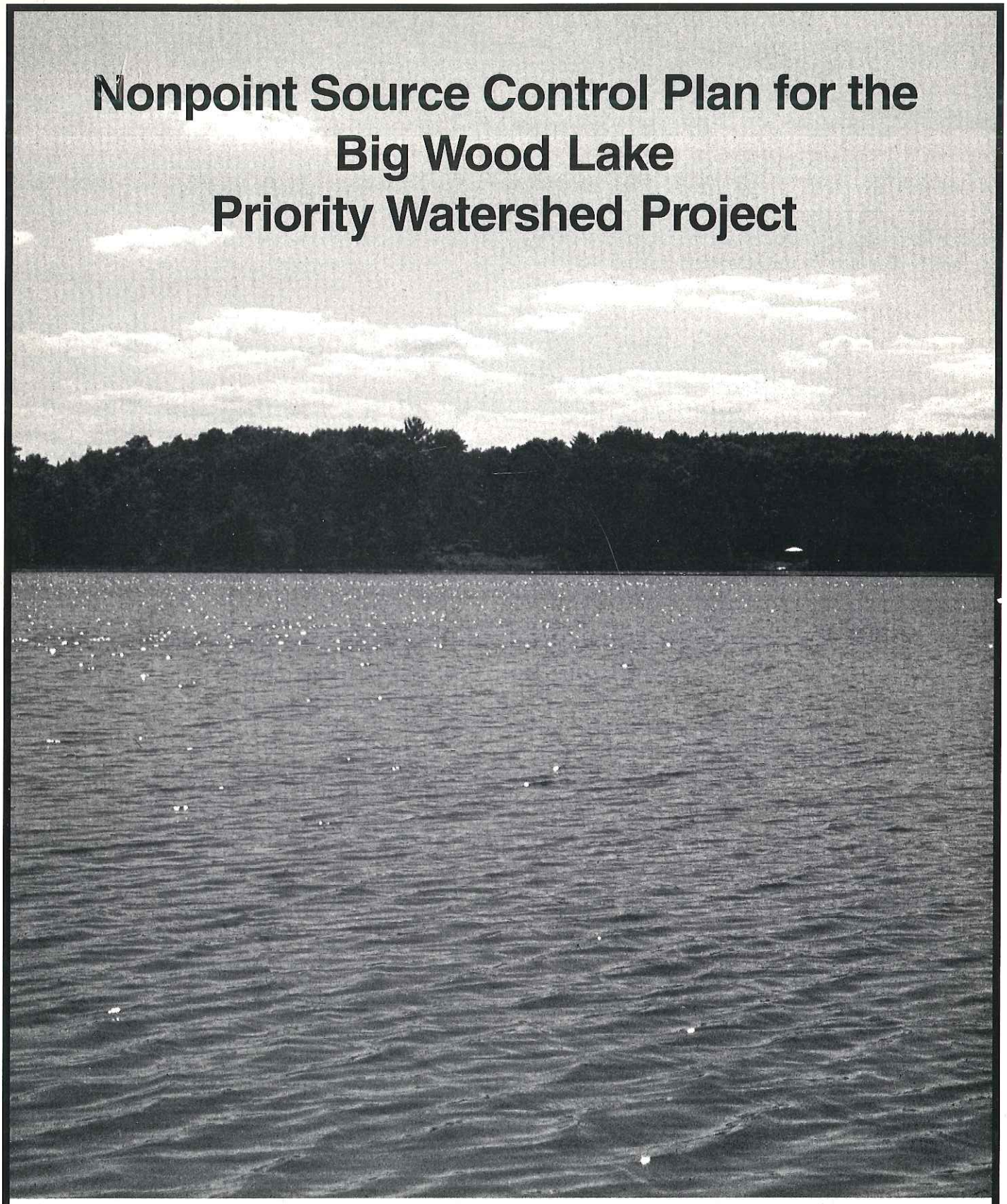
Nonpoint Source Control Plan for the Big Wood Lake Priority Watershed Project



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

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Nonpoint Source Control Plan for the Big Wood Lake Priority Watershed Project

The Wisconsin Nonpoint Source Water Pollution Abatement Program

May 2001

This Plan Was Cooperatively Prepared By:

Wisconsin Department of Natural Resources
Wisconsin Department of Agriculture, Trade and Consumer Protection
Burnett County Land and Water Conservation Department
and
Big Wood Lake Watershed Citizens Advisory Committee

Publication WT-709-2001

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Watershed Plan Credits

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December 1, 2000

Melvin W. Daniels
Burnett County Board Chairman
23555 State Road 35 South
Siren, WI 54872

Subject: Big Wood Lake Priority Watershed Project

Dear Mr. Daniels:

I am pleased to approve the Big Wood Lake Priority Watershed Management Plan prepared through the Wisconsin Nonpoint Source Abatement Program. The plan meets the intent and conditions of s. 281.65, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. This plan was prepared in conjunction with the Department of Agriculture, Trade, and Consumer Protection. The plan went before the Land and Water Conservation Board on October 3, 2000, and was approved at that time. I am also approving the plan as an amendment to the St. Croix River Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Burnett County Land and Water Conservation Department staff who participated in preparing this plan. We look forward to assisting the LWCD and other units of government in the watershed in implementation of the Big Wood Lake Priority Watershed Plan.

Sincerely,

George

George E. Meyer
Secretary

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RESOLUTION NO. 2000-24

ADOPTING THE NONPOINT SOURCE POLLUTION CONTROL PLAN FOR THE BIG WOOD LAKE PRIORITY WATERSHED PROJECT

WHEREAS, the Big Wood Lake Watershed was designated a "Priority Watershed" in 1996 under the Wisconsin Nonpoint Source Water Pollution Abatement Program and accepted by the Burnett County Board of Supervisors; and

WHEREAS, a detailed inventory of the land uses and nonpoint sources of pollution within the watershed was conducted in 1997 and 1998; and

WHEREAS, the Burnett County Land & Water Conservation Department has used this inventory to develop a comprehensive plan to protect and improve Big Wood Lake and the surrounding lakes and streams; and

WHEREAS, the Big Wood Lake Citizens' Advisory Committee has assisted in the development and review of the watershed plan; and

WHEREAS, Burnett County must first adopt the Big Wood Lake Priority Watershed Plan before cost-share grants are available to watershed landowners.

NOW, THEREFORE, BE IT RESOLVED THAT the Burnett County Board of Supervisors approves and adopts the Nonpoint Source Pollution Control Plan for the Big Wood Lake Priority Watershed Project.

Respectfully submitted this _____ day of August, 2000

LAND AND WATER CONSERVATION COMMITTEE

Doug Dewing, Chair

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LIST OF ACRONYMS

ACP:	Agricultural Conservation Program
BARNY:	Barnyard nutrient analysis model (developed by DNR)
BMP:	Best Management Practice
CAC:	Citizens' Advisory Committee
COD:	Chemical Oxygen Demand
CRP:	Conservation Reserve Program (USDA program)
CSA:	Cost-Share Agreement
DATCP:	Wisconsin Department of Agriculture, Trade and Consumer Protection
DILHR:	Department of Industry, Labor, and Human Resources
DNR:	Wisconsin Department of Natural Resources
DO:	Dissolved Oxygen
EPA:	Environmental Protection Agency
ES:	Enforcement Standard
FPP:	Wisconsin Farmland Preservation Program
FSA:	Farm Service Agency (USDA)
HBI:	Hilsenhoff Biotic Index
I&E:	Information and Education
LWCB:	Land and Water Conservation Board
LWCC:	Land and Water Conservation Committee
LWCD:	Land and Water Conservation Department
MFL:	Managed Forest Law
NPM:	Nutrient and Pest Management
NPS:	Nonpoint Source
NRCS:	Natural Resource Conservation Service (USDA)
PAL:	Preventative Action Limit
SHS:	Wisconsin State Historical Society
SIP:	Stewardship Incentive Program
SOS:	Signs of Success
SS:	Suspended Solids
USDA:	United States Department of Agriculture
USGS:	United States Geological Survey
UWEX:	University of Wisconsin – Extension
WGNHS:	Wisconsin Geological and Natural History Survey
WINHUSLE:	Sediment transfer model based on the Universal Soil Loss Equation (this model was not used for this watershed plan)
WPDES:	Wisconsin Pollutant Discharge Elimination System
WUWN:	Wisconsin Unique Well Number (assigned to well sample sites)
WWTP:	Waste Water Treatment Plant

BIG WOOD LAKE PRIORITY WATERSHED:
Project Summary

Introduction

This plan assesses the nonpoint sources of pollution in the Big Wood Lake Watershed and guides the implementation of nonpoint source control measures. These control measures are needed to meet specific water resource objectives for Big Wood Lake and its tributaries. The primary objective of the project is to reduce nonpoint source pollution to the twenty-two lakes and two streams within the watershed and to enhance and protect groundwater quality.

This plan was prepared by the Department of Natural Resources (DNR), the Department of Agriculture, Trade and Consumer Protection (DATCP) and the Burnett County Land and Water Conservation Department. The DNR selected the Big Wood Lake Watershed as a priority watershed project through the Wisconsin Nonpoint Source Pollution Abatement Program in 1996. It joined approximately sixty similar watershed projects statewide in which nonpoint source control measures are being planned and implemented. The Nonpoint Source Water Pollution Abatement Program was created in 1978 by the Wisconsin State Legislature. The program provides financial and technical assistance to landowners and local governments to reduce nonpoint source pollution.

The program is administered on the state level by the DNR and DATCP. The Burnett County Land and Water Conservation Department will administer the project on the local level with assistance from the University of Wisconsin Extension and the Natural Resource Conservation Service (USDA). This plan is primarily used by and written for DNR, DATCP, County LCD's, local units of government, legislators, external program evaluators and the interested public.

General Characteristics

The Big Wood Lake Watershed drains 80 square miles of land in Burnett and Polk Counties in Northwestern Wisconsin. The watershed is part of the St. Croix Basin. It drains to the Lower Wood River, a tributary of the St. Croix River. The watershed was divided into seven smaller drainage areas, called subwatersheds, for this planning effort. (Map 1-1)

Surface Water Quality

There are two major streams in the watershed the Wood River and Spirit Creek. Both support a warm water game fishery. They are relatively low gradient and flow through many wetland areas. The streams are not reaching their highest potential use due to sedimentation. Eroding croplands and streambanks are the major sources of pollution.

Twenty-two lakes fall within the watershed boundaries. Five larger lakes are developed with seasonal and permanent homes. The developed lakes' fertilities range from mesotrophic to hyper-eutrophic. Eroding croplands and streambanks, improperly managed livestock operations and lakeshore development are the major sources of nonpoint source pollution.

Groundwater Quality

Groundwater is typically held in thick permeable layers of soil or rock. The principal aquifer of the Big Wood Lake Watershed is sand and gravel. Groundwater quality in Burnett County is considered very good. Due to the expiration of the contract between the DNR and the State Lab of Hygiene there were only a few well samples taken during the inventory process. Two samples were found to have between 2 and 10 milligrams per Liter and three samples were under 2 milligrams per Liter. Atrazine was not detected in any samples.

Sources of Nonpoint Pollution

The Burnett County Land and Water Conservation Department collected data on all agricultural lands, barnyards, streambanks and lakeshore within the watershed. These data were used to estimate the pollution potentials of these nonpoint sources. The amount of phosphorus (organic) carried in runoff from each barnyard to a receiving stream was calculated. The amount of phosphorus loading from lakeshore land uses was also calculated. The amount of sediment reaching streams from eroding agricultural lands, streambanks and lakeshore was also determined. In the Big Wood Lake Watershed about 97 percent of the sediment deposited in streams is derived from agricultural upland erosion. Nearly three percent of the sediment reaching surface water originates from streambank erosion. Less than one percent of the total sediment is contributed from shoreline erosion, although the total loading is less than one percent, because shoreline erosion occurs so close to sensitive littoral habitat, it can have a much more direct effect upon overall biological health of the system. Soil erosion was also estimated from a road construction site within the watershed. This site contributed approximately five times the amount of sediment as the most erosive, cropped field in the watershed.

Because of the ephemeral nature of road construction sites, it is difficult to estimate annual erosion contributions from this source. During 1997 and 1998 two different sites were encountered. A site at 140th Street at the Wood River crossing near Hickory Lake and 310th Avenue, near Coon Lake Park, in Frederic. Some crude erosion modeling efforts determined that a substantial volume of sediments and nutrients were being deposited into a nearby wetland. No mulch or seeding was used after large bare soil areas were created. Large gullies began to form at both sites. This information was not used in the watershed nutrient loading models, therefore the reader is encouraged to consider that road construction site erosion estimates would reduce the total percentage contribution from other modeled sources. Standard costs for seeding and mulching for a $50,000 to $100,000 road construction site should range from $2,000 to $5,000 and could significantly reduce the amount of sediments and nutrients reaching surface water resources. The costs for trying to remediate these impacts after they have occurred could go into the hundreds of thousands of dollars.

Summary of Inventory Results

Barnyard Inventory Results:

- 24 barnyards were inventoried, 14 drain to surface water and 10 drain to closed depressions
- The barnyards draining to surface water, were found to contribute 488 pounds of phosphorus, annually.

Streambank Inventory Results:

- 46 stream miles were inventoried
- 107 tons of sediment reach streams from eroding and trampled sites
- 17 percent of the streambank were degraded from trampling or erosion

Lakeshore Inventory Results:

- 24 miles of lake shoreline were inventoried.
- 2.4 tons of sediment reach lakes from eroding lakeshore and beach areas
- 1% of lakeshore is degraded from erosion and constructed beach areas
- Lots with no shoreline buffers represent from 27% to 45% of total frontage on developed lakes

Cropland Inventory Results:

- 935 cropped fields were evaluated for soil loss
- 4004 tons of sediment are delivered to surface water from these eroding fields
- 16 percent of fields exceed tolerable soil loss levels for their respective soils

Wetland Inventory Results:

- 2227 acres of altered wetlands due to grazing and cropping practices were identified
- 5560 acres of intact wetlands

Project Pollution Reduction Objectives

To improve water quality in Big Wood Lake and its tributaries, this plan sets objectives for reducing sediment and phosphorus and for restoring wetlands and protecting groundwater.

Sediment Objective

- Reduce the volume of sediment delivered from developed lakeshore with inadequate buffers by a high degree by insuring that adequate shoreline buffer widths and composition are restored.
- Reduce overall volume of sediments from agricultural sources by 10 percent.

Phosphorus Objective

- Reduce Phosphorus delivered from barnyards by 10 percent.
- Reduce Phosphorus delivered from developed lakeshore from a high loading rate to a moderate or low loading rate by implementing shoreline habitat restoration practices.
- To achieve these the sediment reduction objectives must be met.

Groundwater Objective

- Maintain existing groundwater quality by identifying any potential threats and encouraging proper abandonment of unused wells.

Wetland Restoration Objective

- Restoration of degraded or prior converted wetlands, where it has the potential to improve water quality and wildlife habitat. Restorations will be considered with existing state and federal programs.

Construction Site Objective

- Reduce overall sediment delivered from bare soil areas created during construction adjacent to surface waters to a high degree by implementing an educational plan, which promotes proper erosion control measures and offering technical assistance.

Management Actions

The Burnett County Land and Water Conservation Department will contact all landowners who are eligible to receive cost-share funds during the project's implementation. Management classifications are determined based on level of pollution control needed to achieve water quality objectives in the watershed. Specific sites or areas within the watershed project are designated as either Category I (critical sites), or Category II (eligible sites). Designation as Category I, indicates that controlling that source of pollution is essential for meeting the pollution reduction goals for the project. Nonpoint sources which are eligible, but not critical, contribute less of the pollutant load, but are included in cost-sharing eligibility to further insure water quality objectives are met. Landowners with eligible sites need to control every eligible source to receive cost-share assistance.

The Burnett County Land and Water Conservation Department will assist landowners in applying best management practices. Practices range from alterations in farm management (such as changes in manure-spreading and crop rotations) and lakeshore property management, (such as shoreline habitat restoration) to engineered structures (such as diversions, sediment basins and manure storage facilities) and are tailored to specific landowner situations. Burnett County staff will also examine the need for Wellhead protection areas for municipal drinking water supplies.

The following is a list of eligibility criteria for landowners to install best management practices:

Barnyards

Category I
Animal feed lots which contribute over 100 pounds of phosphorus to surface water, annually. Two of the 24 barnyards fall into this category and will only be required to implement low cost practices, such as clean water diversions and\or roof gutter systems.

Category II
Animal feed lots which contribute between 1 and 99 pounds of phosphorus to surface waters, annually. Twelve of the 24 barnyards fall into this category. The remaining 10 barnyards drain to closed depressions and will be dealt with on a site by site basis.

Streambanks

Category I
Eroding streambanks exhibiting severe erosion or greater than 0.5 ft/yr lateral recession. There is only one streambank site in this category.

Category II
Eroding streambanks exhibiting between 0.1 and 0.5 feet per year, lateral recession.

Lakeshore

Category I
(same as streambank criteria, above) There were no sites identified in this category

Category II
(same as streambank criteria, above)

Cropland

Category I
All agricultural uplands with a soil loss exceeding their tolerable soil loss and within 30 feet of surface water. There were approximately 47 fields identified in this category for a total of 470 acres.

Category II
All agricultural uplands with a soil loss exceeding their tolerable soil loss or a sediment delivery greater than zero. This encompasses an estimated 7600 acres.

Wetland Restoration

All altered wetlands will be investigated for the feasibility of wetland restoration. These restorations will be coordinated with other state and federal programs to restore wetlands.

Funds Needed for Cost Sharing, Staffing, and Educational Activities

The DNR will award grants to Burnett County for cost sharing, staff support and educational activities. Table S-1 includes estimates of the financial assistance needed to implement nonpoint source controls in the Big Wood Lake Watershed, assuming a 75 percent participation rate of eligible landowners.

Table S-1. Cost Estimates for the Big Wood Lake Priority Watershed Project (Based on 75% Participation)

Eligible Activity	Total Cost	State Share
Cost Sharing	$1,363,127	$959,589
Easements	75,000	75,000
Burnett County Staffing	210,240	210,240
Educational Activities	39,000	30,000
Totals	**$1,687,367**	**$1,274,829**

Project Implementation

Project implementation is scheduled to begin in 2000. Participants may sign cost-share agreements throughout the implementation phase, but all practices on the agreement must be installed before the project is scheduled to end. Landowners must maintain practices for at least ten years from the installation of the final practice on the agreement. BMPs can be installed as soon as a landowner signs a cost-share agreement with the Burnett County Land and Water Conservation Department.

Information and Education

The Burnett County LWCD will have overall responsibility for conducting an information and education program during the project. The St. Croix Basin, Water Quality Educator will provide assistance. The activities will include BMP demonstrations, tours, newsletters and public meetings.

Project Evaluation and Monitoring

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

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

2. Pollutant Reduction Levels: The Burnett County LWCD will calculate the reductions in nonpoint source pollutant loadings, resulting from changes in land use practices and report to the DNR and DATCP at an annual review meeting.

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

CHAPTER ONE:
Purpose, Legal Status and General Description

Wisconsin Nonpoint Source Water Pollution Abatement Program

The State Legislature created the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1978. The goal of the Program is to improve and protect the water quality of streams, lakes, wetlands and groundwater by reducing pollutants from rural nonpoint sources. The 80 square mile Big Wood Lake Watershed, located in Burnett and Polk Counties, was designated a "priority watershed" in 1996. The primary objective of this project is to reduce nonpoint source pollution loads and to enhance and protect the water quality of the streams, groundwater and lakes in the Big Wood Lake Watershed. The watershed is part of the St. Croix River Basin.

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

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

- The DNR administers the program in cooperation with DATCP. Wisconsin is divided into 330 discrete hydrologic units called watersheds. These watersheds are assessed for water quality concerns as part of a comprehensive basin planning program. Watersheds with a high degree of water quality impairment from nonpoint sources of pollution become eligible for consideration as a priority watershed project. Designation as a priority watershed project enables special financial support to local governments and private landowners in the watershed to reduce nonpoint source pollution.

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

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

- Technical assistance is provided to aid in the design of BMPs. State level cost-share assistance is available to help offset the cost of installing these practices. Eligible landowners and local units of government are contacted by the local staff to determine

their interest in installing the BMPs identified in the plan. Signed cost-share agreements list the practices, costs, cost-share amounts and a schedule to install management practices. Municipal governments are also assisted in developing and installing BMPs to reduce urban pollutants.

- Informational and educational activities are developed to encourage participation.

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

Legal Status of the Nonpoint Source Control Plan

The Big Wood Lake Priority Watershed Plan was prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program described in Section 144.25 of the Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code. It was prepared through the cooperative efforts of the DNR, DATCP, Burnett County Land and Water Conservation Department and the Big Wood Lake Citizens' Advisory Committee.

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

This priority watershed plan was approved by DNR following approvals by the Land and Water Conservation Board, the Burnett County Land and Water Conservation Committee and the Burnett County Board of Supervisors.

Amendments to the Plan

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

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

Wisconsin's Pollution Discharge Elimination System (WPDES), Storm Water Permit Program, is administered by DNR's Bureau of Wastewater Management, under Chapter 147 of the Wisconsin Statutes. This program is separate from the Nonpoint Source Program and applies to certain classes of dischargers statewide as identified in NR 216. In cases where the programs do overlap, implementation grants may only apply to activities identified in the watershed plan.

Priority Watershed Project Planning and Implementation Phases

Planning Phase

The planning phase of the Big Wood Lake Watershed Project began in 1996. The following information gathering and evaluation activities were completed during this stage.

- Determine the conditions and uses of groundwater, streams and lakes.
- Inventory types of land uses and severity of nonpoint sources affecting groundwater, streams and lakes.
- Evaluate the types and severity of other factors, which may be affecting water quality. Examples include discharges from municipal wastewater treatment plants and natural or endemic stream conditions. (This has been completed through the ongoing integrated resource management planning efforts in the St. Croix Basin.)
- Determine nonpoint source controls and other measures necessary to improve and/or protect water quality.
- Prepare and gain approval of a program for local implementation of the project so that plan recommendations are carried out.

Implementation Phase

The implementation phase of the Big Wood Lake Watershed Project began, following review of the draft priority watershed plan, a public hearing and approval by the DNR, LWCB and the Burnett County Board of Supervisors. Public review during plan development occurred primarily through the efforts of the Big Wood Lake Citizens' Advisory Committee.

During the implementation phase:

- DNR enters into local assistance agreements with local units of government that have implementation responsibilities identified in the plan. These agreements provide funds necessary to maintain the resources and staff required for plan implementation.
- In the rural portions of the watershed, the Burnett County LWCD contacts eligible landowners to determine their interest in installing best management practices identified in the plan.
- In rural areas, the landowner signs a cost-share agreement with the county, that outlines the practices, costs, cost-share amounts and a schedule for installation of management practices. Practices are scheduled for installation after an agreement is signed. Practices must be maintained for at least 10 years. Easements must be for a period of at least 20 years and will be perpetual.

Location and Community Information

The Big Wood Lake Watershed is an 80-square mile drainage basin, located approximately eight miles southwest of the Village of Siren in Burnett County, Wisconsin. Although the watershed is named Big Wood Lake, it includes the entire Upper Wood River, from its headwaters in northern Polk County to its outlet at Big Wood Lake. Approximately one half of the total land area is located in northern Polk County. The Big Wood Lake Watershed is within the St. Croix River Basin.

Civil Divisions

The Big Wood Lake Watershed is located within Burnett and Polk Counties. About 50 percent of the watershed lies in each county. The majority of the Watershed lies within the rural townships of Daniels, Wood River, Trade Lake and West Sweden. Smaller areas of Siren, Clam Falls, Luck and Bone Lake Townships are also included. The project area also includes about one half of the Village of Frederic, which is the only Incorporated municipality. There are only about 115 acres of public land within the watershed: 85 acres of Burnett County Forest and 15 acres owned by the WDNR. See Map 1-1 for an example map of civil divisions.

Population Size and Distribution

The Big Wood Lake Watershed population is estimated to be about 5,000 persons. Most of the watershed population lives in rural unincorporated areas. Due to the presence of five heavily developed lakes, many homeowners are seasonal residents from May to September. Population growth rates in the watershed are increasing. All towns and villages have a growth rate over the past decade of 1.3 percent. Regional trends suggest that the watershed's population will continue to expand.

