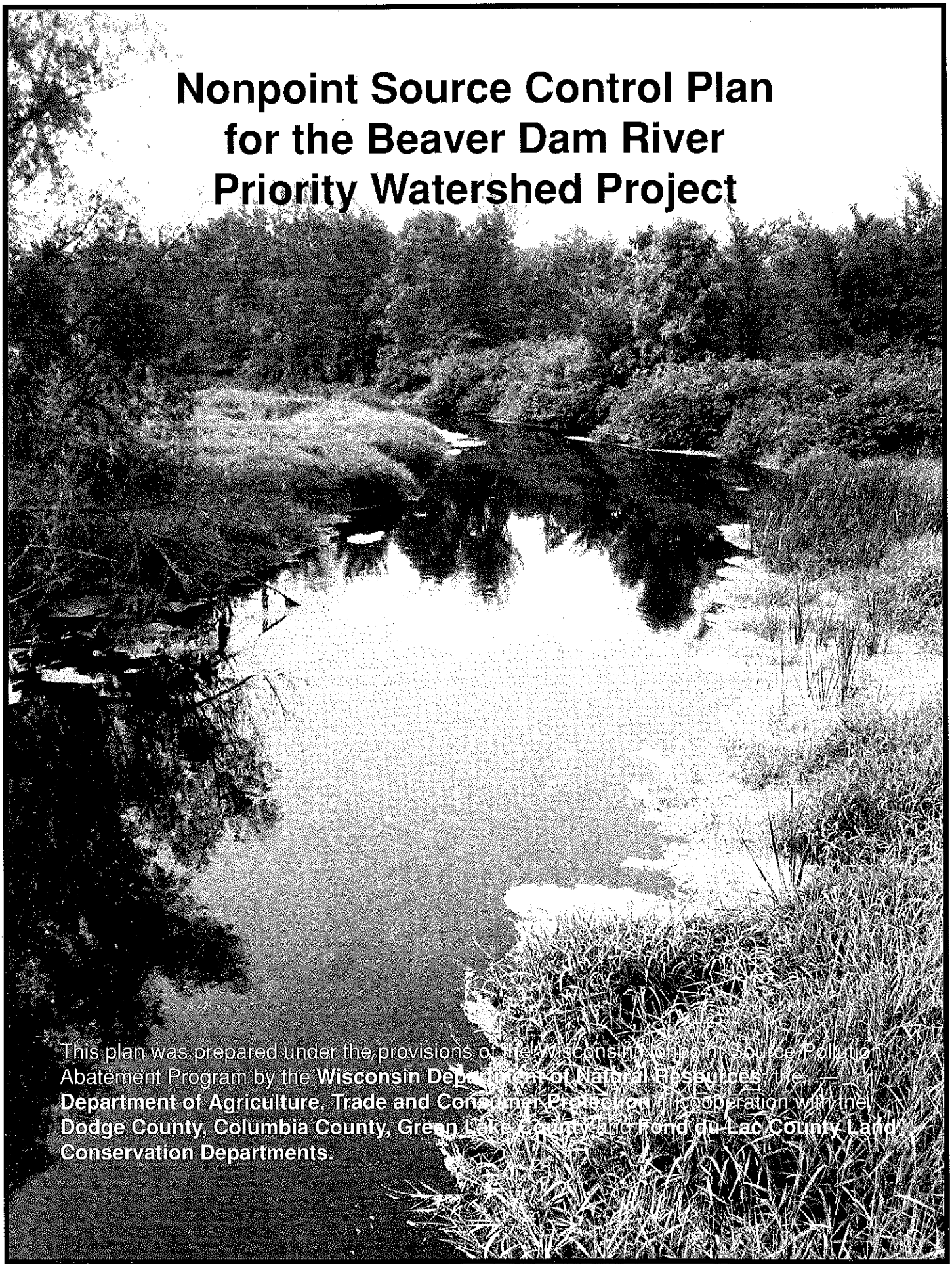
Nonpoint Source Control Plan for the Beaver Dam River Priority Watershed Project



This plan was prepared under the provisions of the Wisconsin Nonpoint Source Pollution Abatement Program by the **Wisconsin Department of Natural Resources**, the **Department of Agriculture, Trade and Consumer Protection**, in cooperation with the **Dodge County, Columbia County, Green Lake County, and Fond du Lac County Land Conservation Departments.**

Watershed Plan Organization Information

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1994

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Keith Foye, Chief, Soil and Water Resource Management Section

A NONPOINT SOURCE CONTROL PLAN FOR THE BEAVER DAM RIVER PRIORITY WATERSHED PROJECT

The Wisconsin Nonpoint Source Water Pollution Abatement Program

July, 1994

This Plan Was Cooperatively Prepared By:

The Wisconsin Department of Natural Resources and
The Department of Agriculture, Trade, and Consumer Protection
In cooperation with
The Dodge, Columbia, Green Lake, and Fond du Lac Counties
Land Conservation Departments

Publication WR 372-94

For copies of this document please contact:

Wisconsin Department of Natural Resources
Bureau of Water Resources Management
Nonpoint Source and Land Management Section
P.O. Box 7291
Madison, WI 53707

The Wisconsin Department of Natural Resources acknowledges the Environmental Protection Agency's Region V Office for their involvement in the partial funding of this activity through Section 319 of the Water Quality Act.

Watershed Plan Credits

Author

Carolyn Rumery Betz, DNR, Bureau of Water Resources Management, Nonpoint Source & Land Management Section

Principal Contributors

Kent Smith, Dave Braunschweig, Nancy Paul and Marc Bethke, Dodge County Land Conservation Department; Ralph Hemling and Kyle Kidney, Columbia County Land Conservation Department; Sue Porter, Departmant of Agriculture, Trade and Consumer Protection; and Andy Morton, Department of Natural Resources.

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Suzanne Wade, UW - Extension, Southern District
Norbert Wozniak, Soil Conservation Service

Beaver Dam River Priority Watershed Project Citizens Advisory Committee

WISCONSIN
DEPT. OF NATURAL RESOURCES
George E. Meyer
Secretary

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

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

June 16, 1993

FILE REF: 2600

Mr. Herb Dahlke, Chair
County Board of Supervisors
Route 2
Markesan, Wisconsin 53946

Dear Mr. Dahlke:

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

I am also approving this plan as an amendment to the areawide water quality management plan for the Upper Rock River Basin.

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

Sincerely,

George

George E. Meyer
Secretary

cc: Dave Jelinski, Department of Agriculture, Trade and Consumer Protection
Jim Huntoon, DNR Southern District Director
Craig Karr, DNR Bureau of Community Assistance

WISCONSIN
DEPT. OF NATURAL RESOURCES
George E. Meyer
Secretary

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Madison, Wisconsin 53707
TELEPHONE 608-266-2621
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June 16, 1993

FILE REF: 2600

Mr. John Tramburg, Chair
County Board of Supervisors
346 South Street
Fall River, Wisconsin 53932

Dear Mr. Tramburg:

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

I am also approving this plan as an amendment to the areawide water quality management plan for the Upper Rock River Basin.

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

Sincerely,

George

George E. Meyer
Secretary

cc: Dave Jelinski, Department of Agriculture, Trade and Consumer Protection
Jim Huntoon, DNR Southern District Director
Craig Karr, DNR Bureau of Community Assistance

WISCONSIN
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George E. Meyer
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June 16, 1993

FILE REF: 2600

Mr. Charles Swain, Chair
Dodge County Board of Supervisors
Administration Bldg. 127 E. Oak Street
Juneau, Wisconsin 53039

Dear Mr. Swain,

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

I am also approving this plan as an amendment to the areawide water quality management plan for the Upper Rock River Basin.

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

Sincerely,

George

George E. Meyer
Secretary

cc: Dave Jelinski, Department of Agriculture, Trade and Consumer Protection
Jim Huntoon, DNR Southern District Director
Craig Karr, DNR Bureau of Community Assistance

State of Wisconsin
Department of Agriculture, Trade and Consumer Protection

Alan T. Tracy, Secretary

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

June 15, 1993

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

Dear ~~Mr. Baker~~ Bruce:

The Department of Agriculture, Trade and Consumer Protection has reviewed and hereby approves the "Nonpoint Source Control Plan For The Beaver Dam River Priority Watershed Project".

We look forward to assisting DNR and the Land Conservation Committees in Dodge, Columbia and Green Lake counties in implementing the project.

Please contact Sue Porter (273-6205) if we can be of any further assistance in moving the project to implementation.

Sincerely,

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

cc: Becky Wallace
Marc Bethke, Dodge County Land Conservation Dept.
Kyle Kidney, Columbia County Land Conservation Dept.
Jim Hebbe, Green Lake County Land Conservation Dept.

GREEN LAKE COUNTY

Margaret R. Bostelmann
County Clerk

Office: 414-294-4005
Fax: 414-294-6216

STATE OF WISCONSIN }

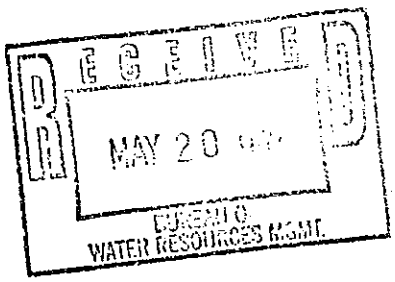
COUNTY OF GREEN LAKE }

I, Margaret R. Bostelmann, hereby certify that I am the duly elected, qualified and acting Clerk of Green Lake County, Wisconsin, and that the above is a true and correct copy of Resolution 17-93, relating to Adopting the Beaver Dam River Nonpoint Source Priority Watershed Plan passed and adopted this 18th day of May, 1993.

In witness whereof I have hereunto set my hand and affixed the official seal of the County Board of Supervisors of Green Lake County, Wisconsin, this 19th day of May, 1993.

Margaret R. Bostelmann

Margaret R. Bostelmann
Green Lake County Clerk



RESOLUTION NUMBER 17-93

Relating to: Adopting the Beaver Dam River Nonpoint Source Priority Watershed Plan

The County Board of Supervisors of Green Lake County, Green Lake, Wisconsin, duly assembled at its regular/~~special~~ meeting begun on the 18th day of May, 19 93, does resolve as follows:

WHEREAS, the Beaver Dam River Watershed was designated by the Department of Natural Resources in 1990 under the Wisconsin Nonpoint Source Water Pollution Abatement Program, and

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

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

WHEREAS, a number of public informational meetings have been conducted throughout the watershed, and an official public hearing was conducted on April 7, 1993, and

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

WHEREAS, the County wishing to receive cost-sharing grants for landowners in the watershed must first adopt the Beaver Dam River Watershed Plan,

NOW THEREFORE, BE IT RESOLVED, by the Board of Supervisors of the County of Green Lake that the Beaver Dam River Watershed Nonpoint Source Priority Watershed Plan be adopted and the implementation of the plan begin as soon as possible.

FISCAL NOTE: Costs to the County for implementation of this watershed plan and additional staff are reimbursed 100% by the State.

Roll Call on Resolution No. 17-93 Submitted By: Land Conservation Committee

Ayes 19, Nays 2, Absent ___, Abstain ___.

Passed and Adopted/~~Rejected~~ this 18th day of May, 19 93.

Herbert A. Dahlke
County Board Chairman

Margaret B. Bartleman
ATTEST: County Clerk

Approved as to Form:

Jon B. Lehr
Corporation Counsel

Room No. ___

Michael Stoddard
Michael Stoddard, Chairman

Raymond Gregor
Raymond Gregor, Vice-Chairman

Edward Wargula, Jr., Secretary

Kenyon Krueger

Joy Rowley
Joy Rowley

Roger Ladwig, ASCS

Columbia County
Land Conservation Department

Columbia County Agricultural Center - Box 485 - Portage, WI 53901
Phone (608) 742-2191

June 1, 1993

Carolyn Betz - WR/2
State of Wisconsin
Department of Natural Resources
Box 7921
Madison, WI 53707

Dear Carolyn:

Enclosed please find a certified copy of the resolution that was passed by the Columbia County Board of Supervisors for the Beaver Dam River Priority Watershed Project.

Please contact me if you have any questions.

We will be looking forward to hearing about the plans progress.

Sincerely,

Kyle Kidney

Kyle Kidney
Land Conservation Director

KK/kh

Enc.

RESOLUTION NO. 32-93

TO THE HONORABLE BOARD OF SUPERVISORS OF COLUMBIA COUNTY:

WHEREAS, the Beaver Dam River Watershed has been selected by the State Department of Natural Resources for priority funding to control nonpoint sources of water pollution, and

WHEREAS, Dodge County, Columbia County, and Green Lake County Land Conservation Departments have inventoried the Beaver Dam River Watershed for animal waste and soil erosion pollution sources, and

WHEREAS, using the inventory results, an implementation plan has been developed in cooperation with the Wisconsin Department of Natural Resources (DNR) and the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP), and

WHEREAS, the watershed plan sets procedures for providing technical and financial assistance to eligible landowners who install various best management practices that reduce nonpoint sources of pollution in the Beaver Dam River Watershed, and

WHEREAS, Columbia County, through its Land Conservation Committee (LCC), is responsible for implementation of control strategies in the unincorporated areas, which would include providing technical assistance to landowners who volunteer to participate, administering cost sharing agreements with rural landowners, and

WHEREAS, the draft watershed plan has been reviewed by the public during a public information hearing which was held on April 7, 1993, and

WHEREAS, the Land Conservation Committee has reviewed the Beaver Dam River Priority Watershed Project draft plan and recommends approval of the plan by the Board.

NOW, THEREFORE, BE IT RESOLVED that the Columbia County Board of Supervisors hereby approves the Nonpoint Source Control Plan for the Beaver Dam River Priority Watershed Project.

BE IT FURTHER RESOLVED that the Land Conservation Committee is hereby authorized to enter into a Nonpoint Source Grant Agreement with the DNR for the purpose of administering cost sharing dollars to rural landowners with the understanding that there be no direct costs for cost-sharing funding to the county.

BE IT FURTHER RESOLVED that Columbia County reserves the right to request future amendments to the watershed plan in order to incorporate new cost sharing opportunities for landowners, to facilitate needed changes in technical standards and specifications, to extend sign-up periods, or to include other

changes that may occur in future revisions to Administrative Rules NR-120.

Reuben Damm

Robert J. Stoltenberg

Kathleen M. Taylor

James R. Humphrey

Oluf Gunderson

AGRICULTURE AND LAND
CONSERVATION COMMITTEE

STATE OF WISCONSIN
ss
COUNTY OF COLUMBIA

I, Cathleen M. Lathrop, County Clerk in and for said County, do HEREBY CERTIFY that the above and foregoing is a true and correct copy of a Resolution adopted by the Columbia County Board of Supervisors at the meeting held on May 19, 1993.

Dated at Portage, Wisconsin, this 28th day of May, 1993.

County Clerk

LCD

DODGE COUNTY LAND CONSERVATION DEPARTMENT

Administration Building, 127 E. Oak Street, Juneau, WI 53039

(414) 386-3660

May 19, 1993

Carolyn Betz
Wisconsin Department of Natural Resources
Bureau of Water Resources
P.O. Box 7921
Madison, WI 53707

Dear Ms. Betz;

This is to inform you that the Dodge County Board of Supervisors adopted Resolution # 93-16 pertaining to the approval of the Beaver Dam River Watershed Project Implementation Plan on May 18, 1993. A copy of the resolution is attached for your information.

SEAL

Dorothy E. Ebert
Dodge County Clerk

RESOLUTION NO. 93-16

TO THE HONORABLE BOARD OF SUPERVISORS OF DODGE COUNTY, WISCONSIN

MEMBERS,

WHEREAS, the Beaver Dam River Watershed has been selected by the State Department of Natural Resources for priority funding to control non-point sources of water pollution, and

WHEREAS, Dodge County, Columbia County, and Green Lake County's Land Conservation Departments have inventoried the Beaver Dam River Watershed for animal waste and soil erosion pollution sources, and

WHEREAS, using the inventory results, an implementation plan has been developed in cooperation with the Wisconsin Department of Natural Resources (DNR) and the Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP), and

WHEREAS, the watershed plan sets procedures for providing technical and financial assistance to eligible landowners who install various best management practices that reduce non-point sources of pollution in the Beaver Dam River Watershed, and

WHEREAS, Dodge County, through its' Land Conservation Committee (LCC), is responsible for implementation of control strategies in the unincorporated areas, which would include providing technical assistance to landowners who volunteer to participate, administering cost sharing agreements with rural landowners, and adopting and administering a county-wide manure storage ordinance, and

WHEREAS, the draft watershed plan has been reviewed by the public during a public informational hearing meeting which was held on April 7, 1993, and

WHEREAS, the Land Conservation Committee has reviewed the Beaver Dam River draft plan and recommends approval of the plan by the Dodge County Board of Supervisors,

THEREFORE, BE IT RESOLVED:

That the Dodge County Board of Supervisors does hereby approve the Non-Point Source Control Plan for the Beaver Dam River Priority Watershed, and

BE IT FURTHER RESOLVED:

That the Land Conservation Committee is hereby authorized to enter into a Non-Point Source Grant Agreement with the DNR for the purpose of administering cost sharing dollars to rural landowners with the understanding that there be no direct costs for cost sharing funding to Dodge County, and

BE IT FINALLY RESOLVED:

That Dodge County reserves the right to request future amendments to the watershed plan in order to incorporate new cost-sharing opportunities for landowners, to facilitate needed changes in technical standards and specifications, to extend sign-up periods, or to include other changes that may occur in future revisions to Administrative Rule NR-120.

All of which is respectfully submitted this 18 day of May, 1993.

ADOPTED
By DODGE COUNTY BOARD

MAY 18 1993

AYES 29 NOES 2
ABSENT 6

Dorothy E. Ebert
Dodge Co. Clerk

Betty Balian
Betty Balian

Joe Ready
Joe Ready

Armin A. Reichow
Armin A. Reichow

Gerald Adelmeyer
Gerald Adelmeyer

William Nass
William Nass

DODGE COUNTY LAND CONSERVATION COMMITTEE

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SUMMARY

Introduction

The Beaver Dam River Priority Watershed Project plan assesses the nonpoint sources of pollution in the Beaver Dam River Watershed and guides the implementation of nonpoint source control measures. These control measures are needed to meet specific water resource objectives for Beaver Dam River and its tributaries. The primary objective of the project is to reduce nonpoint source pollution to the Beaver Dam River, and to enhance and protect the water quality of streams in the Beaver Dam River Watershed.

Nonpoint sources of pollution most commonly found in this watershed include: polluted runoff from barnyards and feedlots; sediment from cropland erosion; urban sources, streambank and gully erosion; runoff from winterspread manure, and infiltration of pollutants to groundwater. The purpose of this project is to reduce the amount of pollutants originating from nonpoint sources that reach surface water and groundwater within the Beaver Dam River Priority Watershed Project area.

This plan was prepared by the DNR (DNR), the DATCP (DATCP), and the Dodge, Columbia and Green Lake County Land Conservation Departments. The DNR selected the Beaver Dam River Watershed as a priority watershed project through the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1990. It joined approximately 54 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 project is administered on the state level by the DNR and DATCP. The Dodge, Columbia and Green Lake County LCDs will administer the project on the local level with assistance from the University of Wisconsin–Extension and the Soil Conservation Service (U.S. Department of Agriculture). Dodge County will be responsible for administering the Fond du Lac County portion of the priority watershed.

General Watershed Characteristics

The Beaver Dam River Watershed drains 292 square miles of land in Dodge, Columbia, Green Lake and Fond du Lac counties in South Central Wisconsin. The watershed is part of the Upper Rock River Basin. The Beaver Dam River drains to Crawfish River. The Beaver

Dam River Watershed was divided into 17 smaller drainage areas, called subwatersheds, for this planning effort (map 2-1).

Land use in the watershed, as shown in table S-1 is mainly agricultural, and is currently dominated by dairy and cash grain farming. The watershed population is stable—approximately 35,000 people. About half the population of the watershed lives in rural areas, while half live in the cities of Beaver Dam, Fox Lake, and Juneau.

Table S-1. Land Use in the Beaver Dam River Watershed[1]

Land Use	Percent of Watershed
Agricultural	
grassland/pasture/grazed woodlots/woodlands	6%
cropland	75%
farmstead	4%
Developed	3%
Wetlands/Wildlife Habitat	11%

[1] These estimates are based on WIN inventory data. The urban estimates are based on the SLAMM model results.

Source: DNR

Water Quality

The Beaver Dam River and the majority of other streams in the watershed support a warm water sport fishery. The streams of the watershed are not reaching their highest potential use due to pollution from point and nonpoint sources. Eroding croplands and streambanks and improperly managed livestock operations are the major source of nonpoint pollution in the watershed. The three lakes in the watershed, Fox, Beaver Dam and Lost Lakes are all eutrophic lakes, and although they support a productive fishery, are also plagued by problems including severe algae blooms, excessive weed growth, and low dissolved oxygen concentrations. The details of the water resource assessments are discussed later in this watershed plan.

An assessment of groundwater quality was completed by sampling private wells for nitrate + nitrite and triazine. Results show that of the well samples collected, 22 percent had nitrate levels over the enforcement standard (health advisory level) of 10 milligrams per liter (mg/L), and 24 percent had nitrate levels between 2 mg/L, the preventative action limit, and 10 mg/L. Nitrate + Nitrite levels greater than the 2 mg/L preventative action limit show that human activities are affecting groundwater quality. Results of the groundwater survey

do not indicate a pattern of groundwater contamination that can be linked to specific sources of nitrate.

Well sampling for triazine showed that less than 1 percent of the samples collected had triazine levels over 3.0 micrograms per liter μg/L, which is the enforcement standard for atrazine plus its breakdown components, called metabolites. Triazines are a family of herbicides which include atrazine and its metabolites which when present in groundwater indicates groundwater contamination. 13 percent of the samples collected had triazine levels between 0.3 and 3.0 μg/L. The preventative action limit for triazine is 0.3 μg/L.

Sources of Water Pollution

The Dodge and Columbia County LCDs collected data on all agricultural lands, barnyards, manure storage sites, and streambanks in the watershed. These data were used to estimate the pollutant potentials of these nonpoint sources. The amount of phosphorus carried in runoff from each barnyard to a receiving stream was calculated. The amount of sediment reaching streams from eroding agricultural lands and streambanks was also determined. In the Beaver Dam River Watershed, about 94 percent of the sediment deposited in streams annually is derived from agricultural upland erosion. About 2 percent of the erosion in the watershed is along the lake shores, and about the same amount is from streambanks.

The results of the investigations of nonpoint sources are summarized below:

Barnyard Runoff Inventory Results:

- 404 barnyard segments were assessed.
- These barnyards were found to contribute 9,533 pounds of phosphorus to surface waters annually.

Shoreline Erosion Inventory Results

- 100 tons of sediment are delivered to the three lakes, annually.

Upland Sediment Inventory Results:

- About 23,000 acres were inventoried.
- 52,121 tons of sediment are delivered to streams and lakes.
- 94 percent is from percent from cropland.
- 4 percent is from farmsteads
- 1 percent is from grassland, pastures, grazed woodlots and woodlands.
- 1 percent is from urban developed areas.

Pollutant Reduction Goals

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

Sediment Goal

Reduce overall sediment delivered to receiving water bodies. In order to meet this goal the following is needed:

- 35 percent reduction in sediment reaching streams from agricultural uplands in all subwatersheds.
- Reduction in gullies eroding more than 6 inches per year.
- Reduction in streambank erosion where cattle are trampling banks.
- Reduction in shoreline sediment delivered to the lakes.

Phosphorus Goal

Reduce overall phosphorus load to receiving water bodies. In order to meet this goal, the following is needed:

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

In addition, this plan calls for a restoration of as many degraded or prior converted wetlands as possible.

Management Actions

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

Table S-2. Examples of Best Management Practices Eligible for Cost Sharing Through the Beaver Dam River Priority Watershed Project (not inclusive)[1]

Best Management Practices	State Cost-Share Rate
Contour Farming	50% (flat rate: $6/acre)
Strip Cropping	50% (flat rate: $10/acre)
Field Diversions and Terraces	70%
Grassed Waterways	70%
Reduced Tillage (No Till)	$15/acre
Critical Area Stabilization	70%
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Shoreline and Streambank Stabilization	70%
Shoreline Buffers	70%
Barnyard Runoff Management	70%
Animal Lot Relocation	70%
Manure Storage Facilities	70%
Livestock Exclusion From Woodlots	50%
Wetland Restoration	70%
Nutrient and Pesticide Management	50%

[1] Note: There are specific caveats for some of these practices; see Chapter Five for more details.

The Dodge/Fond du Lac, Columbia and Green Lake County LCDs will contact all landowners who are eligible to receive cost-share funds during the project's implementation. All Category I sources of nonpoint pollutants must be controlled if a landowner wishes to participate in any aspect of the program. Category I represents the level of pollution control needed to achieve water quality goals in the watershed. Nonpoint sources in Category II contribute less of the pollutant load than those in Category I. They are included in cost sharing eligibility to further insure that water quality goals are met. Controlling sources in this category is not mandatory for a landowner to be funded for controlling other sources.

The Dodge/Fond du Lac, Columbia and Green Lake County LCDs will assist landowners in applying BMPs. Practices range from alterations in farm management (such as changes in

manure-spreading and crop rotations) to engineered structures (such as diversions, sediment basins, and manure storage facilities), and are tailored to specific landowner situations. Participation in the program is voluntary.

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

- **Agricultural Lands**

All agricultural lands contributing sediment to streams at a rate greater than 0.4 tons per acre per year and greater than "T" (tolerable soil loss) will be classified as Category I for cost sharing and must be brought down to "T." This involves an estimated 22,681 critical acres of cropland, to control 15,389 tons (29 percent) per acre per year of sediment reaching a waterbody. Category II will include those fields below "T" but delivering sediment at a rate over 0.4 tons/acre/year, or fields eroding above "T" but below the sediment delivery rate of 0.4 t/a/y. Landowners with fields eroding above "T" but below the sediment delivery rate of 0.4 t/a/y are eligible for low-cost practices only which are described in Chapter Four. Controlling fields in Category II involves 25,526 acres, and 2,786 tons (5 percent) of the upland sediment in the watershed.

The BMPs identified by the Dodge/Fond du Lac, Columbia and Green Lake County LCDs emphasize both improving farm management and controlling pollutants. Table S-2 shows the eligible practices and cost-share rates.

- **Animal Lots**

The manure from barnyards that is carried in runoff needs to be controlled at about 89 of the 404 barnyard segments. All barnyards contributing more than 40 pounds of phosphorus will be classified as Category I for cost sharing and need to be reduced to 15 pounds annually or less. This will control 6,044 pounds of phosphorus, or 63 percent of the phosphorus produced.

Category II barnyards are those that contribute between 40 and 20 pounds of phosphorus annually. These will be eligible for cost sharing and will also need to be reduced to 15 pounds annually, or less. Category II barnyards will affect 64 barnyard segments and control 10 percent of the phosphorus produced.

- **Nutrient and Pest Management**

Livestock operations that are Category I and II for animal lot runoff and those who do not have suitable land for winter spreading manure are eligible to participate in a one-on-one nutrient pest management education program. These farms will have waste utilization plans developed through a professional services contract. They will also be eligible for 50 percent cost-share nutrient and pest management plans, also through a professional services contract. About 141 livestock operations are considered to have insufficient land for winter spreading manure.

- **Manure Storage**

Farms that are eligible for manure storage will be identified through the nutrient management planning process. A manure storage facility will be considered Category I if the farm operator receives cost-sharing for any item other than those funded under the NPM Education Program. There will be no Category II for manure storage.

- **Streambanks and Lakes**

Project participants with identified sites with a severe erosion (0.025 tons per linear foot per year) will be Category I. Those with moderate erosion (0.0125 tons per linear foot, but less than 0.025 tons) will be Category II. Lakeshore property owners will also be eligible for cost-share dollars based on these criteria.

There will be an emphasis on controlling bank erosion and improving fish and wildlife habitat in all subwatersheds to enhance water quality and recreational opportunities.

Funds Needed for Cost Sharing, Staffing, and Educational Activities

Grants will be awarded to Dodge (including Fond du Lac County portion), Columbia and Green Lake Counties by the DNR for cost sharing, staff support and educational activities. Table S-3 includes estimates of the financial assistance needed to implement needed nonpoint source controls in the Beaver Dam River Watershed, assuming a 75 percent participation rate of eligible landowners.

Table S-3. Cost Estimates for the Beaver Dam River Priority Watershed Project

Eligible Activity	Total Cost[1]	State Share[1]
Cost Sharing	$6,315,250	$4,582,057
Easements	274,500	274,500
Counties' Staffing	1,707,657	1,707,657
Educational Activities Stage I Nutrient Management	39,820 59,400	39,820 59,400
Other Direct (travel, supplies, etc.)	262,800	262,800
Engineering Assistance and lake rip rap	300,000	300,000
Urban Nonpoint Source Practices	725,408	725,408
Totals	$9,684,835	$7,951,642

[1] Estimates based on 75% participation.

Project Implementation

Project implementation is scheduled to begin in 1993. The first three years of implementation is the period for participants to sign cost-share agreements. There is a five-year period for practice installation. While an eligible landowner or operator has three years to determine whether to participate in the program, the installation of BMPs can usually begin as soon as a landowner has signed a cost-share agreement with the Dodge/Fond du Lac, Columbia and Green Lake County LCDs.

Information and Education

An information and education program will be conducted throughout the project period with the Dodge/Fond du Lac, Columbia and Green Lake County LCDs having overall responsibility for the program. University of Wisconsin–Extension staff in the county will provide assistance. This program will be most intensive during the first three years of the project as landowners and local governments sign up for state cost sharing for pollution control. The program includes:

- A media campaign to inform the public about nonpoint source pollution and activities the public can do to reduce this type of pollution.

- More intensive educational activities, such as meetings, workshops, tours, and demonstration projects for landowners and local government officials who must adopt new pollution control techniques.

- Water quality newsletters that will inform farmers, local government officials, community groups, and concerned citizens about watershed activities, implementation processes, and pollution control methods.

- Educational activities and service projects to inform youth about water resource issues and help them develop a conservation ethic.

Project Evaluation and Monitoring

The evaluation strategy for the project involves the collection, analysis, and reporting of information so that progress may be tracked in three areas:

- **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 Dodge/Fond du Lac, Columbia and Green Lake LCDs will track the progress in this area and report to the DNR and DATCP quarterly.

- **Pollutant Reduction Levels**

  The Dodge/Fond du Lac, Columbia and Green Lake LCDs 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.

- **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.

Further Information

If you want more information about the Beaver Dam River Priority Watershed Project, or a copy of the watershed plan, contact:

Andy Morton, Coordinator
DNR
Southern District Headquarters
Madison, WI
(608) 275-3311

CHAPTER ONE
Introduction, Purpose and Legal Status

Wisconsin Nonpoint Source Water Pollution Abatement Program

The Wisconsin State Legislature created the Wisconsin Nonpoint Source Water Pollution Abatement Program (NPS) in 1978. The goal of the NPS Program is to improve and protect the water quality of streams, lakes, wetlands, and groundwater by reducing pollutants from urban and rural nonpoint sources. The 292-square-mile Beaver Dam River Watershed, located entirely in Dodge, Columbia, Fond du Lac and Green Lake Counties, was designated a "priority watershed" in 1990. The primary objective of this project is to reduce nonpoint source pollution loads to the Beaver Dam River and to enhance and protect the water quality of the streams and lakes in the Beaver Dam River Watershed.

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

The following is an overview of the NPS Program:

- The DNR and DATCP administer the program which focuses on critical hydrologic units called priority watersheds. The program is implemented through priority watershed projects for which a plan is prepared.

- Local units of government implement the watershed project. Water quality improvement is achieved through voluntary implementation of nonpoint source controls (best management practices or BMPs) and adoption of ordinances. Landowners, land renters, counties, cities, villages, towns, metropolitan Sewerage Districts, 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.

- Informational and educational activities are employed to encourage participation.

- The DNR and DATCP review the progress of the counties and other implementing units of government, and provide assistance throughout the eight-year project. The

DNR monitors improvements in water quality resulting from control of nonpoint sources of pollution in the watershed.

Priority Watershed Project Planning and Implementation Phases

Planning Phase

The planning phase of the project began in 1991 and included the following information-gathering and evaluation steps:

1. Determine the conditions and uses of streams and lakes.

2. Inventory types of land uses and severity of nonpoint sources impacting streams and lakes.

3. 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 will be accomplished through the ongoing integrated resource management planning efforts in the Upper Rock River Basin.

4. Determine levels of nonpoint source pollution control and measures necessary to improve and/or protect water quality.

5. Prepare and gain approval for a priority watershed plan documenting the above evaluations, implementation procedures and costs.

Implementation Phase

The implementation phase will begin in the summer of 1993 following review of the priority watershed plan by the citizen advisory committee, a public meeting and approval by the DNR, the DATCP, and the Board of Supervisors for Dodge, Columbia, and Green Lake Counties. This phase is characterized below:

- The DNR enters into local assistance agreements with local units of government with 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 Dodge/Fond du Lac, Columbia, and Green Lake LCDs contact eligible landowners to determine their interest in voluntarily installing BMPs identified in the plan.

In the urban portions of the watershed, the DNR or its designee will contact local units of government to discuss actions to implement plan recommendations.

- For rural practices, the landowner and the county sign cost-share agreements outlining the practices, costs, cost-share amounts and a schedule for installation of BMPs. All practices are scheduled for installation up to five years from the date the agreement is signed. The DNR and local units of government sign similar agreements for urban practices.

Legal Status of the Nonpoint Source Control Plan

The Beaver Dam River Priority Watershed Plan was prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program described in Section 144.25 of the Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code. Similarly, this plan is subject to the amendment process under NR120.08 (e) for substantive changes. The Department of Natural Resources will make determination if a proposed change will require plan amendment. This plan was prepared under the cooperative efforts of the DNR, DATCP, the Dodge/Fond du Lac, Columbia, and Green Lake County LCDs, and local units of government as well as the Beaver Dam River Watershed Citizens Advisory Committee.

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

Relationship of the Nonpoint Source Control Plan to the Integrated Basin Management Plan

The Upper Rock River Basin is comprised of the thirteen watersheds: Middle Rock River, Lower Crawfish River, Beaver Dam River, Calamus Creek, Waterloo/Maunesha River, Upper Crawfish River, Johnson Creek, Sinissippi Lake, Oconomowoc River, Ashippun River, Rubicon River, Upper Rock River, and East Branch Rock River. The basin drains portions of Fond du Lac, Columbia, Dodge, Washington, Jefferson, Dane, and Waukesha Counties. The basin contains over 30 stream miles of trout streams, 500 stream miles of warmwater fishery streams, 90 stream miles of forage fishery, and hundreds of lakes.

Recommendations contained in the Upper Rock River Basin Management Plan are incorporated in this priority watershed plan. Consequently, this nonpoint plan meets the requirements of Section 144.25 of the Wisconsin statutes requiring the DNR to develop "an

integrated resource management strategy to protect or enhance fish and wildlife habitat, aesthetics, and other natural resources" for priority watersheds.

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

The Stormwater Discharge Permit Program is a result of the 1987 amendments to the federal Clean Water Act. These amendments require permits for discharges of storm water from municipalities with populations of 100,000 or more, certain industrial sites, and construction sites with ground disturbances of 5 or more acres.

Phase 1 of the program, which began in October, 1992, requires permits for municipalities with populations of 100,000 or more. Phase 2 of the program has yet to begin. In phase 2, it is likely that stormwater discharge permits will be required for municipalities with populations of less than 100,000. The EPA has not determined the population size of municipalities that will be required to be included in the next phase of the stormwater permit program, nor has it established a starting date for the next permitting phase. It is not known when a decision on these issues will be made, or when phase 2 will be implemented.

Some of the required activities of the municipal permit program are: to identify and locate existing stormsewer outfalls, check for illicite connections, develop a stormwater plan to deal with identified pollution problems, adopt a stormwater ordinance, and to monitor designated sites. Many of the activities that will be required as part of the EPA municipal permit are eligible for state funding through the Nonpoint Source Program.

Industrial permits will be required for those industries that are likely to introduce pollutants to stormwater runoff. Generally, industries that have outside material storage will be required to apply for industrial permits. Industries that fall under this requirement will be directed to submit a permit application to the Bureau of Waste Water in the DNR. Most of these industries have been notified of this permit requirement.

To deal with the issue of construction site erosion control on ground disturbances of 5 acres or more, a Memorandum of Understanding, or MOU, is being developed by the DNR, and the Department of Industry Labor and Human Relations, (DILHR). The agency responsible for activities and types of construction has not been decided at this is time. The DNR, and the Department of Industry Labor and Human Relations are expected to have a final agreement on the Memorandum of Understanding some time in 1993 to resolve agency responsibility.

In order to fulfill the EPA permit requirements, as part of the MOU agreement, contractors will be directed to follow the erosion control guidance in the Wisconsin Construction Site Best Management Practice Handbook published by the DNR. Some of the other MOU conditions that satisfy the EPA requirements for the construction site erosion control permit

program are: to provide an existing and planned future site map indicating planned erosion control practices that will be implemented on the site, a description of the type of development and construction that will occur on the site, a written description of the erosion control plan for the site, a description of the construction sequence, a maintenance schedule for erosion control devices on the site, the location of the site, and identification of the owner and developer of the construction site.

It is likely that ground disturbances of less than 5 acres will be a required permit activity. The EPA has not made a determination of size area of disturbance, or a date of initiating these requirements. In the future the EPA is likely to require stormwater management plans for new developments. As a part of the watershed plan, communities are strongly advised to devise stormwater management plans in developing areas.

Plan Organization

The remainder of this plan is divided into three parts:

- The Watershed Assessment.
- A Detailed Program for Implementation.
- Project Evaluation.

The contents of each part are described below:

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

Chapter Three. "Water Resource Conditions, Nonpoint Sources and Water Resource Objectives" characterizes the existing and potential biological and recreational uses of surface waters. The results of the nonpoint source inventories and evaluations and water resource objectives are discussed.

Chapter Four. "Nonpoint Source Pollution Control Strategy" identifies the level of urban and rural nonpoint source control needed to meet the water resource objectives and identifies the decision criteria and the nonpoint sources eligible for funding under the priority watershed project.

Chapter Five. "Detailed Program for Implementation" describes the means in which the local units of government administer the project, and estimates a local assistance and management practice cost-share budget.

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

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

Chapter Eight. "Project Tracking" discusses the means for assessing the amount of nonpoint source control gained through installation of best management practices.

Chapter Nine. "Water Quality Monitoring and Evaluation" presents and strategy and a schedule for monitoring streams and lakes to determine the water quality impacts of implementing nonpoint source controls.

