2 Phosphorus Application Rates in Pounds/Acre by Subwatershed

Sub-Watershed	Total Phosphorus (P)	Manure Phosphorus (P)	UW-Extension Goal	Lbs./Acre Surplus Total P	Lbs./Acre Surplus Manure P
Kennedy Creek	154.0 (n=3) [1]	128.1 (n=3)	40	114 (285%)	88 (220 %)
Rib Falls	101 (n=18)	85.7 (n=13)	40	61 (152 %)	45.7 (114 %)
Edgar	91.5 (n=32)	75.3 (n=24)	40	51.51 (129 %)	35.3 (88 %)
Marathon	85 (n=16)	75 (n=12)	40	45 (112.5 %)	35 (88 %)

[1] (n) represents the sample size

By the end of this project, at least 25 percent of the farmers in the watershed should be setting and using cropland yield goals and use appropriate amounts of phosphorous and nitrogen (Currently, an estimated 42 percent of growers in the watershed set yield goals to help determine nitrogen requirements); taking regular soil tests at least once every 4 years (Around 50 percent of farmers

in the watershed routinely test soil, every 4 years or less.); having their manure spreader calibrated to determine its spreading rate (Currently, 15 percent indicate they have had this done.); and plowing under manure within 3 days of spreading (About 45 percent indicated they presently follow this practice.).

Phosphorous Reduction Educational Activities. Educational activities and tools applicable to reducing phosphorous include the following.

- Conservation tillage field days.
- Conservation tillage demonstrations.
- Manure management demonstrations.
- Manure spreader calibration events.
- Distribute brochures/literature through coops and UW-Extension crops and forage agent on nutrient management, fertilizer value of manure, yield goals.
- Manure spreader calibration demonstrations at events such as Forage Council meetings, demonstration field days, county fairs.
- Newsletters and news/feature articles.
- Future Farmers of America's "Operation Green Stripe".

Groundwater Protection

Goal: Increase the understanding among watershed stakeholders of the direct relationship between land use and water (surface and groundwater) quality.

Well Samples and Groundwater Quality. Well tests conducted in the watershed found 29 percent of wells have nitrogen levels 10 ppm or greater. Ten (10) ppm is the health advisory level enforcement standard

Nitrogen Sources. The FPI survey indicated 56 percent of farmers in the watershed over-applied nitrogen, with 37 percent using 65 pounds or more per acre over recommended rates. According to the survey, more than 50 percent of the farmers spread manure throughout the year. Of those farmers applying manure to fields, 76 percent did not take nitrogen credits for the manure they spread, and 14 percent under-credit their manure. A full 100 percent of farmers who could take nitrogen credits from legumes either under-credit or did not credit legume nitrogen.

Table 5-3 Nitrogen Application Rate in Pounds/Acre by Subwatershed

UW-Extension recommended rate=120	Kennedy Creek	Rib Falls	Edgar	Marathon
Total Nitrogen (all sources)	218.8 (n=3)[1]	157.1 (n=18)	151.2 (n=35)	151.6 (n=16)

[1] (n) represents the sample size

Agricultural Information and Education Groundwater Objectives. Once this plan is implemented, the goal is for half of the farmers in the watershed to meet the following objectives.

- Base commercial fertilizer application rates on nitrogen soil tests.
- Have manure tested for N levels and take proper nitrogen credits.
- Be aware of all nitrogen sources and values on their fields and be able to accurately calculate how much additional fertilizer they need to apply and/or how to follow a nutrient management plan.

Groundwater Protection Educational Activities. Among the recommended groundwater protection educational activities are the following.

- Manure management field day.
- Well abandonment demonstration with the DNR and the FSA.
- One-on-one visits.
- Newsletters, news/feature stories, and radio programs.
- Public displays/presentations and speeches.
- Co-operatives advocating nutrient management.

Urban, Rural Non-farm, and Riparian Land Management

Goal: Increase awareness and implementation of urban and rural NPS best management practices (BMPs).

Urban, Rural Non-farm and Riparian Information and Education Objectives. Objectives for this section were developed from the FPI Survey, the Urban Telephone Survey, and urban watershed goals.

- Residents will be able to name the major urban and rural sources of nutrients and sediment polluting local waterways.
- Landowners will restrict animal access to streams and waterways in accordance with AWAC prohibitions.
- Local government officials will enforce proper use of construction site erosion control in their township or village.
- Builders and contractors working in the watershed areas will attend a construction site erosion control workshop and follow proper methods.
- Landowners with riparian areas will maintain or establish riparian buffer areas.
- Landowners will be able to abandon wells according to DNR guidelines.
- All villages, municipalities, and developers will have and follow a stormwater management plan.
- Residents will use the Marathon County Hazardous Waste Collection site to dispose of household and agricultural hazardous waste products.

Urban Nutrient and Sediment Reduction Educational Activities. Among the activities recommended for the watershed are the following.

- Watershed demonstration signs.
- Watershed signs at boat landings.
- Newsletters.
- Meetings with local government officials (stormwater management and construction site erosion control).
- Promote construction site erosion control workshop.
- Newspaper articles.
- Storm drain stenciling.

Wetland Restoration

Goal: Increase awareness, support, and restoration of private wetlands.

The objective of this goal is to restore as many degraded and converted wetlands in the watershed as possible by encouraging more wetland owners to enhance, restore, and protect wetlands on their property.

Among the wetland restoration educational activities that should be undertaken as part of the watershed plan are the following.

- Publishing of newsletters.
- Publishing/placement of newspaper articles.
- Undertaking a wetland restoration demonstration.
- Public speaking/presentations by DNR wetlands specialist and testimonials from people with restored wetlands.
- Watershed tours.
- Wetlands placemats at local restaurants.

Table 5-4a Watershed Plan Information and Education Activities: Sediment and Nutrient Management

Activity	Personnel	Commitment	Cost	Time Involved
Conservation tillage plots (Part of Field Days)	Watershed staff Watershed educator UW-Extension Co-ops Forage Council	2/year Current-2002	$200	200 hours
Partnerships with agribusiness, civic, business, and environmental groups	Watershed educator Watershed staff UW-Extension	Ongoing	-----	400 hours
Conservation tillage walks demonstrating methods, equipment, and farmer experience	Watershed staff Watershed educator UW-Extension Co-ops Forage Council NRCS	4/year Current–2002 1/year 2002–2006	$100	200 hours
Soil erosion demonstration (with conservation tillage demonstration)	Watershed staff Watershed educator UW-Extension Co-ops	1/year Current-2001	$300	40 hours
Workshop: "What is a 590, and Why Do I Need One?"	Watershed staff Watershed educator UW-Extension Co-ops	1/year Current –2002	$250	40 hours
Managed grazing demonstration	Grazing specialist	1/year Current-2002	$100	60 hours
Streambank restoration/ protection demonstration	Watershed staff Watershed educator	Follow 1 project through 8 years, document change and benefits.	$300	100 hours
One-on-one farm visits	Watershed staff Watershed educator	Ongoing	$800	1,700 hours
Nutrient management planning workshop (co-ops and custom spreaders)	Watershed staff Watershed educator UW-Extension	1999 2004	$100	50 hours
Newsletter articles/direct mail/news stories	Watershed educator	2-year life of the project	$27,000	1,500 hours

Table 5-4a Continued

Activity	Personnel	Commitment	Cost	Time Involved
Manure spreader calibration event	Watershed staff Watershed educator UW-Extension Co-ops	Event in 1999 Future event in 2002	$25	40 hours
Distribution of BMP literature	Watershed educator	Ongoing	-----	25 hours
Operation Green Stripe	Watershed staff Watershed educator FFA	2000-2001	-----	50 hours
Manure management field day	Watershed staff Watershed educator UW-Extension Co-ops LCD staff	2003 2006	$450	300 hours
Brochures/fact sheets	Watershed educator UW-Extension	Ongoing	$1500	400 hours
Conduct farm practices inventory	Watershed educator UW-Extension Environmental Resources Center	2002 2009	$350	2,000 hours

Table 5-4b Watershed Plan Information and Education Activities: Groundwater Protection

Activity	Personnel	Commitment	Cost	Time involved
Manure management field day	Watershed staff Watershed educator UW-Extension Co-op LCD staff	-----	-----	-----
Well abandonment demonstration	DNR Watershed educator FSA	2000 2004	$450	200 hours
One-to-one visits	Watershed staff	Ongoing		1,700 hours
Newsletters, news releases/stories	Watershed educator	Ongoing	-----	$750
Public displays at local library/county fair	Watershed educator	2002	$50	60 hours
Work with co-ops in support of nutrient management	Watershed staff Watershed educator	Ongoing	-----	100 hours
Radio programs	Watershed staff Watershed educator	2002	-----	25 hours
Public speaking and presentations	Watershed staff Watershed educator	Ongoing	-----	50 hours
Brochures/fact sheets	Watershed educator UW-Extension	Ongoing	$1,500	400 hours