Land Uses

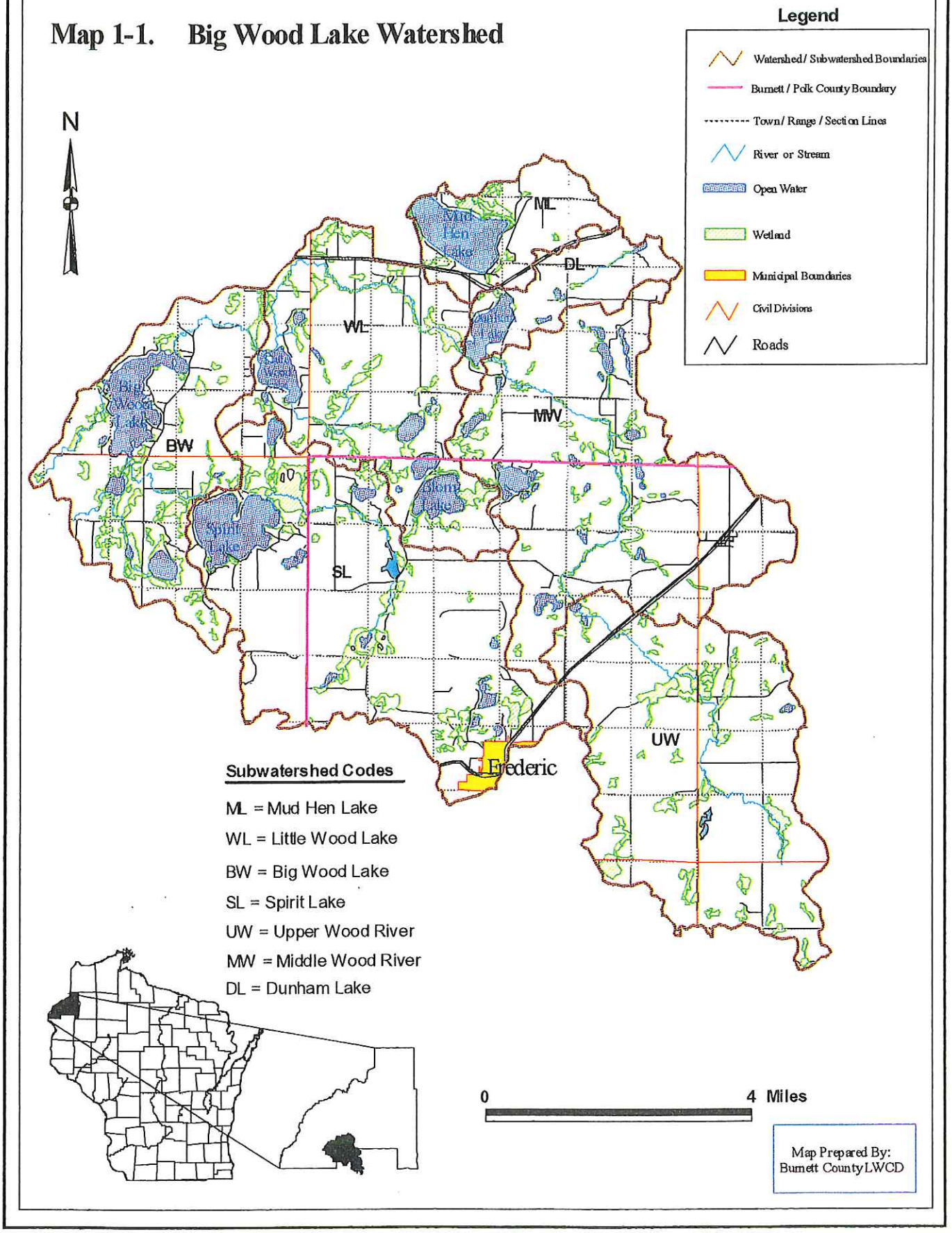
Rural land uses predominate in the watershed. Agriculture is the most important land use, comprising about 21 percent of the total. Dairy farming is the primary enterprise, with an average farm size of about 204 acres. Burnett County ranked 58 in the state for pounds of milk produced in 1997 and Polk County ranked 29. Woodlands are the most abundant land use, covering about 60 percent of the watershed. Developed land uses occupy less than 2 percent of the watershed, but are concentrated around the five developed lakes and in the village of Frederic.

Table 1-1. Summary of Land Uses in the Big Wood Lake Watershed

Land Uses	Acres	Percent
Agricultural	**10,298.8**	**21.2**
(pasture)	(606.9)	(1.2)
(cropland)	(9,691.9)	(20)
Grassland	**2,427.4**	**5**
Woodland	**29,304.1**	**60.3**
Developed	**847.9**	**1.7**
Wetland [1]	**5,742.9**	**11.8**
Total	**48,621.1**	**100**

1 Wetland data taken from WDNR wetland inventory
Source: Burnett County LWCD

Map 1-1. Big Wood Lake Watershed



CHAPTER TWO:
Watershed Conditions, Program Objectives and Eligibility Criteria

This chapter discusses the physical characteristics, existing conditions, objectives and management categories for the water resources in the Big Wood Lake Priority Watershed. Information is presented for each subwatershed and by pollution source.

Physical Setting

Climate and Precipitation

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

Topography

The relief, in the region, is largely controlled by glacial features. Most of the watershed is flat to gently rolling. Elevations range from about 1400 feet above sea level near the headwaters of the Wood River to about 949 feet above sea level near the outlet of the Wood River on Big Wood Lake. Perennial streams predominantly flow to the northwest. Closed depressions are commonly found throughout the watershed and most of the twenty-two lakes are internally drained, with no surface outlet.

Geology

The watershed is underlain primarily by Keweenawan bedrock, which consists of igneous rock. This particular formation is unlimited in depth, originating from deep-seated sources, making it unsuitable for water supply. In the most recent glacial advance, the St. Croix lobe on the continental glacier covered Burnett and Polk Counties forming the natural lakes and covering the area with pitted outwash. Some of the land more suitable for agricultural practices is characterized by glacial till.

Soils

Sandy soils cover nearly all of Burnett and Polk Counties, originating from glacial moraine deposits. Most of the watershed area is dominated by upland soils of the calcareous drift type, making this area more suitable for crop production. The following general soil associations constitute the majority of the soils in the watershed:

Rosholt-Cromwell-Menahga: The Rosholt-Cromwell-Menahga Association is the most dominant within the watershed boundaries. It consists of very deep, nearly level to steep, well drained to excessively drained, loamy and sandy soils on collapsed and uncollapsed outwash plains. It makes up about 40 percent of the soils in the watershed.

Amery-Santiago-Magnor: The Amery-Santiago-Magnor Association is found throughout the watershed. It consists of nearly level to very hilly, well drained and somewhat poorly drained loamy and silty soils on remnant moraines. About 33 percent of the soils within the watershed originate from this association.

Hegge-Smestad-Wildwood: Pockets of this soil are found throughout the watershed. It consists of very deep, nearly level and gently sloping, very poorly drained to somewhat poorly drained, sandy and clayey soils on glacial lake plains. This association comprises about 15 percent of the soils found within the watershed.

Branstad-Alstad-Cushing: This soil complex covers about 12 percent of the watershed area. It consists of very deep, nearly level to steep, somewhat poorly drained to well drained, loamy soils on end moraines.

Big Wood Lake Appraisal Monitoring Report – Executive Summary

The purpose of the appraisal monitoring report (Cahow, King; April 2000) is to set goals for phosphorus reduction based on water quality and habitat measurements for the lakes and streams within the Big Wood Priority Watershed. Lake chemistry samples, Secchi disk readings, top and bottom pH, temperature and dissolved oxygen profiles, phosphorus modeling, lake sensitive area surveys, and shoreline inventories were all conducted as part of this appraisal. Stream sampling also included stream runoff water chemistry samples, a benthic invertebrate survey, and a steam habitat analysis.

Methods

Once baseline water chemistry information had been collected, a computer model was used to predict what effect phosphorus reductions within the watershed would have on the water quality of the lakes. Phosphorus is currently limiting (and contributing to) the growth of algae in these lakes as they contain sufficient amounts of nitrogen for aquatic plant growth. The computer model predicted the response of each of the lakes in the subwatershed given certain phosphorus reduction scenarios.

Results

A reduction in phosphorus loading to any of the lakes should also result in a corresponding reduction of the in-lake phosphorus and an increase in water quality. Phosphorus can become tied up in lake bottom sediments and may be recycled if the lake mixes through spring and fall turnover or wind action. For all five lakes except Mud Hen Lake, predicted in-lake phosphorus reductions are just slightly less than the percentage reduction in phosphorus loads. Mud Hen did not respond like the other lakes because it is much larger in relation to the rest of its watershed and it has a lower flushing rate than the other lakes.

One characterization of a lake's fertility is referred to as its trophic status. Oligotrophic lakes are generally clear-water, lower fertility lakes. These lakes do not support nuisance algae blooms but can support healthy aquatic plant communities and desirable fish populations (although they will be less productive than a more fertile lake). A good example of an oligotrophic lake in Burnett County is North Sand Lake. Summer Secchi disk readings on that lake can be as deep as 25 feet. Eutrophic lakes are the most fertile. They have very low summer Secchi disk readings and often experience heavy algae blooms. Mesotrophic lakes fall somewhere in between. All five lakes in the watershed are mesotrophic to eutrophic. Little and Big Wood Lakes are the most fertile or eutrophic; they have the greatest phosphorus load, the largest average chlorophyll A values, and the lowest Secchi disk readings during the summer months. Summer and early fall Secchi disk readings for Big Wood Lake average 5 feet.

A better way of describing the fertility of a lake is to use the Trophic State Index, or TSI. The TSI incorporates the Secchi disk reading, chlorophyll A (a direct measure of the amount of algae in the water column), and total phosphorus present. Oligotrophic lakes tend to have TSI values of 40 or below, mesotrophic lakes have TSI values between 40 and 50, and eutrophic lakes tend to have TSI values above 50. TSI values for the lakes in the Big Wood watershed were mostly in the 40's and 50's with some values in the low 60's. Mud Hen, Dunham, and Spirit Lakes are mesotrophic to eutrophic; Little and Big Wood Lakes can be considered eutrophic lakes.

Table 2-1. Phosphorus Loading in Big Wood Lake

Lake	Existing Annual Phosphorus Load (lbs)	Pre-development Load (lbs)	Existing Average Summer In-Lake Phosphorus Concentration (ppb)	Pre-development Average Summer In-Lake Phosphorus Concentration (ppb)	TSI
Dunham	2163	1175	26	15	41 – 57
Mud Hen	506	290	29	19	41 – 56
Little Wood	3366	1426	34	15	49 – 61
Big Wood	5544	1976	33	12	45 – 68
Spirit	783	590	17	13	41 – 62

In the Big Wood Lake watershed, phosphorus comes from agricultural runoff, soil erosion from road construction and maintenance, atmospheric deposition, loading from the lakes upstream, or it can be recycled from lake bottom sediments. Mixed agricultural land use is the primary contributor of phosphorus to the Big Wood watershed in all the lakes except Spirit Lake, which is mostly wooded. Spirit and Dunham Lakes have the least amount of phosphorus loading. Phosphorus also comes from soil particles present in runoff from road building and maintenance, decaying leaves and other plant material from forested land, and developed lakeshore. It is estimated that faulty septic tanks are a very minimal contributor to the overall phosphorus load to the lakes (mostly < 2% of the total), however there were no studies conducted to confirm this. For more information on water quality data, please refer to the WDNR publication Big Wood Lake Appraisal Monitoring Report, (Cahow, King; April 2000).

Water Resource Conditions and Goals

This section describes the general conditions of the surface and groundwater resources in the Big Wood Lake Watershed. It describes the classifications used for Wisconsin's waters, then describes the surface water and recreational resources in the watershed. Descriptions of subwatersheds are also included and several tables provide summaries of the watershed's resources. Table 2-1 in the next section also serves as a useful summary of the surface water resources in each subwatershed. Groundwater resources and quality is also discussed.

Water Use Classifications

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

In addition to these standards, other criteria were used to assess the suitability of surface waters for recreational and biological uses. Data characterizing stream size and accessibility were used to help determine the suitability and types of recreation a stream is capable of supporting. Information on current recreational use of surface waters (provided by users at public access points and discussions with local officials) is also used to assess suitability of surface waters for recreation. Use classifications and supporting water quality standards used in evaluating water resource conditions are discussed below. The streams are discussed in more detail in the following subwatershed descriptions later in this chapter. Table 2-2 summarizes the water resource classification and conditions for streams in the Big Wood Lake Watershed.

Biological Stream Use

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

> **COLD = Coldwater Communities** include surface waters capable of supporting a community of coldwater fish and other aquatic life or serving as a spawning area for coldwater fish species.
> **WWSF = Warmwater Sport Fish Communities** include surface waters capable of supporting a community of warmwater sport fish and/or serving as a spawning area for warmwater sport fish.
> **WWFF = Warmwater Forage Fish Communities** include surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.
> **LFF = Limited Forage Fish Communities**

Trout streams carry a separate designation found in "Wisconsin Trout Streams" (DNR Publication number – 6-3600(80)) and Outstanding/Exceptional Resource Waters, Wisconsin Administrative Code NR 102.20 and NR 102.11. Trout classes are:

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

Table 2-2. Big Wood Lake Watershed Streams: Biological Uses and Problems Related to Nonpoint Source Pollution

Stream	Biological Use		Problems Related to Nonpoint Source Pollution
	Current	Potential	
Wood River	WWSF	WWSF	Agricultural Row Crops Road Construction Animal Lot Runoff Streambank Pasturing
Spirit Creek	WWSF	WWSF	Agricultural Row Crops Road Construction Animal Lot Runoff Streambank Pasturing
Unnamed stream – flowing out of Rice Lake, through Peterson Lake and into Wood Lake	WWFF	WWFF	Agricultural Row Crops
Unnamed stream – Outflow from Hunters Lake which enters Little Wood Lake	WWFF	WWFF	Agricultural Row Crops Road Construction
Several other unnamed intermittent streams draining smaller wetlands and ponds	WWFF	WWFF	Agricultural Row Crops Road Construction

Recreational Stream Use

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

Full Body Contact. These waters are used for human recreation where immersion of the head is expected and occurs often. Recreation activities classified as full body contact include swimming, water-skiing, sail boarding and other similar activities.

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

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

Surface Water and Recreational Resources

Major tributaries, associated streams, wetlands and subwatershed divisions within the Big Wood Lake Priority Watershed are shown on Map 1-1. See Tables 2-2 and 2-3 for the general conditions of major water resources in the Big Wood Lake Watershed.

Streams

Perennial streams, which have a combined length of about 35 miles, maintain a small continuous flow throughout the year. The Wood River is the longest perennial stream in the watershed. Spirit Creek is the other perennial stream in the watershed.

The Wood River supports a warm water fishery; however, it is not considered good fishing, because there is a lack of suitable habitat to support larger gamefish. It is not reaching its full potential as a result of nonpoint pollution. The predominate sources of nonpoint pollution include: bare soil areas associated with road construction sites lacking appropriate erosion control measures, cropland runoff and livestock pasturing. Streambank erosion was minimal at the time of the Water Resource Appraisal, but could become a larger factor as land use changes.

Spirit Creek supports a limited warm water sport fishery and is also not reaching its potential due to nonpoint pollution from livestock operations.

Streams within the watershed will be described in more detail in the subwatershed descriptions later in this chapter.

Lakes

The Big Wood Lake Watershed contains 22 lakes. Five of these are heavily developed with permanent and seasonal homes. These lakes total 2127 acres. The remaining 17 lakes are not heavily developed and total approximately 772 acres. The current development trends suggest that these sixteen lakes need to be targeted for shoreline protection. The five developed lakes offer many recreational opportunities including boating and year-round fishing for northern pike, largemouth bass and panfish.

The watershed contains four very active property owner organizations including: Big Wood Lake Association, Round-Trade Improvement Association (which includes Spirit Lake), Little Wood Lake Association and Mud Hen Lake District.

A shoreline inventory was done to assess the condition and health of the shoreline on the five largest developed lakes. Factors considered included: developed vs. undeveloped, type of

development, building setbacks, percent of mowed shoreline within designated buffer areas, length and width of shoreline buffers, composition of buffer, bare soil areas and some limited notes on aquatic habitat. The results of this inventory are summarized later in this chapter.

Table 2-3. General Condition of Lakes in the Big Wood Lake Watershed

Lake	Size (acres)	Maximum Depth (feet)	Sensitivity to Phosphorus Loading
Big Wood Lake	521	35	High
Spirit Lake	593	27	Low
Mud Hen Lake	563	66	High
Dunham Lake	243	63	High
Little Wood Lake	207	23	Low
Little Dunham Lake	11	33	High
Hunters Lake	63	5	Unknown
Lind Lake	42	19	High
Silver Lake	33	35	High
Indian Lake	17	15	High
Rice Lake (T37N, R18W)	83	13	Low
Rice Lake (T37N, R17W)	20	NA	High
Grimhs Lake	31	43	High
Grass Lake	56	3	Unknown
Blom Lake	208	13	Unknown
Diamond Lake	126	15	Low
Fern Lake	17	7	Unknown
Hickory Lake	18	14	Unknown
Fountain Lake	24	20	High
Hawthorn Lake	12	6	Unknown
Black Lake	11	6	Unknown

Wetlands

Wetlands are valuable natural resources. They provide wildlife habitat, fish spawning and rearing areas, recreation, storage of runoff and flood flows and removal of pollutants. Wetlands in the watershed are mainly in the Wood River floodplain. Floodplain wetlands support furbearers and water fowl populations and may provide seasonal habitat for sport fish. There are also extensive wetland areas along the riparian corridor of Spirit Creek and many of the lakes.

A wetland and wildlife habitat inventory was done to identify existing and modified or converted wetlands for the purpose of protection from degradation or potential restoration. The focus of the inventory was on wetlands that are presently, or have been in the past, degraded through

drainage, grazing, cropping, or other activities causing water storage loss and build up of sediments. Data were collected on 414 tracts of wetlands (7761 acres), with an average of 18.7 acres per site. Data were gathered from Natural Resource Conservation Service maps, air photos and the DNR wetland inventory maps. Guidelines for wetland restoration, which will be a component of this project, are outlined at the end of this chapter. See Table 2-4 for Wetland Inventory Summary.

Table 2-4. Altered Wetland Inventory Summary

Subwatershed	Prior Converted Wetland		Grazed Wetland		Converted Wetland		Total Sites	Total Acres
	# sites	acres	# sites	acres	# sites	acres		
Big Wood Lake	9	268.7	0	0	1	0.5	10	269.2
Little Wood Lake	9	236.2	0	0	0	0	9	236.2
Spirit Lake	8	966.7	0	0	0	0	8	966.7
Mud Hen Lake	0	0	0	0	0	0	0	0
Dunham Lake	0	0	0	0	0	0	0	0
Middle Wood River	4	73.7	2	12.1	0	0	6	85.8
Upper Wood River	9	653.4	3	15.5	0	0	12	668.9
Totals	**39**	**2198.7**	**5**	**27.6**	**1**	**0.5**	**45**	**2226.8**

Information taken from NRCS wetland inventory maps, FSA air photos and DNR wetland inventory maps. This table does not include 5561.6 acres of intact wetlands throughout the watershed.

Recreation

The watershed's five developed lakes are popular destinations, attracting many tourists from Northwest Wisconsin and Eastern Minnesota. The most popular activities are fishing, boating and water-skiing. Big Wood Lake is probably the most popular place for recreation in the watershed. It has one public boat landing, two full time summer camps and a county park and picnic area. The five developed lakes totaling 2127 acres are of local importance to Burnett County's tourism industry.

Groundwater Resources

Regional Aquifers

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

Since 1936, the State of Wisconsin has required well drillers to document well construction and rock and soil layers encountered during well installation. Information from geologic logs, driller construction reports and Wisconsin Geological and Natural History Survey (WGNHS) reports is included below. The principle aquifer within the watershed is glacially deposited sand and gravel. Private wells range from 28 to 167 feet in depth and yield between 2 and 70 gallons per minute.

Direction of Groundwater Flow

Local groundwater flow in the Big Wood Lake Watershed roughly mirrors the topography of the land surface and flows "downhill" or down gradient toward Big Wood Lake. Regional groundwater flow in the watershed is northwest toward the outlet of the Wood River.

Groundwater Quality

Groundwater quality in the Big Wood Lake Watershed is generally considered good. As part of the "Big Wood Lake Watershed – Appraisal Monitoring Report" (Cahow, King, April 2000), a limited number of private well samples were collected and analyzed for nitrate (NO3) + nitrite (NO2). Due to the expiration of the WDNR's contract with the Wisconsin State Lab of Hygiene, only a few samples were taken, however Burnett County has conducted an extensive groundwater quality inventory as part of a separate project. Sample analytical results are summarized in Table 2-4. Samples analyzed for nitrate (NO3) + nitrite (NO2) showed concentrations ranging from not detected to 6.9 parts per million or milligrams per liter (mg/L).

The **Enforcement Standard (ES) Health Advisory Level** is the concentration of a substance at which a facility regulated by DILHR, DATCP, DOT or DNR must take action to reduce the concentration of the substance in groundwater. The **Preventative Action Limit (PAL)** is a lower concentration of a contaminant than the Enforcement Standard. The PAL serves to inform DNR of potential groundwater contamination problems, establish the level at which efforts to control the contamination should begin and provide a basis for design codes and management criteria.

The groundwater enforcement standard (ES) for nitrate is 10 mg/L. Nitrate (NO3) + nitrite (NO2) concentrations above 2 mg/L exceed states preventative action limit (PAL). No samples exceeded 10 mg/L and two of the samples exceeded 2 mg/L. Results so far do not indicate a pattern of groundwater contamination that can be linked to specific sources of nitrate. These results do not represent the overall groundwater quality of the watershed.

Water Supplies

Water supplies for domestic, agricultural and industrial uses in the Big Wood Lake Watershed are obtained from both private groundwater sources and municipal wells, in the case of the Village of Frederic. Frederic has four municipal wells, three of which fall within the watershed boundaries. The average depth of the three wells is 270 feet and their yield ranges from 240 gallons per minute to 450 gallons per minute.

The Frederic municipal water supply systems, supply more than 20 percent of the watershed population.

Table 2-5. Big Wood Lake Watershed Nitrate Sampling Results

Subwatershed	Number of Nitrate Samples less than 2.0 mg/L	Number of Nitrate Samples between 2.0 and 10.0 mg/L	Number of Nitrate Samples Greater than 10.0 mg/L
Spirit Lake	1	1	0
Middle Wood River	1	1	0
Little Wood Lake	1	0	0
Totals	3	2	0

Potential Groundwater Quality Problems

Previously identified potential groundwater quality problems in the Big Wood Lake Watershed are listed in Table 2-6.

Table 2-6. Spill Sites and Leaking Underground Storage Tanks

Site	Activity	Township	Range
WDOT-Falun	Spill site	38N	17W
Andy's Bait Shop-Falun	LUST	38N	17W
Birchwood Beach Resort – Frederic	LUST	37N	18W
Bob's Service Station – Falun	LUST	38N	18W
Hedlund DX – Falun	LUST	38N	17W
Town of Daniels – Public Works Garage	Spill site	38N	17W
0.1 miles east of "W" on Hwy. 70	Spill site	38N	17W
Northwestern Electric – Frederic	Spill site	37N	17W
Frederic Farmers Co-op	Spill site	37N	17W
Richard Lundeen yard – Lewis	Spill site	37N	16W
Circle-C Convenience – Frederic	LUST	37N	17W
Circle-C Foods – Frederic	LUST	37N	17W

These sites were listed in DNR Publication SW-144, The Wisconsin Remedial Response Site Evaluation Report (August 1999), which lists superfund sites, solid and hazardous waste disposal sites, leaking underground storage tank sites and reported spill sites. At the date of Watershed Plan approval, some of these sites may have been taken care of, or removed from the list. Potential pollution associated with nonpoint sources is described in various sections throughout the remainder of this chapter.

