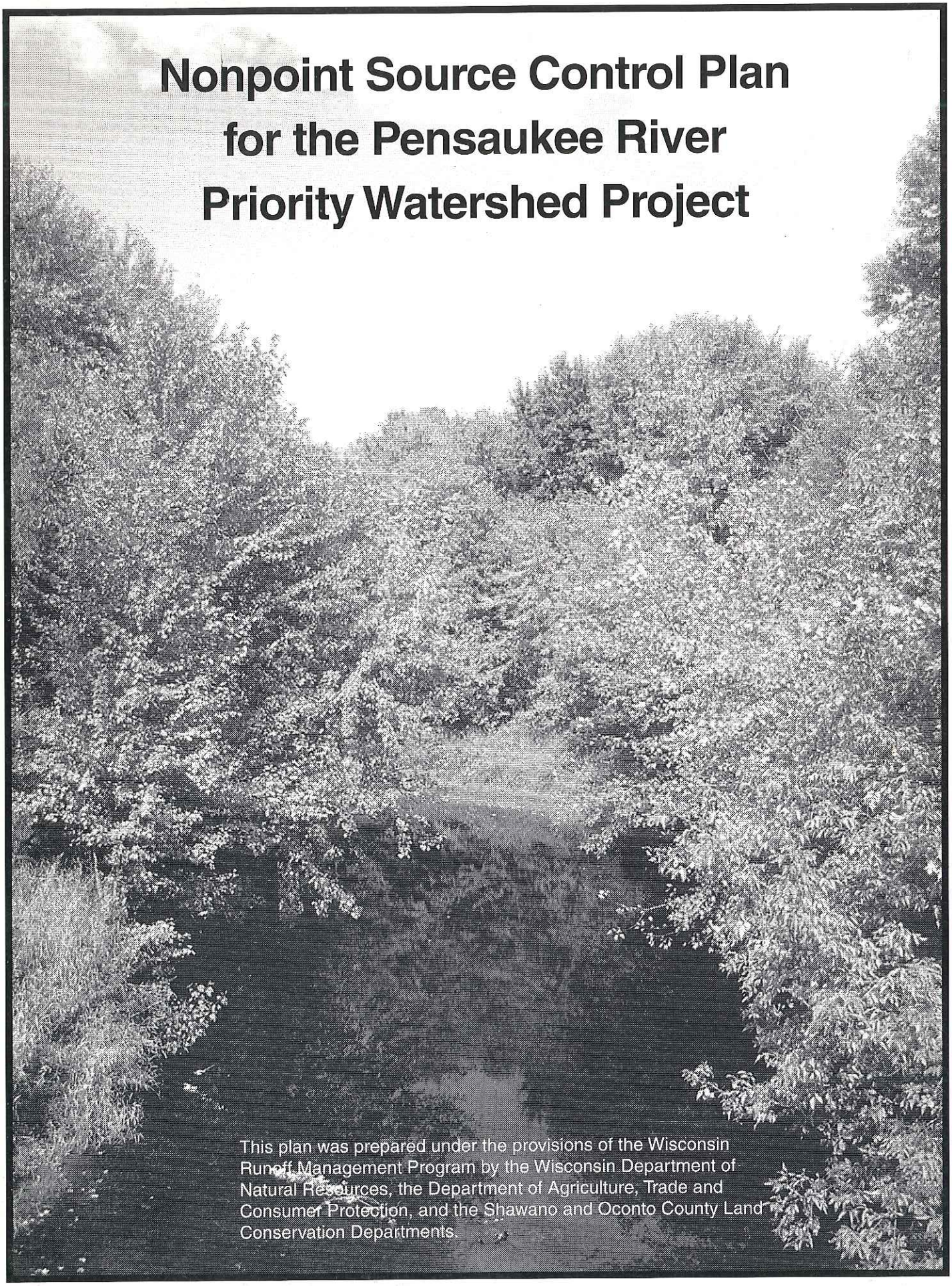
Nonpoint Source Control Plan for the Pensaukee River Priority Watershed Project



This plan was prepared under the provisions of the Wisconsin Runoff Management Program by the Wisconsin Department of Natural Resources, the Department of Agriculture, Trade and Consumer Protection, and the Shawano and Oconto County Land Conservation Departments.

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Nonpoint Source Control Plan for the Pensaukee River Priority Watershed

The Wisconsin Runoff Management Program

Plan Approved December 3, 1996

This Plan Was Cooperatively Prepared By:

Wisconsin Department of Natural Resources
Wisconsin Department of Agriculture, Trade and Consumer Protection
Oconto County Land Conservation Department and
Shawano County Land Conservation Department

Publication WT-484

Published March 1997

For copies of this document please contact:

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December 3, 1996

IN REPLY REFER TO: 3200

Herbert Tauchen, Chair
Shawano County Board
N3397 S. Broadway Road
Bonduel, WI 54107

Herb

Dear ~~Mr.~~ Tauchen:

I am pleased to approve the Pensaukee River Priority Watershed Management Plan prepared through the Wisconsin Runoff Management Program. This plan meets the intent and conditions of s. 144.25, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. This plan has been prepared in conjunction with the Department of Agriculture, Trade and Consumer Protection. The plan went before the Land and Water Conservation Board on December 3, 1996, and was approved at that time. I am also approving this plan as an amendment to the Upper Green Bay Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Shawano County Land Conservation Department staff who participated in preparing this plan. We look forward to assisting the LCD and other units of government in the watershed, including the Oconto County LCD, in the implementation of the Pensaukee River Priority Watershed plan.

Sincerely,

George

Congratulations

George E. Meyer
Secretary

cc: Alan Tracy, DATCP
Jim Bradley, LWCB
Tom Milheiser, Oconto County LCD
Clifford Sellen, Oconto County LCC Chairman
Charles Verhoven, NE
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December 3, 1996

IN REPLY REFER TO: 3200

Donald D. Bartels, Chair
Oconto County Board
17067 Clubhouse Lane
Lakewood, WI 54138

Dear ~~Mr.~~ Don Bartels:

I am pleased to approve the Pensaukee River Priority Watershed Management Plan prepared through the Wisconsin Runoff Management Program. This plan meets the intent and conditions of s. 144.25, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. This plan has been prepared in conjunction with the Department of Agriculture, Trade and Consumer Protection. The plan went before the Land and Water Conservation Board on December 3, 1996, and was approved at that time. I am also approving this plan as an amendment to the Upper Green Bay Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Oconto County Land Conservation Department staff who participated in preparing this plan. We look forward to assisting the LCD and other units of government in the watershed, including the Shawano County LCD, in the implementation of the Pensaukee River Priority Watershed plan.

Sincerely,

George

Congratulations

George E. Meyer
Secretary

cc: Alan Tracy, DATCP
Jim Bradley, LWCB
Ron Ostrowski, Shawano County LCD
Vernon Ainsworth, Shawano County LCC Chairman
Charles Verhoven, NE
Rob McLennan, NE
Keith Foye, DATCP
Cindy Hoffland, CF/8
Bridget Appleberry, WT/2

RESOLUTION NO. 130-96

WHEREAS, a Nonpoint Source Pollution Control Plan for the Pensaukee River Priority Watershed was prepared by the DNR, the Department of Agriculture, Trade and Consumer Protection (DATCP), the Oconto County Land Conservation Department and the Shawano County Land Conservation Department. The DNR selected the Pensaukee River watershed as a priority watershed project through the State's Nonpoint Source Water Pollution Abatement Program in 1994; and

WHEREAS, the Pensaukee project joins approximately 86 similar watershed projects statewide in which runoff control measures are being planned and implemented; and

WHEREAS, the Nonpoint Source Water Pollution Abatement Program was created in 1978 by the State Legislature. This program provides financial and technical assistance to landowners and local governments to reduce Nonpoint Source Pollution. The projects are administered by the DNR and DATCP. The Oconto and Shawano County Land Conservations Department will administer the project at the local level with assistance from the University of Wisconsin-Extension and the Natural Resource Conservation Service; and

WHEREAS, the goals of the Pensaukee Watershed project are to protect, enhance and restore the water quality of the streams of the Pensaukee watershed and the bay of Green Bay; and

WHEREAS, project implementation is scheduled to begin in January, 1997, and continue for a period of 10 years. Implementation will consist of continuous educational programming for watershed residents, individual farm conservation planning, the signing of cost share agreements and practice installation; and

WHEREAS, the estimated cost to Shawano County for the project will be $4,945,077. This project is to be funded by grants from the DNR to provide for cost sharings, staff support and educational activities. No additional county monies should be required.

NOW, THEREFORE, BE IT RESOLVED BY THE SHAWANO COUNTY BOARD OF SUPERVISORS in session this 12th day of November, 1996, that they go on record approving in the Nonpoint Source Control Plan for the Pensaukee River Priority Watershed Project.

SUBMITTED BY:

Vernon Ainsworth

Herbert Tauchen

Cliff Powers

Leo Wojkiewicz

Walter Spieth

LAND CONSERVATION COMMITTEE

Vote: Yes 5; No 0; Absent 0

RESOLUTION 81 - 1996

TO: THE HONORABLE CHAIRMAN AND MEMBERS OF THE OCONTO COUNTY BOARD OF SUPERVISORS

RE: APPROVAL OF PENSAUKEE RIVER WATERSHED PLAN

WHEREAS, the Pensaukee River Watershed in Oconto and Shawano Counties was selected August 1994 as a non point source priority watershed by the Department of Natural Resources, and

WHEREAS, the Land Conservation Departments in Oconto and Shawano Counties have developed a watershed plan with input from Pensaukee River Watershed Citizens Advisory Committee and cooperating agencies,

WHEREAS, the Land Conservation Committee has reviewed the initial draft of the Pensaukee River Watershed Plan and has held a public hearing, and

WHEREAS, the Land Conservation Committee will be the governing committee for carrying out the county's role in the plan, and

WHEREAS, the Department of Natural Resources requires a letter of approval from the Land Conservation Committee,

NOW, THEREFORE, BE IT RESOLVED, that the Oconto County Board of Supervisors does hereby approve the Pensaukee River Watershed Plan and authorize the County Board Chairman, Land Conservation Committee Chairman and the County Conservationist to sign all necessary agreements on behalf of the county.

SUBMITTED THIS 7TH DAY OF NOVEMBER, 1996

By: LAND CONSERVATION COMMITTEE

Clifford Sellen, Chairman

Russel Brock, Vice Chairman

Everett Carlson, Sect.

Donald Telford

Jim Schroeder

William Grady

(20)

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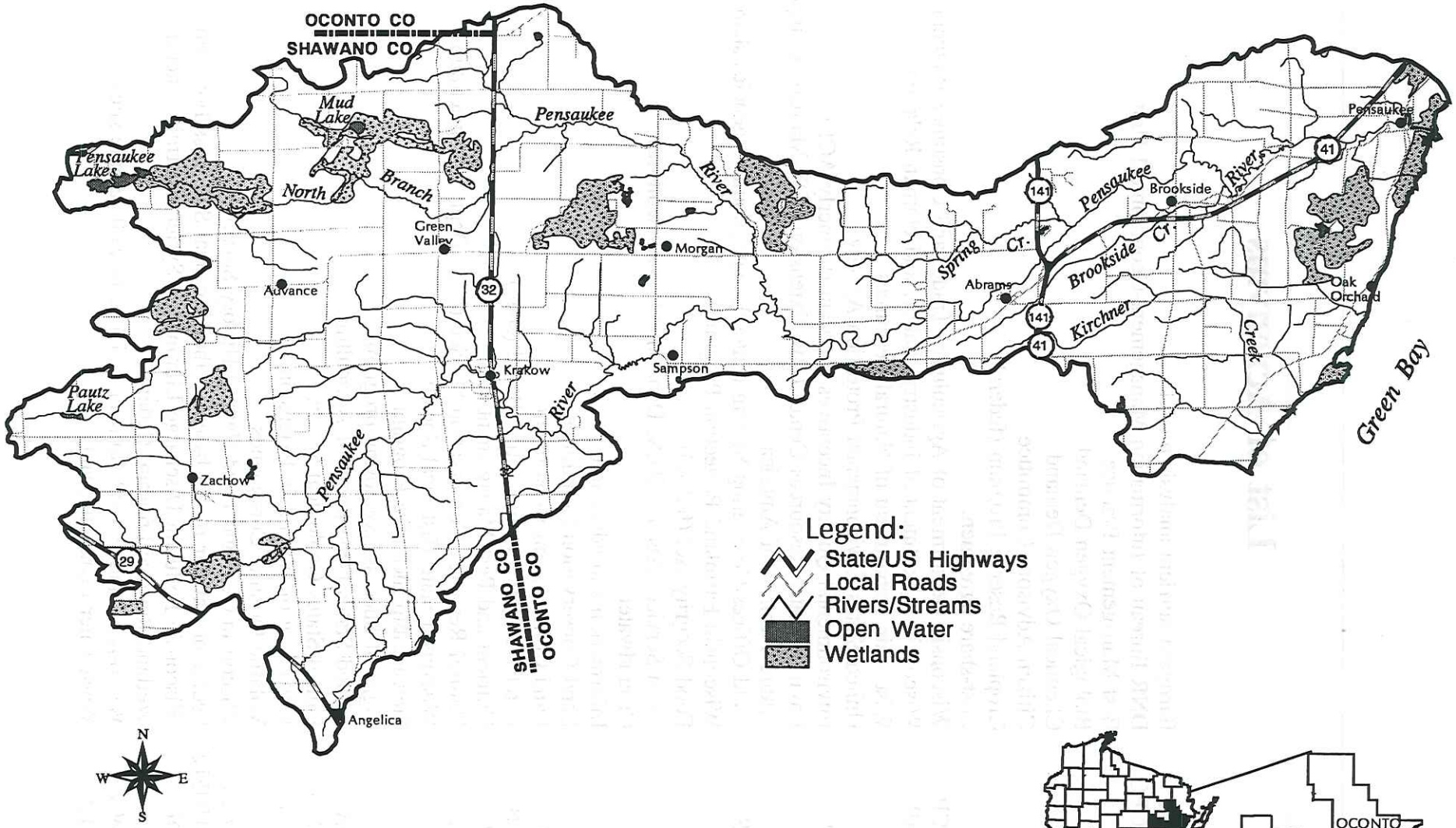
List of Acronyms

BARNY	Barnyard nutrient analysis model
BIM-GEO	DNR Bureau of Information Management-Geographical Unit
BMP	Best Management Practice
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CAC	Citizen Advisory Committee
CRP	Cropland Reserve Program (federal)
CSA	Cost-share agreement
DATCP	Wisconsin Department of Agriculture, Trade, and Consumer Protection
DILHR	Wisconsin Department of Industry, Labor, and Human Relations
DNR	Wisconsin Department of Natural Resources
EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentives Program (formerly ACP)
ERC	Environmental Resources Center (UW-Extension, UW-Madison Campus)
FFA	Future Farmers of America
FOCS	Field Offices Computing System (federal, state, county agencies share)
FPP	Wisconsin Farmland Protection Program
FSA	Food Security Act (federal)
FSA	Farm Services Agency (U.S. Department of Agriculture)
GW	Groundwater
I&E	Information and education
LCC	Land Conservation Committee
LCD	Land Conservation Department
LWCB	Land and Water Conservation Board (state)
NPM	Nutrient and Pest Management
NRCS	Natural Resource Conservation Service (U.S. Dept. of Agriculture)
SHS	Wisconsin State Historical Society
SIP	Stewardship Incentive Program
SOS	Signs of Success monitoring program
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UWEX	University of Wisconsin-Extension
VOC	Volatile Organic Compounds
WGNHS	Wisconsin Geological and Natural History Survey
WINHUSLE	Sediment transfer model based on the Universal Soil Loss Equation
WPDES	Wisconsin Pollutant Discharge Elimination System (permit system)
WRP	Wetland Reserve Program (federal)
WUWN	Wisconsin Unique Well Number assigned to well sample sites
WWTP	Wastewater treatment plant

Map 1-1 Pensaukee River Priority Watershed



Prepared By
Wisconsin Department of Natural Resources
Bureau of Watershed Management
January 1997

CHAPTER ONE
Purpose and Location Description

Wisconsin Runoff Management Program

The state Legislature created the Wisconsin Nonpoint Source Water Pollution Abatement Program (now called the Wisconsin Runoff Management Program) in 1978. The goal of the program is to improve and protect the water quality of streams, lakes, wetlands, and groundwater by reducing pollutants from urban and rural nonpoint sources. The 166-square-mile Pensaukee River Watershed, located in Shawano and Oconto counties, was designated a "priority watershed" in 1994 and began planning in 1995. The primary objective of this project is to reduce nonpoint source pollution loads and to enhance and protect the water quality of the streams, groundwater and lakes within the Pensaukee River Watershed. At the same time, an objective is to reduce the nonpoint source pollution loads flowing out of the Pensaukee system into the bay of Green Bay. The Pensaukee River is part of the Upper Green Bay Basin.

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

Location and Community Information

The Pensaukee River Watershed is a 166-square-mile drainage basin located approximately 25 miles north of the city of Green Bay and 12 miles east of the city of Shawano in northeast Wisconsin (Map 1-1). The Pensaukee River Watershed is within the Upper Green Bay Basin.

Civil Divisions

The Pensaukee River Watershed lies within Oconto and Shawano counties. Unincorporated communities in the watershed include the villages of Abrams, Krakow, Zachow, Pensaukee, Angelica, Advance and Green Valley. Table 1-2 shows the number of acres devoted to community land uses. Public land within the watershed includes the Green Bay State Wildlife Area. There is also a public boat landing at Pensaukee Lakes.

Population Size and Distribution

The Pensaukee River Watershed population is estimated to be about 6,000 residents. Most of the watershed population lives in rural unincorporated areas. Population trends in the watershed show an overall stable trend, with population projected to steadily increase through the year 2015 with new home constructions. Growth trends have been greatly influenced by the recent expansion of Hwy. 29 west from Green Bay as well as previously expanded U.S. Hwy. 41 corridor north of the city of Green Bay which is 4-lane now to Oconto. Regional trends suggest that the watershed's population will continue to expand with new constructions.

Land Uses

Farming is of vital importance to this area's economy as agriculture comprises about 70 percent of the overall land use in the Pensaukee River Watershed (Table 1-1). While the number of farms in the watershed has decreased steadily over the past two decades, the average farm size has stayed about the same, fluctuating between 200 and 210 acres.

Table 1-1 Land Uses in the Pensaukee River Watershed: 107,144 Total Acres

Land Uses	Acres	Percent (rounded off)
Agricultural	73,822	69%
Cropland	68,682	64%
Pasture	804	1%
Farmstead	3,266	3%
Grazed range	428	.4%
Recreation	642	.6%
Grassland, Natural Area, Wetlands	5,475	5%
Woodland	26,223	25%
Developed and Industrial	608	.5%
Mined	374	.4%

[1] These are estimates based on WINHUSLE inventory data (extrapolated from a 20% inventory). The wetland estimates are of actual wetland acres, not cropped wet fields. See wetland section in this chapter for a more comprehensive estimate of wetland acreage.

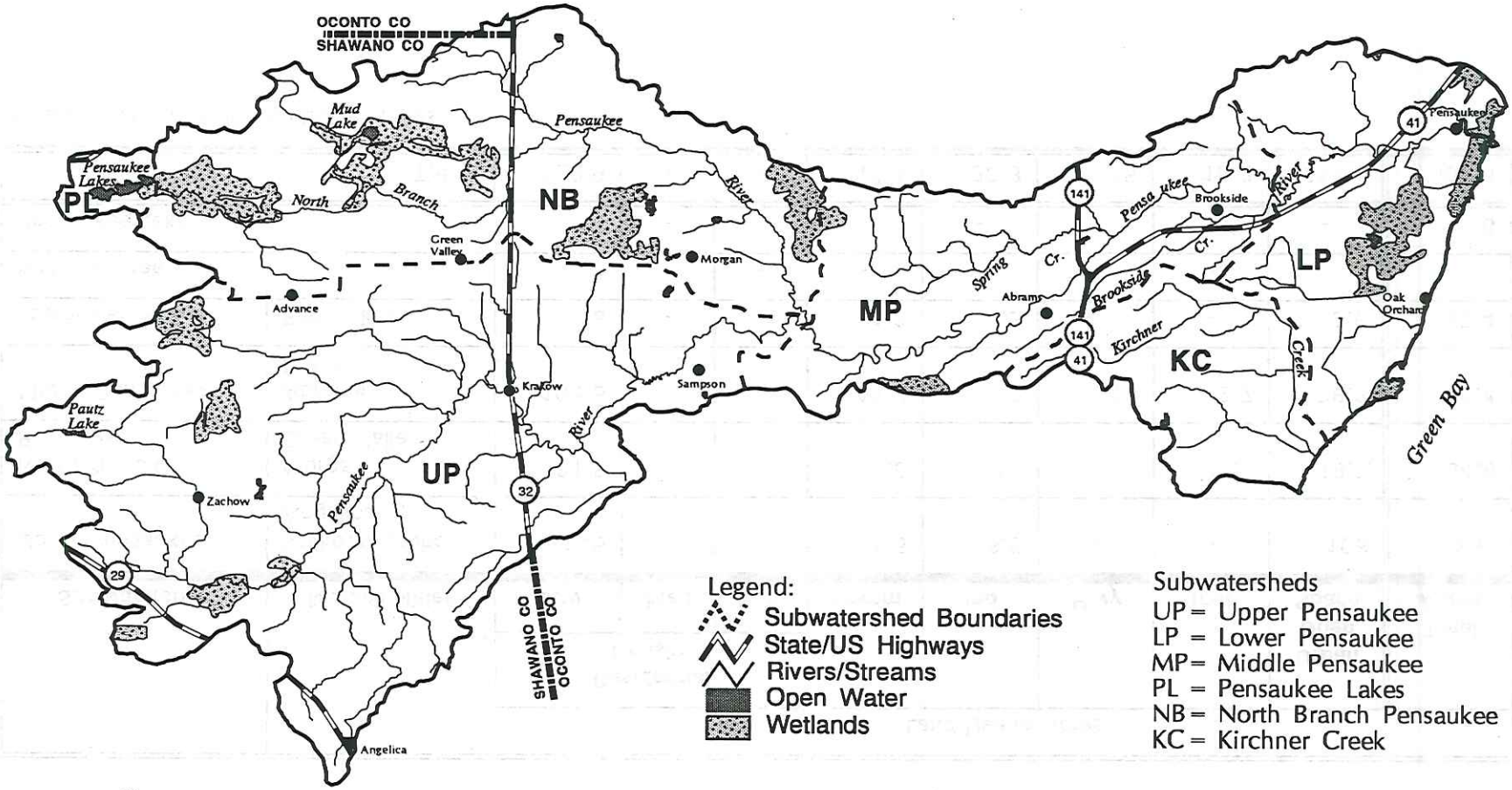
Source: Oconto and Shawano County LCDs

Table 1-2 Areal Extent of Urban Land Uses for Subwatersheds of the Pensaukee River Watershed: 1996

Subwatershed	Municipalities	Land Use in Acres								
		Residential Density								
		Low	Med	High	Comm	Ind	Hwy	Inst	Urban Open Space	Total Acres
Upper Pensaukee	Krakow, Zachow, Angelica	146	-	-	1.5	6.5	-	-	106	260
North Branch Pensaukee	Morgan, Green Valley	21.5	-	-	.5	11	-	2.5	19.3	54.8
Middle Pensaukee	Abrams, Brookside	109.6	-	-	11.8	2	15	12.7	78.3	229.4
Lower Pensaukee	Pensaukee	45.8	-	-	1.3	.8	-	-	9.5	57.4
Kirchner Creek	-	-	-	-	-	-	-	-	-	-
Pensaukee Lakes	-	6	-	-	-	-	-	-	-	6
	Totals	328.9	-	-	15.1	20.3	15	15.2	213.1	607.6

Source: Shawano and Oconto County LCDs

Map 1-2 Pensaukee River Priority Watershed with Subwatershed Boundaries



Prepared By
Wisconsin Department of Natural Resources
Bureau of Watershed Management
February 1997

CHAPTER TWO
Watershed Conditions and Objectives, and Nonpoint Pollution Sources

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

Physical Setting

Climate and Precipitation

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

Topography

The landscape in the Pensaukee River Watershed is primarily the result of continental glaciation. A majority of the watershed consists of a nearly level to gently sloping till plain that has some steep ridges and side slopes. There is also part of an outwash plain that ranges from nearly level to very steep near the center of the watershed. The northeast corner consists of a nearly level to gently sloping glacial lake plain. Several additional small lake plains are located in the western part of the watershed. Elevation ranges from about 880 feet in the northwest part of the watershed to about 580 feet where it enters Green Bay.

Geology

The Pensaukee River Watershed is underlain by two major bedrock formations. In the western portion the bedrock consists of dolomite which is part of the Prairie du Chien formation. The eastern portion of the watershed is underlain by dolomite that is part of the Sinnipee group. Cambrian sandstones underlie the entire watershed and are progressively overlain to the east by the younger Prairie du Chien Formation, St. Peter Formation, and Sinnipee Group, all of Ordovician age. These bedrock formations dip and thicken to the east.

Soils

The majority of the soils in the Pensaukee River Watershed formed in glacial till. These Onaway-Solona association soils are loamy throughout on till plains and range from nearly level to very steep, well drained to somewhat poorly drained. The major soils in this association are used for cultivated crops, pasture and woodland. The main concerns in managing Onaway soil are controlling water erosion, maintaining tilth and fertility. Improving drainage and maintaining tilth and fertility are the primary concerns on Solona soil. The less sloping areas of Onaway soils are moderately suited to septic tank absorption fields because of slow permeability.

There are two smaller areas -- one on the east side and one of the west side of the watershed -- dominated by soil associations formed in lacustrine deposits. On the east side is an area of **Wainola-Cormant** soil association, which is characterized by nearly level to gently sloping topography, drained to very poorly drained, sandy soils on flats and in depressions and drainageways on glacial lake plains. On the west side of the watershed is an area of **Shiocton-Bach-Iosco** association which is nearly level to very steep, excessively drained and moderately well drained, sandy soils and outwash plains. The major soils in these associations that are undrained support woodland or wetland vegetation. The main concerns for cropland o drained areas of these soils are ponding, wetness and soil blowing. These soils are poorly suited to septic tank absorption fields because of wetness, ponding or flooding.

In many of the woodland areas of the watershed, sandy outwash deposits dominate including **Menahga-Rousseau-Shawano** association soils which are excessively or moderately well drained. Nearly level and sloping areas of these soils that are irrigated and protected from soil blowing are suited to crops. Menahga and Shawano soils are poorly suited to septic tank absorption fields because of poor filtering capacity and the danger of groundwater pollution. Rousseau soils are poorly suited because of the seasonal high water table.

There is one association that formed in organic deposits that occurs in the north-central portion of the watershed where **Seelyeville-Markey** association dominates in a nearly level, very poorly drained, mucky soils occur in depressions and drainageways on outwash plains. Most ares of these soils are undrained and support woodland or wetland vegetation. These soils are poorly suited to cropland and septic tank absorption fields because of wetness.

Water Resource Conditions and Goals

This section describes the general conditions of the surface and groundwater resources in the Pensaukee River watershed. It describes the classifications used for Wisconsin's waters, then describes the surface water resources in the watershed. Descriptions of subwatersheds are also included. Table 2-4 provides a summary of the surface water resources in each subwatershed. Groundwater resources and quality is also discussed.

Water Use Classifications

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

Fish and Other Aquatic Life Uses

The biological use of the watershed streams is defined by the fish and other aquatic life communities that live in or have the potential to live in the stream. Use assessment of the watershed streams are defined as follows:

COLD = Coldwater Communities include surface waters capable of supporting a community of coldwater fish and other aquatic life or serving as a spawning area for coldwater fish species.
WWSF = Warmwater Sport Fish Communities include surface waters capable of supporting a community of warmwater sport fish and/or serving as a spawning area for warmwater sport fish.
WWFF = Warmwater Forage Fish Communities include surface waters capable of supporting an abundant diverse community of forage fish and other aquatic life.
LFF = Limited Forage Fish Communities include surface waters of limited capacity because of very low, naturally poor water quality or poor habitat.

Surface Water Resources

For the purposes of this project, the Pensaukee River Watershed is subdivided into six individual subwatersheds. Major tributaries, lakes, wetlands, and subwatershed divides are shown on Map 1-2.

Subwatersheds in the Pensaukee River Watershed

Upper Pensaukee	(UP)
Pensaukee Lakes	(PL)
North Branch Pensaukee	(NB)
Middle Pensaukee	(MP)
Lower Pensaukee	(LP)
Kirchner Creek	(KC)

Streams

Streams in the watershed include the Pensaukee River and its tributaries and several direct drainage tributaries to Green Bay. The Pensaukee River discharges to Green Bay near the community of Pensaukee. Spring Creek, Brookside Creek and Kirchner Creek are the only named intermittent streams in this watershed. Spring Creek and Brookside Creek discharge to the Pensaukee River, but Kirchner Creek drains directly to Green Bay.

The Pensaukee River originates just west of Pautz Lake and has many intermittent tributaries that discharge to it. These intermittent drainage tributaries are a major source of pollution to the Pensaukee River system. The river is generally flashy and floods with snowmelt and rain runoff. The headwaters often dry up in summer. Aquatic life habitat and macroinvertebrate communities in these headwater areas are generally in fair to poor condition. Heavy deposits of silt and sand cover much of the streambed. Nutrients (especially phosphorus) promote excessive aquatic plant (periphyton and algae) growth that influence the dissolved oxygen levels in the water column. Aquatic plants produce abundant oxygen in the daylight as the plants photosynthesize, but the oxygen is used during plant respiration at night. Dissolved oxygen levels often drop to zero in early morning hours when high water temperatures depress oxygen solubility. These severe oxygen fluctuations stress aquatic life. The Wisconsin State standard for dissolved oxygen is 5 mg/l for these warmwater streams.

Continuous flow starts at about the confluence of the North Branch Pensaukee River. The North Branch Pensaukee River is a major tributary entering the Pensaukee River near the Morgan Marsh. This river is significantly impacted by the many nearby wetlands. As the river gradient increases, the rocky substrate and subsequent re-aeration improves aquatic life and habitat although shallow water depths still limit available cover for adult game fish. Excessive nutrients in the water column cause periphyton growth, which in turn, effects dissolved oxygen levels. The river becomes wider and deeper as velocity slows and the Pensaukee River nears its mouth. Sediment, thus, settles out and has accumulated near the river mouth. Many of the tributaries and Pensaukee River have been ditched and straightened to quickly convey water off the land and dry the soils. Eliminating the natural meandering

destroys pools and increases stream velocity. Deep pools provide critically needed mid-summer aquatic habitat. High stream velocities increase erosion and suspended solids concentrations and prevent reproduction of some fish species.

The fishery of the Pensaukee River Watershed is heavily influenced by spawning migrations which run up the Pensaukee River and up streams discharging directly to Green Bay. The many small perennial and intermittent tributaries to the river and to Green Bay proper provide important existing and potential spawning and rearing habitat for game and forage species. High water levels in the spring provide extensive spawning and rearing habitat. As water levels decline, usually by the middle of June, many fish have traveled downstream with the current to Green Bay. Known spawning runs include northern pike, walleye, white sucker, and smallmouth bass. Stream bank stabilization and extending base flow would improve spawning habitat and in-stream cover for both adult and young fish. Deeper pools would result in more and larger adult fish such as northern pike, white sucker, and smallmouth bass. The greater redhorse (Moxostoma valenciennesi), a Wisconsin threatened species, was found in the Pensaukee River at three monitoring stations in 1975; however, none were captured in the 1995 survey.