Appendix A. "Watershed Planning Methods" describes the inventory and evaluation techniques and procedures used to determine the condition of the surface water resources and nonpoint sources impacting them.

Appendix B. Glossary of terms used.

CHAPTER TWO
General Watershed Characteristics

Location

Governmental Units

The Beaver Dam River Watershed is located in south central Wisconsin. The watershed is a sub-basin of the Upper Rock River Basin and drains approxiately 292 square miles, or 176,000 acres. The watershed project is bounded on the north by the Upper Rock River Watershed and on the south by the Lower Crawfish River Watershed.

The Beaver Dam River lies with Dodge, Columbia, Green Lake and Fond du Lac counties (see map 2-1). The distribution of land by county is:

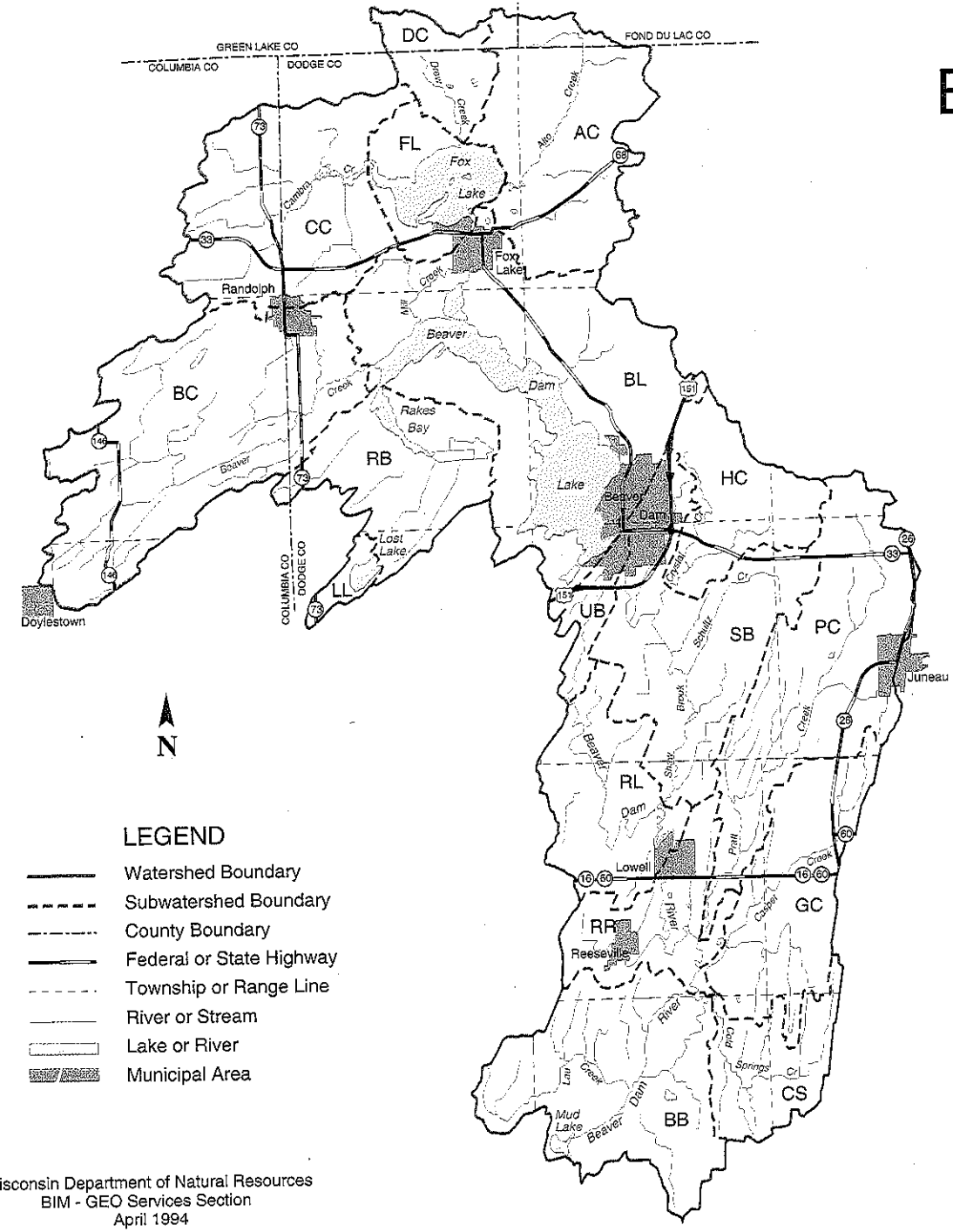
Dodge	85%
Columbia	13%
Green Lake	1%
Fond du Lac	1%

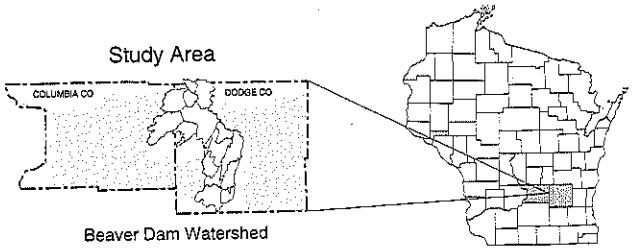
The cities of Fox Lake, Beaver Dam and part of Juneau are located within the watershed, along with the villages of Randolph, Lowell and Reeseville. There are 16 civil townships in the watershed. The Fox Lake Inland Lake Protection and Rehabilitation District is a special purpose unit of government also within the watershed boundaries. State land holdings include four state wildlife areas (Westford Wildlife Area, Shaw Marsh Wildlife Area, Mud Lake Wildlife Area, and Paradise Marsh Wildlife Area) and the Fox Lake Correctional Institution. The northern half of the watershed is part of the Glacial Habitat Restoration Area, a wildlife management project that will work through the State Stewardship Porgram to improve wildlife habitat on privately owned lands.

Population

The 1990 population estimate for the Beaver Dam watershed is about 35,000 people. Approximately half of the population of the watershed lives in rural areas, while half live in the cities of Beaver Dam, Fox Lake and Juneau. Beaver Dam is the largest city with a population of 14,196. The population within the watershed has remained stable over the past decade.

Map 2.1
Beaver Dam River Watershed





Subwatershed Codes

- AC = Alto Creek
- BB = Lower Beaver Dam River
- BC = Beaver Creek
- BL = Beaver Dam Lake
- CC = Cambra Creek
- CS = Cold Springs Creek
- DC = Drew Creek
- FL = Fox Lake
- GC = Casper Creek
- HC = Crystal Creek
- LL = Lost Lake
- PC = Pratt Creek
- RB = Rakes Bay
- RL = Middle Beaver Dam River-Lowell
- RR = Middle Beaver Dam River-Reeseville
- SB = Shaw Brook
- UB = Upper Beaver Dam River

LEGEND

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

0 1 2 3 4 5 6 Miles

0 1 2 3 4 5 6 7 8 9 10 Kilometers

Wisconsin Department of Natural Resources
BIM - GEO Services Section
April 1994

Land Use

Land uses in the watershed are mainly agricultural. Cropland accounts for about 77% of the land use; 11% is wetland and wildlife habitat, 6% is grassland, pasture, grazed woodlots and woodlands, 4% is farmstead, and about 2% is urban (table 2-0). Dairy farming is the predominant agricultural land use. Cash grain cropping is increasing in the watershed with corn, soybeans and vegetables as the principle crops grown.

Approximately 8 square miles, or 2.5% of the watershed area, is located within municipal boundaries of the 6 cities and villages. The Fox Lake Protection and Rehabilitation District includes urban lands around the lake's perimeter.

Public Water Sources

All potable water in the watershed is obtained from groundwater sources. Water obtained from aquifers is either pumped from individual wells owned by homeowners or businesses, or is obtained by municipal pumping facilities. Municipal water supply systems serve the communities of Beaver Dam, Fox Lake, Juneau, Lowell, Randolph, and Reeseville. All communities except Reeseville obtain their water from sandstone aquifers. Reeseville's source is one sandstone over limestone aquifer, and one limestone over sandstone aquifer. Municipal water systems serve over 20,000 people in the watershed. Over two and one-quarter million gallons of water are pumped from municipal wells each day.

Physical Setting

Climate and Precipitation

The Beaver Dam River watershed lies in the continental climate zone which characteristically has short spring and autumn seasons, mild humid summers, and long, cold, snowy winters. The annual growing season averages about 148 days. Average annual precipitation in the watershed, including snowfall, is 32 inches. Approximately 55% of the precipitation occurs from May through September. Runoff averages about nine inches per year.

Topography

The topography of the watershed reflects the underlying eroded dolomite bedrock surface and glacial smoothing. Before glaciation, there were probably steep rolling hills cut by deep river valleys. The glaciers eroded the steep hill tops and deposited material in the valleys smoothing the topography. Much of the watershed is covered by unsorted gravel, sand, silt, and clay deposited under moving glacial ice or as a residue from melting ice. The

Table 2.0 Summary of Total Acres and Sediment Delivered by Land Use – Beaver Dam River Watershed

Subwatershed	Sediment In Tons	Cropland	%	Farmstead	%	Grassland/Pasture Grazed Woodlts. Woodlands	%	Urban * Developed	%	Wetland/ Wildlife Habitat	%	Total	Percent of Grand Total
	Acres	12466	91%	352	3%	183	1%	0	0%	691	5%	13693	8%
Alto Creek	Sediment	6316	98%	157	2%	2	0%	0	0%	2	0%	6477	12%
	Acres	11918	78%	461	3%	1637	11%	0	0%	1192	8%	15208	9%
Lower Beaver Dam River	Sediment	4107	95%	168	4%	32	1%	0	0%	7	0%	4314	8%
	Acres	14310	66%	916	4%	3294	15%	0	0%	3293	15%	21813	12%
Beaver Creek	Sediment	5997	91%	332	5%	153	2%	0	0%	82	1%	6564	13%
	Acres	17244	81%	1308	6%	686	3%	1173	5%	547	3%	21398	12%
Beaver Dam Lake	Sediment	3983	92%	206	5%	4	0%	134	3%	5	0%	4333	8%
	Acres	12782	86%	402	3%	500	3%	0	0%	1216	8%	14900	8%
Cambra Creek	Sediment	4001	96%	136	3%	19	0%	0	0%	0	0%	4156	8%
	Acres	4425	78%	194	3%	549	10%	0	0%	512	9%	5680	3%
Cold Spring Creek	Sediment	1038	93%	69	6%	6	1%	0	0%	0	0%	1113	2%
	Acres	3149	81%	47	1%	217	6%	403	10%	78	2%	3894	2%
Drew Creek	Sediment	1780	96%	26	1%	3	0%	50	3%	1	0%	1861	4%
	Acres	2382	77%	87	3%	88	3%	283	9%	253	8%	3087	2%
Fox Lake	Sediment	969	97%	25	3%	0	0%	5	1%	0	0%	1000	2%
	Acres	8028	76%	433	4%	464	4%	19	0%	1566	15%	10510	6%
Casper Creek	Sediment	3668	93%	234	6%	4	0%	15	0%	5	0%	3926	8%
	Acres	4984	70%	277	4%	682	10%	336	5%	854	12%	7133	4%
Crystal Creek	Sediment	994	91%	17	2%	12	1%	74	7%	0	0%	1097	2%
	Acres	721	64%	46	4%	58	5%	22	2%	274	24%	1121	1%
Lost Lake	Sediment	255	91%	15	5%	1	0%	10	4%	0	0%	281	1%
	Acres	12556	78%	715	4%	1260	8%	413	3%	1115	7%	16059	9%
Pratt Creek	Sediment	4058	94%	227	5%	10	0%	7	0%	4	0%	4307	8%
	Acres	6375	69%	316	3%	195	2%	0	0%	2394	26%	9280	5%
Rakes Bay	Sediment	2646	96%	91	3%	4	0%	0	0%	1	0%	2742	5%
	Acres	6746	77%	688	8%	284	3%	68	1%	977	11%	8763	5%
M. Beaver Dam River – Lowell	Sediment	1688	85%	287	14%	8	0%	1	0%	0	0%	1985	4%
	Acres	4026	59%	67	1%	427	6%	0	0%	2253	33%	6773	4%
M. Beaver Dam R. – Reeseville	Sediment	2393	98%	12	0%	30	1%	0	0%	0	0%	2435	5%
	Acres	9723	66%	635	4%	377	3%	1251	9%	2703	18%	14689	8%
Shaw Brook	Sediment	4610	91%	256	5%	2	0%	172	3%	3	0%	5044	10%
	Acres	860	43%	108	5%	92	5%	635	32%	288	15%	1983	1%
U. Beaver Dam River	Sediment	327	67%	47	10%	5	1%	103	21%	3	1%	486	1%
	Acres	132695	75%	7052	4%	10992	6%	4603	3%	20206	11%	175984	
TOTAL	Sediment	48830	94%	2305	4%	300	1%	571	1%	113	0%	52121	

* All data except urban analysis generated from WIN model.

* Urban numbers from SLAMM model.

landscape, which is gently undulating with elongated hills (drumlins), is called ground moraine.

Geology and Soils

The rocks present in the Beaver Dam watershed range from Precambrian rocks three to four billion years old to glacial sands and gravels deposited two to three million years ago. The bedrock units, from oldest to youngest consists of Precambrian quartzite, Cambrian age (500 million years ago) sandstone, Ordovician age (450 million years ago) dolomite, sandstone and shale, and Silurian age (400 million years ago) dolomite. Quaternary age (2 million years ago) sands and gravels were deposited on top of these layers after a long period of erosion. The Precambrian quartzite slopes to the east as do the younger bedrock layers deposited on top of it. Map 2-2 is a generalized cross-section or side view across the Beaver Dam watershed. It shows that moving across the watershed to the east, the rock units become younger.

The unsorted sands and gravels capping the eroded bedrock surface were deposited by glacial ice or as residue from melting ice. The surface of the ground moraine is gently rolling hills with elongate drumlins aligned in the direction of ice movement. Wetlands can be present between the drumlins. Ridges near Fox and Emily Lakes and east of Beaver Dam Lake are end moraines, unsorted sand and gravel deposited at the terminus of the most recent glaciation.

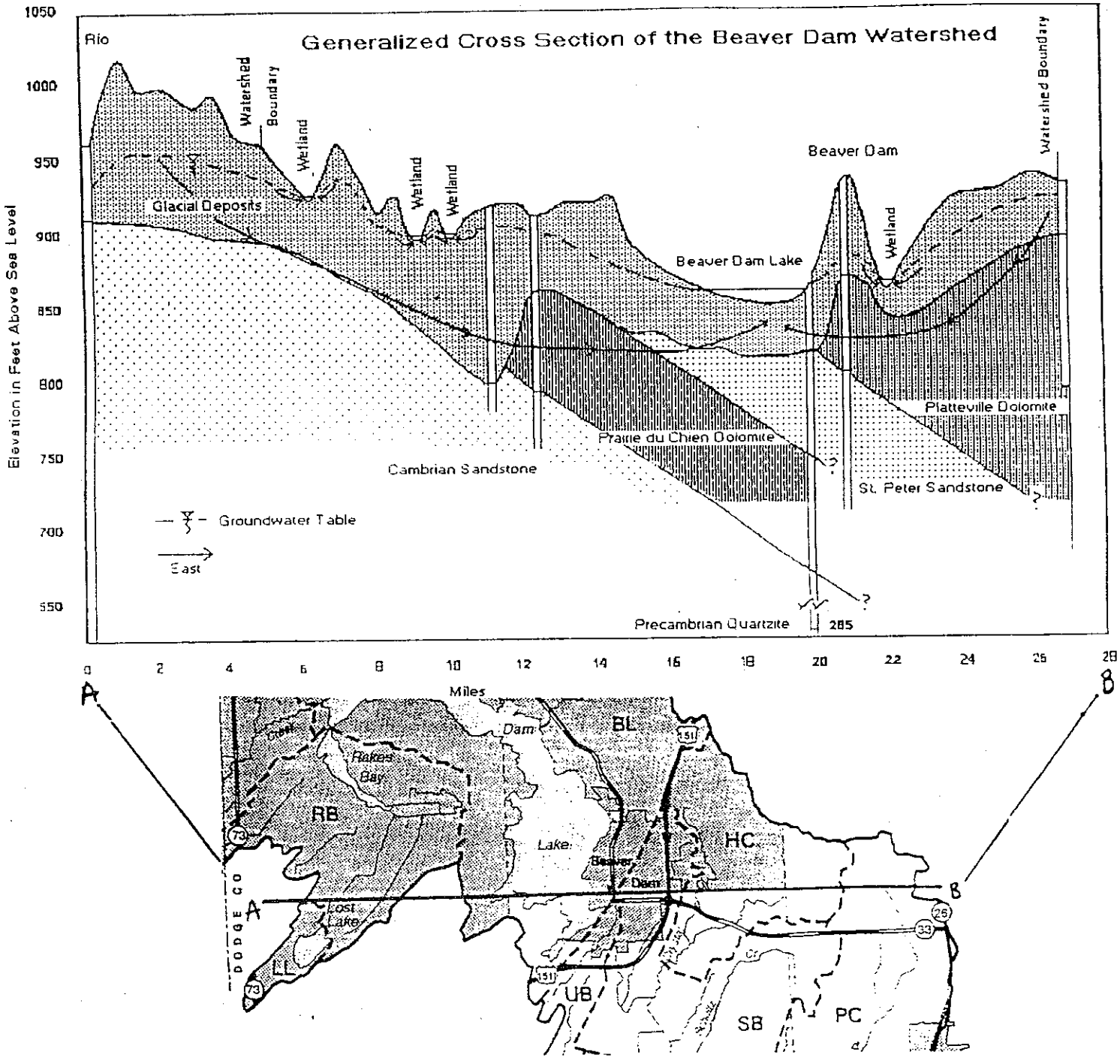
Soils in the Beaver Dam River watershed include silty loams formed from glacial deposits and loess and organic soils. The silty loam soils are present mainly on hilltops, and slopes and in broad glacial valleys. The silt loams are well to moderately drained and have high permeabilities and high available water capacity. These soils cover the majority of the watershed. Very poorly drained soils classified as "mucks" are present along the Beaver Dam River, along Beaver Creek and on the north shore of Fox Lake. Muck soils have formed in old glacial lake basins and on flood plains along meandering streams. Mucks have also formed in small wetlands present between drumlins. Muck soils generally have a lower permeability than the silt loams soils and a high available water capacity.

Water Resources

Streams

There are 13 named creeks and one river in the watershed: Alto Creek, Beaver Creek, Cambra Creek, Casper Creek, Cold Spring Creek, Crystal Creek, Drew Creek, Lau Creek, Mill Creek, Park Creek, Pratt Creek, Schultz Creek, Shaw Brook, and the Beaver Dam River. The Beaver Dam River is the major stream in the watershed, and with the exception of Beaver Creek, all other streams are relatively small. There are also 33 unnamed creeks.

Map 2.2 Map of Groundwater Flow in the Beaver Dam River Watershed



Water quality monitoring indicates that nonpoint source pollution impacts are severe on most streams in this watershed (table 2-1). Habitat is severely impacted by sedimentation. The major apparent source of sediment is upland erosion from row cropping of corn and beans. Insect communities in most streams are poorer than expected in terms of numbers and diversity, indicating dissolved oxygen stress, habitat degredation, or other factors. Fish communities are severely degraded, and are poorer than expected and have degraded since previously surveyed in 1974 and 1980. The poor fish communities are due in part to degraded habitat and dissolved oxygen concentrations, but other unknown factors may be significant. A significant reduction in soil loss from croplands adjacent to streams will be required for most streams to fully attain their potential biological uses.

Lakes

Table 2-2 presents a summary of Lost, Beaver Dam and Fox Lakes which are best known for fish, wildlife, and boating. The three lakes are shallow, fertile and biologically productive. Nutrients, especially phosphorus and nitrogen, are in excess concentration, resulting in high turbitity due to algae. Some uses of the lakes, particularly water contact recreation, are limited. Blooms of blue-green algae have been severe and aesthetic qualities are almost completely eliminated at times. Both external and internal sources influence the quality of these lakes. External sources include land runoff entering tributary streams and storm water outfalls. Internal sources may include carp recycling sediment and nutrients, lake sediments releasing nutrients under anoxic conditions, and occasionally, wetlands. Other sources that affect water quality are wind conditions, depth, anoxia, carp biomass and phosphorus being released from the sediment.

Table 2-1. General Condition of Major Water Resources in the Beaver Dam River Watershed

Rivers and Streams[1]	Biological Uses		Problems Related to NPS Pollution
	Current	Potential	
Alto Creek	Warm Water Sport Fishery (Impacted)	Warm/Cold Water Sport Fishery	Habitat; sedimentation
Beaver Creek	Warm Water Sport Fishery (Severely Impacted)	Warm Water Sport Fishery	Sediment; nutrients
Beaver Dam River	Warm Water Sport Fishery (Severely Impacted)	Warm Water Sport Fishery	Sediment; nutrients; temperature; low DO; flow extremes
Casper Creek	Warm Water Forage Fishery	Warm Water Sport Fishery	Sediment; nutrients; and flow extremes
Crystal Creek Upper reaches Main branch (below lake) Tributary to creek	 Cold Water Fishery (Impacted) Warm Water Forage Fishery Warm Water Forage Fishery	 Cold Water Fishery Warm Water Fishery Cold Water Fishery	Sediment; nutrients
Drew Creek	Warm Water Forage Fishery	Warm Water Forage Fishery	Flow extremes; DO; temp.; sediment; nutrients; algae
Lau Creek	Warm Water Sport Fishery	Warm Water Sport Fishery	
Mill Creek	Warm Water Sport Fishery	Warm Water Sport Fishery	
Park Creek	Warm Water Forage Fishery	Warm Water Forage Fishery	Sediment; nutrients; algae
Pratt Creek	Warm Water Sport Fishery	Warm Water Sport Fishery	
Schultz Creek	Warm Water Forage Fishery (Impacted)	Limited Forage Fishery	
Shaw Brook	Warm Water Sport Fishery (Severely Impacted)	Warm Water Sport Fishery	Sediment; nutrients

[1] No data collected on Cambra Creek or Cold Spring Creek.

Table 2-2. Appraisal Summary for Fox, Beaver Dam, and Lost Lakes

Problems or Threats to Water Quality & Biological Integrity	Pollutants or Limiting Factors Causing Problems or Threats	Observed or Potential Sources	Preliminary Management Recommendations
Recreational use restrictions due to poor aesthetic quality of Lakes (i.e. swimming, skiing, fishing). (Fox, B. Dam, Lost)	Excess algal production due to excess phosphorus and nitrogen in water. Bacteria levels exceed recreational standards (potential))	Internal (lake) sources and watershed sources. Animal wastes in watershed, especially livestock and urban stormwater.	Determine relative importance of sources and reduce nutrient loads. Reduce animal waste sources through improved management of livestock manure and urban sources.
Fish, wildlife, and vegetation community degradation and diversity loss. (Fox, Beaver Dam, and Lost Lake)	Excess algal production due to excess phosphorus and nitrogen creating low light conditions and resultant loss of aquatic plant diversity. Shade tolerant species predominate.	Internal (lake) sources and watershed sources of nutrients.	Determine relative importance of sources and reduce nutrient loads.
Odors and anoxia in shoreline zones, potential toxicity of water to livestock, pets and people due to Blue-green algae blooms. (Fox, B. Dam)	Excess algal production due to excess phosphorus and nitrogen.	Internal (lake) sources and watershed.	Determine relative importance of sources and reduce nutrient loads.
Lake bed (benthic zone) habitat degradation (Fox, B. Dam)	Sediment.	Erosion of farmland exacerbated by wetland ditching, resuspension of lake sediments from wave forces.	Reduce upland erosion sources and/or restore wetland functions.
Lake wetland functions regarding pollutant retention are degraded. (Fox, B. Dam, Lost)	Sediment.	Erosion of upland exacerbated by wetland ditching.	Reduce upland erosion sources and/or restore wetland functions.
Fish, wildlife, and vegetation community degradation and diversity loss. (Fox and B. Dam)	Fluctuating water level Lake sediments and nutrients resuspension resulting in turbidity and physical destabilization of benthic habitat. Erosion of riparian wetland shoreline	Carp, wave forces, dam management.	Water level management improvement. Assess carp population and estimate nutrient loads. Promote rough fish management as a non-point source activity. Resore riparian wetland areas.
General acceleration of lake enrichment processes, i.e. cultural eutrophication. (Fox, B. Dam, Lost)	Sediment, phosphorus, nitrogen delivery.	Watershed land use, especially agricultural activities causing erosion, nutrient runoff and wetland degradation. Urban runoff. Bioturbation, i.e. CARP, Septic System, Atmospheric, and groundwater inputs.	Reduce sources as much as possible utilizing available technology and management resources.
Winterkill from depletion of oxygen. (Fox, B. Dam, Lost)	Sediment and nutrients causing eutrophication of lake sediments and water column.	Watershed, (agricultural and urban) and internal influences.	Reduce nutrient and sediment loadings.

Wetlands

Wetlands are valuable natural resource features for benefits to wildlife habitat, fish spawning and rearing, recreation, attenuation of runoff and flood flows and removal of pollutants. Abundant wetlands once surrounded Fox Lake, and served as excellent habitat and hunting opportunities (table 2-3). These marshes have diminished in recent years, especially on the east end of the lake. Some wetlands in the watershed have been converted to agricultural uses, while others have been channelized, increasing the flow of water and associated pollutants from upland areas.

Table 2-3. Wetland Inventory Summary for Columbia County Only - Beaver Dam River Watershed

County	Prior Converted (Acres)	Wetland (Acres)	Farmed Wetland (Acres)	Converted Wetland (Acres)	Not Inventoried (Acres)	Total (Acres)
Columbia County	9,706	9,482	718	350	638	20,894

Groundwater

Regional Aquifers

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

Since 1936, the State of Wisconsin has required that well drillers document well construction and rock and soil layers encountered during well installation. Information from geologic logs, driller construction reports and Wisconsin Geological and Natural History Survey (WGNHS) reports for Dodge (Devaul et al., 1983) and Columbia County (Harr et al., 1978) counties is summarized below. Principle aquifers within the watershed are, from the surface down, the glacially deposited sand and gravel, the Galena - Platteville dolomite, and the Cambrian sandstone aquifer.

The *sand and gravel aquifer* is present along the Beaver Dam River basin where it is up to 146 feet thick. Information from driller construction reports show few wells drawing water this shallow aquifer within the watershed. Depth to groundwater ranges from zero to 218 feet below the ground surface. Water yields from wells located in the sand and gravel are estimated to range from five to 500 gallons per minute (Devaul, et al., 1983).

Below the glacial deposits are *shaley dolomites* of the Galena - Platteville formations deposited approximately 500 million years ago. Groundwater is stored in fractures and cracks in the aquifer. Driller construction reports for domestic supply wells show wells east of the Beaver Dam River within the watershed draw water from this aquifer. It ranges between 2 and 250 feet thick within the watershed. Wells yield between five and 120 gallon per minute. Depth to groundwater ranges from sixteen feet above (artesian wells) to 40 feet below the ground surface within the Beaver Dam watershed.

The *Cambrian sandstone aquifer* is the major source of water for municipal and industrial supply wells. West of the Beaver Dam River where the sandstone is close to the surface it is the sole source of domestic wells. Driller construction reports show the cambrian sandstone aquifer to be between 150 and 400 feet thick within the watershed. Wells in the sandstone aquifer yield between 13 and 1000 gallons per minute.

Few wells within the watershed draw water from the Precambrian quartzite aquifer. Driller construction reports show that these wells yield between 0.5 and 20 gallons per minute and depth to groundwater ranges from 20 to 70 feet below the ground surface.

Direction of Groundwater Flow

Map 2-2 shows that in general, regional groundwater flow in the Beaver Dam watershed is northwest and southeast, toward the Beaver Dam River (Harr et al., 1978 and Devaul et al., 1983). There is a groundwater divide east of the river which parallels the surface water divide delineating the Beaver Dam watershed. North of the divide, groundwater flows toward Horicon Marsh. Locally, the groundwater flow and depth to groundwater is controlled by the topography. There are numerous small groundwater basins which correspond to drumlins and their associated wetlands.

Groundwater Quality Problems

Groundwater quality in the Beaver Dam River Watershed is generally considered good. As part of the Beaver Dam River Watershed Water Quality Appraisal, 270 and 252 private well samples were collected and analyzed for nitrate+nitrite and triazine respectively. Sample analytical results are summarized in tables 2-4 and 2-5. Atrazine is the most widely used pesticide in Wisconsin and is a possible human carcinogen. Nitrate contaminated groundwater is the cause of methemoglobinemia or blue baby syndrome in infants and can cause abortions in cattle at levels as low as 20 parts per million. Nitrate below 2 ppm in groundwater, is considered "naturally occurring". At levels above 2 ppm, groundwater is showing the effect of contamination by other than natural sources including: manure; fertilizer (farm and lawn); septic systems; and stormwater runoff from streets.

The State of Wisconsin has two groundwater quality standards which are based on the potential health effects of selected contaminants. The higher standard, called the enforcement standard (ES), defines when a violation of Chapter NR 140 Wis. Adm. code, has occurred. When an ES has been attained or exceeded, a regulatory agency must prohibit the continuation of the activity from which the substance came, unless it is demonstrated to the agency that an alternative response action will achieve compliance with the ES. Nonpoint

sources of nitrate and other nutrient contamination are generally not regulated by state agencies. Nonpoint sources of pesticide contamination due to misuse and poor handling practices are regulated by the Department of Agriculture, Trade and Consumer Protection (DATCP).

Table 2-4. Nitrate-Nitrite Sample Analytical Results: Fall 1991 - Beaver Dam River Watershed

Subwatershed	Total Samples Taken	Number and percent of samples below PAL		Number and percent of samples above PAL but below ES		Number and percent of samples above ES	
Alto Creek	22	8	36%	5	23%	9	41%
Lower Beaver Dam River	15	13	87%	2	13%	--	--
Beaver Creek	38	20	53%	13	34%	5	13%
Beaver Dam Lake	33	14	43%	12	36%	7	21%
Cambra Creek	22	11	50%	7	22%	4	18%
Cold Spring Creek	6	2	33%	3	50%	1	17%
Drew Creek	6	1	17%	2	33%	3	50%
Fox Lake	35	28	80%	6	17%	1	3%
Casper Creek	7	3	43%	3	43%	1	14%
Crystal Creek	6	4	67%	2	33%	--	--
Lost Lake	4	2	50%	--	--	2	50%
Pratt Creek	24	16	67%	6	25%	2	8%
Rakes Bay	14	12	86%	1	7%	1	7%
M.B.D.R. - Lowell	11	8	73%	1	9%	2	18%
M.B.D.R. - Reeseville	8	7	88%	--	--	1	12%
Shaw Brook	16	8	50%	2	12%	6	38%
Upper Beaver Dam River	3	2	67%	1	33%	--	--
Total	270	159 AVG: 59%		66 AVG: 24%		45 AVG: 22%	

Table 2-5. Triazine Sample Analytical Results: Fall 1991 - Beaver Dam River Watershed

Subwatershed	Total Number of Samples Taken	Number and Percent of samples less than PAL		Number and Percent of Samples greater than PAL but less than <ES		Number and Percent of samples greater than ES	
Alto Creek	22	19	86%	3	14%	-	-
Lower Beaver Dam River	14	14	100%	-	-	-	-
Beaver Creek	33	24	73%	9	33%	3	9%
Beaver Dam Lake	33	30	91%	2	6%	-	-
Cambra Creek	21	18	86%	3	14%	-	-
Cold Spring Creek	6	5	83%	1	17%	-	-
Drew Creek	6	4	67%	2	33%	-	-
Fox Lake	34	33	97%	1	3%	-	-
Casper Creek	5	3	60%	2	40%	-	-
Crystal Creek	6	6	100%	-	-	-	-
Lost Lake	4	2	50%	2	50%	-	-
Pratt Creek	18	16	89%	2	11%	-	-
Rakes Bay	14	13	93%	1	7%	-	-
M.B.D.R. - Lowell	10	10	100%	-	-	-	-
M.B.D.R. - Reeseville	8	8	100%	-	-	-	-
Shaw Brook	15	11	73%	4	27%	-	-
Upper Beaver Dam River	3	3	100%	-	-	-	-
Total	252	219	AVG: 87%	32	AVG: 13%	3	AVG: 1%

The second standard, called the preventative action limit (PAL), is a lower level standard which is a "warning" for regulatory agencies. Exceeding the PAL creates the possibility that some regulatory response may be necessary. The PAL is either 10%, 20% or 50% of the ES based on health related characteristics of the hazardous substance.

Samples analyzed for nitrate+nitrite showed concentrations ranging from not detected to 26.2 milligrams per liter (mg/L). One milligram per liter is comparable to one drop in a 10 gallon fish tank. The groundwater quality enforcement standard (ES) for nitrate is 10 mg/L as defined in Chapter NR 140, Wis. Adm. code. Nitrate+nitrite concentrations above 2 mg/L exceed the states preventative action limit (PAL). Forty-five (16.6 %) sample analytical results exceeded the 10 mg/L ES and 111 (41%) exceeded the 2 mg/L PAL. Results so far do not indicate a pattern of groundwater contamination that can be linked to specific sources of nitrate.

Concentrations for triazine in the Beaver Dam Watershed ranged from not detected to 13.3 parts per billion (ppb). One part per billion is comparable to one drop in 10,000 gallons (a small swimming pool). The analytical result of three samples (1% of total samples taken) exceeded the ES for triazine of 3.0 ppb. Thirty-three (13%) sample analytical results exceeded the PAL of 0.3 ppb for atrazine. As with the nitrate contamination, no specific source of contamination is indicated by the results.

Archaeological Sites: Coordination With State and Federal Historic Preservation Laws

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

There may be known archaeological sites within the Beaver Dam River Watershed. These areas will need special consideration when structural best management practices are being considered. Settling basins, manure storage structures, and streambank or shoreline shaping and riprapping are likely practices that may impact archaeological sites. As discussed above, state and federal laws require preservation of archaeological resources within the framework of the NPS Program.

The Beaver Dam River Priority Watershed Project will address these concerns with the following procedures:

1. Dodge, Columbia, Fond du Lac Counties will obtain inventory maps from the regional Wisconsin State Historical Society office, and will plot sites on topographic maps. Counties will also obtain a supply of landowner questionnaires from the historical society which will be used to identify additional non-inventoried sites.

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

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

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

which nullifies or partially nullifies the cost-share agreement based on the final results of the archaeological survey.

Endangered and Threatened Resources

Information on 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 Beaver Dam River Priority Watershed. The lack of additional occurrence records does not preclude the possibility that other endangered resources are present in the watershed.

In addition, the Bureau's endangered resource files are continuously updated from ongoing field work. There may be other records of rare species and natural communities which are in the process of being added to the database and so are not in the lists below. Updates or revisions of this watershed plan should be reviewed by the Bureau of Endangered Resources to include new records.

Rare Species

The biological status and locations of 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: Any species whose continued existence as a viable component of this state's wild animals or wild plants is determined by the DNR to be in jeopardy on the basis of scientific evidence.

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

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

The following rare species are known to occur within the Beaver Dam River Watershed:

Wisconsin Endangered Species
Salix cordata (Sand Dune Willow)

Wisconsin Threatened Species
Casmerodius albus (Great Egret)
Venustaconcha ellipsiformis ellipsiformis (Ellipse)

Wisconsin Special Concern Species
Anguilla rostrata (American Eel)
Notropis texanus (Weed Shiner)
Nycticorax nyctricorax (Black-Crowned Night-Heron)

The following rare species occur in the general area just outside the boundaries of the Beaver Dam River watershed. If these species' preferred habitats occur within this watershed, then these species may also be present:

Sterna fosteri (Forster's tern)
Tyto alba (Barn owl)
Chlosyne gorgone carlota (Gongone checker spot)
Opsopoeodus emiliae (Pugnose minnow)
Buteo lineatus (Red-shouldered hawk)
Cypripedium candidum (White lady's-slipper)
Lythrurus umbratilis (Redfin shiner)
Moxostoma carinatum (River redhorse)
Polytaenia nuttallii (Prairie parsley)

Natural Areas

Natural areas, in general, are sites that contain high quality examples of natural communities. State Natural Areas (SNA's) have been officially designated by the DNR Natural Areas Program as deserving protection. They are owned by the DNR, other state and local agencies, or conservation organizations, and are managed to protect their natural features.

The following SNA's (owned by DNR) and other natural areas have been identified in the Beaver Dam River Priority Watershed. The natural communities found at each area are also listed.

SNA's
Lost Lake

Natural Areas

Alto Creek Marsh (emergent aquatic, southern sedge meadow)
Beaver Dam Marsh (emergent aquatic, shrub carr, southern sedge meadow)
Clyman Railroad Prairie (mesic and wet-mesic prairies)
Dearholt Woods (southern dry-mesic forest)
Fox Lake Marsh (emergent aquatic, southern sedge meadow)

Hughes Woods (southern mesic forest)
Lowell maples (southern mesic forest)

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

CHAPTER THREE
Water Quality Conditions, Water Resource Objectives, and Nonpoint Sources

Introduction

The first part of this chapter presents a general description of how nonpoint source pollutants impact water quality. The remainder of the chapter discusses the establishment of water resource objectives; the results of the nonpoint source inventories; individual subwatersheds' general characteristics, condition of water resources, nonpoint pollutant sources and water resource objectives; the amount of pollutant control necessary to achieve the desired water resource conditions; and other potential pollutant sources.

Water Pollution Basics

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

Manure

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

Sediment

Sediment adversely impacts the water resources in many ways. It degrades habitat for aquatic insects which support fish and other forms of aquatic life. High sediment concentrations abrade fish gills making the fish more susceptible to disease. Suspended sediment also causes the water to be warmer in the summer, and warm water cannot hold as much oxygen as cold water. The major source of sediment in this watershed is upland erosion from cropland. Heavy or long term sediment deposits are a problem in lakes and streams of the watershed. This is due to the fact that the streams have low gradients and low velocities. Sediment deposits are the most common form of stream habitat destruction.

Nitrates

Groundwater with nitrate levels greater than 10 milligrams per liter (mg/l) exceed state groundwater standards. At this level it is recommended that infants not consume the water because the nitrate interferes with the ability of the blood to carry oxygen. High levels of nitrates may also indicate other contaminants in the drinking water. High nitrate concentrations in the drinking water are also linked to spontaneous abortions in livestock. The possible sources of nitrates in the groundwater in this watershed are nitrogen fertilizers and manure applied to croplands. See groundwater discussion in Chapter Two.