Water Quality Goals and Project Objectives

The DNR staff, with assistance from Burnett County staff, developed water quality goals and project objectives (Table 2-7). Details can be found in the Big Wood Lake Priority Watershed Project, Nonpoint Source Appraisal Report (Cahow, King, April 2000) available through DNR's St. Croix Basin Geographic Management Unit Headquarters.

Following are the goals for water resources:

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

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

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

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

Project objectives are identified and listed for each subwatershed and for rural nonpoint sources of pollution throughout this chapter.

Table 2-7. Water Quality Goals and Nonpoint Source Reduction Objectives

Subwatershed	Water Quality Goals	Nonpoint Source Reduction Objectives
Mud Hen Lake	Reduce in lake total phosphorus from 29to 27 ug/l Restore shoreline buffer in altered areas Protect aquatic habitat Protect wetlands	Total Phosphorus reduction of 10% from agricultural sources Reduction of sediment and nutrients delivered from developed shorelines Reduce sediment and nutrient loading from road maintenance and construction
Dunham Lake	Form a lake association Reduce in lake total phosphorus from 26 to 23 ug/l Protect aquatic habitat Restore shoreline buffer in altered areas Protect wetlands	Total Phosphorus reduction of 10% from agricultural sources Reduction of sediment and nutrients delivered from developed shorelines Reduce sediment and nutrient loading from road maintenance and construction
Little Wood Lake	Reduce in lake total phosphorus from 34 to 31 ug/l Restore shoreline buffer in altered areas Protect aquatic habitat Protect wetlands	Total Phosphorus reduction of 10% from agricultural sources Reduction of sediment and nutrients delivered from developed shorelines Reduce sediment and nutrient loading from road maintenance and construction
Big Wood Lake	Reduce in lake total phosphorus from 33 to 30 ug/l Restore shoreline buffer in altered areas Protect aquatic habitat Protect wetlands	Total Phosphorus reduction of 10% from agricultural sources Reduction of sediments and nutrients delivered from developed shorelines Reduce sediment and nutrient loading from road maintenance and construction
Spirit Lake	Reduce in lake total phosphorus from 17 to 16 ug/l Restore shoreline buffer in altered areas Protect aquatic habitat Protect wetlands	Total Phosphorus reduction of 10% from agricultural sources Reduction of sediments and nutrients delivered from developed shorelines Reduce sediment and nutrient loading from road maintenance and construction
Upper Wood River	Enhance in stream habitat by reducing sedimentation Restore riparian buffer in altered areas Protect wetlands	Reduce sediment and nutrient loading by 10% from agricultural sources Reduce sediment and nutrient loading from road maintenance and construction
Middle Wood River	Enhance in stream habitat by reducing sedimentation Protect riparian buffer in altered areas Protect Wetlands	Reduce sediment and nutrient loading by 10% from agricultural sources Reduce sediment and nutrient loading from road maintenance and construction

Subwatershed Descriptions

This section describes the physical and water quality conditions for each subwatershed in the Big Wood Lake Project. Discussions for each subwatershed are broken into four parts: a general description, water quality conditions, the nonpoint source pollutants impairing the subwatershed and objectives for the watershed. A more detailed description of each subwatershed can be found in the water quality appraisal, written and available through DNR's St. Croix Basin Geographic Management Unit Headquarters.

Each subwatershed, with the exception of the Mud Hen Lake subwatershed, conveys surface water to the Big Wood Lake Watershed. For the purposes of this project, the Big Wood Lake Watershed is subdivided into seven individual subwatersheds:

Mud Hen Lake	(ML)
Little Wood Lake	(WL)
Big Wood Lake	(BW)
Spirit Lake	(SL)
Upper Wood River	(UW)
Middle Wood River	(MW)
Dunham Lake	(DL)

Upper Wood River (UW)

Description: The Upper Wood River subwatershed includes the headwaters of the Wood River, which begins 6 to 7 miles East of the Village of Frederic and a mile or so south of CTH W (in the NE ¼ of section 8, T36N, R16W). From here, it flows in a northerly direction for approximately 10 miles before crossing State Highway 35, where it reaches the downstream end of the subwatershed near the outlet of Aspen and Hickory Lakes in Section 14, T37M, R17W. The Upper Wood River Subwatershed drains an area of 9,557 acres or 20 percent of the total priority watershed project area.

Predominant land use includes forested (5,678 acres or 59.4%) pasture/grasslands (1,483 acres or 15.5%), mixed agriculture (1,274 acres or 13.3%) and wetlands (942 acres or 10%). Sediment and nutrient sources in addition to the major land uses targeted for nonpoint source controls must also be considered if water quality and ecological integrity are to be maintained within this priority watershed project. Road maintenance and construction is an example of a sediment and nutrient source that is not usually included in land use modeling efforts, because of its transitory nature and the relatively small amount of acreage usually effected. Even though it may only cover a few acres and be difficult to track locations of problem sites, the total volume of sediments and nutrients delivered may result in serious water quality and habitat problems.

Four large wetland areas heavily influence the character of the Wood River in this subwatershed and are very important for potential nutrient and sediment capture and retention. The high percentage of forested land use in this subwatershed also helps to keep nutrient and sediment loading rates low.

Water Quality Conditions: The Wood River within the Upper Wood River Subwatershed is classified as a warm water sport fishery. Most river segments lack adequate habitat for larger gamefish and organically enriched wetlands from historic nonpoint source loadings are providing

increased biological oxygen demand, which may be resulting in dissolved oxygen problems and limiting intolerant species. During larger runoff events the wetlands may be incapable of retaining all of the sediments, organic matter and nutrients that have been historically deposited in them resulting in releases impacting downstream water resources. Fish community structure was dominated by tolerant species throughout this subwatershed.

Stream habitat quality and type are variable in this subwatershed. Upper segments from Clam Falls Drive, upstream, lack adequate depth, flow and water volume to support larger gamefish.

Downstream from Clam Falls Drive, for approximately a half mile, the gradient changes and the stream begins to have a better riffle – run – pool sequence for a relatively short distance until it reaches 130th Street, where it returns to a low gradient stream, with few pools and riffles. The bottom substrate is dominated by shifting sand and runs are the predominant habitat type. A defined stream channel is replaced by an extensive wetland with hummocks and an undefined or braided channel in several of the larger wetland areas.

Invertebrates were sampled at two locations in the subwatershed. Invertebrates at the upper site near the headwaters and CTH W reflect a healthy headwaters stream, with a lot of leaves, providing the necessary energy to drive the basis for the food chain. Invertebrate samples collected at 130th Street, reflect the best water quality found within the priority watershed project and the increased gradient and better riffle habitat in this section.

Streambank erosion was almost non-existent in undeveloped river segments. Road construction has resulted in significant sediment additions, due to a lack of erosion control.

Water chemistry results indicate that runoff is providing sediments and nutrients, which negatively impact water quality. Fecal coliform results indicate that concentrations may exceed safe, full body contact levels during different runoff events.

Nonpoint Source Pollutants:

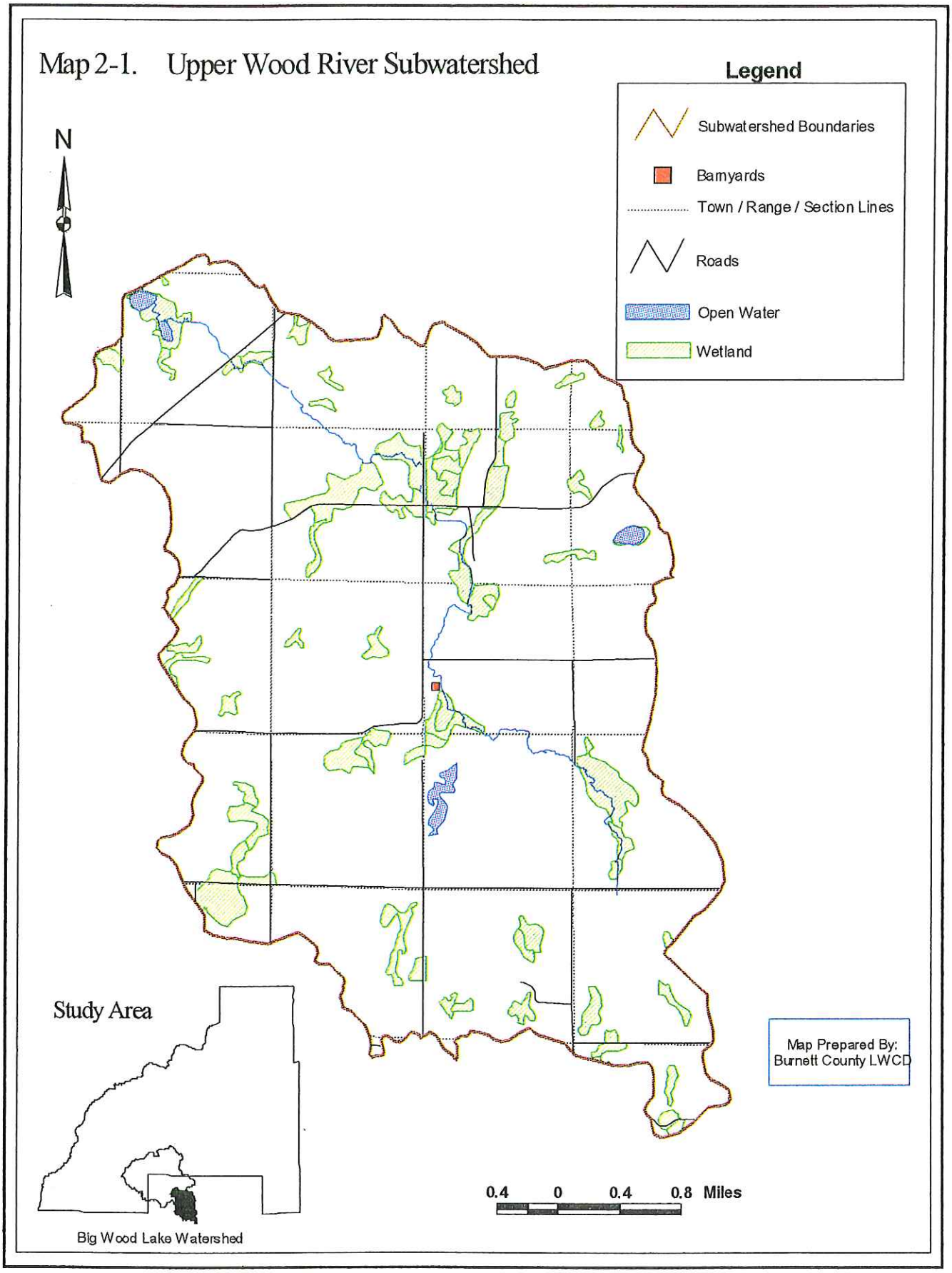
- Sediment delivery from cropland in the Upper Wood River Subwatershed is **933 tons** from 1148 acres, annually, or 23 percent of the entire watershed load.

- The Upper Wood River Subwatershed contains approximately **653 acres** of prior converted wetland, which could be targeted for wetland restoration.

- Streambank erosion contributes **38 tons** of sediment to the watershed, annually.

- The Upper Wood River Subwatershed contains **one animal lot**, which contributes **52 pounds** of phosphorus, annually.

- This subwatershed also had a road construction site, which was eroding at a rate of approximately **50 tons/acre/year**. This estimate does not include any of the gullies forming at this site, which would have made erosion rates well above 50 t/ac/yr.


Map 2-1. Upper Wood River Subwatershed
Legend
Subwatershed Boundaries
Barnyards
Town / Range / Section Lines
Roads
Open Water
Wetland
N
Study Area
Big Wood Lake Watershed
0.4 0 0.4 0.8 Miles
Map Prepared By:
Burnett County LWCD

Water Resource Goals and Objectives:

- Improve water quality:
  - Reduce nutrient, sediment and organic matter delivery by 10% from cropland.
  - Reduce nutrient, sediment and organic matter delivery by 10% from barnyards.
  - Reduce nutrient, sediment and organic matter delivery from road maintenance and construction by a high degree.

- Maintain recreational use standards:Keep bacterial levels below the 400 colonies/100 ml by keeping manure and animal waste out of areas that drain directly to surface water resources.

- Improve in-stream habitat quality:Reduce sediment, nutrients and organic matter delivery from all sources to improve warm water fish community structure and increase numbers of gamefish and intolerant species.

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

Middle Wood River Subwatershed (MW)

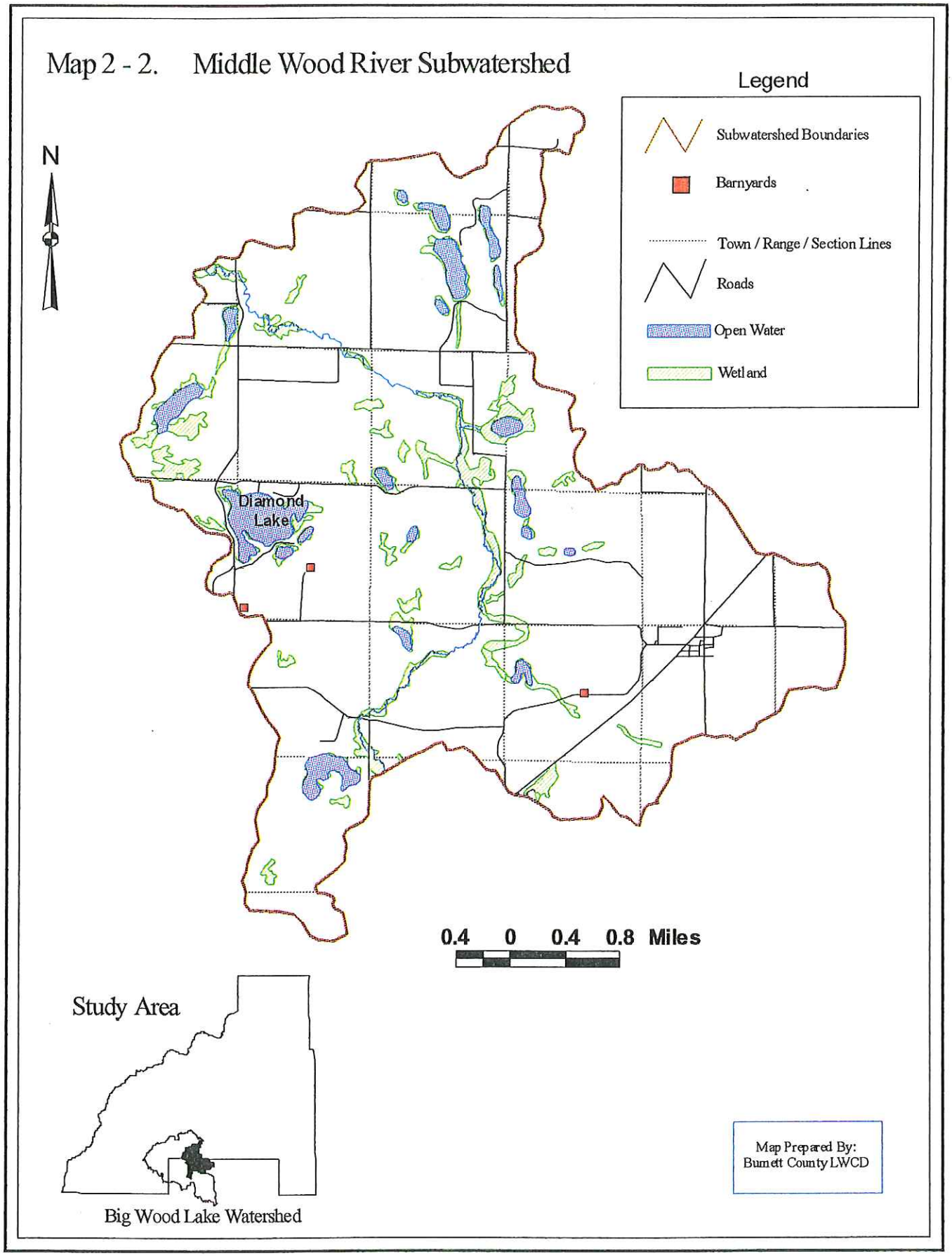
Description: The Middle Wood River Subwatershed begins just downstream from the outflow of Hickory Lake and ends where the Wood River flows into Dunham Lake. The Middle Wood River Subwatershed drains an area of 9,779 acres or 20 percent of the total priority watershed project area between Hickory and Dunham Lakes. This subwatershed also receives drainage from the Upper Wood River Subwatershed, accounting for drainage from another 9,557 acres or an additional 20 percent of the total priority watershed project area.

Predominant land use includes: forested (5,985 acres or 61%), mixed agriculture (1,714 acres or 17.5%), wetlands (823 acres or 8.4%) and pasture and grasslands (716 acres or 7.3%).

Water Quality Conditions: The Wood River within the Lower Wood River Subwatershed is classified as a warm water sport fishery. This subwatershed includes the river segments starting from where the outflow from Hickory Lake joins the Wood River to where the Wood River empties into Dunham Lake. This segment also lacks adequate habitat for larger gamefish and wetland influences may result in other factors which limit intolerant species, most likely temperature and dissolved oxygen. Fish community structure was dominated by tolerant species throughout this subwatershed.

Stream habitat quality and type are less variable in this subwatershed. Upper segments near 140th Street lack riffles and pools and a defined stream channel is non-existent in several of the wetland areas. Downstream of 345th Avenue a well defined stream channel exists, but it has a bottom dominated by shifting sand with few pools and riffles.

Invertebrates were sample at Old Hwy 35 at the most downstream end of the subwatershed near Dunham Lake. Invertebrate community structure is strongly influenced by gradient and substrate in this reach and it would be difficult to separate out their effects from periodic organic enrichment from nonpoint sources and secondary releases from wetlands during major runoff events.


Map 2 - 2. Middle Wood River Subwatershed
Legend
Subwatershed Boundaries
Barnyards
Town / Range / Section Lines
Roads
Open Water
Wetland
N
Diamond Lake
0.4 0 0.4 0.8 Miles
Study Area
Big Wood Lake Watershed
Map Prepared By:
Burnett County LWCD

Streambank erosion was almost non-existent in undeveloped river segments. Road construction activities have resulted in sediment additions due to a lack of erosion control.

Water chemistry results indicate that runoff is providing sediments and nutrients negatively impacting water quality and habitat. Fecal coliform results indicate that concentrations may exceed safe full body contact levels during different runoff events.

Nonpoint Source Pollutants:

- Sediment delivery from cropland in the Middle Wood River Subwatershed is **545 tons** from 1,469 acres, annually, or 14 percent of the entire watershed load.

- The Middle Wood River subwatershed contains approximately **74 acres** of prior converted wetlands, which could be targeted for restoration.

- Degraded streambanks contribute **9 tons** of sediment, annually.

- The Middle Wood River subwatershed contains **three animal lots**, which contribute **64 pounds** of phosphorus, annually.

Water Resource Goals and Objectives:

- Improve water quality:
  - Reduce nutrient, sediment and organic matter delivery by 10% from cropland.
  - Reduce nutrient and organic matter delivery by 10% from barnyards.
  - Reduce nutrient, sediment and organic matter delivery from road maintenance and construction by a high degree.

- Maintain recreational use standards: Keep bacterial levels below 400 colonies/100 ml by keeping manure and animal waste out of areas that drain directly to surface water resources.

- Improve in-stream habitat quality: Reduce sediments, nutrients and organic matter from all sources to improve warm water fish community structure and increase gamefish and intolerant species numbers.

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

Dunham Lake Subwatershed (DL)

Description: The watershed for Dunham Lake includes the Upper and Middle Wood River subwatersheds. The Dunham Lake subwatershed, for the purposes of this subwatershed discussion includes all the land that drains directly into Dunham Lake without first flowing into the Wood River. For discussion purposes, the Upper and Middle Wood River subwatersheds were split out of the Dunham Lake subwatershed.

The Dunham Lake Subwatershed begins at the SW ¼ of Section 13, T38N, R17W and ends at the outlet of Dunham Lake. The Dunham Lake Subwatershed drains an area of 2,005 acres or 4 percent of the total watershed area, while the full watershed for Dunham Lake drains a total of 21,400 acres which represents 44% of the total acreage for the priority watershed project.

Dominate land uses include: forested (990 acres or 49.4%), mixed agriculture (444 acres or 22.1%), wetlands (171 acres or 8.5%), and pasture/grasslands (115 acres or 5.7%).

Dunham Lake is the first lake that occurs on the Wood River. As the Wood River enters Dunham Lake, water velocities decrease, providing an opportunity for suspended matter to settle out. Dissolved nutrients also have an opportunity to be integrated into aquatic plant and algae biomass within the lake, negatively impacting water quality within Dunham Lake. These factors can reduce the volume of sediments and nutrients reaching downstream lakes, having a positive influence on their water quality.

Water Quality Conditions: Dunham Lake is classified as a mesotrophic lake and is the major waterbody in this subwatershed. The lake is approximately 243.3 acres in size with a maximum depth of 63 feet. Fish species present include northern pike, walleyes, largemouth bass, bluegills, black crappies, rock bass, pumpkinseed, perch and bullheads. This lake has been designated as a trophy northern pike lake as a result of the forage base that is present. The natural vegetation along most of the shoreline is still intact leaving an important buffer, protecting water quality and providing valuable habitat.

Water clarity in Dunham Lake is fair year round, with only light to moderate algae blooms during some summer months. A lake wide sensitive area survey has been completed for the lake. The sensitive area report identifies existing sensitive areas and plant species in each of the areas. Information regarding areas that lack adequate shoreline buffers to provide water quality protection and areas with diminished lakeshore habitat functions is also included in the Big Wood Lake Watershed Water Resources Appraisal.

Nonpoint Source Pollutants:

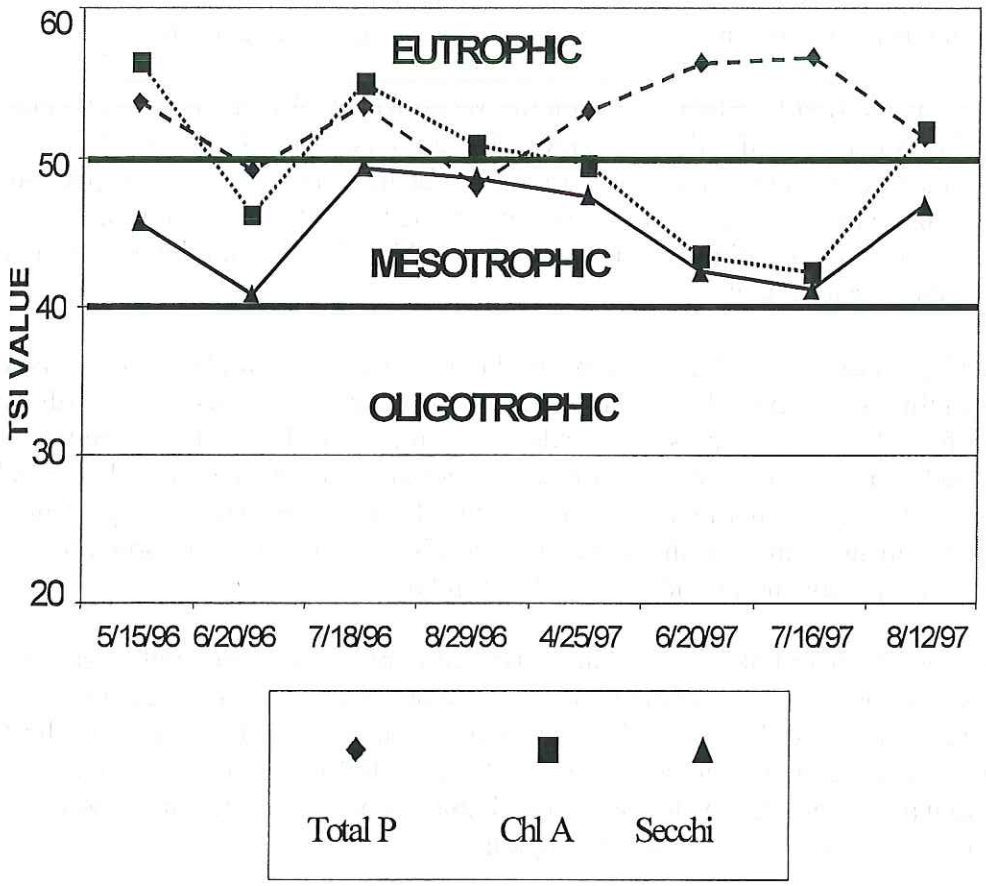
- Sediment delivery from cropland in the Dunham Lake Subwatershed is **112 tons** from 330 acres, annually, or 3 percent of the entire watershed load.