The water resources in the Pensaukee River Watershed show extensive nonpoint source pollution problems. Erosion from streambank pasturing, flooding, and cropland runoff, along with excess nutrient loading has impaired the potential of these watershed streams. Low stream flow and shallow depths, high water temperature, beaver dams, and stream channelization also have negative impacts on water quality. Nonpoint source control measures installed in this watershed would most significantly benefit aquatic life by increasing available aquatic life habitat and providing better water quality year-round in the watershed streams in addition to supplying less pollutants to Green Bay.

Lakes

There are four named lakes in the Pensaukee River Watershed: Pensaukee, Pautz, Mud and Delzer lakes.

Pensaukee Lakes includes three separate basins connected by navigable channels. The total acreage is 109 acres. The east and west basins are shallow with abundant vegetation offering good habitat for waterfowl and fish. The middle basin has a maximum depth of 49 feet and the greatest amount of open water acreage of the three. Extensive wetlands surround the system. A critical area for nutrient and sediment input to the west basin is through the public access. The road and access are asphalt on steep slopes with row crops on both sides. The road ditch collects runoff from the fields where it drains unimpeded to the west basin of the lake. A redesign of this access site is a critical need for the long term protection of Pensaukee Lake.

Pautz Lake is a shallow drainage lake surrounded by wetlands. Mud Lake is a shallow lake surrounded by wooded wetlands and drains to a tributary to the North Branch Pensaukee River. Delzer Lake is even smaller than Mud Lake and is surrounded by fields; Delzer Lake drains to a tributary to the North Branch Pensaukee River.

Wetlands

Wetlands are valuable natural resources. They provide wildlife habitat, fish spawning and rearing areas, recreation, storage of runoff and flood flows and removal of pollutants. Wetlands and former wetlands, now drained for agriculture and residential development, are common throughout the Pensaukee River floodplain. Floodplain wetlands support furbearers and water fowl populations and may provide seasonal habitat for sport fish. It is hoped that restoration of many of these former wetlands may help improve base flow conditions throughout the river, but especially in the upstream reaches in Shawano County.

A wetland and wildlife habitat inventory was done to identify existing and modified or converted wetlands for the purpose of protection from degradation or potential restoration. The focus of the inventory was on wetlands that are presently, or have been in the past, degraded through drainage, grazing, cropping, or other activities causing water storage loss, and build up of sediments. Data were collected on 231 wetlands (1,530.6 acres), with an average of 6.6 acres per site. Data were gathered from Natural Resource Conservation Service maps, air photos, and the DNR wetland inventory maps. Guidelines for wetland restoration, which will be a component of this project, are outlined at the end of this chapter. See Table 2-1 for Wetland Inventory Summary. See section on "Eligibility for Wetland Restoration and Easements" near the end of this chapter (p. 67) for more on wetlands.

Table 2-1 Wetland Inventory Summary: Pensaukee River Watershed

	Prior Converted		Farmed in Dry Years		Converted Wetland			
	number of		number of		number of			
Subwatershed	sites	acres	sites	acres	sites	acres	Total Sites	Total Acres
Pensaukee Lakes	3	4					3	4
North Branch	29	198.8	12	167.2	2	7.6	43	373.6
Upper Pensaukee	119	717.4	18	126.2	3	11	140	854.6
Middle Pensaukee	1	.6	18	141.4	5	24	24	166
Kirchner Creek	1	.3	18	131.4	2	.7	21	132.4
Lower Pensaukee	-	-	-	-	-	-	-	-
						Totals	231	1,530.6

Groundwater Resources

Regional Aquifers

Groundwater is the main source of drinking water in the Pensaukee River Watershed. Groundwater is stored underground in pore spaces and cracks within the soil and rock layers. Unconsolidated material and rock layers which hold groundwater are called aquifers. Aquifers receive and store water and also discharge groundwater to lakes, streams, wetlands, and wells. Wells are simply pipes used to draw groundwater to the surface. Since 1936, Wisconsin law has required well drillers to document well construction and rock and soil layers encountered during well installation. Information from geologic logs, driller construction reports, and U.S. Geological Survey (USGS) reports is summarized below.

The principle aquifers in the watershed include the sand-and-gravel and underlying bedrock aquifers. Although a few wells reach the deeper Precambrian granite basement complex, it is not a primary source of groundwater due to poorer quality and low volume well yields.

The sand-and-gravel aquifer consists of unconsolidated materials that were deposited over bedrock by glacial ice and meltwater. Saturated sand and gravel occurs in discontinuous lenses within less permeable deposits. In the Pensaukee River Watershed, the sand-and-gravel aquifer furnishes sufficient yields for some domestic water supplies, but does not support high-capacity wells due to the size and composition of the deposits. The saturated thickness of this aquifer is generally less than 100 feet, yielding less than 100 gallons per minute to wells. The relatively high concentration of lacustrine (lake) deposit silt and clay within surficial deposits restricts the movement of groundwater and decreases recharge and storage capacity. In much of the watershed, soil infiltration rates are on the order of 0.2 to 0.5 inches per hour, characteristic of soils developed on peat, muck, or lake clay. However, near Lake Michigan, sandy dune areas exhibit much higher infiltration rates and wetland areas exhibit lower infiltration rates, while coarser deposits in the center of the watershed are associated with somewhat higher infiltration rates. The capacity of the ground to attenuate contaminants varies on a site-specific basis and depends upon a combination of factors. Proximity of the sand-and-gravel aquifer to the surface generally increases its susceptibility to contamination, although the presence of large amounts of silt and clay may protect the underlying aquifers.

The bedrock aquifer lies beneath the sand-and-gravel aquifer. This aquifer consists of a complex of Ordovician and Cambrian age sedimentary bedrock, and it is often divided into the sandstone aquifer and Galena-Decorah-Platteville aquifer. Well yields may exceed 500 gallons per minute. The sandstone aquifer produces the highest yields and consists of various Cambrian units in addition to the St. Peter and Prairie du Chien formations, where they are present. The Galena-Decorah-Platteville unit, or Sinnipee Group, consists of dolomite and shale overlying the sandstone aquifer in the eastern part of the watershed. In the Pensaukee River Watershed, the Galena-Decorah-Platteville aquifer varies from 0 to more than 100 feet and offers moderate well yields.

Direction of Groundwater Flow

Local, shallow groundwater flow in the Pensaukee River Watershed roughly mirrors the topography of the land surface and flows "downhill" or down gradient toward stream valleys. Regionally, deep groundwater in the watershed flows eastward toward Lake Michigan.

Groundwater in the watershed generally moves within two systems: 1) the water table system, and 2) the artesian system. The water table system represents largely unconfined groundwater in surficial deposits. The water table may be reached anywhere from at the surface (lakes, wetlands, and streams) to many feet below the surface. Groundwater in this system moves along relatively short paths and discharges to the surface, but also may be locally confined by low permeability layers. Locally, groundwater recharges by downward percolation. The artesian system represents water in the Cambrian sandstone confined beneath Cambrian dolomite and the Prairie du Chien Group, and also in the St. Peter Sandstone confined beneath the Galena-Decorah-Platteville unit. Lateral groundwater flow from the west and, to a lesser extent, downward percolation recharge the artesian system. Flow paths tend to be longer in the artesian system than in the water table system.

Groundwater Quality

Groundwater quality in the Pensaukee River Watershed is generally considered good. Human activities, however, can potentially harm this resource. Potential point sources of groundwater contamination include spills, leaking underground storage tanks, pesticide contamination, old landfills, and unabandoned or improperly abandoned wells. Nonpoint sources include agricultural pesticides and fertilizers, septage spreading, and road salt.

In parts of Wisconsin, elevated nitrate levels in groundwater have been linked to agricultural practices, septage spreading, and faulty septic systems. As part of the water quality appraisal, 113 private well samples were collected and analyzed for nitrate (NO_3) + nitrite (NO_2). Sample analytical results are summarized in Table 2-2. Samples analyzed for nitrate (NO_3) + nitrite (NO_2) showed concentrations ranging from not detected to 22.3 parts per million or milligrams per liter (mg/L). The groundwater enforcement standard (ES) for nitrate is 10 mg/L. The state preventive action limit (PAL) is 2 mg/L.

Six samples (5 percent) exceeded 10 mg/L and eighteen (16 percent) of the samples exceeded 2 mg/L. Results so far do not indicate a pattern of groundwater contamination that can be linked to specific sources of nitrate. These results do not necessarily represent the overall groundwater quality of the watershed.

Pesticides have been detected in past sampling of groundwater from parts of Wisconsin, including the Pensaukee River Watershed. Pesticide testing, however, was not a component of the water quality appraisal. No atrazine prohibition areas now exist within the watershed.

Enforcement Standard (ES) Health Advisory Level: The concentration of a substance at which a facility regulated by DILHR, DATCP, DOT or DNR must take action to reduce the concentration of the substance in groundwater.

Preventive Action Limit (PAL): A lower concentration of a contaminant than the Enforcement Standard. The PAL serves to inform DNR of potential groundwater contamination problems, establish the level at which efforts to control the contamination should begin, and provide a basis for design codes and management criteria.

No samples were collected through the water quality appraisal for coliform bacteria or hazardous substances such as volatile organic compounds. Samples taken in the Pensaukee Watershed in the past, however, have exceeded the enforcement standard for coliform bacteria and also for VOCs. Coliform bacteria can be a drinking water problem where septic systems, land spreading of manure, or barnyards are located up-gradient (generally uphill) from a private well. Bacteria can enter the drinking water supply along the well casing of improperly constructed wells, through a cracked casing, through improperly capped wells, or through fracture flow in bedrock. Generally, wells with bacteria can be rehabilitated.

Volatile organic compounds (VOCs), including many petroleum products such as benzene, generally enter a well from nearby leaking underground gasoline or other fuel storage tanks and spills. Once in the groundwater, VOCs are difficult to clean up. In general, the contaminated wells must be abandoned and a new well drilled.

Table 2-2 Well Sampling Results: Pensaukee River Watershed

NITRATE						
	Number of Nitrate Samples		Number of Nitrate Samples		Number of Nitrate Samples	
Subwatershed	less than 2.0 mg/l	%	between 2.0 and 10.0 mg/l	%	greater than 10.0 mg/l	%
Pensaukee Lakes	0	0	0	0	0	0
Upper Pensaukee	55	87	6	10	2	3
North Branch	18	60	9	30	3	10
Middle Pensaukee	9	82	1	9	1	9
Kirchner Creek	4	100	0	0	0	0
Lower Pensaukee	3	60	2	40	0	0
Totals	89	79	18	16	6	5

Water Supplies

Water supplies for domestic, agricultural, and industrial uses in the Pensaukee River Watershed are obtained from private groundwater systems. The primary source for water supplies is the bedrock aquifer, although the sand-and-gravel aquifer provides limited yields. Groundwater withdrawal within the watershed is relatively light. Groundwater withdrawal in more heavily populated areas to the south may affect groundwater quantity in the Pensaukee River Watershed. (Emmons 1987)

In addition to private water supply systems, watershed residents may also rely upon other-than-municipal community systems, as well as transient or non-transient non-community systems. Other than municipal community systems serve year-round residents, have at least 15 service connections or serve at least 25 people for 60 or more days per year, and are not owned by a municipality. Non-community systems do not serve year-round residents. A non-community system that serves the same 25 people for 6 or more months per year is considered non-transient, otherwise the system is classified as a transient system.

Potential Groundwater Quality Problems

Previously identified potential groundwater quality problems in the Pensaukee River Watershed are provided below. The listed sites are not necessarily currently polluting groundwater, but these types of situations raise contamination concern. Potential pollution associated with nonpoint sources is described in various sections throughout the remainder of this chapter. See Table 2-3 for the list of known leaking underground storage tanks, waste disposal sites and contaminated spill sites in the watershed area.

No high-priority spill sites, and no Superfund sites are listed for the project area.

Table 2-3 LUST Sites, Waste Disposal Sites and Spill Sites

The WDNR Publication SW-504-95(REV), *The Wisconsin Remedial Response Site Evaluation Report* (October 1995), lists EPA Superfund sites, sites which may cause or threaten to cause environmental pollution, leaking underground storage tank (LUST) sites, and reported hazardous substance spill sites. This publication lists the following sites in the Pensaukee River Watershed or within 2 miles of the boundary:

High and medium priority LUST sites:

Town/City	Town	Range	Sect.	Q	QQ		Town/City	Town	Range	Sect.	Q	QQ
Abrams	27N	20E	26	NW	SW		Green Valley	27N	18E	13	SW	SW
Abrams	-	-	-	-	-		Hartland	26N	17E	15	SE	NW
Abrams	-	-	-	-	-		Hartland	26N	17E	15	SE	SE
Abrams	27N	20E	26	NW	SW		Maple Grove	25N	18E	04	NE	SW
Zachow	26N	18E	18	NW	SE		Zachow	26N	18E	07	SE	SW

The WDNR publication SW-108-93, *Registry of Waste Disposal Sites in Wisconsin* lists the following waste disposal sites in the watershed:

Town/City	Town	Range	Sect.	Q	QQ		Town/City	Town	Range	Sect.	Q	QQ
Abrams	27N	20E	29	NW	NE		Angelica	26N	18E	09	NE	SW
Abrams	27N	20E	27	NW	E		Green Valley	27N	18E	12	SW	NE
Abrams	27N	20E	-	-	-		Hartland	26N	17E	03	SE	NE
Abrams	27N	20E	22	SW	SW		Pensaukee	27N	21E	16	NW	SW
Angelica	26N	18E	09	NE	NE		Pensaukee	27N	21E	16	NW	SW
Angelica	26N	18E	08	NE	SE		Morgan	27N	19E	26	SW	SW

WDNR data from August 1996 lists the following spill sites in the watershed where soil or groundwater contamination occurred:

Town/City	Town	Range	Sect.	Q	QQ		Town/City	Town	Range	Sect.	Q	QQ
---	26N	17E	24	SE	SW		Brookside	-	-	-	-	-
---	27N	18E	12	SE	SE		Green Valley	27N	18E	-	SW	SW
---	27N	21E	02	NE	SE		Morgan	27N	19E	21	SE	SE
Morgan	27N	19E	23	NE	SW		Zachow	26N	18E	07	NW	SW
Bonduel	26N	17E	23	NE	NW							

Water Quality Goals and Project Objectives

The DNR staff with assistance from the Shawano and Oconto County Land Conservation Department staff and the DATCP developed water quality goals and project objectives. Goals and objectives for each subwatershed are included in the next section.

Following are the type of goals for water resources:

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

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

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

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

Overall water resources goals for the project:

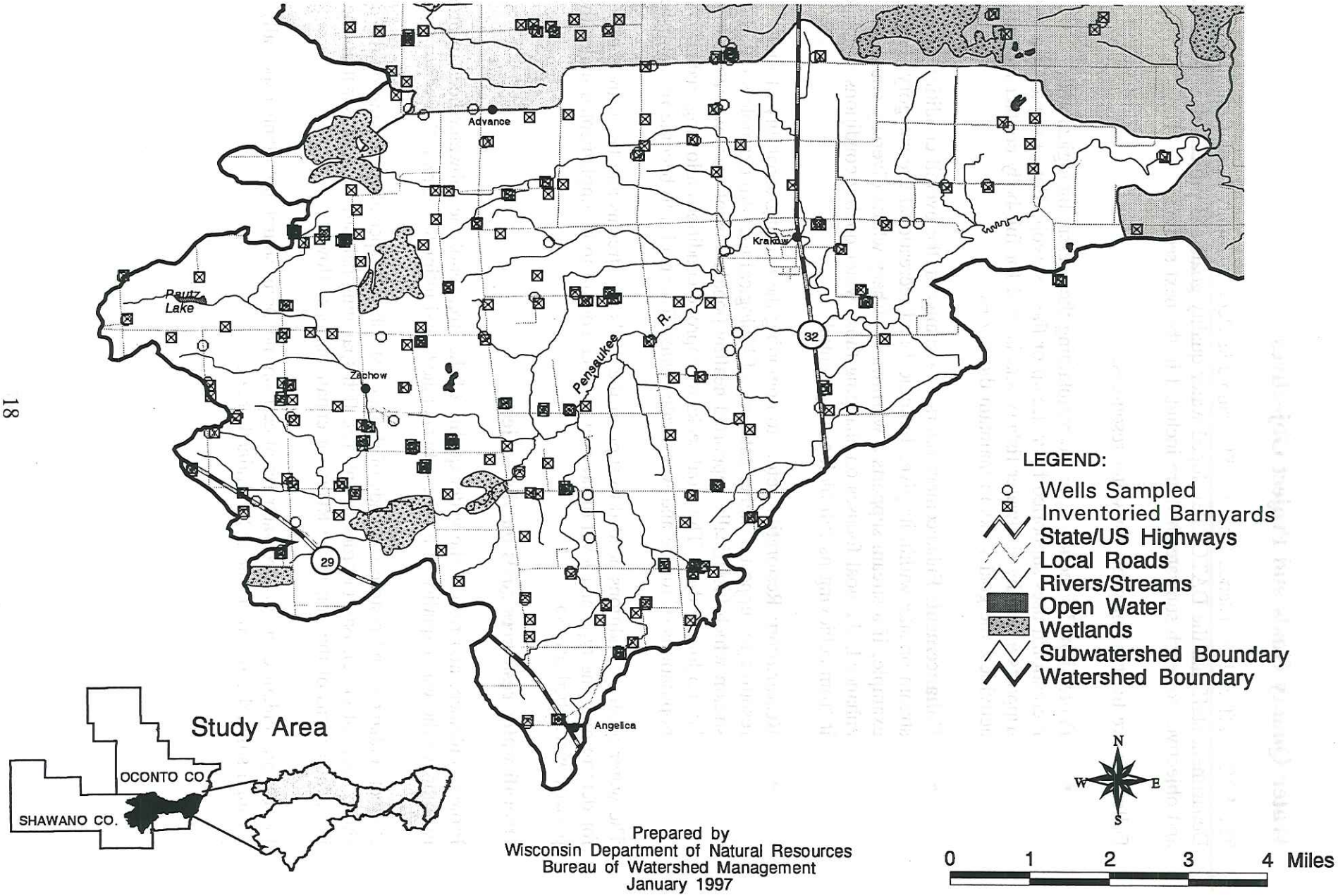
Protect, enhance, and restore the water quality of the streams of the subwatersheds in order to improve the water quality of all the subwatersheds and ultimately Green Bay.

Protect, enhance, and restore wetlands of the subwatersheds, especially focusing on the near-shore areas of Green Bay in order to enhance fish spawning habitat, as well as within the headwater areas of the Pensaukee River for enhancing base flow.

Protect and enhance the groundwater resource from nonpoint source pollutants especially through sinkholes or other internally drained areas.

Map 2-1 Upper Pensaukee Subwatershed

Pensaukee River Watershed



Prepared by
Wisconsin Department of Natural Resources
Bureau of Watershed Management
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Subwatershed Discussions

This section describes the physical and water quality conditions for each subwatershed in the Pensaukee River Priority Watershed Project. Discussions for each subwatershed are broken into four parts: a general description, water quality conditions, the nonpoint source pollutants impairing the subwatershed, and the goals and objectives for the subwatershed. Table 2-4 summarizes the subwatershed conditions.

Upper Pensaukee Subwatershed (UP)

Description

Upper Pensaukee Subwatershed consists of the Pensaukee River from its headwaters just west of Pautz Lake downstream to the confluence of the North Branch Pensaukee River. Several unnamed intermittent tributaries discharge to the Pensaukee River. See Map 2-1. The communities of Zachow, Krakow, Sampson and Angelica are in this subwatershed. The village of Krakow Wastewater Treatment Plant and Graf Creamery near Zachow both discharge to the Pensaukee River.

Water Quality Conditions (UP)

The Pensaukee River in this subwatershed is classified as warmwater sport fish although the upper reaches do not have flow year-round. Snowmelt and rain runoff cause extreme flooding, bank erosion, and a widening of the stream channel. The resulting shallow stream depth allows the water to warm up and limits adequate cover for adult game fish. The river channel becomes deeper and much wider just upstream of Krakow. In summer, water ponds in the river channel and becomes stagnate with low dissolved oxygen levels and thick aquatic plant growth.

The Pensaukee River received aquatic life habitat ratings (using methods described by Ball, 1982) from fair to poor depending upon location. In the upper-most reaches, there is a heavy deposit of silt and sand covering the stream bed. Aquatic plants are abundant and some bank erosion is evident. Many of the tributaries and the Pensaukee River have been ditched and straightened. Aquatic life near Nichols Drive is abundant in early summer when water flow is still good. Crayfish, snails, minnows, and tadpoles are common.

Pautz Lake is a small and shallow drainage lake surrounded by wetlands in the headwaters of the Pensaukee River.

The lower reaches of this subwatershed have somewhat better aquatic life habitat with rock and rubble substrate more common then the silt and sand bottom in the upper reaches. However, many of the rocks are covered by a layer of fine silt. Significant deposits of soft sediment are common near the river banks and in slow current areas. Thick mats of filamentous algae cover much of the stream substrate. Cattle and horses pasturing along the river and tributaries have caused significant bank erosion.

The Pensaukee River at Nichols Drive has severe dissolved oxygen and temperature problems. Continuous monitoring from May 25 to June 23, 1995 (WDNR files), showed extreme dissolved oxygen and temperature fluctuations. It was common to see dissolved oxygen concentrations fluctuate between 20 mg/l down to 0 in a 24-hour period. Water temperatures reached as high as 94°F. These low dissolved oxygen levels and high temperatures are extremely stressful to aquatic life. Rain runoff appears to temporarily cool river water temperature and dampen these daily dissolved oxygen fluctuations.

Aquatic macroinvertebrate samples (using methods described by Hilsenhoff, 1987) collected at Safian Road received fair water quality ratings both spring and fall, 1993; fair ratings at Green Valley Road and CTH C in spring, 1979; and good ratings at CTH C in fall, 1979. These ratings indicate some to fairly significant organic pollution present in the river.

Water chemistry samples collected at Safian Road in 1993 (WDNR files) showed elevated levels of dissolved phosphorus during four rain runoff events sampled. Total phosphorus concentrations were elevated one out of four events sampled.

The lack of stream flow year-round is the most limiting factor in this subwatershed; however, the Pensaukee River has the potential to offer better aquatic life habitat for most of the year when water is available if sediment and nutrient loading were reduced. Sediment has filled in pool areas and covered substrate. Nutrients have caused excessive plant growth in the river which effects the dissolved oxygen level. Ditching, warm summer water temperatures, and streambank flooding which decreases stream depth are also factors which prevent the water resources from meeting its potential.

Nonpoint Source Pollutants (UP)

- The largest in area, stream miles, and pollution sources of all the subwatersheds examined, the Upper Pensaukee Subwatershed contains 184 animal lots which contribute 3,017 pounds of phosphorus [organic], annually. This represents an estimated 62 percent of the phosphorus for the entire watershed.

- The upland sediment delivery in the Upper Pensaukee Subwatershed is 17,075 tons, annually, or 67 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 85 percent of the load.

- Roughly 91 percent of the sediment delivered from streambanks in the watershed comes from the Upper Pensaukee Subwatershed.

Water Resource Goals and Objectives (UP)

The following goals and objectives are recommended for the water resources of the Upper Pensaukee River subwatershed:

1. Improve aquatic life habitat and water quality by:

    a. creating and maintaining buffers that filter sediments and other pollutants, provide shading and stabilize streambanks.
    b. preventing the trampling of the streambanks by limiting livestock access.
    c. reducing nutrient/phosphorus loading by a high level which will reduce macrophyte growth and stabilize oxygen levels.
    d. reducing sedimentation rates by a high level.
    e. discouraging maintenance dredging of drainage ditches to allow the natural meandering of the stream channels.
    f. protecting, enhancing, and restoring wetlands to slow the release of water to the stream and filter sediment and other pollutants.
    g. decreasing extreme flooding which widens the stream channel, warms water, and decreases water depth and cover for adult fish.

2. Improve wildlife habitat by:

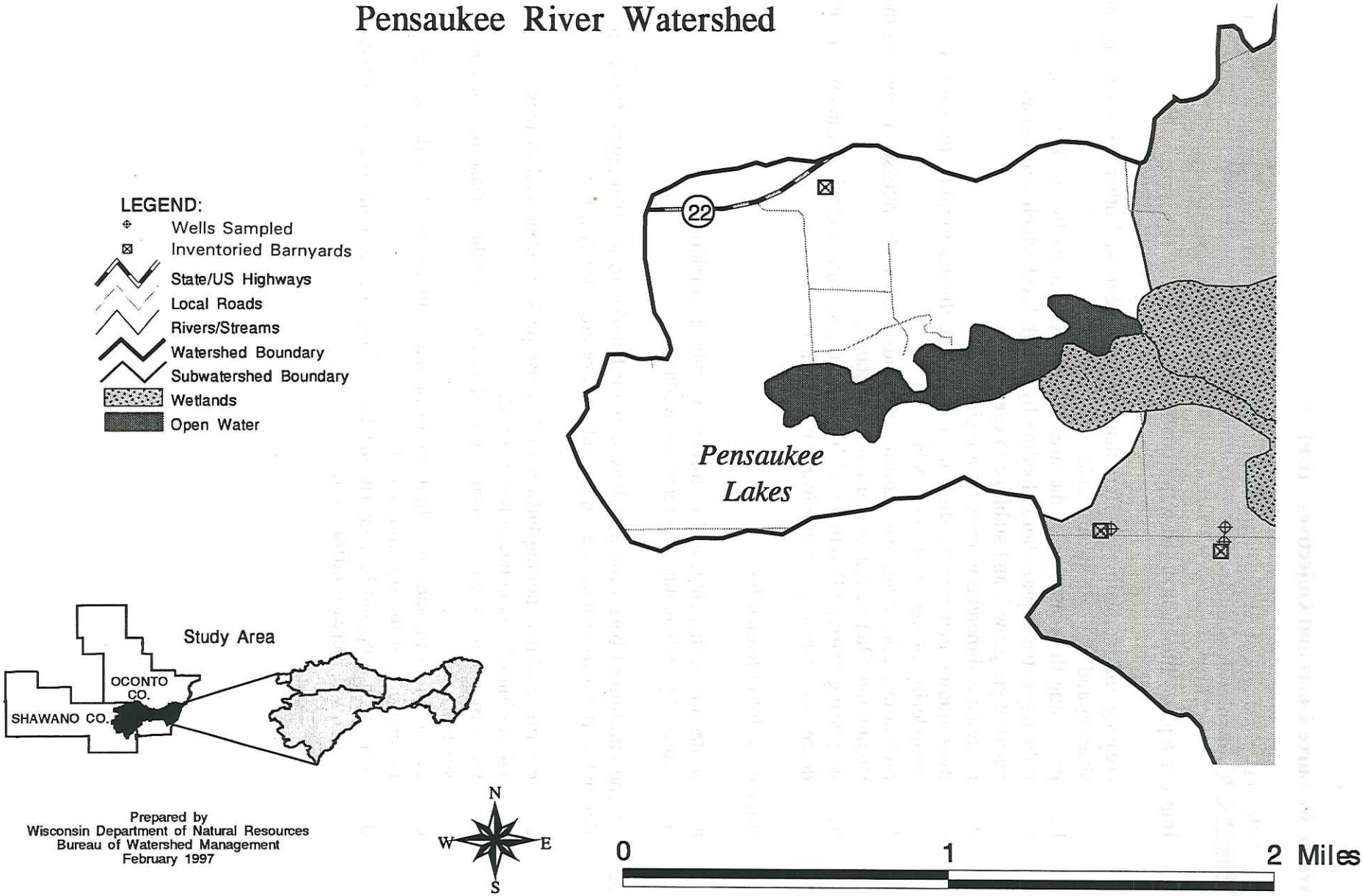
    a. protecting, enhancing, and restoring streambank corridors.
    b. protecting, enhancing, and restoring wetlands.

3. Extend duration of base flow past May in the tributaries to the Pensaukee River and the Pensaukee River to provide spawning and nursery areas for fish by:

    a. creating and maintaining buffers to decrease peak flooding and increase infiltration of precipitation into the soil.
    b. protecting, enhancing and restoring wetlands to slow the release of water to the streams.
    c. discouraging maintenance dredging of drainage ditches to allow the natural meandering of the stream channels.
    d. increasing cropland best management practices, such as conservation tillage, which will increase infiltration.

Map 2-2 Pensaukee Lakes Subwatershed

Pensaukee River Watershed



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Pensaukee Lakes Subwatershed (PL)

Description

Pensaukee Lakes Subwatershed includes the Pensaukee Lakes and the direct drainage to the lakes. Pensaukee Lakes are three separate basins connected by navigable channels. The total acreage is 109 acres. The east and west basins are shallow with abundant vegetation that offers good habitat for waterfowl and fish. The middle basin has a maximum depth of 49 feet and the greatest amount of open water acreage. Extensive wetlands surround the system. See Map 2-2.

Pensaukee Lakes support a diverse fishery common to central Wisconsin lakes. Largemouth bass and northern pike are abundant, although the northern pike are slow growing and small. Panfish are represented by bluegill, yellow perch, black crappie, pumpkinseed and rock bass. Bluegill and pumpkinseed are the most abundant but are somewhat slow growing and small. Black crappie are cyclic, and populations and sizes vary from year to year. Pensaukee Lakes experienced a winterkill in 1986 and again in 1996. These are the only two known winter fish kills for this water body.

Water Quality Conditions (PL)

Surface total phosphorus values are in the high mesotrophic/lower eutrophic category from data that was collected in 1977 and again in 1995. Significant stratification occurs during the summer. The hypolimnion became anoxic after two meters in a nine meter profile in August of 1995. Very high phosphorus levels (179 ug/l), due to anaerobic conditions, were measured in the hypolimnion during summer stratification. This indicates a high internal phosphorus source, as the lake mixes during spring and fall. (Rasman, WDNR files, 1995).

The immediate shoreline is not heavily developed and is in a natural or wild condition. Agricultural activities taking place approximately 1,000 feet beyond the shoreline are extensive. The agriculture consists of dairy farms with accompanying row crops. A critical area for nutrient and sediment input to the west basin is by means of the public access. The road and access are asphalt on steep slopes with row crops on both sides. The road ditch collects runoff from the fields where it drains unimpeded to the west basin of the lake. A redesign of this access site is badly needed for the long-term protection of Pensaukee Lake.

In general, internal nutrient cycling from sediment in the Pensaukee Lakes will probably keep it in the high mesotrophic/lower eutrophic category; however, a reduction in nutrients and sediment inputs from the lake drainage area and public access site will prevent the lake from becoming more eutrophic.

Nonpoint Source Pollutants (PL)

- The smallest subwatershed in land area, the Pensaukee Lakes Subwatershed contains 2 animal lots which contribute 35 pounds of phosphorus [organic], annually. This represents an estimated 1 percent of the phosphorus for the entire watershed.

- The upland sediment delivery in the Pensaukee Lakes Subwatershed is 524 tons, annually, which is deposited into the Pensaukee Lakes chain and does leave the subwatershed. Cropland is the major source in this subwatershed, contributing 94 percent of the load.

- Because sediment loading is delivered to the Pensaukee Lakes, this subwatershed does not contribute to streambank sediment delivery for the remainder of the watershed. There is very little streambank erosion within this subwatershed.