Water Quality Conditions and Uses

Streams

There are 13 named creeks and one river in the watershed: Alto Creek, Beaver Creek, Cambra Creek, Casper Creek, Cold Spring Creek, Crystal Creek, Drew Creek, Lau Creek, Mill Creek, Park Creek, Pratt Creek, Schultz Creek, Shaw Brook, and the Beaver Dam River. The Beaver Dam River is the major stream in the watershed, and with the exception of Beaver Creek, all other streams are relatively small. There are also 33 unnamed creeks.

Water quality monitoring indicates that nonpoint source pollution impacts are severe on most streams in this watershed. Habitat is severely impacted by sedimentation. The major apparent source of sediment is upland erosion from row cropping of corn and beans. Insect communities in most streams are poorer than expected in terms of numbers and diversity, indicating dissolved oxygen stress, habitat degredation, or other factors. Fish communities are severely degraded, and are poorer than expected and have degraded since previously surveyed in 1974 and 1980. The poor fish communities are due in part to degraded habitat and dissolved oxygen concentrations, but other unknown factors may be significant. A significant reduction in soil loss from croplands adjacent to streams will be required for most streams to fully attain their potential biological uses.

Lakes

Lost, Beaver Dam and Fox Lakes are best known for fish, wildlife, and boating. The three lakes are shallow, fertile and biologically productive. Nutrients, especially phosphorus and nitrogen are in excess concentrations that support high turbitity due to algae. Some uses of the lakes, particularly water contact recreation, are limited. Blooms of blue-green algae have been severe and aesthetic qualities are almost completely eliminated at times. Both external and internal sources influence the quality of these lakes. External sources include land runoff entering tributary streams, and storm water outfalls. Internal sources may include carp recycling sediment and nutrients, lake sediments releasing nutrients under anoxic conditions, and occassionally, wetlands. Other sources that affect water quality are wind conditions, depth, anoxia, carp biomass and phosphorus being released from the sediment.

Water Quality Objectives

The DNR staff with assistance from the Columbia, Dodge, Green Lake and Fond du Lac County staffs and the DATCP developed water quality objectives. Objectives were identified for each subwatershed and are listed in the following subwatershed descriptions. Details of objective development can be found in the Appraisal Monitoring Report for the Beaver Dam River Priority Watershed (1991).

Increasing water quality within the watershed is the ultimate goal of this project. This objective will upgrade stream and lake conditions as well as lower nutrients and sediment loads currently being discharged into the Crawfish River.

Results of Nonpoint Source Inventories

Barnyard Runoff

Runoff carrying a variety of pollutants from barnyards and other livestock feeding, loafing, and pasturing areas is a source of pollutants in the streams and lakes of the Beaver Dam River Watershed. Livestock operations are comprised of 404 animal lots delivering 9,533 pounds of phosphorus per year (table 3-1).

Upland Sediment

Intensive agricultural practices have caused considerable amounts of eroded soil to reach lakes, streams, ponds, and wetlands in the Beaver Dam Watershed. Upland erosion is the major source of the sediment that is carried downstream, beyond subwatershed boundaries.

Table 3-1. Barnyard Inventory Results: Beaver Dam River Watershed[1]

Subwatershed	Number of Barnyard Segments	Phosphorus Load (lbs./yr.)	Percent Phosphorus Load
Alto Creek	43	566	6%
Lower Beaver Dam River	29	999	11%
Beaver Creek	57	1429	15%
Beaver Dam Lake	35	732	6%
Cambra Creek	45	1371	15%
Cold Spring Creek	16	364	4%
Drew Creek	8	274	3%
Fox Lake	8	222	2%
Casper Creek	19	517	5%
Crystal Creek	6	89	1%
Lost Lake	3	170	2%
Pratt Creek	46	1034	10%
Rakes Bay	18	267	3%
Middle B. Dam-Lowell	26	326	5%
Middle B. Dam-Reeseville	9	306	3%
Shaw Brook	27	807	8%
Upper B. Dam River	9	60	1%
Totals	404	9533	100%

[1] Based on BARNY model, Ver. 2.1

Sources: Columbia, Dodge, Fond du Lac and Green Lake County Land Conservation Departments, DNR, and DATCP

Upland sediment sources were estimated using actual data extrapolated for the entire watershed (292 square miles). The results of this inventory are summarized in table 3-2. An estimated 435,000 tons of soil erode annually from all land uses. About 12% of this amount (about 52,000 tons/year) is delivered directly to wetlands or streams in the watershed. Cropland is the source of 94 percent of the sediment delivered to surface waters.

Streambank and Shoreline Erosion

Streambank and shoreline erosion is a source sediment to surface waters in the Beaver Dam River Watershed. Bank sloughing causes direct sediment delivery which has a serious affect on water quality. The inventory results show that the majority of streambanks and lake shore property is buffered by grassland (table 3-2).

Table 3-2. Streambank Inventory Results - Beaver Dam Watershed

ALL NUMBERS REPORTED IN FEET						
Subwatershed	**Grassland**	**Cropland**	**Residential**	**Woods**	**Pasture**	**Commercial Developing**
Alto Creek						
Streambank	64,000	1,300	-			
Shoreline	18,100	-	5,600			
Lower Beaver Dam R.	160,100	5,700		7,400		
Beaver Creek	109,800	29,200		2,000	9,600	
Beaver Dam Lake						
Lake Shore	80,500	2,200	75,605	800		
Streambank	56,000	1,800	-			
Cambra Creek	101,900	1,900				
Cold Spring Creek	29,400	39,800		5,800		
Drew Creek	18,400	600	1,000	3,200	5,200	
Fox Lake						
Lake Shore	14,100		39,000			2,100
Casper Creek	73,100	23,100	500			
Crystal Creek	55,300	5,100		800		
Lost Lake						
Lake Shore	9,400		1,100	4,400		
Pratt Creek	175,500	30,450		4,450	3,500	
Rakes Bay						
Streambank	65,100	25,600		-	-	
Lake Shore	21,600	4,100		800	900	
M. Beaver Dam - Lowell	86,300	8,000		17,300		
M. Beaver Dam R. Reeseville	79,800	30,700	600	8,300	3,600	400
Shaw Brook	146,500	55,700		8,400	6,000	3,100
U. Beaver Dam R.	33,300	1,400	6,700	6,100	400	8,100

Winter-Spreading of Manure

The most significant water quality problems associated with the spreading of livestock manure occur when wastes are spread on "critical" areas such as steeply sloped frozen

ground, land in floodplains, or areas with shallow depth to groundwater. Estimates indicate livestock manure is contributing 6,903 pounds of phosphorus annually to both surface waters and wetlands.

Detailed results of nonpoint source inventories can be found in the following individual subwatershed descriptions.

Subwatershed Discussions

Abbreviations for designated biological uses in the subwatershed discussions follow:

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

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

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

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

***Class I** streams are high quality, and populations are sustained by natural reproduction.

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

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

Alto Creek Subwatershed (AC)

Description

Alto Creek Subwatershed (map 3-1) is 13,693 acres or 8% of the total watershed area. Alto Creek is located in the northeast portion of the Beaver Dam River Watershed. Small sections in the north portion of the subwatershed are located in Green Lake and Fond du Lac Counties. This subwatershed is comprised of 91% cropland and 9% non-cropland. Alto Creek flows primarily to the southwest and into the east side of Fox Lake.

Water Resource Conditions

Alto Creek is a relatively large stream that originates from a number of drainage ditches in a large wetland area in the northeast corner of the subwatershed. This stream flows through an extensive area of wetlands near its outlet into Fox Lake. The bottom is primarily a mixture of gravel, silt and muck. Instream habitat quality is poor and the water is occasionally turbid. Alto Creek currently has an impacted warm water sport fishery (WWSF), although the potential for a warm water forage fishery (WWFF) and possibly a cold water fishery (COLD) are viable.

Nonpoint Pollutant Sources

There are 43 active barnyard segments in the Alto Creek Subwatershed which annually produce 819 pounds of phosphorus. The total annual phosphorus load reaching Alto Creek or its receiving water bodies is 566 pounds. This represents 6% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

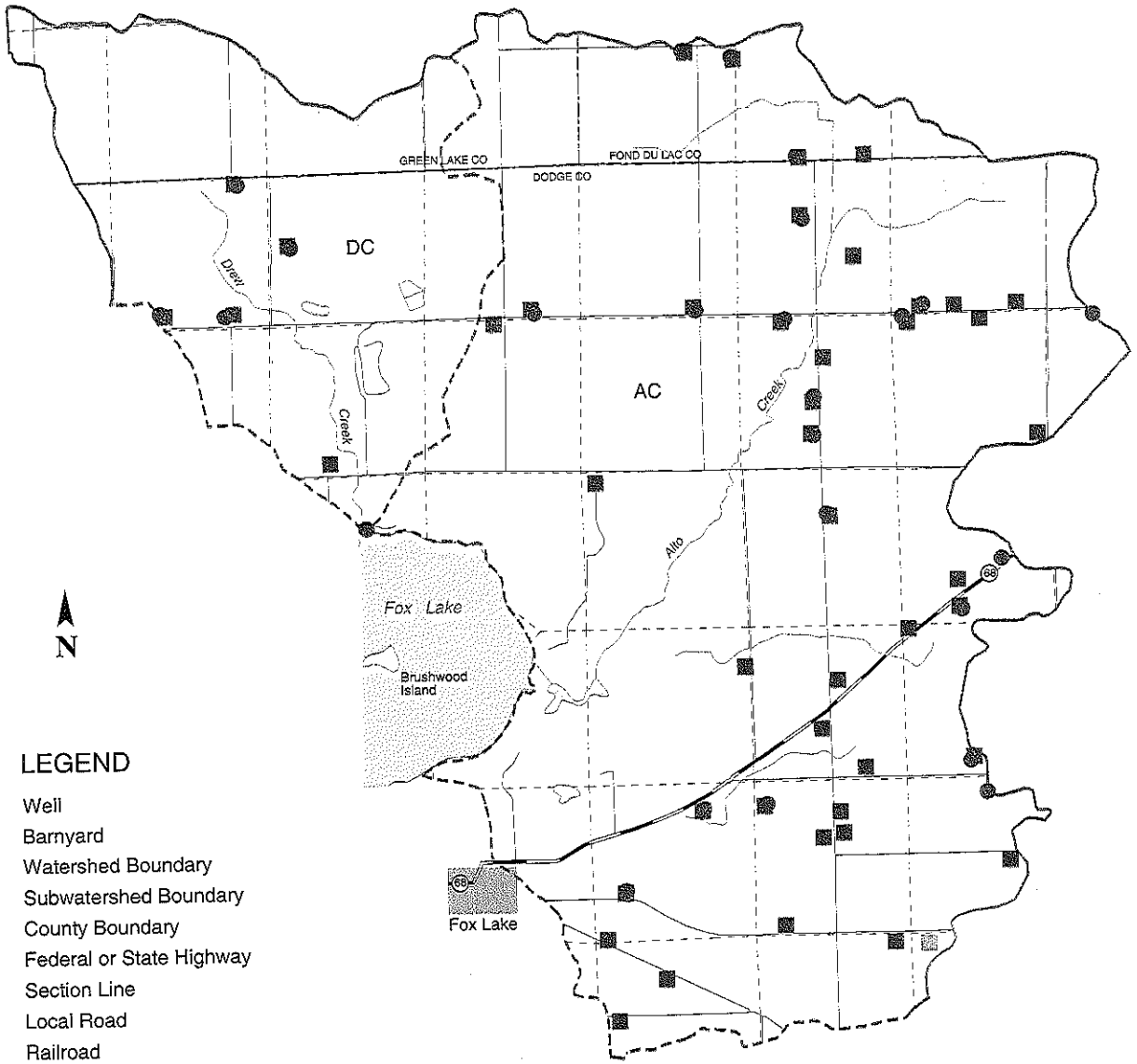
The total sediment load for the Alto Creek Subwaterhed is 6,477 tons per year or 12% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 98% of the upland sediment load to Alto Creek.

Streambank erosion appears to be minimal in Alto Creek. There are 65,300 feet (6.2 miles) of perennial streambank on Alto Creek, the majority of which are well buffered with grassland habitat. There are 23,700 feet (2.2 miles) of shoreline on Fox Lake; the majority is buffered with grassland, although there is also adjacent residential land use.

Water Resources Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50% and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Map 3.1 Alto Creek and Drew Creek Subwatersheds



N

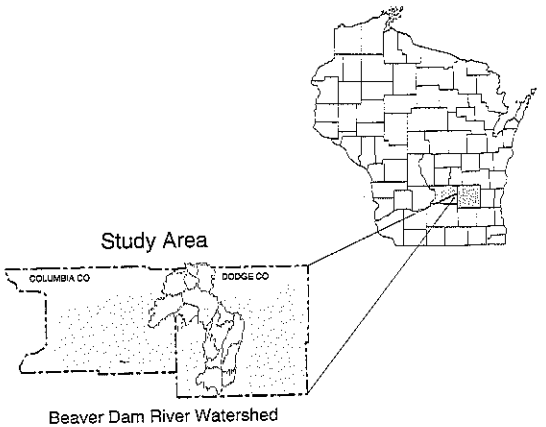
LEGEND

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

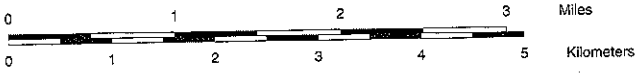
Subwatershed Codes

AC = Alto Creek

DC = Drew Creek



Beaver Dam River Watershed



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Lower Beaver Dam River Subwatershed (BB)

Description

The Lower Beaver Dam River Subwatershed (map 3-2) is 15,208 acres or 9% of the total watershed area. The Lower Beaver Dam River Subwatershed is located in the southwest portion of the Beaver Dam River Watershed. This subwatershed is comprised of 78% cropland and 22% non-cropland. The Lower Beaver Dam River flows primarily southwest to Mud Lake and the Mud Lake State Wildlife Area, which is the end point of the Beaver Dam River Watershed.

Water Resource Conditions

The Beaver Dam River is 35 miles long and divided into four subwatersheds. The water quality has degraded rapidly over the years. High levels of sediment and nutrients are a major problem. Low dissolved oxygen levels, high temperature and extreme fluctuations in water levels are also problems. Instream habitat quality is fair, however improvement is needed.

The river currently has a limited warm water fishery. The potential for improving the warm water forage (WWFF) and sport fishery (WWSF) is there if intense management in the watershed is implemented.

Nonpoint Pollutant Sources

There are 31 active barnyard segments in the Lower Beaver Dam River Subwatershed which annually produce 1,052 pounds of phosphorus. The total annual phosphorus load reaching Lower Beaver Dam River or its receiving water bodies is 1,002 pounds. This represents 10% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

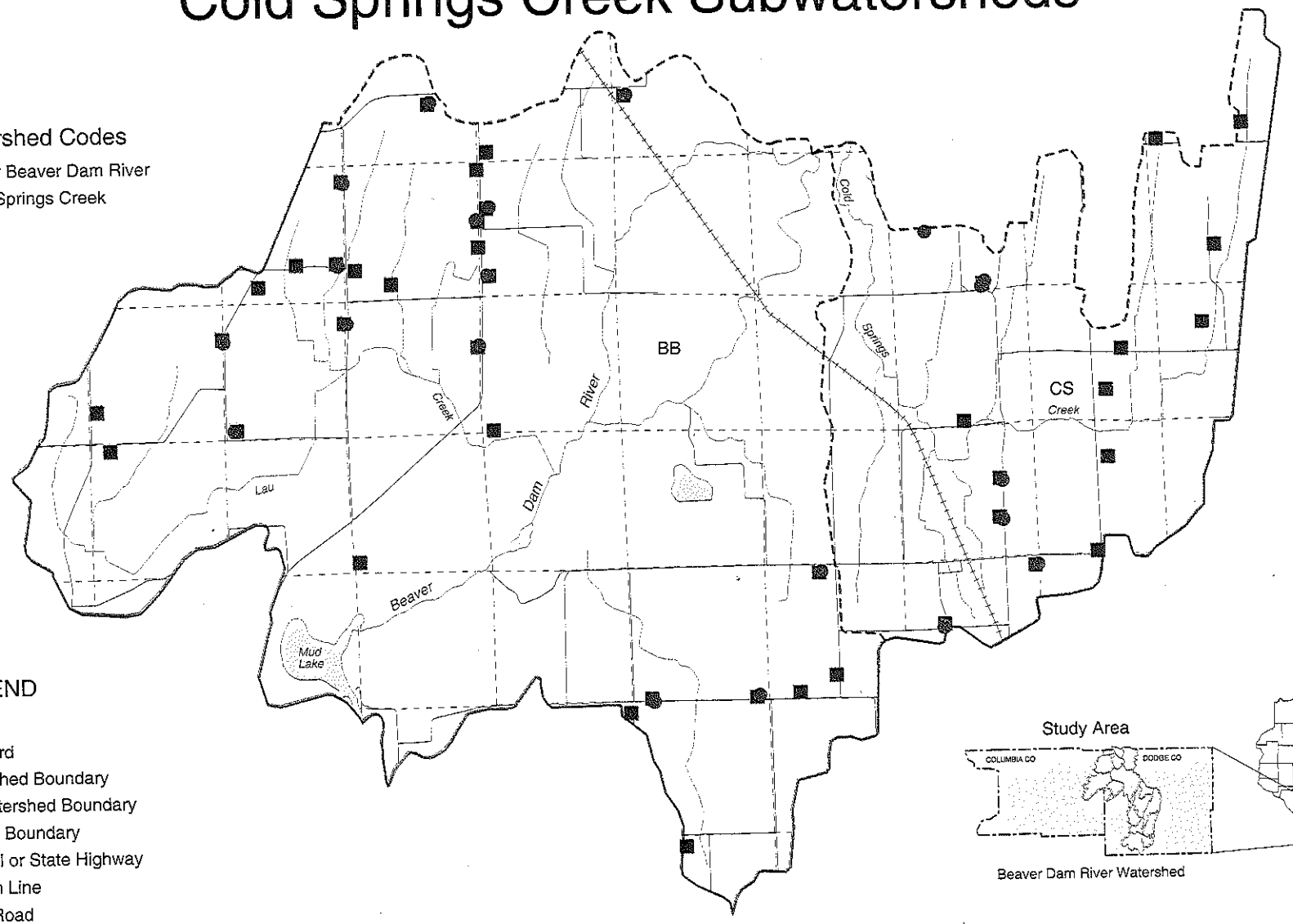
The total sediment load for the Lower Beaver Dam River Subwatershed is 4,314 tons per year or 9% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 95% of the upland sediment load to the Lower Beaver Dam River.

River and streambank erosion appears to be minimal in the Lower Beaver Dam River Subwatershed. There are 173,200 feet (16.4 miles) of perennial riverbank adjacent to the Lower Beaver Dam River and Lau Creek. Nearly 100% of the river and streambank is well buffered with grassland habitat.

Water Resources Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50% and reduce organic loading into the surface water by 73% and to improve wildlife and fish habitat and protect and restore wetlands.

Map 3.2 Lower Beaver Dam River and Cold Springs Creek Subwatersheds



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Beaver Creek Subwatershed (BC)

Description

The Beaver Creek Subwatershed (map 3-3) is 21,813 acres or 13% of the total watershed area. Beaver Creek is located in the northwest portion of the Beaver Dam River Watershed. This subwatershed is comprised of 66% cropland and 34% non-cropland. Beaver Creek has a considerable amount of wetlands, including the Paradise Marsh State Wildlife Area. This subwatershed drains primarily to the east and drains into Beaver Dam Lake.

Water Resource Conditions

Beaver Creek is a relatively large stream which drains a large watershed area west of Beaver Dam Lake. The stream flows through an extensive area of wetlands and is also fed by numerous drainage ditches. The bottom is primarily silt and muck and the water is occasionally turbid. Beaver Creek currently has a severely impacted warm water forage fishery (WWSF), although the potential for a warm water sport fishery (WWSF) is possible.

Nonpoint Pollutant Sources

There are 57 active barnyard segments in the Beaver Creek Subwatershed which annually produce 1,648 pounds of phosphorus. The total annual phosphorus load reaching Beaver Creek or its receiving water bodies is 1,429 pounds. This represents 15% of the phosphorus, produced annually, reaching surface water for the entire watershed.

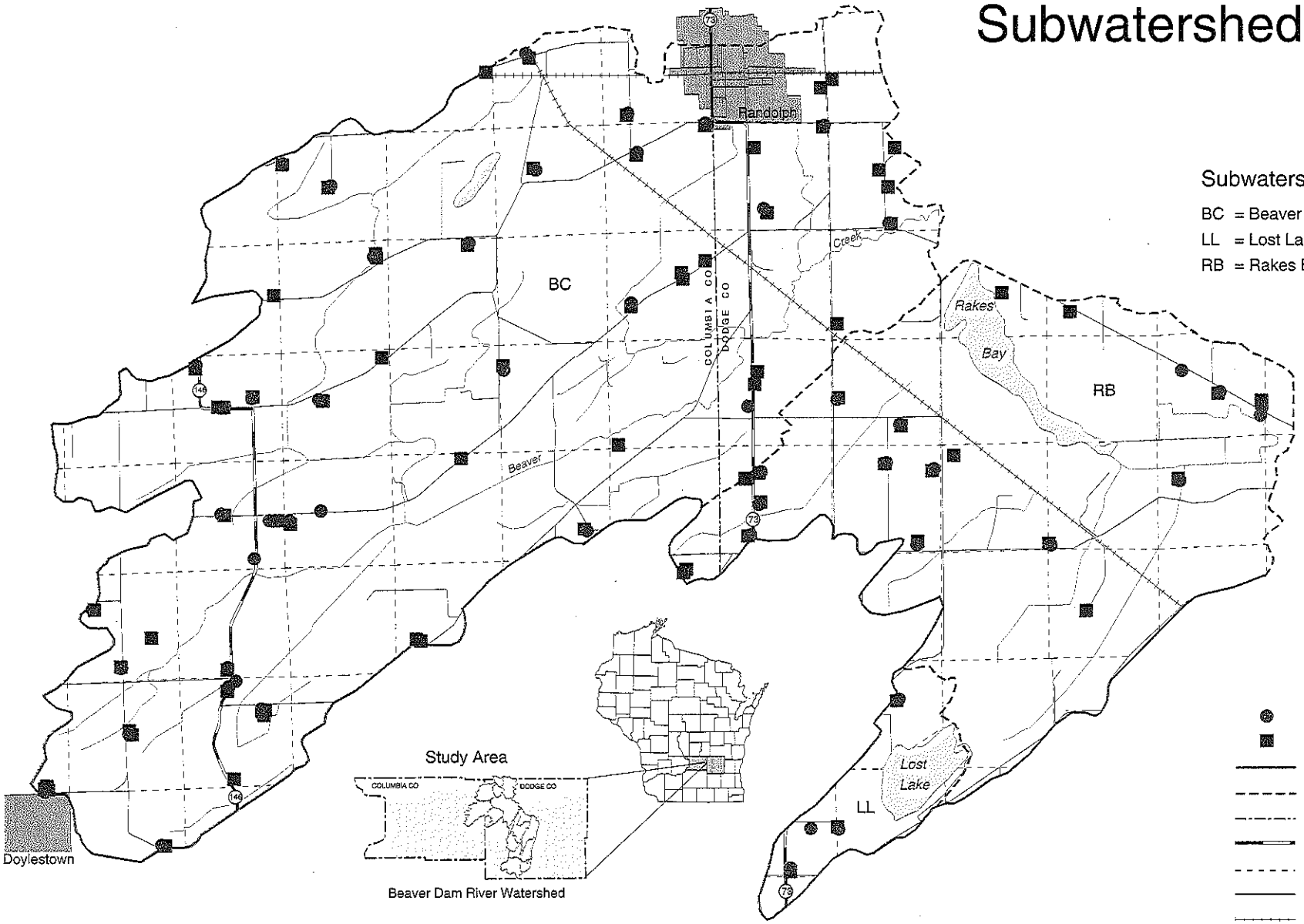
The total sediment load for the Beaver Creek Subwatershed is 6,564 tons per year or 13% of the total for the Beaver Dam River Watershed. Cropland runoff accounts 91% of the upland sediment load to Beaver Creek.

Streambank erosion appears to be minimal in Beaver Creek. There are 150,600 feet (14.3 miles) of perennial streambank in Beaver Creek. 72% of the streambank is well buffered, 20% is cropped within 30 feet of the streambank and 6% has cattle access.

Water Resource Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50% and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Map 3.3 Beaver Creek, Lost Lake and Rakes Bay Subwatersheds



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Beaver Dam Lake Subwatershed (BL)

Description

The Beaver Dam Lake Subwatershed (map 3-4) is 22,398 acres or 12% of the total watershed area. This is the largest subwatershed and is located in the center of the Beaver Dam River Watershed. This subwatershed is comprised of 81% cropland, 14% non-cropland and 5% urban. The Beaver Dam Lake subwatershed surrounds the entire lake with the cities of Fox Lake and Beaver Dam at the north and southeast ends. The Beaver Dam Lake Subwatershed flows primarily to the south into the Beaver Dam River.

Water Resource Conditions

Beaver Dam Lake is 6,542 acres and is fed by Beaver Creek, Mill Creek, Rakes Bay and unnamed tributaries. Beaver Dam Lake has a maximum depth of 7 feet and is a hypereutrophic waterbody. On a scale of 0-100, with 0 being extremely oligotrophic and 100 being extremely hypereutrophic, Beaver Dam Lake ranges between 60 and 95. Problems include blue-green algal blooms, macrophyte community instability, algae blooms, potential fish kills, and the dominance of rough fish. Much evidence points to the fact that this lake is nitrogen, rather than phosphorus limited, accounting for the terrible blue-green algae blooms it sometimes experiences. Water clarity is very poor.

Beaver Dam Lake is threatened by cultural inputs from both rural and urban sources including barnyards, manure storage areas, cropland, cattle access area, tile drainage, and runoff from recreational lands, urban sources, and wetlands. Turbidity from algae and sediments of external and internal origin are degrading the lake's qualities, including chemical, physical, aesthetic and biological qualities. These impair swimming, aesthetics, skiing, fishing, and boating. Fish kills have been a problem during the winter months. Fish spawning in shallow shoreline areas has possibly been restricted because of low oxygen conditions.

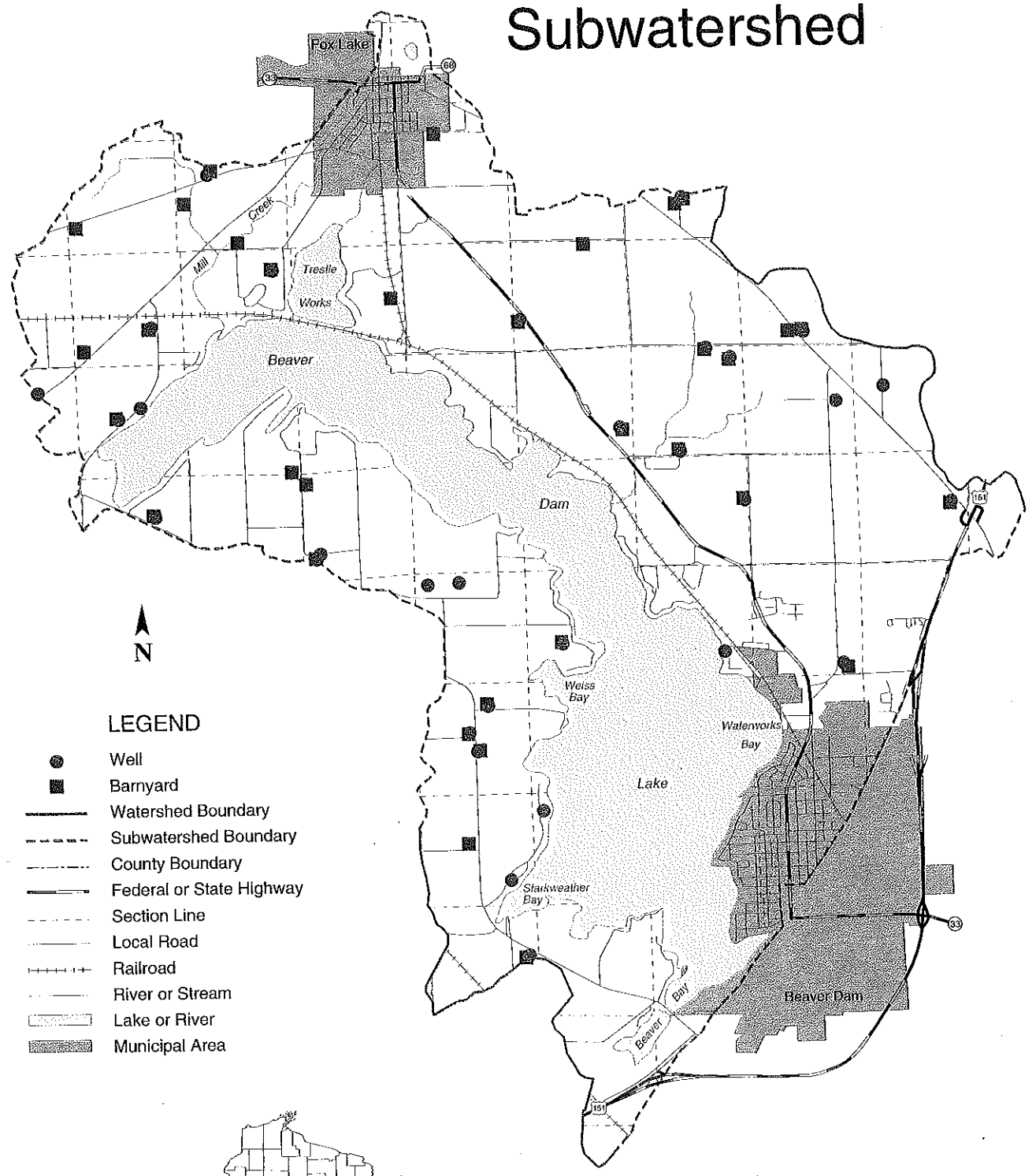
It is necessary to reduce the inputs of sediment and nutrients to Beaver Dam Lake, and to control the internal recycling of nutrients. Habitat quality is also an area that needs improvement. Improving the warm water sport fishery (WWSF) in Beaver Dam Lake is an important goal for Beaver Dam Lake.

Nonpoint Pollutant Sources

There are 35 active barnyard segments in the Beaver Dam Lake Subwatershed which annually produce 1117 pounds of phosphorus. The total phosphorus load reaching Beaver Dam Lake or its receiving water bodies is 732 pounds. This represents 8% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Beaver Dam Lake Subwatershed is 4,333 tons per year or 8% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 92% of the upland sediment load to Beaver Dam Lake.

Map 3.4 Beaver Dam Lake Subwatershed



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There are about 159,105 feet or 30 miles of shoreline along Beaver Dam Lake, and 57,900 (5.5 miles) of streambank in this subwatershed. Half of the adjacent land use along the lake is in grassland, and half is residential. Streambank erosion appears to be minimal in this subwatershed.

Water Resources Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50% and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Cambra Creek Subwatershed (CC)

Description

The Cambra Creek Subwatershed (map 3-5) is located in the northwest portion of the Beaver Dam River watershed. It consists of 14,900 acres or 8% of the entire watershed area. This subwatershed is comprised of 86% cropland and 14% noncropland. The Cambra Creek subwatershed contains a number of wetlands that are drained by ditches. Cambra Creek drains to the east into Fox Lake.

Water Resource Conditions

The Cambra Creek subwatershed, located west of Fox lake, is a large watershed with many small tributaries and extensive wetland areas. The stream bottom is primarily silt and muck and the water is turbid. Instream habitat quality is poor and high nutrient levels exist.

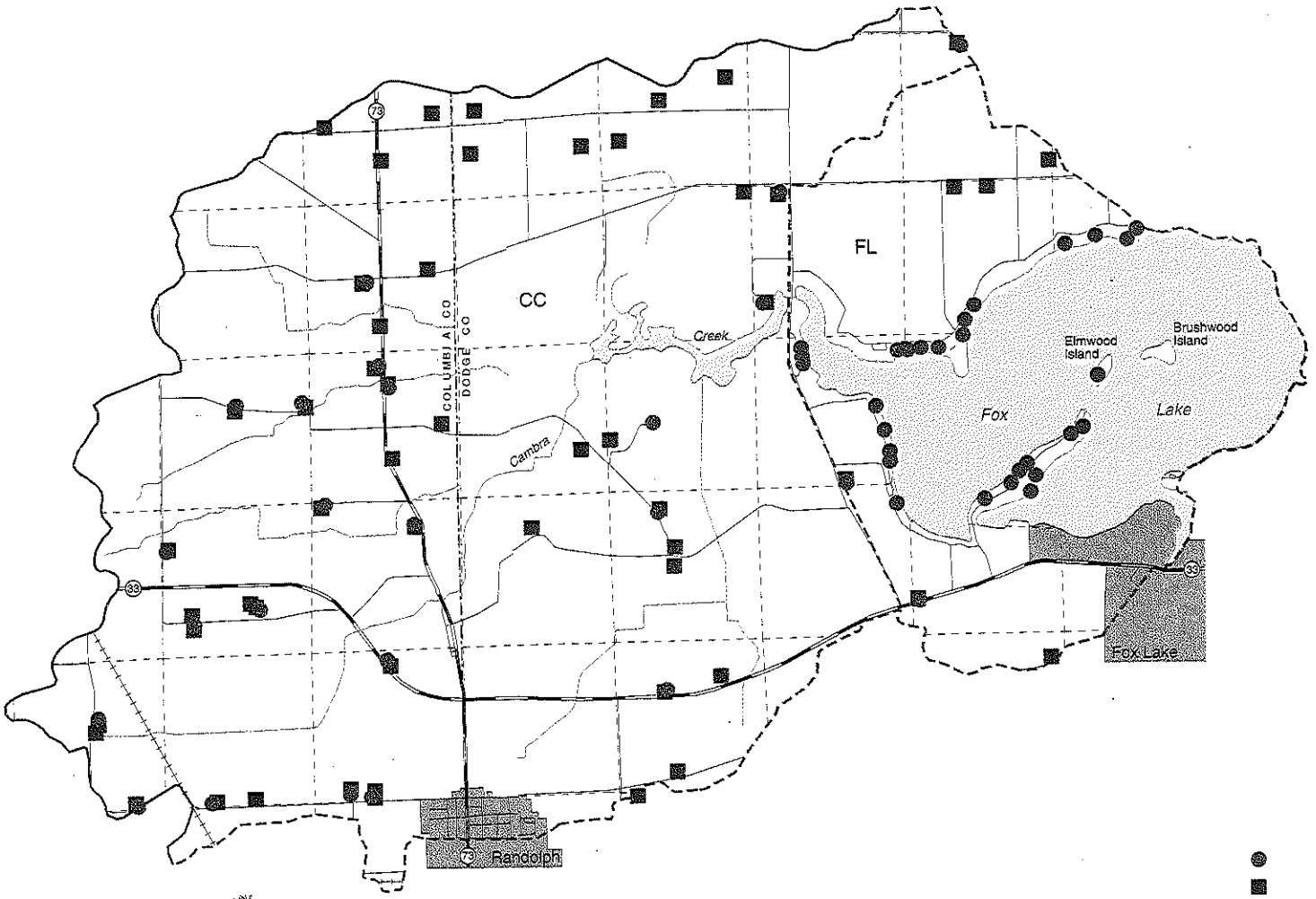
Nonpoint Pollutant Sources

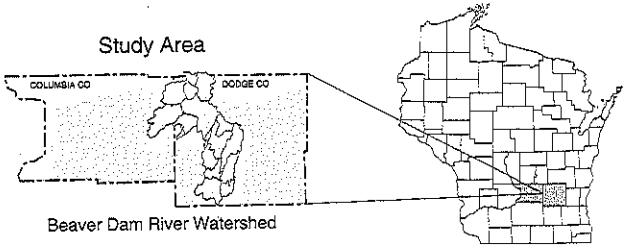
There are 45 active barnyard segments in the Cambra Creek subwatershed which annually produce 1758 pounds of phosphorus. The total annual phosphorus load reaching Cambra Creek or its receiving water bodies is 1371 pounds. This represents 14% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Cambra Creek Subwatershed is 4156 tons per year or 8% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 96% of the upland sediment load to Cambra Creek.

Streambank erosion appears to be minimal in Cambra Creek. There are 103,800 feet (9.8 miles) of perennial streambank. Nearly 100% of the streambank is well buffered, although short stretches are grazed during the summer.

Map 3.5 Cambra Creek and Fox Lake Subwatersheds





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Subwatershed Codes

CC = Cambra Creek
FL = Fox Lake

0 1 2 3 Miles
0 1 2 3 4 5 Kilometers

N

LEGEND

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

Water Resource Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50% and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Cold Spring Creek Subwatershed (CS)

Description

The Cold Spring Creek subwatershed (map 3-2) is 5,680 acres or 3% of the total watershed. The Cold Spring Creek Subwatershed is located in the southeast portion of the Beaver Dam River Watershed. This watershed is comprised of 78% cropland and 22% noncropland. Cold Spring Creek flows northwest into the Beaver Dam River.

Water Resource Conditions

Cold Spring Creek is a warm water drainage stream fed by numerous drainage ditches; the outlet is into the Beaver Dam River. The bottom is primarily silt and muck with poor water quality. High levels of nutrients and sediment fill the stream.

Nonpoint Pollutant Sources

There are 16 active barnyard segments in the Cold Spring Creek Subwatershed which annually produce 430 pounds of phosphorus. The total annual phosphorus load reaching Cold Spring Creek or its receiving water bodies is 364 pounds. This represents 4% of the total phosphorus, produced annually, reaching surface water for the entire watershed.The total sediment load for the Cold Spring Creek Subwatershed is 1113 tons per year or 2% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 93% of the upland sediment load to Cold Spring Creek.

Streambank erosion appears to be minimal in Cold Spring Creek. There are 69,200 feet (6.5 miles) of perennial streambank. 42% of the streambank is well buffered and 56% is cropped within 30 feet of the streambank.

Water Resources Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73%. Objectives are also to Improve wildlife and fish habitat and protect and restore wetlands.

Drew Creek Subwatershed (DC)

Description

The Drew Creek Subwatershed (map 3-1) is 3,894 acres or 2% of the total watershed area. Drew Creek is located in the north portion of the Beaver Dam River.

Watershed with the north section located in Green Lake County. This subwatershed is comprised of 81% cropland and 10% non-cropland. Drew Creek flows primarily to the south and into the north side of Fox Lake.

Water Resource Conditions

Drew Creek is a small stream originating in a wetland and agricultural area about 3 miles north of Fox Lake. The bottom is primarily silt and muck. Instream habitat quality is fair and the water is turbid. High levels of nutrients and low dissolved oxygen (D.O.) levels are also a problem. The stream currently has a limited warm water forage fishery (WWFF), which could be dramatically improved.