- Sediment delivery from shoreline erosion in the Dunham Lake Subwatershed is **480 pounds**, annually. The erosion is a result of very steep topography around Dunham Lake, combined with development.

- Lakeshore development contributes an estimated **15 pounds of phosphorus** to Dunham Lake, annually.

- The Dunham Lake Subwatershed contains **one animal lot,** which contributes **12 pounds** of phosphorus to the watershed, annually.

Figure 2-1. Dunham Lake TSI Values

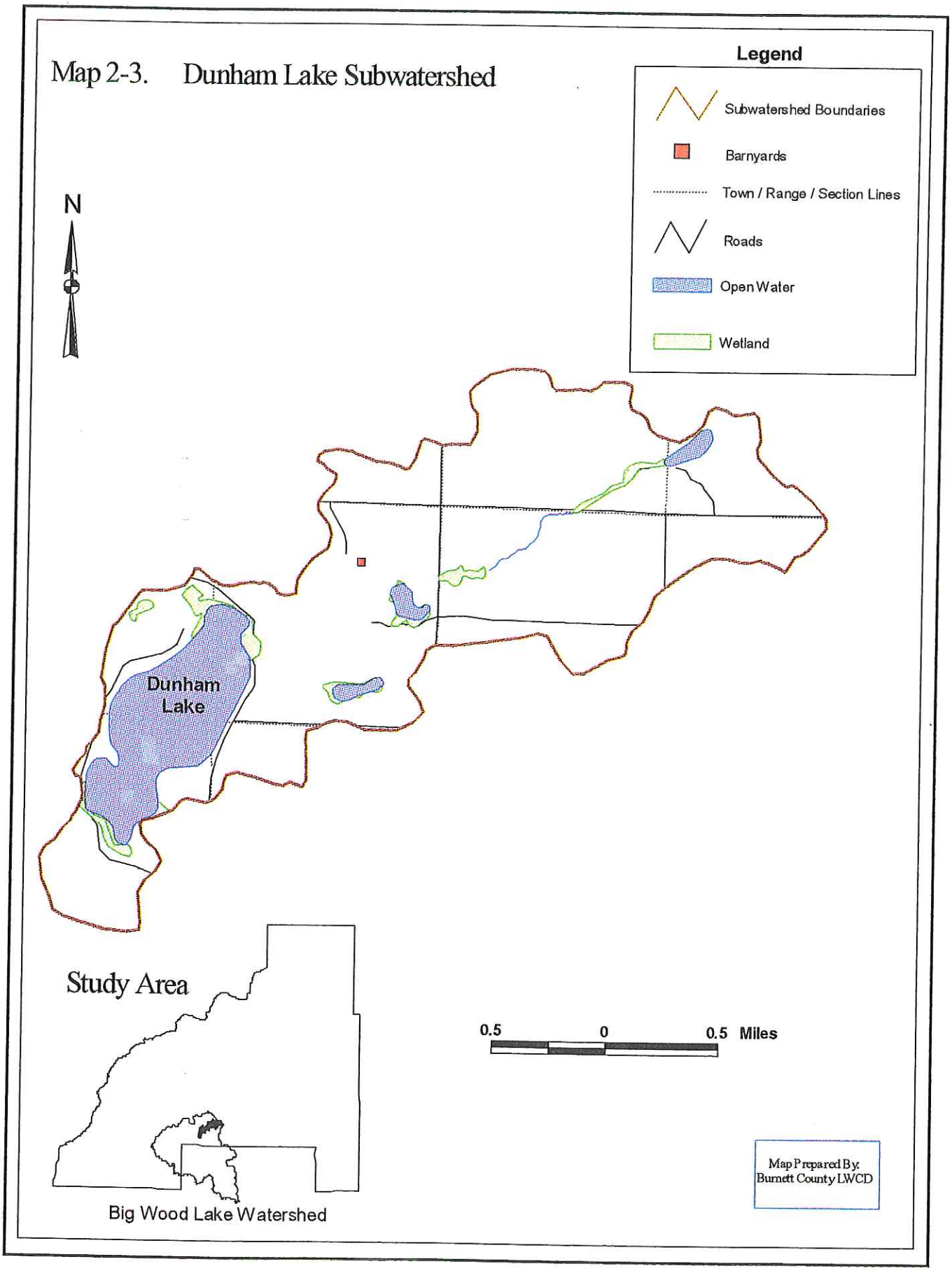


Water Resource Goals and Objectives:

- Improve water quality: Reduce in lake mean summer total phosphorus concentrations from 26 to 23 ug/L. To reach this goal, a total phosphorus loading reduction of 10% must be achieved.

- Restore functional attributes of shoreline ecosystem: Restore shoreline buffer and habitat, particularly in the priority buffer restoration areas, identified in the water quality appraisal report.

- Protect and maintain the aquatic plant sensitive areas in the lake: Protect the aquatic plant sensitive areas as identified in the sensitive area survey report.


Map 2-3. Dunham Lake Subwatershed
Legend
Subwatershed Boundaries
Barnyards
Town / Range / Section Lines
Roads
Open Water
Wetland
N
Dunham Lake
Study Area
Big Wood Lake Watershed
0.5 0 0.5 Miles
Map Prepared By:
Burnett County LWCD

Mud Hen Lake Subwatershed (ML)

Description: The Mud Hen Lake subwatershed has a fairly small drainage basin and for purposes of this study ends at the outlet of Mud Hen Lake. The Mud Hen Lake subwatershed drains an area of 2,461 acres or 5% of the total priority watershed project area. Predominant land uses include: forested (1,178 acres or 47.9%),wetlands (346 acres or 14.1%) and mixed agriculture (268 acres or 10.8%).

Though the total acreage of residential shoreline development is relatively small, the direct impacts on buffers and aquatic habitat can be a dominate limiting factor, hindering the ecological integrity of Mud Hen Lake.

Water Quality Conditions: Mud Hen Lake is classified as a mesotrophic lake and is the major waterbody in this subwatershed. The lake is approximately 562 acres in size, with a maximum depth of 66 feet. Fish species present include northern pike, largemouth bass, bluegills, black crappies, rock bass, pumpkinseed, perch and bullheads. The natural vegetation along the Northwest shoreline has been altered or removed with homes serving as the primary development.

Water clarity in Mud Hen Lake is fair year round, with moderate algae blooms during the summer months. A lake wide sensitive area survey has been completed for the lake. The sensitive area report identifies existing sensitive areas and plant species in each of the areas. Information regarding areas that lack adequate shoreline buffers to provide water quality protection against runoff and areas with diminished lakeshore habitat functions is also included in the Big Wood Lake Watershed Water Resources Appraisal.

Nonpoint Source Pollutants:

- Sediment delivery from cropland in the Mud Hen Lake Subwatershed is **69 tons** from 224 acres, annually or 2 percent of the entire watershed load.

- Lakeshore development contributes an estimated **83 pounds of phosphorus** to Mud Hen Lake, annually.

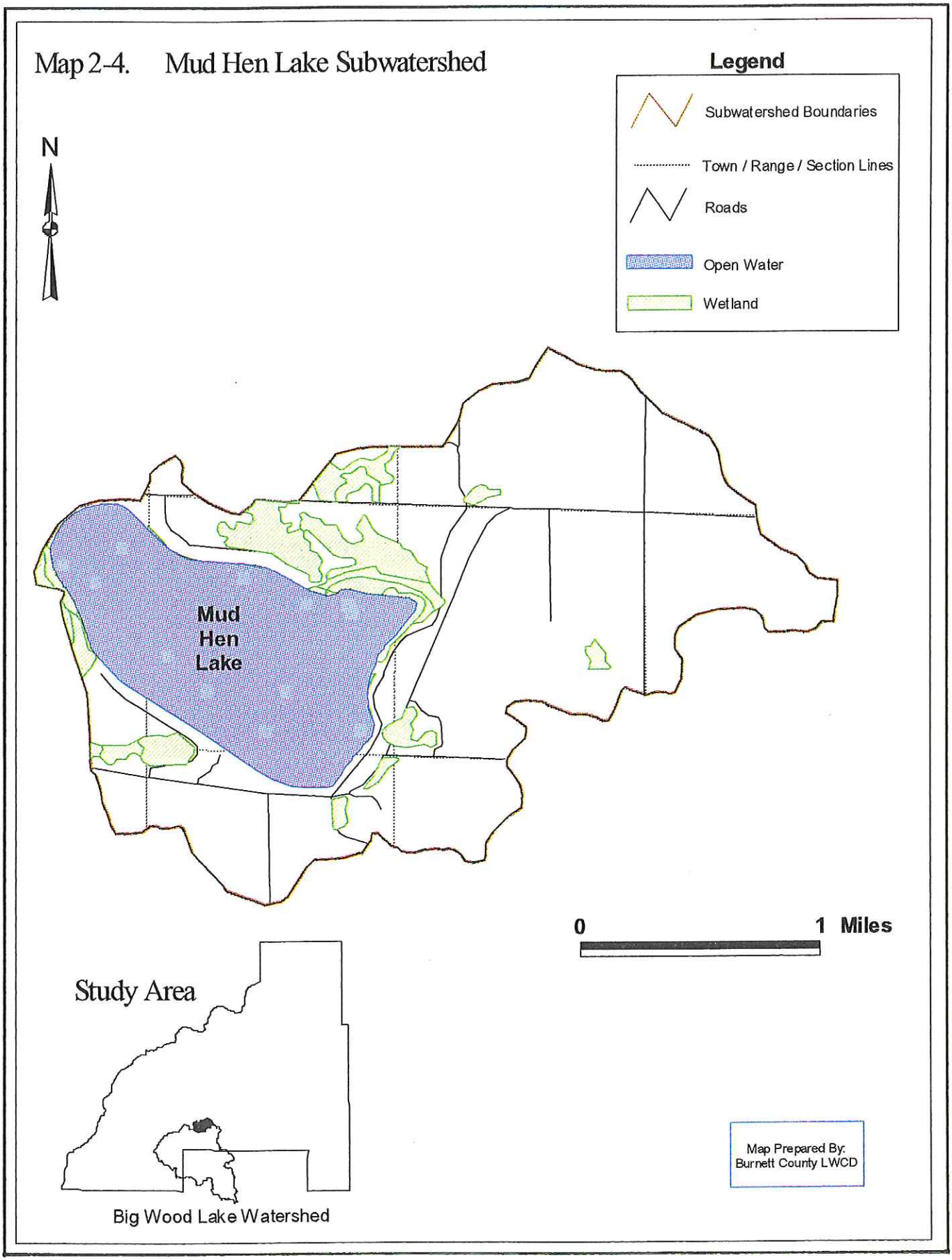
- Sediment delivery from shoreline erosion in the Mud Hen Lake Subwatershed is 300 pounds, annually, as a result of development. Two priority buffer restoration areas were identified as having little or no shoreline buffer functional values.

Water Resource Goals and Objectives:

- Improve water quality: Reduce in lake mean summer total phosphorus concentrations from 29 to 27 parts per billion. To reach this goal, a total phosphorus loading reduction of 10% must be achieved.

- Restore functional attributes of shoreline ecosystem: Restore shoreline buffer and habitat, particularly in the priority areas identified in the water quality appraisal report.

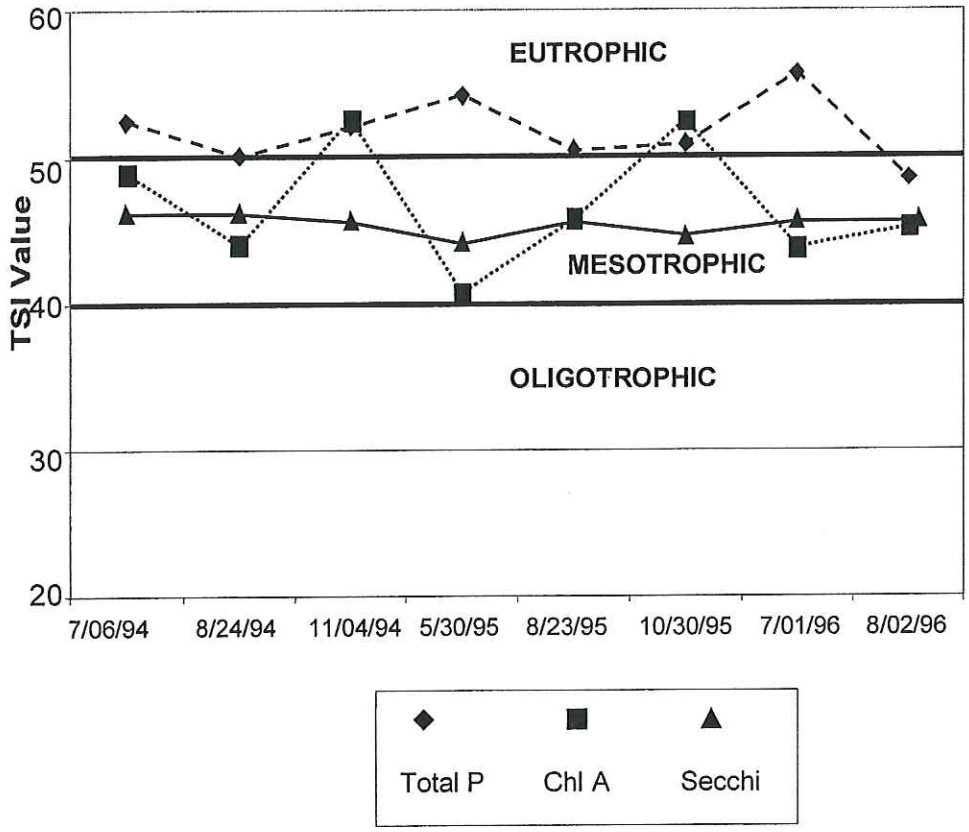
- Protect and maintain the aquatic plant sensitive areas in the lake: Protect the aquatic plant sensitive areas as identified in the sensitive area survey report.


Map 2-4. Mud Hen Lake Subwatershed
Legend
Subwatershed Boundaries
Town / Range / Section Lines
Roads
Open Water
Wetland
N
Mud
Hen
Lake
0
1 Miles
Study Area
Big Wood Lake Watershed
Map Prepared By:
Burnett County LWCD

- Meet recreational use standards: Reduce the periodic high bacterial levels to less than 400 colonies/100 ml.

- As a secondary benefit, installation of best management practices should also reduce the severity of overland runoff.

Figure 2-2. Mud Hen Lake TSI Values



Little Wood Lake Subwatershed (WL)

Description: The Little Wood Lake subwatershed begins at the outlet of the Wood River from Dunham Lake and ends at the outlet of the Wood River on Little Wood Lake. It drains an area of 7,229 acres or 15 percent of the entire watershed area. Dominate land uses include: forested (3,155 acres or 43.6%), mixed agriculture (1,833 acres or 25.4%) and wetlands (1,244 acres or 17.2%

Little Wood Lake is the second lake to occur on the Wood River. The Wood River flows out of Dunham Lake where it enters the Little Wood Lake subwatershed. A small hobby farm located between Shuttleworth and Blomgren Roads had resulted in badly trampled banks and in-stream sedimentation problems during 1996 and 1997. The cattle were subsequently removed in 1998 and much of the sedimentation problems were reduced. The frequency of occurrence for lesions and tumors for fish collected during a 1997 survey exceeded 4% for all species of fish collected within the pastured sections. Cause and effect cannot be positively determined, but it is likely that environmental stress associated with pasturing impacts or in combination with other factors resulted in these abnormalities.

Water Quality Conditions: Little Wood Lake is classified as a eutrophic lake and is the major waterbody in this subwatershed. The lake is approximately 207 acres in size with a maximum depth of 23 feet. Fish species present include northern pike, largemouth bass, bluegills, black crappies, rock bass, pumpkinseed, perch and bullheads. The natural vegetation along some of the shoreline has been altered or removed with homes serving as the primary development.

Water clarity in Little Wood Lake is fair year round, with moderate algae blooms during the summer months. A lake wide sensitive area survey has been completed for the lake. The sensitive area report identifies existing sensitive areas and plant species in each of the areas. Information regarding areas that lack adequate shoreline buffers to provide water quality protection against runoff and areas with diminished lakeshore habitat functions is also included in the Big Wood Lake Priority Watershed Water Resources Appraisal.

Nonpoint Source Pollutants:

- Sediment delivery from cropland in the Little Wood Lake Subwatershed is **650 tons** from 1,467 acres, annually, or 16 percent of the entire watershed load.

- Sediment delivery from shoreline erosion in the Little Wood Lake Subwatershed is **440 pounds**, annually.

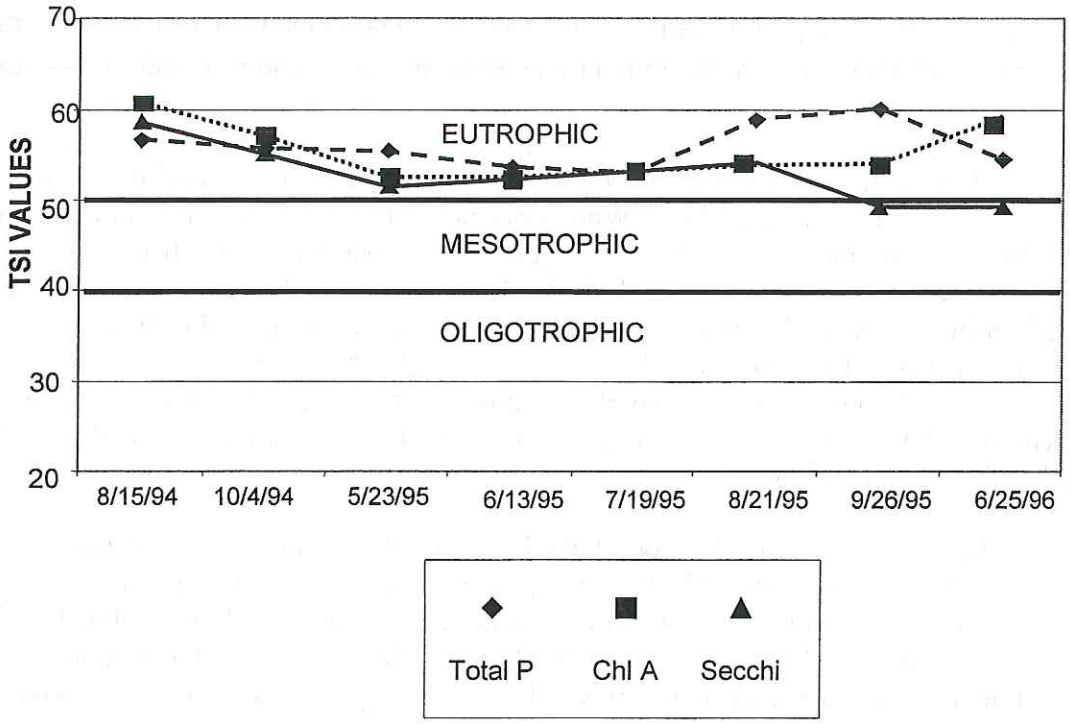
- The Little Wood Lake Subwatershed contains approximately **236 acres** of prior converted wetlands, which could be targeted for restoration.

- Lakeshore development contributes an estimated **47 pounds of phosphorus** to Little Wood Lake, annually.

- Degraded streambanks contribute **36 tons** of sediment, annually.

- The Little Wood Lake Subwatershed contains **3 animal lots**, which contribute **67 pounds of phosphorus**, annually.

Figure 2-3. Little Wood Lake TSI Values



Water Resource Goals and Objectives:

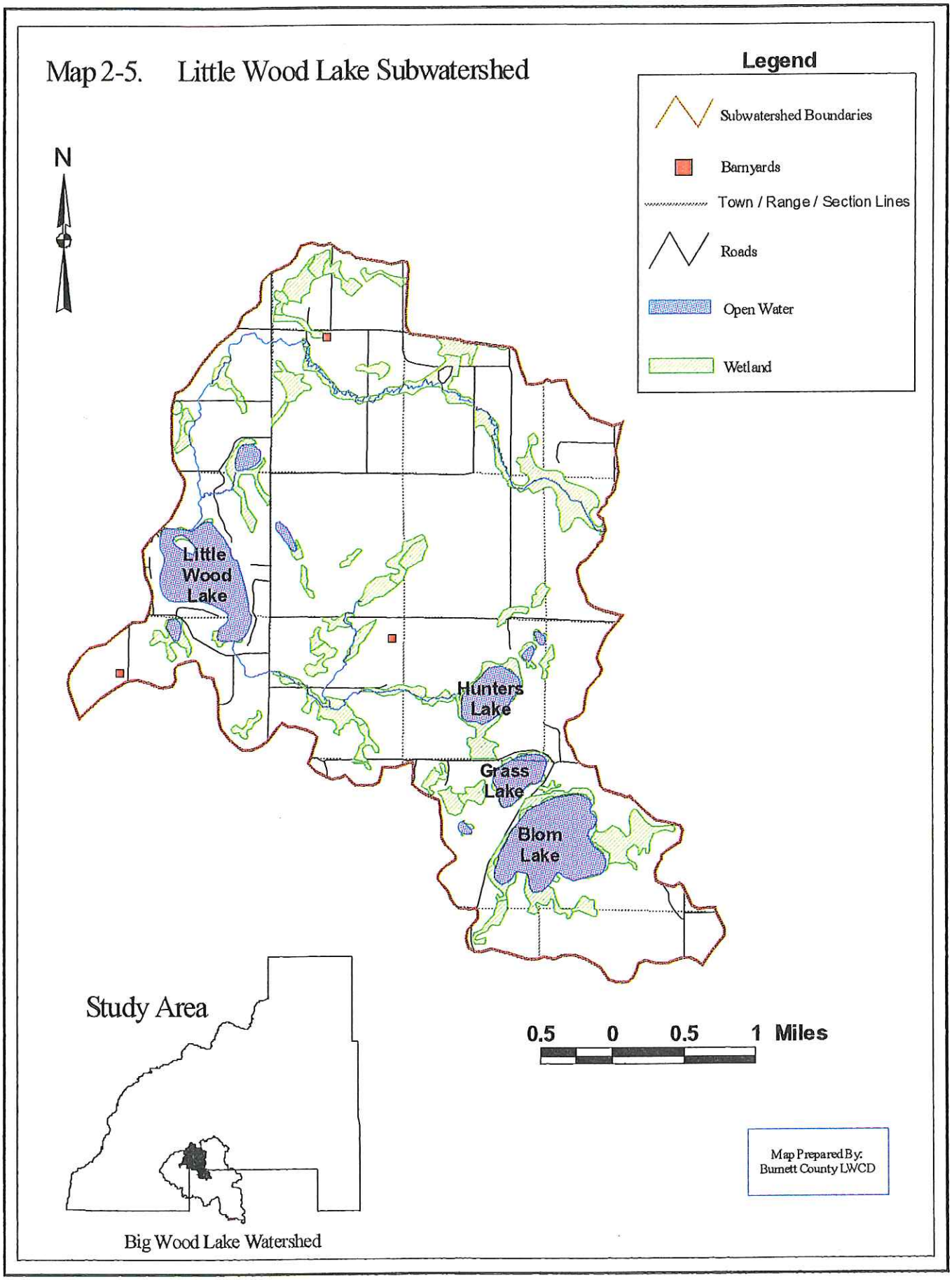
- Improve water quality: Reduce in lake mean summer total phosphorus concentrations from 34 to 31 parts per billion. To reach this goal, a total phosphorus loading reduction of 10% must be achieved.

- Restore functional attributes of shoreline ecosystem: Restore shoreline buffer and habitat, particularly in the priority areas identified in the water quality appraisal report.

- Protect and maintain the aquatic plant sensitive areas in the lake: Protect the aquatic plant sensitive areas as identified in the sensitive area survey report.

- Meet recreational use standards: Reduce the periodic high bacterial levels to less than 400 colonies/100 ml.