Water Resource Goals and Objectives (PL)

The following goals and objectives are recommended for the water resources of the Pensaukee Lakes subwatershed:

1. Protect the Pensaukee Lakes from becoming more eutrophic by:

   a. redesigning the public access site to decrease sediment and nutrient runoff from croplands to the west basin.
   b. reducing the amount of development and impermeable surfaces in the immediate drainage area of the lake.
   c. reducing sediment and nutrient loading by a medium level.

2. Protect wildlife habitat by:

   a. preserving the natural or wild condition of the undeveloped shoreline.

North Branch Pensaukee Subwatershed (NB)

Description

The North Branch Pensaukee Subwatershed consists of the North Branch Pensaukee River from the outlet of Pensaukee Lake downstream to the confluence of the Pensaukee River, and several unnamed intermittent tributaries to the North Branch Pensaukee River. See Map 2-3. Mud Lake and Delzer Lake are also in this subwatershed. A significant portion of this subwatershed is wetland, including Morgan Marsh. The communities of Advance, Green Valley and Morgan are in this subwatershed.

Water Quality Conditions

Since wetlands contribute a significant flow to the North Branch Pensaukee River, the water is often a stained brown color with somewhat cooler temperatures than the Pensaukee River.

The North Branch Pensaukee River received aquatic life habitat ratings from good to poor depending on location. In the upper reaches of the North Branch, the river has the characteristics of a channel through a marsh. The wetland corridor extends downstream to about Green Valley Road. The channel is wide with fairly undefined banks. The substrate is mostly soft dark organic matter. The deep, slow-moving water is stained, and wetland and lake-type aquatic plants are common.

Further downstream, the river develops more of a river channel and flow increases. The river channel is wide and shallow. The substrate is mostly rock, rubble and sand with some soft sediment accumulated near the banks and in slow areas. Stream bank erosion does not appear to be a problem in this subwatershed. Most of the stream corridor is buffered with dense trees, shrubs, and grasses. Historically, the river has been dammed by beavers in the lower reaches.

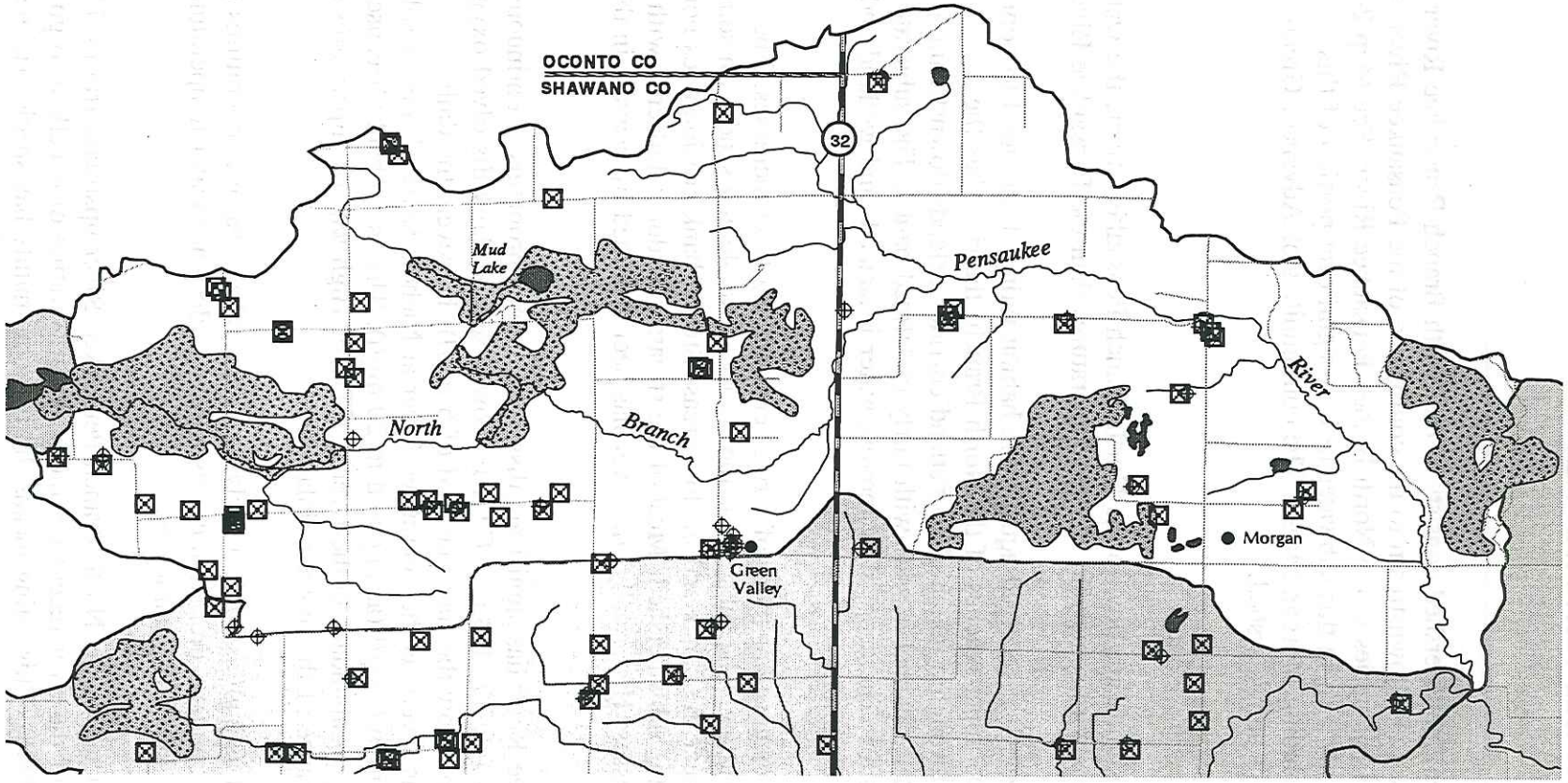
The North Branch Pensaukee River has significant dissolved oxygen problems. Continuous monitoring from June 23 to July 17, 1995, at CTH E showed several daily dissolved oxygen violations (dissolved oxygen below the state standard of 5 mg/l); however, the daily fluctuation was not nearly as severe as the Pensaukee River at Nichols Drive. Daily dissolved oxygen fluctuations were within 6 mg/l (as opposed to 20 mg/l). This is probably because aquatic plants are not nearly as abundant in the river at CTH E. High water temperatures and periphyton growth are the cause of the oxygen violations.

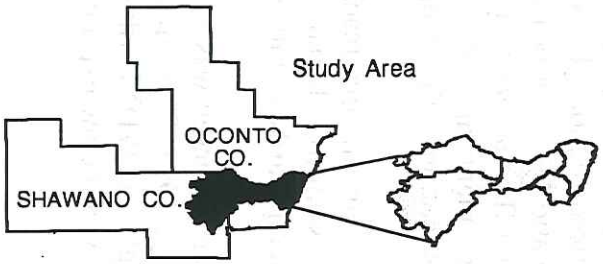
Water temperatures reached as high as 85°F on July 14, 1995. These warm temperatures can be stressful to fish and other aquatic life. Rain events appear to decrease water temperature and temporarily stabilize dissolved oxygen levels.

A fishery survey was conducted on the North Branch Pensaukee River upstream from CTH E in July, 1995. This stretch of the river received a biotic integrity rating of excellent to good (Langhurst, WDNR files, 1996). This rating means the fish community has species richness somewhat below expectation especially due to the loss of the most intolerant forms; some

Map 2-3 North Branch Pensaukee Subwatershed

Pensaukee River Watershed





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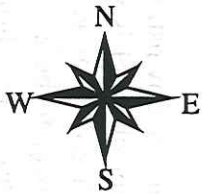


0 1 2 3 4 Miles

LEGEND:

- Wells Sampled
- Inventoried Barnyards
- State/US Highways
- Local Roads
- Rivers/Streams
- Watershed Boundary
- Subwatershed Boundary
- Wetlands
- Open Water

species, especially top carnivores, are present with less than optimal abundances or size/age distributions; trophic structure shows some signs of imbalance.

Aquatic macroinvertebrate samples ranged from good to poor. A sample collected at CTH BB in fall, 1979 received a fair water quality rating. At CTH E, samples received a good rating in spring, 1979 and also in spring, 1993. Three samples at Hwy 32 in 1993 showed poor, fair, and good water quality. These ratings indicate some to very significant organic pollution present in the river.

Water chemistry samples collected at Hwy 32 in 1993 showed elevated levels of dissolved phosphorus during three out of four rain runoff events sampled. Total phosphorus was also elevated during one of the rain events sampled.

Wooded wetlands surround Mud Lake. This small lake drains to a tributary to the North Branch Pensaukee River upstream of CTH BB. Delzer Lake is even smaller than Mud Lake and is surrounded by fields. This lake discharges to an unnamed tributary to the North Branch Pensaukee River downstream of the Shawano and Oconto county line. Many of the intermittent tributaries to the North Branch have been ditched and straightened.

The marshy nature of the North Branch Pensaukee River corridor will inhibit the upper reaches from achieving habitat ratings higher than it already supports; however, the lower reaches have potential to improve with the reduction in sediment and nutrient loading in this subwatershed. A reduction would stabilize dissolved oxygen levels, decrease sediment accumulation in the streambed, and decrease overall loading to the Pensaukee River. Beaver dams, stream channelization, shallow stream depth which provides little overhead and in-stream cover, and high water temperatures are also limiting the aquatic life in this subwatershed.

Nonpoint Source Pollutants (NB)

- The North Branch Pensaukee Subwatershed contains 48 animal lots which contribute 931 pounds of phosphorus [organic], annually. This represents an estimated 19 percent of the phosphorus for the entire watershed.

- The upland sediment delivery in the North Branch Pensaukee Subwatershed is 5,756 tons, annually, or 23 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 90 percent of the subwatershed's load.

- Almost none of the sediment delivered from inventoried streambanks in the watershed comes from the North Branch Pensaukee Subwatershed.

Water Resource Goals and Objectives (NB)

The following goals and objectives are recommended for the water resources of the North Branch Pensaukee subwatershed:

1. Improve aquatic life habitat and water quality by:

   a. creating and maintaining buffers that filter sediments and other pollutants, provide shading and stabilize streambanks.
   b. reducing nutrient/phosphorus loading by a medium level which will reduce macrophyte growth and stabilize oxygen levels.
   c. reducing sedimentation rates by a medium level.
   d. discouraging maintenance dredging of drainage ditches to allow the natural meandering of the stream channels.
   e. protecting, enhancing, and restoring wetlands to slow the release of water to the stream and filter sediment and other pollutants.
   f. decreasing extreme flooding which widens the stream channel, warms water, and decreases water depth and cover for adult fish.

2. Improve wildlife habitat by:

   a. protecting, enhancing, and restoring streambank corridors.
   b. protecting, enhancing, and restoring wetlands.

3. Increase stream flow in the North Branch Pensaukee River by

   a. creating and maintaining buffers to decrease peak flooding and increase infiltration of precipitation into the soil.
   b. protecting, enhancing and restoring wetlands to slow the release of water to the river.
   c. discouraging maintenance dredging of drainage ditches to allow the natural meandering of the stream channels.
   d. increasing cropland best management practices, such as conservation tillage, which will increase infiltration.

Middle Pensaukee Subwatershed (MP)

Description

The Middle Pensaukee Subwatershed consists of the Pensaukee River from the confluence of the North Branch Pensaukee River downstream to just below the confluence of Brookside Creek. See Map 2-4. This subwatershed includes Spring Creek, Brookside Creek, and several unnamed intermittent tributaries to the Pensaukee River. The communities of Abrams and Brookside are in this subwatershed.

Water Quality Conditions

The **Pensaukee River** in this subwatershed is classified as a warmwater sport fishery and flows year-round, though flows are minimal in mid-summer. The Pensaukee River received aquatic life habitat ratings of good at Sandalwood Road and CTH J; and good to fair at Valentine Road. The river is generally wide and shallow, limiting available cover for fish. The substrate is dominated by rocks and rubble and is covered by periphyton growth. Some sedimentation has occurred near the banks and in slow areas. Streambank erosion from high stream flows appear to be significant at some locations even though the bank vegetation is present and appears to be a good buffer.

The Pensaukee River has significant dissolved oxygen and temperature problems in this section. Continuous monitoring at Valentine Road from June 30 to July 17, 1995, and at CTH J from Aug. 29 to Sept. 6, 1995, showed dissolved oxygen violations on a daily basis especially at Valentine Road when water temperatures were the warmest. Water temperatures reached as high as 91°F in July. These high water temperatures depress oxygen solubility in the water column.

A fish survey was conducted on the Pensaukee River upstream from Valentine Road in July 1995. This stretch of the river received a biotic integrity rating of excellent which means the fish community is comparable to the best situations with minimal human disturbance; all regionally expected species for habitat and stream size, including the most intolerant forms, are present with a full array of age and size classes. The trophic structure is balanced.

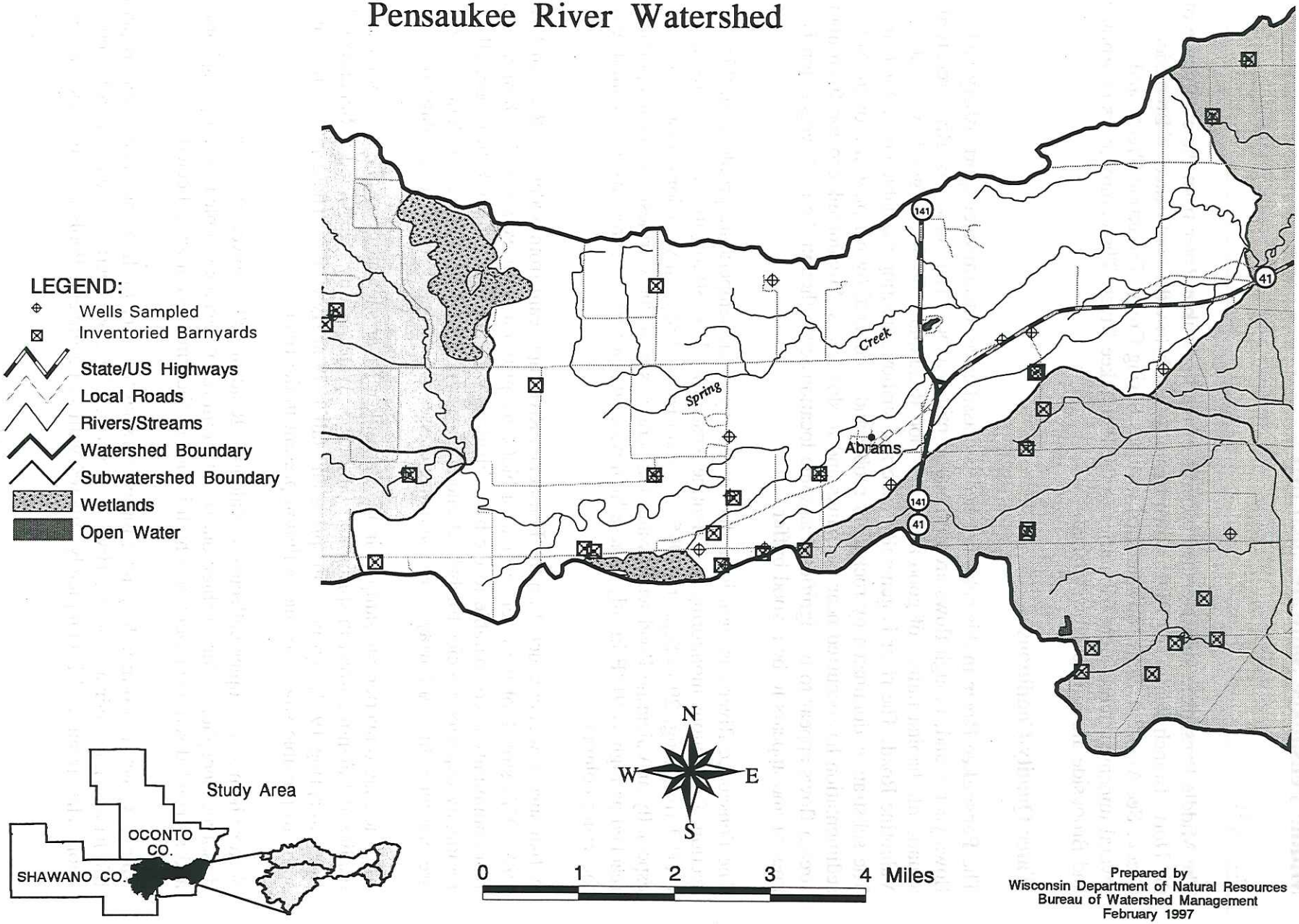
Aquatic macroinvertebrate samples in the Pensaukee River showed good and very good water quality at Valentine Road in spring and fall, 1993. Water quality rated good at Sandalwood Road in spring 1992, and good in spring and fall 1979 at Hwy. 141. These ratings indicate some to possible slight organic pollution present in the river.

Water chemistry samples collected at Valentine Road in 1993 showed elevated levels of dissolved phosphorus during three out of four rain runoff events sampled. Total phosphorus and suspended sediment were also high in one of the runoff samples collected.

Spring Creek is a 6-mile-long intermittent flowing tributary to the Pensaukee River. Aquatic life habitat rated fair at County. Hwy. E in spring 1995, but overall habitat is considered poor. The stream bed is completely covered with soft sediment. Pools and riffles are absent.

Map 2-4 Middle Pensaukee Subwatershed

Pensaukee River Watershed



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Without continuous flow, aquatic life is severely limited in Spring Creek most of the year. A macroinvertebrate sample collected in spring 1993 at Hwy. 141 when flow was good, rated water quality as very good indicating possible slight organic pollution. Several sections of Spring Creek have been channelized and are affected by beaver dams. Much of the Spring Creek drainage area is wooded.

Brookside Creek is a 5-mile-long intermittent flowing tributary to the Pensaukee River. Aquatic life habitat is poor because of the lack of stream flow during most of the year. Brookside Creek has a history of significant runs of northern pike, and therefore, probably other fish species. The stream bed substrate is mostly soft sediment and sand. Riffles are absent and water ponds near bridges and culverts. Most of Brookside Creek has been ditched. Water chemistry samples collected at County. Hwy. J showed elevated levels of dissolved phosphorus during all three rain runoff events sampled in 1995. Biochemical oxygen demand, ammonia, and total phosphorus levels were also found at elevated concentrations in some samples.

Since the Pensaukee River in this subwatershed flows continuously, has a good gradient and rocky substrate, aquatic life habitat is fairly good. An increase in stream depth and available cover would considerably increase the habitat for adult game fish. Flooding and erosion of the streambanks cause the wide and shallow stream channel. A reduction of nutrients and sediment, not only from this subwatershed but also from the upstream subwatersheds, could still improve aquatic life and habitat conditions by stabilizing dissolved oxygen levels and decreasing sediment accumulation.

Aquatic life in both Spring Creek and Brookside Creek is limited by intermittent stream flow. A nutrient and sediment loading reduction would most significantly benefit the receiving waterbody (Pensaukee River); however, it would still improve aquatic life and habitat in the streams themselves when water is present. Stream channelization expedites rain runoff and causes these creeks to dry up earlier than they normally would.

Nonpoint Source Pollutants (MP)

- The Middle Pensaukee Subwatershed contains 9 animal lots which contribute 400 pounds of phosphorus [organic], annually. This represents an estimated 8 percent of the phosphorus for the entire watershed.

- The upland sediment delivery in the Middle Pensaukee Subwatershed is 982 tons, annually, or 4 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 69 percent of the load.

- About 10 percent of the sediment delivered from streambanks in the watershed comes from the Middle Pensaukee Subwatershed.

Water Resource Goals and Objectives (MP)

The following goals and objectives are recommended for the water resources of the Middle Pensaukee Subwatershed:

1. Improve aquatic life habitat and water quality by:
   a. creating and maintaining buffers that filter sediments and other pollutants, provide shading and stabilize streambanks.
   b. reducing nutrient/phosphorus loading by a high level which will reduce macrophyte growth and stabilize oxygen levels.
   c. reducing sedimentation rates by a high level.
   d. discouraging maintenance dredging of drainage ditches to allow the natural meandering of the stream channels.
   e. protecting, enhancing, and restoring wetlands to slow the release of water to the stream and filter sediment and other pollutants.
   f. decreasing extreme flooding which widens the stream channel, warms water, and decreases water depth and cover for adult fish.
2. Improve wildlife habitat by:
   a. protecting, enhancing, and restoring streambank corridors.
   b. protecting, enhancing, and restoring wetlands.
3. Extend duration of base flow past May in Spring Creek and Brookside Creek to provide spawning and nursery areas for fish by:
   a. creating and maintaining buffers to decrease peak flooding and increase infiltration of precipitation into the soil.
   b. protecting, enhancing and restoring wetlands to slow release of water to creeks.
   c. discouraging maintenance dredging of drainage ditches to allow the natural meandering of the stream channels.
   d. increasing cropland best management practices, such as conservation tillage, which will increase infiltration.

Lower Pensaukee Subwatershed (LP)

Description

The Lower Pensaukee Subwatershed consists of the Pensaukee River from just below the confluence of Brookside Creek to the river mouth on Green Bay. This subwatershed includes several unnamed intermittent tributaries to Pensaukee River and also several direct drainage ditches to Green Bay. The Pensaukee State Wildlife Area is along the shore of Green Bay. Wetlands cover a significant portion of land in this subwatershed. The communities of Pensaukee and Oak Orchard are in this subwatershed. See Map 2-5.

Water Quality Conditions

The Pensaukee River in this subwatershed is classified as warmwater sport fish and flows year-round. In the upper reaches it received aquatic life habitat ratings of good at Bell Bridge Road and between good and fair at Hwy 41. The substrate is mostly rocks and rubble with some hard sand in the slow areas. The rocky substrate is covered by periphyton growth. Bank erosion is moderate from high stream flow even though the stream corridor is mostly trees and shrubs. Shallow stream depths limit available cover for fish. Near the mouth, the river is wide, deep, and slower moving then upstream. Sediment accumulates in the river mouth and Green Bay and has been dredged in the past.

Continuous dissolved oxygen and temperature monitoring in the Pensaukee River August 30 through Sept. 13, 1995, at Bell Bridge Road did not show any problems. This is probably because cooler water temperatures in September hold more oxygen than warmer summer temperatures that were monitored upstream. The most critical period for aquatic life is mid-summer during the highest temperatures and lowest flows. Aquatic macroinvertebrate samples showed good water quality in spring and fall, 1979 which indicates some organic pollution present in the Pensaukee River at Bell Bridge Road.

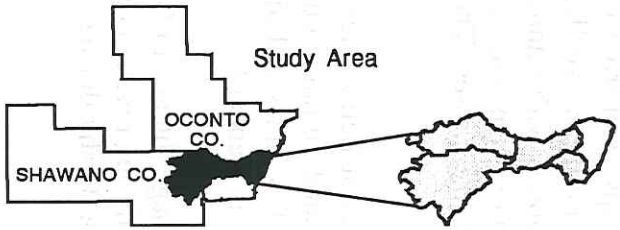
A fishery survey was conducted on the Pensaukee River upstream from Hwy 41 in July, 1995. This stretch of the river received a biotic integrity rating of excellent. This rating means the fish community is comparable to the best situations with minimal human disturbance; all regionally expected species for habitat and stream size, including the most intolerant forms, are present with a full array of age and size classes. The trophic structure is balanced.

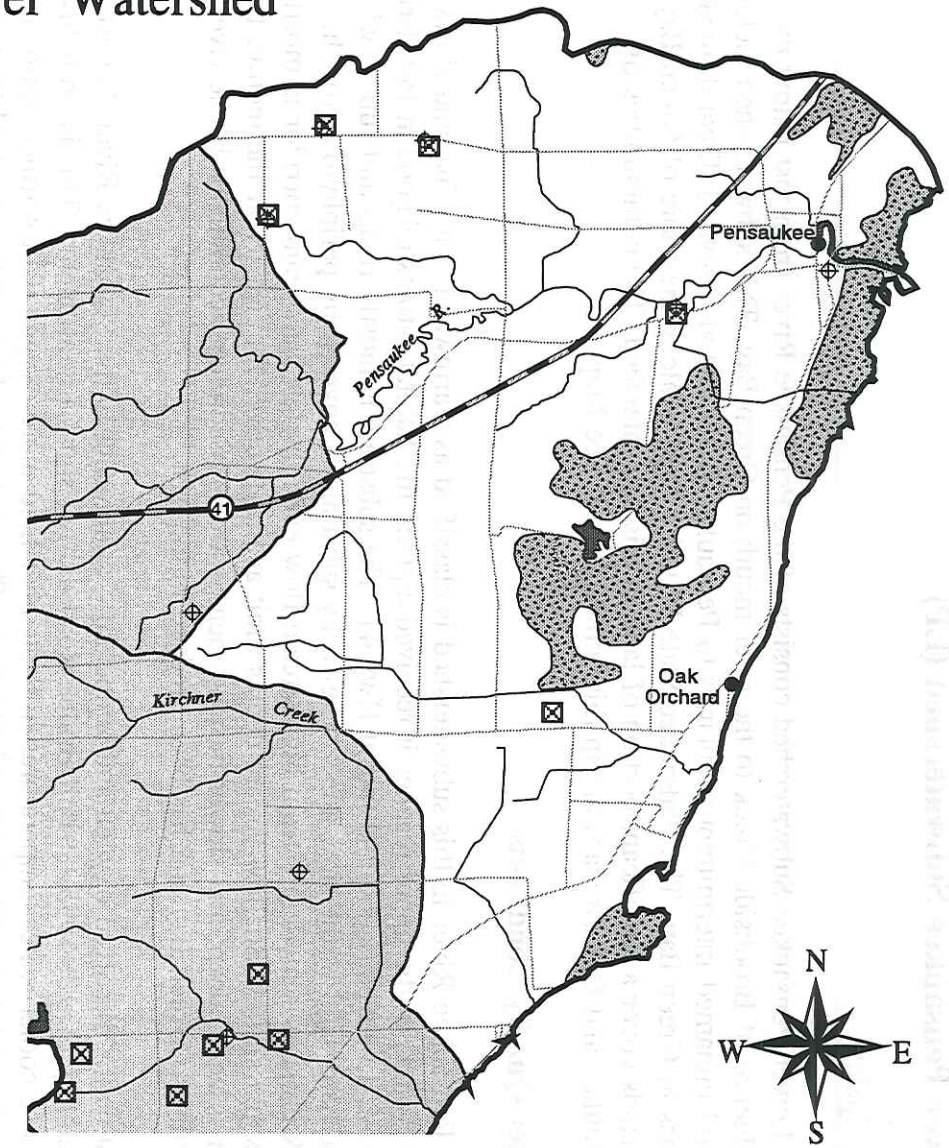
Water chemistry samples collected on the Pensaukee River at Bell Bridge Road monthly from 1977 to 1993 shows total phosphorus concentrations elevated on numerous occasions. Suspended sediment concentrations were elevated only a few times and dissolved oxygen levels were recorded only five times below the 5 mg/l state standard.

No specific monitoring was conducted on the direct drainage ditches to Green Bay. Many of these tributaries are small intermittent streams that flow through wetland areas. Since most have been channelized and have little buffers, they can be flashy during rain events. Cattle pasturing has caused some bank erosion.

Map 2-5 Lower Pensaukee Subwatershed

Pensaukee River Watershed





LEGEND:

- Wells Sampled
- Inventoried Barnyards
- State/US Highways
- Local Roads
- Rivers/Streams
- Watershed Boundary
- Subwatershed Boundary
- Wetlands
- Open Water

0 1 2 3 4 Miles

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The Pensaukee River in this subwatershed is significantly impacted by sediment and nutrient loading from all of the upstream subwatersheds. As the current slows when it reaches Green Bay, sediment and attached nutrients settle out and accumulate near the mouth. A reduction in nutrients and sediment loading to both the upstream subwatersheds and this subwatershed would not only improve conditions in the river mouth and benefit Green Bay, but would also improve aquatic life habitat and reduce periphyton growth in the river upstream of CTH SS. Also, an increase in stream depth and available cover would considerably increase the habitat for adult game fish.

Nonpoint Source Pollutants (LP)

- The Lower Pensaukee Subwatershed contains 7 animal lots which contribute 133 pounds of phosphorus [organic], annually. This represents an estimated 3 percent of the phosphorus for the entire watershed.

- The upland sediment delivery in the Lower Pensaukee Subwatershed was not inventoried due to inaccuracy of the computer model in this flat terrain combined with the relative lesser amount of soil disturbance here compared to other subwatersheds.

- Most of the sediment load in this subwatershed is thought to come from the streambanks of small tributaries which flow directly into Green Bay. There are many potential areas for wetland restoration, if they're not already wetlands, in these near-shore areas.

Water Resource Goals and Objectives (LP)

The following goals and objectives are recommended for the water resources of the Lower Pensaukee subwatershed:

1. Improve aquatic life habitat and water quality by:

    a. creating and maintaining buffers that filter sediments and other pollutants, provide shading and stabilize streambanks.
    b. preventing the trampling of the streambanks by limiting livestock access.
    c. reducing nutrient/phosphorus loading by a medium level which will reduce macrophyte growth.
    d. reducing sedimentation rates by a medium level.
    e. discouraging maintenance dredging of drainage ditches to allow the natural meandering of the stream channels.
    f. protecting, enhancing, and restoring wetlands to slow the release of water to the stream and filter sediment and other pollutants.
    g. decreasing extreme flooding which widens the stream channel, warms water, and decreases water depth and cover for adult fish.

2. Improve wildlife habitat by:

   a. protecting, enhancing, and restoring streambank corridors.
   b. protecting, enhancing, and restoring wetlands.

3. Protect, enhance, and restore perennial and intermittent streams and ditches to the Pensaukee River and Green Bay to provide spawning and nursery areas for fish by:

   a. creating and maintaining buffers to decrease peak flooding and increase infiltration of precipitation into the soil.
   b. protecting, enhancing and restoring wetlands to slow the release of water to the streams.
   c. discouraging maintenance dredging of drainage ditches to allow the natural meandering of the stream channels.
   d. increasing cropland best management practices, such as conservation tillage, which will increase infiltration.

Kirchner Creek Subwatershed (KC)

Description

The Kirchner Creek Subwatershed consists of the entire drainage area of Kirchner Creek.

Water Quality Conditions

Kirchner Creek is a 5-mile-long intermittent tributary to Green Bay. See Map 2-6. Most of this creek and its tributaries have been ditched and straightened causing flows to be very flashy and the creek to dry up earlier than it normally would. Kirchner Creek received an aquatic life habitat rating of fair at CTH S, but overall is considered poor because of the limited supply of water available to aquatic life. The stream banks are protected from erosion with grass growth, although some banks are pastured.

Water chemistry samples collected on Kirchner Creek at CTH S in 1995 showed elevated levels of total and dissolved phosphorus during all three runoff events sampled. Ammonia levels were high in two out of the three samples and biochemical oxygen demand was high once. The creek is very turbid during runoff events.

Aquatic life is most significantly limited by the intermittent stream flow of Kirchner Creek. The channelized creek speeds runoff rates and supplies adequate aquatic life habitat only during snow melt and rain events. The extremely turbid runoff water indicates a high loading of sediment to this creek and ultimately to Green Bay. A loading reduction would not only benefit the bay of Green Bay, but also provide habitat when water is available.