Table 5-4c Watershed Plan Information and Education Activities: Urban, Rural Non-farm and Riparian Land Management / Phosphorus and Sediment Reduction

Activity	Personnel	Commitment	Cost	Time Involved
Newsletters, news releases, and newspaper articles	Watershed educator	Ongoing	-----	-----
Storm drain stenciling	Watershed educator CAC members	1/year throughout project life	$250	250 hours
Construction site erosion control workshops	Watershed educator Basin water educator DNR	1/year	-----	100 hours
Meetings with local officials	Watershed staff Watershed educator DNR	2002	-----	80 hours
Watershed/ water education signs at boat landings	Watershed staff Watershed educator	Completed 1998-99	$500	30 hours
Wetlands placemats in local restaurants	Watershed educator	Ongoing	-----	25 hours
Brochures/fact sheets	Watershed educator UW-Extension	Ongoing	-----	-----
Conduct telephone survey at middle and end of project	Watershed educator UW-Extension Environmental Resource Center	2002 2006		500 hours

Table 5-4d Watershed Plan Information and Education Activities: Wetland Restoration

Activity	Personnel	Commitment	Cost	Time Involved
Wetland restoration demonstration	Watershed staff Watershed educator	2000 2005	$300	60 hours
Public speaking, presentations	DNR Wetlands Specialist- Landowners with restored wetlands watershed ed. Watershed staff	2000 2005	$50	25 hours
Newsletters, newspaper articles	Watershed educator	Ongoing	-----	-----
Brochures/fact sheets	Watershed educator UW-Extension	Ongoing	-----	-----
Watershed tour	Watershed staff Watershed educator	2003	$300	50 hours

Table 5-5 Information and Education Budget and Staff Hours

Activity	Total Direct Costs	Required Staff Hours	
		Years 1-4	Years 5-10
Newsletters, direct mail	$27,000	500	1,000
Brochures, fact sheets	$1,500	200	200
News Releases/ Feature Articles	-----	450	300
Citizen's Group	-----	1,000	500
Student/Youth Education and Involvement • Storm drain stenciling • FFA Operation Green stripe • River Clean-Up	$400	500	250
Water Monitoring • Signs of Success • WAV Volunteer Monitoring	$1,000	300 300	200 250
Outreach Education and Building Awareness: Public speaking, displays, tours, placemats, signs	$500	700	800
Agricultural Landowner Education • One-on-one • Neighborhood meetings	----- $800	2,200 200	1,200 200
Field days/demonstrations	$10,000	1,000	500
Create watershed partnerships		300	100
Educational/Documentation And Evaluation Materials	$500	250	2,000
Meetings with Local Officials	$100	100	50
Surveys: FPI and Telephone	$500	1,250	1,250
TOTAL	**$42,300**	**9,250**	**9,100**

CHAPTER SIX
Project Evaluation

This chapter summarizes the plan for evaluating the progress and effectiveness of the Lower Big Rib River Priority Watershed Project. The evaluation plan includes an administrative review, a pollution reduction evaluation, water resource monitoring, and a final report.

The Marathon County Land Conservation Department (LCD) will collect information on the first two components and forward their work to the Wisconsin Department of Natural Resources (DNR) and the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP). The project team will meet early in the year throughout the implementation phase to review and evaluate accomplishments. The DNR's Bureau of Community and Financial Assistance will provide additional information on cost-share agreements practices and funds encumbered and expended. The water resource monitoring plan follows guidance established by the DNR's Bureau of Water Resources Management to select specific watershed sites to monitor resource quality changes.

Administrative Review

The administrative review will focus on the progress of Marathon County and other units of government in implementing the project. Evaluation of the project will include information on accomplishments, financial expenditures, and staff time spent on project activities.

Progress Reporting

Evaluation data provided by the Marathon County LCD for the annual watershed review will include the following.

- Planned and completed best management practices (BMPs).
- Planned and completed conservation systems.
- Major information and education activities undertaken.
- Pollutant load reductions.
- Status of grants and related financial activities.
- Evaluation of landowner participation.
- Status of project administration (e.g., data management, staff training, and BMP monitoring).
- Status of nutrient management planning and easement acquisition and development.
- Effectiveness of construction site erosion control activities.

Accomplishment data are summarized in the Annual Accomplishment Report (prepared by the DNR and DATCP) and discussed at annual watershed review meetings. Participating local units of government implementing the urban NPS management program meet periodically with DNR staff to review progress. The DNR and local units of government will jointly evaluate the urban implementation program. Annual reports of governmental units will include the following.

- Status of stormwater management activities for new development undertaken by the City of Wausau and the Town of Rib Mountain.
- Information and education activities.
- Adopted construction site erosion control ordinance amendments.
- Number of permits monitored for ordinance compliance.
- Implementation of urban housekeeping program activities.
- Acres of existing (as of 1996) urban development that is covered by stormwater management plans.
- Acres of new (post-1996) urban development covered by stormwater management plans.
- Adopted stormwater management ordinance provisions.

Details of reporting requirements for watershed projects are contained in DNR Publication WR-223-97, *An Evaluation Plan for the Soil and Water Resource Management Program and the Nonpoint Source Water Pollution Abatement Program*, and will be reviewed every 2 years by the DNR and DATCP and revised as necessary.

Marathon County will initially use a specialized computer data management system developed by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) for watershed reporting. The system, the Field Operating Computing System (FOCS) will be used wherever possible to collect data about administrative accomplishments. The information will be forwarded to the DNR and DATCP for program evaluation. (The DNR, NRCS, and DATCP use FOCS to meet the accomplishment reporting requirements of all 3 agencies.) Eventually, it is expected Marathon County will use a newer computer program developed by the Local Automation Needs Determination (LAND) Team in 1996. Data in FOCS will be integrated into the new software database. The LAND software package will enable Marathon County to determine local automation needs for resource inventory, planning, and product delivery; identify and evaluate the existing and new alternative available to meet these needs; and develop a recommended course of action, along with guidelines for implementation.

Additionally, the Marathon County LCD is currently integrating county Geographic Information System (GIS) capabilities. The system will allow watershed staff to enhance recordkeeping by tying inventory data and pollutant load reductions with specific parcels of land.

Financial Expenditures

The Marathon County LCD and other participating units of government will provide the following financial data to the DNR and DATCP on an annual basis.

- Number of landowner cost-share agreements signed.
- Amount of money encumbered in cost-share agreements.
- Number of landowner reimbursement payments made for the installation of BMPs and the amount of money disbursed.
- 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 Marathon County LCD staff.
- Amount of money paid for installation of BMPs and money encumbered in cost-share agreements.
- Staff training expenditures.
- The amount of interest earned and expended.
- Total budget and expenditures for the project.

The Marathon County LCD will also provide information on an annual basis about the amount of time spent on project activities to the DNR for each employee.

Nonpoint Source Pollutant Load Reduction

Pollutant load reduction goals have been established for sediment from croplands, streambanks, urban areas, and construction sites and for phosphorus from the land-spreading of manure, from barnyards, from streambanks, from urban areas, and on cropland.

Cropland Sources. The Marathon County LCD is currently using the Wisconsin Nonpoint Source (WINHUSLE) computer model to estimate sediment delivery to the Lower Big Rib River. The inventoried sediment load from cropland is 15,625 tons per year. This sediment contains 123,530 pounds of phosphorus. The goal for reducing sediment from cropland is 25 percent. This accounts for 3,907 tons of sediment and 30,883 pounds of phosphorus.

Landowners with cropland fields delivering the highest sediment (25 percent of the goal) will be identified initially as critical sites. This includes approximately 117 fields owned by 65 landowners. Reducing sediment delivery to 0.5 tons per acre per year or soil loss to T-1 will reduce sediment delivery by about 1,007 tons per year.

If, after 5 years of project implementation, the amount of sediment reduction, based on cost share agreements, is less than 60 percent of the goal, additional fields will be classified as critical sites. This includes approximately 426 fields owned by 148 landowners. Reducing sediment delivery to 0.5 tons per acre per year or soil loss to T-1 will reduce sediment delivery by about 1,123 tons per year.

Gully erosion was identified as a separate category in the inventory. Based on the inventory, gullies contribute 148 tons of sediment per year and 1,170 pounds of phosphorus. The reduction goal for gully erosion is 25 percent, or 37 tons of sediment and 293 pounds of phosphorus annually.

Streambank Sources. Marathon County LCD staff walked all of the tributaries and canoed the Lower Big Rib River to inventory streambank erosion. The inventoried loads from streambank erosion on the main branch of the Lower Big Rib River is 2,935 tons of sediment and 1,468 pounds of phosphorus annually. Because access was poor, low phosphorus retention ability of soils, size, and extent of streambank erosion on the main stem of the Lower Big Rib River, no reduction goals were set.