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


Map 2-5. Little Wood Lake Subwatershed
Legend
Subwatershed Boundaries
Barnyards
Town / Range / Section Lines
Roads
Open Water
Wetland
N
Little Wood Lake
Hunters Lake
Grass Lake
Blom Lake
Study Area
Big Wood Lake Watershed
0.5 0 0.5 1 Miles
Map Prepared By:
Burnett County LWCD

Big Wood Lake Subwatershed (BW)

Description: The Big Wood Lake subwatershed begins at the outlet of the Wood River from Little Wood Lake and ends at the outlet of the Wood River on Big Wood Lake. The Big Wood Lake subwatershed drains an area of 6,302 acres or 13 percent of the total watershed area.

Dominate land uses include: forested (2,483 acres or 39.4%), mixed agriculture (1,823 acres or 28.9%) and wetlands (1,036 acres or 16.4%).

Though the total acreage of residential shoreline development is relatively small, the direct impacts on buffers and aquatic habitat can be a dominant, limiting factor, hindering the ecological integrity of the Big Wood Lake ecosystem.

Water Quality Conditions: Big Wood Lake is classified as a eutrophic lake and is the major waterbody in this subwatershed. The lake is approximately 520 acres in size, with a maximum depth of 35 feet. Fish species present include northern pike, largemouth bass, bluegills, black crappies, rock bass, pumpkinseed, perch and bullheads. The natural vegetation along much of the developed shoreline has been altered or removed with homes serving as the primary development.

Water clarity in Big Wood Lake is fair, year round with moderate algae blooms during the summer months. A lake wide sensitive area survey has been completed for the lake. The sensitive area report identifies existing sensitive areas and plant species in each of the areas. Information regarding areas that lack adequate shoreline buffers to provide water quality protection against runoff and areas with diminished lakeshore habitat functions are also included in the Big Wood Lake Priority Watershed Water Resource Appraisal.

Nonpoint Source Pollutants:

- Sediment delivery from cropland in the Big Wood Lake Subwatershed is **647 tons** from 1,601 acres, annually, or 16 percent of the entire watershed load.

- Sediment delivery from shoreline erosion in the Big Wood Lake Subwatershed is **1 ton**, annually. This is a result of shoreline development.

- Lakeshore development contributes an estimated **127 pounds of phosphorus** to Big Wood Lake, annually. The close proximity of this pollution source to the water body, makes it a priority.

- The Big Wood Lake Subwatershed contains approximately **269 acres** or prior converted wetlands, which could be targeted for restoration.

- Degraded streambanks contribute **20 tons** of sediment, annually.

- The Big Wood Lake Subwatershed contains **three animal lots**, which contribute **95 pounds of phosphorus**, annually.

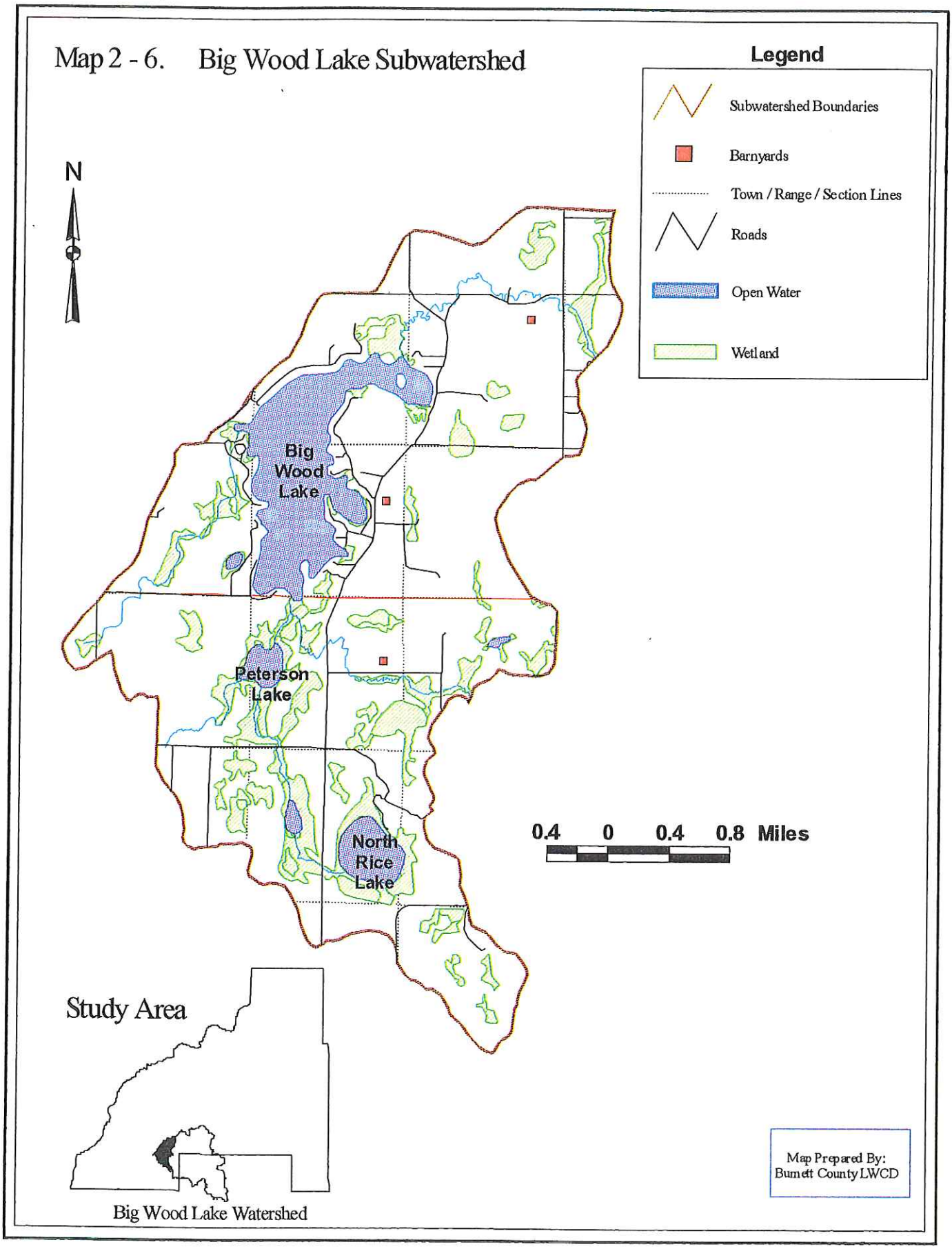
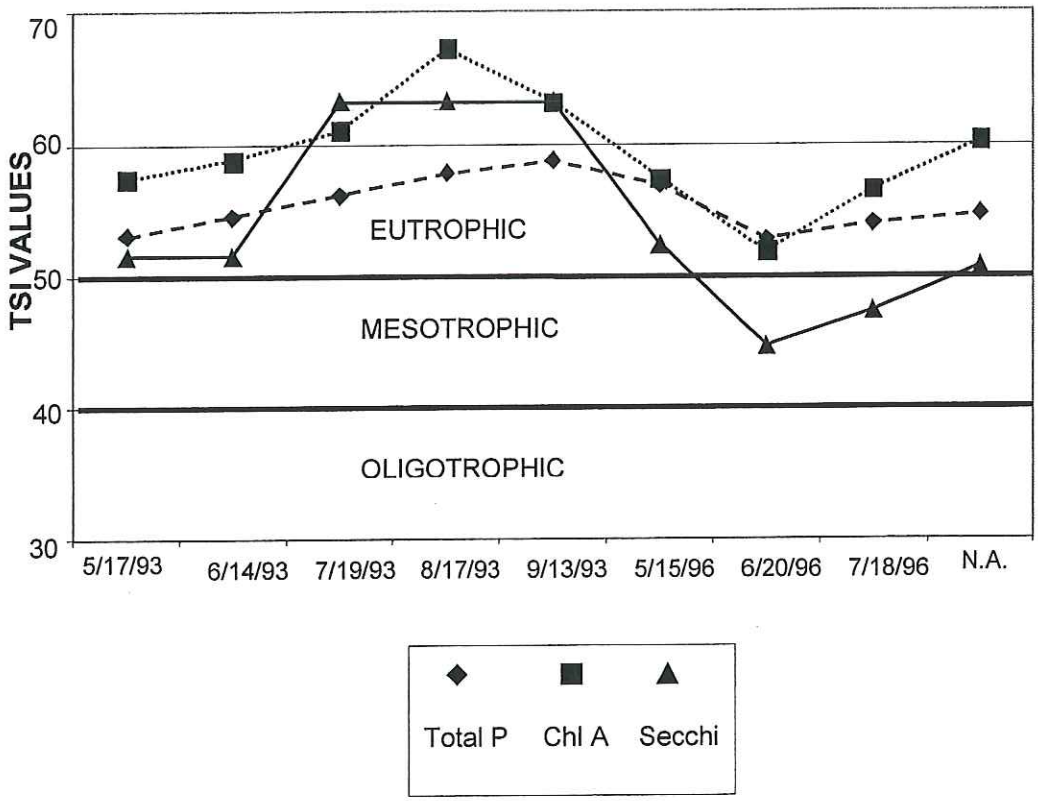

Map 2 - 6. Big Wood Lake Subwatershed
Legend
Subwatershed Boundaries
Barnyards
Town / Range / Section Lines
Roads
Open Water
Wetland
N
Big Wood Lake
Peterson Lake
North Rice Lake
0.4 0 0.4 0.8 Miles
Study Area
Big Wood Lake Watershed
Map Prepared By:
Burnett County LWCD

Figure 2-4. Big Wood Lake TSI Values



Water Resource Goals and Objectives:

- Improve water quality: Reduce in lake mean summer total phosphorus concentrations from 33 to 30 parts per billion. To reach this goal, a total phosphorus loading reduction of 10 percent must be achieved.

- Restore functional attributes of shoreline ecosystem: Restore shoreline buffer and habitat, particularly in the priority areas identified in the water quality appraisal report.

- Protect and maintain the aquatic plant sensitive areas in the lake: Protect the aquatic plant sensitive areas as identified in the sensitive areas survey report.

- Meet recreational use standards: Reduce the periodic high bacterial levels to less than 400 colonies/100mL.

- Improve water quality:
  - Reduce nutrient, sediment and organic matter delivery to Big Wood Lake
  - Stabilize streambanks at critical locations to reduce in-stream sedimentation.

- Improve warm water fishery habitat: Reduce sediment, nutrient and organic loading from watershed streams.

Spirit Lake Subwatershed (SL)

Description: The Spirit Lake subwatershed drains a rather large area beginning with the headwaters of Spirit Creek and the Northwest corner of the Village of Frederic and ends at the outlet of Spirit Lake.

The Spirit Lake subwatershed drains an area of 11,289 acres or 23 percent of the total priority watershed project area.

Dominant land uses include: forested (6,503 acres or 57.6%), mixed agriculture (2,337 acres or 20.7%) and wetlands (1,181 acres or 10.5%).

Though the total acreage of residential shoreline development is relatively small, the direct impacts on buffers and aquatic habitat can be a dominant, limiting factor hindering the ecological integrity of the Spirit Lake ecosystem.

Water Quality Conditions: Spirit Lake is classified as a eutrophic lake and is the major water body in this subwatershed. The lake is approximately 593 acres in size with a maximum depth of 27 feet. Fish species present include northern pike, largemouth bass, bluegills, black crappies, rock bass, pumpkinseed, perch and bullheads. The natural vegetation along the shoreline has been altered or removed with homes serving as the primary development.

Water clarity in Spirit Lake is fair, year round, with moderate algae blooms during the summer months. A lake wide sensitive area survey has been completed for the lake. The sensitive area report identifies existing sensitive areas and plant species in each of the areas. Information regarding areas that lack adequate shoreline buffers to provide water quality protection against runoff and areas with diminished lakeshore habitat functions is also included in the Big Wood Lake Priority Watershed Water Resource Appraisal.

Nonpoint Source Pollutants:

- Sediment delivery from cropland in the Spirit Lake Subwatershed is **1,057 tons** from 1,908 acres, annually or 26 percent of the entire watershed load.

- Sediment delivery from shoreline erosion in the Spirit Lake Subwatershed is **960 pounds**, annually. The erosion is a result of development around Spirit Lake.

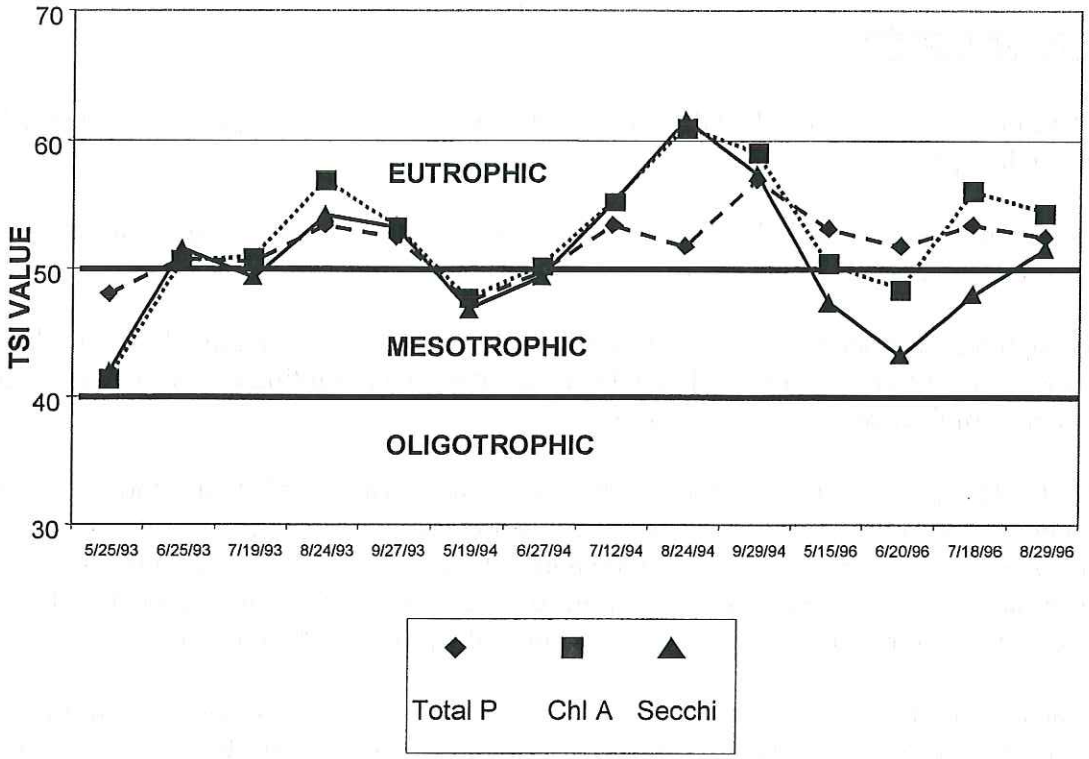
- Lakeshore development contributes an estimated **112 pounds of phosphorus** to Spirit Lake, annually.

- The Spirit Lake Subwatershed contains approximately **967 acres** of prior converted wetland, which could be targeted for restoration.

- Degraded streambanks contribute **3 tons** of sediment to the subwatershed, annually.

- The Spirit Lake Subwatershed contains 13 animal lots, which contribute **642 pounds** of phosphorus, annually.

Figure 2-5. Spirit Lake TSI Values



Water Resource Goals and Objectives:

- Improve water quality: Reduce in lake mean summer total phosphorus concentrations from 17 to 16 parts per billion. To reach this goal, a total phosphorus loading reduction of 10 percent must be achieved.

- Restore functional attributes of shoreline ecosystem:Restore shoreline buffer and habitat, particularly in the priority areas identified in the water quality appraisal report.

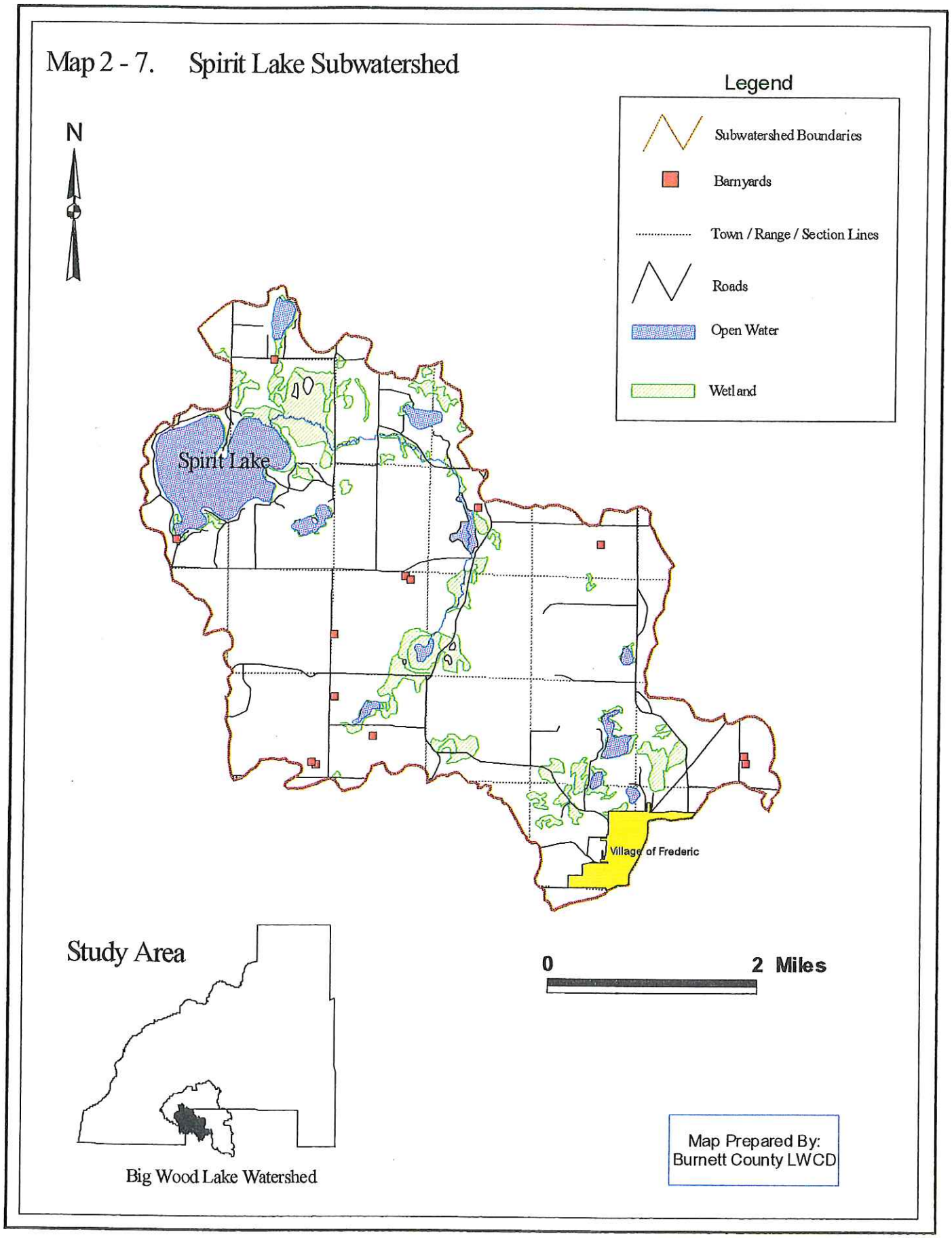

Map 2 - 7. Spirit Lake Subwatershed
Legend
Subwatershed Boundaries
Barnyards
Town / Range / Section Lines
Roads
Open Water
Wetland
N
Spirit Lake
Village of Frederic
0
2 Miles
Study Area
Big Wood Lake Watershed
Map Prepared By:
Burnett County LWCD

Table 2-8. Water Resource Conditions and Objectives for the Major Streams within Each Subwatershed

Sub-watershed	Stream Name	Length (miles)	Biological [1] & Potential [2] Use*	Supporting Potential Use [3]	Limiting Factors [4]	Observed or Potential Sources [5]	Water Resource Goals
Upper Wood River	Wood River	10	WWSF	Partial	SED, HAB, DO, NUT	NPS, CL, BY, RMC	Improve fish habitat and water quality by reducing sediment & nutrient delivery. Maintain or improve riparian buffers.
Lower Wood River	Wood River	10	WWSF	Partial	SED, HAB, DO, NUT	NPS, CL, BY, RMC	Improve fish habitat and water quality by reducing sediment & nutrient delivery. Maintain or improve riparian buffers.
Little Wood Lake	Wood River	5	WWSF	Partial	SED, HAB, DO, NUT	NPS, CL, BY, RMC	Improve fish habitat and water quality by reducing sediment & nutrient delivery. Improve riparian buffers.
Big Wood Lake	Wood River	5	WWSF	Partial	SED, HAB, DO, NUT	NPS, CL, BY, RMC	Improve fish habitat and water quality by reducing sediment & nutrient delivery. Maintain or improve riparian buffers.
Big Wood Lake	Spirit Creek	3	WWSF	Partial	SED, HAB, DO, NUT	NPS, CL, BY, RMC	Improve fish habitat and water quality by reducing sediment & nutrient delivery. Maintain or improve riparian buffers.
Big Wood Lake	Unnamed stream flowing out of Rice Lake, through Peterson Lake and into Wood Lake	2	WWFF	Partial	SED, HAB, DO, NUT	NPS, CL, BY, RMC	Improve fish habitat and water quality by reducing sediment & nutrient delivery. Maintain or improve riparian buffers.
Little Wood Lake	Unnamed stream flowing out of Hunters Lake and into Little Wood Lake	2	WWFF	Partial	SED, HAB, DO, NUT	NPS, CL, BY, RMC	Improve fish habitat and water quality by reducing sediment & nutrient delivery. Maintain or improve riparian buffers.

1 **Biological Use**: This column indicates the existing biological use supported by the stream as defined in NR 102 (04)(3) under fish and aquatic life uses.
COLD – coldwater communities
WWSF – warmwater sport fish communities
WWFF – warmwater forage fish communities
LFF – limited forage fishery (intermediate surface waters)

2 **Potential Biological Use** is the biological use a stream or stream segment could meet if it was well managed and pollution sources controlled. In all of the above subwatersheds, the potential use is the same as the existing biological use. In other areas potential use may be higher than the existing use. The sources of information are indicated by footnotes on each table. The classifications for trout streams came from "Wisconsin Trout Streams" (DNR Publ. 6-3600 [*80].

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

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

5 **Observed or Potential Sources**
NPS - Unspecified nonpoint sources
CL - Cropland erosion
SL - Shoreline erosion
SB - Streambank erosion
PSB - Streambank pasturing
BY - Barnyard or exercise lot runoff
PSM - Point source, municipal treatment plant discharges
PSI - Point source, industrial discharge
NMM - Non-metallic mining (rotten granite/gravel)
UR - Urban runoff
RMC - Road maintenance & construction

Rural Inventory Results, Nonpoint Source Pollutants, Objectives and Cost-Share Eligibility Criteria

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

Management Categories

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

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

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

Critical Management Category (Category I)

Nonpoint sources included in this category contribute a significant amount of the pollutants impacting surface waters. Critical sites are those sites where BMPs must be applied to have a reasonable likelihood of achieving water quality objectives. These sites are designated by both numeric and descriptive criteria.

Nonpoint sources designated as critical are eligible for funding and/or technical assistance through the priority watershed project. The most severe critical sites will receive notification to correct the practices soon after designation. The remaining critical sites will receive notification if voluntary participation fails to meet expectations.

Eligible Management Category (Category II)

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

Ineligible Management Category

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

Barnyard Runoff

Runoff carrying a variety of pollutants from barnyards and other confined livestock areas is a significant source of pollutants, yet it's only a small percentage of the overall phosphorus load. For this reason, low-cost practices will be implemented to achieve a slight reduction in pollutant loads. Twenty-four animal lots are a source of 932 pounds of phosphorus, annually. Most of the oxygen-demanding pollutants and nutrients associated with these operations drain via overland flow to surface water or closed depressions.

The BARNY model was used to estimate pounds of phosphorus from animal feed lots. The objective for barnyard runoff control is to reduce phosphorus loading to surface water by a total of 10 percent. Barnyard sites contributing a phosphorus load greater than 100 pounds per year, will be designated as a critical site for control. Those landowners with an animal lot designated as a critical site for control are eligible for a complete barnyard system, but will only be required to divert upland clean water and roof runoff away from the lot. Installation of these low-cost practices alone will provide the necessary pollutant load reductions in the Big Wood Lake Priority Watershed.