Nonpoint Pollutant Sources

There are 18 active barnyard segments in the Drew Creek Subwatershed which annually produce 302 pounds of phosphorus. The total annual phosphorus load reaching Drew Creek or its receiving water bodies is 274 pounds. This represents 3% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Drew Creek Subwatershed is 1,861 tons per year or 4% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 96% of the upland sediment load to Drew Creek.

Streambank erosion appears to be minimal in Drew Creek. There are 28,400 feet (2.7 miles) of perennial streambank. 76% of the streambank is well buffered, 2% is cropped within 30 feet of the streambank and 18% has cattle access.

Water Resources Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Fox Lake Subwatershed (FL)

Description

The Fox Lake Subwatershed (map 3-5) is 3,087 acres or 2% of the total watershed area. Fox Lake is located in the northern portion of the Beaver Dam River Watershed. The Fox Lake Subwatershed is strictly located from the northwest to the southwest corners of the Lake. This subwatershed is comprised of 77% cropland, 14% non-cropland, and 9% urban development. Fox Lake Subwatershed flows to the northeast and southeast into Fox Lake which outlets into Mill Creek that flows to Beaver Dam Lake.

Water Resource Conditions

Fox Lake is a 2,625 acre partial impoundment created in 1845 by the construction of an 8-foot dam on the outlet (Mill Creek) of the original Fox Lake. It is fed by Alto, Drew, Cambra Creeks and unnamed tributaries. 58 square miles of agricultural land drain this subwatershed. Fox Lake has a maximum depth of 19 feet, and is highly eutrophic. On a scale of 0-100, with 0 being extremely oligotrophic and 100 being extremely hypereutrophic, Fox Lake ranges between 60 and 90. Problems include blue-green algal blooms, macrophyte community instability, potential fish kills, and the dominance of rough fish. Fox Lake is phosphorus limited, although there is the potential for it to be nitrogen limited during summer months, accounting for the terrible blue-green algae blooms it sometimes experiences. Water clarity is very poor. An aeration system on the lake prevents winter fishkills from occurring.

Sediment from uplands is a continual threat to Fox Lake. Sources of sediment are barnyards, manure storage areas, cropland, cattle access area, tile drainage, and runoff from recreational lands, urban sources, and wetlands. Turbidity from algae and sediments of external and internal origin are degrading the lake's qualities, including chemical, physical, aesthetic and biological qualities. These impair swimming, aesthetics, skiing, fishing, and boating.

Internal recycling of nutrients in Fox Lake is also a contributing factor to the degraded water quality.

A core of the sediments was taken from the bottom of Fox Lake in 1991, and data indicate that historically, the lake possessed much better water quality than is experienced at the present time. The lake had clear water with abundant plants until the mid-1950's. The water quality has degraded since that time. Based on the data found, it appears tha the water quality conditions could degrade further if nothing is done to control external loadings to the lake, or internal recycling of nutrients. Improving the warm water sport fishery (WWSF) in Fox Lake is one important goal of the project.

Nonpoint Pollutant Sources

There are 8 active barnyard segments in the Fox Lake Subwatershed which annually produce 310 pounds of phosphorus. The total annual phosphorus load reaching Fox Lake or its receiving water bodies is 222 pounds. This represents 2% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Fox Lake Subwatershed is 1,000 tons per year or 2.5% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 97% of the upland sediment load to Fox Lake.

Water Resource Objectives

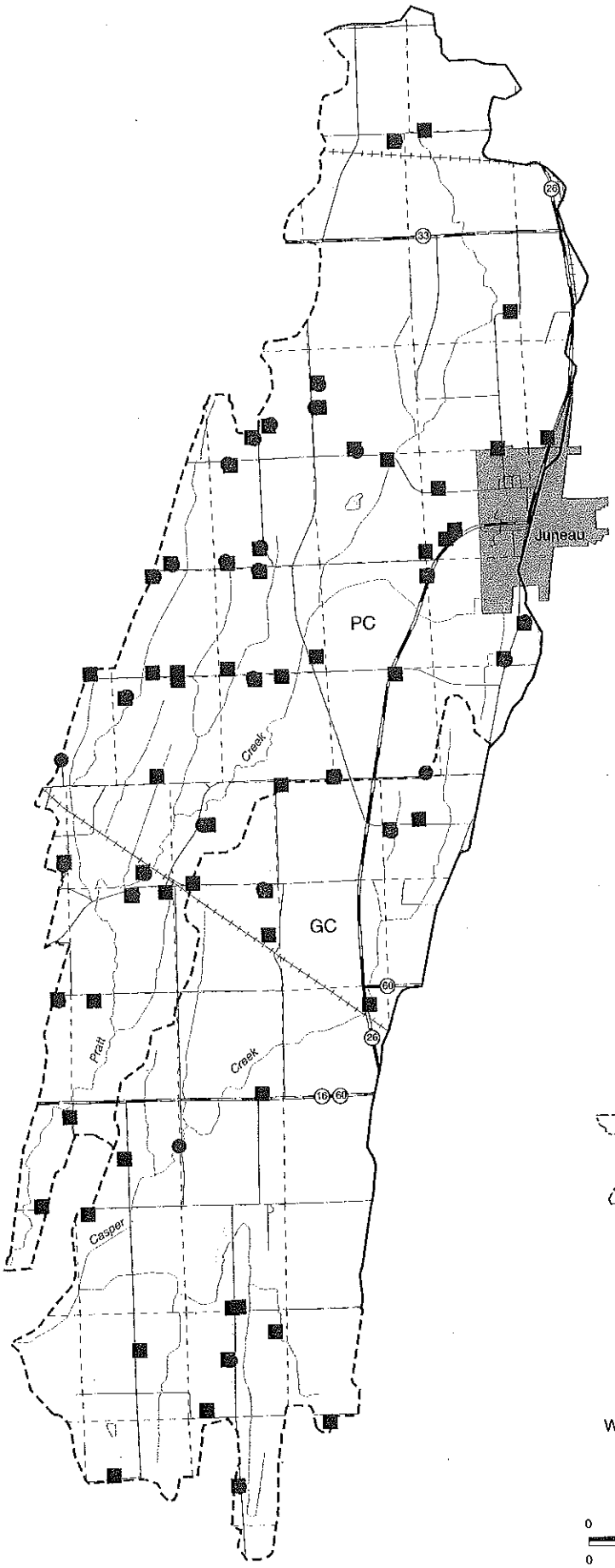
Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Casper Creek Subwatershed (GC)

Description

The Casper Creek Subwatershed (map 3-6) is 10,510 acres or 6% of the total watershed area. The Casper Creek Subwatershed is located in the south portion of Beaver Dam River Watershed along the east border of the watershed. This subwatershed is comprised of 76% cropland and 24% noncropland. Casper Creek flows primarily to the southwest into the Beaver Dam River.

Map 3.6 Casper Creek and Pratt Creek Subwatersheds



N

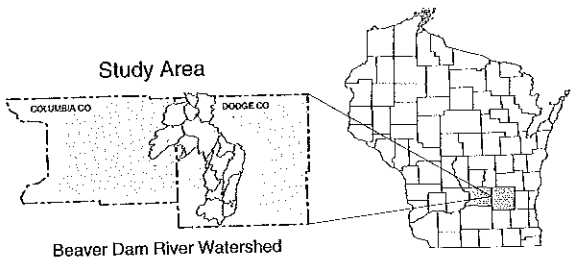
LEGEND

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

Subwatershed Codes

GC = Casper Creek

PC = Pratt Creek



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Water Resource Conditions

Casper Creek is a warm water drainage stream fed by numerous drainage ditches and outletting into Beaver Dam River. The bottom is primarily silt and muck, with poor water quality. High levels of nutrients and sediment fill the stream. Fishery sources are very limited, with intense management, the potential for a warm water sport fishery (WWSF) is possible.

Nonpoint Pollutant Sources

There are 19 active barnyard segments in the Casper Creek Subwatershed which annually produce 588 pounds of phosphorus. The total annual phosphorus load reaching Casper Creek or its receiving water bodies is 517 pounds. This represents 5% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Casper Creek Subwatershed is 3,926 tons per year or 8% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 93% of the upland sediment load to Casper Creek.

Streambank erosion appears to be minimal in Casper Creek. There are 96,700 feet (9 miles) of perennial streambank. 75% of the streambank is well buffered and 24% miles) is cropped within 30 feet of the streambank.

Water Resources Objectives

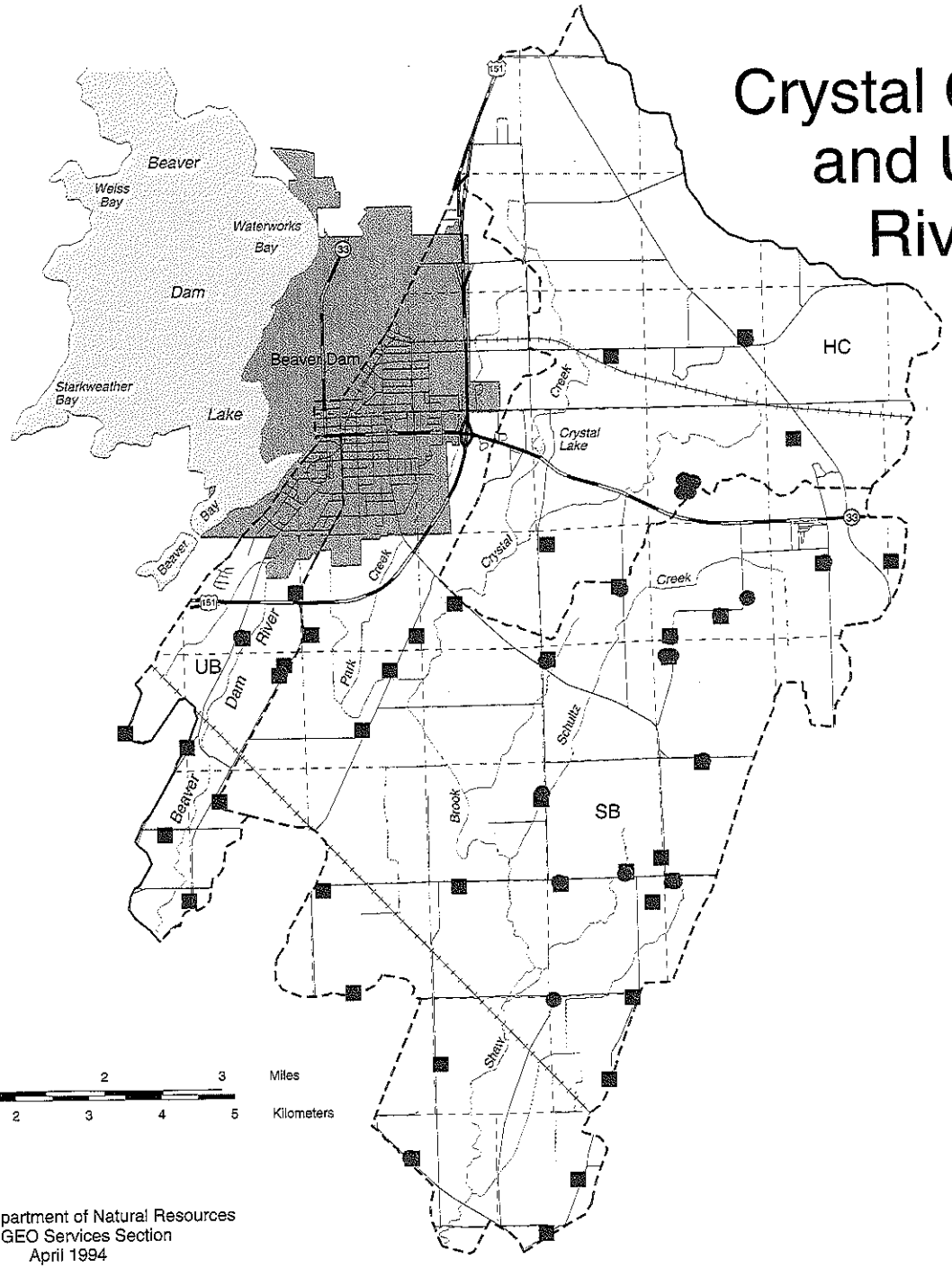
Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Crystal Creek Subwatershed (HC)

Description

The Crystal Creek Subwatershed (map 3-7) is 7,133 acres or 4% of the total watershed area. The Crystal Creek Subwatershed is located in the center of the watershed along the east border of the Beaver Dam River Watershed. This subwatershed is comprised of 70% cropland, 25% non-cropland and 5% urban. Crystal Creek flows primarily to the southwest into Shaw Brook.

Map 3.7
Crystal Creek, Shaw Brook and Upper Beaver Dam River Subwatersheds



LEGEND

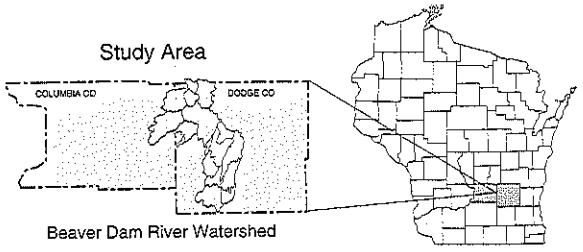
- Well
- Barnyard
- Watershed Boundary
- Subwatershed Boundary
- County Boundary
- Federal or State Highway
- Section Line
- Local Road
- Railroad
- River or Stream
- Lake or River
- Municipal Area

Subwatershed Codes

HC = Crystal Creek
SB = Shaw Brook
UB = Upper Beaver Dam River

N

0 1 2 3 Miles
0 1 2 3 4 5 Kilometers



Beaver Dam River Watershed

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Water Resource Conditions

Crystal Creek is fed by numerous springs, which fill the manmade Crystal Lake in Beaver Dam. The bottom has turned from gravel to silt over the years, causing water quality problems. High levels of nutrients are also a major impact on the streams quality. The stream currently has a limited forage fishery, although the potential for a cold water sport fishery (COLD) is possible.

Nonpoint Pollutant Sources

There are 6 active barnyard segments in the Crystal Creek Subwatershed which annually produce 174 pounds of phosphorus. The total annual phosphorus load reaching Crystal Creek or its receiving water bodies is 89 pounds. This represents 1% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Crystal Creek Subwatershed is 1,097 tons per year or 2% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 91% of the upland sediment load to Crystal Creek. Streambank erosion appears to be minimal in Crystal Creek. There are 61,200 feet (5.8 miles) of perennial streambank. Nearly 100% of the streambank is well buffered with grassland habitat.

Water Resources Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Lost Lake Subwatershed (LL)

Description

Lost Lake Subwatershed (map 3-3) is 1,121 acres or 1% of the total watershed area. Lost Lake Subwatershed is the smallest subwatershed and is located in the north portion along the west border of the Beaver Dam River Watershed. This subwatershed is comprised of 64% cropland, 34% non-cropland (25% is wetland), and 2% urban. This subwatershed flows primarily to the northeast into Lost Lake whose water level is naturally controlled by an intermittent stream that flows into the Rakes Bay Subwatershed.

Water Resource Conditions

Lost Lake is 245 acres, with a maximum depth of 5 feet. The bottom is primarily silt and muck. Like Beaver Dam and Fox Lakes, it is also hypereutrophic. On a scale of 0-100, with 0 being extremely oligotrophic and 100 being extremely hypereutrophic, Lost Lake averages 78. The lake experiences excessive turbidity, due to rough fish populations, wave action, and nonpoint sources of pollution. It has a restricted macrophyte population which in

turn has a negative impact on the fishery and waterfowl habitat. Lost Lake does experience winter fish kills, common for a lake so shallow.

Improving the warm water sport fishery (WWSF) is a primary goal for Lost Lake.

Nonpoint Pollutant Sources

There are 3 active barnyard segments in the Lost Lake Subwatershed which annually produce 170 pounds of phosphorus. The total annual phosphorus load reaching Lost Lake or its receiving water bodies is 170 pounds. This represents 2% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for Lost Lake Subwatershed is 281 tons per year or less than 1% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 91% of the upland sediment load to Lost Lake.

Lake shore erosion appears to be minimal in Lost lake. There are 14,900 feet (3 miles) of lake shore. Nearly 100% of the lake shore is well buffered with grassland habitat.

Water Resource Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Pratt Creek Subwatershed (PC)

Description

The Pratt Creek Subwatershed (map 3-6) is 16,059 acres or 9% of the total watershed area. The Pratt Creek Subwatershed is located in the southern half of the Beaver River Watershed, along the east border including a portion of the city of Juneau. This subwatershed is comprised of 78% cropland, 19% non-cropland, and 3% urban. Pratt Creek flows primarily to the southwest and flows into Beaver Dam River.

Water Resource Conditions

Pratt Creek is a warm water drainage stream fed by numerous drainage ditches and outletting into Beaver Dam River. The bottom is primarily silt and muck, with poor water quality. High levels of nutrients and sediment fill the stream. Fishery sources are very limited, with intense management, the potential for a warm water sport fishery (WWSF) is possible.

Nonpoint Pollutant Sources

There are 46 active barnyard segments in the Pratt Creek Subwatershed which annually produce 1,034 pounds of phosphorus. The total annual phosphorus load reaching Pratt Creek or its receiving water bodies is 925 pounds. This represents 10% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Pratt Creek Subwatershed is 4,307 tons per year or 8% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 94% of the upland sediment load to Pratt Creek.

Streambank erosion appears to be minimal in Pratt Creek. There are 213,900 feet (20 miles) of perennial streambank. 82% of the streambank is well buffered, 14 % is cropped within 30 feet of the streambank and 2% miles) has cattle access.

Water Resources Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Rakes Bay Subwatershed (RB)

Description

The Rakes Bay Subwatershed (map 3-3) is 9,280 acres or 5% of the total watershed area. Rakes Bay is located in the northern portion, along the west border of the Beaver Dam River Watershed. This subwatershed is comprised of 69% cropland and 31% non-cropland. Rakes Bay subwatershed has a considerable amount of wetland habitat (26%) including the Westford State Wildlife area. This subwatershed flows primarily to the northeast draining into Rakes Bay which flows into Beaver Dam Lake.

Water Resource Conditions

Rakes Bay Subwatershed drains a large watershed area southwest of Beaver Dam Lake. This bay is surrounded by an extensive area of wetlands and is fed by numerous drainage ditches. The bottom is primarily silt and muck, resulting in a turbidity problem. High levels of nutrients and low dissolved oxygen (D.O.) levels currently exist. Rakes Bay currently has a limited warm water fishery. With intensive management we can improve the warm water sport fishery (WWSF).

Nonpoint Pollutant Sources

There are 18 active barnyard segments in the Rakes Bay Subwatershed which annually produce 276 pounds of phosphorus. The total annual phosphorus load reaching Rakes Bay or

its receiving water bodies is 267 pounds. This represents 3% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Rakes Bay Subwatershed is 2,742 tons per year or 5% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 96% of the upland sediment load to Rakes Bay.

Streambank erosion appears to be minimal in Rakes Bay. There are 90,700 feet (8.5 miles) of perennial streambank, and 27,400 fet of shoreline. 72% of the streambank and 82% of the shoreline is well buffered; 28% of the streambank and 15% of the shoreline is cropped within 30 feet of the streambank and 3% of the shoreline has cattle access.

Water Resource Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic load into the surface water. Improve wildlife and fish habitat and protect and restore wetlands.

Middle Beaver Dam River - Lowell (RL)

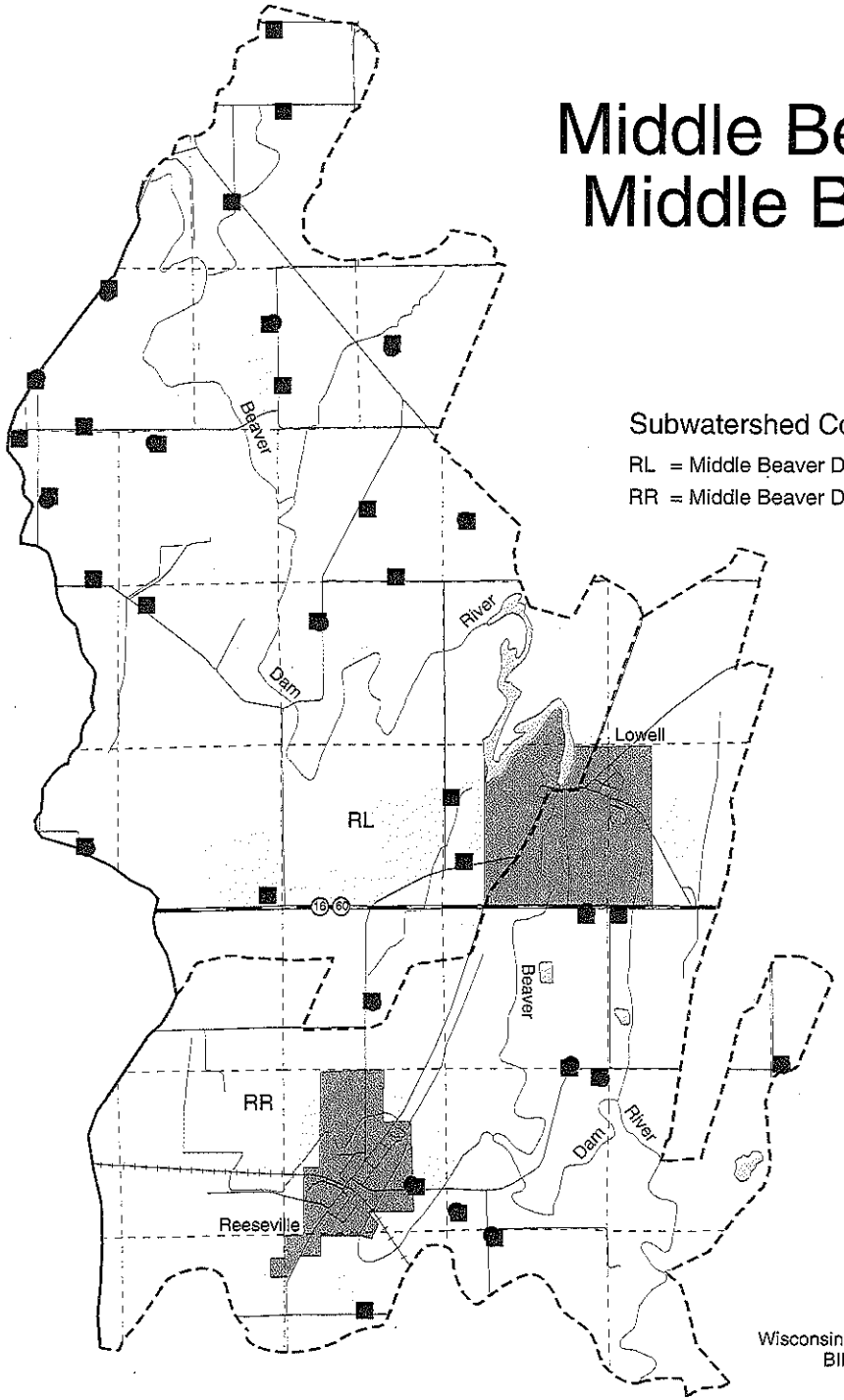
Description

The Middle Beaver Dam River (Lowell) Subwatershed (map 3-8) is 8,763 acres or 5% of the total watershed area. The Middle Beaver Dam River (Lowell) Subwatershed is located in the southern portion of the Beaver Dam River Watershed along the west border and includes a portion of the village of Lowell. This subwatershed is comprised of 77% cropland, 22% non-cropland, and 1% urban. The Middle Beaver Dam River (Lowell) Subwatershed flows primarily south into the Middle Beaver Dam River (Reeseville) Subwatershed.

Water Resource Conditions

The Beaver Dam River is 35 miles long and divided into four subwatersheds. The water quality has degraded rapidly over the years. High levels of sediment and nutrients are a major problem. Low dissolved oxygen (D.O.) levels and temperature levels are fluctuating constantly. Instream habitat quality is fair, however improvement is needed. The river currently has a limited warm water fishery. The potential for improving the warm water forage (WWFF) and sport fishery (WWSF) is there if intense management in the watershed is implemented.

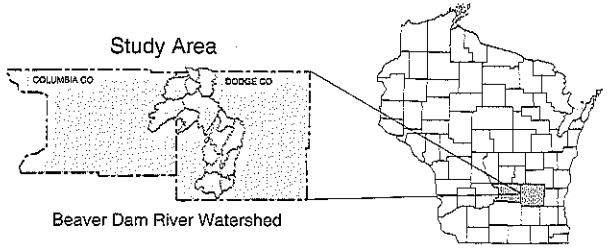
Map 3.8
Middle Beaver Dam River-Lowell and Middle Beaver Dam River-Reeseville Subwatersheds



Subwatershed Codes

RL = Middle Beaver Dam River-Lowell

RR = Middle Beaver Dam River-Reeseville



N

LEGEND

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

0 1 2 3 Miles

0 1 2 3 4 5 Kilometers

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BIM - GEO Services Section
April 1994

Nonpoint Pollutant Sources

There are 26 active barnyard segments in the Middle Beaver Dam River (Lowell) Subwatershed which annually produce 462 pounds of phosphorus. The total annual phosphorus load reaching the Middle Beaver Dam River (Lowell) subwatershed or its receiving water bodies is 326 pounds. This represents 5% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Middle Beaver Dam River (Lowell) Subwatershed is 1985 tons per year or 4% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 85% of the upland sediment load to Middle Beaver Dam River (Lowell).

Riverbank erosion appears to be minimal in the Middle Beaver Dam River (Lowell) Subwatershed. There are 111,600 feet (10.5 miles) of perennial riverbank. 77% of the riverbank is well buffered with grassland or woodland habitat; 7% is cropped within 30 feet of the river.

Water Resource Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Middle Beaver Dam River - Reeseville (RR)

Description

The Middle Beaver Dam River (Reeseville) Subwatershed (map 3-8) is 6,773 acres or 4% of the total watershed area. The Middle Beaver Dam River (Reeseville) is located in the southern portion of the Beaver Dam River Watershed including a portion of the village of Lowell and the entire village of Reeseville. This subwatershed is comprised of 59% cropland and 41% non-cropland. The Beaver Dam River in this subwatershed has a considerable amount of wetlands surrounding it, approximately 33% is wetland habitat. The Middle Beaver Dam River (Reeseville) flows primarily south into the Lower Beaver Dam River Subwatershed.

Water Resource Conditions

Beaver Dam River is 35 miles long and divided into four subwatersheds. The water quality has degraded rapidly over the years. High levels of sediment and nutrients are a major problem. Low dissolved oxygen (D.O.) levels and temperature levels are fluctuating constantly. Instream habitat quality is fair, however improvement is needed. The river currently has a limited warm water fishery. The potential for improving the warm water forage (WWFF) and sport fishery (WWSF) is there if intense management in the watershed is implemented.

Nonpoint Pollutant Sources

There are 9 active barnyard segments in the Middle Beaver Dam River (Reeseville) Subwatershed which annually produce 306 pounds of phosphorus. The total annual phosphorus load reaching Middle Beaver Dam River (Reeseville) or its receiving water bodies is 306 pounds. This represents 3% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Middle Beaver Dam River (Reeseville) Subwatershed is 2,435 tons per year or 5% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 98% of the upland sediment load to the Middle Beaver Dam River (Reeseville).

There are 123,400 feet (11.7 miles) of perennial riverbank. 71% of the riverbank is well buffered, 25% is cropped within 30 feet of the riverbank and 3% has cattle access.

Water Resource Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Shaw Brook Subwatershed (SB)

Description

The Shaw Brook Subwatershed (map 3-7) is 14,689 acres or 8% of the total watershed area. The Shaw Brook Subwatershed is located in the southern portion of the Beaver Dam River Watershed with the north portion including the city of Beaver Dam. This subwatershed is comprised of 66% cropland, 25% non-cropland, and 9% urban. The Shaw Brook Subwatershed has a considerable amount of wetland habitat (18%) including the Shaw Marsh State Wildlife Area. Shaw Brook flows primarily to the south into the Beaver Dam River.

Water Resource Conditions

Shaw Brook is a relatively large stream that is fed by numerous drainage ditches and two creeks, Schultz and Park. High amounts of suspended solids and nutrients in Shaw Brook and tributary streams are a major problem. Warm water fishery is very limited. Shaw Brook has potential for a warm water sport fishery (WWSF), with Schultz and Park Creeks having potential warm water forage fisheries (WWFF).

Nonpoint Pollutant Sources

There are 27 active barnyard segments in the Shaw Brook Subwatershed which annually produce 880 pounds of phosphorus. The total annual phosphorus load reaching Shaw Brook

or its receiving water bodies is 807 pounds. This represents 8% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Shaw Brook Subwatershed is 5,044 tons per year or 10% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 91% of the upland sediment load to Shaw Brook.

There are three perennial streams in the Shaw Brook Subwatershed. There are 219,600 feet (21 miles) of streambank for Shaw Brook, Park Creek and Schultz Creek. 70% of the streambanks are well buffered, 25% are cropped within 30 feet of the streambanks, and 3% have cattle access.

Water Resource Objectives: Objective are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73% by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Upper Beaver Dam River Subwatershed (UB)

Description

The Upper Beaver Dam River Subwatershed (map 3-7) is 1,983 acres or 1% of the total watershed area. This subwatershed is located in the center, along the west border of the Beaver Dam River Watershed, and the north portion includes the city of Beaver Dam. This subwatershed is comprised of 43% cropland, 25% non-cropland, and 32% urban. The Upper Beaver Dam River Subwatershed flows primarily south, flowing into the Middle Beaver Dam River (Lowell) Subwatershed.

Water Resource Conditions

Beaver Dam River is 35 miles long and divided into four subwatersheds. The water quality has degraded rapidly over the years. High levels of sediment and nutrients are a major problem. Low dissolved oxygen (D.O) levels and temperature levels are fluctuating constantly. Instream habitat quality is fair, however improvement is needed. The river currently has a limited warm water fishery. The potential for improving warm water forage (WWFF) and sport fishery (WWSF) is there if intense management in the watershed is implemented.

Nonpoint Pollutant Sources

There are 9 active barnyard segments in the Upper Beaver Dam River Subwatershed which annually produce 60 pounds of phosphorus. The total annual phosphorus load reaching Upper Beaver Dam River or its receiving water bodies is 60 pounds. This represents 1% of the total phosphorus, produced annually, reaching surface water for the entire watershed.

The total sediment load for the Upper Beaver Dam River Subwatershed is 486 tons per year or 1% of the total for the Beaver Dam River Watershed. Cropland runoff accounts for 67% and urban development accounts for 21% of the upland sediment load to Upper Beaver Dam River.

There are 56,000 feet (5.3 miles) of perennial riverbank. 60% of the riverbank is well buffered, with short stretches of commercial and residential land use along the river.

Water Resources Objectives

Objectives are to increase water quality, reduce sediment delivery by approximately 50%, and reduce organic loading into the surface water by 73%. Improve wildlife and fish habitat and protect and restore wetlands.

Pollutant Reduction Goals

The water resource objectives listed for each subwatershed were goals established through a water resource appraisal conducted for the Beaver Dam River watershed. These objectives were written to achieve the maximum improvement to each water resource, regardless of practicality, financial limititations, or acceptability of those whose land would be affected. The following does include these factors, and while the goals are not as stringent as the former, they represent a more realistic approach to current conditions.

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

- Upland Sediment Erosion: reduction goal of 35% of sediment.
- Gully Erosion: control gullies eroding more than 6 inches per year.
- Barnyard Runoff: reduction goal of 73% of phosphorus load.
- Winterspreading of Manure: reduction goal of 42% of the winter spread phosphorus load.
- Streambank and Shoreline Erosion: Erosion protecton will be provided to areas that meet the eligibility criteria outlined in Chapter Four.
- Wetlands: restoration of as many degraded wetlands as possible.

Other Pollution Sources

Municipal and Industrial Point Sources of Water Pollution

Discharges of wastewater from permitted municipal and industrial sources are important considerations for improving and protecting surface water resources. Refer to the Upper Rock River Basin Areawide Water Quality Management Plan (May, 1989) for additional details on potential point sources. Treated effluent entering from municipal sewage plants are controlled through permits which the DNR issues under the Wisconsin Pollution Discharge Elimination System (WPDES) permit system.

Urban Nonpoint Sources

Urban runoff carries a wide array of pollutants to surface water; some are unique to urban runoff while others also are contained in runoff from agricultural areas. Pollutants found primarily in urban runoff include heavy metals (lead, copper, zinc, cadmium or chromium) and a large number of toxic organic chemicals (PCB's, aromatic hydrocarbons, esters and many others). Other substances in urban runoff that are also contained in runoff from rural areas include sediment, nutrients, bacteria and other pathogens, and pesticides.

Estimations of lead, copper, zinc, suspended solids and phosphorus were made for 11 subbasins within two municipalities located in the Beaver Dam River watershed: the city of Beaver Dam (map 3-9 and table 3-3) and the village of Fox Lake (map 3-10 and table 3-4). Lead is a common pollutant found in most samples of urban runoff. The sources of lead and copper are automobiles and industrial areas. Zinc comes from automobiles, industry, and rooftop downspouts. Suspended solids are always found in urban runoff. The sources are many, but the primary source in urban areas is construction site erosion. Phosphorus also comes from a variety of sources; the primary concerns in an urban area are fertilizer use and leaves left in the street.

Pollutant loadings were estimated for existing municipal land uses within the watershed. Loadings were also estimated for planned land uses within the urban service areas.

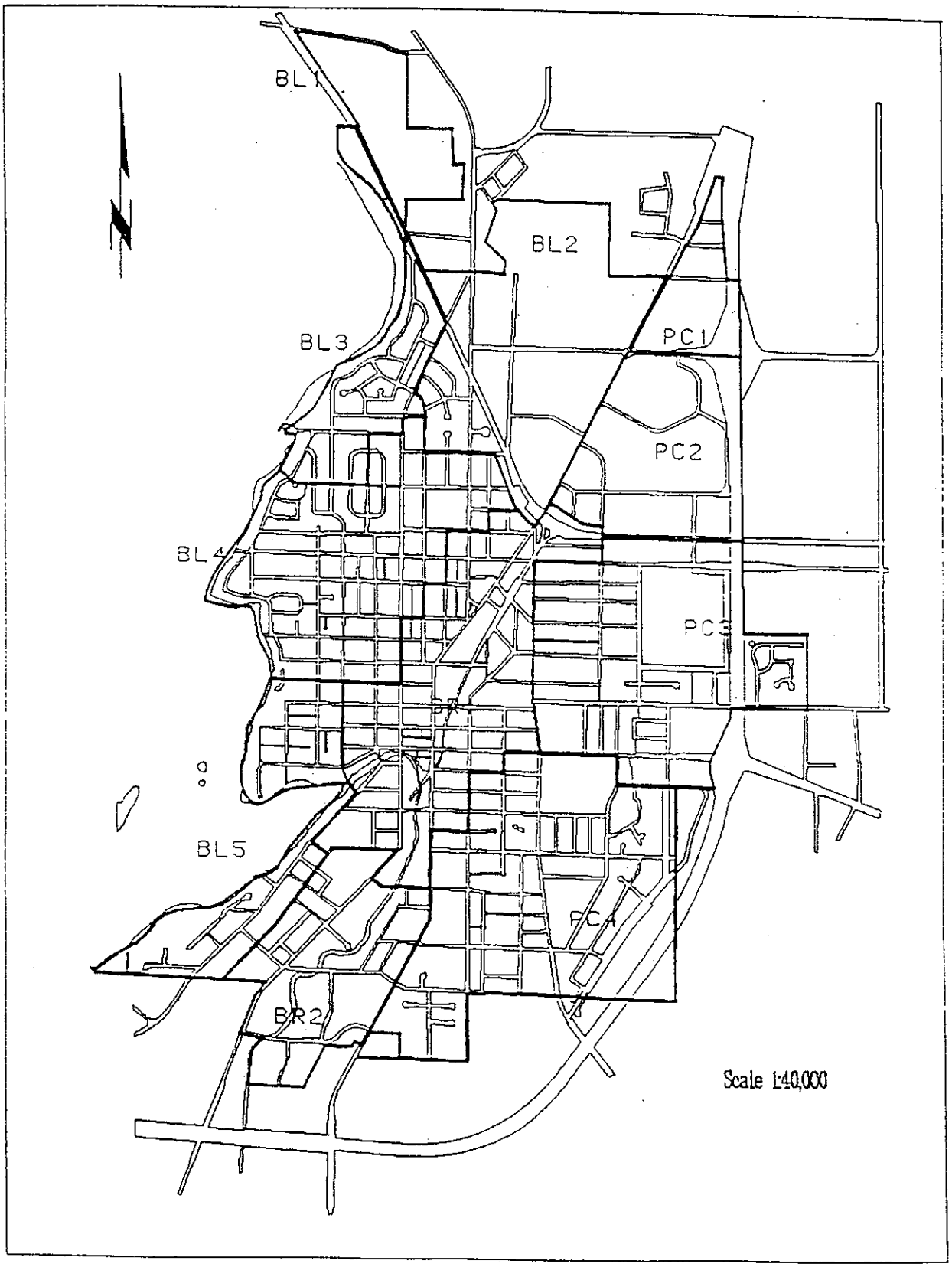
Table 3-3. Annual Pollutant Loadings for the city of Beaver Dam (reported in pounds per year)

Pollutant	Existing Land Use	Planned Land Use (Year 2010)	Total (Year 2010)
Lead	402.0	197.0	599.0
Copper	201.0	80.0	281.0
Zinc	1285.0	544.0	1829.0
Cadmium	10.5	3.3	13.8
Phosphorus	1704.0	547.0	2251.0
Suspended Sediment	816,337.0	349,129.0	1,165,466.0

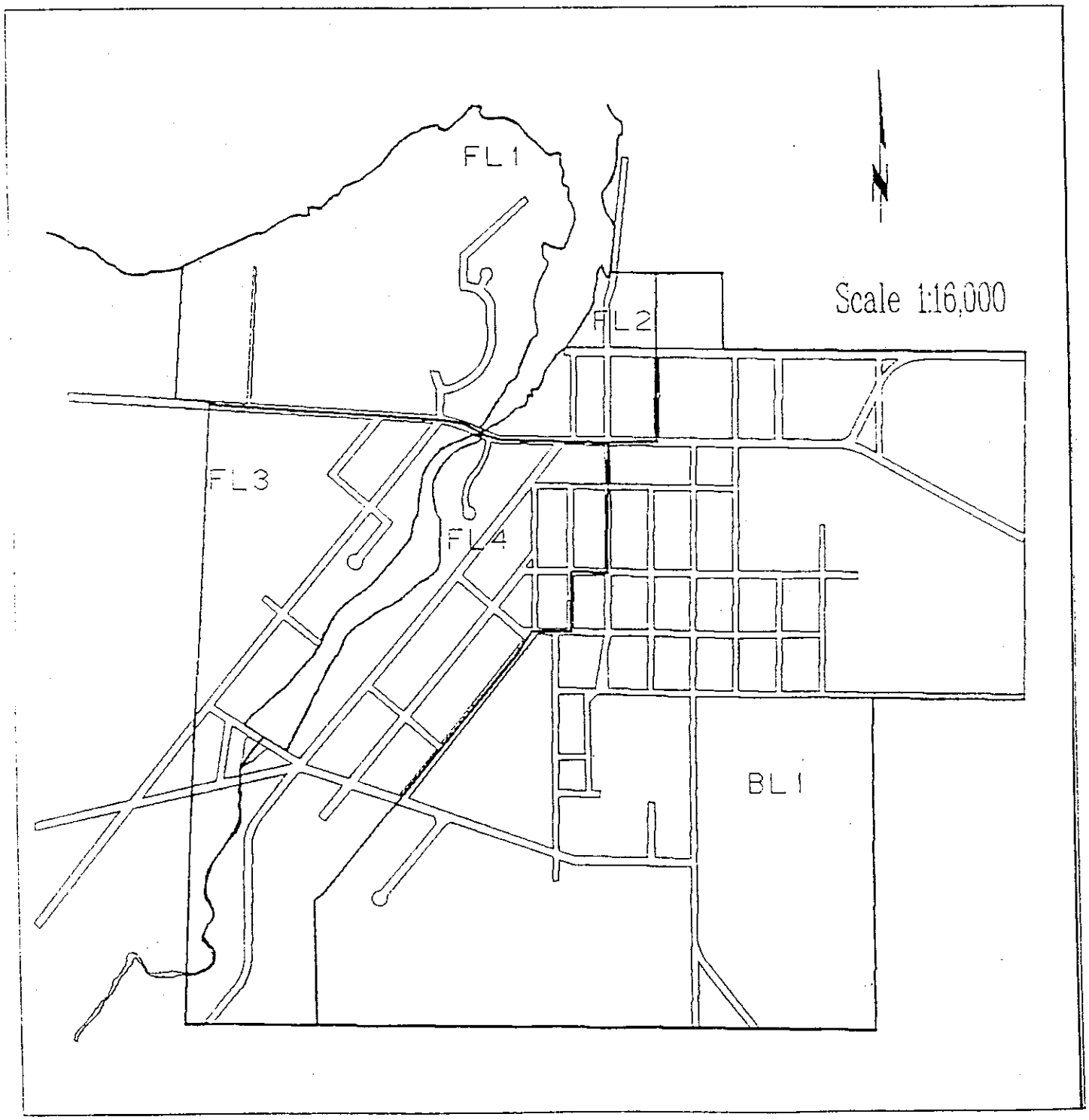
Table 3-4. Annual Pollutant Loadings for the village of Fox Lake (reported in pounds per year)

Pollutant	Existing Land Use	Planned Land Use (Year 2010)	Total (Year 2010)
Lead	53.0	47.0	100.0
Copper	20.0	19.0	39.0
Zinc	150.0	131.0	281.0
Cadmium	1.2	0.8	2.0
Phosphorus	228.0	133.0	361.0
Suspended Sediment	103,314.0	83,706.0	187,020.0

Map 3.9 City of Beaver Dam Storm Sewer Sub-basins



Map 3.10 Village of Fox Lake Storm Sewer Sub-basins



Runoff from urban areas also impacts stream hydrology. This occurs as runoff volume increases in magnitude and is produced in a short time period creating large increases in peak stream flows. In some areas, groundwater recharge is also significantly reduced as concrete and other impervious surfaces prevent rainwater and snowmelt from soaking into the ground. This reduces base stream flows needed to sustain fish and aquatic life during periods of low rainfall.