Streambank erosion from the tributaries to the Lower Big Rib River was inventoried at 1,170 tons of sediment and 2,340 pounds of phosphorus per year. The reduction goal is 20 percent or 234 tons of sediment and 468 pounds of phosphorus annually.

Barnyard Runoff. The Marathon County LCD is using the Barnyard Nutrient Analysis (BARNY) model to estimate phosphorus runoff from barnyards. The inventoried phosphorus load from 204 barnyards is 10,000 pounds annually. Nine (9) barnyards have been identified as critical sites. The reduction goal is 50 percent or 5,000 pounds of phosphorus. These critical sites account for 2,020 pounds of phosphorus per year or 40 percent of the total reduction goal.

Land-spread Manure. The Marathon County LCD is using the Manure Storage Rating Guide to estimate phosphorus loading from winter-spread manure, along with the lack of nutrient management planning. The inventoried phosphorus load from 193 farms evaluated for land-spreading manure is 23,000 pounds annually. Spreading manure in sensitive areas accounts for 56 percent of the total load, and spreading without a nutrient management plan accounts for 44 percent. The reduction goal from land spread manure is 50 percent or 11,500 pounds of phosphorus. The phosphorus reduction from spreading in sensitive areas is 6,440 pounds of phosphorus and the phosphorus reduction from nutrient management planning is 5,060 pounds.

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

Urban Runoff. The Marathon County LCD used SLAMM model export coefficients to inventory sediment and phosphorus runoff from urban areas. The inventoried load from urban areas is 1,895 tons of sediment and 2,713 pounds of phosphorus annually. The reduction goal for urban areas is 50 percent or 948 tons of sediment and 1,357 pounds of phosphorus annually.

Municipalities will report annually to the DNR on any activities that may result in changes in urban pollutant loadings. Such activities include acres of existing (as of 1996) and new (post-1996) urban land served by new stormwater BMPs, new urban lands not served by stormwater BMPs, and other information requested by the DNR concerning BMP characteristics.

Interim BMPs

Interim BMPs are created to meet specific objectives identified during the inventory and planning process. Marathon County identified ginseng management as a potential problem in the Lower Big Rib River. As a result, a ginseng planning and management BMP, including vegetated riparian buffer strips, will be utilized as an interim BMP. Interim BMPs will be evaluated over a 3-year period by the Marathon County LCD and the DNR for effectiveness in reducing NPS pollution before they are considered a standard. These cost-shared practices include ginseng planning and management.

The evaluation process will include an analysis of the practice based on the amount of pollution controlled, landowner acceptance, and state and landowner cost. The report will also include a discussion of results, problems encountered, transferability to other watershed projects, and recommendations based on local experience with the BMP.

Water Resource Monitoring

Limited funds and the intensive staffing needed to properly evaluate water quality changes prohibits monitoring each watershed individually. Instead, 2 types of evaluation monitoring are conducted on a statewide basis: whole stream monitoring and "Signs of Success". The goal of these monitoring activities is to determine the progress the Nonpoint Source Program is making toward improving the quality of Wisconsin's water resources.

Monitoring activities were developed to answer five (5) questions about the water resource objectives and the pollution reduction goals.

- Do the levels and types of best management practices recommended in the watershed plans achieve the water resource objectives?
- Do the types and levels of best management practices recommended in the watershed plans achieve the pollutant reduction goals?
- Does any level of practice installation below 100 percent achieve the water resource objectives or the pollutant reduction goals?
- Is there a need to adjust the pollutant load reduction goals to achieve the water resource objectives?
- Can simple environmental indicators be used to provide some early evidence that the practices might achieve the water resource objectives and pollutant reduction goals?

A team of experts from state and federal agencies and the University of Wisconsin was formed to develop and direct the evaluation monitoring activities at the whole stream monitoring and "Signs of Success" sites. And volunteers will monitor water quality in the Lower Big Rib River watershed in order to gather more information during the life of the project.

Whole Stream (Master) Monitoring Sites. Whole stream monitoring programs have been utilized in Wisconsin since 1990. Twelve (12) streams within priority watersheds have been selected for intensive chemical and biological monitoring. The stream sites represent the five (5) major types of fisheries found in agricultural and urban parts of priority watersheds. The five (5) fishery types are: high gradient cold water sport fishery, high gradient warm water sport fishery, high gradient warm water forage fishery, low gradient warm water forage fishery, and low gradient cold water sport fishery. The streams also represent three (3) of the five (5) eco-regions in the state.

A stormsewer outfall is also being monitored. Three (3) eco-region types represented are the Southeastern Wisconsin till plains, the Driftless area, and the North Central Hardwood Forest. All but one of the stream sites drains a small area (about 10 square miles or less). The schedule involves 2 years of monitoring before any BMPs are installed, 5 years of monitoring during the practice installation phase, 2 years of monitoring during the response period, and 2 years of monitoring during the post-practice installation phase, for a total of 11 years of monitoring.

State-of-the-art chemical and physical monitoring is being done at all the stream sites. State-of-the-art biological monitoring will be done at 8 of the 12 streams. Results of the monitoring will be used to determine how well the BMPs achieve the pollution reduction goals and objectives. The whole stream monitoring program will help the project team understand the effectiveness of BMPs on water quality and help landowners make better choices.

The success of the evaluation activities depends on the installation of all BMPs at the whole stream monitoring sites.

"Signs of Success" Monitoring. "Signs of Success" is short-term monitoring designed to provide some early evidence that better land management does make a difference. In the Lower Big Rib River, three (3) to six (6) sites are being sought for monitoring above and below BMP project sites before and after installation. These sites will be jointly identified between the Marathon County LCD and the DNR water quality specialist. "Signs of Success" will focus on a practice such as barnyard runoff controls, manure storage, pastured streambank, or streambank fencing. The impact of these BMPs can be seen in a relatively short time frame.

Monitoring will take place the year before and the year after a practice is installed. Expected improvements are expected at those sites with degraded habitats. Habitat sampling and photographs will be used to indicate the benefit of a practice. Limited chemical monitoring and fish sampling also will be done at some sites.

The results of the "Signs of Success" monitoring will be featured in educational materials (e.g., local newsletters, local newspapers, and the statewide newsletter "Fields and Streets"). "Signs of Success" sites for the Lower Big Rib River watershed project are being identified and will be established shortly after implementation of the watershed plan begins.

Volunteer Monitoring. The Water Action Volunteers (WAV) model will be used to enlist help in monitoring water quality in the Lower Rib River over the life of the watershed project. Students, youth and civic groups, business and industry, and concerned individuals will be recruited, trained, and armed with the equipment necessary to collect data. Each volunteer monitor (individual or team) will be assigned a site and will collect data once a month. Monitors will measure dissolved oxygen, temperature, and turbidity and inspect and assess habitat and macro-invertebrate populations. Data will then be given to the project coordinator and will be posted on a statewide monitoring website.

In an attempt to utilize the baseline information, the Marathon County LCD will obtain the location and results of the initial water quality assessment. The Marathon County LCD will promote WAV monitoring at the same sites, for the same parameters, so any observable changes in water quality can be documented. (A detailed description of the initial water quality appraisal is available from Jim Klosiewski, DNR office in Rhinelander.)

Final Report

A final report will be prepared for the Lower Big Rib River Priority Watershed Project within 18 months of the end of the grant period. This report will include information on landowner participation, project management, grant management, technical assistance, and any "Signs of Success" sites completed within the watershed. The report will evaluate progress, provide documentation on attainment of water quality and pollutant load reduction objectives, evaluate BMP effectiveness, and provide recommendations on key areas needing improvement in the NPS program. A final report will be developed jointly by Marathon County LCD, the DNR and DATCP.

APPENDIX A
Rural NPS Best Management Practices

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

Barnyard abandonment or relocation - Relocation of an animal lot from a critical site, such as a flood way to a suitable site, to minimize the amount of pollutants from the lot to surface or groundwater.

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

Cattle mounds. Earthen mounds used in conjunction with feeding and dry-lot operations, intended to provide a dry and stable surface area for cattle.

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

Contour stripcropping. Growing alternating strips of row crops and grasses or legumes on the contour.

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

Cropland protection cover (green manure). Consists of close-growing grasses, legumes, or small-grain grown for seasonal soil erosion protection and soil improvement.

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

Field diversions. A channel constructed across the slope with a supporting ridge on the lower side to divert excess water to safe outlet in other areas.

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.

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

High residue. A system that leaves at least 30 percent of the ground covered with crop residue after crops are planted.