Barnyard sites that contribute between 1 and 99 pounds of phosphorus, annually, will be considered as eligible for cost-sharing, yet essential for participation, in the Big Wood Lake watershed, if the phosphorus reduction objective is to be met. Landowners wishing to participate in the watershed project who have an animal lot that falls within this category may need to address their barnyard as a component of the agreement, based solely on the discretion of the Burnett County Land and Water Conservation Department. The landowner would need only to divert clean upland water and roof runoff away from the animal lot. Barnyard sites contributing zero pounds of phosphorus, annually, will not be eligible for cost-sharing.

Table 2-9. Barnyards Targeted for Runoff Control (75% Landowner Participation)

Subwatershed	Total Phos (lbs)	Management Category I			Management Category II		
		Yards (#)	Control (lbs)	Control (%)	Yards (#)	Control (lbs)	Control (%)
Upper Wood River	53	0	0	0	1	9	17
Middle Wood River	30	0	0	0	2	6	20
Dunham Lake	12	0	0	0	1	0	0
Mud Hen Lake	0	0	0	0	0	0	0
Little Wood Lake	18	0	0	0	2	6	0
Big Wood Lake	12	0	0	0	2	0	0
Spirit Lake	364	2	13	3	4	15	4
Totals	489	2	13	3	12	36	7

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

Internally Drained Barnyards

Internally drained barnyards drain to surface depressions rather than directly to surface waters. Ten internally drained yards were identified in the Big Wood Lake Watershed. Eligibility for cost-sharing for internally drained animal lots is based on a site by site analysis where significant groundwater contamination is determined to be likely.

Where an internally drained lot was not identified during the planning phase, field investigations will be conducted jointly by the county project staff, water resource management staff from the Department's St. Croix Basin Geographical Management Unit Headquarters and staff from the DATCP.

Manure

An inventory will be done to determine critical acres spread with manure for each farm in the Big Wood Lake watershed. Critical acres were defined as those lands which have greater than 6

percent slope or which are in a flood plain and receive manure applications. A complete inventory of critical acres spread with manure during the winter is not available. This inventory will be done at the time of a farm visit.

Manure Storage

Eligibility for a grant for manure storage practices will be based on the Nutrient Management Plan, developed in accordance with NRCS standard 590. A manure storage facility will be considered eligible if the farm operator receives cost-sharing for any item other than those funded under the NPM Educational Program. There is no critical designation for manure storage.

An operation is eligible if the nutrient management plan demonstrates that manure cannot be feasibly managed during periods of snow covered, frozen and saturated conditions without the installation of storage practices. The nutrient management plan must also demonstrate that proper utilization of the manure can be achieved following adoption of the intended storage practice.

The eligibility for storage facilities will be based on the least cost system. These options may include manure stacks (in accordance with Std. 312), short term storage (capacity for 30 to 100 days production in accordance with Std. 313) and long term storage (capacity for up to 210 days production in accordance with Std. 313 or 425).

Landowners receiving cost-sharing funds for manure storage and/or barnyard practices are required to develop a nutrient management plan for those acres that will receive manure applications resulting from these practices. The NRCD Std. 590 nutrient management plan is used to indicate whether a storage facility is needed (see the following section on Nutrient Pest Management). If indicated, cost-sharing will be available for six month storage facilities. If the farmer agrees to apply manure on a more frequent basis during more difficult months, a smaller storage facility can also be constructed.

Nutrient and Pest Management

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

Critical and eligible livestock operations listed in Table 2-9 will be encouraged to participate in an on-farm nutrient and pest management educational program to reduce over application of nutrients and pesticides.

Nutrient and pest management will be addressed with the development of both nutrient management (NRCS Std. 590) and pest management (NRCS Std. 595) plans, soil tests and crop scouting. These plans may be prepared by crop consultants and must be consistent with NRCS Standard 590 and 595. Landowners will be eligible to participate for up to three years and will receive reduced consultant fees. These plans will be submitted to and approved by the Burnett

County Land and Water Conservation Department. Records should be kept showing progress towards reducing the use of fertilizer and pesticides.

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

Rural Sediment

Cropland Erosion

Intensive agricultural practices have caused considerable amounts of eroded soil to reach streams, ponds and wetlands in the Big Wood Lake Watershed. Upland erosion is the major source of the sediments that are carried downstream, beyond individual subwatershed boundaries. Upland sediment sources were evaluated on a field by field basis utilizing the Revised Universal Soil Loss Equation (RUSLE). Sediment delivery to surface water was then estimated using sediment delivery factors. See Appendix A for details of the method used to calculate sediment delivery. The following criteria were used:

Factor	Criteria
0.1	> 450 feet from water
0.2	30-450 feet from water
0.3	< 30 feet from water

An estimated 4,013 tons of soil per year are delivered to wetlands or streams, from cropland. A 10 percent reduction in sediment from eroding fields is targeted for agricultural lands.

To be classified as critical, landowners' fields must be exceeding their tolerable soil loss and have a sediment delivery factor of 0.3 (within 30 feet of surface water). The average sediment delivery rate for all fields in this category is 1.75 tons/acre/year. This category will control an estimated 470 acres of cropland, or 3 percent of the entire watershed sediment load.

An additional 7 percent of the sediment load will be controlled through eligible sites, which includes an estimated 7600 acres. The eligible classification includes those fields with an annual soil loss, exceeding the tolerable soil loss or a sediment delivery greater than 0.

Gully Erosion

Gully erosion has not been identified as a significant problem in this watershed, therefore, a field inventory of gully erosion was not done. Any significant gullies identified during implementation will be evaluated to determine if they are significant sediment sources and eligible for cost-sharing.

Gullies identified as being actively eroding will be classified as eligible for cost-sharing.

Table 2-10. Cropland Targeted for Erosion Control

Subwatershed	Total Sediment Load (tons/yr)	Management Category I			Management Category II		
		# Fields	Control (tons)	Control (%)	# Fields	Control (tons)	Control (%)
Upper Wood River	932	9	9	1	113	30	3
Middle Wood River	545	3	4	1	173	14	3
Dunham Lake	112	2	2	2	43	14	13
Mud Hen Lake	70	0	0	0	40	17	24
Little Wood Lake	650	9	28	4	201	64	10
Big Wood Lake	647	7	22	3	215	43	7
Spirit Lake	1057	17	35	3	185	115	11
Totals	**4013**	**47**	**100**	**3**	**970**	**297**	**7**

Streambank Erosion

Streambank erosion contributes 4 percent of the total sediment to surface waters in the Big Wood Lake Watershed. Approximately 46 miles of streams were evaluated. Significant erosion has occurred and/or aquatic habitat and water quality were degraded along approximately 8 miles of streambank. An estimated 107 tons of sediment are eroding into streams, annually. See Table 2-10 for streambank inventory results.

Critical management areas participants will be those with identified severe erosion sites with a lateral recession rate of greater than 0.5 feet/year. County staff will evaluate site accessibility/feasibility on these sites. One critical erosion site was found during the streambank inventory.

Eligible management streambanks are those with identified moderate lateral recession rates of between 0.1 and 0.5 feet per year, or sites where livestock access is permitted. Ineligible sites are those with slight erosion and lateral recession rates of less than 0.1 feet per year.

Shoreline Erosion

While shoreline erosion on the lakes within the watershed is essentially a natural process caused by wind and wave action, it may be affected by water level fluctuations, human trampling and shoreline land use practices. A shoreline erosion inventory was done during the Spring of 1997. The inventory showed that most of the erosion is caused from bare soil areas in the shoreland zone, due to man-made beaches or other construction activities, which are a result of a lack of enforcement of state and local zoning regulations. Shoreline erosion is estimated to contribute 3 tons, annually to the lakes within the watershed, which is less than one percent of the total sediment delivered to surface water.

Table 2-11. Streambank Erosion and Eligibility Criteria

Sub-watershed	Inventory Results			Eligibility Criteria					
	Inventoried Stream Length (ft.)	Total Sediment Loss (tons/yr)	Percent of total contributed	Critical Sites: Lateral recession > 0.5 ft/yr			Eligible Sites: Lateral recession 0.1 – 0.5 ft/yr		
				# owners: cattle access	feet	tons	# owners: cattle access	feet	tons
Upper Wood River	119,348	38.09	36	0	0	0	7	31,234	36
Spirit Lake	99,838	3.35	3	0	0	0	1	2,980	3
Mud Hen Lake	27,412	0	0	0	0	0	0	0	0
Middle Wood River	54,738	9.13	9	0	0	0	1	3,550	4
Little Wood Lake	24,261	36.24	34	1	260	10	1	2,590	2
Dunham Lake	0	0	0	0	0	0	0	0	0
Big Wood Lake	38,175	20.39	19	0	0	0	1	13,540	20
Total	**363,772**	**107**	**100**	**1**	**260**	**10**	**11**	**53,894**	**65**

While the inventory does not identify shoreline erosion as a major sediment problem, there may be areas where shoreline habitat is being affected where erosion becomes severe.

Critical area sites for shoreline erosion are those with severe erosion. Severe sites have a lateral recession rate greater than 0.5 feet per year. There were no critical sites identified during this inventory, if critical sites are identified during implementation, they will be handled based on this critical criteria.

Eligible area sites are those with moderate erosion. Moderate sites are defined as having a lateral recession rate between 0.1 and 0.5 feet per year.

Pollutant Reduction Goals and Project Objectives for Rural Nonpoint Sources

Goals for water quality in the Big Wood Lake Watershed were identified earlier in the chapter as protection, enhancement and restoration of water resources. In rural areas these will be achieved through project objectives for sediment and phosphorus.

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

Sediment Objective: Reduce overall sediment delivered by 10 percent. To meet this objective, the following is needed:

- 10 percent reduction in sediment reaching surface water from agricultural uplands.
- Reduce sediment from developed lakeshore properties with inadequate buffers, from a high loading rate to a moderate or low loading rate.

Phosphorus Objective: Reduce overall phosphorus load by 10 percent to meet this objective, the following is needed:

- 10 percent reduction in P from barnyards.
- A reduction in P from developed lakeshore, by restoring areas with inadequate buffers.

**Note: In addition to sediment and phosphorus reduction percentages, streambank and shoreline habitat should be restored, where it has been degraded.*

Groundwater Objective: maintain existing groundwater quality. To meet this objective the following is needed:

- Identify and properly abandon unused wells.
- Identify any threats to groundwater quality from nutrient sources such as internally drained barnyards.

Wetland Restoration Objective: Restore altered wetlands, where it will improve water quality and wildlife habitat. To meet this objective the following is needed:

- Identify sensitive areas containing altered wetlands and encourage restorations in conjunction with state and federal programs.

Construction Site Objective: Reduce overall sediment delivered from bare soil areas caused by road, bridge and home construction. To achieve this the following is needed:

- Implement an aggressive educational plan with township and county road crews, teaching the proper methods of erosion control.
- Encourage enforcement of current zoning regulations within the shoreland zone.

Eligibility for Wetland Restoration and Easements

Wetland Restoration

There will be no critical areas for wetland restoration. All altered wetlands will be classified as eligible for restoration.

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

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

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

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

2. Pastured wetlands riparian to streams, or tributaries.

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

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

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

   - All upland fields draining to the wetland must be controlled to a soil loss rate that is less than or equal to the soil's "T" value.

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

Land Easements

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

- Shoreline Buffers: vegetated areas which minimize nonpoint source impacts and other direct impacts to surface water.

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

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

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

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

Easements should be considered in the following situations:

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

   - there is any grazing of wetlands.
   - livestock density is so great that areas of unvegetated soil are within 60 feet of streams or intermittent streams.
   - channel erosion is exacerbated by livestock grazing such that unvegetated streambanks are two feet or more in height.

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

   - Row cropping is occurring within 60 feet or less of streams or intermittent streams.
   - Row cropping is being practiced on slopes greater than 12 percent.

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

   - The eligible wetland restoration is greater than 10 acres in size.

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

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

Ordinances

Manure Storage Ordinance

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

Burnett County enacted an animal waste storage ordinance in 1985. This ordinance applies only to earthen pits. The ordinance is in the process of being replaced by an ordinance that will

encompass manure storage as well as the Animal Waste Advisory Committee Prohibitions, which are as follows:

1) No overflow of manure storage structures
2) No unconfined manure stacking within the Water Quality Management Areas (1000' from a lake, 300' from a river or stream)
3) No direct runoff from feedlots or stored manure to waters of the state
4) No unlimited livestock access to waters of the state, where high concentrations of animals prevent adequate sod cover maintenance

The ordinance could go into effect in time for the 2000 construction season. All counties must have ordinances to control manure or repay all of the NPS grant at the end of the project.

Construction Site Erosion

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

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

The DNR suggests that Wisconsin Construction Site Erosion Best Management Handbook (DNR Publication WR-222-93) be used as a reference for any development that occurs in the Big Wood Lake Watershed Project. A construction site erosion control ordinance will not be a requirement of plan approval, however watershed staff will provide technical assistance for townships to implement erosion control for road and bridge construction. Building construction projects within the shoreland zone are required to implement erosion control as a condition of receiving a building permit.

Other Pollution Sources

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

Industrial Point Sources of Pollution

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

Sewage Treatment Systems

Sanitary sewer service availability is limited throughout the Watershed. Approximately 500 persons, 20 percent of the watershed population, receive service. Wastewater generated by the remainder of the watershed residents is disposed of through private on-site systems.

Municipal Waste Water Treatment Plants

The village of Frederic has a municipal wastewater treatment plant that discharges to closed depressions within the village. The system is scheduled to be upgraded by the year 2003.

Private Sewage Systems

Septic systems consist of a septic tank and a soil absorption field. Septic systems fail due to soil type, location of system, poor design or maintenance, such as tanks which go unemptied.

Pollutants from septic system discharges are nitrates, bacteria, viruses and hazardous materials from household products. Generally, in the watershed, the majority of soils are suitable for conventional septic tank soil absorption systems. Approximately 20 percent of the soils in the watershed, are not suitable for septic tank absorption fields, due to wetness and low infiltration rates. Land spreading of septic system waste during the winter months can also create surface water quality problems.

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

Land Application of Municipal and Industrial Wastes

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

Land application of municipal and industrial sludge is regulated under NR 204 and NR 214 respectively which require a WPDES permit, site criteria, minimum distances from wells,

application rates to ensure that environmental and public health concerns such as proper soil types, depth to groundwater, distance from surface water and type of crop to be grown on sludge amended fields are taken into consideration when the DNR approves agricultural fields for sludge application.

Other Contaminated Sites

The Wisconsin Remedial Response Site Evaluation Report (DNR publication number SW-144-91) lists leaking underground storage tanks, spill sites and other sites which may cause or threaten to cause environmental pollution. A complete list of these sites can be found in Table 2-6.

CHAPTER THREE:
Implementation Program

Introduction

This chapter identifies the means for implementing the management actions for nonpoint source pollution control described in the previous chapter. The success of this priority watershed project depends on the aggressive implementation of these control strategies.

This chapter identifies:

- Best management practices (BMPs) needed to control nonpoint sources of pollution
- Cost containment policies
- Cost share agreement procedures
- Schedules for implementing the project
- The estimated project budget for cost-sharing, staffing and other support

Best Management Practices Eligible for Cost-Sharing and their Rates

Best management practices control nonpoint sources of pollution and are identified in NR 120 and NR 154. The practices eligible for cost-sharing and the cost-share rates for each BMP are listed in Tables 3-1 and 3-2 below.

Design and installation of all BMPs must meet the conditions listed in NR 120 and NR 154. Generally these practices use specific standard specifications included in the NRCS Field Office Technical Guide. In some cases additional specifications may apply. The applicable specifications for each BMP can be found in NR 154.03. The Department may also approve other alternative best management practices and design criteria based on the provisions of NR 120.15.

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

Table 3-1. Practices Using a Flat Rate for State Cost-Share Funding

Best Management Practice	Flat Rate
Contour Farming	$ 9.00/ac [1]
Contour Stripcropping	$ 13.50/ac [1]
Field Stripcropping	$ 7.50/ac [1]
High Residue Management	$ 18.50/ac [2]
Cropland Protection Cover	$ 25.00/ac [3]

1 Wildlife habitat restoration components of this practice are cost-shared at 70%
2 Up to six years
3 Up to three years

Following is a brief description of some of the most commonly used BMPs listed above. A more detailed description of these practices can be found in NR 154.03.

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

Animal Lot Relocation: Relocation of an animal lot from a critical site such as a floodway to a suitable site to minimize the amount of pollutants from the lot to surface or groundwater; or abandonment of the lot without relocation.

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

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

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

Table 3-2. State Cost-Share Rates for Best Management Practices

Best Management Practice	State Cost-Share Rate
Nutrient and Pesticide Management	50%
Pesticide Handling Spill Control Basins	70%
Livestock Fencing	50%
Intensive Grazing Management	50% [1]
Manure Storage Facilities	70% and 50% [2]
Animal Waste System Storage Abandonment	70%
Field Diversions and Terraces	70%
Grassed Waterways	70%
Critical Area Stabilization	70% [3]
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Shoreline and Streambank Stabilization	70% [3]
Shoreline Buffers	70% [3]
Wetland Restoration	70% [3]
Barnyard Runoff Management	70%
Barnyard Abandonment and Relocation	70%
Roofs for Barnyard Runoff Management and Manure Storage Facilities	70%
Milking Center Waste Control	70%
Cattle Mounds	70%
Well Abandonment	70%
Structural Urban BMPs	70% [4]
Shoreland Habitat Restoration	70%
Lake Sediment Treatment	70%

1 To a maximum of $2,000 per watering system

2 Manure storage is cost-shared at 70% for the first $20,000 and at 50% for the remaining cost, not to exceed $35,000.

3 Easements may be entered into with landowners identified in the watershed plan in conjunction with these BMPs. See Chapter Two for an explanation of where easements may apply.

4 The maximum cost-share rate for land acquisition, storm sewer rerouting and removal of structures necessary to install structural urban BMPs is 50%.

Contour Stripcropping: growing alternating strips of row crops and grasses or legumes on a contour.

Critical Area Stabilization: Planting suitable vegetation on nonpoint source sites and other treatment necessary to stabilize eroding lands.

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

Easements: Easements are 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 a safe outlet in another area.

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 Management: a system which leaves at least 30 percent of the ground covered with crop residue after crops are planted. It is utilized in two situations; one for continuous (at least 3 consecutive years) row crops, the other for short crop rotations (no more than 2 years corn and small grains and hay) or for the establishment of forages and small grains.

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

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

Livestock Fencing: The exclusion of livestock from woodlots, wetlands, streams, or lakes to protect an area from grazing by fencing or to prevent nonpoint source pollution.

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

Manure Storage System Abandonment: Manure storage system abandonment is the proper abandonment of leaking and improperly 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 which has documented reports of discharging manure

into surface or groundwater due to structural failure; and a system where there is evidence of structural failure. The practice includes proper removal and disposal of wastes, liner materials and saturated soil as well as shaping, filling and seeding of the area.

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

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

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

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

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.

Shoreland Habitat Restoration: The establishment of a shoreline buffer zone of native vegetation that extends inland and lakeward from the ordinary high water mark. The shoreline habitat restoration design seeks to restore the functions provided by the original, natural vegetation and includes a mixture of native trees, shrubs, ground cover or wetland species.

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

Terraces: a system of ridges and channels with suitable spacing and constructed on the contour with a suitable grade to prevent erosion by runoff waters.

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

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

Alternative Best Management Practices

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

Practices Not Cost-Shared

Practices not cost-shared, but which shall be included on the cost-share agreement if necessary to control the nonpoint sources, are listed below (as listed in NR 120.176):

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

Activities and Sources of Pollution Not Eligible for Cost-Share Assistance

Priority watershed cost-share funds cannot be used to control sources of pollution and land management activities specifically listed in NR 120.17(2). The following is a partial list of those ineligible activities:

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

Rural Implementation Program

Rural Area Roles and Responsibilities

Landowners and Land Operators: Owners and operators of public and private land are important participants in the program. They will adopt BMPs to reduce nonpoint sources of water pollution and enhance fish, wildlife and other resources.

Burnett County: Burnett County is the primary unit of government responsible for implementing this plan. The Burnett County Land and Water Conservation Committee will act for the Burnett County Board and will be responsible contractually and financially for management of the project in rural areas.

The Land and Water Conservation Department will carry out implementation of the program including contacting landowners, developing farm plans and practice designs, administering cost-share agreements and conducting the information and education program. The LWCD will track project progress and participate in project review meetings.

Polk County: Polk County Land and Water Resources Department will not be directly involved with project administration, however, they will offer technical assistance for implementing conservation practices.

Department of Natural Resources: The DNR is responsible for overall administration of the Nonpoint Source Program in the state. Their responsibilities include monitoring project progress, providing financial support and guidance and providing technical assistance.

Other Agencies: Other state and federal agencies including the Department of Agriculture, Trade and Consumer Protection, the University of Wisconsin Extension, the Natural Resource Conservation Service and the Farm Service Agency will provide assistance in administering the watershed program.

Cost-Share Budget

Costs of Installing BMPs

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

The capital cost of installing the Best Management Practices is approximately $ 1,438,127.00, assuming 75 percent participation.

- State funds necessary to cost-share this level of control would be approximately $ 1,034,589.00.
- The local share provided by landowners and other cost-share recipients would be approximately $ 403,538.00.

Easement Costs

Chapter Two identifies where nonpoint source program funds can be used to purchase easements. The estimated cost of purchasing easements on eligible lands in the watershed is shown in Table 3-3. At 75 percent participation, the estimated purchase price of easements on eligible lands would be $75,000.00. Easements are funded at the 100 percent level and will be purchased by the DNR.

Cost Containment Procedures

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

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

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

Flat Rates: BMPs using flat rates are shown in Table 3-1. The rates shown are the State's share of the practice installation costs.

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

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

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

Table 3-3. Cost-Share Budget Needs for Rural Management Practices in Burnett County (Assuming 75% Landowner Participation)

Best Management Practice	Number	Cost/Unit ($)	Total Cost @ 100%	State Share	Local Share [1]
Upland Control					
Change in Crop Rotation (ac)	3,000	NA	0	0	0
High Residue Management (ac) [1, 2]	3,000	18.5	277,500	208,125	0
Cropland Protection Cover (ac) [1] (Green Manure)	500	25	12,500	9,375	0
Intensive Grazing Management (Rotational Grazing)	1	4,000	4,000	1,500	1,500
Critical Area Stabilization (ac)	60	500	30,000	15,750	6,750
Grassed Waterways (ac)	20	3,500	70,000	36,750	15,750
Field Diversions and Terraces (ft)	1,200	15	18,000	9,450	4,050
Grade Stabilization	10	8,000	80,000	42,000	18,000
Agricultural Sediment Basins	10	12,500	125,000	65,625	28,125
Shoreline Buffers (ac)	175	300	52,500	27,563	11,813
Nutrient Management (ac) [3]	10,000	6	180,000	67,500	67,500
Pest Management (ac) 3	10,000	4	120,000	45,000	45,000
Spill Control Basin	1	15,000	15,000	7,875	3,375
Wetland Restoration	10	500	5,000	2,625	1,125
Livestock Fencing (ft)	5,000	1	5,000	1,875	1,875
Shoreland Habitat Restoration	150	2,000	300,000	157,500	67,500
Lake Sediment Treatment (TBD)		TBD			
Animal Waste Control					
Complete Barnyard System or Abandonment and Relocation	2	25,000	50,000	26,250	11,250
Rood Gutters	10	2,500	25,000	13,125	5,625
Clean Water Diversion	10	5,000	50,000	26,250	11,250
Manure Storage Facility [4]	2	65,000	130,000	54,750	42,750
Manure Storage Facility Abandonment	10	10,000	100,000	52,500	22,500
Cattle Mounds	2	3,000	6,000	3,150	1,350
Milking Center Waste Control	2	7,000	14,000	7,350	3,150

Streambank Erosion Control					
Shape and Seeding (ft)	2,000	12	24,000	12,600	5,400
Fencing (ft)	20,000	1	20,000	10,500	4,500
Rock Riprap (ft)	1,000	30	30,000	15,750	6,750
Bio Riprap (ft)	1,000	25	25,000	13,125	5,625
Crossing	5	2,500	12,500	6,563	2,812
Remote Watering System	10	2,000	20,000	10,500	4,500
Miscellaneous					
Well Abandonment	30	550	16,500	8,663	3,713
Subtotal			1,817,500	959,589	403,538
Easements (ac)	40	2,500	100,000	75,000	0
Total			**1,917,500**	**1,034,589**	**403,538**

Source: Wisconsin DNR and Burnett County
1 Local Share included labor and equipment costs. Also see flat rates in Table 3-1.
2 High Residue Management is cost-shared per acre over a six year period.
3 Nutrient and Pest Management is cost-shared per acre over a three year period.
4 Manure storage is cost-shared at 70% for the first $20,000 of cost and at 50% for the remaining cost, not to exceed $35,000.