Overall, urban runoff produces "flashy" streams with temperatures and chemical characteristics which limit animal life and recreational uses. Stream bank erosion may increase as the stream tries to cut a channel in equilibrium with widely variable stream flows. Flooding of adjacent property may also occur, sometimes requiring channelization and/or lining with concrete to accommodate flood flows or prevent flood damage. This often destroys the natural stream system and speeds the transport of pollutants downstream.

Urban nonpoint sources described below include: runoff from existing urban areas including established commercial, industrial, and residential land uses; and runoff from areas where new urbanization is anticipated.

Existing Urban Area Characteristics and Pollutant Loading

The delivery of urban pollutants to streams from existing urban areas depends on: 1) the type of urban land use; 2) the type of storm water conveyance system; and 3) urban housekeeping practices including but not limited to street sweeping and leaf collection. Each factor is discussed below.

Urban Land Uses

Freeways, industrial areas, commercial areas, and high density residential areas are the greatest collectors of sediment, lead, and zinc on a per acre basis. Medium density residential areas are less important sources of sediment and lead, but are significant sources of pesticides, bacteria, and household or automotive maintenance products dumped into the storm sewer system. Low density residential areas are important where the improper use and disposal of pesticides, fertilizers, and automotive maintenance products occurs.

The variability of pollutants in urban runoff also depends on the configuration of "source areas". Source areas, defined as streets, parking lots, rooftops and lawn areas; are present in different proportions depending on the type of land use. For example, residential areas contain more lawn area than commercial areas, while commercial areas have more rooftop, street, and parking lot surfaces. Lawns can be important sources of fertilizers and pesticides. Rooftops, important sources of zinc and asbestos, vary in the proportion of land they cover in each urban land use, and also in the degree they are connected to the storm sewer system. Streets are sources of significant amounts of lead, cadmium, and other pollutants, depending on their area and the amount of traffic.

Storm Water Conveyance

Storm water is most commonly conveyed to streams through storm sewers either separately or in combination with grassed swales or roadside ditches. Storm sewers transport runoff rapidly with no "treatment" or filtering of the runoff before it enters streams. Properly designed grassed swales generally transport lesser amounts of runoff because of infiltration and vegetation serves to remove some pollutants from the runoff before it flows into streams or storm sewer systems.

The types and amounts of pollutants transported by runoff, depends on the extent to which pollutant-producing surfaces are hydrologically "connected" to the storm sewer system. For example automobile traffic density, a prime determinant in the production of lead, asbestos, cadmium, and street dirt, is highest for street surfaces in commercial areas and freeways. Normally, these areas are connected to storm sewers.

Urban Housekeeping Practices

Street sweeping and storm water conveyance systems affect the portion of pollutants from urban surfaces carried to streams by runoff. Street sweeping removes some of the particulate pollutants from street and parking lot surfaces before they can be transported to surface waters. The most benefit is realized by repeated sweeping of commercial and industrial areas in the early spring. Other sweeping is primarily cosmetic, and serves little role in reducing urban pollutant loads.

New Urban Development

Runoff from new urban development anticipated to take place over about the next 10 to 15 years has the potential to impact stream water quality for two reasons. First constructing roads, utilities and buildings disturbs large areas, exposing large amounts of soil to erosion. This sediment can easily be carried by runoff to drainageways, storm sewers and ultimately streams. Without adequate controls, construction site erosion can have catastrophic impacts on urban rivers and streams, clog storm sewers, and accumulate on road surfaces and sidewalks.

Second, newly established urban surfaces accumulate pollutants which are carried in runoff to streams. Consequently, as new areas urbanize, water quality problems caused by urban pollutants and excessive storm water runoff can worsen.

Tables 3-3 and 3-4 show how new development in the watershed may result in increased pollutant loadings. Urban land use is expected to increase by about 30% by the year 2010. Runoff from new urban areas has the potential to further degrade stream water quality unless storm water management practices are incorporated during development.

Renewal of established urban areas should be considered as new development for purposes of assessing their potential impact on water quality. Renovation of buildings and utilities can cause pollution from construction site erosion similar to new construction. In addition, even though urban renewal projects will not necessarily increase the amount of established urban

surface, they represent opportunities to install storm water management practices to treat runoff from both the renewal property and adjacent established areas.

Construction Site Erosion

Construction site erosion is an additional water quality concern associated with new urban development. Uncontrolled construction site erosion can introduce sediment to water bodies at rates of 10 to 100 times the rate of agriculture areas. Typically Wisconsin construction sites allow 6 tons of sediment per acre per year to leave the site.

The sediment generated from construction sites devastate aquatic communities in streams receiving sediment laden runoff. Sediment abrades mucus membranes of fish and crustaceans leaving them susceptible to disease and infection. It also restricts the vision on predatory species, increasing the chance of starvation. In streams, soil particles kill invertebrates and destroys their habitat by scouring stream bottoms. Soil particles that settle to the bottom of water bodies cover plant species, fill in interspacial voids in cobbles eliminating invertebrate habitat and fish spawning beds. Sediment also acts as a heat sink increasing water temperature. The combined affects of sediment reduces the bio-diversity of the water body and tip the scales in favor of pollutant-tolerant species such as carp and bullheads.

Sediment from construction site also plug storm water conveyance systems. This causes increased stormsewer maintenance expenses and may cause localized flooding.

Importantly, water quality improvements occurring through implementation of nonpoint source control practices for existing urban areas can be negated by these pollution sources. With the proper application of erosion control practices, the rate of erosion from construction sites can be reduced from 70 to 97%.

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

Introduction

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

Management Categories

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

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

Management Category I

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

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

Management Category II

Nonpoint sources in this category collectively contribute less of the pollutant load than those in Management Category I. These nonpoint sources are identified and included in cost-sharing eligibility to further insure that water quality objectives for pollutant controls are met. Due to the limited state funding available for watershed projects the size of this category is relatively limited.

Nonpoint sources in this category are eligible for funding and/or technical assistance under the priority watershed project. It is not mandatory for a landowner to control sources in this category to participate in this project.

Management Category III

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

It is estimated that over 90% of the sediment loading and 80% of the phosphorus loading in the Beaver Dam River watershed is from upland sources. To achieve the goals of the project it is essential that upland sources be controlled.

Criteria for Eligibility and Management Category Designation

Croplands and Other Upland Sediment Sources

Upland Erosion

Upland erosion represents 94% (48,830 tons) of the total sediment load to streams in the watershed. The average sediment delivery rate (soil that ends up in receiving water bodies) for all subwatersheds is 0.32 tons/acre/year. A 34% reduction in sediment from eroding fields is targeted for the entire watershed (table 4-1). This translates into bringing all fields that are above the tolerable soil loss, or "T" and delivering sediment to a receiveing water body at a rate greater than 0.4 tons/acre/year down to T, those below T but above the 0.4 tons per acre per year sediment delivery rate to 0.4 tons/acre/year, or those above T but below the 0.4 tons/acre/year sediment delivery to T.

Category I fields must be above "T" and contribute greater than 0.4 tons/acre/year of sediment; they will be brought down to T. This category will control an estimated 22,681 "critical" acres of cropland, or 29% of the total sediment load (15,389 tons) of the watershed.

An additional 5% of the sediment load delivered to the receiving water body will be controlled through Category II mangement. This includes an estimated 25,526 critical acres that will controll 2,786 tons of sediment entering a receiving water body. Category II includes two components: 1) those landowners with fields below "T" but delivering sediment at a rate over 0.4 tons/acre/year or 2) landowners with fields eroding above "T" but below the sediment delivery rate of 0.4 t/a/y. Landowners with fields eroding above "T" but below the sediment delivery rate of 0.4 t/a/y are eligible for low-cost practices only. Low cost practices include contouring, contouring strips, conservation tillage, changes in rotation, and grassed waterways. See table 4-2.

Table 4-1. Rural Uplands Targeted for Sediment Control

			Management Category I			Management Category II		
Subwatershed	Total Acres	Total Sediment	Acres Managed	Tons Controlled	Percent Controlled	Acres Managed	Tons Controlled	Percent Controlled
Alto Creek	13692	6477	2178	1549	24%	4498	701	11%
Lower Beaver Dam River	15208	4314	1208	1141	26%	1668	234	5%
Beaver Creek	21813	6564	2646	1269	19%	3200	454	7%
Beaver Dam Lake	21398	4669	1522	1943	42%	2980	189	4%
Cambra Creek	14900	4156	2197	830	20%	883	55	1%
Cold Spring Creek	5680	1113	329	260	23%	463	101	9%
Drew Creek	3894	2397	1541	656	27%	579	21	1%
Fox Lake	3087	1349	369	290	21%	799	72	5%
Casper Creek	10510	3926	1628	1216	31%	2352	242	6%
Crystal Creek	7133	1097	616	378	34%	1104	7	1%
Lost Lake	1121	281	126	68	24%	120	18	6%
Pratt Creek	16059	4523	2230	761	17%	2872	216	5%
Rakes Bay	9280	2742	1643	1004	37%	1308	179	7%
M. B.D.R.-Lowell	8763	2047	767	385	19%	1023	59	3%
M. B.D.R.-Reeseville	6773	2435	1346	1170	48%	160	22	1%
Shaw Brook	14689	5464	2145	2235	41%	1304	192	4%
U. Beaver Dam River	1983	624	190	234	38%	213	24	4%
TOTAL	175,983	54278	22681	15389	AVG: 29%	25526	2786	5%

Table 4-2. **Upland Sediment Erosion Eligibility Criteria - Beaver Dam River Watershed**

Management Control Category	Eligibility Criteria Sediment Delivery	Acres Involved	Soil Loss (tons/acre/year)	Percent Control
I	Above T and greater than 0.4 t/a/y	22,681	15,389	29%
II	Below T and greater than 0.4 or above T and less than 0.4 t/a/y	25,526	2,786	5%
III	Below T and less than 0.4 t/a/y	127,776	—	—

Source: DNR

Gully Erosion

Gully erosion has not been identified as a significant nonpoint source of sediment in this watershed; therefore, a field inventory of gully erosion was not conducted. There will be no category I for gully erosion control (table 4-3). During implementation, gullies identified to be eroding at more than 6" per year will be eligible for category II control.

Table 4-3. **Gully Erosion Eligibility Criteria in the Beaver Dam River Watershed**

Management Category	Eligibility Criteria
I	None eligible
II	Eroding more than 6"/year (recession rate)

Animal Lot Runoff

To achieve the water quality objectives in the Beaver Dam River Watershed Project, the phosphorus and other pollutants contained in animal lot runoff needs to be controlled at a high level (table 4-4). A 73% percent reduction of animal lot runoff is necessary in all subwatersheds to meet stated objectives. There are a total of 404 livestock operations in the watershed. Category I criteria involve operations that produce over 40 pounds of phosphorus per year. These landowners will need to reduce loads down to 15 pounds or less in order to reach the pollutant reduction target. 89 barnyard segments fall into this category, yielding 63 percent control. Landowners whose operations produce between 40 and 20 pounds

Table 4-4. Animal Lot Runoff Eligibility Criteria - Beaver Dam River Watershed

Management Category	Phosphorus Load per Barnyard	Number of Barnyard Segments	Pounds Reduced	Percent Reduction
I	greater than 40 lbs	89	6045	63%
II	between 20 and 40 lbs	64	985	10%
III	less than 20 lbs	304	—	—

phosphorus are eligible for Category II funding; these operations will also need to reduce their load to 15 pounds or less to be eligible for cost sharing. 64 barnyard segments fall into this category, yielding 10 percent control.

Approximately 69 full barnyard segments in Category I and 19 in Category II will need a filter wall. This shows that the large majority of Category II will be low cost practices such as clean water diversions and gutter systems (table 4-5).

Under the SCS guidelines, Nutrient Management (590) must be included as a component when a Waste Management System (312) is planned. 312 includes handling and storage of waste. When planning a Waste Management System (312), those fields where the waste is to be applied must be included in a Nutrient Management Plan (590). These fields must have all nutrients planned regardless of the source. Operations eligible for Waste Management Systems are also eligible for cost-sharing of nutrient management practices, specifically the development of both nutrient management (SCS Std. 590) and pest management (SCS Std. 595) plans, soil testing and crop scouting.

Some practices may be exempt from development of a Waste Management System (312) if they do not need additional waste management practices to solve an identified problem. They can consist of: Roof Runoff Management (558), Livestock Exclusion (472), and Clean Water Diversion (362).

Table 4-5. Barnyards Targeted for Runoff Control - Beaver Dam River Watershed

		Management Category I			Management Category II			Category III
Subwatershed	Phosphorus Load (lbs./yr)	Yards (#)	Control (lbs.)	Control (%)	Yards (#)	Control (lbs.)	Control (%)	Yards (#)
Alto Creek	566	6	277	49%	8	96	17%	29
Lower B.D. River	999	12	812	81%	1	10	1%	16
Beaver Creek	1429	7	746	52%	16	267	19%	34
Beaver Dam Lake	732	4	455	62%	5	79	11%	26
Cambra Creek	1371	13	998	73%	6	100	7%	26
Cold Spring Creek	364	2	233	64%	3	62	17%	11
Drew Creek	274	5	196	72%	0	0	0%	3
Fox Lake	222	3	207	93%	0	0	0%	5
Casper Creek	517	3	359	69%	3	67	13%	13
Crystal Creek	89	1	88	99%	0	0	0%	5
Lost Lake	170	1	133	78%	1	21	12%	1
Pratt Creek	1,034	11	575	57%	5	87	8%	30
Rakes Bay	267	3	149	56%	1	15	6%	14
M.B.D.R. - Lowell	326	3	152	49%	4	33	11%	19
M.B.D.R. - R'sville	306	3	173	57%	3	62	20%	3
Shaw Brook	807	12	491	61%	7	74	9%	8
U. Beaver Dam R.	60	0	0	0%	1	13	22%	8
Total	9533	89	6044	63%	64	986	10%	251

Nutrient and Pest Management

Eligible landowners in the Beaver Dam River Watershed will be encouraged to participate in an on farm nutrient pest management educational program to improve farm management related to over application of nutrients and pesticides. Implementation of this program will take place in two stages. The first stage is developing a waste utilization plan using the 590 standard without soil tests. The counties will develop a professional services contract to have this work done within the first three years of sign-up. The waste utilization plans will be submitted to and approved by the Dodge, Columbia and Green Lake County Land Conservation Departments. Records will be kept by the counties showing progress towards reducing the use of fertilizer and pesticides. At the end of the second year of sign-up, the counties will be responsible for providing an evaluation to the DNR and DATCP on the effectiveness of this first stage.

The second stage of this program will be the development of nutrient and pest management plans complete with soil tests, crop scouting and farm visits. These plans will follow Soil Conservation Service Nutrient Management Standard 590 and SCS Pest Management Standard 595. A new professional services contract will be established for this purpose through a local assistance grant. Each landowner is eligible to participate in this stage of the program for one year, and is responsible for paying 50% of these consulting fees.

Livestock operations that are category I & II in table 4-4 (Animal lot runoff) or table 4-6 (Winterspread manure runoff), or growers of specialty crops such as vegetables, are eligible for this educational program. These specialty crop operations comprise a large portion of the agriculture in this watershed and are likely to be contributing excess nutrients and pesticides to ground and surface waters because of over application to these high value crops. No more than 66,000 acres from these operations will be eligible to participate in this program.

Table 4-6. Winter Spread Manure Runoff Information and Education Program Beaver Dam River Watershed

Participation Groups	Suitability Ratio	Number of Livestock Operations (approximately)	Phosphorus Reduction (pounds & percent)
I	Greater than 4	141 (49,000 ac)	2413 lbs (35%)
II	Between 1 and 4	50 (17,000 ac)	856 (12%)
not eligible	Less than 1	266	—

It is estimated that 33,000 acres (half of the total), will be evaluated for nutrient management only, and 33,000 will be evaluated for nutrient *and* pest management. The planning of these practices is closely tied together in their implementation, and it is cost effective to

develop these plans simultaneously. It is also more cost effective to prevent further ground and surface water degradation now than to try and treat it after damage has occurred.

Like the waste utilization plans, the nutrient and pest management plans will be submitted to and approved by the Dodge, Columbia and Green Lake County Land Conservation Departments. Records will be kept showing progress towards reducing the use of fertilizer and pesticides. An evaluation report to the DNR and DATCP will be required at the end of the implementation of the watershed project.

A landowner in the Nutrient and Pest Management Education Program is not required to comply with Category 1 practices identified for his/her farm until they receive cost-sharing for other practices.

How Eligibility Is Determined for Nutrient and Pesticide Management

A computer model (SPREADIT) was used to rank livestock operations in the Beaver Dam River Watershed based on a partial inventory of acres spread with manure during the winter. The model develops a suitability ratio ranking livestock operations that are likely to produce excessive manure runoff from croplands due to lack of suitable spreading sites. If the suitability ratio is equal to 1.0, then there is likely to be enough land to safely spread manure in the winter months. If the suitability ratio is greater than 1.0, there is a probability that this farm does not have enough land for manure spreading.

The ranking from SPREADIT places any operation with a suitability ratio greater than 4.0 into group I. There are approximately 141 livestock operations in this group. Group II operations are those with a suitability ratio less than 4.0 but greater than or equal to 1.0. There are approximately 50 livestock operations that fall into this group.

Although the nutrient and pest management plans will be optional, it will be a priority to work with the farms in group 1 first. This group is likely to have livestock operations that produce excessive manure runoff from croplands due to lack of suitable spreading sites. If the farms in group 1 have enough land to safely spread manure, they may still have a runoff problem from over application on some fields. If all the livestock operations in group 1 (approx. 49,000 acres) adopt nutrient plans, it is estimated that approximately 2000 lbs of phosphorus runoff could be controlled. These nutrient management plans will help to improve manure management and determine if manure storage is necessary.

Manure Storage

Eligibility for a grant for manure storage practices will be based on the Nutrient Management Plan developed in compliance with SCS Standard 590 (table 4-7). A manure storage facility will be considered Category I if the farm operator receives cost-sharing for any item other than those funded under the NPM Educational Program. There is no Category II for manure storage.

Table 4-7. Manure Storage - Beaver Dam River Watershed

Management Category	Eligibility Criteria
I	Exceeds 590 Standard
II	None
III	Do Not Exceed SCS Std. 590

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 storage facility that will satisfy the Std. 590 specifications. 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 storage practices or nutrient management are required to adopt a nutrient management plan (Std.590). Additionally, manure removed from cost-shared storage facilities designed to hold greater than 6 months' manure shall not be spread on frozen, snow covered, or saturated ground as stated in NR 120.

Streambanks and Lake Shorelines

Streambank and Lakeshore Erosion

Streambanks contribute a small percentage of the overall sediment delivered to streams in the watershed. A survey on Fox and Beaver Dam Lakes show that they contribute around 1000 tons (less than 2%) of all sediment delivered to a waterbody. Category I participants are those with identified sites eroding with a severe lateral recession rate of greater than or equal to 0.025 tons per linear foot. For Fox Lake, specific site eligibility for category I and II will be determined by an engineering contractor hired by the Fox Lake Inland Lake Renewal and Protection District. Category II participants are also eligible for streambank and lakeshore erosion control practices. Criteria for category II sites are those with an erosion rate greater than 0.0125 tons per linear foot, but less than 0.025 tons per linear foot (table 4-8).

Category III streambanks and lakeshores are those with an lateral recession rate of less than 0.0125 tons per linear foot.

Table 4-8. **Shoreline Eligibility Criteria - Beaver Dam River Watershed**

Management Category	Lakes and Streams Shoreline Erosion Criteria
I	Severe erosion: rate of 0.025 tons per linear foot.
II	Moderate erosion: rate of greater than 0.0125 tons per linear foot but less than 0.025 tons per linear foot.
III	Slight erosion: rate of less 0.0125 tons per linear foot.

* See Chapter Five for specifics related to funding for Fox Lake.

Streambank Habitat

Category I (essential) streambanks include livestock access sites that are severely trampled to the point where no vegetation exists. Management category II are moderate to slight animal access to streambank sites or where cropping takes place to within 10 feet of the streambank (table 4-9).

Table 4-9. **Streambank Habitat Eligibility Criteria - Beaver Dam River Watershed**

Management Category	Streambank Habitat
I	Livestock access sites: severely trampled, with no vegetation.
II	Moderate to slight livestock access sites, and/or where cropping extends to within 10 ft. of streambank.

Wetland Restoration

Chapter Two contains information about the wetlands in the Beaver Dam River Watershed. There will be no Category I for wetland restoration. Management category II wetlands will be classified as farmed wetlands, prior converted wetlands, old pastured wetlands, and old wetland basins that have silted in. Upland erosion must be controlled in conjunction with wetland restoration. The targeted goal is to restore as many wetlands as feasible in the watershed. Additional cost share money (30% of total cost share, amounting to 100% cost share for wetland restoration) may be available through the Habitat Restoration Area for

those wetlands that are within the HRA boundary area (see map 2-1). Additional cost share money for wetlands outside the HRA boundary may be available through the Fish and Wildlife Service (again, 30% cost share available).

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

Wetland restoration includes: 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, or fencing of livestock out of a wetland.

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

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

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

2. Pastured wetlands riparian to streams, or tributaries.

Eliminating livestock grazing within wetlands will reduce the organic and sediment loading to the wetland and adjacent water resource, and reduce the direct damage to the wetland from the livestock.

3. Wetlands that have been silted in.

4. Previously converted wetlands downslope or upslope from fields identified as Management Category I upland sediment sources through the WIN model.

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

* A significant portion of upland fields draining to the wetland must be controlled to a soil loss rate that is less than or equal to the soils "T" value.

* One or more of the fields downlope of the wetland must have a sediment loss rate (after the application of any erosion control measures) greater than the average sediment delivery rate of 0.4 t/a/yr. Restoring the upstream wetland will help reduce the sediment delivery rate of the downslope fields.

Easements

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

- Shoreline Buffers
- Critical Area Stabilization
- Wetland Restoration

Although easements are not considered a best management practice, they can help achieve desired levels of nonpoint source pollution control in specific conditions. Easements are used to support best management practices, enhance landowner cooperation and 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.

Within the Priority Watershed Easements should be considered in the following situations:

1. To exclude livestock from grazed wetlands or along eroding stream banks 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.
    - more than 100 feet of stream bank are severely trampled and eroding.
    - channel erosion is exacerbated by livestock grazing such that unvegetated stream banks 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.

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

    - The eligible wetland restoration is greater than 0.5 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.

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

Ordinances

Manure Storage Ordinance

Improperly stored manure can be a significant source of surface or groundwater contamination. Poorly sited and/or designed earthen storage facilities often contaminate groundwater near these facilities. Elevated nitrate-nitrogen is particularly common in groundwater near leaking earthen storage facilities. In Dodge County, few regulations exist to protect water resources from the threat of contamination due to animal waste storage and handling.

Properly storing manure entails utilizing certain minimum standards, such as those determined by the USDA Soil Conservation Service, when sighting and constructing a manure storage structure. These technical standards provide effective, practical and environmentally safe mentods for storing animal waste.

Surface water resources are also at risk with manure storage facilities, when improperly located and/or designed. Manure overflows or a blowout from earthen storage facilites are a serious threat to aquatic life. When above-ground facilities are improperly installed, the potential for system malfunctions increases. Drainage from these facilities can degrade surface water quality unless properly treated. Uncontrolled drainage may also affect

groundwater quality, particularly when it occurs in an area with shallow depth to groundwater.

The need for animal waste regulation is evident. More than thirty Wisconsin counties have already adopted ordinances for managing animal waste. Columbia and Green Lake counties have enacted animal waste storage ordinances for the protection of surface and groundwater resources.

To help assure the attainment of surface water quality objectives and to protect the groundwater resource, the adoption of an animal waste storage ordinance in Dodge County is necessary during the span of the Beaver Dam River Watershed Project. Certain costs for the development and administration of the ordinance are eligible for reimbursement under the Priority Watershed Project. Dodge County Land Conservation Department will initiate the development of a manure storage ordinance with the intention of adopting an ordinance following the "sign-up" phase of the project (years 1 through 3).

A manure storage ordinance which implements the requirements outlined in Chapter 92.16 Wisconsin Statutes, must be enacted during the watershed project. This ordinance will be required for grant eligibility and will be administered by the county.

Construction Site Erosion Ordinance

Wisconsin State Statues Sections 89.19, 101.65, 101.651, and 101.653 were created in 1992 to address the problem of construction site erosion on statewide basis.

Road and Bridge Construction Erosion Control

Wisconsin State Statute 89.19 deals with construction site erosion control for highway and bridge construction that is funded in whole or in part by state or federal funds. State Statute 89.19 requires the Department of Transportation in consultation with the DNR, to establish standards for the control of erosion related to highway and bridge construction, and establish a program of training for persons who prepare plans for, review plans for, conduct inspections of or engage in highway or bridge construction activities.

Highway and bridge construction that is not state or federally funded is not covered under the provisions of State Statute 89.19. Highway and bridge construction projects are often next to streams and water conveyance structures, for this reason it is of utmost importance that erosion be controlled in these areas. As a part of the Beaver Dam Priority Watershed Plan, the DNR strongly recommends that areas of road and bridge construction not covered under State Statute 89.19, abide by the guidance standards for erosion control as specified by the Department of Transportation's Facilities Development Manual and the DNR Wisconsin Construction Site Best Management Practice Handbook.

Construction Site Erosion Control

Wisconsin State Statutes 101.65, 101.651, and 101.653 deal with a statewide construction site erosion control ordinance. Currently inspection and enforcement measures for erosion control on construction sites for 1 and 2 family dwellings will be administered by the Wisconsin Dept. of Industry, Labor, and Human Relations. Other provisions to be included on a state wide erosion control ordinance are being explored in the DNR - DILHR Memorandum of Understanding. One of the major provisions that is being discussed in the MOU is agency responsibility for residential, commercial, and industrial developments with ground disturbances of 5 acres or greater.

Currently DILHR has been authorized to enforce erosion control measures on 1 and 2 family dwellings in areas that have adopted the Uniform Dwelling Code. At this time areas with populations less than 2,500 are not mandated to regulate construction site erosion for 1 and 2 family dwellings.

As a part of the Nonpoint Program counties are encouraged to adopt erosion control ordinances to provide enforcement authority in these areas.

Urban Nonpoint Source Management Actions

Reduction Goals

The reduction goals for urban stormwater are based on the appraisal of the water resources with the watershed, these goals are listed in table 4-10. The range in goals is due to the fact that each municipality is broken into subbasins (see maps 3-9 and 3-10), and each subbasin has its own goal.

Table 4-10. Urban Reduction Goals Beaver Dam Watershed

	Lead	Zinc	Copper	Phosphorus	Suspended Solids
city of Beaver Dam Existing (1991)	0-32%	0-79%	0-86%	0-50%	0-90%
Planned (2010)	80%	75%	75%	60%	90%
village of Fox Lake Existing (1991)	0-6%	0-64%	0-63%	0-50%	0-90%
Planned (2010)	80%	75%	75%	60%	90%

Federal Stormwater Regulations administered by the U.S. Environmental Protection Agency (EPA) regulating municipal and industrial stormwater discharges may *eventually* affect the municipalities within the Beaver Dam River Watershed. Most industrial facilities and incorporated municipalities with populations over 100,000 need to obtain a stormwater permit. This permit is a three phase process in which 1) the permit application must be submitted, 2) a monitoring program must take place for a certain period of time, and 3) a control strategy must be implemented. The permit requirements will include best management practices to prevent pollutants from entering stormwater. These practices could range from storing materials indoors to wet detention basins. There will also be some numeric limits imposed on certain pollutants which have yet to be determined.

While the municipalities of Beaver Dam and Fox Lake do not fall under the EPA regulations now, it more than likely they will in the future. In 1993, the next phase of permits will be required for municipalities *under 100,000* people. The population size has not yet been determined.

Management Alternatives

Two key concepts that must be understood is the relationship between existing and future land use development, and the idea of critical nonpoint source polluting land uses.

The idea behind existing and future land use development is one of keeping the waterbody in a state no worse then it is now. This entails combining both the existing pollutant numbers with the future pollutant loading numbers to obtain an "ultimate" loading number for a municipality. This "ultimate" loading number is for the year 2010.

The estimation of pollutant loads relies on land use definitions. Each land use is assigned a pollutant loading number from which yearly pollutant load estimates are made, based on event mean concentrations and pounds per year. When working through the management alternatives, the first target of control are those heaviest polluting land uses, and in some cases the lighter loading land uses will also have to be included to obtain the desired reductions needed.

City of Beaver Dam Recommendations

The city of Beaver Dam was divided into eleven subbasins (map 3-9); 5 subbasins drain to Beaver Dam Lake, 2 subbasins drain to the Beaver Dam River, and the remainder drain to Park Creek.

Table 4-11 lists the management recommendations for the city of Beaver Dam. These recommendations range from no action in certain subbasins to wet ponds/infiltration basins controlling 90% of the total suspended solids in other subbasins. All land uses within the subbasins of Beaver Dam Lake 2, 3, 4, 5, Beaver Dam River 1, and Park Creek 1, 2, 3,4 are eligible for cost share dollars for control of urban stormwater.

The subbasin of Beaver Dam River 1 has had a more detailed planning effort done upon it for control of stormwater pollutants. This effort has led to siting of stormwater wet pond /

infiltration basins within certain parts of the subbasin (map 3-9). Through this work, it was determined that a regional facility would be more cost effective for controlling stormwater pollutants than a smaller multiple site strategy.

Table 4-11. Management Recommendations for Existing Lands within the city of Beaver Dam

Subbasin	Management Recommendation	Wet Pond/Infiltration Acres or Street Sweeping Miles
Beaver Dam Lake 1	No Action	-
Beaver Dam Lake 2	No Action	-
Beaver Dam Lake 3	Street Sweeping 1x a week all land uses	255.0 miles
Beaver Dam Lake 4	Street Sweeping 2x a week all land uses	1745.0 miles
Beaver Dam Lake 5	Wet pond / infiltration to control 60% of suspended solids from all land uses	1.54 acres
Beaver Dam River 1	Wet pond / infiltration to control 90% of suspended solids from all land uses	4.2 acres
Beaver Dam River 2	No Action	-
Park Creek 1	Wet pond / infiltration to control 90% of suspended solids from all land uses	0.9 acres
Park Creek 2	Wet pond / infiltration to control 90% of suspended solids from all land uses	3.6 acres
Park Creek 3	Wet pond / infiltration to control 90% of suspended solids from all land uses	5.2 acres
Park Creek 4	Wet pond / infiltration to control 90% of suspended solids from all land uses	3.6 acres

Along with actions on the existing lands, the planned or incremental land increase will also require management actions. Listed in table 4-12 are the planned land use recommendations. All items are cost share eligible *except* the building of Best Management Practices on newly developing areas.

Table 4-12. Management Recommendations for Planned Lands within the city of Beaver Dam

Develop an enforcement strategy for construction site erosion control
Development of a stormwater plan to incorporate both water quality and quantity controls (as was done for subbasin beaver dam river)
Best Management Practices with a minimum control rate of the 2 year /24 hour storm

Village of Fox Lake Recommendations

The village of Fox Lake is broken into 5 subbasins (map 3-10); 4 of these subbasins drain to Fox Lake, and the other drains to a tributary that flows to the Beaver Dam River.

Listed Below in table 4-13 are the management recommendations for existing land uses for the village of Fox Lake. These recommendations range from no action in certain subbasins to wet ponds/infiltration basins controlling 90% of the total suspended solids in other subbasins. All land uses within the subbasins of Fox Lake 3 & 4 are eligible for cost share dollars for control urban stormwater.

Table 4-13. Management Recommendations for Existing Lands within the village of Fox Lake

Subbasin	Management Recommendation	Wet Pond/ Infiltration Acres
Fox Lake 1	No Action	-
Fox Lake 2	No Action	-
Fox Lake 3	Wet pond / infiltration to control 90% of suspended solids from all land uses	0.5
Fox Lake 4	Wet pond / infiltration to control 90% of suspended solids from all land uses	1.25
Beaver Dam River 1	No Action	-

Along with actions on the existing lands, the planned or incremental land increase will also require management actions. Listed in table 4-14 are the planned land use recommendations. All items are cost share eligible except the building of Best Management Practices on newly developing areas.

Table 4-14. Management Recommendations for Planned Lands within the village of Fox Lake

Develop an enforcement strategy for construction site erosion control
Development of a stormwater plan to incorporate both water quality and quantity controls (as was done for subbasin Beaver Dam River 1 in the city of Beaver Dam)
Best Management Practices with a minimum control rate of the 2 year /24 hour storm

CHAPTER FIVE
Recommended Management Actions: Control Needs and Eligibility for Cost-share Funding

Introduction

This chapter identifies the means for implementing the management actions for nonpoint source control described in Chapter Four. It is divided into two major sections. The first describes the county's nonpoint source implementation strategy for rural areas. The second section contains the elements of nonpoint source pollution control implementation strategy for the urban and developing portions of the watershed. These areas include the cities of Beaver Dam, Fox Lake, and Juneau, the villages of Randolph, Lowell and Reeseville. Included in the implementation program for rural areas is an information and education strategy. The success of this priority watershed project depends on the aggressive implementation of these nonpoint source control strategies.

More specifically this chapter identifies:

1) The agencies and units of government responsible for carrying out the identified tasks,

2) The best management practices (BMPs) necessary to control pollutants on the critical sites identified in Chapter Four,

3) The cost-share budget,

4) The cost containment policies,

5) The cost share agreement reimbursement procedures including administrative procedures for carrying out the project,

6) Staffing needs including total hours per year and number of staff to be hired,

7) Schedules for implementing the project,

8) The involvement of other programs,

9) The information and education activities that will be carried out in the project area, and

10) The project budget including the expense for cost-sharing, staffing for technical assistance, administration, and the information and education program.

Project Participants: Roles And Responsibilities

Landowners and Land Operators

Owners and operators of public and private lands are important participants in the priority watershed program. They will adopt BMPs which reduce nonpoint sources of pollution and protect and enhance fish, wildlife, and other resources. Land owners and operators in the Beaver Dam River watershed eligible for cost share assistance through the priority watershed program include: 1) individuals, 2) Dodge, Columbia, Fond du Lac, Green Lake counties 3) other governmental units described in NR 120.02(19), 4) corporations, and 5) the State of Wisconsin.

Dodge, Columbia, and Green Lake counties are the primary unit of government responsible for implementing this plan in rural areas. The area of the watershed in Fond du Lac County will be administered by the Dodge County Land Conservation Department.

The Land Conservation Committees (LCC) in Dodge, Columbia, and Green Lake counties will act for the respective County Boards, and be responsible contractually and financially to the State of Wisconsin for management of the project in areas with rural land uses. The county LCCs will coordinate the activities of all other local agencies involved with the rural portion of the project. Specific responsibilities will be carried out provided that adequate state funding is available to hire and maintain sufficient county technical and educational support staff throughout the project period.

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

1) Identify in writing a person to represent the county during implementation of the project.