Intensive grazing management (rotational grazing). The division of pastures into multiple cells that receive a short but intensive grazing period, followed by a period of recovery of the vegetative cover. Rotational grazing systems can correct existing pasturing practices that result in degradation and should replace the practice of summer dry-lots when this practice results in water quality degradation. If the cost sharing switches to a flat rate in ch. NR120, Wis. Admin. Code, that will be the cost share method used in the watershed.

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

Land acquisition. The purchase of land or the interest in land that is contributing or will contribute nonpoint source pollution or for the construction of an urban structural practice.

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

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

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

Milking center waste control systems. A piece of equipment, a practice, or combination of practices installed in a milking center for purposes of reducing the quantity or pollution potential of the wastes.

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

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

Roofs for barnyard runoff management and manure storage facilities. Roofs and/or supporting structures constructed specifically to prevent rain and snow from contacting manure.

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

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

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

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.

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

APPENDIX B
Marathon County Animal Waste and Manure Management Ordinance

The County Board of Supervisors of the County of Marathon does ordain as follows:

Section 11.02 of the General Code relating to Animal Waste is repealed and recreated as follows:

11.02 ANIMAL WASTE AND MANURE MANAGEMENT. (Cr. #256)

(1) INTRODUCTION.

(a) Authority. This section is adopted under authority granted by §59.02, §59.025 and §92.16, Wisconsin Statutes.

(b) Title. This section shall be known, referred to and cited as the, "County Animal Waste and Manure Management Ordinance."

(c) Findings and Declaration of Policy.

1. The County Board finds that storage of animal waste and manure in storage facilities not meeting technical design and construction standards may cause pollution of the surface and groundwater of the County, and may result in actual or potential harm to the health of County residents and transients; to livestock, aquatic life and other animals and plants; and to the property tax base of the County.

2. The County Board finds that the technical standards developed by the USDA Natural Resources Conservation Service and adopted by the County Land Conservation Committee provide effective, practical and environmentally safe methods of storing animal waste and manure.

(d) Purpose. The purpose of this section is to regulate the location, construction, installation, alteration, design, operation, maintenance, abandonment, and the application of waste and manure from all storage facilities covered by this Ordinance; in order to prevent water pollution and thereby protect the spread of disease; to further the appropriate use and conservation of land and water resources for its communities; and promote the prosperity, aesthetics and general welfare of the citizens of the County. It is also intended to provide for the administration and enforcement of this section and to provide penalties for its violation.

(e) Applicability. This section applies to all unincorporated areas of the County.

(f) Interpretation. In their interpretation and application, the provisions of this section shall be held to be minimum requirements and shall be liberally construed in favor of the County, and shall not be deemed a limitation or repeal of any other power granted by the Wisconsin Statutes.

(2) DEFINITIONS.

(a) Animal Waste and Manure. Agriculture related industrial byproducts including paunch manure. The fecal waste and excreta from domestic livestock, poultry or other animals kept for agricultural purposes. For the purpose of this Section, substances found in the manure [for example, bedding materials (straw, wood shaving, etc.), water from precipitation, milkhouse water, etc.] will be considered a part of the animal manure.

(b) Applicant. Any person who applies for a permit under this section.

(c) Earthen Storage Facility. A storage facility which is constructed and lined totally or lined partially with soil materials, and in which the animal manure stored within the facility comes in direct contact with the earthen liner at any time.

(d) Existing Concrete Liners in Storage Facility. A concrete liner found within an animal waste and manure storage facility which fully or partially covers the bottom and/or the sidewalls of a waste and manure storage facility that has been installed and placed in use at a livestock operation in Marathon County prior to the adoption of this ordinance.

(e) Existing Earthen Storage Facility. An earthen animal waste and manure storage facility which has been installed and placed in use at a livestock operation in Marathon County prior to the adoption of this ordinance.

(f) Idle Storage Facility. A waste and manure storage facility which is:

1. No longer being used for its intended purpose and no longer having any additional animal waste and manure placed into it.

2. Has not had any animal waste and manure placed into it for a period of one year.

3. Will, by all the evidence available, not again be used to store animal waste and manure by an active livestock operation.

(g) Land Conservation Department (LCD). The department of Marathon County government which is responsible for soil and water conservation activities in Marathon County.

(h) Land Conservation Committee (LCC). A committee made up of members of the Marathon County Board of Supervisors and others who, by authority from Chap. 92,

Wisconsin Statutes, determine policy and give direction for soil and water conservation activities. The Land Conservation Committee also provides direction for the Land Conservation Department. The Land Conservation Committee shall be the decision making board for purposes of this ordinance.

(i) Malfunctioning Storage Facility. An animal waste and manure storage facility which is no longer functioning as intended, as defined by the Technical Guide, and poses a real or potential threat to any person, the groundwater, any stream, lake or river, or any other component of the environment. A malfunctioning storage facility includes, but is not limited to the following:

1. The storage facility in which the outside face of the sidewall(s) have been damaged or eroded, which may weaken the structure of the storage facility.

2. A storage facility in which there are visible and serious deformities of the structure and shape of the inside sidewall(s).

3. A storage facility in which the waste and manure is visibly leaking through the sidewalls or floor.

4. A storage facility in which any other serious deformity or activity that is not consistent with the design and function of a storage facility as determined by the Technical Guide.

(j) Mismanaged Storage Facility. An animal waste and manure storage facility which is not functioning properly due to the neglect or carelessness of the owner or operator, and poses a real or potential threat to any person, the groundwater, any stream, lake or river, or any other component of the environment. A mismanaged storage facility includes, but is not limited to the following:

1. A storage facility that is overflowing or is being operated improperly and inconsistent with the recommended operating methods as defined by the Technical Guide.

2. A storage facility in which the safety devices are absent or are nonfunctional.

(k) Natural Resources Conservation Service. An agency of the United States Department of Agriculture which, for purposes of this Section, provides the Marathon County Land Conservation Committee and Land Conservation Department with technical assistance and information on the design criteria, size, shape, engineering strength and other necessary technical data for the proper and safe installation of a storage facility.

(l) Nutrient Management Plan . A nutrient management plan is a plan that balances the nutrient needs of a crop with the nutrients available from legume crops, manure, fertilizer, etc.

(m) Permit. The signed, written statement issued by the County Conservationist with the Land Conservation Department under this section authorizing the applicant to construct, install, move, reconstruct, extend, enlarge, convert or substantially alter a storage facility.

(n) Permittee. Any person to whom a permit is issued under this section.

(o) Person. Any individual, corporation, partnership, joint venture, agency, unincorporated association, municipal corporation, County or State agency within Wisconsin, the federal government or any combination thereof.

(p) Safety Devices, Storage Facility. Devices which are designed to protect humans and livestock from the hazards associated with a storage facility. Safety devices include the following:

1. A fence around the storage facility constructed of woven wire with barbed wire above it or woven livestock panels no less than 4 feet in height or a fence of another design that will provide the same or greater protection as the above fence.

2. A grate covering the opening to the pump or gravity flow collection pit that will hold a minimum of 400 pounds (two people) and will not allow any person, especially a child to fall between the bars of the grate. A barrier around the transfer system may be used in lieu of the grate providing the barrier provides protection to children and others that is equal to or greater than the above mentioned grate.

3. Proper ventilation is required in the area of the Manure Transfer System. Ventilation can be obtained by providing two or more windows in the immediate area of the transfer system, and a circulation or exhaust fan along with an opening for air to the outside or to the other areas of the livestock building.

4. Concrete curbing or metal posts anchored in concrete that will prevent a tractor, skid steer, or any other implement from sliding into the storage facility when pushing manure to a push off ramp.

5. Gates across access roads to a storage facility. The gates shall have the same ability to keep out children and livestock as the fence for the storage facility.

6. The following components of storage facilities shall have signs posted warning of lethal gases that can accumulate. Such signs will be made available at cost by the Land Conservation Department.

a. Gravity flow reception pits

b. Tanks (concrete or steel) used for temporary storage of manure.

c. Any other area where lethal gases could accumulate, as determined by the LCD.

7. Other like devices deemed necessary by the LCD, or by the Technical Guide.

(q) Storage Facility. Any site or area specifically designed and/or constructed for the purpose of storage or holding of animal waste and manure. This includes any storage facility previously designed and installed meeting the NRCS Technical Guidelines current at the time of installation, any commercial-prefabricated storage facility, concrete slabs, earthen dugouts, dikes or any other area intended for the storage of animal manure. For the purposes of this Section, a storage area intended to hold an accumulation of manure within an area excavated, or diked for the purpose of storing the manure, no matter how small that accumulation may be or how long the manure is to be stored there, shall be considered a storage facility.

(r) Technical Guide. The document provided by the Natural Resources Conservation Service which contains technical data, including the standards referenced within this ordinance to properly and safely locate, construct, install, alter, design, operate and maintain a storage facility.