Cost-Share Agreement and Contact Strategy

Money for cost-share agreements is distributed by the Burnett County LWCD from a Nonpoint Source Grant provided by the DNR. Burnett County receives additional grant money to support administrative responsibilities. Cost-share agreements are binding contracts between landowners and the Burnett County LWCD. Landowners must meet eligibility requirements defined in Chapter Two.

The following procedure will be used to make landowner contacts:

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

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

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

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

Critical Site Notification Process

The following procedure will be used for critical site notification:

- Project staff will begin to contact the landowners of sites that have been designated as "critical" immediately after plan approval to begin the critical site verification process. All critical site contacts will be completed within six months after plan approval (plan approval is the same as the date on which the project receives the Nonpoint Source Grant). The department may allow up to three, 90 day extensions beyond the six month period to allow the county sufficient time to verify that all sites meet the critical site criteria. The department may also allow extensions if the project sponsor's ACRA is insufficient for installation of practices necessary for critical sites. The county shall make an extension request to DNR, in writing, which includes the reasons to support an extension.

- After critical site verification, the project staff will send a report to DNR that states that each site meets the critical site criteria or has changed status according to NR 120.09(6), Adm. Code. The reasons for these conclusions will be included in the report. Documentation of site visits and additional information will be maintained at the LWCD offices and will be available for inspection upon request.

- Following receipt of the report, DNR has 60 days to send critical site notification letters to landowners.

- Critical site notification must be completed within five years of the plan approval.

Critical Site Appeals Process

The owner or operator of a site designated as a critical site may appeal the critical site designation to the Burnett County Land and Water Conservation Committee. The site owner or operator, now called the appellant, must write to the LWCC and ask for an informal hearing. The appeal request must be received by the LWCC within 60 days of the day that the notification letter was received by the owner or operator.

The Land and Water Conservation Committee shall:

- Provide the appellant with a hearing and give reasonable notice of the hearing to the appellant, the DNR and DATCP.
- Conduct the hearing as an informal hearing. Chapter 68.11(2) Wis. Stats, does not apply to this hearing.
- Hold the hearing in a place that is convenient for the appellant.

The appellant and project staff will present information about the site so the LWCC members may make a decision. Representatives of DNR and DATCP may attend the hearing. DNR is required to submit a report and recommendation to the LWCC within 60 days after the hearing. DATCP has the option to submit a report and recommendations within 60 days.

The LWCC shall provide a decision, in writing, within 45 days of receiving:

- The DNR and DATCP reports and recommendations
- The notification by the DNR and DATCP that no report or recommendations would be submitted, or
- The conclusion of the 60 day period following the hearing

The LWCC may support or overturn the designation of the critical site. To make its decision, the LWCC shall consider whether or not the critical site designation is consistent with the critical site criteria established in the project's priority watershed plan. The LWCC shall also consider whether the verification of the site and the site management is adequate. Loss of profit is not grounds for support of an appeal. Violations by, or appeals granted to, other appellants shall not justify support of an appeal.

The owner or operator of a site designated as a critical site may request a review of the LWCC decision by filing a written request with the Land and Water Conservation Board within 60 days after receiving the decision of the Burnett County LWCC.

The owner or operator of a site designated as a critical site may request a contested case hearing under Chapter 227 to review the decision of the Land and Water Conservation Board by filing a written request with the DNR within 60 days after receiving an adverse decision by the LWCB.

Rural Budget and Staffing Needs

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

Staff Needs and Costs

Table 3-4. lists the total estimated staff needed to implement the project assuming a 75 percent level of participation by eligible landowners. A total of approximately 18,970 staff hours are required to implement this plan. This includes 6,000 staff hours to carry out the information and education program.

Currently, one position is being funded for the Big Wood Lake Watershed Project. The Burnett County Land and Water Conservation Department will determine the need for additional staff based on the annual Workload Analysis and pursue contracts to acquire the extra staff time.

The estimated cost for staff at the 75 percent participation rate (see Table 3-4.) is approximately $ 330,240. These costs will be paid by the state through the Local Assistance Grant Agreement.

Table 3-4. Estimated Burnett County LWCD Staff Needs for Project Implementation (Based on 75% Landowner Participation Through a 6-Year Implementation Schedule)

Activity	Staff Hours
Project and Financial Management	3,600
Information and Education Program	6,000
Pre-Contact Office Inventory; Landowner Contracts and Progress Tracking	720
Conservation Planning and Cost-Share Agreement Development	3,000
Plan Revisions and Monitoring	250
Practice Design and Installation	
Upland Sediment Control	3,600
Animal Waste Management	500
Streambank Erosion Control	500
Easements	200
Training	600
Total Burnett County LWCD Workload:	**18,970**
Estimated Staff Required per year	**1.6**
Hours per year	**3,162**

Source: DNR and the Burnett County LWCD

Implementation Schedule

Project Cost

The state funding required to meet the rural nonpoint source pollution control needs at a 75 percent level of landowner participation is presented in Table 3-3. The estimated cost to the state for practices is $ 1,034,589. The estimated cost to landowners and others is $ 403,538. This figure includes the capital cost of practices and easement costs as presented above. The total cost of plan implementation, including staff support costs, is expected to be approximately $1,910,927.

These costs are based on projections from agency planners and local staff. Historically, the actual expenditures for projects are less than the estimated costs. The factors affecting

expenditures for this watershed project might include: the participation rate, the amount of cost-sharing that is actually expended, the number of staff working on the project and the amount of support costs.

Grant Disbursement and Project Management Schedule

Implementation of this watershed project will begin following approval of this plan and receipt of the Nonpoint Source Grant. This plan has been approved by WDNR, the Burnett County Land and Water Conservation Department, the Burnett County Board of Supervisors and the Wisconsin Land and Water Conservation Board.

The project implementation period is from September 2000 to December 2007. Cost-share agreements may be signed with eligible landowners during implementation and will end on December 31, 2006. Practices listed on any cost-share agreement must be installed before the end of the implementation phase. The implementation phase of this project is scheduled to conclude in 2007.

The initial Nonpoint Source Grant will cover the cost of practices over the entire implementation phase. The amount of the rural Nonpoint Source Grant is calculated at 75 percent participation by eligible landowners. Grants may be amended due to changes needed for time of performance, funding levels, or scope of work.

Local Assistance Grants will be disturbed annually to Burnett County to cover the costs of personnel, operating expenses and equipment. The DNR will evaluate each annual workload analysis and grant application.

Table 3-5. Cost Estimates for the Big Wood Lake Priority Watershed Project (75% Landowner Participation)

Item	State Share	Local Share
Cost-Share Funds: Practices	1,034,589	403,538
Cost-Share Funds: Easements	75,000	0
Local Assistance Staff Funding	196,800	0
Information and Education Direct	30,000	27,000
Other Direct (travel, supplies, etc.)	15,000	9,000
Engineering Assistance	60,000	0
Professional Services	60,000	0
Total	**1,471,389**	**439,538**
Total Project Cost	**1,910,927**	

Source: Wisconsin DNR, DATCP, Burnett County LWCD

CHAPTER FOUR:
Integrated Resource Management Program

Introduction

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

Fisheries and Wildlife Management

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

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

Wetland Restoration

Significant amounts of restorable wetlands have been identified in the Big Wood Lake Watershed. There are several funding sources for restoring wetlands within the project area. These include, Partners for Fish and Wildlife, the Wetlands Reserve Program (WRP), Wildlife Habitat Incentive Program (WHIP) and the Conservation Reserve Program (CRP). County staff will work cooperatively with NRCS, USFWS and DNR to contact eligible landowners and promote wetland restoration.

The general guidelines for wetland restoration, easement acquisition and shoreline buffers to protect existing wetlands should be followed. Wetlands that are important wildlife habitats will

be identified in consultation with DNR Wildlife Management and Water Management personnel. Shoreline buffer easements may be acquired adjacent to these wetlands to offer better protection from sedimentation and other nonpoint source pollution.

Groundwater Management

Wells provide a direct conduit for pollutants to reach groundwater resources. Preventing well contamination and sealing abandoned wells are important steps for protecting these resources. If not properly sealed, abandoned wells can directly channel contaminated surface water or shallow groundwater into deeper drinking water aquifers, by-passing the normal purifying action that takes place as surface water slowly percolates downward. Abandoned wells are a significant threat to groundwater quality in the Big Wood Lake Watershed. Cost-sharing is available through this watershed plan for properly abandoning unused wells. Burnett County LWCD will encourage all landowners to properly seal abandoned wells. Information on the proper abandonment procedures will be provided to landowners when abandoned wells are located.

Wisconsin Well Compensation Grants

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

Private Sewage System Maintenance and Rehabilitation

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

Burnett County staff will prepare educational materials to promote the proper maintenance of private sewage systems. Sewage system maintenance and household tips to reduce groundwater contamination will also be stressed during fields visits.

Wisconsin Fund

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

Burnett County staff will inform watershed residents about the benefits of the Wisconsin Fund grant program and encourage eligible landowners to apply.

Riparian Zones

Cattle access to streams and lakes has not been identified as a serious problem in the watershed. Any sites impacted by cattle access that are identified during the implementation phase of the project should be protected with BMPs. Sensitive riparian areas can be acquired through easements so they receive lasting protection.

Shoreline Habitat Restoration

The new Shoreline Habitat Restoration BMP will be used in this project to restore wildlife and fishery shoreline habitat as well as enhance shoreline aesthetics and reduce nutrient loading from runoff on developed lake lots. Burnett County has also implemented a new Shoreline Preservation Program, which places a permanent covenant on land and offers a tax incentive to landowners who keep a natural shoreline. This program will offer an extra incentive to riparian landowners.

Lake Management

The DNR Lake Management Planning Grant Program (NR 190) and the Lake Management Protection Grant Program (NR 191) will be coordinated as potential funding sources to develop specific lake management plans and/or fund eligible lake protection practices.

The Lake Management Planning Grant Program has two funding cycles in each calendar year. Grant applications must be received by the regional lake management coordinator in Spooner, by May 1, annually. The four active lake associations will set their own priorities for lake planning grants. The Burnett County LWCD will assist with the development of grant applications.

Stewardship

The stewardship program enables the purchase of land or easements to protect sensitive environmental areas. The streambank protection program under stewardship is an important additional means of protecting water quality. Under this program, the DNR could obtain an easement on both sides of streams in the watershed (generally 66 feet wide on each side). If needed, the DNR will financially support the fencing of the stream to protect it from livestock access. There are no watershed streams currently eligible for stewardship protection.

Forestry Programs

Private forest lands, which account for over 25,000 acres within the Big Wood Lake Watershed, are important producers of forest products in Burnett County. Private forest lands also contribute to the quality of water resources and fish and wildlife resources in the watershed. Financial assistance is available for forest management and soil and water resource protection through the Managed Forest Law Program (MFL) and other forest stewardship programs. Additional information can be found in DNR publication FR-093-95, Wisconsin Forestry Best Management Practices For Water Quality, developed by DNR Bureau of Forestry. Management of private

forested land, has not been identified as a significant source of nonpoint source pollution in the watershed.

Managed Forest Law

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

Other Stewardship Programs

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

Burnett County staff and DNR Foresters will encourage eligible forest landowners in the Big Wood Lake Watershed to participate in Forest Stewardship Programs to benefit water resources and forest habitat. Protection of soil and water resources should be addressed in all MFL plans where applicable.

Coordinating Regulations, Permits and Zoning

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

The LWCD will work closely with the DNR Water Regulation and Zoning staff, the Burnett County Zoning and the US Army Corps of Engineers to assure that necessary permits are received prior to the installation of shoreline stabilization practices.

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

Burnett County LWCD will work in cooperation with the Property Listing Department, Zoning Department and the DNR to provide information packets to new waterfront property owners throughout Burnett County to educate residents about the existence of zoning regulations and the proper contacts to make within each agency. The guides will also educate lakefront residents about the steps they can take to become responsible lake stewards.

Coordination with State and Federal Conservation Compliance Programs

The Big Wood Lake Watershed Project will be coordinated with the conservation compliance features of the Wisconsin Farmland Preservation Program (FPP) administered by DATCP and the Federal Food Security Act (FSA) administered by the Natural Resource Conservation Service. DATCP will assist the LWCD and the NRCS offices to identify landowners within the watershed that are subject to the compliance provisions of FPP and FSA. Conservation Farm Plans were completed for all landowners in FSA by December 31, 1989. There are six FPP plans and 266 FSA plans within the watershed project.

Implementation and amendment of these conservation plans will be necessary during the implementation phase of the watershed project. Watershed project staff will inform FPP and NRCS staff of changes in plans resulting from management decisions and the installation of needed BMPs for nonpoint source pollution abatement.

Archaeological Sites: Coordination with State and Federal Historic Preservation Laws

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

Before finalizing the cost-share agreement with the landowner, project staff will call the state archeologist (Dr. Victoria Dirst) to determine if there is a known site that occurs within the vicinity of a proposed BMP, this does not necessarily mean the BMP needs to be moved or altered. In some cases, the specific location of the BMP will not actually be near enough to the location of the known site to warrant further review. Project staff should visit the area and conduct a "prereview" to ensure that the specific location of the proposed BMP will not disturb the known archeological or historic site. Instructions and Cultural Resource Site Review Documentation forms are available in the implementation Manual. Any costs incurred as a part of a site review will not be passed on to the landowner. The DNR's Nonpoint Source Pollution Abatement Program will pick up the costs of professional historic and/or archeological site reviews. In some cases, a representative from the U.S. Natural Resources Conservation Service (NRCS) may conduct the review.

Practices of concern:

Field Diversions
Terraces
Grade Stabilization Structures
Agricultural Sediment Basins
Streambank and Shoreline Stabilization
Sediment Retention, Erosion or Water Control Structures

Structural Urban Practices
Wetland Restoration
Buildings
Barnyard Runoff Management Systems
Animal Lot Relocation
Manure Storage Facilities
Roofs for Barnyard/Manure Storage Facilities

Practices of no concern:

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

Endangered and Threatened Resources

Information on threatened and endangered resources was obtained from the Bureau of Endangered Resources of the DNR. Endangered resources include rare species and natural communities. It should be noted that comprehensive endangered resource surveys have not been completed for the entire Big Wood Lake Watershed. The lack of additional occurrence records does not preclude the possibility that other endangered resources are present in the watershed. In addition, the Bureau's endangered resource files are continuously updated from on-going field work. There may be other records of rare species and natural communities which are in the process of being added to the database and so are not listed in this document.

Rare Species

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

Wisconsin Endangered Species

An endangered species is one whose continued existence as a viable component of this state's wild animals or wild plants is determined by the DNR to be in jeopardy on the basis of scientific evidence.

Wisconsin Threatened and Special Concern Species

A threatened species is one which, if not protected, has a strong probability of becoming endangered. Wisconsin threatened species within the watershed are:

Clemmys insculpta, Wood Turtle; sited during 1997 field surveys on the Wood River

Wisconsin Special Concern Species:

A special concern species is one for which some problem of abundance or distribution is suspected in Wisconsin, but not yet proven. The purpose of this category is to focus attention on certain species before they become endangered or threatened. Wisconsin special concern species within the watershed are:

Scirpus torreyi, Torrey's bulrush
Haliaeetus leucocephalus, Bald Eagle
Fundulus diaphanous, Banded killifish
Notropis texamus, Weed Shiner

Natural Areas

Natural areas are sites that contain high quality examples of natural communities. No specific natural areas have been identified, however there are several large wetland tracts, under private ownership, which should be targeted for preservation.

If specific locational or other information is needed about these species or natural communities, contact the Bureau of Endangered Resources, DNR. Please note that the specific location of endangered resources is sensitive information. Exact locations should not be released or reproduced in any publicly disseminated documents.

CHAPTER FIVE:
Information and Education Activities

Goal

The goal of the Big Wood Lake Priority Watershed Project Information and Education Program is to help watershed residents develop a sense of responsibility and ownership for the water resources and water resource problems in the watershed and assume responsibility for improving these aquatic resources.

The information and education strategy is built around seven key issues for improving and preserving water quality in the Big Wood Lake Priority Watershed:

Shoreland Development
Agricultural Soil Erosion
Wetlands Protection
Watershed Project Awareness
Construction Site Erosion Control
Agricultural Nutrient and Pest Management
Groundwater Quality Protection

Implementation Team

The educational strategy was developed by Burnett County staff, with assistance from the Watershed Citizens' Advisory Committee, UW Extension, DNR and the Land and Water Conservation Committee.

The LWCD will take lead responsibility for the implementation of the information and education strategy. A work plan will be developed, annually. The University of Wisconsin Cooperative Extension (UWEX), the Department of Natural Resource (DNR), and the Department of Agriculture (DATCP) will provide supporting assistance. The LWCD will work with and seek support from local units of government and organizations such as townships, lake rehabilitation districts, villages, lake associations and other community groups and businesses.

Strategy

Issue: ***Shoreland Development***

Topics: Restoring shoreland habitat in areas where it has been lost.
Protecting existing shoreland and aquatic habitat.

Target Audiences: Property owners:
Shoreland property owners
Lake Districts and Lake Association members
Local Government:
County Zoning Committee and Board of Adjustment members

County Zoning Department staff
Long Range Planning Committee members
County Board members
Village and Town Board members

Building trades and real estate:
Home builders / contractors
Landscapers
Architects / home designers
Real estate agents
Developers
Building supply companies
Garden shops and hardware stores

Key messages:

1. Don't use phosphorus lawn fertilizer if you don't need to.
2. "Edit" shoreland vegetation for views instead of clearing large areas.
3. Shoreland vegetation is important habitat for land and water wildlife.
4. Infiltrate and filter runoff as much as possible.
5. Disturb the minimal amount of land when building.
6. Maximize construction site erosion control.
7. Certain wildlife need large blocks of habitat – avoid fragmentation.
8. Deed restrictions can assure shoreland protection after property is sold.

Issue: ***Construction Site Erosion Control***

Topics:
Home construction
Commercial construction
Road and bridge construction

Target Audiences:

Property owners:
Those building or having homes built
Businesses undergoing construction
Lake Districts and Lake Association members

Local Government:
County Board members
Village and Town Board members
County Zoning Department staff
Town and County road crews

Building trades and real estate:
Builders / contractors / engineering consultants
Landscapers
Architects / house designers
Real estate agents
Developers

Key messages:

1. Sediment clogs streams and fills lake bottoms.

2. Sediment is a source of nutrients that "greens up" lakes.
3. Sediment directly and indirectly damages fish and wildlife.
4. Erosion control is not complicated, but requires diligence and dedication to be successful.
5. Those having construction being done should make erosion control a priority.
6. Key to effective construction site erosion control is keeping the soil covered and trapping sediment before it leaves the site.

Issue: ***Agricultural Soil Erosion***

Topics:
Erosion from cropland
Streambank erosion

Target audiences:
Property owners:
Farm owners and renters

Ag-business:
Farm supply businesses
Crop consultants
Farm equipment dealers
Ag lenders (bankers)

Key messages:
1. Sediment clogs streams and fills in lake bottoms.
2. Sediment is a source of nutrients that "greens up" lakes.
3. Sediment directly and indirectly damages fish and wildlife
4. Erosion control is not complicated, but requires diligence and dedication to be successful.
5. Growing close grown crops and pasture reduces erosion.
6. Keeping soil covered with crop residue reduces erosion.
7. Erosion caused by concentrated flow can be reduced through the use of waterways, diversions and water control structures.
8. Streambank erosion can be controlled by lowering stream flows and by protecting streambanks with plants, brush or rock.

Issue: ***Agricultural nutrient and pesticide management***

Topics:
Manure management
Commercial fertilizer use
Pest management and pesticide use

Target audience:
Property owners:
Farm owners and renters

Ag-business:
Farm supply businesses
Crop consultants

Farm equipment dealers
Ag lenders (bankers)

Key messages:

1. Make full proper use of "home grown" nutrients.
2. Apply fertilizer according to soil tests and crop need.
3. Excess manure can be either stored, traded to another farm or applied to newly cut hay.
4. Apply pesticides based on scouting information and crop tolerance.

Issue: ***Wetland Protection***

Topics:

Restoring degraded wetlands
Protecting existing wetlands

Target audiences:

Property owners:
Landowners with wetlands

Local Government:
County Board members
Village and Town Board members
County Zoning Department staff
Town and county road crews

Building Trades and Real Estate:
Builders / contractors / engineering consultants
Landscapers
Developers

Key messages:

1. Wetlands capture, store and infiltrate runoff water.
2. Wetlands filter runoff water.
3. Wetlands provide special and needed habitats.
4. Wetlands should be protected and restored.

Issue: ***Groundwater quality protection***

Topics:

Protecting private water supplies
Protecting community water supplies

Target audience:

Property owners:
Landowners with private wells
Landowners in community well zones

Community water supply users / operators
Town and Village Board members

Key messages:

1. We all depend on groundwater for our drinking water.

2. The source of our drinking water is beneath our feet – what we do on the ground affects the quality of our groundwater.
3. Activities that have potential to contaminate groundwater should not be permitted in well recharge areas.
4. Cleaning up groundwater is difficult – protection of groundwater is key.
5. Owners of private wells should have them tested annually.
6. Communities should develop wellhead protection programs.
7. Unused wells should be properly abandoned.

Issue: ***Watershed Project Awareness***

Topics:
Watershed resource awareness (streams, lakes, wetlands, groundwater)
Watershed awareness (land use impacts)
Nonpoint source pollution (runoff pollution)
Quality of water directly affects quality of life

Target audiences: All who live, work or recreate in the watershed:
- Landowners
- Civic groups
- Local units of government
- Businesses
- Youth

Key messages:
1. Quality of life is dependant on quality water.
2. Protection of property value and local economy is dependant on quality water.
3. How we carry out our daily activities impacts water quality.
4. We are community members of the watershed in which we live.
5. The Big Wood Lake Watershed Project can offer assistance on activities that will improve and protect water quality and habitat.
6. The Big Wood Lake Watershed Project is a state funded effort, run locally through the County Land and Water Conservation Committee.

How to reach key groups:

Shoreland property owners:
1. Presentation at lake district and association meetings.
2. Place articles in lake district and association newsletters.
3. Create "self-help" property assessment guide.
4. Placemat for use in area restaurants.
5. Delivery of information packet door-to-door.
6. Demonstration projects.
7. Tours.
8. Use of shoreland habitat restoration video.

Wetland property owners:

1. Mail out "wetland owners manual".
2. One-on-one visits with wetland property owners.

Farmers and Ag business:

1. One-on-one visits from project staff and committee members.
2. Practice demonstrations.
3. Small group meetings and tours.

Local government officials;

1. Presentation at board meetings of town, village and county officials.
2. Field tours.
3. Add local official's names to county's lake issues newsletter.
4. One-on-one visits to key individuals and staff.

Builders, contractors, developers, etc:

1. Small group meetings followed by field tour.
2. Information packets shared when building permits are pulled.
3. Presentations at association meetings.

Lawn care centers, garden shops, hardware stores, etc:

1. One-on-one visits from project staff and committee members.

General public awareness:

1. Newspaper coverage, especially regular column in summer issues.
2. Watershed project signs.
3. Internet "web" site.
4. Develop project logo.
5. Placemat for use at restaurants and civic events.
6. Radio coverage.
7. Participate in Lake Fair and Community Fairs.
8. Develop a project brochure.
9. Personal contacts from project staff and committee members.

Youth:

1. Project WET (Water Education for Teachers) training for watershed teachers.
2. Student field days.
3. Involve FFA, 4-H, biology classes in water quality monitoring and protection projects.

Evaluation

An evaluation report of information and education activities will be prepared annually. Evaluation will be built into program activities, where feasible. Activities may be evaluated through recording the number of attendees at a function, the number of target audience members reached, event surveys, or other methods.