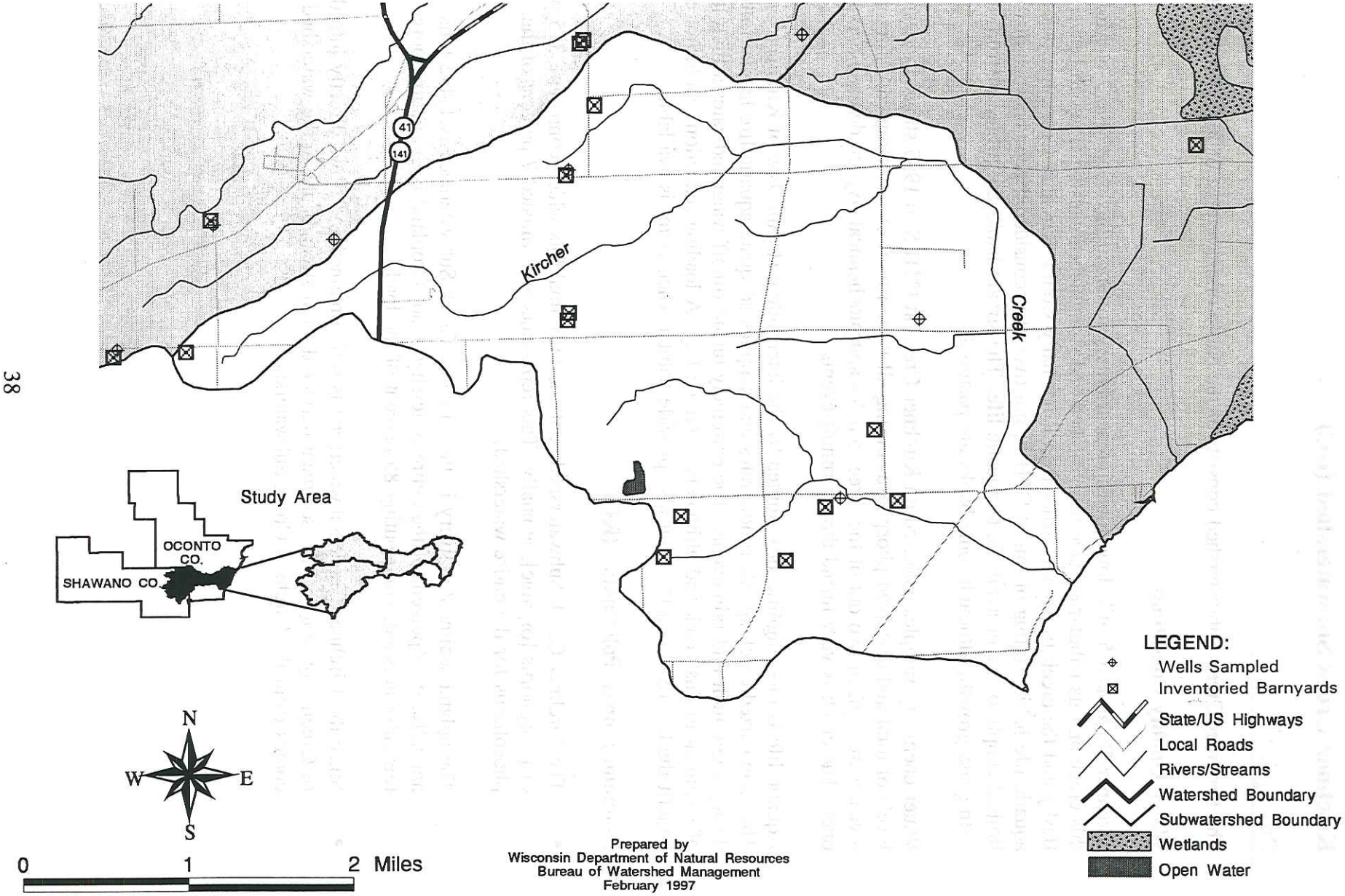
Nonpoint Source Pollutants (KC)

- The Kirchner Creek Subwatershed contains 11 animal lots which contribute 345 pounds of phosphorus [organic], annually. This represents an estimated 7 percent of the phosphorus for the entire watershed.

- The upland sediment delivery in the Kirchner Creek Subwatershed is 1,492 tons, annually, or 6 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 85 percent of the load.

- Since the Kirchner Creek Subwatershed is self-contained and flows directly into the bay of Green Bay, none of the sediment delivered from streambanks in the watershed comes from the Kirchner Creek Subwatershed.

Map 2-6 Kirchner Creek Subwatershed
Pensaukee River Watershed



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Water Resource Goals and Objectives (KC)

The following goals and objectives are recommended for the water resources of the Kirchner Creek Subwatershed:

1. Improve aquatic life habitat and water quality by:

    a. creating and maintaining buffers that filter sediments and other pollutants, provide shading and stabilize streambanks.
    b. preventing the trampling of the streambanks by limiting livestock access.
    c. reducing nutrient/phosphorus loading by a medium level.
    d. reducing sedimentation rates by a medium level.
    e. discouraging maintenance dredging of drainage ditches to allow the natural meandering of the stream channels.
    f. protecting, enhancing, and restoring wetlands to slow the release of water to the stream and filter sediment and other pollutants.
    g. decreasing extreme flooding which widens the stream channel, warms water, and decreases water depth and cover for adult fish.

2. Improve wildlife habitat by:

    a. protecting, enhancing, and restoring streambank corridors.
    b. protecting, enhancing, and restoring wetlands.

3. Protect, enhance, and restore perennial and intermittent streams and ditches to Kirchner Creek and Green Bay to provide spawning and nursery areas for fish by:

    a. creating and maintaining buffers to decrease peak flooding and increase infiltration of precipitation into the soil.
    b. protecting, enhancing and restoring wetlands to slow the release of water to the streams.
    c. discouraging maintenance dredging of drainage ditches to allow the natural meandering of the stream channels.
    d. increasing cropland best management practices, such as conservation tillage, which will increase infiltration.

Table 2-4 Surface Water Resource Conditions, Problems, and Nonpoint Sources of Pollution of Each Subwatershed in the Pensaukee River Watershed

Subwatershed	Stream Name	Fish and Other Aquatic Life Uses[1]	Fishery IBI[2]	Habitat Rating[3]	Biotic Index Rating[4]	Chemistry[5]	Problems/ Limiting Factor[6]	Observed or Potential Sources of Pollution[7]
Upper Pensaukee	Pensaukee River	WWSF	—	Fair to Poor	Good to Fair	DP, TP, DO, TEMP	FLO, SED, PL, DO, NUT, TEMP, HAB, CH, FLD, DEPTH	CL, SB, PSM, PSI, PSB, BY, WSM
Pensaukee Lakes	Pensaukee Lakes	—	—	—	—	TP, DO	NUT, SED, DO, STRAT	CL, PAS, WSM
North Branch Pensaukee	North Branch Pensaukee River	WWSF	Excellent to Good	Good to Poor	Good to Poor	DP, TP, DO, TEMP	DO, TEMP, HAB, BD, SED, CH, NUT, DEPTH	CL, BY, WSM
Middle Pensaukee	Pensaukee River	WWSF	Excellent	Good to Fair	Very Good to Good	TP, DP, SS, DO, TEMP	SED, DO, PL, NUT, TEMP, DEPTH, FLD	SB, CL, BY, WSM
	Spring Creek	WWSF	—	Fair	Very Good	—	FLO, SED, HAB, CH, BD	CL, BY, WSM
	Brookside Creek	WWSF	—	Poor	—	BOD, AMM, TP, DP	FLO, SED, HAB, NUT, CH	CL, BY, WSM
Lower Pensaukee	Pensaukee River	WWSF	Excellent	Good to Fair	Good	TP, SS, DO	PL, NUT, SED, HAB, DEPTH, FLD	SB, CL
	Unnamed Direct Drainage Tributaries	WWSF	—	Poor	—	—	CH, FLO, FLD	CL, PSB
Kirchner Creek	Kirchner Creek	WWSF	—	Fair	—	AMM, TP, DP, BOD	FLO, CH, TURB, HAB, NUT, FLD, SED	CL, PSB, BY, WSM

LEGEND:

[1] **Fish and Other Aquatic Life Uses** - this column indicates the current biological use and classification supported by the stream.
COLD - coldwater communities
WWSF - warmwater sport fish communities
WWFF - warmwater forage fish communities
LFF - limited forage fishery (intermediate surface waters)

[2] **Fishery IBI** - this column indicates fish assemblages for assessing biotic integrity and environmental health in warmwater streams based on fish habitat and communities present.

[3] **Habitat Rating** - this column indicates the relative quality and quantity of aquatic life habitat in the stream.

[4] **Biotic Index Rating** - this column indicates water quality condition based on the Hilsenhoff Biotic Index which uses macroinvertebrates as an indicator of organic pollution.

[5] **Chemistry** - this column indicates water chemistry monitoring values exceeding acceptable levels (except dissolved oxygen)
DP - Dissolved Phosphorus
TP - Total Phosphorus
SS - Suspended Solids
AMM - Ammonia
BOD - Biochemical Oxygen Demand
DO - Dissolved Oxygen (less than state standard of 5 mg/l)
TEMP - Temperature

[6] **Problems/Limiting Factors**
HAB - Habitat (lack of sufficient habitat)
SED - Sedimentation
TEMP - Temperature (warm)
DO - Dissolved oxygen problems
FLO - Limited stream flow
PL - Aquatic plants/algae (abundant)
NUT - Nutrient enrichment
TURB - Turbidity
CH - Channelization (ditching)
BD - Beaver dams
STRAT- Summer stratification
DEPTH- Stream depth and little overhead cover
FLD - Flooding streambanks

[7] **Observed or Potential Sources of Pollution**
CL - Cropland erosion
SB - Streambank erosion
PSB - Streambank pasturing
BY - Barnyard or exercise lot runoff
PSM - Point source, municipal treatment plant discharge
PSI - Point source, industrial discharge
PAS - Public access site
WSM - Winter spread manure

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

This section describes the nonpoint source inventories, objectives and cost-share eligibility criteria for each pollutant source. These sources include: barnyard runoff; agricultural nutrients; and sediments from upland areas, gully erosion, and streambank and shoreline erosion.

Management Categories

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

Management category eligibility criteria are expressed in terms of tons of sediment delivered to surface waters from eroding uplands and streambanks; pounds of phosphorus (organic) delivered to surface waters; feet of streambank trampled by cattle; and pounds of heavy metals and organics from urban areas. Any newly created sources requiring controls after the signing of a cost-share agreement for a particular site must be controlled at the landowners' expense.

Nonpoint source pollutant load reduction in the Pensaukee River Priority Watershed project will be achieved mainly through voluntary participation. The Oconto and Shawano 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.

Critical Management Category

Nonpoint source sites included in this category individually contribute a significant amount of the pollutants affecting surface waters. State statutes require that the nonpoint source control plan contain necessary language to ensure the reasonable likelihood of achieving water quality goals and objectives. Landowners with sites that meet the critical sites criteria established during plan development are required by law to address those specific sites by reducing the nonpoint source pollutant load to an acceptable level. Pollutant load reduction can occur solely through the action of the landowner with guidance from county staff or through watershed cost-share participation.

Each site will be field verified before the landowner receives notification of the critical site, with the findings sent to the DNR Northeast Region office in Green Bay. Landowners interested in receiving cost-share assistance to install best management practices (BMPs) will need to sign cost-share agreements with the appropriate county Land Conservation Department.

Notification of landowners with critical sites will begin when Shawano and Oconto counties are able to identify individual fields for specific management categories in the FOCS/WINHUSLE database. The highest ranked sites will be notified first until all landowners or land operators with critical sites have been notified. A more detailed schedule is written in the "Cost-Share Agreement, Landowner Contact Strategy and Inventory Completion" section of this plan, p. 92. The notification will include the following information:

- The 36-month period during which landowners are eligible for the level of state cost sharing described in Wisconsin Administrative Code Chapter NR 120, after which the cost-share rate is reduced by half.

- The potential consequences the landowner may face if no action is taken as defined in either Chapter NR 243 for animal waste, or s. 281.20(1), (3), or (5) or receiving a notice of discharge, requiring a WPDES permit, or the issuing of a notice of intent.

- The right to appeal the designation of a critical site through a written request to the Land Conservation Committee within 60 days of receipt of the notification letter. See also "Critical Sites Appeal Process" section on p. 93-94.

Eligible Management Category

Specific nonpoint sources of pollution in this category contribute less significantly to water quality. These sites are eligible for technical and cost-share assistance but are not as critical to reaching water quality objectives. Other sites and practices which reduce pollutant loads; protect groundwater; or improve and protect habitat for fish and wildlife will be eligible for state cost sharing.

Ineligible Management Category

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

Barnyard Runoff

Runoff carrying a variety of pollutants from barnyards and other confined livestock areas is a major source of pollutants in the streams of the Pensaukee River Watershed. Barnyard runoff is detrimental because of high BOD (biological oxygen demand), COD (chemical oxygen demand), bacteria, phosphorus, ammonia, salts and sediment. Phosphorus is the primary nutrient of concern because it is most often the limiting nutrient in natural water bodies. Phosphorus is also the nutrient most amenable to control, and for this reason will be the target of most broad strategies for water quality management in the Pensaukee River Watershed project.

A total of 261 animal lots are a source of 4,862 pounds of phosphorus, per year (Table 2-5). Most of the oxygen-demanding pollutants and nutrients associated with these operations drain via concentrated flow to the Pensaukee River, tributary creeks and wetlands.

The objective for barnyard runoff control is to reduce phosphorus loading to streams by a total of 50 percent. Based on past experience, it was determined that a total of 75 percent of this reduction will be obtained solely through voluntary participation.

Barnyard sites contributing a phosphorus load greater than 100 pounds annually will be designated as a critical site for control. An estimated five sites meet this criteria in the entire watershed. Those landowners with animal lots designated as critical sites for control are eligible for a complete barnyard system. If the site owner is unable to manage installation or operation of a complete barnyard system, or if the LCD determines that a complete system is not necessary to greatly reduce the phosphorus load from that site, the owner will only be required to divert upland clean water and roof runoff away from the lot. Installation of these low-cost practices alone will provide significant pollutant load reductions in the Pensaukee River Watershed. State cost sharing is available for these low-cost clean water diversions, and landowners of critical sites will also be eligible for a full barnyard system to achieve more phosphorus control if they wish to install them with state cost sharing.

Barnyard sites that contribute between 20 pounds and 100 pounds of phosphorus annually, will be considered as eligible for cost sharing on either low-cost diversion practices or full barnyard systems, yet important for participation in the Pensaukee River Watershed if the phosphorus reduction objective is to be met. After the barnyard inventory, watershed staff identified about 79 yards which meet this phosphorus loading criteria in the entire watershed.

Cost-Share Cap. To maintain cost effectiveness, only those landowners with barnyard sites delivering more than 40 pounds of phosphorus to surface water on an annual basis will be eligible for cost sharing for a complete barnyard runoff management system (37 barnyards). Landowners with barnyards delivering between 39 pounds and 20 pounds of phosphorus annually will be eligible to receive barnyard runoff management systems or less expensive clean water diversions, with a $10,000 cost-share cap for state funding on any concrete work within that 20-39 pound range (42 barnyards). Cost sharing funds for clean water work (roof gutters, diversions, etc.) are not included in this $10,000 cost-share cap.

Low-Cost/Low-Tech Only. Barnyard sites that are contributing between 10 and 20 pounds of phosphorus annually will only be eligible for clean water diversions and roof runoff control. Approximately 48 barnyards fall into this category. Barnyards contributing less than 10 pounds of phosphorus are not eligible for cost sharing.

Landowners wishing to participate in the watershed project who have an animal lot that falls within this category may need to address their barnyard as a component of the agreement, based solely on the discretion of the Shawano or Oconto county Land Conservation Department. The landowner would need only to divert clean upland water and roof runoff away from the animal lot.

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

Internally Drained Barnyards

Internally drained barnyards drain to surface depressions or wetlands rather than directly to surface waters. A total of 12 internally drained yards and 2 yards draining to sinkholes were identified in the Pensaukee River Watershed. Eligibility for internally drained animal lots is based on a site-by-site analysis where significant groundwater contamination was determined to be likely.

Where an internally drained lot was not identified during the planning phase, field investigations will be conducted jointly by the county project staff, water resource management staff from the DNR's Northeast Region office, and staff from the DATCP.

Table 2-5 Barnyards Inventory Results and Eligibility Criteria
Goal: 50% Reduction in Phosphorus Loading

Subwatershed	Inventory Results			Criteria	
	Number of Barnyards	Lbs. Phosphorus	% of Barnyard Phosphorus by Subshed	Critical Sites > 100 lbs. P	Eligible Sites 10-100 lbs. P
				# Barnyards	# Barnyards
Upper Pensaukee (UP)	184	3,018	62	2	81
North Branch (NB)	48	931	19	1	20
Middle Pensaukee (MP)	9	400	8	1	8
Lower Pensaukee (LP)	7	133	3	0	4
Kirchner Creek (KC)	11	345	7	1	7
Pensaukee Lakes (PL	2	35	1	0	2
Total	261	4,862	100	5	122

Critical Sites	5		Eligible Sites	122		Total Sites	261
P Reduced by Critical Sites	578 lbs.		P Reduced by Eligible Sites	1,722 lbs.		Total Reduction	2,300 lbs.
Reduction from Critical Sites of Overall P Load	12%		Reduction from Eligible Sites	35%		Total Reduction	~50%
Portion of Reduction Goal Achieved from Critical Sites	25%						

Agricultural Nutrients

The overall watershed goal is to reduce the amounts of nutrients, pesticides, and sediment delivered to the streams. Mismanagement of cropland spread or stored manure, fertilizers, and pesticides causing runoff will be targeted for improved management through the adoption of a Nutrient Management Plan (NRCS Standard 590).

Development of a Nutrient and Pesticide Management Plan (NRCS Standard 595) will give a landowner an opportunity to have an equal balance of enhancing water quality while maintaining a sustainable agricultural system that reduces excess nutrient applications and the costs associated with it.

The Pensaukee River Watershed project goal for manure spreading on unsuitable lands is to reduce manure applications on snow-covered cropland not suited for winterspreading by 90 percent.

Nutrient and Pest Management

Nutrient and pest management is recognized as one of only a few BMPs for manure spreading that can be applied for protection or improvement of groundwater and surface water. Farmers can benefit from nutrient and pest management plans by taking nutrient credits for legumes and landspread manure. Commercial fertilizer applications are then adjusted to meet crop needs and can generally be reduced. Landowners with cropland involved in critical and eligible livestock operations (Table 2-5) and cropland used for "cash cropping" will be encouraged to participate in an on-farm nutrient an pest management educational program to reduce the over-application of nutrients and pesticides.

More than 68,000 acres of cropland from these operations will be eligible to participate in this program. Every landowner is eligible for cost sharing for nutrient management.

Nutrient management will be addressed with the development of nutrient management plans. Nutrient and pest management will be addressed with the development of both nutrient management and pest management plans which may include crop scouting and soil tests. These plans may be prepared by crop consultants and must be consistent with NRCS Standard 590 and 595. Landowners will be eligible to participate for up to three years of cost sharing towards crop consultant fees, soil testing and residual nitrogen analysis, and manure nutrient analysis. A cost-share rate of 50 percent is available for all nutrient and pesticide management practices, with a cost-share rate of 70 percent on spill control basins. These plans will be submitted to and approved by the Shawano and Oconto County Land Conservation Departments. Records should be kept showing progress towards reducing the use of fertilizer and pesticides.

Manure Storage

Nutrient management will be a significant component of manure management systems, barnyards and manure storage facilities. DNR fish managers have documented their field observations and concerns that "winter and fall manure spreading appear to be a massive problem," and "land spreading should be a paramount concern" in the Pensaukee River Watershed. Oconto and Shawano County LCDs conducted an inventory to determine critical acres spread with manure for each farm in the watershed. Critical acres were defined by using the "nutrient rating guide" and the NRCS Standard 590. Cost-sharing eligibility for a grant for manure storage practices will be based on the development of a preliminary nutrient management plan, developed in accordance with NRCS Standard 590. A landowner is encouraged to address the water quality impact if the nutrient management plan demonstrates that manure cannot be practically 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 use of the manure can be achieved following adoption of the intended storage practice.

The eligibility for storage facilities will be based on the least-cost system. These options may include, but are not limited to: properly sited unconfined manure stacks (in accordance with Standard 312); the construction of a short-term storage facility (capacity for 30 to 100 days manure production in accordance with Standard 313); the construction of a long-term storage facility (capacity for up to 210 days production in accordance with Standard 313 or 425). Additional options for reducing the surface water quality impact from over-application of manure to cropland are: a reduction in the number of animals; the rental of additional lands suitable for winter spreading; or haul or broker manure which cannot be spread (without causing a surface water quality problem) to a neighboring farm to use the manure in accordance with a nutrient management plan. Landowners with site-specific manure handling problems coming directly from the barn and with indirect runoff to the stream will be eligible for temporary manure stacking based on county staff evaluation.

Landowners receiving cost sharing for manure storage or barnyard practices are required to develop a nutrient management plan for those acres that will receive manure applications resulting from these practices.

Manure Storage Facility Abandonment

Malfunctioning manure storage facilities as defined in Shawano and Oconto county manure storage ordinances will be eligible for cost sharing. Manure pits will be abandoned according to NR 120 Wisconsin Administrative Code requirements, to protect groundwater and surface water. Landowners with storage facilities abandoned under this cost-share program will be eligible for state cost sharing for new storage facilities.

Rural Sediments

Upland Sediment

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

Upland sediment sources were evaluated through subarea sampling and extrapolation for the entire watershed (166 square miles). The results of this inventory are summarized in Table 2-6. Based on extrapolated computer modeling data, an estimated 25,791 tons of soil per year are delivered to wetlands or streams in the watershed from croplands. An additional 2,441 tons/year are estimated as delivered from uplands that are not used for cropland. Uplands are the source of an estimated 91 percent of the sediment delivered to surface waters. Table 2-6 summarizes upland sediment loading by land use for all subwatersheds, not including the Lower Pensaukee Subwatershed which was not included in the computer-assisted inventory because of its flat topography.

Reduction Goal

A 30-percent reduction in sediment from eroding fields is targeted for agricultural lands. This would reduce the sediment load delivered to surface waters by approximately 7,729 tons/year. This translates into bringing *all lands* delivering sediment to streams at a rate greater than .6 tons/acre/year down to .6 tons/acre/year or less. Soil erosion and sediment delivery rates are calculated using the USLE in addition to other hydrology information located in the WINHUSLE model (FOCS database). A partial inventory (a representative sample of roughly 23 percent of the entire watershed land area) was completed at the time of plan writing and the results were extrapolated to the rest of the watershed; therefore, the county staff will need to continue the inventory throughout the first three or four years after plan approval to more thoroughly identify eligible and critical fields.

Cropland Critical Sites

To be classified as "critical sites," landowners' fields must be contributing greater than "T," or the tolerable soil loss in tons/acre/year, ***or*** be determined to deliver greater than 1.4 tons/acre/year of sediment reaching surface waters. Based on an extrapolation of the inventory information, approximately 3,055 acres of cropland in the Pensaukee River Watershed meet the critical site criteria. Controlling these acres would reduce the sediment load delivered to surface waters by an estimated 1,952 tons per year. All critical site cropland fields will need to be reduced to T or less and deliver sediment to the stream at 1.4 tons/acre/year or less.

Those landowners having cropland fields with a soil loss greater than T will receive initial critical site notification. [See "Cost-share Agreements, Landowner Contact Strategy and Inventory Completion" section of Chapter 3, p. 92.] This includes approximately 625 acres,

when inventory information is extrapolated to the entire watershed. Implementing soil conservation practices to bring the soil loss down to T on these fields would reduce the sediment load delivered to surface waters by approximately 614 tons/year, or 8 percent of the total sediment reduction objective, and 32 percent of the cropland critical site loads.

The remaining 68 percent of the cropland critical site sediment loads will be focused on cropped fields delivering sediment to surface waters at a rate greater than 1.4 tons/acre/year. An additional 2,430 acres of cropland (1,338 tons of sediment) meet this critical site criteria, when extrapolated from inventory data. Project staff members believe these critical site fields have one or more of the following characteristics:

1. Land Slope of C (6-12 percent).
2. Directly adjacent to tributaries of the Pensaukee River or the main stem.
3. Moldboard plowing tillage practice.
4. Row cropping of 3 or more years in succession.

Project staff will target these fields through face-to-face contact with landowners as part of the continuing inventory process. In addition to early contacts and field verification of critical sites during the first year of implementation, county staff will complete inventory of cropland fields for those landowners with barnyard critical sites to evaluate the whole farm for total critical sites. The county watershed staff will be accountable, as part of their annual evaluation meeting with DNR, for making reasonable progress towards addressing fields in these situations. Evaluations with Oconto and Shawano County LCD staff members, the DNR and DATCP staff are conducted annually. Following the third year of project implementation, the Pensaukee River Watershed will be evaluated by the Shawano and Oconto County LCDs in conjunction with the DNR's Northeast Region (or Upper Green Bay Basin) priority watershed coordinator and DNR's Central Office critical sites coordinator for progress. If acceptable progress has been made prior to the fourth year of the project implementation, the criteria for critical sites may be re-evaluated and a plan amendment pursued.

Acceptable progress at the four-year mark (January 2000) is defined as completing the entire WINHUSLE inventory and achieving 50 percent (3,865 tons) of the project's total cropland sediment reduction objective through various management options which have either been installed or are part of signed cost-share agreements.

Cropland Eligibility

An additional 75 percent of the sediment reduction goal delivered to the stream, as shown by the WINHUSLE model, will be controlled through "eligible" sites, which includes roughly 46,000 acres, controlling a minimum of 5,800 tons. Eligible classification includes those fields delivering sediment at a rate down to .1 tons/acre/year. See Table 2-7.

Table 2-6 Summary of Upland Sediment Loading By Land Use: Pensaukee River Watershed

Subwatershed		Cropland	Farmstead	Pasture	Woodland	Natural Areas	Mined	Recreation	Developed and Industrial	Totals
Upper Pensaukee	Acres	33,497	950	401	5,210	2,111	240	0	260	42,669
	Sediment	17,473	1,183	94	63	0	0	0	36	18,849
North Branch	Acres	16,315	469	178	6,653	1,928	134	0	55	15,732
	Sediment	5,876	419	0	0	0	0	0	16	6,311
Pensaukee Lakes	Acres	641	25	0	246	65	0	0	0	977
	Sediment	495	29	0	0	0	0	0	0	524
Middle Pensaukee	Acres	6,184	1,150	583	7,322	1,045	0	642	230	17,156
	Sediment	679	295	0	4	0	0	4	63	1,045
Lower Pensaukee	Acres	7,247	414	37	4,528	228	0	0	57	12,511
	Sediment	*	*	*	*	*	*	*	11	11*
Kirchner Creek	Acres	4,798	258	33	2,264	98	0	0	0	7,451
	Sediment	1,268	224	0	0	0	0	0	0	1,492
Totals	Acres	68,682	3,266	1,232	26,223	5,475	374	642	602	106,496
	Sediment	25,791	2,150	94	67	0	0	4	126	28,232

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

* Because of flat topography of this subwatershed, the WINHUSLE model was not accurate for that area. It was considered as one temporary settling area for sediment loads from upstream watersheds. Therefore the sediment load totals coming out of the entire watershed were actually calculated from the outflow point of the Middle Pensaukee Subwatershed. Landowners in the Lower Pensaukee will be eligible for upland sediment-reduction practices based on site-by-site evaluation throughout the watershed project.

Table 2-7 Upland Sediments

Subwatershed	Inventory Results			Goal: 30% reduction in sediment delivered = 7,729 tons						
	Cropland Area - (Acres)	Tons per year - Sediment delivered from cropland	% contributed by watershed	Critical Sites >T soil loss or >1.4 tons/acre/yr sediment delivery			Eligible Sites >/= .1 sediment delivery			Total % of Goal from each Subshed based on WINHUSLE alone
				# Acres	Target - Tons Reduced	% Reduced of Goal	# Acres	Target - Tons Reduced	% Reduced of Goal	
Upper Pensaukee	33,497	17,473	67%	2,497	1,528	20%	31,155	3,714	48%	67%
North Branch	16,315	5,876	23%	519	395	5%	11,714	1,368	18%	23%
Pensaukee Lakes	641	466	2%	39	29	.4%	938	111	1%	2%
Middle Pensaukee	6,184	679	3%	-	-	-	260	204	3%	3%
Lower Pensaukee	7,247	NA	NA	-	-	-	-	-	-	-
Kirchner Creek	4,798	1,268	5%	-	-	-	1,817	380	5%	5%
Totals	68,682	25,791	100%	3,055	1,952	25%	45,884	5,777	75%	100%

Gully Erosion

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

Soil erosion that occurs from gully activity on cropland will mainly be controlled through grassed waterways. In some instances, other BMPs such as high residue management or installing structural practices that reduce peak flow and increase infiltration up-field may reduce or eliminate the need for grassed waterways.

If an on-site evaluation of an active gully leads local LCD staff to the conclusion that installing structural practices would not be cost effective, that site will be deemed as ineligible for those specific practices. All active gullies will be eligible for critical area stabilization and seeding.

Landowners with active gullies who wish to participate in the Pensaukee River Priority Watershed project through cost sharing for any practice must agree to control at least 50% of the runoff from their gullies through the priority watershed or other means.

Lesser noticed ephemeral gullies are suspected to be significant part of the erosion problem in northeastern Wisconsin in general with its clay soils and flat slopes. During runoff events, they both erode and aggrade; but after the runoff has dissipated, they may appear no different than surrounding land, making them difficult to detect during an inventory. As part of their landowner contacts, LCD staff will consider upland areas on the farm which may be susceptible to ephemeral gullies and examine options with the landowner for reducing sediment runoff from them.

Streambank Erosion

Streambank erosion contributes less than 1 percent of the total sediment to surface waters in the Pensaukee River Watershed. Approximately 36 miles of stream were evaluated representing a very small portion of the total stream miles in the watershed. Sites for the evaluation were selected based on whether or not there was a problem there and if it could be corrected in a cost effective manner through the watershed program. Significant erosion has occurred and/or aquatic habitat and water quality were degraded along approximately 2 miles of streambank. An estimated 379 tons of sediment are eroding into streams annually. See Table 2-8 for streambank inventory results. The formula used to evaluate tons delivered from slumping streambanks was: bank length, multiplied by the bank height multiplied by the lateral recession rate and soil density, all divided by 2,000.

Continued evaluation of streams -- named and unnamed -- and ditches will be conducted on a site-by-site basis at the discretion of the Shawano and Oconto county LCDs during the implementation phase.

Since streambank erosion has not been identified as a significant problem in the watershed, no critical sites for control will be designated. Eligible streambanks are those sites that contribute at least 1 ton of sediment to the stream annually using the formula described above. If an on-site evaluation of an eroding streambank leads local LCD staff to the conclusion that installation of structural practices would not be cost effective, that site will be deemed ineligible. Generally, streambank sites that are located within woodland or wetland areas are not accessible and would not be cost effective to correct.

See Tables 2-9a and b for streambank eligibility criteria and results of the limited inventory. Additional sites on continuous streams, uninventoried ditches, and intermittent streams which meet the criteria above may be identified.

Eligible streambanks include all those with livestock access.