2) Contact all owners or operators of lands identified as significant nonpoint sources at least once during the cost sharing sign-up period. The counties' strategies for contacting landowners are included in this chapter.

3) Develop farm conservation plans consistent with the needs of the project.

4) Enter into nonpoint source cost-share agreements with eligible landowners and enforce terms and conditions of cost-share agreements as defined in s. NR 120.13, Wisconsin Administrative Code.

5) For lands the county owns and operates, to enter into cost share agreements with DNR to correct identified nonpoint sources and fulfill their obligations as a cost share recipient.

6) Design best management practices and verify proper practice installation.

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

8) Prepare and submit annual work plans for activities necessary to implement the project. The Dodge, Columbia, and Green Lake County LCDs shall submit a workload analysis and grant application to the DATCP (DATCP) as required in s. Ag. 166.50.

9) Prepare and submit to the DNR (DNR) and DATCP the annual resource management report required under s.NR 120.21(7) to monitor project implementation by tracking changes in the nonpoint source inventory, and quantifying pollutant load reductions which result for installing BMPs.

10) Participate in the annual watershed project review meeting.

11) Conduct the information and education activities identified in this plan for which they are responsible.

DNR

The role of the DNR (DNR) is identified in s. 144.24, Stats. and s. NR 120, Wis. Adm. Code. (NR120) The Department has been statutorily assigned the overall administrative responsibility for the Wisconsin Nonpoint Source Pollution Abatement Program. The Department's role is summarized below.

Project Administration

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

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

Financial Support

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

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

Project Evaluation

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

Technical Assistance

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

Other Responsibilities

These include:

1) The appropriate District Nonpoint Source Coordinator to arrange for DNR staff to assist county staff with site reviews to determine the impacts of nonpoint sources on wetlands and/or groundwater quality.

2) Assisting county staff to integrate wildlife and fish management concerns into selection and design of BMPs.

DATCP

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

1) Manage a training program for the staff involved with project implementation.

2) Cooperate with the University of Wisconsin - Extension to act as a clearinghouse for information related to agricultural best management practices (BMPs), sustainable agriculture and nutrient and pest management.

3) Assist the counties to carry out the information and education activities or tasks described in this plan.

4) Assist county staff to identify watershed participants subject to federal or state conservation compliance programs.

5) Assist counties, if requested, to develop a manure storage ordinance.

6) Assist county staff to complete annual workload analyses and grant applications for work conducted under the priority watershed project.

7) Participate in the annual project review meetings.

8) If the need arises, assist in developing technical standards for agricultural BMPs, and provide technical assistance to county staff concerning application of these practices.

9) Assist county staff to evaluate the site specific practicality of implementing rural BMPs.

Other Agencies

The Beaver Dam River Watershed Project will receive assistance from many agencies, including but not limited to those listed below.

Soil Conservation Service (SCS)

This agency works through the local LCD to provide technical assistance for planning and installing conservation practices. The local SCS personnel will work with the county staff to provide assistance with technical work when requested by the Land Conservation Departments and if SCS staff time is available. Personnel for the Area SCS office will provide staff training and engineering assistance for best management practices. Efforts will be made by the DATCP to assist SCS to coordinate the Beaver Dam River Priority Watershed Project with the conservation compliance and other conservation provisions of the 1985 and subsequent Federal Farm Bills.

University of Wisconsin Extension (UWEX)

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

Agricultural Stabilization and Conservation Service (ASCS)

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

Agricultural Best Management Practices (BMPs)

BMPs Eligible For Cost-Sharing And Their Rates

Best Management Practices are those identified in NR 120 which are determined in this watershed plan to be the most effective controls of the nonpoint sources of pollution. The practices eligible for cost-sharing under the Beaver Dam River Priority Watershed Project are listed in table 5-1. This table shows the maximum cost share rates available from the state as seen in NR 120.18. See table 5-2 for maximum flat rates available for some practices.

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

If the installation of BMPs destroys significant wildlife habitat, NR 120 requires that habitat will be recreated to replace the habitat lost. The DNR District Private Lands Wildlife Specialist or a designee will assist the LCDs in determining the significance of wildlife habitat and the methods used to recreate the habitat. Every effort shall be taken during the planning, design, and installation of BMPs to prevent or minimize the loss of existing wildlife habitat.

Table 5-1. State Cost-share Rates (%) for Rural Best Management Practices*

BEST MANAGEMENT PRACTICE	STATE COST SHARE RATE
Contour farming	50%*[1]
Contour and field stripcropping	50%*[1]
Reduced tillage	50%*
Shoreline and streambank stabilization (includes livestock exclusion)	70%
Livestock exclusion from woodlots	50%*
Field diversions and terraces	70%
Grassed waterways	70%
Critical Area Stabilization (includes in-field buffers)	70%[2,5]
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Shoreline Buffers	70%[2,5]
Wetland Restoration	70%[2]
Nutrient management	50%[7]
Pesticide management	50%[3,7]
Barnyard Runoff Management	70%
Animal Lot Relocation	70%
Manure Storage Facilities	70%[4]
Sinkhole and Crevice Treatment	70%
Roofs for Barnyard Runoff Management and Manure Storage Facilities	70%
Rotational Grazing	50%
Proper Abandonment of Manure Storage Pits	50%
Green Manure Crops	50%[6]

[1] Wildlife habitat recreation has a state cost share rate of 70%.

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

[4] Spill control basins have a state cost share rate of 70%.

[4] Maximum cost share amount is $20,000 including no more than $5,000 for manure transfer equipment. (Legislation is proposed to change these amounts. If the legislation is adopted the cost share amount will correspond with the new statutory language).

[5] In-field buffers will be cost-shared at $200/acre in addition to cost-sharing for restoration; shoreline buffers will be cost-shared at $200/acre.

[6] Green manure crops will be cost shared at 50%, or $25/acre, whichever is less.

[7] 50% of $6/acre for nutrient management and 50% of $10/acre for nutrient and pest management.

* See table 5-2 for BMPs cost shared at a flat rate. Table 5-2 lists maximum state cost share flat rates. The watershed project should use either a percentage cost share rate or a flat cost share rate for each practice.

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

BEST MANAGEMENT PRACTICE	FLAT RATE
Contour farming	$ 6/ac*
Contour strip cropping	$ 12/ac*
Reduced tillage > 3 yrs. continuous row crops (over 3 yrs)	$ 45/ac[1]
Infield Buffers	$200/acre[3]
Shoreline Buffers	$200/acre
Reduced tillage crop rotation using hay	$ 15/ac[2]
Green Manure Crops	The lesser of $25/acre or 50%

[1] Reduced tillage systems for continuous row cropping over three years (excluding no-till). $15/ac/year for no more than 3 years.

[2] Reduced tillage systems for short crop rotations, and establishment of forages and small grains (including no-till). One year only.

[3] This payment is in addition to the cost-sharing available for restoration.

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

Following is a brief description of some of the most commonly used cost-shared BMPs included in table 5-1. A more detailed description of these practices can be found in NR 120.14.

1. Contour Farming and Contour Strip-cropping - Growing crops in a systematic arrangement, usually on the contour, in alternate strips of close grown crops, such as grasses and legumes, and tilled row crops.

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

3. Critical Area Stabilization - The planting of suitable vegetation on critical nonpoint source sites and other treatment necessary to stabilize a specific location, including in-field buffers. Mowing or haying of infield buffers is limited to the period between July 15 and September 1.

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

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

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

7. Shoreline and Streambank Stabilization - The stabilization and protection of stream and lake banks against erosion and the protection of fish habitat and water quality from livestock access. This practice includes streambank fencing and rip rap it may also include pasture pumps for watering livestock excluded from water bodies.

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

9. Field Diversions - The purpose of this practice is primarily to divert excess water away from areas which it is doing damage, to where if can be transported safely.

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

11. 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 nutrient management plan.

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

13. 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. Mowing and haying of shoreline buffers is limited to the period between July 15 and September 1.

14. 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 the surface or ground water.

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

16. Roofs for Barnyard Runoff Management and Manure Storage Facilities - Construction of roofs to prevent rain and snow from contacting manure.

17. Sinkhole and Crevice Treatment - The protection of ground water by diverting surface runoff away from critical sites.

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

19. Pesticide Management/ Spill Control Basin - The management of the handling, disposal, and application of pesticides including the rate, method, and timing of application to minimize the amount of pesticide entering surface and ground water. This practice includes crop scouting and pest management planning.

20. Shoreland/Upland Grazing Management - A management plan that provides for the maintenance of a vegetated buffer along the banks of streams, lakes and drainage ways in the presence of livestock. The objectives of the practice are to buffer nutrient runoff, protect fish and wildlife habitat, reduce bank erosion and instream and lake turbidity, and preserve stream and lake channel structure. Plans will be based on SCS Standard 510, 512 and UWEX guidelines. Structural practices such as fencing, stream crossings, watering access, watering facilities, spring development, and streambank and shoreland protection may be included in the practice. Implementation of shoreland grazing management will take one of the following forms based on an evaluation of both environmental and management factors:

    a. Livestock Exclusion - Total livestock exclusion through the use of fencing or relocation, from all or portions of the shoreland. Used when other means can not be expected to provide adequate shoreland protection.

    b. Limited Term Grazing - A grazing plan developed using SCS 510 as a general guideline, and generally used in conjunction with other streambank and woodlot protection BMPs, to ensure the protection of surface waters from livestock. Controls animal density (stocking rate) to maintain vegetative cover and limits grazing to a period from late spring to early fall.

21. Easements - Although not considered to be Best Management Practices, easements are useful legal tools. Their applicability is defined in Chapter Four, Management Actions. Details for such arrangements will be worked out between DNR and the counties during implementation phase.

Alternative Best Management Practices

Three alternative Best Management Practices will be eligible for cost-share dollars for the Beaver Dam River Watershed. They are Abandoned Agricultural Waste Systems, Rotational Grazing, and Green Manure Crops. No-till cropping is a fourth alternative best management practice that *may* be eligible (through a plan amendment) at some point in the future.

1. Abandoned Agricultural Waste Systems: The proper abandonment of leaking and improperly sited manure stroage systems includes proper removal and disposal of wastes, liner material, and saturated soil. Also included is necessary shaping, filling, and seeding of the area. The proposed abandoned site should be shown to have caused or have potential to cause a surface or groundwater quality roblem.

2. Rotational Grazing: a management scheme that divides the pasture into multiple cells (usually 5 to 30) that receive a short but intensive grazing period followed by a recovery period of approximately 28 days. Rotational grazing increases pasture production while enhancing a dense, stable vegetative cover, thus decreasing water quality problems. One farm within the Beaver Dam River Watershed may be selected to serve as a demonstration project. The majority of fields that will be eligible to be included as part of a rotational grazing system must be shown to cause a water quality problem (Cat. 1 for sediment delivery). Individual practices, which are listed in a separate DNR/DATCP policy paper will be cost shared at the 50% flat rate, with a cap on the total amount to be cost share. LCD project managers must submit a project proposal to DNR and DATCP to be considered for cost-share dollars for rotational grazing.

3. Green Manure Crops: Cost-share dollars will be provided to those farmers who harvest vegetable or other crops early in the growing season and would otherwise leave fields unseeded. Fields must be planted with a cover crop within one month of harvest.

4. No till cropping: No till cropping may be considered as an alternative best management practice in the future based on research and evaluation by DNR/DATCP. If there is clear evidence that no-till cropping for more than two years of continuous row crops does not pose an increased risk of groundwater contamination, it may at some point be a cost-shared BMP.

BMPs Not Cost-Shared

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

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

Activities and Sources of Pollution Not Eligible for Cost Share Assistance

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

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

Cost Share Budget

Costs of Installing BMPs

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

Table 5.3: Cost-Share Budget Needs for Rural Management Practices in Dodge and Fond du Lac County

Source: DATCP, DNR, Dodge/Fond du Lac LCD

Management Needs / Best Management Practices	Number	Cost/Unit	Total Cost (1)	100% Participation State Share	100% Participation Local Share	75% Participation State Share	75% Participation Local Share	
Upland NPS Control								
Change in Crop Rotation	14500 ac	NA(2)	0	0	0	0	0	
Contour Cropping	6,904 ac	$6.00	41,424	41,424	(3)	31,068	(3)	
Contour Strip Cropping	2,000 ac	$12.00	24,000	24,000	(3)	18,000	(3)	
Reduced Tillage (4)	20,000 ac	$45.00	900,000	900,000	0	675,000	0	
Reduced Tillage (5)	1,516 ac	$15.00	22,740	22,740	0	17,055	0	
Critical Area Stabilization/In-field Buffers	1,000 ac	$275.00	275,000	192,500	82,500	144,375	61,875	In-field buffers cost-shared at $200/ac.
Grass Waterways	100 ac	$2,800.00	280,000	196,000	84,000	147,000	63,000	
Field Diversions & Terraces	50,000 ft	$3.00	150,000	105,000	45,000	78,750	33,750	
Grade Stabilization	50 ea	$3,000.00	150,000	105,000	45,000	78,750	33,750	
Agricultural Sediment Basin	15 ea	$11,800.00	177,000	123,900	53,100	92,925	39,825	
Nutrient Manangement Only (8)	28,380 ac	$6.00	170,280	85,140	85,140	63,855	63,855	
Nutrient and Pest Management (8)	28,380 ac	$10.00	283,800	141,900	141,900	106,425	106,425	
Spill Control Basin	6 ea	$15,000.00	90,000	63,000	27,000	47,250	20,250	
Shoreline Buffers (6)	322 ac	$200.00	64,400	45,080	19,320	33,810	14,490	
Wetland Restoration	120 ea	$3,000.00	360,000	252,000	108,000	189,000	81,000	
Livestock Exclusion from Woodlots	300 rods	$14.00	4,200	4,200	(3)	3,150	(3)	
Green Manure Crops	850 ac	$25.00	21,250	10,625	10,625	7,969	7,969	
Abandoned Ag. Manure Pits	8 units	$5,000.00	40,000	20,000	20,000	15,000	15,000	
Animal Waste Management								
Barnyard Runoff Control								
Complete System	76 ea	$25,000.00	1,892,000	1,324,400	567,600	993,300	425,700	
Simple System	56 ea	$8,000.00	447,200	313,040	134,160	234,780	100,620	
Manure Storage Facility (7)	57 ea	$30,000.00	1,702,800	1,191,960	510,840	893,970	383,130	
Streambank Erosion Control								
Shape and Seeding	25,500 ft	$3.00	76,500	53,550	22,950	40,163	17,213	
Streambank Fencing	1,500 rods	$10.00	15,000	15,000	(3)	11,250	(3)	
Rural Rip-Rap	2,000 ft	$12.00	24,000	16,800	7,200	12,600	5,400	
Livestock/Machinery								
Crossing/Watering Ramp	25 ea	$1,150.00	28,750	20,125	8,625	15,094	6,469	
Remote Watering Systems	12 ea	$500.00	6,000	4,200	1,800	3,150	1,350	
Subtotal:			$7,246,344	$5,271,584	$1,974,760	$3,953,688	$1,481,070	
Easements, wetlands, Critical Areas, Streambanks	200 ac	$1,000.00	200,000	200,000	0	150,000	0	
TOTALS:			$7,446,344	$5,471,584	$1,974,760	$4,103,688	$1,481,070	

(1) Total cost to control identified critical pollution sources
(2) NA means that cost share funds are not available for this practice
(3) Local share consists of labor and any additional equipment costs; also see flat rates
(4) Reduced tillage on continuous row crops, greater than 3 years
(5) Reduced tillage, including no-till, on rotations including hay
(6) Shoreline Buffer practice needs will be determined during implementation
(7) Maximum cost-share is $20,000 of which a maximum of $5000 can be for waste transfer
(8) Calculated on 1 year of cost share from BMPs listed in NR 120 - Stage II

Table 5.3: Cost-Share Budget Needs for Rural Management Practices in Columbia County

Source: DATCP, DNR, and Columbia Co. LCD

Management Needs / Best Management Practices	Number	Cost/Unit	Total Cost (1)	100% Participation State Share	100% Participation Local Share	75% Participation State Share	75% Participation Local Share	
Upland NPS Control								
Change in Crop Rotation	2200 ac	NA(2)	0	0	0	0	0	
Contour Cropping	400 ac	$6.00	2,400	2,400	(3)	1,800	(3)	
Contour Strip Cropping	150 ac	$12.00	1,800	1,800	(3)	1,350	(3)	
Reduced Tillage (4)	2,000 ac	$45.00	90,000	90,000	0	67,500	0	
Reduced Tillage (5)	200 ac	$15.00	3,000	3,000	0	2,250	0	
Critical Area Stabilization/In-field Buffers	20 ac	$275.00	5,500	3,850	1,650	2,887	1,238	In-field buffers cost-shared at $200/
Grass Waterways	20 ac	$2,800.00	56,000	39,200	16,800	29,400	12,600	
Field Diversions & Terraces	8,000 ft	$3.00	24,000	16,800	7,200	12,600	5,400	
Grade Stabilization	4 ea	$3,000.00	12,000	8,400	3,600	6,300	2,700	
Agricultural Sediment Basin	2 ea	$11,800.00	23,600	16,520	7,080	12,390	5,310	
Nutrient Management Only (8)	4,290 ac	$6.00	25,740	12,870	12,870	9,653	9,653	
Nutrient and Pest Management (8)	4,290 ac	$10.00	42,900	21,450	21,450	16,088	16,088	
Spill Control Basin	4 ea	$15,000.00	60,000	42,000	18,000	31,500	13,500	
Shoreline Buffers (6)	48 ac	$200.00	9,680	6,776	2,904	5,082	2,178	
Wetland Restoration	16 ea	$3,000.00	48,000	33,600	14,400	25,200	10,800	
Livestock Exclusion from Woodlots	100 rods	$14.00	1,400	1,400	(3)	1,050	(3)	
Green Manure Crops	140 ac	$25.00	3,500	1,750	1,750	1,313	1,313	
Abandoned Ag. Manure Pits	1 units	$5,000.00	5,000	2,500	2,500	1,875	1,875	
Animal Waste Management								
Barnyard Runoff Control								
Complete System	11 ea	$25,000.00	286,000	200,200	85,800	150,150	64,350	
Simple System	8 ea	$8,000.00	67,600	47,320	20,280	35,490	15,210	
Manure Storage Facility (7)	9 ea	$30,000.00	257,400	180,180	77,220	135,135	57,915	
Streambank Erosion Control								
Shape and Seeding	5,800 ft	$3.00	17,400	12,180	5,220	9,135	3,915	
Streambank Fencing	350 rods	$10.00	3,500	3,500	(3)	2,625	(3)	
Rural Rip-Rap	200 ft	$12.00	2,400	1,680	720	1,260	540	
Livestock/Machinery Crossing/Watering Ramp	10 ea	$1,150.00	11,500	8,050	3,450	6,037	2,588	
Remote Watering Systems	5 ea	$500.00	2,500	1,750	750	1,313	563	
Subtotal:			$1,062,820	$759,176	$303,644	$569,382	$227,733	
Easements, wetlands, Critical Area, Streambank	150 ac	$1,000.00	150,000	150,000	0	112,500	0	
TOTALS			$1,212,820	$909,176	$303,644	$681,882	$227,733	

(1) Total cost to control identified critical pollution sources
(2) NA means that cost share funds are not available for this practice
(3) Local share consists of labor and any additional equipment costs; also see flat rates
(4) Reduced tillage on continuous row crops, greater than 3 years
(5) Reduced tillage, including no-till, on rotations including hay
(6) Shoreline Buffer practice needs will be determined during implementation
(7) Maximum cost-share is $20,000 of which a maximum of $5000 can be for waste transfer
(8) Calculated on 1 year of cost share from BMPs listed in NR 120 - Stage II

Table 5.3: Cost-Share Budget Needs for Rural Management Practices in Green Lake County

Source: DATCP, DNR, Green Lake Co. LCD

Management Needs / Best Management Practices	Number	Cost/Unit	Total Cost (1)	100% Participation State Share	100% Participation Local Share	75% Participation State Share	75% Participation Local Share	
Upland NPS Control								
Change in Crop Rotation	100 ac	NA(2)	0	0	0	0	0	
Contour Cropping	40 ac	$6.00	240	240	(3)	180	(3)	
Contour Strip Cropping	20 ac	$12.00	240	240	(3)	180	(3)	
Reduced Tillage (4)	160 ac	$45.00	7,200	7,200	0	5,400	0	
Reduced Tillage (5)	120 ac	$15.00	1,800	1,800	0	1,350	0	
Critical Area Stabilization/ In-field Buffers	1 ac	$275.00	275	193	83	144	62	In-field buffers cost-shared at $200/ac.
Grass Waterways	2 ac	$2,800.00	5,600	3,920	1,680	2,940	1,260	
Field Diversions & Terraces	600 ft	$3.00	1,800	1,260	540	945	405	
Grade Stabilization	2 ea	$3,000.00	6,000	4,200	1,800	3,150	1,350	
Agricultural Sediment Basin	1 ea	$11,800.00	11,800	8,260	3,540	6,195	2,655	
Nutrient Management Only (8)	330 ac	$6.00	1,980	990	990	743	743	
Nutrient and Pest Management (8)	330 ac	$10.00	3,300	1,650	1,650	1,238	1,238	
Spill Control Basin	1 ea	$15,000.00	15,000	10,500	4,500	7,875	3,375	
Shoreline Buffers (6)	3 ac	$200.00	600	420	180	315	135	
Wetland Restoration	1 ea	$3,000.00	4,200	2,940	1,260	2,205	945	
Livestock Exclusion from Woodlots	8 rods	$14.00	112	112	(3)	84	(3)	
Green Manure Crops	10 ac	$25.00	250	125	125	94	94	
Abandoned Ag. Manure Pits	1 units	$5,000.00	5,000	2,500	2,500	1,875	1,875	
Animal Waste Management								
Barnyard Runoff Control								
Complete System	2 ea	$25,000.00	50,000	35,000	15,000	26,250	11,250	
Simple System	1 ea	$8,000.00	5,200	3,640	1,560	2,730	1,170	
Manure Storage Facility (7)	0 ea	$30,000.00	0	0	0	0	0	
Streambank Erosion Control								
Shape and Seeding	500 ft	$3.00	1,500	1,050	450	788	338	
Streambank Fencing	20 rods	$10.00	200	200	(3)	150	(3)	
Rural Rip-Rap	20 ft	$12.00	240	168	72	126	54	
Livestock/Machinery								
Crossing/Watering Ramp	1 ea	$1,150.00	1,150	805	345	604	259	
Remote Watering Systems	3 ea	$2,000.00	6,000	4,200	1,800	3,150	1,350	
Subtotal:			$129,687	$91,613	$38,075	$68,709	$28,556	
Easements, wetlands								
Critical Area, Streambank	16 ac	$1,000.00	16,000	16,000	0	12,000	0	
TOTALS			$145,687	$107,613	$38,075	$80,709	$28,556	

(1) Total cost to control identified critical pollution sources
(2) NA means that cost share funds are not available for this practice
(3) Local share consists of labor and any additional equipment costs; also see flat rates
(4) Reduced tillage on continuous row crops, greater than 3 years
(5) Reduced tillage, including no-till, on rotations including hay
(6) Shoreline Buffer practice needs will be determined during implementation
(7) Maximum cost-share is $20,000 of which a maximum of $5000 can be for waste transfer
(8) Calculated on 1 year of cost share from BMPs listed in NR 120 - Stage II

The capital cost of installing the Best Management Practices in Dodge/Fond du Lac, Columbia, and Green Lake counties is approximately $7,230,244; $1,060,400; and $129,687 respectively, assuming 100% participation.

- State funds necessary to cost-share this level of control would be about $5,260,314; $757,482; $91,613 for Dodge/Fond du Lac, Columbia, and Green Lake counties, respectively.
- The local share provided by landowners and other cost-share recipients would be about $1,969,930; $302,918; and $38,075 respectively.

At a 75% level of participation, the state funds needed to cover capital installation would be about $3,945,236; $568,112; $68,709 for Dodge/Fond du Lac, Columbia, and Green Lake counties, respectively, for a total of $4,582,057.

Easement Costs

Chapter Four identifies where nonpoint source program funds can be used to purchase easements. The estimated cost for purchasing easements on eligible lands in Dodge/Fond du Lac, Columbia, and Green Lake counties are shown in table 5-3. At 75% participation, the estimated purchase price of easements on eligible lands would be $150,000; $112,500; and $12,000 respectively. The easement costs would be paid for entirely by the state.

Cost Containment

Cost Containment Procedures

Chapter NR 120 requires that cost containment procedures be identified in this plan. The cost containment procedures to be used by Dodge/Fond du Lac, Columbia, and Green Lake counties are described below.

Cost-share payments will be based on actual installation costs. If actual installation costs exceed the amount of cost-sharing determined by the bidding, range of costs, average cost methods, and unit bid quantities, the amount paid to the grantee may be increased with the approval of the Dodge/Fond du Lac, Columbia, and Green Lake Land Conservation Committees. Appropriate documentation regarding the need for changes will be submitted to the DNR.

Bids

Competitive bids will be required in Dodge/Fond du Lac, Columbia, and Green Lake counties for all structural BMPs with estimated total costs, as determined by the project technician, exceeding $5,000. The bidding process requires the cost share recipient to receive a minimum of two bids from qualified contractors in lump sum bid. The cost share recipient must provide copies of the bids to the county prior to initiating construction. In

cases where the cost share recipient provides proof that bids were requested from a minimum of three qualified contractors but only one bid was received, the county 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 in Dodge/Fond du Lac, Columbia, and Green Lake counties for all structural BMPs with an estimated cost equal to or less than $5,000 and for all non-structural BMPs not using a flat rate, unless the cost share recipient decides, and the county agrees, to bid the installation of the BMPs. If the cost share recipient or any county decides to bid a structural BMP under $5,000 the before mentioned bid procedure will pertain.

The average cost list will be reviewed periodically and appropriate changes made. If changes are made, the list will be forwarded to the DNR and the DATCP for final approval before the changes are used for calculating cost share agreements and payments.

Flat Rates: BMPs using flat rates are shown in table 5-2. The rates shown are the state's share of the practice installation costs.

Cost-share Agreement Reimbursement Procedures

Nonpoint Source Grant Agreement And Administration

General Information

The Nonpoint Source Grant Agreement is the means for transmitting funds from the DNR (through the Nonpoint Source Program) to Dodge, Columbia and Green Lake counties for use in funding the state's share of cost share agreements. Cost share agreements are the means to transmit funds from the county to the landowners. A portion of the Nonpoint Source Grant is forwarded to Dodge, Columbia, and Green Lake counties to allow the county to set up an "up front" account. Funds from this account are used by the county to pay landowners after practices are installed under the project. As this account is drawn down, the county will request reimbursements from the DNR to replenish the account. The counties will submit reimbursement requests on a quarterly basis. This reimbursement schedule will insure that the "up front" account balance is maintained at an adequate level. The NPS Grant Agreement will be amended annually to provide funding needed for cost sharing for the year. The funds obligated under cost share agreements must never exceed the total funds in the NPS Grant Agreement.

Fiscal Management Procedures, Reporting Requirements

Counties are required by NR 120 to maintain a financial management system that accurately tracks the disbursement of all funds used for the Beaver Dam River Priority Watershed

Project. The records of all watershed transactions must be retained for 3 years after the date of final project settlement. A more detailed description of the fiscal management procedures can be found in NR 120.25 and 120.26.

Cost Share Agreement And Administration

Purpose and Responsibilities

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

The cost-share agreement is a legal contract between the landowner and the county. The agreement includes the name and other information about the landowner and grant recipient, conditions of the agreement, the practices involved and their location, the quantities and units of measurement involved, the estimated total cost, the cost share rate and amount, the timetable for installation, and number of years the practice must be maintained. The agreements also identify and provide information on practices not cost-shared through the nonpoint program but that are essential to controlling pollution sources (such as crop rotations). Once it is signed by both parties, they are legally bound to carry out the provisions in it.

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

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

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

Dodge, Columbia, Fond du Lac and Green Lake counties are responsible for enforcing compliance of cost-share agreements to which they are party. Where the DNR serves as a party to an agreement with a unit of government, the DNR will take responsibility for monitoring compliance. The responsible party will insure that BMPs installed through the

program are maintained in accordance with the operation and maintenance plan for the practice for the appropriate length of time. These counties will check for compliance with practice maintenance provisions once every three years after the last practice has been installed. The county must check maintenance at it's own expense after the Nonpoint Source Agreement has lapsed, unless state funding for this activity becomes available during the implementation or monitoring phase of the project.

Landowner Contact Strategy

The following procedure will be used to make landowner contacts.

a. 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.
b. After the initial landowner mailings, county staff will make personal contacts with all landowners that have been identified as having critical nonpoint sources of pollution (Management Category I). These contacts will occur **during the cost share period.**
c. The county will continue to make contacts with eligible (Management Category I and II) landowners and operators until they have made a definite decision regarding participation in the program.
d. The county will contact all eligible landowners (as defined in C. above) not signing cost-share agreements by personal letter, six months prior to the end of the cost-share sign up period.

Procedure for Developing a Cost Share Agreement

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

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

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

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

a. Landowner and county staff meet to discuss the watershed project, NPS control practice needs, and coordination with conservation compliance provisions is applicable.

b. Landowner agrees to participate with the watershed project.
c. A farm conservation plan is prepared by the county.
d. The landowner agrees with the plan, a Cost Share Agreement is prepared and both documents are signed by the landowner and the county. A copy of the Cost Share Agreement (CSA) is sent to the DNR Southern District Nonpoint Source Coordinator, and a copy given to the landowner. The CSA will be recorded by the county with the County Register of Deeds.
e. Practices are designed by the county or designee, and a copy of the design is provided to the landowner.
f. Landowner obtains 2 or more bids or other information required in the cost containment policy.
g. Amendments to the CSA are made if necessary.
h. The county staff oversee practice installation
i. The county verifies the installation.
j. The landowner submits bills and proof of payment (canceled checks or receipts marked paid) to the county.
k. Land Conservation Committee or the designated representative and if required, county boards, approve cost-share payments to landowners.
l. Checks are issued by the county to the respective landowners and project ledgers are updated.
m. The county records the check amount, number, and date.
n. DNR reimburses the county for expended cost-share funds.

Identifying Wildlife and Fishery Needs

The Dodge, Columbia, and Green Lake county staff will consult with the DNR's Southern District wildlife and fisheries management staffs to optimize the wildlife and fishery management benefits of nonpoint source control BMPs. Specifically, the county staff will contact the DNR staff if in the county's opinion: Fence rows, rock piles, wetlands, and other wildlife habitat components will be adversely affected by installation of agricultural BMPs.

The DNR staff will assist county staff by:

a. Identifying streambank protection practices that benefit fish and wildlife.
b. Identifying wildlife habitat components that could be incorporated into vegetative filter strips along streams or in uplands.
c. Recommending wildlife habitat components and reviewing placement of agricultural sediment basins to assure that negative impacts on fish and aquatic life do not occur.
d. Providing technical assistance when the installation of BMPs will require the removal of obstructions or other wildlife habitat by proposing measures to minimize impact on wildlife habitat.
e. Helping to resolve questions concerning effects of agricultural nonpoint source BMPs on wetlands.

Submittal to the DNR

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

a. where cost-share funds are to be used for practices on land owned or controlled by the county.
b. for agreements or amendments where the cost-share amount for all practices for a landowner exceeds $50,000 in state funds.
c. for grade stabilization structures and agricultural sediment basins with embankment heights between 15 and 25 feet and impoundment capacities of 15 to 50 acre feet.
d. for streambanks to be controlled using riprap or other materials with banks over 6 feet high, according to NR120.14. If applications are similar to each other in content, they will be reviewed to determine if future applications need to be subjected to this approval procedure.
e. for animal lot relocation.
f. for roofs over barnyards or manure storage facilities.

Local Assistance Grant Agreement Administration

General Information

The Local Assistance Grant Agreement (LAGA) is a grant from the DNR to Dodge, Columbia and Green Lake counties for support of staff and support costs to carry out this watershed plan. Consistent with NR120, Dodge, Columbia, and Green Lake Counties will use funds from the LAGA for additional staff to implement the project and conduct information and educational activities. Other items such as travel, training, and certain office supplies are also supported by the LAGA. Further clarification of eligible costs supported be this grant is given in NR 120.14 (4) and (6).

Grant Agreement Application Procedures

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

Fiscal Management Procedures, Reporting Requirements

Dodge, Columbia, and Green Lake counties are required by NR 120 to maintain a financial management system that accurately tracks the disbursement of all funds used for the Beaver Dam River Priority Watershed Project. The records of all watershed transactions must be

retained for 3 years after the date of the final project settlement. A more detailed description of the fiscal management procedures can be found in NR 120.25 and NR 120.26.

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

Staffing Needs

Budget And Staffing Needs:

This section estimates the funding and staffing required to provide technical assistance for the rural portion of this project. These estimates are based on needs identified for Dodge/Fond du Lac, Columbia, and Green Lake counties.

Staff Needs

Table 5-4 lists the total estimated staff needed to implement the Beaver Dam River Watershed Project. Figures are provided for both the 50% and 75% levels of participation. Total staff hours needed to implement this plan at 75% landowner participation is about 84,420 for Dodge/Fond du Lac County; 10,982 for Columbia County; and 1845 for Green Lake County . This includes 5,581 for Dodge; 250 for Columbia; and 21 for Green Lake counties in staff hours to carry out the information and education program.

Project staff employed by the Land Conservation Departments during the first year of this project will be: 3 positions in Dodge County; 1 position in Columbia County; and a partial position in Green Lake County. The workload estimated in table 5-4 is not feasible at the present time in Dodge/Fond du Lac counties. Dodge county will assess the number and type of staff required for the remainder of the project based on the experience gained during the first year of implementation.

Staffing Costs

The estimated cost for staff at the 75% landowner participation rate (table 5-5) is approximately $1,482,415; $192,844 and $32,398 in Dodge/Fond du Lac, Columbia and Green Lake counties respectively. All of these costs, with the exception of some direct cost items, would be paid for by the state.

Table 5.4. Estimated County LCD Staff Needs for Project Implementation

Activity	Project Years When Work Will Be Done	Dodge and Fond du Lac County 75% Landowner Participation (Staff Hrs)	Dodge and Fond du Lac County 50% Landowner Participation (Staff Hrs)	Columbia County 75% Landowner Participation (Staff Hrs)	Columbia County 50% Landowner Participation (Staff Hrs)	Green Lake County 75% Landowner Participation (Staff Hrs)	Green Lake County 50% Landowner Participation (Staff Hrs)
Project & Financial Mgmt.	1-8	7,000	7,000	666	666	60	60
Information & Education Program	1-8	5,581	5,581	250	250	21	21
Pre-Contact Office Inventory; Landowner Contacts, & Progress Tracking	1-3	6,000	4,000	582	388	48	32
Conservation Planning & Cost Share Agreement Developme	1-3	6,000	4,000	1,082	721	89	60
Plan Revisions and Monitoring	1-8	4,500	3,000	200	133	17	11
Practice Design & Installation	1-8						
Upland Sediment Control		20,000	13,333	1,747	1,165	144	96
Animal Waste Management		20,000	13,333	3,744	2,496	309	206
Streambank Erosion Control		3,500	2,333	545	363	45	30
Archaeological Studies	1-8	500	500	100	100	100	100
Training	1-8	1,600	1,600	800	800	800	800
Total LCD Workload:		74,681	54,681	9,716	7,082	1,634	1,416
Estimated Staff Required for Years 1-3:		6.2 per	4.5 per yr	0.8 per yr	0.6 per yr	0.1 per yr	0.1 per yr
hours		12,850 per	9,323 per yr	1,724 per yr	1,239 per yr	260 per yr	220 per yr
Estimated Staff Required for Years 4-8:		4.4 per	3.3 per yr	0.6 per yr	0.4 per yr	0.1 per yr	0.1 per yr
hours		9,174 per	6,769 per yr	1,162 per yr	858 per yr	213 per yr	188 per yr

Source: DATCP, DNR, Dodge, Fond du Lac, Columbia, and Green Lake Co. LCDs

Table 5.5: Grant Disbursement Schedule at 75% Landowner Participation for Dodge and Fond du Lac counties

Item	Project Year 1	2	3	4-8	TOTAL
Cost-Share Funds: Practices (2)	$1,183,571	$1,183,571	$1,578,094	$0	$3,945,236
Cost-Share Funds: Easements	$25,000	$25,000	$25,000	$75,000	$150,000
Local Assistance Staff Support	$225,646	$225,646	$225,646	$805,477	$1,482,415
Information/Education: Direct Stage I Nutrient Management	$7,737 $15,325	$7,737 $15,325	$7,737 $15,325	$11,174 $0	$34,385 $51,084
Other Direct: (travel, supplies, etc.)	$36,288	$36,288	$36,288	$117,936	$226,800
Engineering Assistance and lake rip rap (1)	$48,000	$48,000	$48,000	$156,000	$300,000
TOTAL	$1,541,567	$1,541,567	$1,936,091	$1,165,587	$6,184,812

Salary + Indirect=$36,525/yr $17.56/hr

(1) Fox Lake Protection and Rehabilitation District will receive $150,000
(2) Includes Professional Services Contract for Nutrient Pest Management
Source: DATCP, DNR, and Dodge, Fond du Lac County LCDs

Table 5.5: Grant Disbursement Schedule at 75% Landowner Participation for Columbia County

Item	Project Year 1	2	3	4 - 8	TOTAL
Cost-Share Funds: Practices (1)	$170,434	$170,434	$227,245	$0	$568,112
Cost-Share Funds: Easements	$18,750	$18,750	$18,750	$56,250	$112,500
Local Assistance Staff Support	$30,273	$30,273	$30,273	$102,024	$192,844
Information/Education: Direct Stage I Nutrient Management	$1,136 $2,317	$1,136 $2,317	$1,136 $2,317	$1,640 $0	$5,047 $7,722
Other Direct: (travel, supplies, etc.)	$5,328	$5,328	$5,328	$17,316	$33,300
Engineering Assistance	$0	$0	$0	$0	$0
TOTAL	$228,237	$228,237	$285,048	$177,230	$918,753

Salary + Indirect=$36,525/yr $17.56/hr

(1) Includes Professional Services Contract for Nutrient Pest Management
Source: DATCP, DNR, and Columbia Co. LCD

Table 5.5: Grant Disbursement Schedule at 75% Landowner Participation for Green Lake County

Item	Project Year 1	2	3	4 - 8	TOTAL
Cost-Share Funds: Practices (1)	$20,613	$20,613	$27,484	$0	$68,709
Cost-Share Funds: Easements	$3,600	$3,600	$4,800	$0	$12,000
Local Assistance Staff Support	$4,566	$4,566	$4,566	$18,701	$32,398
Information/Education: Direct	$87	$87	$87	$126	$388
Stage I Nutrient Management	$178	$178	$178	$0	$594
Other Direct: (travel, supplies, etc.)	$432	$432	$432	$1,404	$2,700
Engineering Assistance	$0	$0	$0	$0	$0
TOTAL	$29,476	$29,476	$37,547	$20,231	$116,730

Salary + Indirect=$36,525/yr $17.56/hr

(1) Includes Professional Services Contract for Nutrient Pest Management
Source: DATCP, DNR, and Green Lake LCD

Schedule of Implementation

Grant Disbursement And Project Management Schedule

Implementation may begin upon approval of this watershed plan by the Dodge/Fond du Lac, Columbia and Green Lake County Boards; DATCP; and the DNR. The priority watershed project implementation period lasts eight years. It includes an initial three year period for contacting eligible landowners and signing cost-share agreements. Practices on any cost-share agreements must be installed within a five year period.