CHAPTER SIX:
Project Evaluation

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

- Administrative Review
- Pollution reduction evaluation
- Watershed Resource Evaluation Monitoring

Information on these components will be collected by the Burnett County LWCD and reported on a regular basis to the DNR and the DATCP. Additional information on the numbers and types of practices on cost-share agreements, funds encumbered on cost-share agreements and funds expended will be provided by the DNR's Bureau of Community Assistance. The Watershed Resource Evaluation Monitoring follows guidance established by DNR's Bureau of Water Resource Management to select and monitor specific sites in the watershed to monitor resource quality changes.

A final report will be prepared for the Big Wood Lake 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, among other topics. It is developed to evaluate progress, provide documentation on attainment of water quality and pollutant load reduction objectives, evaluate BMP effectiveness and provide recommendations, which target key areas needing improvement in the NPS program. The Burnett County LWCD will prepare the final report.

Administrative Review

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

Accomplishment Reporting

Accomplishment data are summarized in the Annual Accomplishment Report prepared by DATCP and DNR, and are also discussed in annual watershed review meetings. The Burnett County LWCD will provide the following data to the DNR and the DATCP:

- Number of farms in the project having conservation plans.
- Number and type of conservation practices/BMPs installed by project.

- Number of farms and acres of cropland monitored for program compliance.
- Number of personal contacts made with landowners.
- Completed information and education activities.
- Number of cost-share agreements signed.
- Number of farm conservation plan and cost-share agreement status reviews completed.

Details of the reporting requirements are contained in DNR Publication WR-223-94, which is reviewed every two years by DATCP and DNR and revised as necessary.

Financial Expenditures

The Burnett County LWCD will provide the following financial data to the DNR and the DATCP:

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

The Burnett County LWCD and other participating units of government will also provide the DNR with the following financial data on an annual basis:

- Staff training expenditures.
- Interest money earned and expended.
- Total budget and expenditures on the project.

Time Spent on Project Activities

The Burnett County LWCD will provide time summaries to both departments for the following activities on a quarterly basis:

- Project and fiscal management
- Clerical assistance
- Pre-design and conservation planning activities
- Technical assistance: practice design, installation, cost-share agreement status review and monitoring
- Educational activities
- Training activities
- Leave Time

Nonpoint Source Pollutant Load Reduction

The purpose of the second evaluation component, pollutant load reduction, is to estimate reductions in nonpoint source pollutants as a result of installing BMPs. Key sources were identified for estimating changes in pollutant loads that reach surface waters in the Big Wood Lake Watershed. Data collected for evaluation include sediment load reduction from uplands, streambanks and gullies, reduced winter spreading of manure and streambank (habitat) protection. Chapter Two of this plan describes target pollutant reductions for each of the subwatersheds.

Cropland Sources

The Burnett County LWCD will use a sediment factor model (described in previous chapter) to estimate sediment reductions due to changes in cropping practices. The LWCD will use local databases to provide data for the model.

Streambank Sources

Burnett County staff will estimate changes in streambank sediment erosion. A tally will be kept of landowners contacted, the amount of streambank sediment (in tons) being generated at the time of contact and changes in erosion levels estimated after installing BMPs.

Barnyard Runoff

The Burnett County LWCD will use the BARNY model to estimate phosphorus reductions due to the installation of barnyard control practices. The LWCD will report the information to the DNR.

Water Resource Evaluation Monitoring

Limited funds and the intensive staffing needed to properly evaluate water quality changes, prohibits monitoring each watershed individually. Instead, two types of evaluation monitoring are being conducted on a state-wide basis: Master Monitoring Sites and Signs of Success. The goal of the evaluation monitoring activities is to determine the progress the Nonpoint Source Program is making towards improving the quality of Wisconsin's water resources. Evaluation monitoring activities were developed to answer five questions about the water resource objectives and the pollution reduction goals:

1. Do the levels and types of best management practices recommended in the watershed plans achieve the water resource objectives?
2. Do the types and levels of best management practices recommended in the watershed plans achieve the pollutant reduction goals?
3. Does any level of practice installation below 100 percent achieve the water resource objectives or the pollutant reduction goals?
4. Do we need to adjust the pollutant load reduction goals to achieve the water resource objectives?

5. Can we use simple environmental indicators in many of the watershed projects to provide some early evidence that the practices might achieve the water resource 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 Master Monitoring and Sign of Success sites.

Master Monitoring Sites

Criteria were developed to select and monitor twelve streams around the state. The stream sites represent the five major types of fisheries found in agricultural and urban parts of priority watersheds and they also represent three of the five eco-regions in the state. The five fishery types are: high gradient cold water sport fishery, high gradient warm water sport fishery, high gradient warm water forage fishery, low gradient warm water forage fishery and low gradient cold water sport fishery. A storm-sewer outfall is also being monitored. The three 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 ten square miles or less). The schedule involves two years of monitoring before any best management practices are installed, five years of monitoring during the practice installation phase, for a total of eleven years of monitoring.

State-of-the-art chemical and physical monitoring is being done at all the stream sites. State-of-the-art biological monitoring will be done at eight of the twelve streams. Results of the monitoring will be used to determine how well the best management practices achieve the pollution reduction goals and objectives. Improving the fish community is the most important water resource objective for all the streams.

A total of about $8,360,000 would be needed for the stream monitoring, if the work is carried out over a period of eleven years. The success of the evaluation monitoring activities depends on the installation of all the best management practices at the Master Monitoring Sites.

Signs of Success

Signs of Success (SOS) monitoring is a short-term monitoring program designed to provide some early evidence that better land management does make a difference. At least one sight is being sought for each priority watershed project. Signs of Success monitoring will focus on barnyard runoff controls, manure storage, or streambank fencing that is expected to have an early effect on the adjacent stream.

Monitoring will take place over a two-to-three year period, the year before and the year after a practice is installed. Documenting the expected positive improvements will focus on those sites where degraded habitat has occurred and a strong visual improvement is likely. Habitat sampling and photographs will be the primary monitoring method used to document the improvements associated with BMP installation. Macroinvertebrate and fish community structure may also be done at some sites. Pollutant load modeling should also be done for before and after conditions citing projected sediment and nutrient reductions accomplished through BMP installation.

Upon completion of post-BMP monitoring, results should be integrated into an informational pamphlet summarizing the improvements that occurred as a result of BMP installation. A template was developed in which information can be easily incorporated. The informational pamphlet should be used to promote the benefits of the Priority Watershed Project and newly installed BMPs to increase participation within the project boundaries. The informational pamphlet should also be forwarded to the Nonpoint source pollution abatement staff in Madison, to be promoted in the publication "Fields & Streets".

The results of the signs of success monitoring will be featured in educational materials such as local newsletters and newspapers.

SOS sites for the Big Wood Lake Watershed Project are still being identified and will be established shortly after the implementation stage begins.

Potential SOS sites will be identified and evaluated through a cooperative effort between County LWCD staff and DNR St. Croix Basin, Water Resource Specialists.

APPENDIX A:
Calculating Sediment Delivery

Method of determining sediment delivery for cropland erosion

The most widely accepted tool for determining sediment delivery from cropland is a computer model called, WinHUSLE. This model does not perform well in watersheds which exhibit a large number of internally drained areas or lakes. For this reason, the soil loss for all fields was calculated using the Revised Universal Soil Loss Equation (RUSLE). While a field may have a soil loss of 5 tons/acre/year, that does not mean that 5 tons/acre/year of sediment is delivered to surface water. This sediment delivery is then estimated using a sediment delivery factor. These factors have been developed by other watershed projects in Wisconsin, which exhibit many internally drained areas. The following criteria was used to assign a sediment delivery factor to a particular field:

Factor	Criteria
0.1	> 450 feet from water
0.2	30-450 feet from water
0.3	< 30 feet from water

The definition of water is the next variable that will ultimately determine which fields are assigned a particular sediment delivery factor. For the purposes of this inventory water includes all rivers and intermittent or perennial streams, lakes not internally drained and wetlands not internally drained. This inventory was completed using crop reports from the Farm Service Agency, Conservation Plans from the NRCS and high resolution (1 foot per pixel) aerial photography. Field investigations will be conducted to verify all critical sites.

GLOSSARY

Algae:
A group of microscopic, photosynthetic water plants. Algae gives off oxygen during the day as a product of photosynthesis and consumes oxygen during the night as a result of respiration.

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

Anaerobic:
Without oxygen.

Area Wide Water Quality Management Plan (208 plans):
A plan to document water quality conditions in a drainage basin and make recommendations to protect and improve basin water quality. Each basin in Wisconsin must have a plan prepared for it, according to section 208 of the Clean Water Act.

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

Basin Plan:
See "Areawide Water Quality Management Plan".

Benthic Organisms (Benthos):
Organisms living in or on the bottom of a lake or stream.

Best Management Practice (BMP):
The most effective, practical measures to control nonpoint sources of pollution in runoff from land surfaces.

Biochemical Oxygen Demand (BOD):
A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. BOD5 is the biochemical oxygen demand measured in a five day test. The greater the degree of organic pollution, the higher the BOD5.

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

Biotic Index:
An assessment technique which uses habitat characteristics and/or fish and aquatic insect community structure to evaluate the health of aquatic systems.

Buffer Strip:
Strips of vegetation located between disturbed or developed areas and a stream or lake, designed to reduce erosion and filter nutrients from runoff.

Carcinogenic:
Capable of causing cancer.

Clean Water Act:
See "Public Law 92-500".

Conservation Tillage:
Planting row crops while only slightly disturbing the soil and leaving a protective layer of plant residue on the surface to decrease erosion.

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.

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

Criteria:
See "Water Quality Standard Criteria".

Dissolved Oxygen (DO):
A measure of the amount of oxygen dissolved in water. The DNR considers five parts per million of DO necessary for most fish and aquatic life. The decomposition of biological wastes such as dead plants and algae or manure depletes DO levels.

Dredging:
The mechanical removal of sediment from the bottom of lakes and streams.

Ecosystem:
An interacting system composed of all the members of a biological community and its environment.

Ephemeral Gully Erosion:
Small scale gully erosion that takes place in cultivated fields and is usually repaired through annual tillage practices.

Erosion:
The wearing away of the land surface by running water, wind, ice or other geological forces.

Eutrophic:

Refers to nutrient-rich, and therefore very productive water bodies. Large amounts of algae and weeds characterize a eutrophic lake or stream (also see "Oligotrophic" and "Mesotrophic").

Eutrophication:

The process of nutrient enrichment of a water body leading to increased production of aquatic plants and algae. Eutrophication can be accelerated by human activity such as agricultural practices, improper waste disposal and urban development.

Filter Strip:

An engineered buffer of vegetation designed to remove nonpoint source pollutants from barnyard or manure storage runoff.

Fishable and Swimmable;

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

Groundwater:

Water which fills underground internal passageways of porous geologic formations (aquifers) and flows in response to gravity and pressure.

Gully Erosion:

The erosion process where water accumulates in narrow channels and over short periods, removes the soil from a narrow area, often to considerable depths.

Habitat:

The environment in which the life needs of a plant, animal, population or community are supplied.

Habitat Rating:

An assessment technique which uses physical characteristics to evaluate habitat quality.

Heavy metals:

Metals present in municipal and industrial wastes and urban runoff. 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.

Herbicide:

A chemical substance designed to kill or inhibit growth, especially weeds, but which can also be toxic to other organisms.

Internally drained:

Refers to small watershed or drainage area which drains to a closed area or depression with no surface water outlet.

Landfill:

An area where solid wastes are buried for disposal. A conventional sanitary landfill is engineered to minimize environmental hazards from surface runoff and groundwater contamination.

Leachate:

The contaminated liquid which seeps from pollution sources such as manure piles or landfills. Leachate may enter surface or groundwater and contaminate drinking water supplies.

Load:

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

Macrophyte;

A rooted aquatic plant.

Management Category:

Categories based on the amount of nonpoint source pollution generated and the feasibility of controlling the pollution source. Management categories define which nonpoint sources are eligible for cost-sharing under the priority watershed project.

Mesotrophic:

Refers to moderate nutrient levels or fertility in a lake or stream

Milligrams Per Liter (mg/L):

A measure of the concentration of a substance in a liquid. Milligrams per liter is equivalent to "parts per million" (ppm).

Nonpoint Source Pollution:

Pollution whose sources cannot be traced to a single point such as a municipal or industrial wastewater treatment plant discharge pipe. Agricultural nonpoint sources include eroding farmland and runoff from feedlots and manure stacks. Urban nonpoint sources include runoff from construction sites, streets, rooftops and industrial areas.

Oligotrophic;

Refers to a nutrient limited water body. Such lakes and streams typically have very clear water.

Pesticide:

A chemical agent such as insecticides, herbicides or fungicides, used to kill or inhibit the growth of undesirable plants, insects or disease causing organisms.

pH:

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

Phosphorus:

A nutrient that, when reaching lakes or streams in excess amounts, can lead to over fertile conditions, excessive macrophyte growth and algae blooms.

Plankton:
Tiny plants and animals that live in water.

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

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

Priority Watershed:
A drainage area selected to receive state cost-share funds and technical assistance to protect and enhance water quality by reducing nonpoint source pollution.

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 sets 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 federal funds have been made available to help communities pay the cost of building sewage treatment facilities. Amendments to the Clean Water Act were made in 1977 and 1987.

Riparian Land:
Land adjacent to the bank of a lake, river or stream.

Riprap:
Broken rock, cobbles or boulders placed on the bank of a stream or lake to protect it against erosion.

Runoff:
Water from rain, snowmelt or irrigation that flows over the ground surface. Runoff can collect pollutants from air or land and carry them to receiving waters.

Sediment:
Solid material, both mineral and organic, that is in suspension, is being transported or has been moved from its site of origin by wind, water, gravity or ice and has come to rest on the earth's surface either above or below sea level.

Septic System:
A sewage treatment and disposal system for homes not connected to sewer line. Usually the system includes a tank and drain field. Solids settle to the bottom of the tank, while liquids percolate through the soil in the drain field.

Sludge:
A byproduct of wastewater treatment.

Solid Waste:
Unwanted or discharged material with insufficient liquid to be free flowing.

Standards:
See "Water Quality Standards"

Suspended Solids (SS):
Small particles or solid pollutants suspended in water.

Toxic Substance:
A substance that through its chemical or physical action, kills, injures or impairs an organism either upon direct contact or long-term exposure.

Treatment Plant:
See "Wastewater Treatment Plant".

Trophic Status:
The level of growth or productivity of a lake as measured by phosphorus content, algae abundance or depth of light penetration (also see "Eutrophic, Mesotrophic and Oligotrophic").

Turbidity:
Lack of water clarity. Turbidity is usually closely related to the amount of suspended solids (SS) in water.

University of Wisconsin-Extension (UWEX):
A special outreach, education branch of the Wisconsin University system.

Variance:
Government permission for a delay or exception in the application of a given law, ordinance or regulation.

Wastewater:
Water that has become contaminated as a byproduct of some human activity. Wastewater includes sewage, washwater and the water-borne wastes of industrial processes.

Waste:
Unwanted materials left over from manufacturing processes, refuse from places of human or animal habitation.

Wastewater Treatment Plant (WWTP):
A facility for purifying wastewater. Modern wastewater treatment plants are capable of removing 95% of organic pollutants.

Water Quality Criteria:
A measure of the physical, chemical or biological characteristics of a water body necessary to protect and maintain different water uses (fish and aquatic life, recreation, etc.)

Water Quality Standards:
The physical, chemical or biological water quality criteria that must be met to make a water body suitable for a specified use.

Watershed:

The land area that drains into a specific lake or river.

Wetlands:

Areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support a specific variety of wetland vegetation or aquatic life. 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.

Wisconsin Nonpoint Source Water Pollution Abatement Grant Program:

A state cost-share program established by the State Legislature in 1978 to help pay the costs of controlling nonpoint source pollution. Also known as the nonpoint source element of the Wisconsin Fund or the Priority Watershed Program.

Wisconsin Pollutant Discharge Elimination System (WPDES):

A permit system to monitor and control the point source discharges of wastewater in Wisconsin. Dischargers are required to have a discharge permit and meet the conditions it specifies.

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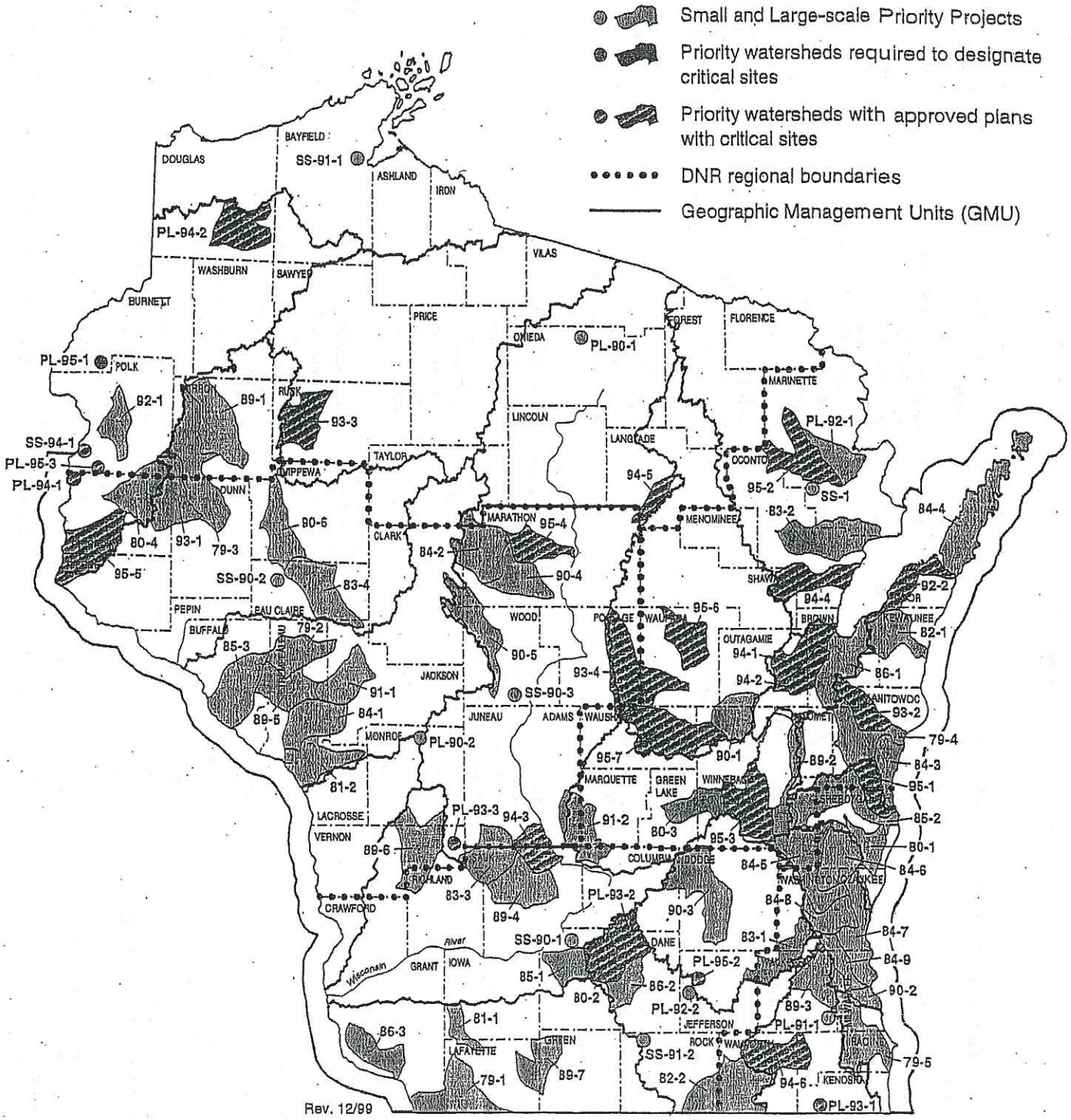
Priority Watershed Projects in Wisconsin



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

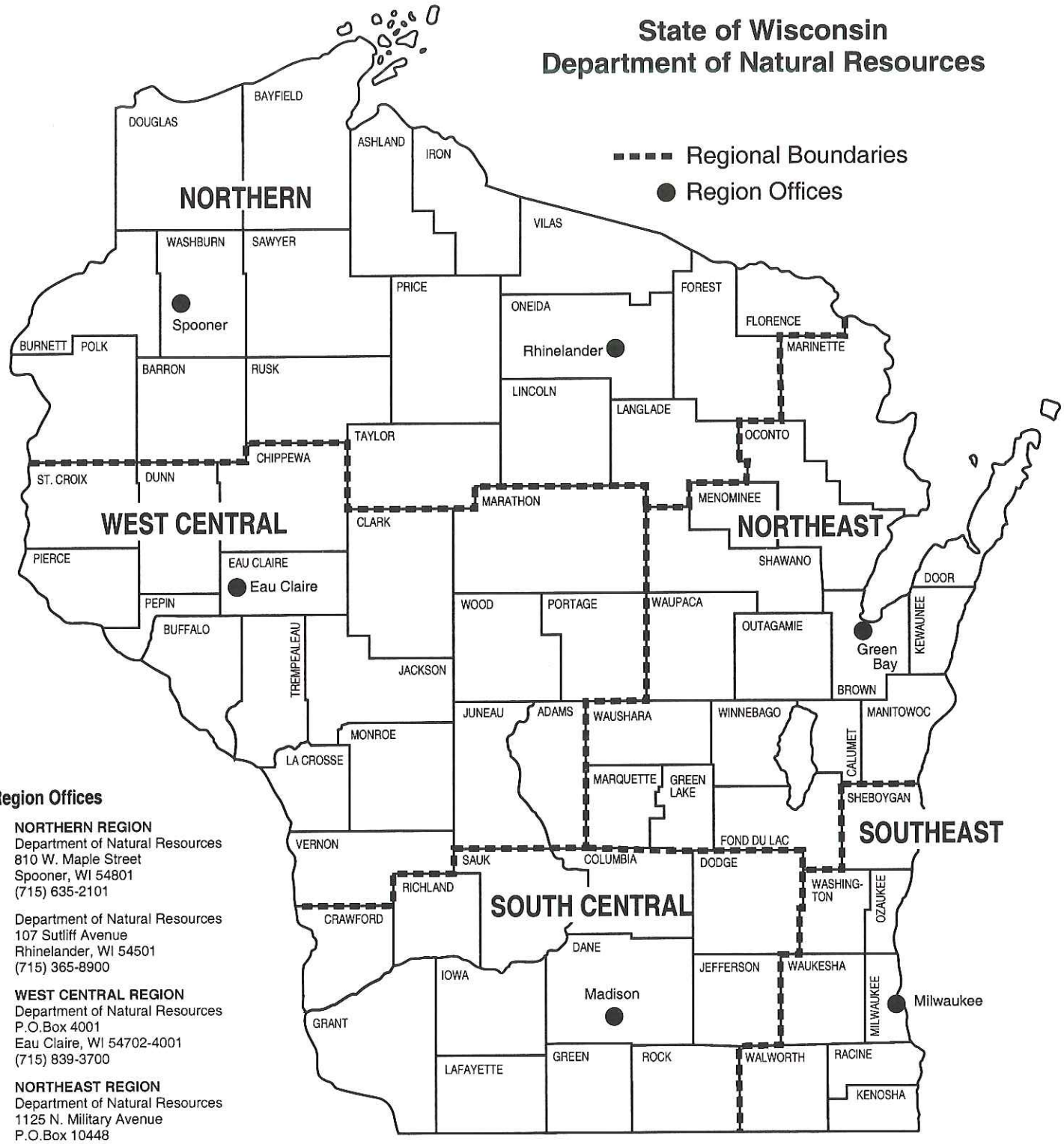
Year Selected-Map Number	Small-scale Priority Watershed Project	County(ies)
SS-1	Bass Lake ♦	Marinette
SS-90-1	Dunlap Creek	Dane
SS-90-2	Lowes Creek	Eau Claire
SS-90-3	Port Edwards - Groundwater Prototype ♦	Wood
SS-91-1	Whittlesey Creek	Bayfield
SS-91-2	Spring Creek	Rock
SS-94-1	Osceola Creek	Polk

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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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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