(s) Technical Standard 313. A section of the Technical Guide. This standard covers the proper location, construction, installation, alteration, design, operation and maintenance of a manure storage structure, normally placed above ground, with a nearly level bottom, and vertical sidewalls.

(t) Technical Standard 358. A section of the Technical Guide. This section covers installation of components such as conduits, pumps, valves, and other structures or devices to transfer animal waste from buildings and yards to a storage and/or loading area for final disposal and establishes the minimum acceptable requirements for design, construction, and operation of waste transfer system components. It includes mechanical pumping or elevation differential (gravity head) systems.

(u) Technical Standard 425. A section within the Technical Guide. This standard covers the proper location, construction, installation, alteration, design, operation and maintenance of a manure storage pond that is placed in the ground, with a nearly level bottom and sloping inside sideslopes.

(v) Technical Standard 590. A section of the Technical Guide. This standard covers managing the amount, form, placement and timing of plant nutrients and establishes the minimum acceptable requirements for the application of plant nutrients associated with organic wastes (manure and organic byproducts), commercial fertilizer, legume crops and crop residues.

(w) Temporary Storage Facility. A storage facility that is intended to store waste and manure for less than 30 days.

(x) Topographical Map: A detailed map showing the surface topography, surface waters, intermittent streams, and drainage directions and patterns, as prepared by the Wisconsin Geological and Natural History Survey.

(y) Transfer System: A mechanism designed to transfer the animal waste and manure from a barn or feedlot where livestock are kept to the storage facility. The transfer system generally consists of, but is not limited to, a pump or gravity flow collection basin and a pipe leading to the storage facility.

(z) Water Pollution. Contaminating or rendering unclean or impure the ground or surface waters of the State, or making the same injurious to public health, harmful for commercial or recreational use or deleterious to fish, bird, animal or plant life.

(3) ACTIVITIES SUBJECT TO REGULATION.

(a) General Requirement. Any person who locates, installs, moves, reconstructs, extends, enlarges, converts, substantially alters or changes use of a storage facility or parts thereof; or who employs another to do the same, on land subject to this section, shall be subject to the provisions of this section.

(b) Malfunctioning and Mismanaged. Malfunctioning or mismanaged storage facilities are a menace to the health and general welfare of the citizens of Marathon County; are declared to be nuisances, and shall be subject to forfeiture and injunction provisions of this section. A storage facility found to be malfunctioning shall be repaired to a condition meeting the Technical Standards of Marathon County Land Conservation Department within two (2) years of the date that the storage facility is found to be malfunctioning. A storage facility found to be mismanaged shall be brought into compliance within one (1) year of the date the storage facility is found to be mismanaged. The LCC may extend this time for good cause, such extension not to exceed an additional one (1) year. The decision of the LCC may be appealed to the Administration Review Board.

(c) Idle Storage Facilities. Removal of waste and manure and restoration of an idle manure storage facility to a safe and sanitary condition, as determined by the Land Conservation Department is required within two (2) years of the time the storage facility becomes idle. The Land Conservation Committee may extend this time for good cause, such extension not to exceed one (1) year increments.

(d) Design Life of Storage Facility. The design life of a storage facility, for the purposes of this Section, shall be twenty (20) years. Animal waste and manure storage facilities in Marathon County may be inspected at any time; however, when an animal manure storage facility reaches the age of twenty (20) years, it shall be inspected by the LCD. If found to be malfunctioning, or idle, the storage facility shall be brought up to the current standards or properly abandoned within two (2) years of the date found to be malfunctioning or idle. If found to be mismanaged, the storage facility shall be brought up to standards within one (1) year of the date found to be mismanaged. The Land Conservation Committee may extend this time for a good cause, such extension not to

If upon inspection the storage facility is found to be lacking any of the necessary safety devices, the safety devices that are lacking must be corrected or properly installed immediately, the time allowed for correction shall be between 10 and 30 days.

(e) Existing Concrete Lined Storage Facilities. No permit shall be issued to move, reconstruct, extend, enlarge, convert or substantially alter the use of an existing concrete-lined storage facility unless such facility meets the current watertight requirements of the Technical Guide or is brought up to those requirements.

(f) Short Term Storage of Animal Waste and Manure. A permit is required for the installation of a storage facility intended for temporary storage of waste and manure (less than 30 days). This would involve one of the following design types:

1. in ground small concrete "manure pit" (Technical Standard 425)

2. above ground concrete manure storage facility (Technical Standard 313)

3. pre-cast in ground concrete tank, and

4. in ground metal tank

Types 1, 2 and 3 must comply with the Technical Guide and the standards for a Type 4 shall be adopted from DILHR standards for septic tanks.

(g) Steel Tanks for Storage Facilities: Steel tanks used for temporary animal waste and manure storage shall comply with the following guidelines adopted from the Wisconsin DILHR. New tanks shall be 1/4" thick metal with U.L. Standard bituminous coating on the inside and outside surfaces. Before used tanks can be used for temporary storage of animal waste and manure, they must be:

1. filled with water for a leak test.

2. sandblasted inside and out.

3. coated with U.L. standard bituminous or epoxy inside and out when the temperature is at least 50 degrees F.

4. allowed to dry for 8 to 10 days before used.

(h) Safety Devices. Certain safety devices, as defined in section 11.02(2)(p) are required on all storage facilities in Marathon County.

(i) Compliance With Permit Requirements. A person is in compliance with this section if he or she follows the procedures of this section, receives a permit from the County Conservationist before beginning activities subject to regulation under this section and complies with the requirements of the permit.

(4) STANDARDS.

The Technical Guide of the USDA-Natural Resources Conservation Service has been adopted by the Marathon County Land Conservation Committee and the Land Conservation Department. The following components of the Technical Guide will be used when a storage facility is to be constructed, installed, moved, reconstructed, extended, enlarged, converted or substantially altered: 425 - Manure Storage Pond; 313 - Manure Storage Structure; 358 - Waste Transfer System; and 590 - Nutrient Management.

(5) APPLICATION FOR AND ISSUANCE OF PERMITS.

(a) Permit Required. No person may undertake an activity subject to this section without obtaining a permit from the LCD prior to beginning the proposed activity.

(b) Exception to Permit Requirement. All emergency repairs on any component of the animal manure storage facility or transfer system which cause any disruption of the original construction of the storage facility shall be done so as to restore the storage facility to the original state, as determined by the technical standards set forth in Section (4) above; and such repairs shall further be reported to the Marathon County Land Conservation Department within two days.

(c) Fees. Two separate fees are required. The fee for a site assessment requested by the landowner shall be $150. The subsequent permit fee under this section will be determined by size of the storage facility: 50,000 gallons or less, $100; 50,001-150,000 gallons, $200; 150,001-250,000 gallons, $250; 250,001-500,000, $300; or 500,001 gallons or greater, $350.

(d) Storage Facility Plan Required. Each application for a construction permit under this section shall include a storage facility plan. The plan shall specify:

1. The number and kinds of animals for which storage is provided or daily gallons of waste and manure produced.

2. A sketch of the facility and its location in relation to buildings within 250' and homes within 500' of the proposed facility. The sketch shall be drawn to scale with a scale no smaller than 1" = 100'.

3. The structural details, including dimensions, cross sections, concrete thickness.

4. The location of any wells within 300' of the facility.

5. The soil test pit locations and descriptions or logs to a depth of at least 3' below the planned bottom of the facility.

6. The elevation of seasonally high groundwater or bedrock if encountered in the soil profile and date of any such determinations.

7. Provisions for adequate drainage and control of runoff to prevent pollution of surface water and groundwater. If a navigable body of water lies within 500' of the facility, the location and distance to the body of water shall be shown.

8. 590 Nutrient Management Plan

9. The scale of the drawing and the north arrow.

10. A time schedule for construction of the facility.

(e) Review of Application. The County Conservationist shall receive and review all permit applications and shall determine if the proposed facility meets required standards set forth in sub. (4) of this section. Within 15 days after receiving the completed application and fee, the County Conservationist shall inform the applicant in writing whether the permit application is approved or disapproved. If additional information is required, the Conservationist shall so notify the permit applicant. The Conservationist has 15 days from the receipt of the additional information in which to approve or disapprove the application. If the County Conservationist fails to approve or disapprove the permit application in writing within 15 days of the receipt of the permit application or additional information, as appropriate, the application shall be deemed approved and the applicant may proceed as if a permit had been issued.

(f) Permit Conditions. All permits issued under this section shall be issued subject to the following conditions and requirements. Activities authorized by permit shall be completed within 2 years from the date of issuance after which such permit shall be void.

1. Storage facility design and construction shall be according to LCD approved storage facility plan.

2. The permittee shall give five (5) working days' notice to the Land Conservation Department before starting any construction activity authorized by the permit.