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

The disbursement of the grants (Local Assistance and Nonpoint Source) to Dodge, Columbia and Green Lake counties will be based on an annual workload analysis and grant application process. The estimated grant disbursement schedule based on 75% participation by eligible landowners can be found in table 5-5.

Total Project Cost

The total state funding required to meet the rural nonpoint source pollution control needs at 75% level of landowner participation is presented in table 5-5. This figure includes the capital cost of practices, staff support, and easement costs presented above. The estimated cost to the state would be $7.6 million for implementing the Beaver Dam River Priority Watershed Project.

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

Involvement of Other Programs

Coordination With State And Federal Conservation Compliance Programs

The Beaver Dam River Watershed project will be coordinated with the conservation compliance features of the Wisconsin Farmland Preservation Program (FPP) administered by the DATCP, and the Federal Food Security Act (FSA) administered by the Soil Conservation

Service. The DATCP will assist the Land Conservation Departments and the SCS office to identify landowners within the watershed that are subject to the compliance provisions of FPP and FSA.

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

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

Urban Program for Implementation

Timing and Sequencing of Urban Management Program

The following discussion provides guidance on the manner in which the urban nonpoint source control program will be implemented. It considers first, the elements of a "core" program for controlling urban nonpoint source. Second, the contents and means for implementing the more complex elements of the urban management program--detention, infiltration, street sweeping--are presented.

Core Elements of the Urban Management Program

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

The basic elements of the "core" program are:

1) Vigorously enforce the erosion control provisions developed through the DNR - Department of Industry, Labor and Human Relations Memorandum of Understanding (see Chapter Three).

2) Develop and implement a community specific program of urban "housekeeping" practices which reduce urban nonpoint source pollution. This may include a combination of such efforts as an information and education program, adoption of ordinances regulating pet wastes or changes in the timing and scheduling of leaf collection.

3) Implement an information and education program containing the elements and achieving the goals of the urban I&E strategy presented at the end of this chapter.

4) The DNR is in the process of adopting a Stormwater Management Guidebook. Once this is finalized, it is recommeneded that the communities adopt a stormwater management ordinance to be incorporated into the "core" program.

"Segmented" Elements of the Urban Management Program

The "segmented" elements of the urban nonpoint source program include those requiring site specific investigations prior to implementation. It is anticipated that many of these segmented elements will be implemented individually as discrete nonpoint source control practices. An example would be construction of one or more detention ponds in a given subwatershed following completion of an engineering feasibility study.

Importantly, the higher costs of implementing this portion of the urban management program will require communities to budget expenditures over the course of several years. Best management practices implemented under this portion of the program likely will include detention ponds, infiltration devices, stream bank erosion controls and other structural means for reducing urban nonpoint source pollution. These elements also include changes in schedules and equipment used for street sweeping.

The detailed studies will include engineering feasibility and other site specific investigations for existing and new development. The results will determine the best means for reducing urban nonpoint sources in a specific community by more site specific application of the plan's recommendations.

Communities can implement the segmented elements of the urban management strategy any time following development and initial implementation of the "core" program. However, cost sharing will be limited to those elements of the segmented program completed within the 8 year implementation period.

The basic elements of the segmented program are:

1. Conduct detailed engineering studies to determine the best means to implement community specific nonpoint source control measures for existing urban areas. These studies should set forth the allocation of local costs between municipalities where more than one municipality contributes runoff to an urban structural practice. The allocation should result in an equitable distribution of costs based on the contribution of each municipality to the total pollutant loading or stormwater runoff volume being controlled. This element will also consider accelerated street sweeping as a component of the control strategy for existing urban areas.

2. Design and install structural urban best management practices for existing urban areas with completed detailed engineering studies. (Practices for locations outside of areas having detailed engineering studies will be considered only on a case-by-case basis.)

3. Develop, as needed, management plans for planned urban development. These plans will identify the type and locations of structural urban best management practices.

4. Adopt and enforce a comprehensive storm water management ordinance consistent with the State "model" storm water ordinance under preparation.

Program Participants—Roles and Responsibilities

The specific roles and responsibilities for program participants are summarized below. The primary participants include local units of government (cities, villages, towns, counties); the DNR; other agencies; landowners and land operators. Where applicable, the roles and responsibilities are discussed according to the previously described "core" and "segmented" approaches to project implementation. As noted in Chapter One, "Plan Purpose and Legal Status", implementation begins following approval of this priority watershed plan by the Dodge/Fond du Lac, Columbia, and Green Lake Counties, DATCP, and DNR.

Local Units of Government "Core" Program Roles and Responsibilities

The following is a schedule for implementing the "core" elements of the urban nonpoint source control strategy for this priority watershed project. Each community wishing to participate should:

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

2. Identify the roles and responsibilities of towns and the county for controlling construction erosion in unincorporated areas within 6 months of the start of implementation. Develop administrative procedures, and determine staff needs to enforce a construction erosion control ordinance in unincorporated areas within 12 months of the start of implementation.

3. Develop and implement a community specific program of urban "housekeeping" practices which reduce urban nonpoint source pollution. This may include but is not limited to a combination of information and education efforts, adoption of ordinances regulating pet wastes, and changes to the timing and scheduling of leaf collection. The content of the community specific program and a schedule for implementation will be negotiated by the local unit of government and the DNR within 12 months of the start of implementation.

4. Implement the information and education strategy according to the schedule described in this chapter.

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

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

7. Participate in the annual watershed project review meeting.

Local Units of Government "Segmented" Program Roles and Responsibilities

The following is a schedule for the "segmented" elements of the urban nonpoint source control strategy for this priority watershed project. Each community wishing to participate should:

1. Identify within 12 months of the start of implementation, the high priority segments the community wishes to pursue in existing and planned urban areas through the priority watershed project. This list can be amended throughout the 8 year project period.

2. Conduct engineering feasibility and site location studies for urban nonpoint source control practices in high priority areas for existing urban development. The type and manner of practice installation will be guided by the above referenced detailed engineering studies. A commitment to implementing the recommendations will be required as a condition for subsequent financial assistance for these studies.

3. Adopt, administer, and enforce a comprehensive storm water management ordinance for planned urban development within 12 months of completion of an approved State "model" ordinance.

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

    a) For practices installed and maintained by private individuals, the cost-share agreement is between the landowner and the local unit of government.

The local units of government will be required to:

1) Design or contract for the design of best management practices and verify proper practice installation.
2) Request reimbursement from the Department for practices installed by private landowners, and in turn reimburse those landowners for the eligible amount of cost sharing.
3) Monitor landowner compliance with provisions of the cost-share agreement.

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

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

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

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

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

5. Conduct detailed alternative financing/implementation studies which determine the means to pay for administering an urban nonpoint source control program in each municipality. These studies will be conducted on a parallel schedule with the other initial high priority elements undertaken under the segmented program.

6. Submit information to DNR needed for project evaluation.

DNR

The Department has been statutorily assigned the overall administrative responsibility for the Wisconsin Nonpoint Source Water Pollution Abatement Program. This includes providing

financial support for local staff and installation of management practices, assisting local units of government to integrate wildlife and fish management concerns into selection and design of BMPs, and conducting project evaluation activities.

The Department's role in assisting local units of government in carrying out the "core" and segmented" activities are as follows.

Core Program Roles and Responsibilities--

1. Assist local units of government to enforce construction erosion control provisions developed by the DNR - DILHR Memorandum of Understanding.

2. Review community specific programs of urban "housekeeping" practices for nonpoint source control.

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

4. Review and approve annual project implementation reports.

5. Participate in the annual watershed project review meeting.

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

Segmented Program Roles and Responsibilities--

1. Develop a comprehensive storm water management ordinance for planned urban development. Assist communities with adoption and enforcement of storm water management ordinances.

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

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

4. Enter into nonpoint source cost-share agreements with the eligible lands the local unit of government owns or operates.

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

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

Landowners and Land Operators

In some situations, private landowners will install bmps on their property. As such, they can be important participants in the urban implementation strategy. Eligible land owners will participate in the project by signing cost-share agreements with local units of government. Maintenance responsibility can be allocated using agreements similar to those discussed above.

Other Agencies with Urban Implementation Responsibilities

USDA-Soil Conservation Service (SCS)

This agency works through the local land conservation committee to provide technical assistance for planning and installing conservation practices. The local SCS personnel may work with the local units of government in selected circumstances to provide assistance with technical work.

University of Wisconsin Extension (UWEX)

Area Extension agents will provide support in developing and conducting a public information and education program aimed at increasing voluntary participation in the project. These activities are described later in this chapter in the information and education strategy.

Best Management Practices (BMPs)

BMPs Eligible For Cost-Sharing and Their Rates

Best management practices are those practices identified in NR 120 determined in this watershed plan to be the most effective in reducing nonpoint sources of pollution. Design and installation of the best management practices previously described under the rural implementation strategy must meet the conditions listed NR 120. Generally these practices use standard specifications in the
U.S. Soil Conservation Service Field Office Technical Guide.

Specifications for the structural urban practices were described in Chapter Four, "Nonpoint Source Control Needs." Application of these practices will be guided by technical assistance provided by the DNR. Eligible practices and state cost share rates are listed in table 5-6.

Table 5-6. State Cost-Share Rates for Urban Management Practices

Best Management Practice	State Cost-Share Rate
Critical Area Stabilization	70%[1]
Grade Stabilization Structures	70%
Stream Bank Stabilization	70%
Shoreline Buffers	70%[1]
Wetland Restoration	70%[1]
Structural Urban Practices	70%[2]
Street Sweeping	50%[3]
Line Purchase for Urban BMPs and Pipe Routing	50%

[1] Easements may be used in conjunction with these practices.

[2] Applies only to structures for established urban areas--those in existence prior to the date the DNR approves this watershed plan.

[3] This is an alternative best management practice not listed in NR 120, of the Wisconsin Administrative Code, See Appendix D for more information.

Source: DNR

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 excluded in NR 120.10 and NR 120.17. The following is a partial list of ineligible activities most often inquired about for cost-sharing in urban areas.

1. Operation and maintenance of cost-shared best management practices (BMPs).
2. Construction erosion control practices.
3. Structural BMPs for new urban development--those whose construction activity commenced after DNR approval of this plan.
4. BMPs installed prior to signing cost-share agreement.
5. Activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) Program. (includes industry run-off)
6. On-site septic system controls or maintenance.
7. Dredging activities.
8. Activities and structures intended primarily for flood control.
9. Minimum levels of street sweeping & leaf collection. Minimum levels of street sweeping are defined in Appendix D.

Nonpoint Source Grant Agreement and Administration

The Nonpoint Source Grant Agreement is the means for transmitting funds from the DNR to local units of government to provide cost sharing for installation of urban best management

practices. In some cases the municipality will act only as a grantee. In this case, the municipality will use funds obtained under the grant agreement directly for practices it will install, own, and operate.

In other cases, the municipality will play an additional role as a grantor. In these situations, the muncipality will pass the cost share funds it has received from the Department to private landowners who have responsibility for installing, operating, and maintaining the management practices. When this occurs, the municipality will enter into a separate cost-sharing agreement with the private landowner receiving the state funds.

The procedures for administering Nonpoint Source Grant Agreements and Cost Share Agreements parallel those contained in this plan's rural implementation strategy and in NR 120, Wis. Adm. Code.

Cost Share Agreement and Administration

Purpose and Responsibilities

Consistent with s. 144.25, Stats. and NR 120, cost-share funding is available to landowners and local units of government for a percent of the costs of installing BMPs to meet the project objectives. Cost-share agreements must be initiated within three years after formal approval of the watershed plan and are filed as part of the property deed. They may be amended throughout the 8 year project period.

Practices included on cost-share agreements must be installed within the schedule agreed to on the cost-share agreement. Unless otherwise approved, the schedule of installing BMPs will be within 5 years of signing of the cost-share agreement. Practices must be maintained for a minimum of ten years from the date of installing the final practice included in the cost-share agreement.

Local, state, or federal permits may be needed prior to installation of some BMPs. The areas most likely to need permits are zoned wetlands and the shoreline areas of lakes and streams. These permits are needed whether the activity is a part of the watershed project or not. The cost share recipient is responsible for acquiring the needed permits prior to installation of practices.

Local units of government are responsible for enforcing compliance of cost-share agreements to which they are a party. Where DNR serves as a party to an agreement with a unit of government, the DNR will take responsibility for monitoring compliance. The responsible party will insure that BMPs installed through the program are maintained in accordance with the operation and maintenance plan for the practice for the appropriate length of time.

Identifying Wildlife and Fishery Needs

The local units of government will consult with DNR's Southeast District wildlife management and fisheries management staff to optimize the wildlife and fish management benefits of nonpoint source control BMPs. Specifically, the DNR will be contacted if:

a. Stream bank protection practices or critical area stabilization practices are being considered.

b. Wetlands or other wildlife habitat components will be adversely affected by installation of BMPs.

The DNR staff will assist by:

a. Identifying stream bank protection practices that benefit fish and wildlife.

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

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

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

Cost Containment Procedures

Cost containment procedures for local units of government are governed by State Statute.

Local Assistance Grant Agreement Administration

General Information

The Local Assistance Grant Agreement (LAGA) is a grant from the DNR to local units of government for supporting their staffing and support costs of carrying out the urban implementation strategy. Each local unit of government will have its own agreement. Consistent with NR 120 these grant funds will be used for installation of best management practices on land owned by the local unit of government, additional staff to implement the project and conduct information and education activities. Other items such as travel, training, and certain office supplies are also supported by the LAGA. Further clarification of eligible costs supported by this grant is given in NR 120.14(4) and (6).

Activities described in the "core" and "segmented" elements of the urban implementation strategy are eligible for financial assistance. The type of eligible activities and the amount of state funds available are described in table 5-7.

Table 5-7. Urban Implementation Strategy Measures Eligible for State Funding

Activity	Support Rate
Development of Construction Erosion Control Ordinances	100%
Development of Storm Water Management Ordinances	70%
Engineering Studies for Existing Urban Areas; Studies for Planned Urban Areas	100%
Design and Engineering for Structural Best Management Practices	100%[1]
Staff for Enforcing Construction Erosion and Storm Water Management Ordinances	100%
Additional Staff Needed for Accelerated Street Sweeping	100%[2]
Development of Alternative Financing and Administration Strategies	100%

[1] Funding not available for components dealing exclusively with drainage and flooding.

[2] Funding limited to 5 years. Level of staffing based on a work plan submitted by local units of government and approved by the DNR.

Source: DNR.

Grant Agreement Application Procedures

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

Fiscal Management Procedures, Reporting Requirements

The local units of government are required by NR 120 to maintain a financial management system that accurately tracks the disbursement of all funds used for the Beaver Dam River Watershed Project. The records of all watershed transactions must be retained for 3 years after the date of final project settlement. A more detailed description of the fiscal management procedures can be found in NR 120.25 and NR 120.26. NR 120 requires quarterly reports from each local unit of government accounting for staff time, expenditures, and accomplishments regarding activities funded through the watershed project. Reimbursement requests may be included with the submittal of the quarterly project reports.

Urban Budget and Staffing Needs

The urban program budget and staffing requirements include several key components. These are presented below, along with estimates of budget and staffing needs.

Detailed Engineering Designs

Once practices are sited, detailed designs must be prepared. These designs will probably be prepared partly by the private sector and partly by staffs of local governments. The cost of site designs for structural practices located in existing and planned urban areas is included in cost estimates presented in the following section. It has been assumed that designs are prepared by the private sector and supported 100% by the DNR.

Alternative Funding Sources

A substantial portion of the estimated costs of implementing this plan's urban management recommendations is for the construction of stormwater management practices in existing urban areas to control pollutants generated by a wide variety of activities. Where urban structural practices are used to control stormwater pollutants, the state cost share is limited and the burden falls on local funding sources as a result of current constraints set forth in state statutes and administrative rules.

Some municipalities have endorsed a concept of internalizing the cost of pollution control by developing a mechanism to charge the cost of control to those responsible for generating the pollutants. In addition, municipalities have indicated a desire to pursue additional state or federal funding sources.

One way to internalize costs is to assess the source of each stormwater pollutant. This requires the identification of sources responsible for pollutant generation. This plan endorses investigations that identify sources of urban pollutants so that pollutant generation can be reduced. If pollutant generation cannot be reduced, this identification would provide an alternative means of assigning pollution control costs.

State or federal programs could be developed to help internalize the cost of pollution control. This could be done by collecting pollution generation fees and redistributing these funds to local units of government. Such fees could be associated with the production or use of polluting materials. Current examples include the state's tire tax which is collected on every tire sale to finance long-term tire disposal. Alternatively, costs could by internalized by assessing local charges within the urban area based on the amount of polluted runoff generated. Current examples include utility districts and basin authorities being used throughout the country to finance stormwater management practices.

This plan endorses continuing investigation into source control alternatives as well as development of alternatives for internalizing local pollution control costs. Some of these alternatives, such as the collection and redistribution of fees at the state level and increased state funding for urban nonpoint source control practices should be investigated through

further Legislative Council Study on Nonpoint Source Pollution Control. Other alternatives, such as the creation of local utility districts should be investigated by respective municipalities.

Cost of Installing Structural Practices in Existing Urban Areas

There are many factors that can affect the cost of constructing practices to control existing urban runoff. Key factors include:

* labor rates,
* land costs,
* cost of relocating residences,
* excavation costs, and
* cost of re-routing storm sewers.

The relative importance of these costs will vary tremendously on a case-by-case basis. Land costs will vary by community, and include acquisition costs for land procured from the private sector and the opportunity cost of using land currently held in the public domain. Residences in densely urbanized areas may need to be relocated to make space for structural practices; where open land exists, this would not be necessary. Excavation costs for structures that must be put underground, such as detention chambers, are several times greater than if the excavation is for a surface structure. Finally, re-routing storm sewers to get urban stormwater to the site of control practices can be costly.

Table 5-8 presents cost information for installing wet detention ponds and street sweeping in existing urban areas. The cost estimates pond excavation and development, such as the construction of pond inlet and outlet structures and pond landscaping, at about $40,000 per acre.

Table 5-8. Total Estimated Costs for Urban Practices for Project Period (8 years) - Beaver Dam River Watershed

Item	State Cost Share Rate	Local Cost	State Cost	Total Cost
Stormwater Planning $100 / acre[1]	70%	$137,790	$322,210	$460,000
Construction Site Erosion Control $250 / acre	0%	$92,500	$0	$92,500
Construction Site Erosion Control Staff - 1/4 time staff @ $40,000 / year	100% (for first 5 years, reaming 3 years at 0%)	$30,000	$50,000	$80,000
BMPs on Existing areas [2]	70%	$255,000	$595,000	$850,000
BMPs on Newly Developing areas[3]	0%	$150,000	$0	$150,000
Total		$665,290	$967,210	$1,632,500

[1] Planning for existing and developing areas.

[2] BMPs for existing areas at $40,000 per acre of wet pond, $25.00 curb mile for street sweeping. Pond costs include land purchase at a 50% cost share rate.

[3] BMPs for newly developing areas are at $40,000 per acre of wet pond.

The state share of the cost is limited to 70% of the cost for pond excavation and development, and 100% of the design costs. The remaining costs, including annual operation and maintainence are not eligible for cost sharing under the existing rules governing the state nonpoint source program.

Some local governments have indicated that there may be an inability to fund some components of these costs. Therefore, this financing plan recognizes that additional funding through new initiatives must be provided to improve full program implementation.

Cost of Installing Structural Practices in Planned Urban Areas

Table 5-8 presents an estimate of the cost for wet detention in planned urban areas. The factors that make retro-fitting so expensive should not be of concern in developing areas, as good planning can assure that land is set aside and stormwater practices located in harmony with the conveyance systems.

Table 5-8 shows that an estimated $150,000 will be required to install wet detention in the planned urban areas. Land costs would be additional. The entire cost would be borne locally, as Nonpoint Source Program funds are not used for practices in areas of new development.

Operation and Maintenance for Structural Practices

Operation and maintenance costs for detention are about 5% of the capital construction cost per year. This cost is not included in table 5-8. It must be borne locally.

Cost of preparing construction site erosion control plans

This cost has not been estimated.

It will be borne primarily by the private sector to meet requirements of local ordinances.

Cost of installing construction erosion control practices

The cost of construction site erosion control practices must be borne locally by the private sector to meet requirements of local ordinances.

Cost of administering a construction and stormwater control ordinances

This is potentially a significant cost for some communities. An estimate has not been made. For the first five years, the local governments' costs of providing additional staff to administer and enforce ordinances will be supported 100% by the DNR. After the first five years, the cost of continuing the ordinance programs must be borne locally.

Table 5.9: Total Project Costs at 75% Landowner Participation Rate

Item	Dodge and Fond du Lac County costs (state share)	Columbia County co (state sha	Green Lake County costs (state share)	Watershed Total costs (state share)	
Cost Share Funds: Practices	$3,945,236	$568,112	$68,709	$4,582,057	Table 5.3 75% participation, state share
Cost Share Funds: Easements	$150,000	$112,500	$12,000	$274,500	Table 5.3 75% participation, state share
Local Assistance Staff Support	$1,482,415	$192,844	$32,398	$1,707,657	Table 5.4 total LCD workload x $17.56
Information/Education Direct	$34,385	$5,047	$388	$39,820	from I & E chapter
Stage I Nutrient Management	$51,084	$7,722	$594	$59,400	does not include staff contract on 66,000 acres
Other Direct (travel, supplies, etc.)	$226,800	$33,300	$2,700	$262,800	from county's calculations
Engineering Assistance and lake rip rap	$300,000	$0	$0	$300,000	from county's calculations includes riprap & engineering
Urban Nonpoint Practices	$725,408	$0	$0	$725,408	from urban analysis
TOTAL	$6,915,328	$919,525	$116,789	$7,951,642	

Source: DATCP, DNR, and Dodge/Fond du Lac, Columbia, and Green Lake Co. LCDs

CHAPTER SIX
Information and Education Program

Objectives and Goals

The Information and Education (I&E) program objectives are to gather support for the Beaver Dam River Priority Watershed Project and to maximize landowner participation in the project.

To achieve its objectives, the I&E program was structured around the following goals:

1. Increased awareness, understanding and appreciation of the water resources in the Beaver Dam River Priority Watershed Project.

2. Increased understanding of the principles of nonpoint source pollution as experienced in the watershed project.

3. Increased awareness and understanding of best management practices (BMPs) that are promoted through the watershed project--including how these practices can lead to cleaner water and improved farm management.

4. Increased awareness and understanding of the purpose, operation and benefits of the watershed project.

Audience

The primary audience of the I&E program is priority watershed landowners who are eligible for project participation. Secondary audiences are priority watershed landowners and residents who are not eligible for project participation, suppliers of services to the priority watershed, interest groups, and the general public.

Delivery Team

The University of Wisconsin - Extension (UWEX) I&E Specialist will take the lead responsibility for delivering the I&E program along with the Dodge County Land

Conservation Department, the Dodge County Agricultural agent, and UWEX Area Water Quality Specialist. The DNR (DNR) and the DATCP (DATCP) will also provide supporting assistance.

Activities

Newsletters

Description

Newsletters will be a major component of the I&E program for this priority watershed project. During the sign-up period, newsletters will focus on eligibility requirements, best management practices (BMPs), and the benefits from their application. The implementation period newsletters will focus on the operation and maintenance of BMPs, the water quality improvements resulting from BMP application, and the overall progress in the watershed. In addition, existing publications of agencies such as UWEX and U.S. Agricultural Stabilization and Conservation Service (ASCS) will be used to distribute information on the watershed project.

Schedule

Three per year for four years, two per year for four years.

Responsibility

I&E Specialist (lead)

Public Announcement Sheets

Description

Fact sheets will be descriptive narratives announcing upcoming events in the watershed, such as tours and public meetings. Demonstration plot results will be distributed through fact sheets.

Schedule

As activities occur.

Responsibility

I&E Specialist

News Releases

Description

News releases will be sent to local newspapers. Topics of the news releases will include the purpose and progress of the watershed project.

1. Description of the water resources and the impacts of nonpoint source pollutants in the watershed.

2. Current status of watershed project progress.

3. Explanation of best management practices.

4. Success stories of improved water quality.

5. Bid invitations for demonstrations or large projects.

Schedule

Minimum of four releases per year.

Responsibility:I&E Specialist

Radio

Description

Radio coverage of project activities and progress will be aired on local stations.

Schedule

Minimum of four per year.

Responsibility

I&E Specialist

Public Information Meetings and Presentations

Description

A series of public information meetings will be held to cover the following topics:

1. The nature of nonpoint source water pollution and effectiveness of BMPs.
2. Goals and objectives of the watershed plan.
3. Administrative rules of the watershed project, including eligibility and cost sharing.
4. Conservation Tillage
5. Well Water Education
6. Using Reduced Chemical Rates
7. Intergrated Pest Manaagement
8. Farmsted Assesment

Schedule: Approximately twenty meetings will be held throughout the duration of the project.

Responsibility: I&E Specialist (lead), with watershed technicians and County Agriculture Agents contributing.

Advisory Committee

Description: A committee of community leaders, agribusinesses, farm organizations schools and elected officials formed to provide a local link between the many watershed interests and to advise the counties of landowner concerns.

Schedule: Meetings will be held as warranted.

Responsibility: I&E Specialist (lead) with watershed technicians contributing.

Field Days

Description

Field days and display areas will be organized to demonstrations nutrient and pest management, barnyard runoff control, wetland restoration, well abandonment, no-till and conservation tillage practices.

Schedule

1993; Five field days
1994-1997; Five field days

Responsibility:I&E Specialist (lead), with watershed technicians and Nutrient Pest Management Specialist contributing.

Animal Waste Management Demonstrations

Description

Two sites have been selected for animal waste management demonstrations. Both sites will address barnyard runoff control. A tour of both these demonstrations, along with the wetland restoration demonstration will be held in the fall of 1993.

Schedule

Construction of these demonstrations will start in the spring of 1993.

Responsibility

Watershed Technicians (lead), with I&E Specialist-contributing.

Wetland Restoration Demonstration

Description

One site has been selected for wetland restoration demonstration.
A tour of this demonstration will be conducted in conjuction with the two barnyard runoff sites.

Schedule

Construction of this demonstration will start in the spring of 1993.

Responsibility

Watershed Technicians (lead) with I&E Specialist contributing

Storm Sewer Stenciling

Description

A storm sewer stenciling program will be established in the communities of Fox Lake, Beaver Dam and Juneau. The program will utilize volunteer participation from local schools, civic groups, lake districts, lake associations, and individuals to do the stenciling. The media will be called in to give coverage to the stenciling event, and door hangers will be distributed to emphasize proper home owner activities in regards to storm sewers.

Schedule

Spring/Summer 1993 and 1994

Responsibility

I&E Specilist (primary contact) with Area Water Quality Agent contributing

Signs

Description

Project participation signs will be utilized to increase awareness of project activity:

1. "Beaver Dam River Watershed Project Participant" signs for display at each participant's farm.

Schedule

Participation signs will be posted during implementation.

Responsibility

I&E Specialist will be responsible for having the signs made up, and the technicians will be responsible for putting them up.

Posters

Description

Posters with the Beaver Dam River Watershed logo will be developed and used for the purpose of announcing upcoming events and meetings. These posters will be displayed at locations within the watershed that are frequented by priority watershed landowners such as agribusinesses, stores and banks.

Schedule

Fifteen posters will be placed when activities warrant.

Responsibility

I&E Specialist

Promotional Items

Description

The following items will be produced and distributed in the watershed. Project staff will use these promotional items as well as distribute them to project participants.

1. 350 baseball-style caps with project logo.

2. Anti-back flow devices for groundwater wells.

Schedule

Production of caps and t-shirts is scheduled for spring 1993.

Responsibility

I&E Specialist

Picnic/Barbecue

Description

A picnic/barbecue will be held for priority watershed residents to promote the watershed project. Project staff and landowners would gather to exchange ideas and discuss project activities. Landowner who have installed BMPs and landowners who have signed up for cost-sharing will be recognized.

Schedule

Each fall throughout implementation period.

Responsibility

I&E Specialist

Fair Display

Description

The County Fair has proven to be an effective method of visiting with the residents within the watershed on a one to one basis. The county fairs in both Dodge and Columbia Counties are well attended by both rural and urban land owners. The display is staffed with watershed personal, and well supplied with fact sheets and informational handouts pertaining to rural and urban nonpoint source pollution.

Schedule

Exhibits will be at the Dodge and Columbia County fairs during the project.

Responsibility

I&E Specialist will be responsible for the display, while staffing the display during the fair will be shared by watershed technicians.

Storm Water Testing

Description

The watershed project will work with high school students in testing storm water runoff samples in the city of Beaver Dam. They will test two sites on two different rain events. The media will be called in to cover the event.

Schedule

Spring/Summer 1993

Responsibility

I&E Specialist (lead), with Area Water Quality Specialist-contributing

Farm Calls

Description

One-on-one visits with landowners whose lands pose important water quality risks will be visited. The visits will help the landowner understand how specific BMPs on his land could help reduce the risk of surface and/or groundwater pollution.

Schedule

Throughout sign up, with emphasis on the first year of sign up.

Responsibility

I&E Specialist, with Watershed Technicians

CHAPTER SEVEN
Integrated Resource Management Program

Introduction

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

Fisheries

Watershed best management practices (BMPs), such as streambank protection, shoreline buffer strips, and easements, should be implemented in such a way that will enhance fishery management goals. Rock riprap and other types of streambank protection should be installed and sized so that the placement and size of rock will positively benefit fish habitat. The fishery manager should be consulted for input in the design of streambank protection BMPs.

Wetland Restoration

Significant amounts of restorable wetland areas exist in this watershed. Wetland restoration, easement acquisition, and shoreline buffers to protect existing wetlands should be installed. Shoreline buffers may be acquired adjacent to those existing wetlands that are important wildlife habitats to better protect them from sedimentation and other nonpoint source pollution.

In addition to the normal priority watershed funding, additional cost-sharing may be available to provide for a 100 percent payment for installation of the BMP. This additional funding may be available through the DNR district private lands manager, Alan Crossley, and/or Eldon McLaury of the U.S. Fish and Wildlife Service. Eligibility for this additional funding would be determined by the DNR's private lands manager or the district nonpoint source coordinator.

Riparian Zones

Where possible, riparian zones along creeks should be protected with fencing to protect them from grazing and trampling. These can be acquired through easements so that they receive lasting protection.

Stewardship

The streambank protection program under stewardship is an important additional means of protecting water quality. Under this program, the DNR could obtain an easement on both sides of the stream (generally 66 feet wide on each side). If needed, the DNR will fence the stream to protect it from livestock access. Table 7-1 lists the streams in the Beaver Dam River Watershed that are eligible for the streambank protection program.

Table 7-1. Streams Eligible in the Beaver Dam River Watershed

Drew Creek	3.5 miles	Dodge County
Alto Creek	7.0 miles	Dodge County
Cambria Creek	5.0 miles	Dodge County

Habitat Restoration Area

A significant portion of the watershed lies within the Habitat Restoration Area, or GHRA (see map 2-1). This project has a goal of restoring grassland and wetland habitats for wildlife, particularly for grassland nesting birds (songbirds, pheasants, and ducks). Specific ways that the GHRA will be integrated with the priority watershed project are listed below.

Cost Sharing Procedures

It is possible for a landowner or land operator to receive additional cost sharing from the GHRA project for certain BMP installations. This could raise the total cost sharing to 100% The following conditions apply:

1. The practice installed must meet the objectives of both the GHRA and priority watershed program.

2. Cost sharing using GHRA funds will be available for the following BMPs described in NR 120.14: 1) critical area stabilization (including in-field buffer areas in accordance

to NR 120.15), and 2) shoreline buffer sites. Sites developed for these two practices must be five acres or larger to receive GHRA cost sharing. The areas must be planted to cool season grass/legume mixtures, warm season grass mixtures, or prairie mixtures. Mowing would not be allowed without the approval of the GHRA manager. Spot treatments for control of noxious weeds will be permitted with notification of the GHRA manager.

3. Cost sharing using GHRA funds will be available for wetland restorations (NR 120.14) regardless of size.

4. Permanent easements using GHRA funds may be purchased to protect the above three practices. The minimum size for GHRA easements is five acres.

5. For a landowner to sign up with both the GHRA and the priority watershed program, two separate cost sharing agreements will have to be completed. Besides the cost sharing agreement with the watershed program, the county would direct the eligible landowner to contact the GHRA manger at the DNR office in Horicon to develop a GHRA cost share agreement. The GHRA agreement has a term length that coincides with that of the priority watershed agreement. The GHRA would reimburse the landowner following completion of the practice installation independent of the priority watershed reimbursement process. On the respective cost sharing agreement forms, it should be indicated that additional funding was secured from another program. No public access is required for obtaining a GHRA cost share agreement.

Watershed Areas Outside of the GHRA

Additional money may be available for land outside of the GHRA for the above mentioned practices (shoreline buffers, crital area stabilization including in-field buffers, and wetland restoration). This assistance may be available through the U.S. Fish and Wildlife Service, DNR-Wildlife Management, and private conservation organizations. These projects would be evaluated on a case-by-case basis as funds become available.

Beaver Dam River

DNR Fisheries Management has indicated their resource objectives for the Beaver Dam River include improving the instream habitat. Any streambank protection best management practices that are designed for the Beaver Dam River should be done in consultation with the Area Fish Manager so that their design would be conducive to improving the fisheries habitat.

CHAPTER EIGHT
Project Evaluation

Introduction

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

★ Administrative review.

★ Pollution reduction evaluation.

Information on these components will be collected by the Dodge/Fond du Lac, Columbia and Green Lake LCDs and reported on a regular basis to the DNR (DNR) and the DATCP (DATCP). Additional information on the numbers and types of practices on cost-share agreements; funds encumbered on cost-share agreements, and funds expended will be provided by the DNR's Bureau of Community Assistance.

Administrative Review

The first component, the administrative review, will focus on the progress of Dodge/Fond du Lac, Columbia and Green Lake Counties in implementing the project. The project will be evaluated with respect to accomplishments, financial expenditures, and staff time spent on project activities.

1. **Accomplishment Reporting**

   The Computer Assisted Management and Planning System, called CAMPS, is a computer data management system that has been developed by the U.S. Soil Conservation Service (SCS). The SCS, the DNR and the DATCP use CAMPS to meet the accomplishment reporting requirements of all three agencies. The Dodge/Fond du Lac, Columbia and Green Lake LCDs will use CAMPS to collect data for administrative accomplishments, and will provide the information to the DNR and the DATCP for program evaluation to the extent possible.

The Dodge/Fond du Lac, Columbia and Green Lake LCDs will provide the following data to the DNR and the DATCP on a quarterly basis:

2. Number of personal contacts made with landowners.

3. Completed information and education activities.

4. Number of farm conservation plans prepared for the project.

5. Number of cost-share agreements signed.

6. Number of farm conservation plan and cost-share agreement status reviews completed.

7. Number of farms and acres of cropland checked for proper maintenance of BMPs.

In addition to quarterly reports, Dodge/Fond du Lac, Columbia and Green Lake Counties representatives will meet with the DNR and the DATCP staff annually to review progress and plan for the subsequent year.

8. **Financial Expenditures**

Dodge/Fond du Lac, Columbia and Green Lake Counties will provide the following financial data to the DNR and the DATCP on a quarterly basis:

9. Number of landowner cost-share agreements signed.

10. Amount of money encumbered in cost-share agreements.

11. Number of landowner reimbursement payments made for the installation of best management practices (BMPs), and the amount of money paid.

12. Staff travel expenditures.

13. Information and education expenditures.

14. Expenditures for equipment, materials, and supplies.

15. Expenditures for professional services and staff support costs.

16. Total project expenditures for the LCDs' staff.

Dodge/Fond du Lac, Columbia and Green Lake Counties will also provide both agencies with the following financial data on an annual basis:

a. Staff training expenditures.
b. Interest money earned and expended.
c. Total county LCD budgets and expenditures on the project.

17. **Time Spent On Project Activities**

    Dodge/Fond du Lac, Columbia and Green Lake Counties will provide time summaries to both departments for the following activities on a quarterly basis:

18. Project and fiscal management.

19. Clerical assistance.

20. Pre-design and conservation planning activities.

21. Technical assistance: practice design, installation, cost-share agreement status review and monitoring.

22. Educational activities.

23. Training activities.

24. Leave time.

Pollutant Load Reduction

Key Nonpoint Sources for Evaluating Pollutant Load Reductions

The purpose of the second evaluation component, pollutant load reduction, is to calculate reductions in the amount of key pollutants as a result of installing BMPs. Key sources were identified for estimating changes in pollutant loads that reach streams, wetlands, and lakes in the Beaver Dam River Watershed; upland sediment, and runoff from barnyards and fields spread with manure, and streambank/shoreline erosion.

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

1. A 34% percent reduction in upland sediment delivered to streams, wetlands and lakes.
2. A 73% percent reduction in phosphorus from barnyard runoff.
3. A 47% percent reduction of critical acres winterspread with manure
4. A reduction in sediment delivered to streams from streambanks and overall repair of bank habitat.
5. Restoration of degraded or prior converted wetlands.

Streambanks

Dodge/Fond du Lac, Columbia and Green Lake Counties LCDs staff will calculate changes in streambank sediment in terms of tons of sediment and length of eroding sites. A tally will

be kept of landowners contacted, the amount of streambank sediment being generated at the time of contact, and changes in erosion levels estimated after installing BMPs.

Upland Sediment Sources

Dodge/Fond du Lac, Columbia and Green Lake Counties will use the WIN/WINHUSLE (Wisconsin Nonpoint Source) models to estimate sediment reductions due to changes in cropping practices. The counties will use CAMPS to provide data for the WIN/WINHUSLE model on a quarterly basis, as described above.