Table 2-8 Streambank Inventory Results: Pensaukee River Watershed Streambank Erosion and Degraded Habitat

Stream	Streambank Length (feet)	Inventoried Streambank Length (feet)	Eroded Sites (feet)	Trampled Sites (feet)	Slumped Sites (feet)	Cattle Access (feet)	Total Sediment Loss Tons/Year	% of Total Bank Erosion in Watershed
North Branch	110,291	19,000	0	0	0	0	0	0
Upper Pensaukee	141,088	72,000	20,655	3,550	275	3,550	372	91%
Middle Pensaukee	76,300	76,300	650	500	0	500	7	9%
Lower Pensaukee	34,200	34,200	0	0	0	0	0	0
Kirchner Creek	26,400	0	0	0	0	0	0	0
Spring Creek	31,680	0	0	0	0	0	0	0
Brookside Creek	26,400	0	0	0	0	0	0	0
Totals	446,359	201,500	21,305	4,050	275	4,050	379	100%

Source: Shawano and Oconto County LCDs

The formula used to evaluate tons delivered from slumping, eroding or trampled streambanks was: $\frac{\text{bank length} \times \text{bank height} \times \text{lateral recession rate} \times \text{soil density}}{2{,}000.}$

Table 2-9a Eroding Streambanks

Management Category	Sediment Delivery	Target Reduction
Eligible	> 1 ton/year	< 1 ton year
Not Eligible	< 1 ton/year or in inaccessible areas where BMPs would not be cost effective	N/A

Table 2-9b Trampled Streambanks

Management Category	Description	Objective
Eligible	Trampled / Degraded / Livestock Access	Vegetated / No Livestock Access
Not Eligible	Vegetated / No Livestock Access	N/A

Pollutant Reduction Objectives for Rural Nonpoint Sources

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

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

Sediment Objectives: Reduce overall sediment delivered by 30 percent. To meet this, the following is needed:

- 30 percent reduction in sediment reaching streams from agricultural uplands in all subwatersheds.
- 50 percent reduction in streambank sediment delivered to all streams and a 20 percent overall repair of streambank habitat in all subwatersheds.

Phosphorus Objective: Reduce overall phosphorus load by 50 percent to meet this, the following is needed:

- 50 percent reduction in P from barnyards in all subwatersheds.
- A reduction in P from landspread manure.
- 30 percent reduction in P from sediment delivered from uplands to all streams in the watershed.

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

Urban Inventory Results, Runoff Pollutants and Pollution Reduction Goals

Due to the majority of Pensaukee River Watershed area currently in rural land uses, an urban nonpoint source inventory and analysis was not conducted. However, on a smaller scale a broad-based analysis was developed including the types of nonpoint source pollutants associated with the existing urban land uses in the small communities in the watershed. Also, given the current trends towards residential development in the watershed area, local communities are strongly encouraged to develop land use plans and construction site erosion control measures in order to stay ahead of any potential degradation of the Pensaukee River and its tributaries through urbanization.

Description of Urban Runoff

The principal water quality and quantity problems derived from urban runoff result from many factors including:

- Loadings of sediment, nutrients, heavy metals and other toxic materials.
- Stream channel modifications, including straightening and lining with concrete.
- Hydrologic disturbances, including flashy high flows and loss of base flow.
- Streambank erosion.

Urban runoff carries a variety of pollutants to surface water. Pollutants found in urban runoff include heavy metals (lead, copper, zinc, cadmium and chromium) and a large number of toxic organic chemicals (polychlorinated biphenols, polycyclic aromatic hydrocarbons, pesticides and many others). Other substances in urban runoff include sediment, nutrients, bacteria, and protozoans.

The delivery of pollutants to streams from existing urban areas depends on the types of urban land uses, the types of stormwater conveyance systems, and urban pollution prevention practices, such as street sweeping, yard waste collection, and waste oil recycling programs. Freeways, commercial and industrial areas have the highest unit/area/year pollutant loads, producing the most significant amounts of metals and other urban toxic pollutants. Medium density and multi-family residential areas also generate metals, sediment and phosphorus and include large impervious areas. Residential areas contain more lawn area than commercial areas, while commercial areas have more rooftop, street, and parking lot surfaces. Lawns can also contribute fertilizers and pesticides. Rooftop areas are important sources of zinc and atmospheric pollutants. Their connection to the storm drainage system may be direct or indirect, depending on the use of downspouts, grassed areas, drain tiles, etc.

Existing urban land uses are shown in Tables 2-10a and b. The respective amounts and types of pollutant loads are shown in Tables 2-11 and 2-12. The greatest amount of urban land in the watershed is concentrated near the highway corridors of U.S. Hwys. 41 and 141 and State Hwy. 29 which is being expanded to four lanes from Green Bay westward. In addition, the southwestern and eastern areas of the watershed have the greatest amount of new medium

to low-density residential development. Runoff from new urban areas has the potential to further degrade lake and stream water quality unless stormwater management controls are incorporated during development.

Average Urban Loads
Pollutant - lbs/acre/year

Estimated Pollutant Generation Rates from Urban Land Uses Without Control Practices

Pollutant (in lbs. per acre per year)	Land Use					
	Residential	Institutional	Commercial	Industrial	Open Spaces	Freeway
Solids	400	650	1,900	1,750	46	3,000
Phosphorus	.326	.266	1.26	.76	.16	1.52

Land Use Descriptions

Residential - The value in the table represents a medium density residential development, urban single and two-family housing at a density between 2 and 6.5 units per acre, including the house, driveway, yard, and streets. Low-density residential is at a density less than 2 units per acre, and high-density residential is greater than 6.5 units per acre.

Institutional - Includes such land uses as schools, churches, hospitals, and government buildings.

Commercial - Commercial areas for which the primary function involves the sale of goods and services. This also includes shopping malls.

Industrial - Those buildings and premises which are devoted to the manufacture of products. This category also includes utility power plants.

Open Spaces - Outdoor recreational areas including municipal playgrounds, golf courses, cemeteries, and natural areas.

Freeway - Limited-access highways and the interchange areas. The pollutant load can be significantly lessened through the use of grass swales.

Construction sites - Unit area load averages for acres under construction are estimated to be 20 tons/acre/year, or 40,000 lbs/acre/year.

Source: Source Loading and Management Model (SLAMM)

Table 2-10a Urban Land Uses for Pensaukee River Watershed Communities

Village	Land Use in Acres						
	Res	Inst	Comm	Indust	Open	Freeway	Total
Brookside	19.5	2	2.5	-	10	-	34
Morgan	4.5	2.5	.5	3.1	2.8	-	13.4
Abrams	90.1	10.7	9.3	2	68.3	15	195.4
Pensaukee	45.8	-	1.3	.8	9.5	0	57.4
Green Valley	17	-	-	8	16.5	-	41.5
Zachow	18	-	1.5	4	10	-	33.5
Krakow	108	-	-	2.5	96	-	206.5
Angelica	20	-	-	-	-	-	20
TOTAL	322.9	15.2	15.1	20.4	213.1	15	615.1

Table 2-10b Urban Land Uses by Subwatershed

Subwatershed	Land Use in Acres						
	Res (low density)	Inst	Comm	Indust	Open	Freeway	Total Urban Acres
Pensaukee Lakes	6	-	-	-	-	-	6
North Branch	21.5	2.5	.5	11.1	19.3	-	54.9
Upper Pensaukee	146	-	1.5	6.5	106	-	260
Middle Pensaukee	109.6	12.7	11.8	2	78.3	15	229.4
Lower Pensaukee	45.8	-	1.3	.8	9.5	-	57.4
Kirchner Creek	-	-	-	-	-	-	-
TOTAL	328.9	15.2	15.1	20.4	213.1	15	607.7

The land use abbreviations used in these four tables stand for the words below (definitions on previous page):

Res = Residential
Inst = Institutional
Indust = Industrial
Comm = Commercial
Open = Open Space
Freeway = Freeway

Table 2-11 Sediment Loading from Communities

Village	**Sediment:** Unit Area Load (pounds/year)						
	Res	Inst	Comm	Indust	Open Space	Freeway	Total
Brookside	7,800	1,300	4,750	-	460	-	14,310
Morgan	1,800	1,625	950	5,425	129	-	9,929
Abrams	36,040	6,955	17,670	3,500	3,142	45,000	112,307
Pensaukee	18,320	-	2,470	1,400	437	-	22,627
Green Valley	6,800	-	-	14,000	759	-	21,559
Zachow	720	-	2,850	7,000	460	-	11,030
Krakow	43,200	-	-	4,375	4,416	-	51,991
Angelica	8,000	-	-	-	-	-	8,000
Totals	122,680	9,880	28,690	35,700	9,803	45,000	251,753
Total Sediments From All Communities							

Table 2-12 Phosphorus Loading in Communities

Village	**Phosphorus:** Unit Area Load (pounds/year)						
	Res	Inst	Comm	Indust	Open Space	Freeway	Total
Brookside	6.36	.53	3.14	-	1.60	-	11.63
Morgan	1.47	.66	.63	2.36	.45	-	5.57
Abrams	29.37	2.85	11.72	1.52	10.93	22.80	79.19
Pensaukee	14.93	-	1.64	.61	1.52	-	18.70
Green Valley	5.54	-	-	6.08	2.64	-	14.26
Zachow	5.87	-	1.89	3.04	1.60	-	12.40
Krakow	35.21	-	-	1.90	15.36	-	52.47
Angelica	6.56	-	-	-	-	-	6.56
Totals	105.31	4.04	19.02	15.51	34.10	22.80	200.78
Total Phosphorus From All Communities							

Stormwater Conveyance

Description

Stormwater is most commonly conveyed to streams through a combination of storm sewers, roadside ditches, grassed swales and ponds. Since there are no storm sewers in the small communities within the Pensaukee watershed, stormwater from urban areas is most typically carried via roadside ditches to nearby streams. Properly designed grassed swales generally reduce runoff volume because of infiltration, and sod vegetation serves to remove some pollutants from runoff before it flows into streams and storm sewer systems.

The types and amounts of pollutants transported by runoff depend on the way that pollutant-bearing surfaces are connected to the storm drainage system. For example, commercial parking areas and arterial streets, deliver the highest concentrations of lead, asbestos, cadmium, and street sediment because normally these areas are drained by storm sewers or pipes that discharge to a stream or lake.

Reducing pollutant transport to surface waters involves reducing the amount of urban storm water reaching streams, primarily from impervious paved surfaces. This is accomplished by increasing the infiltration of storm water into the soil and ground layers. Storm water infiltration on a suitable site can effectively reduce nonpoint pollution. In addition, infiltration can help stabilize the hydrology of small urban streams by replenishing groundwater, much of which is ultimately discharged to surface water. Infiltration can reduce bank erosion and the need for expensive, highly engineered drainage structures such as concrete lined channels. Infiltration practices can be used with wet detention ponds to supplement pollutant removal effectiveness or reduce pond size.

Practices that increase on-site infiltration include porous pavements, redirecting roof downspouts to grassed areas, and directing runoff water to infiltration trenches. These practices are generally most applicable to small source areas such as rooftops and parking lots. Grassed swale drainage systems can also be used to reduce runoff and erosion. Finally, infiltration basins can be located at the end of drainage outlets serving larger drainage areas.

Management Needs and Alternatives

Local municipalities should be educated if they are not already as to the effects of further development of urban areas on the watershed. This will be addressed as part of the Pensaukee River Education Plan. [See Chapter 5.]

Construction Site Erosion

Description

Construction sites are those areas in any phase of construction that involves disturbing the soil through grading or excavation. Construction sites in the project area entail new development and

renovation or redevelopment. The renovation and redevelopment activities include utility replacement, street replacement, bridge reconstruction, or rehabilitation of commercial, industrial, or residential areas.

Construction site erosion is an increasingly major water quality concern in the watershed. Uncontrolled construction site erosion can devastate aquatic communities in lakes receiving sediment-laden runoff. The reduced capacity of stormwater conveyance systems resulting from sedimentation can cause localized flooding. Importantly, water quality improvements occurring through implementation of nonpoint source control practices for existing urban areas can be negated by construction site erosion pollution sources. Predicting rates of construction site erosion is difficult. However, erosion rates exceeding 75 tons/acre/year can occur. This rate of erosion is greater than occurs on the most severely eroding croplands and 65 times the sediment loading rate from existing commercial and industrial areas. Often the proximity of construction sites to storm sewers or other drainage ways serving urban areas results in nearly all of the sediment being delivered to streams.

Management Needs and Alternatives

Two levels of management were evaluated for construction sites:

1. Manage construction sites, assuming control practices which are 70 percent effective in controlling off-site sedimentation.

2. Manage construction sites, assuming control practices which are 50 percent effective in controlling off-site sedimentation.

Construction site erosion control throughout most of the watershed project area is critical to achieving sediment reduction goals. It is expected that the rate of construction activity will remain steady in the future. Without at least a 50-percent control of the sediment from theses sites, construction site erosion will remain a serious deterrent to desired water quality and aquatic life in the watershed project area.

Adopting and enforcing state and local ordinances can be an effective means to reduce construction site erosion and its adverse water quality impacts. In 1986, the DNR and the League of Wisconsin Municipalities cooperatively developed a model ordinance for the control of construction site erosion (DNR, 1987). It contains provisions for planning, designing, installing and maintaining erosion control practices. It also contains guidance for administering and enforcing the ordinance.

None of the counties or municipalities in the project area has ordinance requirements for controlling construction site erosion and sedimentation, and adopting such ordinances is strongly encouraged to reduce sediment delivery. In addition, developers are governed by state regulations (Ch. 281 Wis. Stats.) set forth by the Department of Industry, Labor and Human Relations (DILHR) for erosion control on sites with one and two family dwellings; and the DNR Wisconsin Pollutant Discharge Elimination System (WPDES) permit regulations for sites greater than five acres.

Despite these regulations, several potential impediments to effective erosion control exist. For example, developers sometimes perceive erosion control as an add-on cost and not a built-in cost of construction, enforcement is often done only in response to complaints, maintenance of erosion control is often poor, sedimentation basin designs consume large areas where vacant land is scarce, unnecessary grading and excavation is commonplace, soil is routinely tracked onto roads because preventative measures are not a high priority for builders, and there is often confusion about who is responsible for installing erosion control practices.

Local ordinances must meet the applicability and content requirements of NR 120.16 dealing with erosion control. The "Model Construction Site Erosion Control Ordinance," developed cooperatively by the DNR and the League of Wisconsin Municipalities (DNR, 1987), and suggested changes to the model ordinance (set forth by Mr. James H. Schneider, League Legal Counsel, in the March 1989 issue of "The Municipality") will be used as guides to determine adequacy of ordinances. Erosion control practice standards and applicability criteria should be consistent with those set forth in the *Wisconsin Construction Site Best Management Practice Handbook* (DNR, 1989).

The following is a list of specific recommendations that units of government and developers should address in developing an effective construction site erosion control program.

- Municipalities should review (and modify where needed) their existing ordinances to assure effective penalties for non-compliance and responses to concerns of citizens, inspection staff and developers.
- Municipalities should evaluate staffing and training needs for effective ordinance administration and enforcement.
- Municipalities should evaluate their permit fee schedule to investigate ways to raise revenue to support effective enforcement activities.
- Developers and contractors need to know what is expected of them, and they need better access to technical information through seminars and other educational activities and materials.
- Erosion control inspectors need specific guidelines for documenting ordinance violations in order to provide for more consistent and effective legal action.

An erosion control information and education strategy is described in Chapter Five.

Objectives

High priority items to improve compliance include more consistent issuance of citations, hiring of additional inspection staff where needed, new fee structures to cover the cost of improved staffing, and more effective court action when ordinance violations occur.

Because of the gaps in state agency regulations, construction erosion control is best accomplished through a local erosion control ordinance, locally administered building codes, practice standards

and application guidelines, an effective administrative program and effective enforcement. Training programs are needed for staff administering ordinances and developers who are responsible for installing and maintaining the erosion control practices.

Pollution Prevention Practices

Description

Pollution prevention practices are conducted to remove pollution at its source and prevent the need for treatment once they enter the resource. Practices include street sweeping, yard waste collection, recycling programs, and a variety of behavioral changes.

These factors affect the amount of pollutants from urban surfaces carried to lakes and 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. Repeated street sweeping of commercial and industrial areas in the early spring, to remove winter accumulation of sand and street dirt, and in the fall, to remove leaves, provides the greatest benefit. The potential for lawn care chemicals to be carried by runoff to nearby streams and drainageways is also a concern. Fertilizer residues can enrich surface waters with nutrients and promote algae growth. Pesticides can add to toxic pollution.

Many benefits can be gained through changes in lifestyle by urban residents such as reducing the amount of automobile traffic and adopting erosion control practices. There are many actions individuals can take; the following is a partial list:

- Reduce or eliminate the use of galvanized roof materials and gutters, a primary source of zinc in urban runoff. Revise municipal building codes where possible.

- Remove pet wastes immediately from lawns, sidewalks, and streets to reduce bacterial contamination of urban runoff. Enforce local pet waste ordinances and familiarize pet owners with good pollution prevention practices.

- Control the timing and reduce the amount and type of fertilizer and pesticide applications in all areas. Market phosphorus-free fertilizer.

- Dispose of automobile waste fluids such as radiator water and engine oil appropriately, keeping them out of the storm sewer system. Set up municipal recycling programs for antifreeze and waste oil. Create partnerships with car dealerships and auto maintenance shops in the watershed project area.

- Remove street dirt, leaves and debris from catch basins, streets and parking lot surfaces through municipal street maintenance and leaf collection programs.

- Control development and redevelopment through zoning which, in part, considers on-site suitability for storm water management practices to meet water quality, habitat, and flood prevention objectives.

- Control construction site erosion.

- Minimize use of street de-icing compounds.

- Reduce the amount of motorized traffic.

- Reduce the areal extent of parking lots.

Objective

Encourage the use of pollution prevention practices, such as those listed through local programs. This goals ties together closely with the information and education component of the project.

Eligibility for Wetland Restoration and Easements

Wetland Restoration

There will be no critical sites for wetland restoration. All inventoried wetlands or former wetlands (1,530 acres) will be classified as eligible for restoration if the sites meet the criteria on p. 10. Other sites not meeting these criteria may be eligible if prior approval is obtained from DNR. The targeted goal is to restore at least 10 percent (23 sites, or 150 acres) of the wetland sites inventoried. See Table 2-1 for wetland inventory details.

Wetland restoration is considered a best management practice for the purpose of controlling nonpoint sources of pollution. In the case of the Pensaukee River Watershed, staff hope that wetland restorations will also serve to improve or restore the overall hydrology of the river system, especially in terms of improved base flow through the summer months. Other practices such as conservation tillage, buffers, nutrient management and reforestation (not cost-shared) will also be encouraged to achieve this goal. Wetland restoration includes: the plugging or breaking up of existing tile drainage systems, the plugging of open channel drainage systems, other methods of restoring the pre-development water levels of an altered wetland, and the fencing of wetlands to exclude livestock. Secondary benefits of wetland restoration may be enhancement of fish and wildlife habitat.

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

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

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

2. Pastured wetlands riparian to streams, or tributaries.

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

3. Prior converted wetlands downslope or upslope from fields identified as Critical Management Area upland sediment sources through the WINHUSLE model.

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

- All upland fields draining to the wetland must be controlled to a soil loss rate that is less than or equal to the soils "T" value.

- Wetland restoration costs should normally be the **least-cost** practice to reach sediment reduction goals. However, within the Upper Pensaukee, Lower Pensaukee and Kirchner Creek Subwatersheds, wetland restorations of eligible prior converted wetlands will be considered over lower cost practices to control nonpoint source pollutants. The Upper Pensaukee Subwatershed is particularly threatened by sediment loading and low base flow levels and the Lower Pensaukee and Kirchner Creek Subwatersheds are valuable for northern pike migration and spawning habitat which is sometimes at risk due to low base flow levels.

It is important to note that wetland restorations can achieve a variety of objectives which could ultimately conflict with each other. Simply put, there are three different values that wetlands can provide: 1) water quality; 2) water quantity (includes both base flow stabilization and flood attenuation functions); and 3) habitat. These are separately valuable in their own rights, but we must rank each wetland restoration opportunity -- depending on its location in the watershed -- for which value we want the wetland to provide. For example, restoring a wetland for wildlife habitat purposes may mean something quite different in terms of how the restoration is engineered and designed than restoring a wetland for purposes of peak flow runoff retention. In some cases, the same wetland may fulfill two or more values, but probably does one better than the others.

During the wetland inventory process, much thought was given to these questions, and early conclusions suggest that if the potential wetland restoration is located in the Upper Pensaukee Subwatershed, the focus will be on establishing or re-establishing the wetland mainly for the purposes of enhancing base flow to the river ("quantity"). This could mean that wetland restorations and/or easements are just as valuable -- if not more valuable -- in areas not adjacent to the stream. Case-by-case, during implementation of this plan, the county watershed staff who are working with the landowners for a potential wetland restoration site, should meet with the local DNR fisheries manager, the local DNR wildlife manager, the DNR Northeast Region (or Upper Green Bay Basin) watershed implementation coordinator, and the NRCS area engineer to evaluate the best placement, size and design for each potential wetland. It would also be beneficial to include a representative from the U.S. Fish & Wildlife Service and the DNR's Northeast Region liaison to the state Department of Transportation working with the DOT to find and develop compensatory wetland restoration and mitigation sites.

In each case, the group will examine all the potential objectives of wetland establishment that can be achieved. In general, staff will avoid establishing only "monotype" wetlands that only catch sediment from upland fields. However, the objective of base flow ("quantity") should be held as the most important objective if there are multiple objectives possible. In establishing wetlands throughout the Pensaukee River Watershed, staff are advised by the fish managers to attempt to avoid, or stay upstream of, areas where the northern pike spawn so as to limit their chances of getting trapped in near-stream wetlands. Devices can be engineered to prevent fish from getting to the wetland area and keep discharges from harming the ecosystem of the stream.

An evaluation after each wetland is installed will be conducted by the county LCD staff and updated every few years to determine its effectiveness for water quality, quantity and/or habitat as well as how well the landowner perceives it is working. Computer modeling may be helpful.

Land Easements

Runoff Management 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: vegetative areas which minimize nonpoint source impacts and other direct impacts to streams;

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

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

- Animal Lot Relocation: areas such as a floodway where relocating an animal lot to a suitable site is necessary to minimize the amount of pollutants from the lot to surface or groundwater.

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

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

Easements should be considered in the following situations:

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

   - There is any grazing of wetlands.
   - Livestock density is so great that areas of non-vegetated soil are within 60 feet of streams or intermittent streams.
   - The streambank is severely trampled and eroding.

- Channel erosion is exacerbated by livestock grazing such that non-vegetated streambanks are two feet or more in height.

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

   - Row cropping is occurring within 60 feet or less of streams or intermittent streams.
   - Row cropping is being practiced on slopes greater than 6 percent.

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

   - The eligible wetland restoration is greater than 3 acres in size.

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

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

Ordinances

Manure Storage Ordinance

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

Oconto and Shawano counties enacted animal waste storage ordinances in 1986 and 1984, respectively. Oconto County's ordinance applies only to earthen pits. Shawano County's ordinance applies to all types of storage facilities.

Construction Site Erosion

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

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

The DNR suggests that the Wisconsin Construction Site Erosion Best Management Handbook (DNR Publication WR-222-93) be used as a reference for any development that occurs in the Pensaukee River Watershed.

The townships or villages of Abrams, Angelica, Zachow, Krakow, Green Valley, Brookside and Pensaukee are encouraged to adopt construction site erosion control ordinances.

Other Pollution Sources

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

Industrial Point Sources of Pollution

Discharges of wastewater from permitted municipal and industrial sources are important considerations for improving and protecting surface water resources. Chapter 283, Wis. Stats., requires any person discharging pollutants into the waters of the state to obtain a Wisconsin Discharge Elimination System (WPDES) Permit issued by the DNR.

Graf Creamery, Inc., near Zachow is the only industrial discharger in the Pensaukee River Watershed. Graf Creamery, Inc., discharges effluent directly to the Pensaukee River and to groundwater through direct discharge, spray irrigation on agricultural land, and ridge and furrow systems. Graf's WPDES permit expires in June 2000.

Sewage Treatment Systems

The Village of Krakow has its own sanitary district, as does the Village of Green Valley (see next paragraph). Wastewater generated by the remainder of the watershed residents is disposed of through private on-site systems.

Municipal Wastewater Treatment Plants

There is one wastewater treatment plant in the Pensaukee River Watershed. The village of Krakow has a municipal wastewater treatment plant that discharges to surface water (see below). Green Valley Sanitary District collects its wastewater and discharges it to the village of Krakow's treatment plant which then discharges it to surface water with the remainder of its discharge.

The village of Krakow WWTP discharges to the Pensaukee River. Treatment processes include: activated sludge, aerobic digestion, final clarification and effluent polishing. The system is currently in compliance with the requirements of its discharge permit. The Village of Krakow's WWTP's current permit expires in September 2000.

The Village of Pensaukee has applied for state funding of sewage treatment facility. The Pensaukee River Watershed staff endorses this application to protect ground and surface water of the river and the bay of Green Bay. Currently, the nearby City of Oconto (not in the watershed area) has connected sewer service to areas in the villages of Pensaukee and Oak Orchard, both in the watershed area.

The growing Village of Abrams and the surrounding area are encouraged to develop a sewage treatment facility.

Private Sewage Systems

Septic systems consist of a septic tank and a soil absorption field. Septic systems fail due to soil type, location of system, poor design or maintenance such as tanks which go unemptied. Pollutants from septic system discharges are nitrates, bacteria, viruses and hazardous materials from household products. Generally, in the Pensaukee River Watershed, the majority of soils are not suited for conventional septic tank soil absorption systems. The types of septic systems typically being installed at the time of this writing include above-ground, mound systems which involve hauling in suitable fill. Landspreading of septic system waste during the winter months can also create surface water quality problems.

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

Land Application of Municipal and Industrial Wastes

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

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

Municipal
There are eight approved septage landspreading sites in the Pensaukee River Watershed. Annual spreading of septic tank sludge is about 525,000 gallons on these sites and spreading of holding tank wastewater is approximately 338,000 gallons.

Industrial
There are three approved sites in the watershed that accept and spread industrial sludge ("ponch manure," or meat packing factory waste) from Green Bay Dressed Beef in Morgan Township.

Solid Waste Disposal Sites

Landfills

There are six inactive, formerly-licensed landfills in the Pensaukee River Watershed, three in Shawano County and three in Oconto County. The Town of Abrams, Town of Green Valley, and Shawano County-Angelica landfills ranked high enough to have monitoring wells installed; the sampling results show low levels of contamination and low levels of contaminants in the adjacent stream. There are no active landfill sites in the Pensaukee River Watershed.

Petroleum Storage: Leaking Underground Storage Tank (LUST) Sites

The Wisconsin Remedial Response Site Evaluation Report (DNR publication number SW-144-91) lists the sites identified through the LUST program. There are 10 known LUST sites listed under Table 2-3 with locations.

Other Contaminated Sites

The Wisconsin Remedial Response Site Evaluation Report also has the Inventory of Sites or Facilities Which May Cause or Threaten to Cause Environmental Pollution and the Spills Program List which includes sites or facilities identified under the Hazardous Substance Spill Law. See Table 2-3 for list of spill sites.

Mining

There is no known metallic mining in the Pensaukee River Watershed. There is some mining of sand and gravel in the Pensaukee River Watershed. At this time, Oconto County is working on an ordinance that would require a permit be obtained before opening up a mine. The ordinance would also contain language regarding the reclamation of mine sites and possible cost sharing available for reclamation of pre-existing mines.

CHAPTER THREE
Implementation

Introduction

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

- Best management practices (BMPs) needed to control nonpoint sources of pollution as described in Chapter Two;
- Cost containment policies;
- Cost-share agreement procedures;
- Schedules for implementing the project;
- Estimated project budget for cost-sharing, staffing, and for other support.

Best Management Practices

BMPs Eligible For Cost-Sharing And Their Rates

Best management practices control nonpoint sources of pollution and are identified in Wis. Admin. Code Ch. NR 120. Design and installation of all BMPs must meet the conditions listed in NR 120. Generally these practices use standard specifications included in the NRCS Field Office Technical Guide. In some cases additional specifications may apply. The applicable specifications for each BMP can be found in NR 120.14. The Department may also approve other "interim" best management practices and design criteria based on the provisions of NR 120.15.

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

The practices eligible for cost sharing and the cost-share rates for each BMP are listed in Tables 3-1 and 3-2 below; the BMPs listed in Table 3-1 can either be cost-shared at 50 percent or at the flat rates listed, except high residue management which is solely a flat rate.

Table 3-1 BMP Flat Rates

BEST MANAGEMENT PRACTICE	FLAT RATE
Contour Farming	$ 9.00/ac[1]
Contour Stripcropping	$ 13.50/ac[1]
Field Stripcropping	$ 7.50/ac[1]
High Residue Management	$ 18.50/ac[2]
Cropland Protection Cover	$ 25.00/ac[3]
Riparian Vegetated Buffer Strips	$100.00/ac[4]

[1] Wildlife habitat restoration components of this practice are cost-shared at 70%.
[2] Up to six years, pending approval of 1997 NR 120 code revision. Otherwise, up to three years as code reads at time of plan approval.
[3] Up to three years.
[4] Up to five years, as an "interim BMP" meaning initial and follow-up evaluation of effectiveness will need to be conducted by county staff at each installation of a buffer. As of plan approval, this practice is not yet an approved BMP, but staff expect DNR approval for its use in the Pensaukee River Priority Watershed project by the end of 1998 or sooner, allowing buffer sign-ups for at least 5 more years.

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

BEST MANAGEMENT PRACTICE	STATE COST SHARE RATE
Nutrient and Pesticide Management	50%
Pesticide Handling Spill Control Basins	70%
Livestock Exclusion from Woodlots	50%
Intensive Grazing Management	50% [1]
Manure Storage Facilities	70% [2] and 50%
Manure Storage Facility Abandonment	70%
Field Diversions and Terraces	70%
Grassed Waterways	70%
Critical Area Stabilization	70% [3]
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Shoreline and Streambank Stabilization	70% [3]
Shoreline Buffers	70% [3]
Wetland Restoration	70% [3]
Barnyard Runoff Management	70% [5]
Barnyard Relocation	70%
Roofs for Barnyard Runoff Management and Manure Storage Facilities	70%
Well Abandonment	70%
Structural Urban BMPs	70% [4]
Milking Center Waste Control	70%
Lake Sediment Treatment	70%
Cattle Mounds	70%

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

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

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

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

[5] Depending on pollutant load, a cost-share cap may apply.

Following are brief descriptions of some of the most commonly used BMPs.

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

Contour Stripcropping. Alternative strips of row crops and grasses or legumes on the contour.

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

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Barnyard Abandonment and Relocation. Abandonment or relocation of an animal lot from a crucial area such as a floodway to a suitable site to minimize the amount of pollutants from the lot to surface or groundwater.

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

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

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

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

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

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

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

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

Interim Best Management Practices

Under some circumstances, practices may be recommended that are not included on the BMP list. Administrative Code Ch. NR 120.15 provides for interim practices where necessary to meet the water resource objectives identified in the watershed plan. The Department may identify in the nonpoint source grant agreement the design criteria and standards and specifications where appropriate, cost share conditions, and cost share rates for each interim best management practice. It is important to note that these interim BMPs are not yet approved for use in this project, but are defined here because their use may be requested during the implementation phase. Interim BMPs that will be requested for the Pensaukee River Priority Watershed Project include, but are not necessarily limited to, the following:

Vegetated Riparian Buffer. Riparian buffers are permanently vegetated areas immediately adjacent to intermittent or perennial streams that are designed and constructed to function as a filter to delay, absorb, or purify contaminated runoff before it enters watershed streams and improve wildlife habitat. Because of the topography of the Pensaukee River Watershed and the current farm conservation practices already being applied keeping almost all cropped fields within or under "T" for soil loss, staff expect to focus on this BMP as one of the main tools for reducing sediment delivery to drainage ditches and other tributaries and the Pensaukee River itself. Staff expect DNR approval of its use as an interim BMP in this priority watershed project within the first three years of implementation.