3. Approval in writing shall be obtained from the LCD prior to any modifications to the approved storage facility plan.

4. The permittee and, if applicable, the contractor, shall certify in writing that the facility was installed as planned.

(g) Permit Revocation. The County Conservationist may revoke any permit issued under this section if the holder of the permit has misrepresented any material fact in the permit application or storage facility plan, or if the holder of the permit violates any of the conditions of the permit.

(6) ADMINISTRATION

(6) ADMINISTRATION

(a) Delegation of Authority. The County hereby designates the County Conservationist, or that person's representative to administer and enforce this section.

(b) Administrative Duties. In the administration and enforcement of this section, the County Conservationist or that person's representative shall:

1. Keep an accurate record of all permit applications, storage facility plans, permits issued, inspections made and other official actions.

2. Review permit applications and issue permits in accordance with sub. (5) of this section.

3. Inspect facility construction to insure the facility is being constructed according to plan specifications.

4. Investigate complaints relating to compliance with the section.

2. Perform other duties as specified in this section.

(c) Inspection Authority. Pursuant to authority granted by Section 92.07(14) Wisconsin Statutes, the County Conservationist, or that person's representative is authorized to enter upon any lands affected by this section to inspect the land prior to or after permit issuance to determine compliance with this section. If permission cannot be received from the applicant or permittee, entry by the County Conservationist or that person's representative, shall be according to §§66.122 and 66.123, Wisconsin Statutes. Refusal to grant permission to enter lands affected by this ordinance for purposes of inspection shall be grounds for permit denial or revocation.

(d) Enforcement Authority.

1. The County Conservationist, or that person's representative is authorized to post an order stopping work upon land which has had a permit revoked or is currently undergoing activity in violation of this section. Notice shall be given by both: posting, upon the land where the violation occurs, one or more copies of a poster stating the violation; and, by mailing a copy of the order by certified mail to the person whose activity is in violation of this section. The order shall specify that the activity shall cease or be brought into compliance within 15 days.

2. Any permit revocation or order stopping work shall remain in effect unless retracted by the Administrative Review Board, the County Conservationist or by court of general jurisdiction; or until the activity is brought into compliance with this section. The County Conservationist is authorized to refer any violation of this section or of an order stopping work issued pursuant to this section to the Corporation Counsel for commencement of further legal proceedings.

(7) VIOLATIONS.

(a) Penalty. Any person who violates, neglects or refuses to comply with, or resists the enforcement of any of the provisions of this section, shall be subject to a forfeiture as provided in §25.04 of this General Code. A violation includes failure to comply with any standard of this section, or with any condition or qualification attached to the permit.

(b) Enforcement of Injunction. As a substitute for, or an addition to, forfeiture actions, the County may seek enforcement of any part of this section by court actions seeking injunctions or restraining orders.

(8) APPEALS.

Appeals from any administrative order issued pursuant to this Chapter shall be governed by Chapter 24 of the General Codes of Ordinances. Appeals from any County ordinance prosecution commenced pursuant to this Chapter, shall be governed by applicable state statutes concerning appeals.

APPENDIX C
Interim Best Management Practices

The Nonpoint Source Pollution Abatement Program will no longer use alternative as the defining word for interim Best Management Practices (BMPs). Interim BMPs are created to meet the specific and individual needs identified during the planning process of a priority watershed project and will be used on a trial basis. The practice will be evaluated for its effectiveness before consideration as a standard BMP. A procedure defining the process for interim BMP approval will be detailed within the *Implementation Handbook*.

I. Vegetated Riparian Buffer

A. Definition

Riparian Buffers are permanently vegetated areas immediately adjacent to intermittent or perennial streams that are designed and constructed to function as a filter to delay, absorb, or purify contaminated runoff before it enters watershed streams.

B. Purpose

The predominant sources of nonpoint source pollutants in the Lower Big Rib River Priority Watershed originate from croplands in the form of excess phosphorus, nitrogen and sediment. Establishment of Vegetated Riparian buffer-strips will provide significant protection to the water resource and increase the likelihood of achieving the water quality objectives identified in the Lower Big Rib River Watershed Nonpoint Source Control Plan.

This practice is primarily an informational and educational tool to promote water quality awareness, with the intent of providing watershed participants with a feasible management option that will reduce nonpoint source pollutant runoff to surface water.

All watershed participants will also be eligible for NPS corridor easement acquisition where the establishment of a vegetated riparian buffer is necessary to meet nonpoint source program objectives.

C. Eligibility Parameters for Buffer Establishment

1. To be eligible for an annual payment, the establishment of a 35-foot-wide buffer strip will be required as a minimum although a 66 foot wide buffer is preferred.

    a. All perennial and intermittent streams delineated on the USGS 7.5 minute quadrangle are eligible for buffer establishment. Approval from the DNR District Coordinator will be required to establish eligibility for streams not delineated on a USGS map.

    b. The measurable width of a buffer begins at the centerline of an intermittent

stream, and the edge of bank of a perennial stream (ordinary high-water mark).

c. Vegetated buffer widths may be extended to cover floodplain areas to meet nonpoint source program objectives. Approval from the DNR District Coordinator will be required for proposed buffer areas that exceed 66 feet in width.

2. At a minimum, buffers must be maintained in permanent hayland or an NRCS approved perennial grass mixture for a period of 10 years from the installation date of the final practice listed on the cost-share agreement.

3. The mowing and removal of grasses that were established through the nonpoint source program for the specific intent of providing a vegetated buffer will be allowed between July 15 and September 1 of each year to maintain grasses.

   a. Permanent hayland established at the expense of the landowner may be harvested for forage prior to September 1st of each year during the growing season.

   b. Soil disturbance within the established buffer area during reseeding shall be held to a minimum. When soil disturbance becomes necessary due to streambank or gully repair, the appropriate action(s) shall be taken to limit the disturbance and protect all exposed areas.

4. Wildlife and environmental consideration must be given when designing this practice.

5. A Cost-Share Agreement must be signed by the landowner.

6. Cost-share eligibility for the establishment of vegetated riparian buffers is dependent upon the cost effectiveness and the ability to produce a sheet flow (laminar) condition through the width of the buffer.

7. Before a landowner is to receive an annual payment, the sediment delivery rate of fields immediately adjacent to the proposed vegetated riparian buffer shall be planned down to the tolerable soil loss ("T").

8. Installation of the vegetated riparian buffer must be verified by county staff before the initial payment to the landowner is made.

9. Buffer strip boundaries shall be delineated in an identifiable manner. Acceptable methods would be fencing or sign placement every 100 feet, or other DNR-approved methods.

10. As a minimum, a status review of established buffers shall be conducted by the

county agent every 3 years. If a riparian buffer is rendered ineffective due to circumstances beyond the cost-share recipients control during the grant period, the local unit of governmental may amend the cost-share agreement to make the necessary repairs. While conducting a status review of a riparian buffer, the county agent shall inspect the following conditions.

a. encroachment within the delineated boundary.
b. the presence of rills or gullies.
c. sparse vegetative cover and the presence of invasive species.
d. buffer degradation due to cattle or machinery access.

11. Outstanding flat-rate payments for the vegetated riparian buffer practice will be taken into account during the easement appraisal process for those landowners interested in selling a NPS corridor easement.

D. Cost-sharing is authorized

1. At a rate of 70 percent for the grading and shaping of the buffer area to eliminate concentrated flow.

2. At a rate of 70 percent for permanent fencing or boundary delineation.

3. At a rate of 70 percent for the planting of trees or an NRCS approved perennial grass mixture.

4. At a flat rate of $100.00/acre/year for a maximum of 5 years for buffers planted to an NRCS approved perennial grass mixture that does not contain Reed Canary grass.

E. Cost-sharing is not authorized for

1. Areas with pre-established vegetated buffers that meet the requirements listed under condition number 1.

2. The establishment of buffer areas for/or in conjunction with another program such as the Conservation Reserve program of Federal "set-aside" acreage.

3. The establishment of vegetated buffers in areas in which the landowner or operator will allow livestock access.

4. Sites where there are no direct benefit to protecting the surface water resource.

F. Sediment and Phosphorus Crediting Parameters

1. The establishment of vegetative riparian buffers that comply with the aforementioned conditions can be credited at a 46 percent sediment and phosphorus removal rate.

2. Cropland within 300 feet of a vegetated riparian buffer that has a slope greater than ten percent, is not eligible for a sediment and phosphorus reduction credit.

3. Sediment and phosphorus removal credits for vegetative buffer strips of 35 to 66 feet wide is limited to drainage areas of 1,750 feet or less, measured perpendicular to the buffer.

II. Ginseng Planning/Management

A. Definition

Ginseng Planning/Management would include the development of a strategic plan to include, but not limited to, pre-plant management strategy (garden size, sequence of development, row grades in relation to slope and needed diversion), pest-tracking strategy (buffer strip around garden), post harvest (rotation) and root washing.