Barnyard Runoff

Dodge/Fond du Lac, Columbia and Green Lake Counties will use the BARNY (Modified ARS) model to estimate phosphorus reductions due to the installation of barnyard control practices. The county will report the information to the DNR through CAMPS.

NOTE: When CAMPS is replaced by FOCS, the new system will be used for all project tracking.

CHAPTER NINE
Water Resources Evaluation Monitoring

Introduction

The goal of the priority watershed evaluation monitoring program is to evaluate the progress of the nonpoint source control project toward improving the quality of water resources of the Beaver Dam River Priority Watershed.

Evaluation monitoring objectives are to:

1. Evaluate the attainment of water quality "objectives" that result from implementation of best management practices at specific sites.

2. Evaluate the attainment of pollutant load reduction goals, and the effectiveness of those goals in improving water quality at specific sites.

3. Evaluate the implementation of BMPs needed, and their effectiveness in reducing the problems that contribute to the non-attainment of water quality objectives at specific sites.

4. Evaluate the priority watershed plans applicability to the management of water resources, and the attainment of water quality standards and beneficial uses.

Program Organization

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

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

2. Evaluation monitoring may be conducted on selected waterbodies in priority watersheds that meet specific site selection criteria. These sites would be part of a statewide strategy designed to meet the program evaluation monitoring goal and objectives.

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

Site Selection Criteria

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

Location

1. Where BMPs are planned but yet to be implemented in priority watersheds;

2. Where serious water quality, habitat or both problems exist, and a direct cause/effect relationship between problems and nonpoint sources are obvious;

3. Where a high probability exists that appropriate BMPs will be installed in the site's watershed. If possible, final monitoring site selection should come after cost share agreements have been signed. Extra effort should be made to achieve full participation by all land owners;

4. Where sites are not meeting attainable uses and have a high potential to improve following management of nonpoint sources;

5. Where reference sites with similar characteristics, including attainable uses, are available in the same or adjacent watersheds. A reference site can be either an impacted site that will not be managed, or preferably, a site without water quality problems and meeting attainable uses. The important consideration is that reference site conditions are not expected to change except due to climatic conditions; and

6. Where sites have adequate access for sampling personnel and equipment.

Size

1. Sites should be located on permanent streams large enough to support well developed fish communities. Streams should be 5 to 30 feet wide with base flows of 1 to 20 cfs; and;

2. Watersheds should be manageable with areas of 5 to 50 square miles.

Water Quality

1. Suspected or known water quality problems caused by manageable nonpoint sources should not be present or not significant; and

2. Point sources should not be present or not significant; and

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

Habitat

1. Habitat problems should be caused by poor land use practices immediately adjacent to or near sites, and in-stream habitat should have a high potential to improve following implementation of BMPs; and

2. Sites should not be selected that have been ditched within 10 to 15 years.

Site Selection Process

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

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

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

Evaluation Monitoring Approaches

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

The following evaluation monitoring options are provided as guidance for developing monitoring plans. Any option, or a combination of options, may be used for evaluating priority watershed projects.

Basin Assessment Approach

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

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

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

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

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

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

Special Project Approach

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

Beaver Dam River Priority Watershed

Evaluation monitoring will be conducted during the eight year implementation phase and will continue for an additional two years (table 8-1). Thus evaluation monitoring activities will not be completed until 2003.

Southern District staff recommends a 5-year basin assessment approach. If time and staff are available and if it is approved in the district surface water monitoring plan, a special project monitoring approach will also be considered at selected sites which meet the site selection criteria.

Watershed Streams

- Southern District staff will conduct or repeat appraisal type monitoring at the same sites that were monitored in 1990-91 as part of the Appraisal Monitoring Plan/Report. Monitoring will follow the five year basin assessment schedule and will include the same types of monitoring outlined in the Beaver Dam River Appraisal Report (Ball and Miller, 1991). This monitoring approach should detect habitat and surface water quality improvements, especially where they are significant. Monitoring will occur only in subwatersheds where significant Best Management Practice Installation has occurred.

- Fox Lake will continue to be monitored by lake management specialtists as part of the Long-Term Trends Monitoring Program. The lake will be monitored five times a year for physical, chemical and biological parameters. Additional parameters to be collected will be surficial sediment nutrients at 10 sites and macrophyte surveys within 4 carp enclosure plots.

- Beaver Dam Lake will be monitored following the Long-Term Trends protocol at two established mid-lake sites representing the north and south lake areas.

Table 8-1. Lake Monitoring Sampling Schedule for Fox Lake - Beaver Dam River Watershed

Parameter	Spring Turnover	Mid June	Mid July	Mid August	February	Remarks
Complete Water Chemistry (1)	X					Two depths: 1 ft. above the water surface and 2 ft. above the lake bottom.
Total Phosphorus	X*	X**	X**	X**	X*	* = 2 depths: 1 ft. below water surface and 2 ft. above the lake bottom. ** = Third additional depth at top of hypolimnion.
Water Temperature Dissolved oxygen pH and specific conductance	X	X	X	X	X	Profile: 1 ft. below water surface and proceed to lake bottom using 3-6 ft. intervals, depending on existing conditions and/or total lake depth. pH and conductance dependent on meter availability.
Chlorophyll a	X	X	X	X	X	One depth: 1 ft. below water surface and at depth of observed metalimnion oxygen maxima.
Secchi disk depth	X	X	X	X		Minimum frequency; weekly by local volunteer if possible
Lake water level	X	X	X	X		Minimum frequency; weekly by local volunteer if possible
Fish survey						Netting during spawning season, boom shocking after Sept. 1. Shocking every other year; gill netting every sixth year.
Perch Young of Year				X		Sampling for mercury analysis
Macrophyte			X or	X		Survey every third year (general abundance and location by species)
Phytoplankton	X	X	X	X	X	Water collected at 1 ft. depth (identification and general abundance).
Zooplankton	X	X	X	X	X	One vertical tow with plankton net (identification and general abundance).
Macroinvertebrates					X	Late winter sampling inlake and instream.

: Water chemistry sampling includes NO2-N+; No3-N; NH3-N; KJN-N; Cl; Org. N; Diss. P; Ca; Mg, Na, K, pH, So4; tot alk; Fe; Mn; color; turbidity; total diss. solids, volatile solids; and suspended solids.

APPENDIX A
Watershed Planning Methods

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

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

Evaluating Water Quality and Aquatic Habitat

The DNR (DNR) is responsible for: designating the biological and recreational uses that surface waters can support under proper management; prescribing the water quality required to sustain these designated uses; and indicating the methods to implement, achieve and maintain those conditions.

The DNR's Water Resources Management staff conducted investigations of the existing quality and natural resource conditions for lakes and streams during 1991. Their purpose was to evaluate water quality problems and establish a basis for setting water resources management objectives. Detailed assessment results are documented in water resource appraisal reports.

Data Collection

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

Subwatershed Delineation and Stream Segmentation

Prior to collecting field data, the watershed was divided into seventeen hydrologic subwatersheds. This was accomplished using 1"=400' scale aerial photographs and

1"=2,000' (7.5 minute) U.S. Geological Survey quadrangle maps. These maps were also used to divide the perennial and intermittent stream network into segments. Stream segments were used to separate portions of waterways where either natural conditions or human-induced changes resulted in pronounced differences in stream character and/or water quality.

Stream Habitat Evaluation

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

Water Quality Assessment

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

Fisheries Resource Assessment

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

Navigability and Recreational Use Determinations

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

Data Interpretation

The data described above were used to determine the existing and potential biological and recreational uses for surface waters. The existing uses reflect present biological and recreational conditions. Potential uses reflect biological and recreational conditions that could be achieved under prescribed types and levels of management. Even though existing and potential uses of a surface water are the same, management programs can result in significant changes in the quality of the aquatic environment. Use classifications and supporting water quality standards used in evaluating water resource conditions are discussed below.

Biological Stream Use Classification

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

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

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

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

Recreational Stream Use Classification

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

Full Body Contact

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

Partial Body Contact

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

Noncontact

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

Water Quality Standards and Criteria

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

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

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

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

If well sample results using the triazine screen exceeded 1 μg/L, wells were resampled and analyzed specifically for atrazine and it's metabolites. This was free of charge and on voluntary basis by the Bureau of Water Supply who assisted well owners in obtaining a clean water supply.

Assessing Pollution Sources

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

Rural Nonpoint Sources

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

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

The Dodge/Fond du Lac, Columbia and Green Lake County LCDs staff conducted inventories 1991. Inventory procedures are documented by the counties. The DNR in cooperation with the DATCP (DATCP) and the LCDs staff completed the data analyses. Inventory and evaluation procedures are summarized below.

Barnyard and Livestock Area Runoff

The LCDs staff mapped the locations of the barnyards in the watershed on 1985 1"=400' scale aerial photographs. A field survey of each barnyard was conducted to collect information needed to determine its pollution potential.

The barnyard data was used in the "BARNY" Model (Baun, 1992), a modification of the animal lot runoff model, which the U.S. Department of Agriculture, Agricultural Research Service developed. Information about the mass loading of total phosphorus annually was generated to evaluate the relative pollution potential of each barnyard. The livestock operations were ranked according to their potential to impact surface and/or groundwater quality.

Upland Erosion and Sediment Delivery

The LCDs staff conducted the inventory on about 23,000 acres, or 12 percent of the watershed, using existing data and field investigations. Cropland, pastures, grasslands, woodlands and other open (non-urban) land uses were investigated. Existing data sources included site specific farm conservation plans, current 1"=400' scale aerial photographs, and U.S. Geological Survey 1"=2,000' scale quadrangle maps. The information obtained for each parcel included size, soil type and erodibility, slope percent and length, land cover, crop rotation, present management, overland flow distance and destination, channel type and receiving water.

Upland erosion and sediment delivery was determined using the Wisconsin Nonpoint Source (WIN HUSLE) Model (Baun & Snowden, 1992). The WIN HUSLE model calculates the average annual quantity of eroded soil reaching surface waters from each farm field. The determination is made based on a "typical" year of precipitation. Estimated sediment delivery was used to assess the relative pollution potential of each farm field in the watershed.

Shoreline Erosion

The Dodge County LCD staff and the DNR conducted field surveys on Fox, Beaver Dam and Lost Lakes. The method used is a modification of the streambank erosion analysis included in Phase II of the Land Inventory Monitoring process used by the U.S. Department of Agriculture, Soil Conservation Service. At locations where erosion was occurring, the following information was recorded:

- Length of eroding bank.
- Vertical height.
- Estimated annual rate of recession.

The amount of sediment lost annually was calculated for each erosion site, and an overall sediment load for the three lakes was calculated.

In addition, land uses adjacent to streams were also inventoried.

Runoff from Areas Winterspread with Livestock Waste

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

This analysis was completed using a three-step process. First, the number of acres that each livestock operation needed to landspread manure was calculated for a six-month period approximating when manure cannot be incorporated into the ground because of frozen or

saturated conditions. The amount of manure that each operation generated was based on the number and type of livestock.

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

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

Urban Nonpoint Sources

Nationwide investigations confirm that urban runoff can have a significant adverse impact on receiving waters. The result is that urban areas and activities can upset several important components of a stream including stream flow, habitat, water quality, bottom sediment quality, and stream biology.

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

Principal urban nonpoint sources of pollution evaluated in preparing this plan include:

- Existing urban land uses.
- New urban development, including the potential for construction site erosion as well as increased pollutant loading from the newly established urban surfaces.
- Eroding streambanks.

Stormwater pollutant concentrations, runoff volumes, and pollutant yields vary according to the urban land use (residential, commercial, industrial) and development characteristics (intensity of the development, stormwater conveyance system). The inventory of existing and planned urban areas was designed to quantify the urban land use and development

characteristics for existing and planned urban development. This information was used to estimate the existing and future urban pollutant loads.

Existing Urban Areas

The municipalities of Beaver Dam and Fox Lake were inventoried for nonpoint source planning needs. The University of Wisconsin - Madison delineated 1"=20,000' panchromatic airphotos including streets, stormsewers, land use and hydrology. All delineations were digitized with maps and tabular data produced for urban modeling needs.

Other remotely sensed sources of information were used in this inventory. These sources included SPOT and LANDSAT satellite images, NHAP2 aerial photographs, and zoning maps. Through this work, it was determined that visual interpretations of aerial photography is the most cost effective method for identifying land use categories within study areas of 50 square miles or less. If the study area is greater than 50 square miles, satellite imagery becomes more economical.

The DNR used this information on existing and planned urban development in its Source Loading and Management Model (Pitt and Voorhees, 1989) to estimate urban nonpoint source loads for three pollutants—sediment, phosphorus, and lead (representing copper, zinc, and cadmium). Information on existing pollutant loads was used to identify the magnitude and distribution of the current urban nonpoint source loadings and to identify high priority land uses responsible for most of these loads. Information on planned urban development was used to estimate the future pollution potential associated with uncontrolled development. The effectiveness of applying urban management practices to existing and planned urban areas was also evaluated to determine what level of management is needed to reduce current urban pollutant loads to acceptable levels by the year 2000.

The potential for construction site impacts was assessed based on the number of acres planned for development and the adequacy of existing local construction erosion control programs. The University provided the number of acres planned for development to the DNR. The adequacy of existing local construction erosion control programs was evaluated through a survey, which the University of Wisconsin Cooperative Extension Service (UWEX) and the DNR jointly developed, and completed by an authorized representative from each local unit of government.]

Streambank Erosion

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

Other Pollution Sources

Additional sources of surface water pollution beyond those discussed in this plan are degrading water quality in the watershed. These pollution sources have the potential of

overshadowing improvements in water quality that might otherwise occur as a result of the priority watershed program.

Establishing Water Resource Objectives

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

Establishing Pollution Reduction Goals

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

Nonpoint source pollution reduction goals contained in this plan were recommended by the technical work groups. The nonpoint source pollution reduction goals in this plan specifically target the control of sediment and phosphorus in rural areas and the control of sediment, phosphorus, urban toxic materials and stream flow changes in urban areas. Importantly, reducing the quantity of these substances reaching surface waters decreases the amount of other substances such as pesticides and bacteria which degrade water quality.

Water resource objectives presented in this plan recognize that pollution control and resource management efforts beyond the scope of the Wisconsin Nonpoint Source Water Pollution Abatement Program are needed to achieve the identified objectives. These will include implementation of other recommended management actions which are established in the amended areawide water quality management plan for the Upper Rock River basin.

Developing a Nonpoint Source Management Strategy

The final step in the planning process is the development of a strategy for achieving the nonpoint source pollution reduction goals identified in the plan. Several items are addressed in developing the management strategy including:

- Critical nonpoint pollution sources.
- Effective management practices and guidelines for use of state cost-share funds for practice installation.

- Responsibilities, estimated workloads and work schedules for local implementing agencies, and guidelines for use of state funds to support local implementation activities.

- Estimated cost of installing practices and supporting staff at the local level.

- Information and education needs.

- Project evaluation needs.

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

- Evaluating pollutant loading for each nonpoint source in each subwatershed.

- Determining the relative importance of controlling each source (barnyards, urban runoff, cropland erosion, etc.) to achieving the water resource objectives.

- Developing criteria to determine which sources need to be controlled.

- Applying the criteria to determine eligibility for participation in the priority watershed project.

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

Involving the Public and Local Units of Government

A citizen advisory committee and several technical work groups were formed to assist in preparing this watershed plan. The advisory committee was comprised of representatives from cities, counties, villages, and towns in the watershed, environmental groups and interested citizens. This committee primarily provided policy guidance during the planning process and reviewed plan chapters and the final watershed plan.

Two types of technical work groups were convened to help with developing technical aspects of the plan—a water resource appraisal work group, and a land resources work group. These groups reviewed land and water resource assessment information, assisted in developing water resource objectives and pollution reduction goals and assisted in developing the pollution control strategy.

APPENDIX B
Glossary

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

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

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

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

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

ANAEROBIC:
Without oxygen.

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

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

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

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

BACTERIA:
Single-cell, microscopic organisms. Some can cause disease, and some are important in the stabilization of organic wastes.

BASIN PLAN:
See "Areawide Water Quality Management Plan".

BENTHIC ORGANISMS (BENTHOS):
The organisms living in or on the bottom of a lake or stream.

BEST MANAGEMENT PRACTICE (BMP):
The most effective, practical measures to control nonpoint sources of pollutants that runoff from land surfaces.

BIOACCUMULATION:
The uptake and retention of substances by an organism from its surrounding medium and from its food. Chemicals move through the food chain and tent to end up at higher concentrations in organisms at the upper end of the food chain such as predator fish, or in people or birds that eat these fish.

BIOASSAY STUDY:
A test for pollutant toxicity. Tanks of fish or other organisms are exposed to varying doses of treatment plant effluent; lethal doses of pollutants in the effluent are thus determined.

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

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

BIOTA:
All living organisms that exist in an area.

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

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

CARCINOGENIC:
A chemical capable of causing cancer.

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

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

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

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

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

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

CONFINED DISPOSAL FACILITY (CDF):
A structure built for the containment and disposal of dredged material.

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

CONSERVATION TILLAGE:
Planting row crops while disturbing the soil only slightly. In this way a protective layer of plant residue says in the surface; erosion is decreases.

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

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

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

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

CRITERIA:
See water quality standard criteria.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

GREEN STRIPS:
See buffer strip.

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

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

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

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

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

INCINERATOR:
A furnace designed to burn wastes.

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

IN-PLACE POLLUTION:
As used in the RAP refers to pollution from contaminated sediments. These sediments are polluted from post discharges from municipal and industrial sources.

INTERNATIONAL JOINT COMMISSION (IJC):
An agency formed by the United States and Canada to guide management of the Great Lakes and resolve border issues.

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

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

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

LC_{50}:
Lethal concentration for 50 percent of the test population exposed to a toxicant substance.

LD_{50}:
Lethal dose for 50 percent of the test population exposed to a toxicant substance.

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

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

MACROPHYTE:
A rooted aquatic plant.

MASS:
The amount of material a substance contains after measured by its weight (in a gravitational field).

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

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

MILLIGRAMS PER LITER (mg/1):
A measure of the concentration of substance in water. For most pollution measurement this is the equivalent to "parts per million".

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

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

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

NPS:
See nonpoint source pollution.

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

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

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

PELAGIC:
Referring to open water portion of a lake.

PESTICIDE:
Any chemical agent used for control of specific organisms, such as insecticides, herbicides, fungicides, etc.

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

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

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

PLANKTON:
Tiny plants and animals that live in water.

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

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

POLYCHLORINATED BIPHENYLS(PCBs):
A group of 209 compounds, PCBs have been manufactured since 1929 for such common uses as electrical insulation and heating/cooling equipment, because they resist wear and chemical breakdown. Although banned in 1979 because of their toxicity, they have been detected on air, land and water, and recent surveys have found PCBs in every section for the country, even those remote from PCB manufacturers.

POLYCHLORINATED ORGANIC COMPOUNDS:
A group of toxic chemicals which contains several chlorine atoms.

PRETREATMENT:
A partial wastewater treatment required from some industries. Pretreatment removes some types of industrial pollutants before the wastewater is discharged to a municipal wastewater treatment plant.

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

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

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

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

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

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

RAP:
See Remedial Action Plan.

RECYCLING:
The process by which waste materials are transformed into new products.

REMEDIAL ACTION PLAN:
A plan designed to restore beneficial uses to a Great Lakes Area of Concern.

REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RF/FS):
An investigation of problems and assessment of management options conducted as part of a superfund project.

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA):
This federal law amends the Solid Waste Disposal Act of 1965 and expands on the Resource Recovery Act of 1970 to provide a program which regulates hazardous wastes, to eliminate open dumping and to promote solid waste management programs.

RETRO-FIT:
The placement of an urban structural practice in an existing urban area, which may involve rerouting existing storm sewers and/or relocating existing buildings or other structures.

RIPARIAN:
Belonging or relating to the bank of a lake, river or stream.

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

RULE:
Refers to Wisconsin administrative rules. See Wisconsin Administrative Code.

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

SECONDARY IMPACTS:
The indirect effects that an action can have on the health of the ecosystem or the economy.

SECONDARY TREATMENT:
Two-stage wastewater treatment that allows the coarse particles to settle out, as in primary treatment, followed by biological breakdowns of the remaining impurities. Secondary treatment commonly removes 90 percent of the impurities. Sometimes "secondary treatment" refers simply to the biological part of the treatment process.

SEDIMENT:
Soil particles suspended in and carried by water as a result of erosion.

SEICHES:
Changes in water levels due to the tipping of water in an elongated lake basin whereby water is raised in one end of the basin and lowered in the other.

SEPTIC SYSTEM:
Sewage treatment and disposal for homes not connected to sewer lines. Usually the system includes a tank and drain field. Solids settle to the bottom of the tank; liquid percolates through the drain field.

SLUDGE:
A byproduct of wastewater treatment; waste solids suspended in water.

SOLID WASTE:
Unwanted or discharged material with insufficient liquid to be free flowing.

STANDARDS:
See water quality standards.

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

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

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

SYNERGISM:
The characteristic property of a mixture of toxicants that exhibits a greater-that-additive cumulative toxic effect.

TACs:
Technical advisory committees that assisted in the development of the Remedial Action Plan.

TERTIARY TREATMENT:
See advanced wastewater treatment.

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

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

TOXIC:
An adjective that describes a substance which is poisonous, or can kill or injure a person or plants and animals upon direct contact or long-term exposure. (Also, see toxic substance.)

TOXIC SUBSTANCE:
A chemical or mixture of chemicals which through sufficient exposure, or ingestion, inhalation of assimilation by an organism, either directly from the environment or indirectly by ingestion through the food chain, will, on the basis of available information cause death, disease, behavioral or immunologic abnormalities, cancer, genetic mutations, or development of physiological malfunctions, including malfunctions in reproduction or physical deformations, in organisms or their offspring.

TOXICANT:
See toxic substance.

TOXICITY:
The degree of danger posed by a toxic substance to animal or plant life. Also see acute toxicity, chronic toxicity and additivity.

TOXICITY REDUCTION EVALUATION:
A requirement for a discharger that the causes of toxicity in an effluent be determined and measures taken to eliminate the toxicity. The measures may be treatment, product substitution, chemical use reduction or other actions that will achieve the desired result.

TREATMENT PLANT:
See wastewater treatment plant.

TROPHIC STATUS:
The level of growth or productivity of a lake as measured by phosphorus content, algae abundance, and depth of light penetration.

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

UNIVERSITY OF WISCONSIN-EXTENSION (UWEX):
A special outreach, education branch of the state university system.

VARIANCE:
Government permission for a delay or exception in the application of a given law, ordinance or regulation. Also, see water quality standard variance.

VOLATILE:
Any substance that evaporates at a low temperature.

WASTELOAD ALLOCATION:
Division of the amount of waste a stream can assimilate among the various dischargers to the stream. Results in the limit on the amount (in pounds) of chemical or biological constituent discharged from a wastewater treatment plant to a water body.

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

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

WASTEWATER TREATMENT PLANT:
A facility for purifying wastewater. Modern wastewater treatment plants are capable of removing 95 percent of organic pollutants.

WATER QUALITY AGREEMENT:
The Great Lakes Water Quality agreement was initially signed by Canada and the United States in 1972 and was subsequently revised in 1978 and 1987. It proves guidance for the management of water quality, specifically phosphorus and toxics, in the Great Lakes.

WATER QUALITY LIMITED SEGMENT:
A section of river where water quality standards will not be met if only categorical effluent standards are met.

WATER QUALITY CRITERIA:
A measure of the physical, chemical or biological characteristics of a water body necessary to protect and maintain different water uses (fish and aquatic life, swimming, etc.).

WATER QUALITY STANDARDS:
The legal basis and determination of the use of a water body and the water quality criteria, physical, chemical, or biological characteristics of a water body, that must be met to make it suitable for the specified use.

WATER QUALITY STANDARD VARIANCE:
When natural conditions of a water body preclude meeting all conditions necessary to maintain full fish and aquatic life and swimming a variance may be granted.

WATERSHED:
The land area that drains into a lake or river.

WETLANDS:
Those areas that are inundates or saturated by surface or groundwater at a frequency and duration sufficient to support a variety of vegetative or aquatic life. Wetland vegetation requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas.

WISCONSIN ADMINISTRATIVE CODE:
The set of rules written and used by state agencies to implement state statutes. Administrative codes are subject to public hearing and have the force of law.

WISCONSIN FUND:
A state program that helps pay the cost of reducing water pollution. Funding for the program comes from general revenues and bonds and is based on a percentage of the state;s taxable property value. The Wisconsin Fund includes these programs:

Point Source Water Pollution Abatement Grant Program

Provides grants for 60 percent of the cost of constructing wastewater treatment facilities. Most of this program's money goes for treatment plant construction, but three percent of this fund is available for repair or replacement of private , onsite sewer systems.

Nonpoint Source Water Pollution Abatement Grant Program

Funds to share the cost of reducing water pollution nonspecified sources are available in selected priority watersheds.

Solid Waste Grant Program

Communities planning for solid waste disposal sites are eligible for grant money. $500,000 will be available each year to help with planning costs.

WISCONSIN NONPOINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM:
A state cost-share program established by the State Legislature in 1978 to help pay the costs of controlling nonpoint source pollution. Also known as the nonpoint source element of the Wisconsin Fund or the Priority Watershed Program.

WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES):
A permit system to monitor and control the point source dischargers of wastewater in Wisconsin. Dischargers are required to have a discharge permit and meet the conditions it specifies.

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PRIORITY WATERSHED PROJECTS IN WISCONSIN
1992

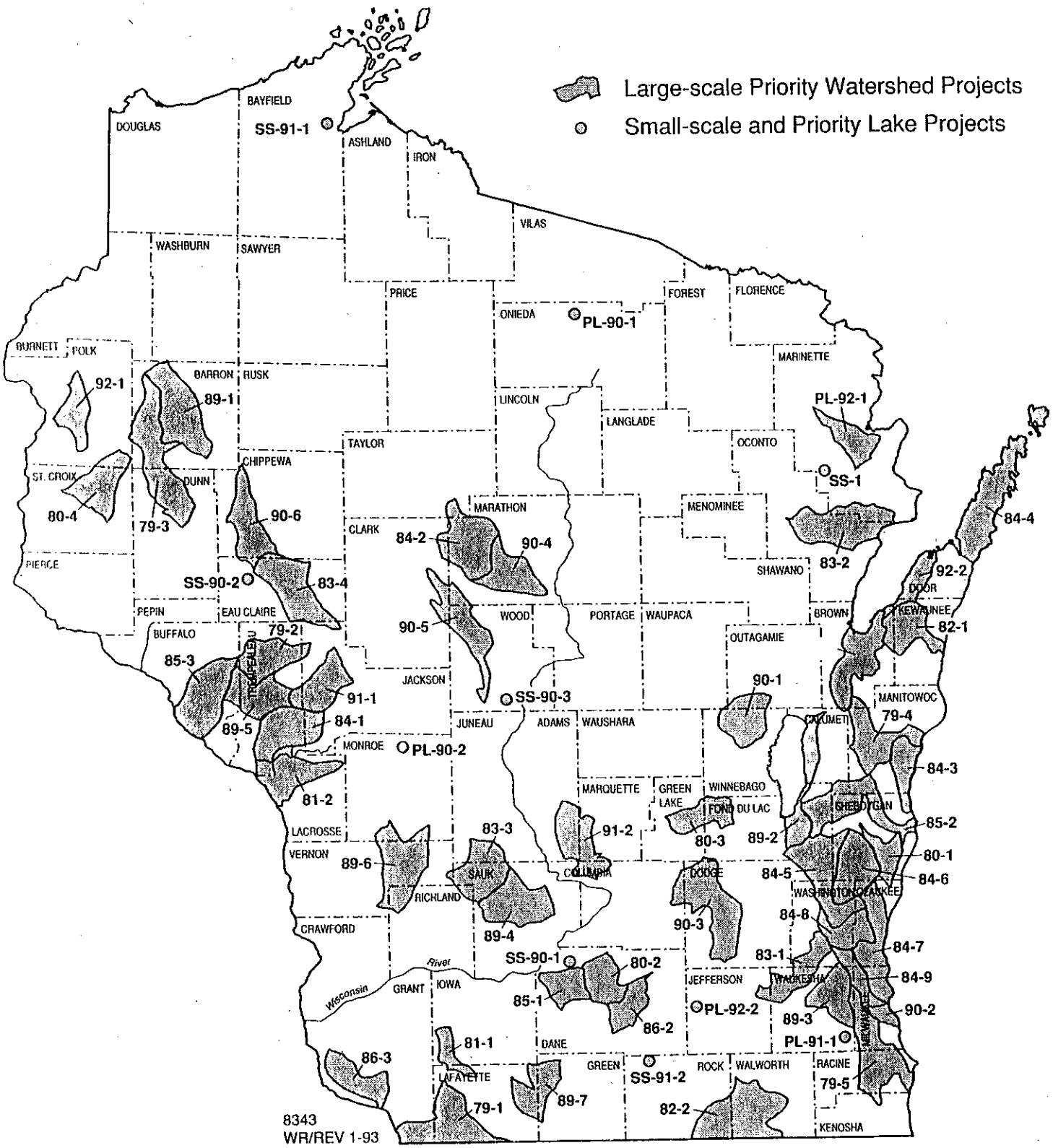
Map Number	Large-scale Priority Watershed Project	County(ies)	Year Project Selected
79-1	Galena River*	Grant, Lafayette	1979
79-2	Elk Creek*	Trempealeau	1979
79-3	Hay River*	Barron, Dunn	1979
79-4	Lower Manitowoc River*	Manitowoc, Brown	1979
79-5	Root River*	Racine, Milwaukee, Waukesha	1979
80-1	Onion River*	Sheboygan, Ozaukee	1980
80-2	Sixmile-Pheasant Branch Creek*	Dane	1980
80-3	Big Green Lake*	Green Lake, Fond du Lac	1980
80-4	Upper Willow River*	Polk, St. Crox	1980
81-1	Upper West Branch Pecatonica River*	Iowa, Lafayette	1981
81-2	Lower Black River	La Crosse, Trempealeau	1981
82-1	Kewaunee River*	Kewaunee, Brown	1982
82-2	Turtle Creek	Walworth, Rock	1982
83-1	Oconomowoc River	Waukesha, Washington, Jefferson	1983
83-2	Little River	Oconto, Marinette	1983
83-3	Crossman Creek/Little Baraboo River	Sauk, Juneau, Richland	1983
83-4	Lower Eau Claire River	Eau Claire	1983
84-1	Beaver Creek	Trempealeau, Jackson	1984
84-2	Upper Big Eau Pleine River	Marathon, Taylor, Clark	1984
84-3	Sevenmile-Silver Creeks	Manitowoc, Sheboygan	1984
84-4	Upper Door Peninsula	Door	1984
84-5	East & West Branch Milwaukee River	Fond du Lac, Washington, Sheboygan, Dodge, Ozaukee	1984
84-6	North Branch Milwaukee River	Sheboygan, Washington, Ozaukee, Fond du Lac	1984
84-7	Milwaukee River South	Ozaukee, Milwaukee	1984
84-8	Cedar Creek	Washington, Ozaukee	1984
84-9	Menomonee River	Milwaukee, Waukesha, Ozaukee, Washington	1984
85-1	Black Earth Creek	Dane	1985
85-2	Sheboygan River	Sheboygan, Fond du Lac, Manitowoc, Calumet	1985
85-3	Waumandee Creek	Buffalo	1985
86-1	East River	Brown, Calumet	1986
86-2	Yahara River - Lake Monona	Dane	1986
86-3	Lower Grant River	Grant	1986
89-1	Yellow River	Barron	1989
89-2	Lake Winnebago East	Calumet, Fond du Lac	1989
89-3	Upper Fox River (Ill.)	Waukesha	1989
89-4	Narrows Creek - Baraboo River	Sauk	1989
89-5	Middle Trempealeau River	Trempealeau, Buffalo	1989
89-6	Middle Kickapoo River	Vernon, Monroe, Richland	1989
89-7	Lower East Branch Pecatonica River	Green, Lafayette	1989
90-1	Arrowhead River & Daggets Creek	Winnebago, Outagamie, Waupaca	1990
90-2	Kinnickinnic River	Milwaukee	1990
90-3	Beaverdam River	Dodge, Columbia, Green Lake	1990
90-4	Lower Big Eau Pleine River	Marathon	1990
90-5	Upper Yellow River	Wood, Marathon, Clark	1990
90-6	Duncan Creek	Chippewa, Eau Claire	1990
91-1	Upper Trempealeau River	Jackson, Trempealeau	1991
91-2	Neenah Creek	Adams, Marquette, Columbia	1991
92-1	Balsam Branch	Polk	1992
92-2	Red River - Little Sturgeon Bay	Door, Brown, Kewaunee	1992

Map Number	Small-scale Priority Watershed Project	County(ies)	Year Project Selected
SS-1	Bass Lake*	Marinette	1985
SS-90-1	Dunlap Creek	Dane	1990
SS-90-2	Lowes Creek	Eau Claire	1990
SS-90-3	Port Edwards - Groundwater Prototype	Wood	1990
SS-91-1	Whittlesey Creek	Bayfield	1991
SS-91-2	Spring Creek	Rock	1991

Map Number	Priority Lake Project	County(ies)	Year Project Selected
PL-90-1	Minocqua Lake	Oneida	1990
PL-90-2	Lake Tomah	Monroe	1990
PL-91-1	Little Muskego, Big Muskego and Wind Lakes	Waukesha, Racine, Milwaukee	1991
PL-92-1	Lake Noquebay	Marinette	1992
PL-92-2	Lake Ripley	Jefferson	1992

* *Project completed*

Priority Watershed Projects in Wisconsin
1992



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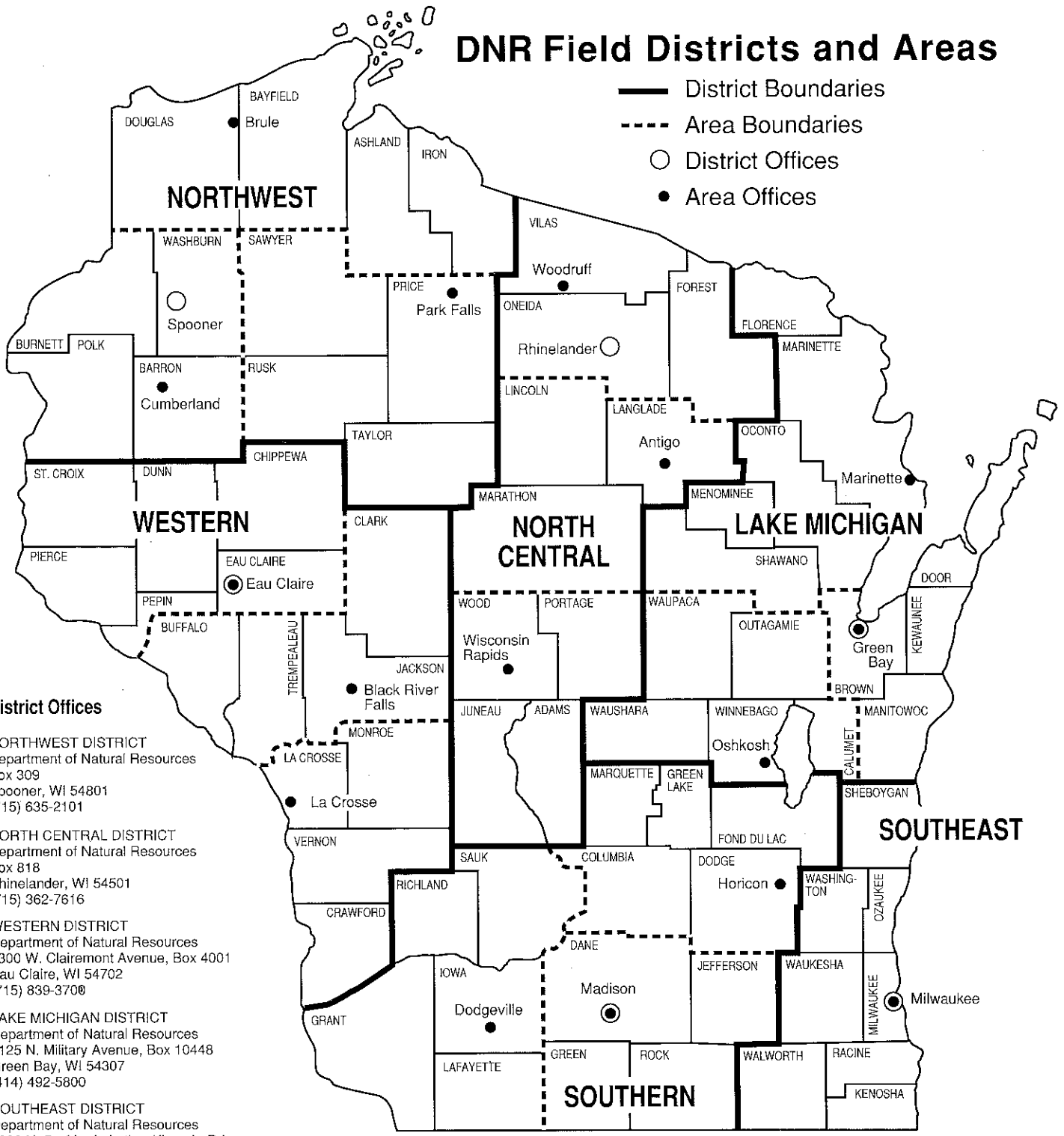

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NORTH CENTRAL DISTRICT
Department of Natural Resources
Box 818
Rhinelander, WI 54501
(715) 362-7616

WESTERN DISTRICT
Department of Natural Resources
1300 W. Clairemont Avenue, Box 4001
Eau Claire, WI 54702
(715) 839-3700

LAKE MICHIGAN DISTRICT
Department of Natural Resources
1125 N. Military Avenue, Box 10448
Green Bay, WI 54307
(414) 492-5800

SOUTHEAST DISTRICT
Department of Natural Resources
2300 N. Dr. Martin Luther King, Jr. Drive
Box 12436
Milwaukee, WI 53212
(414) 263-8500

DNR, Richards Street Annex
4041 N. Richards Street
Box 12436
Milwaukee, WI 53212
(414) 961-2727

SOUTHERN DISTRICT
Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg, WI 53711
(608) 275-3266

REV 5/93

Our Mission:

To protect and enhance our Natural Resources—
our air, land and water;
our wildlife, fish and forests.

To provide a clean environment
and a full range of outdoor opportunities.

To insure the right of all Wisconsin citizens
to use and enjoy these resources in
their work and leisure.

And in cooperation with all our citizens
to consider the future
and those who will follow us.

WISCONSIN
DEPT. OF NATURAL RESOURCES