A more detailed description of this requested interim BMP is located in the Appendix B of this plan.

Conservation Tillage Incentive Systems (CTIS). Conservation Tillage Incentive Systems are those combinations of cost-share incentive packages that are developed within the watershed plan for a specific project. CTIS typically use the high residue management system components to address the upland sediment reduction goals of the project. CTIS is defined as the existing high

residue management BMP in Wis. Admin. Code Ch. NR 120, with the ability to use it for a maximum of six years rather than the three-year limit currently in NR 120. At the time of this plan publication, a code revision was being pursued to change NR 120 to allow high residue management for up to six years. If this code revision is passed as it is expected to early summer 1997, CTIS would no longer be considered an "interim" BMP, but could be used as a regular BMP in this project. If the code revision is not passed, the county LCD would need to pursue approval as an interim BMP for use in this watershed project.

Total Livestock Confinement. Total livestock confinement shall be defined by the successful implementation of the "weather-proof" facility with total containment of all livestock and total containment of livestock-produced organic material until such time that it can be properly applied to cropland as a credited nutrient source or stored within an approved "liquid-tight" structure. If approved, this practice would have to be accompanied by a nutrient management plan.

The site must be otherwise eligible for a barnyard under the criteria in this plan. Cost sharing for total livestock confinement would be limited to the amount that would be cost-shared for an outdoor animal lot runoff control system which would have been installed for that site. For cost containment purposes, the county LCD shall determine the most cost-effective method of controlling the runoff pollutant source at that site to meet the water resource objectives and estimate the costs associated with each method; this estimate would not require a complete engineering design, but must be reviewed and agreed upon by a qualified engineering professional outside the county LCD such as NRCS or DATCP.

Approval of this practice and associated cost sharing are subject to approval and guidance by the DNR on a case-by-case basis. A formal application must be made by the county LCD to the DNR to use this practice. County LCD staff may also wish to consult the animal lot relocation BMP and request guidance from DNR.

Practices Not Cost-Shared

Practices not cost-shared, but which shall be included on the cost share agreement if necessary to control the nonpoint sources, are listed below (as listed in NR 120.17):

- That portion of a practice to be funded through other programs.
- Practices previously installed and necessary to support cost-shared practices.
- Changes in crop rotations.
- Changes in location of unconfined manure stacks involving no capital cost.
- Non-stationary manure spreading equipment.
- Practices needed for land use changes during the cost-share agreement period.
- Other practices necessary to achieve the objectives of the watershed project.
- Minimum levels of street sweeping and leaf collecting.
- Operation and maintenance of cost-shared BMPs.
- Practices already installed,with the exception of repairs to the practices which were rendered ineffective due to circumstances beyond the control of the landowner.
- Practices required to control sources which were adequately controlled at the time the cost-share agreement was signed, but which are producing an increased amount of pollutant loading to the surface or groundwater, counter to the water resource objectives of the watershed plan, due to the landowner's change in land management.
- Practices whose purpose is to accelerate or increase drainage of land or wetlands, except where drainage is required as a component of a BMP.
- Practices normally and routinely used in growing crops and required for growing crops or feeding livestock.
- Activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) Program or covered in other ways by Chapter 147 of Wis. Statutes, except urban nonpoint sources that must be controlled to obtain a WPDES permit if control of the sources is identified in the priority watershed plan and the sources are not required to obtain coverage under a WPDES stormwater permit for discharges associated with an industrial activity, as defined under ch. NR 216.

- Livestock operations which: have applied for and are eligible for WPDES permits, have been issued WPDES permits, have greater than 1,000 animal units, or are greater than 1,000 animal units and have been issued a notice of discharge.

- Septic system controls or maintenance.

- Dredging activities.

- Silviculture activities except as necessary for site stabilization.

- Practices to control spills from commercial bulk storage of pesticides, fertilizers, petroleum and similar materials.

- Activities and structures intended solely for flood control.

- Activities required as part of a license for a solid waste management site.

- Activities funded through state or federal grants for wastewater treatment plants.

- Active mining activities.

- Pollution control measures needed during building and utility construction and stormwater management practices for new developments.

- Pollution control measures needed during construction of highways and bridges.

- Other practices or activities determined by DNR not to meet the objectives of the program.

Cost-Share Budget

Costs of Installing BMPs

The quantity and type of management practices that are required to meet the water quality objectives of this project are listed in Tables 3-3, 3-4, and 3-5. The total capital cost of installing the BMPs are listed for a 100-percent landowner participation rate. However, the state share and local share capital costs for BMPs listed are based on 75-percent participation, a rate necessary to meeting pollutant reduction objectives. Units of measurement and cost per unit for the various BMPs are also included.

The capital cost of installing the Best Management Practices is approximately $9 million, assuming 100-percent participation. At 75-percent participation the capital cost is $6.7 million.

- State funds needed to cost-share this level of control would be approximately $4.5 million.
- The local share provided by landowners and other cost-share recipients would be approximately $2 million.

Easement Costs

Chapter Two identifies where Runoff Management program funds can be used to purchase easements. The estimated cost of purchasing easements on eligible lands is shown in Table 3-5. At 75-percent participation, the estimated purchase price of easements on eligible lands would be $500,000. Easements are funded at 100 percent and will be purchased by the state or by Oconto County or Shawano County.

Cost Containment

Cost Containment Procedures

Wis. Admin. Code Ch. NR 120 requires the LCDs, as grantors of cost-share agreements, identify and agree to use one or more of the following cost containment procedures that are described below to control the costs of installing BMPs. The cost containment procedure for this watershed project will likely frequently involve determining average costs and range of costs, but all the procedures listed below may be used to contain costs.

Average Costs: Based on past cost information, the LCD determines an average cost per unit of materials and labor for the installation of BMPs which may not be exceeded.

Range of Costs: Based on past cost information, the LCD establishes a cost range for installing a BMP. Eligible costs may not exceed the maximum cost of the range.

Bidding: The LCD requires the landowner or land operator to request bids from contractors for installing a BMP. The cost-share payment shall be calculated based on the lowest bid received.

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

Maximum Cost Share Limit: The LCD or the DNR established a maximum cost share rate limit not to exceed the rates specified in Chapter NR 120.18 for installing a BMP.

Municipal Work Group: The LCD hires or assigns its employees to install a BMP for a number of landowners and land operators if the employees are able to perform the work at a cost lower than the private sector.

Wisconsin Conservation Corps: The LCD may use the WCC to install BMPs for landowners.

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

Cost-share payments will be based on actual installation costs. If actual installation costs exceed the amount of cost sharing determined by the cost estimates, then the amount paid the grantee shall be documented in writing, explaining the unusual circumstances and attached to the cost-share agreement or amendment and attached to the request for reimbursement submitted to the DNR by the LCD.

Table 3-3 Cost-Share Budget Needs for Management Practices in Oconto County

BMP	Number	Cost/Unit ($)	Total Cost ($)	75% Participation		Hrs/ Unit	Total Hours
				State Share	Local Share		
Upland Control							
Change in Crop Rotation	200 ac	NA	0	0	(1)	.1	20
Contour Cropping	200 ac	9	1,800	1,350	135	.3	60
Contour Strip Cropping	60 ac	13.5	810	608	61	.5	30
High Residue Management (4)	3,600 ac	18.5	66,600	49,950	4,995	.04	144
Cropland Protection Cover (Green Manure)	1,800 ac	25	45,000	33,750	3,375	.04	72
Intensive Grazing Management (Rotational Grazing)	2 ea	4,000	8,000	3,000	3,000	15	30
Critical Area Stabilization	20 ac	800	16,000	8,400	3,600	.5	10
Grass Waterways	10 ac	3,000	30,000	15,750	6,750	22	220
Field Diversions and Terraces	500 ft	3	1,500	788	338	.04	20
Grade Stabilization	3 ea	4,000	12,000	6,300	2,700	50	150
Agricultural Sediment Basin	2 ea	11,000	22,000	11,550	4,950	90	180
Shoreline and Riparian Buffers	500 ac	500	250,000	131,250	56,250	2	1,000
Nutrient Management (2)	15,000 ac	6	90,000	33,750	33,750	.1	1,500
Nutrient and Pest Management (2)	12,500 ac	10	125,000	46,875	46,875	.1	1,250
Spill Control Basin	3 ea	20,000	60,000	31,500	13,500	40	80
Wetland Restoration	12 ea	2,000	24,000	12,600	5,400	34	408
Livestock Exclusion, Woods	5,000 ft	1	5,000	1,875	1,875	.01	50
Uplands Subtotals				389,296	187,554		5,224

(1) Local share consists of labor and equipment costs. Also see flat rates in Table 3-1.
(2) Nutrient and Pest Management is cost shared per acre over a three year period. Number of acres shown represents 3 times the eligible acres.
(3) Manure storage is cost-shared at 70% for the first $20,000 of cost and at 50% for the remaining cost, not to exceed $35,000.
(4) High Residue Management is cost-shared per acre over a 6-year period as a interim BMP until approved and incorporated into NR 120. Number of acres shown represents 6 times the eligible acres.

Source: Wisconsin DNR, DATCP, and Oconto County

(Table continues next page)

BMP	Number		Cost/Unit ($)	Total Cost ($)	75% Participation (Critical Sites 100%)		Hrs/ Unit	Total Hours
					State Share	Local Share		
Barnyard Runoff Control & Manure Storage								
Filter Strip / Filter Wall / Sediment Basin - *Regular Cost Sharing*	10	ea	20,000	200,000	112,000	48,000	100	800
Filter Strip / Filter Wall / Sediment Basin - *$10,000 Cost-Share Cap*	9	ea	14,285	128,565	67,500	28,927	100	700
Roof Gutters	30	ea	1,500	45,000	23,625	10,125	3	70
Clean Water Diversion	30	ea	2,500	75,000	39,375	16,875	21	500
Roofs	2	ea	25,000	50,000	13,125	5,625	0	0
Manure Strg. Facility (3)	18	ea	62,000	1,116,000	472,500	364,500	120	1,680
Manure Storage Facility Abandonment	2	ea	10,000	20,000	10,500	4,500	20	40
Cattle Mounds	2	ea	3,000	6,000	3,150	1,350	20	40
Barnyard Abandonment or Relocation	2	ea	16,500	33,000	17,325	7,425	100	200
Well Abandonment	15		600	9,000	4,725	2,025	20	300
Milking Ctr. Waste Ctrl.	15	ea	7,000	105,000	55,125	23,625	40	600
Barnyard & Storage Subtotals					818,950	512,977		4,930
Streambank Erosion Control								
Shape and Seeding	5,000	ft	10	50,000	26,250	11,250	.1	500
Fencing	4,500	ft	1	4,500	2,363	1,013	.06	270
Rock Riprap	1,000	ft	30	30,000	15,750	6,750	.2	200
Bio-Bank Stabilization	1,450	ft	20	29,000	15,225	6,525	.5	725
Crossing	2	ea	3,000	6,000	3,150	1,350	18	36
Remote Watering Syst.	3	ea	2,000	6,000	3,150	450	15	45
Streambank Subtotals					65,888	27,338		1,776
Miscellaneous								
Structural Urban BMPs	1	ea	4,000	4,000	2,100	300	80	80
Subtotal					1,276,234	728,169		12,260
Easements	225	ac	1,000	225,000	225,000	0	10	2,250
Total					1,501,234	728,169		14,260

See footnotes at bottom of previous page of this table. Source: Wisconsin DNR, DATCP, and Oconto County

Table 3-4 Cost-Share Budget Needs for Management Practices in Shawano County

BMP	Number		Cost/Unit ($)	Total Cost ($)	75% Participation		Hrs/ Unit	Total Hours
					State Share	Local Share		
Upland Control								
Change in Crop Rotation	6,250	ac	NA	0	0	(1)	.1	625
Contour Cropping	500	ac	9	4,500	3,375	338	.3	150
Contour Strip Cropping	500	ac	13.5	6,750	5,063	506	.5	250
High Residue Management (4)	62,500	ac	18.5	1,156,250	867,188	86,719	.04	2,500
Cropland Protection Cover (Green Manure)	3,000	ac	25	75,000	56,250	5,625	.04	120
Intensive Grazing Management (Rotational Grazing)	8	ea	4,000	32,000	12,000	12,000	15	120
Critical Area Stabilization	20	ac	800	16,000	8,400	3,600	.5	10
Grass Waterways	90	ac	3,000	270,000	141,750	60,750	22	1,980
Field Diversions and Terraces	1,200	ft	3	3,600	1,890	810	.04	48
Grade Stabilization	15	ea	4,000	60,000	31,500	13,500	50	750
Agricultural Sediment Basin	5	ea	11,000	55,000	28,875	12,375	90	450
Shoreline and Riparian Buffers	250	ac	500	125,000	65,625	28,125	2	500
Nutrient Management (2)	25,000	ac	6	150,000	56,250	56,250	.1	2,500
Nutrient and Pest Management (2)	22,500	ac	10	225,000	84,375	84,375	.1	2,250
Spill Control Basin	3	ea	20,000	60,000	31,500	13,500	40	120
Wetland Restoration	25	ea	2,000	50,000	26,250	11,250	34	850
Livestock Exclusion, Woods	5,000	ft	1	5,000	1,875	1,875	.01	50
Uplands Subtotals					1,422,166	391,598		13,273

(1) Local share consists of labor and equipment costs. Also see flat rates in Table 3-1.
(2) Nutrient and Pest Management is cost shared per acre over a three year period. Number of acres shown represents 3 times the eligible acres.
(3) Manure storage is cost-shared at 70% for the first $20,000 of cost and at 50% for the remaining cost, not to exceed $35,000.
(4) High Residue Management is cost-shared per acre over a 6-year period as a interim BMP until approved and incorporated into NR 120. Number of acres shown represents 6 times the eligible acres.

Source: Wisconsin DNR, DATCP, and Shawano County

(Table continues next page)

BMP	Number		Cost/Unit ($)	Total Cost ($)	75% Participation (Critical Sites 100%)		Hrs/ Unit	Total Hours
					State Share	Local Share		
Barnyard Runoff Control & Manure Storage								
Filter Strip / Filter Wall / Sediment Basin - *Regular Cost Sharing*	27	ea	20,000	540,000	294,000	126,000	100	2,100
Filter Strip / Filter Wall / Sediment Basin - *$10,000 Cost-Share Cap*	33	ea	14,285	471,405	247,488	106,066	100	2,500
Roof Gutters	97	ea	1,500	145,500	76,388	32,738	3	218
Clean Water Diversion	37	ea	2,500	92,500	48,563	20,813	21	588
Roofs	2	ea	25,000	50,000	26,250	11,250	0	0
Manure Strg. Facility (3)	32	ea	62,000	1,984,000	840,000	648,000	120	2,880
Manure Storage Facility Abandonment	3	ea	10,000	30,000	15,750	6,750	20	60
Cattle Mounds	20	ea	3,000	60,000	31,500	13,500	20	400
Barnyard Abandonment or Relocation	5	ea	16,500	82,500	43,313	18,563	100	500
Well Abandonment	25		600	15,000	7,875	3,375	20	500
Milking Ctr. Waste Ctrl.	10	ea	7,000	70,000	36,750	15,750	40	400
Barnyard & Storage Subtotals					1,667,877	1,002,805		10,146
Streambank Erosion Control								
Shape and Seeding	5,000	ft	10	50,000	26,250	11,250	.1	500
Fencing	8,500	ft	1	8,500	4,463	1,913	.06	510
Rock Riprap	1,000	ft	30	30,000	15,750	6,750	.2	200
Bio-Bank Stabilization	2,000	ft	20	40,000	21,000	9,000	.5	1,000
Crossing	5	ea	3,000	15,000	7,875	3,375	18	90
Remote Watering Syst.	25	ea	2,000	50,000	26,250	3,750	15	375
Streambank Subtotals					101,588	36,038		2,675
Miscellaneous								
Structural Urban BMPs	2	ea	4,000	8,000	4,200	600	80	160
Subtotal					3,195,831	1,431,041		
Easements	275	ac	1,000	275,000	275,000	0	10	2,750
Total					3,470,831	1,431,041		29,004

See footnotes at bottom of previous page of this table. Source: Wisconsin DNR, DATCP, and Shawano County

Table 3-5 Combined Cost-Share Budget Needs for Management Practices for the Pensaukee River Watershed Project

BMP	Number		Cost/Unit ($)	Total Cost ($)	75% Participation		Hrs/ Unit	Total Hours
					State Share	Local Share		
Upland Control								
Change in Crop Rotation	6,450	ac	NA	0	0	(1)	.1	645
Contour Cropping	700	ac	9	6,300	4,725	473	.3	210
Contour Strip Cropping	560	ac	13.5	7,560	5,671	567	.5	280
High Residue Management (4)	66,100	ac	18.5	1,222,850	917,138	91,714	.04	2,644
Cropland Protection Cover (Green Manure)	4,800	ac	25	120,000	90,000	9,000	.04	192
Intensive Grazing Management (Rotational Grazing)	10	ea	4,000	40,000	15,000	15,000	15	150
Critical Area Stabilization	40	ac	800	32,000	16,800	7,200	.5	20
Grass Waterways	100	ac	3,000	300,000	157,500	67,500	22	2,200
Field Diversions and Terraces	1,700	ft	3	5,100	2,678	1,148	.04	68
Grade Stabilization	18	ea	4,000	72,000	37,800	16,200	50	900
Agricultural Sediment Basin	7	ea	11,000	77,000	40,425	17,325	90	630
Shoreline and Riparian Buffers	750	ac	500	375,000	196,875	84,375	2	1,500
Nutrient Management (2)	40,000	ac	6	240,000	90,000	90,000	.1	4,000
Nutrient and Pest Management (2)	35,000	ac	10	350,000	131,250	131,250	.1	3,500
Spill Control Basin	6	ea	20,000	120,000	63,000	27,000	40	200
Wetland Restoration	37	ea	2,000	74,000	38,850	16,650	34	1,258
Livestock Exclusion, Woods	10,000	ft	1	10,000	3,750	3,750	.01	100
Uplands Subtotals				3,051,810	1,811,462	579,152		18,497

(1) Local share consists of labor and equipment costs. Also see flat rates in Table 3-1.
(2) Nutrient and Pest Management is cost shared per acre over a three year period. Number of acres shown represents 3 times the eligible acres.
(3) Manure storage is cost-shared at 70% for the first $20,000 of cost and at 50% for the remaining cost, not to exceed $35,000.
(4) High Residue Management is cost-shared per acre over a 6-year period as a interim BMP until approved and incorporated into NR 120. Number of acres shown represents 6 times the eligible acres.

Source: Wisconsin DNR, DATCP, and Shawano and Oconto Counties

(Table continues next page)

BMP	Number		Cost/Unit ($)	Total Cost ($)	75% Participation (Critical Sites 100%)		Hrs/ Unit	Total Hours
					State Share	Local Share		
Barnyard Runoff Control & Manure Storage								
Filter Strip / Filter Wall / Sediment Basin - *Regular Cost Sharing*	37	ea	20,000	740,000	406,000	174,000	100	2,900
Filter Strip / Filter Wall / Sediment Basin - *$10,000 Cost-Share Cap*	42	ea	14,285	599,970	314,985	134,993	100	3,200
Roof Gutters	127	ea	1,500	190,500	100,013	42,863	3	288
Clean Water Diversion	67	ea	2,500	167,500	87,938	37,688	21	1,088
Roofs	4	ea	25,000	100,000	39,375	16,875	0	0
Manure Strg. Facility (3)	50	ea	62,000	3,100,000	1,312,500	1,012,500	120	4,560
Manure Storage Facility Abandonment	5	ea	10,000	50,000	26,250	11,250	20	100
Cattle Mounds	22	ea	3,000	66,000	34,650	14,850	20	440
Barnyard Abandonment or Relocation	7	ea	16,500	115,500	60,638	25,988	100	700
Well Abandonment	40		600	24,000	12,600	5,400	20	800
Milking Ctr. Waste Ctrl.	25	ea	7,000	175,000	91,875	39,375	40	1,000
Barnyard & Storage Subtotal				5,328,470	2,486,824	1,515,782		15,076
Streambank Erosion Control								
Shape and Seeding	10,000	ft	10	100,000	52,500	22,500	.1	1,000
Fencing	13,000	ft	1	13,000	6,826	2,926	.06	780
Rock Riprap	2,000	ft	30	60,000	31,500	13,500	.2	400
Bio-Bank Stabilization	3,450	ft	20	69,000	36,225	15,525	.5	1,725
Crossing	7	ea	3,000	21,000	11,025	4,725	18	126
Remote Watering Syst.	28	ea	2,000	56,000	29,400	4,200	15	420
Streambank Subtotal				319,000	167,476	63,376		4,451
Miscellaneous								
Structural Urban BMPs	3	ea	4,000	12,000	6,300	900	80	240
Subtotal				8,711,280	4,472,065	2,159,210		38,264
Easements	500	ac	1,000	500,000	500,000	0	10	5,000
Grand Total				9,211,280	4,972,065	2,159,210		43,264

See footnotes at bottom of previous page of this table. Source: Wisconsin DNR, DATCP, and Oconto and Shawano Counties

Cost-Share Agreements, Landowner Contact Strategy and Inventory Completion

Money for cost-share agreements is distributed by the Shawano and Oconto County LCDs from a Nonpoint Source Grant provided by the DNR. The LCD receives additional grant money to support administrative responsibilities. Cost share agreements are binding contracts between landowners and the LCD. Landowners must meet eligibility requirements defined in Chapter 2 (p. 43-70).

Landowner Contacts and Critical Sites Notification

The following procedure will be used to make landowner contacts.

- During the first three months of the implementation period, all landowners or operators with eligible nonpoint sources will receive a mailing from the county LCD staff explaining the project and how they can become involved. County LCD staff will give priority to the workload associated with owners of critical sites, since these sites are most important for the success of the project.

- The process of notification to landowners of critical sites will begin within six months of the date that the project receives approval from DNR and the state Land and Water Conservation Board (Dec. 3, 1996). The department may grant up to three 90-day extensions beyond the six-month notification period to allow the counties sufficient time to verify that all sites meet the critical site criteria.

  Five barnyards have been identified during the inventory as exceeding 100 pounds of phosphorus loading, the critical sites criteria. As part of the verification process, the inventory of all lands associated with the five critical barnyard owners will be completed as well as any upland sites greater than T.

  The findings of the site visits will be summarized and sent to DNR. DNR is responsible for sending the notification to the owners of critical sites within 60 days after receiving the report from county LCD staff.

  County LCD staff will also identify those landowners who sign cost-share agreements to install necessary best management practices or who make voluntary changes which cause the site to no longer meet the critical site criteria. The notification to these landowners will be postponed in accordance with NR 120.09(4).

- During the first year of implementation, county LCD staff will also make personal contacts with all additional landowners whose fields meet all or most of the characteristics believed to be associated with high sediment delivery rates. These characteristics were identified during the initial inventory in preparing the plan.

Approximately 75 percent of the watershed's upland fields remain to be inventoried as of plan approval. Beginning with the second year of implementation, each year the county LCD staff will complete the inventory on a minimum of 25 percent of the remaining uplands. At this rate, the inventory should be completed within four years of plan approval. An additional year will be available in the event of unanticipated delays.

As part of the annual inventory work, county LCD staff expect to identify fields that meet the criteria for critical sites. The county LCD staff will complete the verification for all sites identified each year and send a report to DNR. The annual schedule for the verification process will be linked to the county workload schedule as well as the optimum time for field checks. The DNR county LCD staff propose to follow the following cycle each year until the inventory and notification process is completed for all sources:

- April-November: Conduct site visits and inventory work
- Prepare report and send to DNR implementation coordinator by February 1. DNR would send the notification to the critical site landowners within 60 days of receiving the report.

The above schedule may be adjusted with work planning at annual meetings with DNR.

- In addition to the inventory work each year, the county LCD staff will make contacts with eligible landowners and operators until they have made a definite decision regarding program participation.

  Progress on the inventory and landowner contacts will be reviewed at the annual watershed meeting. The schedule will be adjusted as necessary in order to complete both the inventory and the notifications to all critical sites within five years and 60 days of the department's plan approval date.

- The county LCD staff will also contact all eligible landowners who have not signed cost-share agreement by personal letter six months prior to the end of the cost-share sign-up period (scheduled to end in the year 2004).

Critical Sites Appeal Process

The owner or operator of a site designated as a critical site may appeal the critical site designation to the county Land Conservation Committee (LCC). If the site is located in more than one county, the appeal goes to the LCC of the county which contains the largest portion of the site. The site owner or operator, now called the appellant, must write to the LCC and ask for an informal hearing. The appeal must be received by the LCC within 60 days of the day the notification letter was received.

The LCC shall:

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

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

The LCC must provide a decision in writing within 45 days of receiving: 1) the DNR and DATCP reports and recommendations; 2) the notification by the DNR and DATCP that no report or recommendations would be submitted, or; 3) the conclusion of the 60-day period following the hearing.

The LCC may support or overturn the designation of the site as critical. To make its decision, the LCC shall consider whether the critical site designation is consistent with the critical site criteria established in this plan. The LCC shall also consider whether governmental representatives erred in their verification of the site conditions or management. Loss of profit is not grounds to support an appeal. Violations by, or appeals granted to, other appellants does not justify support of an appeal.

The owner or operator of a site designated as a critical site may request a review of the LCC decision by a filing a written request with the state Land and Water Conservation Board by filing a written request with the DNR within 60 days after receiving an adverse decision by the board.

Budget and Staffing Needs

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

Staff Needs and Costs

Table 3-6 lists the total estimated staff needed to implement the project assuming a 75-percent level of participation by eligible landowners. A total of approximately 105,000 staff hours are required to implement this plan. This includes 20,800 staff hours to carry out the information and education program. Currently, three positions are being funded on the Pensaukee River Watershed project staff. The LCD and agencies have determined the need for additional staff based on the annual workload analysis.

The estimated cost for staff at the 75-percent participation rate is approximately $1,920,000 for the 10 years of the project. These costs will be paid by the state through the Local Assistance Grant (LAG) Agreement.

Implementation Schedule

Grant Disbursement and Project Management Schedule

Implementation of this priority watershed project began upon both approval of this plan (December 1996) and receipt of the Nonpoint Source (NPS) Grant. The plan has been approved by the Wisconsin DNR, the Shawano and Oconto County Boards and the Wisconsin Land and Water Conservation Board. Implementation can begin only when a NPS Grant has been awarded which was first done for this project in January 1997.

The project implementation period is 10 years. During the first eight years of implementation, cost-share agreements with eligible landowners may be signed. This sign-up period may be extended for two years if an evaluation, conducted by the DNR, shows that an extension is warranted. Practices listed on any cost-sharing agreement must be installed before the end of the implementation phase. The implementation phase of this project is scheduled to conclude in 2007.

The initial Nonpoint Source Grant will cover the cost of practices over the entire 10-year implementation. The amount of the NPS Grant is calculated as 75-percent participation by eligible landowners; see Table 3-5 for a detailed explanation. This grant may be amended due to changes needed for time of performance, funding levels, or work plan.

Local Assistance Grants will be disbursed annually to Shawano and Oconto Counties to cover the costs of personnel, operating expenses, and equipment. The eligible costs for LAGs are in NR 120.21. The DNR will evaluate a workload analysis and grant application submitted by Shawano and Oconto Counties.

Project Cost

The total state funding required to meet the rural nonpoint source pollution control needs at 75 percent of eligible landowner participation is presented Table 3-7. This figure includes the capital cost of practices, staff support, and easement costs presented in the previous cost tables in this chapter. The estimated cost to the state is $6.9 million. The estimated cost to landowners and others is $2.02 million for a total project cost estimate of $9.92 million.

This cost estimate is based on projections developed by agency planners and local staff. Historically, the actual expenditures for projects are less than the estimated costs. The factors affecting expenditures for this watershed project might include: the participation rate; the amount of cost sharing that is actually expended; the number of staff working on the project; and the amount of support costs.

Table 3-6 Estimated County LCD Staff Needs for Ten Years of Project Implementation: Pensaukee River Priority Watershed

Activity	Oconto County Staff Hours (based on 75% participation)	Shawano County Staff Hours (based on 75% participation)
Project and Financial Management	7,000	7,000
Information and Education Program	10,400	10,400
Pre-Contact Office Inventory; Landowner Contracts and Progress Tracking	3,000	3,500
Conservation Planning and Cost-Share Agreement Development	5,000	7,500
Plan Revisions and Monitoring	3,000	3,000
Practice Design and Installation		
Upland Sediment Control	5,224	13,223
Animal Waste Management	4,930	10,146
Streambank Erosion Control	1,776	2,675
Easements	2,250	2,750
Urban BMPs	80	160
Training	720	1,200
Total:	43,380	61,554
Estimated Staff Required per year	2	3
Hours per year	5,198	7,097

Table 3-7 Total Project Costs at 75-Percent Landowner Participation Rate

Activity	Oconto County	Shawano County	Total Cost (State Share)
Cost-Share Funds: Practices	$ 1,273,484	$ 3,121,593	$ 4,395,077
Cost-Share Funds: Easements	225,000	275,000	500,000
Local Assistance Staff Support	806,400	1,113,600	1,920,000
Information/Education Activities (staff not incl.)	8,757	12,093	20,850
Other (travel, supplies, etc.)	56,270	56,270	112,540
Engineering Assistance	15,000	15,000	30,000
Total	2,384,911	4,593,556	$ 6,978,467

Sources for both tables: DNR, DATCP and the Shawano and Oconto County LCDs

CHAPTER FOUR
Integrated Resource Management

Introduction

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

Fisheries and Wildlife Management

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

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

Additional information can be obtained from the fisheries managers at DNR offices in Peshtigo or Shawano:

DNR	DNR
P.O. Box 127	647 Lakeland Road
Peshtigo, WI 54157	Shawano, WI 54166
(715) 582-5000	(715) 526-4227

Wetland Restoration

Watershed staff will use NRCS wetland inventory maps and site visits to identify potential sites for wetland restoration projects. The general guidelines for wetland restoration, easement acquisition and shoreline buffers to protect existing wetlands should be followed. As discussed in the previous chapter, each time a wetland restoration or easement purchase is possible, the county staff will consult with DNR wildlife management, fish management and watershed management personnel, and the NRCS area engineer to determine the best design and use for the particular site. Shoreline buffer easements may be acquired adjacent to these wetlands to offer better protection from sedimentation and other nonpoint source pollution.

Wetland restoration programs exist through the watershed project, NRCS Wetland Reserve Program, NRCS Conservation Reserve Program (CRP), U.S. Fish & Wildlife Service and DNR Wildlife Management programs. U.S. Army Corps of Engineers staff may also need to be contacted for assistance on the project. For additional information on wetland restorations in the Pensaukee River Priority Watershed, contact any of the following agencies:

Shawano County LCD
311 N. Main St. (Courthouse)
Shawano, WI 54166
(715)526-9239

Oconto County LCD
111 Arbutus Ave.
Oconto, WI 54153
(414)834-5688

U.S. Fish & Wildlife
Green Bay ES Field Off.
1015 Challenger Ct.
Green Bay, WI 54311
(414)433-3803

USDA-NRCS (Shawano Co.)
603 C Lakeland Road
Shawano, WI 54166
(715)524-8520

USDA-NRCS (Oconto Co.)
(same address as LCD)

DNR offices (listed in previous section)

Groundwater Management

Wells provide a direct conduit for pollutants to reach groundwater resources. Preventing well contamination and sealing abandoned wells are important steps for protecting these resources. If not properly sealed, abandoned wells can directly channel contaminated surface water or shallow groundwater into deeper drinking water aquifers, bypassing the normal purifying action that takes place as surface water slowly percolates downward. Abandoned wells are a significant threat to groundwater quality in the Pensaukee River Watershed.