B. Purpose

The purpose of this practice is to reduce the amount of sediment and phosphorus runoff from ginseng fields. Development of a ginseng management plan will provide significant protection to the water resources and aide in reaching water quality objectives identified in the Lower Big Rib River Watershed.

The process of growing ginseng developed with some secrecy and tradition. Some of these BMP practices conflict with traditional cropping practices. It is for this reason that a strong information education program will need to be developed specific to ginseng growers.

C. Eligibility Parameters for Plan/Management Development

1. Fields that meet eligibility criteria under the cropland inventory will be eligible for the field management plan development and installation.

a. A plan map will be developed using air photos and will be updated as needed for a period of 10 years. The following items will be identified on the plan map.

- field boundary
- garden size
- garden development sequence
- garden row direction
- field slope direction(s)

- distance to well, wetlands, surface water and waterways
- garden diversions

b. Management strategies will be developed for the year prior to planting, development of a 30 ft. minimum grass buffer strips around the garden and green manure the year after harvest.

2. A cost-share agreement must be signed by the landowner.

3. Before the landowner can receive payment, all other critical site issues must be addressed.

4. Installation of parts of the plan must be verified prior to payment.

5. As a minimum, a status review of all cost shared items included in the ginseng management plan will be reviewed by the County LCD once every 3 years. Cost shared garden plans will be updated and maintained for 10 years. Cropland practices will be maintained for the life of the garden (3-5 years).

D. Cost Share Conditions and Rates

1. The watershed pays 50 percent of the plan development:
   - Ginseng Garden plan development by a private consultant (to a maximum of $200.00). This rate will be reviewed every 2 years to determine if rate is accurate.

2. The watershed pays 70 percent of the eligible costs which include:
   - grassed filter strip
   - earth sediment basin(dry)
   - field diversions(only if there will be a reduction in soil loss and/or sediment delivery)
   - critical area seeding

3. Cropland Protection Cover will be cost shared at a rate of $25.00 per acre.

E. Costs not covered

- Plan development or practices installed on fields that do not have a sediment delivery rate of greater than 0.1 tons per acre per year.
- Mulching or other practices associated with traditional management already being done that reduces soil loss.

F. Sediment and Phosphorus Crediting Parameters

The ability of these practices to reduce sediment and phosphorus runoff will be done through the use of the USLE, or the WINHUSLE model if available.

APPENDIX D
Glossary

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

ADVANCED WASTEWATER TREATMENT:The highest level of wastewater treatment for municipal treatment systems, requiring 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."

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.

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.

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

AREA-WIDE 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, as required by section 208 of the Clean Water Act.

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 "Area-wide 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.

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 are 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.

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 the Wisconsin Department of Natural Resources and the Wisconsin Department of Health and Family Services 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 coliform, 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 banned because of its persistence in the environment.

DHFS:Wisconsin Department of Health and Family Services.

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

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

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

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

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

EFFLUENT:Solid, liquid or gas wastes (byproducts) disposed on land, in water, or in air. Effluent generally refers to wastewater discharges.

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

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

ENFORCEMENT STANDARD (ES) HEALTH ADVISORY LEVEL:The concentration of a substance at which a facility regulated by DILHR, DATCP, DOT or the DNR must take action to reduce the concentration of the substance in groundwater.

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 QUALITY INCENTIVE PROGRAM (EQIP):A federal cost-sharing program to help landowners install measures to conserve soil and water resources. Funds are targeted to priority areas to achieve the maximum environmental benefit per dollar spent. EQIP is administered by NRCS.

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 or bay. Large amounts of algae and weeds characterize a eutrophic lake. (See also "Oligotrophic" and "Mesotrophic".)

EUTROPHICATION: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 disease causing bacteria. The number of coliform present is particularly important when water is used for drinking and swimming.

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

FLOURANTHENE:A polyaromatic hydrocarbon (PAH) 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 highly toxic chlorinated organic compound.

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.

HAZARDOUS WASTE:Waste that has been found to be fatal to humans or animals in low doses, or is otherwise capable of causing or significantly contributing to an increase in serious illness.

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

HERBICIDE:A type of pesticide 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 is river intake water used in processing. Influent to a municipal treatment plant is untreated wastewater.

IN-PLACE POLLUTION:Refers to pollution from contaminated sediments.

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

LANDFILL:A waste disposal site.

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.

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

MILLIGRAMS PER LITER (mg/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.

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

NONPOINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM: Funds to share the cost of reducing water pollution. Non-specified sources are available in selected priority watersheds.

NRCS:U.S. Natural Resource Conservation Service, part of the U.S. Department of Agriculture.

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 over fertile conditions and algae blooms.

PLANKTON:Tiny plants and animals that live in water.

POINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM: Provides grants for 60 percent of the cost of constructing wastewater treatment facilities. Most of this program's money goes for treatment plant construction, but three percent of this fund is available for repair or replacement of private, on-site sewer systems.

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.

PREVENTATIVE ACTION LIMIT (PAL):A lower concentration of a contaminant than the Enforcement Standard. The PAL serves to inform DNR of potential groundwater contamination problems, establishes the level at which efforts to control the contamination should begin, and provides a basis for design codes and management criteria.

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

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

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

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

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

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

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

REMEDIAL 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 stormsewers 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:A 2-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.

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.

STANDARDS:See "Water Quality Standards".

STORMSEWERS:A system of sewers that collect and transport rain and snow runoff. In areas that have separated sewers, such stormwater is not mixed with sanitary sewage.

SUPERFUND:A federal program that provides for cleanup of major hazardous landfills and land disposal areas.

SUSPENDED SOLIDS (SS):Small particles of solid pollutants suspended in water.

SYNERGISM:The total effect is greater than the sum of the individual effects. For example, the characteristic property of a mixture of toxicants that exhibits a greater-than-additive cumulative toxic effect.

TERTIARY TREATMENT:See "Advanced Wastewater Treatment".

TOP-DOWN MANAGEMENT:A management theory that uses bio-manipulation, specifically the stocking of predator species of fish to improve water quality.

TOTAL MAXIMUM DAILY LOADS (TMDLs):The maximum amount of a pollutant that can be discharged into a stream without causing a violation of water quality standards.

TOXIC:A substance that is poisonous or that can kill or injure a person or plants and animals upon direct contact or long-term exposure. (See also "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. See also "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. (See also "Oligotrophic," "Mesotrophic," "Eutrophic.")

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 and 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. See also "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, wash water, 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 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 (e.g., fish and aquatic life, swimming, etc.).

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.

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.

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:

WISCONSIN NONPOINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM:A state cost-share program established by the Wisconsin 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.

Bibliography

Attig, J.W. and Muldoon, M.A., 1989. "Pleistocene Geology of Marathon County, Wisconsin," *Wisconsin Geological and Natural History Survey Information Circular 65*.

Becher-Hoppe Engineers, Inc., 1981. *An Engineering Evaluation of Water Supply, Treatment and Distribution Facilities serving the Wausau Water and Sewerage Utilities Marathon County, Wisconsin.*

Becher-Hoppe Inc. 1983. *An Engineering Evaluation of Water System Improvement for the Water Utility, Village of Marathon City, Marathon County, Wisconsin.*

Bell, B.A. and M.G. Sherrill, 1974. "Water Availability in Central Wisconsin - An Area of Near-Surface Crystalline Rock," Geological Survey Water-Supply Paper 2022.

Devaul, R.W. and J.H. Green, 1971. "Water Resources of Wisconsin, Central Wisconsin River Basin, Hydrologic Investigation Atlas HA-367," USGS and Wisconsin Geological and Natural History Survey.

Falkowski, 1993 and 1989. "Report on an Investigation of the Public Water Supply at the Village of Edgar, Wisconsin," DNR files.

Falkowski, 1996. "Report on an Investigation of the Public Water Supply at the Village of Marathon City, Wisconsin," DNR files.

Falkowski, 1993. "Report on an Investigation of the Public Water Supply at the Rib Mountain Sanitary District, Wisconsin," DNR files.

Falkowski, 1993. "Report on an Investigation of the Public Water Supply at the City of Wausau, Wisconsin," DNR files.

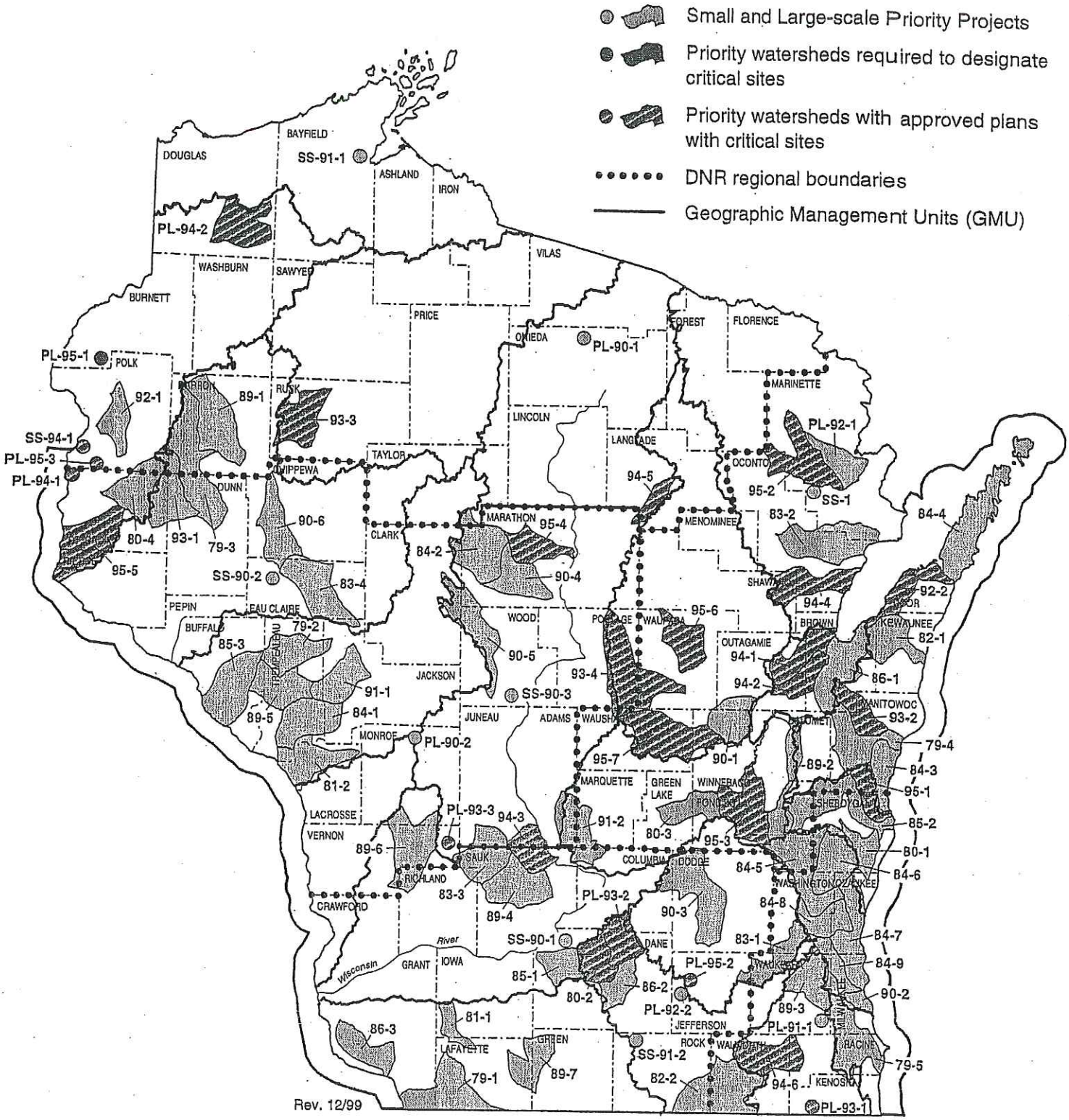
Geraghty &Miller, Inc., 1987. "City of Wausau New City Test Well Hydrogeologic Assessment," prepared for the City of Wausau, Wisconsin.

Kendy, E., and Bradbury, K.R., 1988. "Hydrogeology of the Wisconsin River Valley in Marathon County, Wisconsin," Wisconsin Geological and Natural History Survey Information Circular 64.

LaBerge, G.L. and P.E. Meyers, 1983. "Precambrian Geology of Marathon County, Wisconsin," Wisconsin Geological and Natural History Survey Information Circular 45.

Postle, J., 1998. Personal communication: Split sampling using the triazine screen vs. gas chromatography; DATCP field study.

Priority Watershed Projects in Wisconsin



Rev. 12/99

Priority Watershed Projects in Wisconsin: 1999

REV. 12/99

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

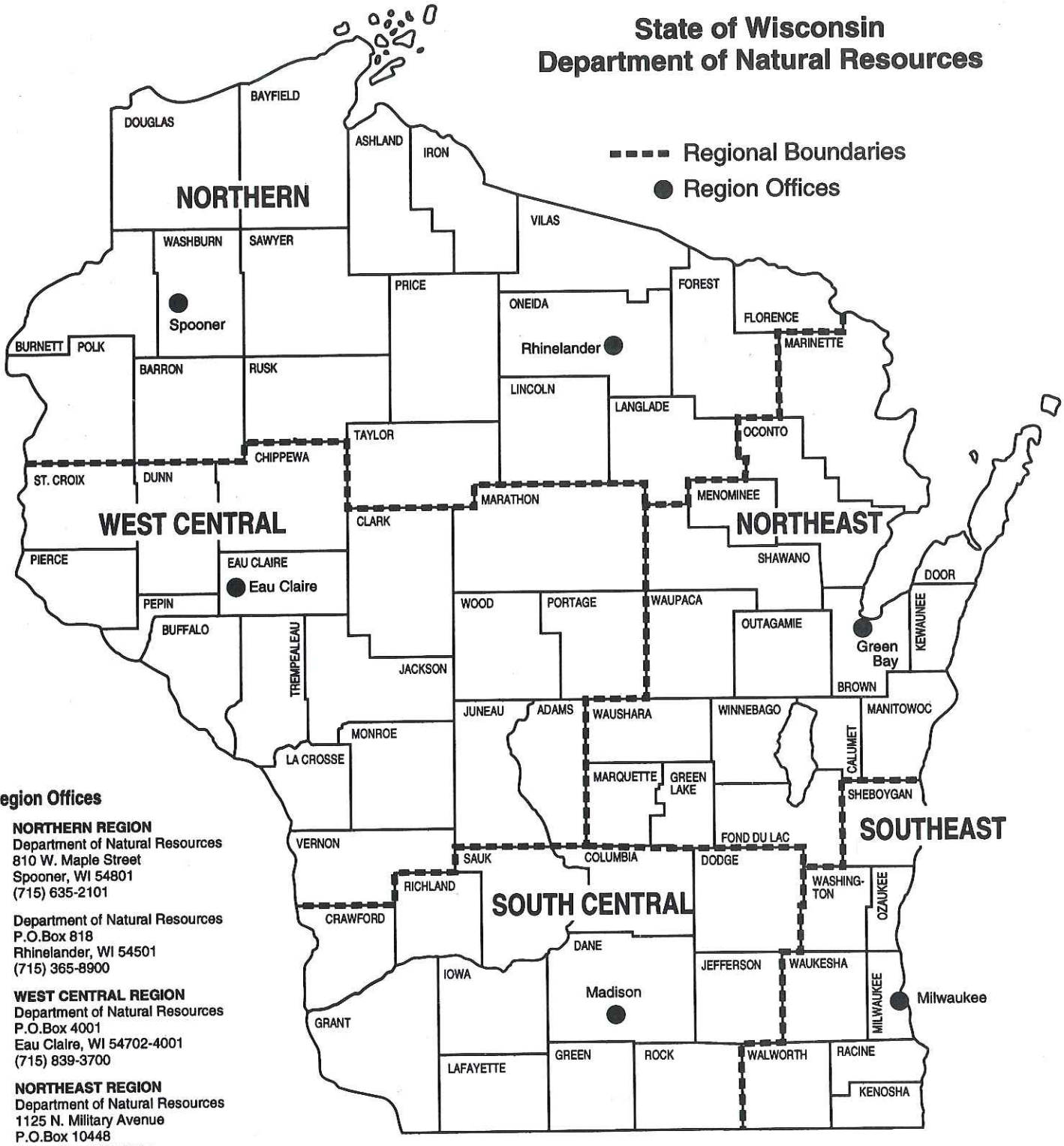
Year Selected-Map Number	Small-scale Priority Watershed Project	County(ies)
SS-1	Bass Lake ♦	Marinette
SS-90-1	Dunlap Creek	Dane
SS-90-2	Lowes Creek	Eau Claire
SS-90-3	Port Edwards - Groundwater Prototype ♦	Wood
SS-91-1	Whittlesey Creek	Bayfield
SS-91-2	Spring Creek	Rock
SS-94-1	Osceola Creek	Polk

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

♦ Project completed

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

State of Wisconsin
Department of Natural Resources



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REV 7-97

Our Mission:

To protect and enhance our natural resources:
our air, land and water;
our wildlife, fish and forests
and the ecosystems that surround them.

To provide a clean, sustainable 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.

To work with people
so that we understand their views
and can carry out their will.

And in this partnership with our citizens,
consider the future
and those who will follow us.

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