Shawano and Oconto County LCD staffs will encourage all landowners to properly seal abandoned wells. Information on the proper abandonment procedures will be provided to landowners when abandoned wells are located.

Well Abandonment

The DNR provides cost-share assistance to Pensaukee River Priority Watershed farm operators to properly seal abandoned wells to protect groundwater resources. Design assistance for well abandonment is available from local well drillers, the local county NRCS office or the county LCD offices in Shawano or Oconto.

Wisconsin Well Compensation Grants

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

Eligible landowners will be encouraged to apply for well replacement funds through the Wisconsin Well Compensation Grant Program.

Fuel Storage Tanks

Leaking fuel storage tanks can be a source of contamination for both groundwater and surface water. Description of programs funding removal and remediation of leaking underground storage tanks (LUSTs) can be found through:

DNR - Northeast Region
1125 N. Military Ave.
Green Bay, WI 54307
(414)497-4034

Private Sewage System Maintenance and Rehabilitation

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

Wisconsin Fund

The Private Sewage System Replacement and Rehabilitation Grant Program (Wisconsin Fund) provides financial incentives to protect and improve groundwater quality in Wisconsin. The Wisconsin Fund provides funds to update private sewage systems installed before 1978. To be eligible the septic system must have been inspected by the Shawano or Oconto County Sanitarian and determined to be failing by discharging waste to the groundwater or surface water. Only permanent residences qualify, and there are income restrictions. Applications for Wisconsin Fund are made through the local county zoning department (see addresses and telephone numbers under the "Coordinating Regulations, Permits and Zoning" section on the following pages.

Riparian Zones

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

Shawano and Oconto County staff will promote protecting riparian areas where possible.

Stewardship

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

Forestry Programs

Private forest lands, which account for over 26,000 acres within the Pensaukee River Watershed, contribute to the quality of water resources and fish and wildlife resources in the watershed. Financial assistance is available for forest management and soil and water resource protection through the Stewardship Incentive Program (SIP), the Managed Forest Law Program (MFL) and other forest stewardship programs. Additional information can be found in DNR publication FR-093-95, *Wisconsin Forestry Best Management Practices For Water Quality*, developed by DNR Bureau of Forestry. For more information on forestry programs, contact:

DNR Forester 647 Lakeland Road Shawano, WI 54166 (715) 524-2183	Oconto County Land and Water Resources Dept. Land and Forestry Division 301 Washington St. Oconto, WI 54153 (414)834-6827

Stewardship Incentive Program

The Stewardship Incentive Program (SIP) was developed to stimulate enhanced management of forest lands by cost-sharing approved management practices. SIP provides cost share funding of up to 75 percent for practices that provide soil and water protection. The SIP program applies to nonindustrial private forest land of 10 acres or more on forested or forest related (i.e., prairie, wetlands) lands. Practices that are cost-shared by SIP include: development of a landowner forest stewardship plan; site preparation and tree planting; timber stand improvement; windbreak and hedgerow establishment; soil and water protection and improvement; riparian and wetland protection and improvement; fisheries habitat enhancement; wildlife habitat enhancement; and forest recreation enhancement.

Managed Forest Law

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

Other Stewardship Programs

Some other forest stewardship programs available to watershed landowners include the Forest Improvement Program (FIP) and the federal Environmental Quality Incentive Program (EQIP). These programs provide funding for the establishment of timber stands.

Coordinating Regulations, Permits, and Zoning

Local, state and federal regulations regarding surface water and wetland protection must be considered whenever BMPs are installed. Best management practices that address streambank or shoreline erosion such as riprap or vegetative shoreline stabilization will require permits from the DNR. Any BMP which effects wetland form or function may require permits from the DNR, Shawano and Oconto County Zoning office and the U.S. Army Corps of Engineers.

The Shawano and Oconto County LCD staff will work with the DNR Water Regulation and Zoning staff, the Shawano and Oconto County Zoning Department and the U.S. Army Corps of Engineers to assure that necessary permits are received prior to the installation of streambank or shoreline stabilization practices.

Landowners will be referred to the appropriate regulators prior to construction projects for proper permits. For more information on water regulations, contact:

Shawano County Zoning
and Land Use Planning Dept.
311 N. Main St. (courthouse)
Shawano, WI 54166
(715) 526-6766

Oconto County Land and
Water Resources Dept.
Zoning Division
301 Washington St.
Oconto, WI 54153
(414)834-6827

USDA-NRCS
(see above section
for addresses)

U.S. Army Corps of Engineers
Suite 211, Old Fort Square
211 N. Broadway
Green Bay, WI 54303
(414)448-2824

Coordination With State and Federal Conservation Compliance Programs

The Pensaukee River Watershed project will be coordinated with the conservation compliance features of the Wisconsin Farmland Preservation Program (FPP) administered by DATCP, and the Federal Food Security Act (FSA) administered by the Natural Resource Conservation Service. DATCP will assist the LCD and the NRCS offices to identify landowners within the watershed that are subject to the compliance provisions of FPP and FSA. Conservation Farm Plans were to have been completed for all landowners in FSA by December 31, 1989. There are 71 FPP plans and 135 FSA plans within the watershed project.

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

Staff will also want to work cooperatively with other agency programs, such as NRCS's Wetland Reserve Program, Conservation Reserve Program (CRP), the Environmental Quality Incentives Program (EQIP), the Grazing Lands Conservation Initiative, the Forestry Incentive Program (FIP) and the Wildlife Habitat Incentive Program (WHIP) as they have funds to help achieve complementary goals to those of the priority watershed. Additional information can be obtained from the following:

USDA-NRCS (Oconto County)
District Conservationist
111 Arbutus Ave.
Oconto, WI 54153
(414)834-5688

USDA-NRCS (Shawano County)
District Conservationist
603 C Lakeland Road
Shawano, WI 54166
(715) 524-8520

Archaeological Sites: Coordination with State 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 are several known archaeological sites within the Pensaukee River Watershed. The sites are mainly along the banks of the Pensaukee River itself. Archaeologists have known about sites along the river, especially toward the mouth, for a long time. The status of many of the sites is unknown, however. Parts of the sites may be present, but road construction has affected the sites to an unknown degree, according to a state archeologist in the area. Erosion of the sites along the riverbanks also has not been assessed. Systematic archeological survey has only been conducted in a few areas of the watershed.

Work done under the auspices of the Coastal Zone Management program in the late 1970s by Great Lakes Archaeological Research, Inc., concentrated on a short stretch of the Pensaukee River near the U.S. 41 wayside and on plowed fields on either site of County Hwy. S near the Green Bay shoreline. Survey work along the widening of U.S. 141 and the conversion of U.S. 41 to a freeway has been done in parts of the watershed, but highway work is limited to the right-of-way corridor.

Private collections from parts of the watershed include what appear to be Paleo-Indian materials, possibly 8,000 years old and were found near the Green Bay shoreline. Metal tools have been found along the Pensaukee River which could have originated from either the historic Menominee village or from native copper about 3,000 or 4,000 years ago. Artifacts

found also include stone spearpoints that may be 3,000 to 4,000 years old. Corn hills, or garden beds, perhaps 800 to 300 years old, at one time were visible at Oak Orchard. Burial mounds and cemeteries are reported for the area near the river. Other undiscovered cemeteries may be present, both Native American and European immigrant. Things to look for besides the mounds would be an unplowed corner of a field in which large trees are still present -- this may just be a sugar bush, but is may also be a place at which skeletons were once uncovered and left uncultivated.

A list of all the registered cemeteries in the watershed may be obtained through the State Historical Society. Wisconsin state law makes it illegal to knowingly disturb a burial. Landowners themselves may have information on some sites that have not been reported.

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 state watershed program.

Before finalizing the cost-share agreement with the landowner, project staff will review the maps showing known archaeological and historic sites. Also, staff will review the list of practices of concern listed below. If a known site occurs in the vicinity of a proposed BMP of concern, this does not necessarily mean the BMP needs to be moved or altered. In some cases, the specific location of the BMP will not actually be near enough to the location of the known site to warrant further review. Project staff should consult with the DNR Northeast Region watershed coordinator to arrange an informal visit to the area by a cultural resource professional (either DNR employee or otherwise). This first visit would consist of a "pre-review" to ensure that the *specific* location of the proposed BMP will not disturb the known archaeologic or historic site. In some cases, a representative from the U.S. Natural Resources Conservation Service (NRCS) may conduct the review. Instructions and cultural resource site review documentation forms are available in the Implementation Handbook.

If it is too difficult to determine through a pre-review, or if it appears that the known site would indeed be disturbed, contact the Wisconsin State Historical Society to set up a formal Archaeological or Historic Site Review of the area. Any costs incurred as part of a site review *will not be passed on to the landowner*. The DNR's Nonpoint Source Pollution Abatement (Runoff Management) Program will pick up the costs of professional historic and archaeological site reviews.

Practices of concern

Archaeological Sites
Field Diversions
Terraces
Grade Stabilization Structures
Agricultural Sediment Basins
Streambank and Shoreline Stabilization
Structural Urban Practices
Wetland Restoration
Sediment Retention, Erosion or Water Control Structures
Grass Waterways
Critical Area Stabilization

Historic Buildings
Barnyard Runoff Management Systems
Animal Lot Relocation
Manure Storage Facilities
Roofs for Barnyard
Roofs for Manure Storage Facilities

Practices - No Concern Needed for Historic Cultural Sites

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

Endangered and Threatened Resources

Information on threatened and endangered resources was obtained from the Bureau of Endangered Resources of the DNR. Endangered resources include rare species and natural communities. It should be noted that comprehensive endangered resource surveys have not been completed for the entire Pensaukee 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 listed in this document.

Rare Species

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

Wisconsin Endangered Species

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

Charadrius melodus, piping plover (bird)
Podiceps grisegena, red-necked grebe (bird)

Wisconsin Threatened Species

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

Moxostoma valenciennesi, greater redhorse (fish)
Buteo lineatus, red-shouldered hawk
Alasmidonta viridis, slippershell mussel
Lepomis megalotis, longear sunfish
Clemmys insculpta, wood turtle

Wisconsin Special Concern Species

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

Poanes massasoit, mulberry wing (butterfly)
Poanes viator, broad-winged skipper (butterfly)
Euphyes dion, Dion skipper (butterfly)
Medeola virginiana, Indian cucumber root (plant)
Ophioglossum vulgatum var pseudopodum, adder's tongue (plant)

Natural Areas

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

Northern Mesic Forest: In Shawano County, at an area used as a sugar bush, this old, second-growth woodlot is dominated by sugar maple-beech and hemlock. The understory is open and appears undisturbed by grazing.

Spring Pond and *Shallow, Hard, Seepage Lake:* Pensaukee Lakes, in Shawano County, contains this rare natural community. The most eastern of the three lake basins at the headwaters of the Pensaukee River contains a clear, hardwater spring lake with chara

and coontail dominating the tract. The lake is bordered by white cedar and tamarack swamp. The outlet is clogged with water willow. The only upland portion of the shoreline has been cleared.

Northern Sedge Meadow and *Floodplain Forest*: Charles Pond, in Oconto County, is a wetland complex on Green Bay and is subject to the influences of water level fluctuations. The hardwood swamp forest on lacustrine deposits is one of the few of its kind. The bay-mouth bar lake, extensive shallow marsh, and shrub zones vary in extent according to the level of Green Bay.

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

CHAPTER FIVE
Information and Education Activities

Introduction

This education plan for the Pensaukee River Priority Watershed project addresses existing gaps in the knowledge, skills and attitudes of watershed residents. These gaps were identified during the watershed planning in 1995 using a phone survey, focus groups, and input from watershed staff and the Pensaukee River Watershed Citizens Advisory Committee.

This watershed educational program aims to motivate the "learners" (both farm and non-farm) from their present management to a higher level of performance, and benefit both the learners and the natural resources.

Note: Carrying out this education plan depends on funding to hire an **information and education coordinator** (part- or full-time) to work in the county Land Conservation Department offices. Without a county I&E staff person, this plan will most likely not be implemented effectively, if at all.

The telephone survey showed that:

- Farmers believe their wells, and the lakes and streams in the watershed are generally free of pollution, but not the bay of Green Bay.
- Non-farmers are more aware of water pollution.
- Watershed landowners consider manure, pesticides and other organics (oil, antifreeze, road salt) to be major water pollutants. Very few recognize soil as a pollutant.
- More than 80 percent of the landowners are interested in farm management practices that protect or improve water quality.
- More than 70 percent of watershed landowners are willing to install streamside buffers, but definitions of buffers and terms of the agreement are problematic.

We *assume* that by enhancing people's skills, knowledge and attitudes, we will enhance their performance and improve the quality of the river. However, not all performance problems can be addressed through education. People can possess the skills, knowledge and or attitudes necessary to perform common tasks, but *still* not do them. In this case, non-educational factors are affecting people's management choices. Some of these factors include: equipment, tools and resources; motivation; feedback and rewards.

While an education program cannot address these non-educational factors directly, we listed some activities that can help motivate people. Activities such as encouragement from watershed staff, partnerships, feature stories, youth activities (youth can support and encourage adult actions), farmer-to-farmer networks (support groups), and one-on-one instruction (coaching) by the watershed staff are all included.

Education Mission

The Pensaukee River Watershed Information and Education (I&E) Work Team has the following mission:

> *To develop and implement educational strategies that will motivate watershed landowners and residents (including children) to change behaviors which adversely affect the watershed, and to adopt behaviors which positively impact water quality.*

Learning Objectives

This education plan addresses five main issues identified during project planning:

1. Soil conservation and conservation tillage.

2. The hydrology of the river/river ecosystem/river system. This includes past-present-future uses of the river (oral histories), cause and effects (positive and negative effects caused by different activities), how the river changes as it moves from the headwaters to the mouth, the cumulative effect of pollutants as you move downstream, and wildlife and wetlands.

3. The economics of BMPs.

4. Rural non-farm issues.

5. Environmental ethic. This includes the reason why the watershed was selected--to help clean up the bay of Green Bay

The Pensaukee River Watershed Information and Education (I&E) Work Team developed performance-based learning objectives using the SMART Method: The objectives are **S**imple, **M**easurable, **A**ttainable, **R**ewarding and **T**imely. To make them SMART, the objectives complete this phrase "After the educational/informational program, the learners will..."

Each outcome (objective) starts with an action verb that is measurable, and then we added the evaluation criteria, such as when we want to see the results (outcomes) of our work.

The following five lists correspond to the five main issues on p. 111.

1. Soil Conservation and Conservation Tillage

1. In 10 years, all land under a canning contract will have effective soil erosion control measures in place.

2. In 10 years, 25 percent of the farmers in the watershed will have effectively adopted conservation tillage as their primary means of tillage.

3. In 10 years, 50 percent of the watershed livestock producers will be aware of the soil conservation and water quality benefits of adopting rotational grazing.

4. In 5 years, 50 percent of the farmers identified as needing conservation tillage will be able to describe a conservation tillage system/method.

5. In 5 years, 50 percent of landowners will recognize the water quality impacts of soil erosion.

We will meet these objectives using the activities listed in **Table 5-1**.

2. Physical and Human Resources in the Watershed Ecosystem

1. In 10 years, 50 percent of residents will be aware of how land uses impact/impacted water quality and quantity.

2. In 10 years, 75 percent of landowners will identify with the watershed.

3. In 10 years, 50 percent of the landowners will know pollution sources in the river.

4. In 10 years, buffer strips will be installed along 75 percent of the sensitive areas of the river (as identified by the inventory).

5. Within 10 years, 50 percent of all wells will be screened for nitrates.

6. Within 5 years, 5 landowners will be interested in pursuing easements.

7. Within 5 years, the CAC and schools will engage in water quality educational efforts under a common logo and cooperative effort.
8. Within 10 years, 10 percent of landowners with drained/farmed wetlands will restore a wetland.
9. In 10 years, 75 percent of the watershed residents will read or hear about an existence of a sense of pride and history in the river through newsletter or personal accounts.

We will meet these objectives using the activities listed in **Table 5-2**.

3. Rural Non-farm Issues

1. Within 10 years, 25 percent of non-farm residents will adopt home/yard care activities to reduce negative effects on water quality.

2. Within 10 years, 25 percent of the non-farm rural landowners will recognize the impact of home/yard ("stormwater") runoff on surface water quality.

3. Within 5 years, 50 percent of non-farm rural landowners will recognize the harmful effects of non-farm fertilizers and pesticides on the watershed ecosystem.

We will meet these objectives using the activities listed in **Table 5-3**.

4. Economics of BMPs

1. Within 10 years, 70 percent of eligible farm operators will adopt one or more BMPs appropriate to their operation/land management.

2. Within 10 years, 50 percent of eligible farm operators (the above 70 percent) installing BMPs will be able to calculate the cost of production.

We will meet these objectives using the activities listed in **Table 5-4**.

5. Role of Governmental Units in the Watershed Project

1. Within 5 years, all local governmental officials will be aware of the watershed project's goals and progress, including any potential recommendations for land use planning and stormwater planning.

We will meet these objectives using the activities listed in **Table 5-5.**

Education Evaluation

The needs assessment (phone surveys and focus groups) collected baseline data that we will use to evaluate the education campaign. The objectives listed on p. 112-113 are the overall **educational outcomes** for the watershed -- how we want people to perform by the end project. The education activities tables show activities to help us arrive at the outcomes.

The watershed education coordinator will have to write learning objectives for each of these activities in order to evaluate learning and whether the I&E plan is working. Staff will keep in mind that people will need time to incorporate new skills, knowledge, attitudes into their daily routines or businesses. Therefore, skills that are used daily can be evaluated sooner than skills that are used less frequently.

The following list of evaluation techniques is not exhaustive, but should serve as a guide to evaluating the educational activities and outcomes.

To Evaluate Learning:

- Discussions
- Demonstrations
- Observations During Watershed Staff Contacts
- Role Play/Simulations/critical incident exercises - The learners perform a task (such as operate a chisel plow) and observers measure the performance.
- Self Assessment
- Surveys
- Interviews with learners
- The ability to teach others

To Evaluate Attitudes:.

- Sharing ideas
- Attitude Surveys/Questionnaires
- Focus Groups
- Interviews with learners
- Observations During Watershed Staff Contacts

To Evaluate Reactions to Educational Activities:

- Ask the participants (informally)
- Observations on the Land
- Program Evaluation Instrument (such as questionnaires)
- Group Discussions

To Evaluate Performance: (applying new knowledge, skills, attitudes)

- Interviews with learners
- Observations during Watershed Staff Contacts
- Focus Groups
- Demonstrations
- Self-Appraisals, including Performance Checklists
- On-Site Observations of peers, supervisors, professionals ("experts")
- Performance Records - comparing reports before and after the educational programs Examples of reports include customer complaints, equipment breakage, safety reports, etc.
- Critical Incident Analysis
- Performance Appraisals/Performance Checklists
  (Evaluating performance may require hard data about actual performance, such as farm production records, measuring runoff, etc. Gathering hard data often requires the use of control groups.)

A note about Questionnaires: Questionnaires can interfere with learning and may generate resentment if you use them too often. Also, to gather reliable information about people's reactions, the questions must be specific. For example, "What things do you do as a result of your learning?" will probably produce better results than "What do you think you learned?"

In addition, the evaluation processes will be viewed as learning processes rather than means of measuring. It also provides an opportunity to "showcase" education successes.

Education Activity Tables

Each table contains a list of activities that will meet the learning objectives, as follows: Table 5-1 contains activities relating to Objective 1 relating to "soil conservation and conservation tillage." Table 5-2 contains those activities that address the "ecosystem." Activities that address non-farm learning objectives and BMP economics are listed in Tables 5-3 and 5-4, respectively. Finally, Table 5-5 contains activities that address the governmental learning objectives. The costs and staff hours for the activities are totals. Therefore, if an activity is repeated, the costs (and possibly the time estimates) will double.

Due to budget constraints, we only gave **estimates** for the timing of activities (the "when" column). As mentioned previously, the implementation of this plan relies on funding for an I&E coordinator. The watershed I&E coordinator and the I&E Work Team will set priorities every two years or every year, depending on need, to fit the current learning needs and learning climate. The dates in our tables now are our "best guess" for the first several years.

The tables on the following pages represent activities which are targeted to take place at various points throughout the 10-year project. These activities should be reviewed annually by the I&E Work Team for changes and adjustments (winter planning meetings).

Winter Planning Meetings

As indicated in the above paragraph, the watershed I&E coordinator should sit down each year with the other project staff (members of the I&E Work Team) to evaluate how the tasks and activities are going, and a new planned set of activities for the coming year. In other words, each year (preferably in early fall or winter), the staff should remind themselves of the overall watershed objectives and make sure that any planned activities will continue to go toward those goals. If not, the I&E coordinator and work team should agree to some changes -- perhaps adding new activities, or dropping ineffective ones. Having annual meetings in fall or early winter also allows for an evaluation of the past season's activities.

The first such "winter" planning meeting was held Sept. 19, 1996, in Oconto. An annual schedule for future meetings was set then.

Table 5-1 Activities Relating to Soil Conservation and Conservation Tillage

ACTIVITIES	WHO	WHEN	COST	TIME	EVALUATION
Annual field day: (1 topic each year or several lumped together of the following) tillage equipment, yield, pest control, fertility management, economics of cons. tillage, rainfall simulator, green cover crop, rotational grazing (coordinate with Forage Councils on this)	I&E coordinator[1], UWEX, LCD, equipment dealers, Forage Councils	1996-2000	$300 (covers food, supplies, equip. rental, publicity)	120 hours per event	
Winter meetings	I&E coordinator UWEX, LCD	1 per year until 2006	---	8 hrs./ mtg.	
Develop partnerships with agri-businesses	I&E coordinator UWEX, LCD	Continually	---	40	
Cover (green manure) crop demonstration and field day on the farm of a canning crop operator	I&E coordinator UWEX, LCD, DNR	1997-98	$200 for seed	40 - 60	
Conservation tillage demonstration (to be showcased at one or more of the annual field days -- see 1st item above)	I&E coordinator UWEX	1996-97 seasons	$100 for equip. rent	40	
Cooperate with the Northland Grazers and Forage Councils to promote rotational grazing	I&E coordinator UWEX, LCD	1996-2001	---	30 hrs/year	
Job Aids: Pocket notebooks and cards, manure wheels	I&E coord., UWEX	Throughout	$100	---	
Newsletter with conservation tillage information	I&E coordinator UWEX, LCD, Env. Resources Ctr.	2 issues/year	$1,600/issue[2]	40 hrs/issue	
Machinery cost comparisons	I&E coord., LCD	Throughout	---	4 hours/year	
Maintain a list of cons. tillage equipment available for rent	I&E coordinator UWEX, LCD	Throughout Project	---	20 (year 1) 10 hrs./year	
Farmer-to-Farmer Network: conservation tillage, nutrient mangmt, rotational grazing	I&E coordinator UWEX, LCD, CAC	Throughout Project	---	120[3]	

[1]I&E coordinator (also, I&E coord.) refers to a watershed project staff person hired by the LCD to carry out and coordinate these I&E activities.
[2]Cost included in UWEX (Environmental Resources Center - UW-Madison Campus) budget.
[3]40 hours per network. Most of the staff hours will be incurred during the preparation and first few meetings, after which the network participants should rely less and less on staff assistance to facilitate the groups.

Table 5-2 Activities Relating to the Physical and Human Resources in the Watershed Ecosystem

ACTIVITIES	WHO	WHEN	COST	TIME (hours)	EVALUATION
CAC Stream Ecology Day	I&E coordinator, DNR, UWEX, LCD	Fall 1996	$500	80	
Display at County Fair: With CAC involvement	I&E coordinator UWEX, LCD, CAC	Fall 1996 (to develop) Annually (at fairs)	$2,000	60 (to develop) 20 (to set up/ show)	
Develop a complete mailing list	LCD	Winter 95-96	---	30	
Advertise/promote well screening	I&E coordinator UWEX, LCD	w/ county & town events	$100	20	
Develop logo design	LCD, Bruce Web.	1996	---	10	
One-on-One contacts with watershed landowners	LCD, UWEX	Continually	---	2,000/year	
Watershed signs on main roads at river crossings (CAC could help install them -- could cut costs)	I&E coordinator, LCD, CAC	1998	$250-1,000[4]	40	
Field days at demonstration sites	I&E coordinator, LCD, UWEX	by 1997	$100	20	
Wetland demonstration with signs	LCD, I&E coord.	by 1997	$100-500[4]	40	
Buffer strip demonstration with signs	LCD, I&E coord.	by 1997	$100-500[4]	40	
Representatives and displays at community events	I&E coordinator, LCD, UWEX	as scheduled	---	30	
Placemats	I&E coordinator	1996	---	20[5]	
Radio	UWEX & LCD, I&E coordinator	Throughout Project	---	1 hr/wk	
Partnerships with groups: Pheasants Forever, Ducks Unltd., etc. to promote buffer strips and wetland restorations	LCD, UWEX, I&E coordinator	Throughout Project	---	60	
Hats for cooperators & CAC members (contact Spring Creek Watershed staff for ideas)	LCD I&E coordinator	1996	$3-$5 each[6]	30	

ACTIVITIES	WHO	WHEN	COST	TIME (hours)	EVALUATION
Newsletter	I&E coordinator, LCD, UWEX, Env. Resources Ctr.	2 issues/year	$1,600/ issue[7]	40 hrs/issue	
WAV Program	WAV coordinator (at UWEX), LCD, I&E coord.	Spring 1997 (WAV coord availability)	See below[8]	200 (year 1) 100 (rest)	
Advertise U.S. Fish & Wildlife Wetland Restorations and NRCS Wetland Reserve Program	I&E coordinator, LCD, NRCS, UWEX	Throughout Project	NC	10	
River Clean-up Day with picnic and canoeing	I&E coordinator, LCD, UWEX	May 1997 or May 1998	$500	80	
Fact Sheets	I&E coordinator, LCD, UWEX	Throughout Project	---	---	
Coordinate with NRCS 1996 workshop in Cecil	LCD, UWEX	Spring 1996	---	20	
Case Studies to monitor "the human side" of participation (measuring personal feelings/satisfaction of working with the project, knowledge that they're effecting positive change in the environment)	I&E coordinator, LCD, UWEX, DNR	Every 2 years	---	8 hrs/time per case	This is an evaluation in itself. Could be publicized in local newsletter and at state level.
Signs of Success (SOS) project	DNR, LCD	1996-97 (more if interest)	---	20 hours	

[4]Per sign installed.
[5]Time for distributing placemats and coordinating the printing.
[6]Depends on style. Estimates include design, hat, printing.
[7]Cost in UWEX (Environmental Resources Center - UW-Madison Campus) budget.
[8]$3,500 year 1; $250-$500 annually for replacement materials.

Table 5-3 Activities Relating to Rural Non-Farm Issues

ACTIVITIES	WHO	WHEN	COST	TIME (hours)	EVALUATION
Newsletters to all landowners	I&E coordinator, LCD, UWEX, Env. Resources Ctr.	2 issues/yr	$1600/issue[9]	40 hrs/issue	
Detailed "how to" information on environmentally-friendly home and lawn care activities. Put in newsletters, and also advertise UWEX bulletins	I&E coordinator, UWEX	Throughout Project	$50/year	40 hrs per topic	
Detailed fact sheets on disposing of household wastes	UWEX, I&E coord.	Throughout	Existing	---	
Work with UWEX Master Gardeners	UWEX	Throughout	Existing	10 hrs/yr	
Construction Site Erosion	I&E coord., LCD	1997-99	$1,000[10]	40	
Clean Sweep	I&E coordinator, UWEX, LCD	As scheduled through proj.	---	20	
News Releases	I&E coordinator	As warranted through proj.	---	4 hrs/release	

[9]Cost in UWEX (Environmental Resources Center - UW-Madison Campus) budget.

[10]Depends on scope of the project. Estimate includes labor (at $20/hour) for installing, maintaining and removing runoff controls.

Table 5-4 Activities Relating to the Economics of BMPs

ACTIVITIES	WHO	WHEN	COST	TIME (hours)	EVALUATION
Provide a list of BMPs to farmers	LCD, UWEX, I&E coordinator	In newsletter, or contacts	---	4 (to make list)	
Side-by-side, replicated field demos with yield checks and costs	UWEX	1996	$200[11]	40 hrs/demo	
Field days (where appropriate)	(see tables 5-1, 5-2)	Throughout	$100	20	
Winter workshops and town meetings	I&E coordinator, UWEX, LCD	Throughout as scheduled	--	8 hrs/mtg	
Encourage farmers to attend the UWEX Farm Bus. Mgt. Classes	UWEX	Throughout	--	10	
Speak at meetings sponsored by other groups/organizations	I&E coordinator, UWEX, LCD	Throughout as scheduled	--	8 hrs/mtg	
Develop a slide program	I&E coordinator	1997	$200	40	
Develop a video program	I&E coordinator	1998	$800/minute	100+	
Newsletters	I&E coord., LCD, Env. Resources Ctr.	2 issues/year	$1,600/ issue[12]		
News Releases	I&E coordinator	As warranted through proj.	---	4 hrs/release	
Radio	UWEX & LCD, I&E coordinator	Throughout Project	---	1 hr/week	
Individual Consultation (one-on-one)	LCD, UWEX	Throughout	---	120	
Farmer-to-Farmer Network	(see Table 5-1)	Throughout	---	40 hrs./ network	
Class presentations to tech. college ag classes	UWEX	Once/year	---	8 hrs. ea.	
Fair Displays	(see Table 5-2)	Annually (at fairs)	$2,000	60	

[11]Includes fee for certified agronomist.
[12]Cost in UWEX (Environmental Resources Center - UW-Madison Campus) budget.

Table 5-5 Activities Relating to the Role of Governmental Units in the Watershed Project

ACTIVITIES	WHO	WHEN	COST	TIME (hours)	EVALUATION
Presentation to town officials and Towns Association	I&E coordinator, LCD, UWEX	1996-2001 (1 per town)	---	10	
Direct mailing about watershed issues to influence public officials. Tours for elected officials.	I&E coordinator, LCD	1996-2001	$500	20	
WAV participants report results to governmental units	I&E coordinator	As results come in	---	10	
Fact Sheets for officials	I&E coordinator	Throughout (anytime)	---	---	
Press Releases	I&E coordinator	As warranted through proj.	---	4 hrs/release	
Report results of Case Studies (see Table 5-2) to local officials, the DNR, legislators, and EPA, CAC	I&E coordinator, LCD, UWEX, DNR	Every 2 years	---	4 hrs/time (incl. prep)	
Report results of SOS (see Table 5-2) to DNR, EPA, legislators, CAC (through DNR newsletter, project newsletter, local presentations)	I&E coordinator, LCD, UWEX, DNR	When SOS data comes (1997-98)	---	8 hours to coordinate and publicize	
Survey public officials on planned development	I&E coordinator, LCD, UWEX	1996	$100	60	

I&E Activity Definitions

Listed below, in alphabetical order, are descriptions of the activities in the tables.

Advertise U.S. Fish and Wildlife Restoration of Wetlands - The U.S. Fish and Wildlife Service still provides funding and technical assistance for restoring wetlands. We will promote this program and ask the agencies to promote our watershed programs.

BMP List to Farmers - This complete list will include all of the practices cost-shared through the DNR's Priority Watershed program (and other programs, such as the U.S. Fish and Wildlife Service) and the cost-share rates.

CAC Stream Ecology Day - This streamside ecology class is not limited to the CAC, but will be open to all watershed residents. Since enrollment should be limited to 15-20 people, the class will probably be repeated several times. At this streamside workshop the participants will learn the basics of stream ecology through macroinvertebrate identification and identifying ecosystem stressors, such as sediment.

Case Studies - Intensive periodic observations of a few selected watershed participating landowners or groups for the purpose of evaluating their personal satisfaction levels and the impacts of learning gained through the project. The results would be used as a unique way to monitor and quantify grass-roots support of the project through documentation of perceived improvements to the resource, to the land, to wildlife, to farm management, etc., by implementing BMPs. It would offer a positive alternative to the preponderance of data and "numbers" used to evaluate the success of each project and of the watershed program.

Clean Sweep - The watershed project will promote the county Clean Sweep programs, both those dealing with Household & Hazardous Waste and those dealing with Agricultural.

Community Events - Throughout the year a variety of community events are held in the watershed. Where appropriate, we will set up a display and have people on hand to discuss the watershed project.

Conservation Tillage Demonstration - This demonstration will include replicated strips that will allow for yield comparisons, cost comparisons, and comparing pest control.

Construction Site Erosion Control/Stormwater Management Demonstration - Increased development pressure in the watershed posses several problems, including sediment from construction sites and increased stormwater runoff. We will demonstrate how to economically reduce both sediment delivery and post-construction stormwater runoff on a single-family lot.

Cooperation with the Northland Grazers and Forage Councils - Both groups have missions that fit into the goal of the watershed program. Therefore, we will cooperate with them to promote rotational grazing and better forage management.

Cover Crop demonstration - Demonstrate how cover crops can be used successfully on a field used to grow canning crops. This will require a change of attitude for both the growers who tend to leave the fields in seed bed condition during the winter, as well as the canning companies. Therefore, planning the demonstration will require intensive communication with both the canning company and grower.

Develop Partnerships with Agribusiness - Implement dealers and agronomists will help watershed staff educate farmers. This win-win relationship will enhance business opportunities for the dealers/agronomists (increased interest in conservation tillage, nutrient management and crop scouting) and increase BMP use in the watershed.

Direct Mailings - The staff will generate public interest to watershed residents using information materials related to specific land uses for specific audiences.

Fact Sheets - The UWEX, DNR, USDA agencies and U.S. Fish & Wildlife Service have a number of fact sheets that we can use in the watershed. In addition, county recycling fact sheets and fact sheets distributed by hardware and "home centers" can enhance the watershed education program.

Farmer-to-Farmer Network - Small support groups of 6-8 farmers who meet on a regular basis (in someone's home) to discuss BMPs. For example, a small group of farmers interested in no-till corn would meet to discuss their concerns, share their experiences (good and bad), and help each other solve problems. "Early adopters" could lead the discussions that should help newcomers make a smoother transition to different farming practices.

This network is a way to move information through the watershed using the most experienced/knowledgeable people. An experienced person will be placed with a group of 4-6 less experienced people. The group exchanges ideas and analyzes issues. The group also provides feedback and advice to one another. The leader:

- Asks questions to provoke new ideas and new ways of thinking
- Offers suggestions
- Offers advice based on experience--*when asked!*
- Helps people learn from their own experiences
- Reinforces good performance
- Is a good listener

Field Days - In-the-field instruction that teaches people, and allows them to experience the proper use, management and results of a BMP.

Hats - The hats will contain the watershed logo or slogan.

How-To Information - Many of the existing fact sheets contain general information for homeowners. We will give specific recommendations in short, recipe-type formats and print them in newsletters and newspapers. Some of the topics will include safe disposal of yard wastes and household hazardous wastes; environmentally-friendly yard care practices (mowing, fertilizing, pest control), etc.

Job Aids - Quick-reference guides that reduce complicated information to simple terms. They provide easy access to critical information and work well to reinforce learning that takes place through instruction (workshops, field days, etc.). They also work well to help people remember complicated procedures, especially when the procedures are not used frequently. Job aids are presented in an easy-to-use format and must be accessible during the activity. Examples of job aids include posters, signs, wallet-sized cards (etc.) that contain step-by-step instructions, photos and descriptions to help with identifications, flow charts/decision aids, checklists and placards. Some job aides already exist for manure management, identifying runoff, managing pesticides and conservation tillage.

Logo Design - The I&E Work Team will select a logo to be used on various promotional items for the watershed. Staff of UWEX's Environmental Resources Center (ERC), Madison Campus will assist in design development. The CAC may make the final choice among the designs picked/developed by the I&E team and ERC staff.

Machinery Cost Comparisons - Working with the dealers and farmers (custom operators) to provide a list of conservation tillage equipment available for rent, and the rental rates. The UWEX agents have software that provides cost comparisons for different cropping systems.

Mailing list - will contain all landowners in the watershed.

Master Gardeners - The UWEX Master Gardener program teaches people environmentally responsible lawn care and gardening activities. People who complete the Master Gardener training are certified to teach workshops and represent UWEX at public events.

Newsletter - Printed two or three times a year to explain a BMP, promote BMP use, provide short, simple how-to information, and to show the efforts of people who are trying to enhance the watershed ecosystem. The cost of the newsletter can be incorporated into the UWEX (ERC's) publications budget.

News Releases - County UWEX agents to discuss watershed topics in their weekly columns.

One-On-One Instruction - LCD, DNR and UWEX staff will work directly with landowners to help them identify threats to the watershed ecosystem, and to successfully adopt BMPs that reduce the negative impacts to the ecosystem. Watershed staff will describe the watershed goals to watershed landowners. Staff will also help landowners recognize runoff on their property and understand the effects of the runoff on the stream. Also, staff will provide feedback on the success of pollution reduction efforts and affirm people for their efforts.

Placemats - The statewide watershed placements, re-printed with the watershed map, will be distributed in popular watershed restaurants.

Partnerships with Conservation Groups - Work with groups having missions that fit into the goal of the watershed program. We will cooperate with them to promote wetland restorations, streamside buffer strips, etc. since practices that enhance wildlife habitat tend to reduce runoff pollution.

Radio - UWEX, DNR and LCD radio programs that address watershed issues.

Rainfall Simulator - This demonstration will be held in conjunction with the fall tillage equipment day. The rainfall simulator will allow the participants to observe how different tillage systems reduce runoff. The rainfall simulator should result in self-discovery by the learners rather than someone lecturing to the learners.

River Clean-Up Day, Picnic and Canoeing - Held in mid to late April, this day will be devoted to 1) people becoming familiar with the river by walking along the banks or canoeing and 2) becoming concerned over the pollution problems along the river. After the morning clean-up, people who didn't use canoes for the clean-up will be encouraged to canoe the river. Furthermore, people will be invited to a noon picnic (cookout with warm cider may be more appropriate considering the time of year).

SOS - Signs of Success (SOS) is a short-term water quality monitoring effort in which the benefits to a stream from installing a BMP are readily seen and can be publicized to encourage further sign-ups. This highly visual effort is especially effective for demonstration projects and shows both the "before" and "after" data accompanied by photos of the recovering stream or lake. The county watershed project staff should coordinate with the DNR district water quality biologist, Mary Gansberg, to define sites where an SOS evaluation would be beneficial and to enlist her assistance for the monitoring. The water quality biologist will need to be contacted early on in the BMP signup phase in order to gather good "before" data.

Slide Program - A slide program (with script) that explains the goal of the watershed project in non-technical, jargon-free terms.

Speaking Engagements - Presentations to producer groups, schools groups, environmental groups, conservation groups, community groups, etc.

Survey - Survey residents on land use concerns and report the results to elected officials.

Other Surveys - Surveys or questionnaires at certain points during the watershed project to determine whether our I&E efforts are working and to help us evaluate what people are learning and what changes need to be made in our overall activity lists. For example, we

could conduct another telephone survey mid-term (after 5 years) to verify that our efforts are working and continue them, or to find that we need to change course.

Tillage Equipment Day - Implement dealers will demonstrate conservation tillage equipment. In July they will demonstrate equipment for reduced or no-till seedings of alfalfa and winter grains. In November they will demonstrate conservation tillage equipment for corn and soybean residue,including zone tillage equipment.

Town Meetings - Small meetings held in town halls in order to share and discuss information, such as demonstration results.

UWEX Farm Business Management Classes - County UWEX ag agents will present a guest lecture for a farm management class at an area technical college.

Video - Some excellent videos are available that present the story of runoff pollution, wetland loss, conservation farming, etc. In addition, the DNR, UWEX and agribusiness dealers all have access to high quality "how-to" videos for a variety of audiences.

Watershed Display - A table-top *or* floor-standing display board with several different sets of photos and text to explain the watershed project, provide information on specific BMPs (such as conservation tillage or wetland restoration), create interest in BMPs, and show progress in the watershed. Rather than designing a new display for the watershed, we will try to use existing displays in the interest of money-saving.

Watershed Signs - 1) The DOT should have signs on all bridges identifying the river or stream, 2) "Area Protected/Enhanced by the Pensaukee River Priority Watershed" signs at major stream crossings, 3) demonstration signs that draw attention to good conservation measures and demonstrations, and 4) signs that draw attention to good stretches of streams (healthy riparian zones).

WAV Program - A statewide voluntary water quality monitoring program, WAVe is the acronym for Water Action Volunteers. Students (classes), scouting troops, 4-H clubs, service clubs, conservation groups and citizen groups receive equipment and training to test the quality of the river. They will test for dissolved oxygen, nitrate-nitrogen, total phosphorus, turbidity and macroinvertebrates. The test results can be used in a number of ways, such as monitoring the effects of watershed improvement efforts, applying educational concepts to the "real world" (school groups), or to earn a badge (scouting programs). The results will also be reported to elected officials, especially if the volunteers monitor water quality before and after a land use change supported by elected officials. The costs include ten complete sets of testing equipment (test kits, sampling gear, etc.) and a one-day training program for ten project leaders (teachers, youth directors, club presidents, etc.).

Well Testing/Nitrate Screening - We will set up water testing stations throughout the watershed in town halls, and at the county fairs or at other village celebrations in the

watershed. The Town Hall locations will be one-day events. During the well screening program, watershed landowners can bring in a well water sample and have it screened for nitrate-nitrogen. We will test the water using cadmium pillow packs and a spectrometer (using the Hach colormetric test). We may want to get high school chemistry students or the FFA involved in this activity.

Wetland Model - Work with a youth group (FFA, Biology Class, 4-H, etc.) or talented adults to create a portable model that demonstrates how wetlands impact base flow in streams.

Winter Meetings - Throughout the winter, different organizations host a series of meetings. Watershed staff will take advantage of these meetings to deliver messages that tie the goals of the watershed project to the mission of the organization and the interests of the meeting participants. Specifically, watershed staff will discuss reduced tillage, cover crops, wetland restorations, buffer strips, easements and other BMPs.

More I&E Activity Ideas

The I&E Work Team and CAC suggested the following activities that were not incorporated into the activity tables. The I&E coordinator could draw upon the following list later, perhaps during one of the annual I&E activity evaluation and planning-for-next-year meetings.

4-H Environmental Project - 4-H members conduct their environmental projects in the watershed and discuss the watershed.

Responsibility: Watershed I&E coordinator/4-H Agent
Frequency: Annually

FFA Programs - Getting FFA groups involved in the Green Stripe Program and getting runoff pollution (how it occurs, how to stop it) in the vocational-ag curriculum. FFA members should also be invited to tours and field days.

Time: 100 hours
Responsibility: Watershed education specialist/FFA Directors
Frequency: Annually

Field Trips - For school children to learn about the watershed ecosystem and how they can enhance it. The trips should be tied into a curriculum.

Road Salt Demonstration - Coordinate with the county highway departments or DOT to demonstrate reduced road salt use on some stretch of road in the watershed and publicize it with signs and in the newsletter. Get local reaction and report to public officials along with cost savings figures to the county.

School Programs - Working with school districts and individual teachers to build natural resource/water quality issues into the curriculum or classroom activities. This activity also includes providing booklets, posters, models and other learning materials to teachers; building the water quality monitoring program into the curriculum; and establishing an outdoor classroom at one of the schools. The outdoor classroom may include a pond/wetland, prairie and woodland. Note: The Abrams School Principal is *very* interested in cleaning up the river.

Time: 100 hours for the first year, then 40 hours per year after that
Responsibility: Watershed I&E coordinator
Frequency: This will be an ongoing activity once it is started
Cost: $5,000 for the outdoor classroom, $1,000 for in-service training (cost for materials and paying for substitute teachers).

Scouting Project - A project that will help a Boy Scout, Girl Scout, Weblow, Brownie, Cub Scout, Daisy Scout or Tiger Scout earn a badge.

Time: 20 hours
Responsibility: Scout Troop leader/Watershed I&E coordinator
Frequency: Annually

Success Charts - Bar charts, thermometers, graphics, etc. that show progress towards watershed goals.

Responsibility: Watershed I&E coordinator and project managers
Frequency: Continual

Watershed Vision - We should work with the CAC to develop a shared vision for the watershed and articulate both the vision and mission for the watershed.

Youth Research and River Clean-up Projects - Age-appropriate (K-12) activities. The kids will report to (and educate) various groups, including the LCC's.

Youth Scholarships - Provide scholarships to high school or college students who want to pursue a research project in the watershed.

CHAPTER SIX
Project Evaluation

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

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

Information on the first two components will be collected by the Shawano and Oconto County LCD and reported on a regular basis to the DNR and the DATCP. The project team will meet early in the year throughout the implementation phase to review and evaluate the accomplishments of the preceding year. 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 Financial Assistance. The Watershed Resource Evaluation Monitoring follows guidance established by DNR's Bureau of Watershed Management to select and monitor specific sites in the watershed to monitor resource quality changes.

A final report will be prepared for the Pensaukee River Priority Watershed Project within 18 months of the end of the grant period. This report will include information on landowner participation, project management, grant management, technical assistance, and any Signs of Success sites completed within the watershed among other topics. It is developed to evaluate progress, provide documentation on attainment of water quality and pollutant load reduction objectives, evaluate BMP effectiveness, and provide recommendations on which target key areas needing improvement in the NPS program.

The county LCDs will prepare the final report or will provide the necessary pollutant load reduction data to the DNR for inclusion in the final report.

Administrative Review

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

The Field Offices Computing System (FOCS) is a computer data management system, developed by NRCS. NRCS, DNR and DATCP use FOCS to meet the accomplishment reporting requirements of all three agencies. The county LCDs will use FOCS to collect data for administrative accomplishments, and will provide the information to the DNR and the DATCP for program evaluation.

The nonpoint source pollution data reported by the counties are used in reports to the state Legislature, Land and Water Conservation Board, governor, and federal funding agencies, primarily EPA. The information is used to assess the state program and the individual projects so managers may make necessary changes.

Accomplishment Reporting

The LCDs will provide the following data to the DNR and the DATCP annually:

- Planned and completed BMPs
- Planned and completed conservation systems
- Major information and education activities undertaken

Accomplishment data are summarized biennially in the joint evaluation report prepared by DATCP and DNR, discussed at watershed review meetings held annually for projects in implementation, and reported to the Land and Water Conservation Board in odd-numbered years. Additional evaluation data provided by Shawano and Oconto County LCDs for the annual watershed review include:

- Pollutant load reductions (described later in this chapter)
- Status of grants and related financial activities
- Program participation status including number and frequency of contacts with rural cost-share eligible landowners
- Status of project administration including data management, staff training, and BMP monitoring
- Status of nutrient management planning and easement acquisition
- Information and education accomplishments

The DNR and local units of government will jointly evaluate the urban implementation program. Annual reports of county LCDs will include:

- Information and education activities
- Construction site erosion control ordinances or amendments adopted
- Number of permits monitored for ordinance compliance
- Implementation of urban "housekeeping" activities including yard care
- Acres of existing urban development, by land use, covered by stormwater management plans for controlling water quality
- Acres of new urban development, by land use, covered by stormwater management plans for controlling water quality
- Construction site erosion control ordinance provisions adopted

In addition to reporting the above program information, priority watershed projects having designated critical sites in their plans (such as this one) have additional tasks to carry out and report to the DNR including:

- Verification of critical site status
- Implementing the schedule of notification to landowners with critical sites
- Following through with contact strategy to affected landowners

Financial Expenditures

Shawano and Oconto LCDs will provide the following financial data to the DNR and the DATCP on an **annual** basis:

- Number of landowner cost-share agreements signed
- Amount of money encumbered in cost-share agreements
- Number of landowner reimbursement payments made for the installation of BMPs, and the amount of money paid
- Staff support costs (salary, travel, training, equipment, supplies)
- Administrative expenditures for Shawano and Oconto County LCDs (single purpose audits, deed recording, etc.)
- Other project expenditures (professional services, information and education, easements, etc.)
- Interest earned and spent

In addition, DATCP will collect the following on an **annual** basis:

- County funds allotted and spent

Each county receiving state grant funds, regardless of the origin, are subject to single county audits once each year. Staff from DATCP and DNR review audit guidelines annually and offer recommendations for updating these document.

Time Reporting

The Shawano and Oconto County LCDs will provide time summaries to DNR and DATCP for the following activities on an annual basis (on or before April 15 each year):

- General county activities
- Priority watershed projects
- Farmland Preservation Program
- Soil Erosion Control Program
- USDA programs
- Wildlife Damage Control
- Soil and Water Resources
- Regulatory Animal Waste Response (NR 243)
- Nutrient and Pest Management
- Agricultural Shoreland Management

Nonpoint Source Pollutant Load Reduction

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

Cropland Sources

Oconto and Shawano County LCDs will use the WINHUSLE model to estimate sediment reductions due to changes in cropping practices. The county staff will use FOCS to provide data for the WINHUSLE model on an annual basis, as described above.

As described in detail in Chapter 2 (p. 50-51), WINHUSLE is used in the Pensaukee River Watershed project to evaluate cropped fields based on their sediment delivery rates, and eligibility and critical sites cutoffs are drawn based on these sediment delivery numbers for a partial inventory (roughly 23 percent). The inventory is to be completed within a maximum of four years of plan approval. Progress towards completing this inventory should be identified and discussed as part of the annual evaluation meetings with the county staff, DNR and DATCP.

Also as part of these annual meetings, staff will be evaluating and discussing progress towards meeting the critical sites objectives through voluntary participation. As detailed in Chapter 2, to be classified as "critical sites," landowners' fields must be contributing greater than "T," or the tolerable soil loss in tons/acre/year, ***or*** be determined to deliver greater than 1.4 tons/acre/year of sediment reaching surface waters. Approximately 3,055 acres of cropland in the Pensaukee River Watershed meet the critical site criteria. To promote voluntary participation, only those landowners having cropland fields with a soil loss greater than T will receive initial critical site notification, while the remaining 68 percent of the cropland critical site sediment loads will be focused on crop fields delivering sediment to surface waters at a rate greater than 1.4 tons/acre/year. Project staff members believe these critical site fields have one or more of the following characteristics and will target their efforts early on to sign up landowners with fields with the following:

1. Land Slope of C (6-12 percent).
2. Directly adjacent to tributaries of the Pensaukee River or the main stem.
3. Moldboard plowing tillage practice.
4. Row cropping of three or more years in succession.

The county watershed staff will be accountable, as part of their annual evaluation meeting, for making reasonable progress towards addressing fields in these situations. Evaluations with Oconto and Shawano County LCD staff members, the DNR and DATCP staff are conducted annually, and during the fourth year of project implementation, the Pensaukee River Watershed will be evaluated by the Shawano and Oconto County LCDs in conjunction with the DNR's Northeast District priority watershed coordinator and DNR's Central Office critical sites coordinator for progress. If "acceptable progress" has been made at the end of the third year of the project implementation, a portion of the remaining critical sites that have not yet been notified by letter, may be reclassified as "eligible" or the criteria for critical sites may be re-evaluated and a plan amendment pursued.

Acceptable progress is defined as completing the entire WINHUSLE inventory and achieving 50 percent (3,865 tons) of the project's total cropland sediment reduction objective through various management options. If acceptable progress is not made, the DNR, DATCP and county staff will re-examine how to best achieve the critical sites sign up, and this may result in DNR notification of critical sites status for those landowners who remain not signed up at that point.

Streambank Sources

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

Barnyard Runoff

County LCDs will use the BARNY model to estimate phosphorus reductions due to the installation of barnyard control practices. The LCDs will report the information to the DNR through FOCS. In the event that FOCS is replaced, the replacement system will be used for all project tracking. Again, the first few annual meetings will include discussion on how well the project is progressing towards critical sites participation. Specifically, the county project staff have 6 months (with three possible 90-day extensions) to achieve voluntary sign-up for those critical site barnyard landowners before notification must occur.

Urban Areas

County staff will report annually to the DNR on any activities that may result in changes in urban pollutant loadings. Such activities include acres of existing and new urban land, by land use, served by new stormwater BMPs; new urban lands, by land use, not served by stormwater BMPs; new construction; new municipal ordinances; and other information requested by the DNR concerning BMP characteristics.

Water Resource Evaluation Monitoring

Limited funds and the intensive staffing needed to properly evaluate water quality changes prohibits monitoring each watershed individually. Instead, two types of evaluation monitoring are being conducted on a state-wide basis: Whole Stream Monitoring and Signs of Success. The goal of the evaluation monitoring activities is to determine the progress the DNR's Runoff Management Program is making towards improving the quality of Wisconsin's water resources.

Evaluation monitoring activates were developed to answer five questions about the water resource objectives and the pollution reduction goals:

1. Do the levels and types of best management practices recommended in the watershed plans achieve the water resource objectives?

2. Do the types and levels of best management practices recommended in the watershed plans achieve the pollutant reduction goals?

3. Does any level of practice installation below 100 percent achieve the water resource objectives or the pollutant reduction goals?

4. Do we need to adjust the pollutant load reduction goals to achieve the water resource objectives?

5. Can we use simple environmental indicators in many of the watershed projects to provide some early evidence that the practices might achieve the water resource objectives and pollutant reduction goals?

A team of experts from state and federal agencies, and the University of Wisconsin was formed to develop and direct the evaluation monitoring activities at the Whole Stream Monitoring and Signs of Success sites.

Whole Stream Monitoring Sites

Criteria were developed to select and monitor twelve streams around the state. The stream sites represent the five major types of fishery found in agricultural and urban parts of priority watersheds, and they also represent three of the five eco-regions in the state. The five fishery types are: high gradient coldwater sport fishery, high gradient warmwater sport fishery, high gradient warmwater forage fishery, low gradient warmwater forage fishery, and low gradient coldwater sport fishery. A storm sewer outfall is also being monitored. The three ecoregion types represented are the Southeastern Wisconsin till plains, the Driftless area, and the North Central Hardwood Forest.

All but one of the stream sites drains a small area (about 10 square miles or less). The schedule involves two years of monitoring before any best management practices are installed, five years of monitoring during the practice installation phase, two years of monitoring during the response period, and two years of monitoring during the post-practice installation phase, for a total of 11 years of monitoring.

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

A total of about $8,360,000 would be needed for the stream monitoring, if the work is carried out over a period of 11 years. The success of the evaluation monitoring activities depends on the installation of all the best management practices at the Whole Stream Monitoring Sites.

Signs of Success

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

Monitoring will take place over a two-year period -- the year before and the year after a practice is installed. Expected positive improvements will be on those sites where degraded habitat has occurred. Habitat sampling and photographs will be used to indicate the benefit of the practice. Limited chemical monitoring and fish sampling will be done at some sites.

The results of the Signs of Success monitoring will be featured in educational materials such as local newsletters and newspapers and the statewide newsletter *Fields and Streets*.

Potential SOS sites for the Pensaukee River Watershed are still being identified. If any sites meet selection criteria, one SOS site may be established shortly after the implementation phase begins.

APPENDIX A
Program Purpose and Legal Status

Wisconsin Runoff Management Program

The state Legislature created the Wisconsin Nonpoint Source Water Pollution Abatement Program (now called the Runoff Management Program) in 1978. The goal of the Program is to improve and protect the water quality of streams, lakes, wetlands, and groundwater by reducing pollutants from urban and rural nonpoint sources. The 166-square-mile Pensaukee River Watershed, located in Shawano and Oconto counties, was designated a "priority watershed" in 1994 and began planning in 1995. The primary objective of this project is to reduce nonpoint source pollution loads and to enhance and protect the water quality of the streams, groundwater and lakes within the Pensaukee River Watershed. At the same time, an objective is to reduce the nonpoint source pollution loads flowing out of the Pensaukee system into the bay of Green Bay. The Pensaukee River is part of the Upper Green Bay Basin.

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

The following is an overview of the Nonpoint Source (NPS) Priority Watershed program.

- The DNR administers the program in cooperation with DATCP. Wisconsin is divided into 333 discrete hydrologic units called watersheds. These watersheds are assessed for water quality concerns as part of a comprehensive basin planning program. Watersheds with a high degree of water quality impairment from nonpoint sources of pollution become eligible for consideration as a priority watershed project. Currently, there are 150 large-scale equivalent watersheds (one large-scale could be equal to two small scale or two lake projects) eligible for "priority" designation. A total of 22 watersheds (large and small-scale) are completed, and 64 are underway in either the planning or implementation phase. Designation as a priority watershed project enables special financial support to local governments and private landowners in the watershed to reduce nonpoint source pollution.

- A priority watershed project is guided by a plan such as this one, prepared cooperatively by the DNR, DATCP and local units of government, with assistance and comments from a local citizen's advisory committee. Project staff evaluate the conditions of surface water and groundwater, and inventory

the types of land use and nonpoint sources of pollution throughout the watershed. The priority watershed plan assesses nonpoint and other sources of water pollution and identifies best management practices (BMPs) needed to control pollutants to meet specific water resource objectives. The plan guides implementation of these practices in an effort to improve water quality.

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

- Technical assistance is provided to aid in the design of BMPs. State level cost-share assistance is available to help offset the cost of installing these practices. Eligible landowners and local units of government are contacted by the local staff to determine their interest in installing the BMPs identified in the plan. Signed cost-share agreements list the practices, costs, cost-share amounts and a schedule to install management practices. Municipal governments are also assisted in developing and installing BMPs to reduce urban pollutants.

- Informational and educational activities are developed to encourage participation and change behavior to be positive for water resources.

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

Legal Status of the Nonpoint Source Control Plan

The Pensaukee River Priority Watershed Plan was prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program described in Section 281 of the Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code. It was prepared through the cooperative efforts of the DNR, DATCP, the Land Conservation Departments (LCDs) for Shawano and Oconto counties, NRCS, and the Pensaukee River Watershed Citizens Advisory Committee.

This watershed plan is the basis for the DNR to enter into cost-share and local assistance grants with agencies responsible for project implementation and will be used as a guide to

implement measures to achieve desired water quality conditions. If a discrepancy occurs between this plan and the statutes or the administrative rules, or if statutes or rules change during implementation, the statutes and rules will supersede the plan. This watershed plan does not in any way preclude the use by local, state or federal governments of normal regulatory procedures developed to protect the environment. All local, state and federal permit procedures must be followed. In addition, this plan does not preclude the DNR from using its authority under chapters 283 and 281 of the state statutes to regulate significant nonpoint pollution sources in the project area.

This priority watershed plan was approved by DNR following approvals by the state Land and Water Conservation Board, and the County Boards of Shawano and Oconto counties.

Amendments to the Plan

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

The Nonpoint Source Control Plan and the Stormwater Discharge Permit Program

Wisconsin's Pollution Discharge Elimination System (WPDES) Storm Water Permit Program is administered by DNR's Bureau of Watershed Management under Chapter 147 of the Wisconsin Statutes. This program is separate from the Runoff Management program and applies to certain classes of dischargers statewide as identified in NR 216. In cases where the programs do overlap, implementation grants may only apply to activities identified in the watershed plan. Practices to control construction site erosion and storm water runoff from new development are not eligible for cost sharing. In industrial areas, cost sharing is available as specified in NR 120.17 — only in the non-industrial parts of facilities where a problem has also been identified in the priority watershed plan.

Project Planning and Implementation Phases

Planning Phase

The planning phase of the Pensaukee River project began in 1995. The following information gathering and evaluation activities were completed during this stage:

- Determine the conditions and uses of groundwater, streams, and lakes.
- Inventory types of land uses and severity of nonpoint sources affecting groundwater, streams and lakes.

- Evaluate the types and severity of other factors which may be affecting water quality. Examples include discharges from municipal wastewater treatment plants and natural or endemic stream conditions. (This has been completed through the continual integrated resource management planning efforts in the Upper Green Bay Basin.)

- Determine nonpoint source controls and other measures necessary to improve and/or protect water quality.

- Prepare and gain approval of a program for local implementation of the project so that plan recommendations would be carried out.

Implementation Phase

The implementation phase of the Pensaukee River Priority Watershed Project began following review of the draft priority watershed plan, a public hearing, and approval by the DNR, LWCB, and the Board of Supervisors for Shawano and Oconto counties. Public review during plan development occurred primarily through the efforts of the Pensaukee River Citizen Advisory Committee and the Land Conservation Committees from both counties.

During the implementation phase:

- DNR enters into local assistance agreements with local units of government that have implementation responsibilities identified in the plan. These agreements provide funds necessary to maintain the resources and staff required for plan implementation.

- In the rural portions of the watershed, the Shawano and Oconto County LCDs contacted eligible landowners to determine their interest in installing best management practices identified in the plan.

  In the urban portions of the watershed, the DNR or its designee contacts local units of government to discuss in detail the required actions for implementing the plan recommendations.

- In rural areas, the landowner signs a cost-share agreement with the county outlining the practices, costs, cost-share amounts and a schedule for installation of management practices. Practices are scheduled for installation after an agreement is signed. Practices must be maintained for at least 10 years. Easements must be for a period of at least 20 years, and are usually perpetual.

  In urban areas, similar processes are used. In some cases, the local units of government and the DNR sign agreements for urban practices. In other cases the agreements will be between local units of government and their private landowners.

APPENDIX B
Interim Best Management Practices

Interim best management practices (BMPs) are created to meet the specific and individual needs identified during the planning process of a priority watershed project and will be used on a trial basis. The practice will be evaluated for its effectiveness before consideration as a standard BMP. A procedure for interim BMP approval is detailed within the "Implementation Handbook" from the Runoff Management Program, DNR.

Vegetated Riparian Buffer

Definition

Riparian buffers are permanently vegetated (not cropped) areas immediately adjacent to intermittent or perennial streams that are designed and constructed to function as a filter to delay, absorb, or purify contaminated runoff before it enters watershed streams and lakes.

Purpose

The predominant sources of nonpoint source (runoff) pollutants in the Pensaukee River Watershed originate on croplands in the forms of excess phosphorus, nitrogen and sediment. Establishing vegetated buffer strips will provide significant protection to the water resource and increase the likelihood of achieving the water resource objectives identified in this plan.

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

All watershed participants will also be eligible for an NPS corridor easement acquisition where the establishment of a vegetated riparian buffers is determined necessary to meet water resource objectives.

Eligibility

1. To be eligible for an annual payment, the establishment of a 35-foot-wide buffer strip will be required as a minimum, although a 66-foot-wide buffer is preferred. This buffer width will be further defined on a case-by-case basis, using the formula developed and revised for the Branch River Watershed project, pending DNR approval.

- All perennial and intermittent streams delineated on the USGS 7.5-minute quadrangle maps are eligible for the vegetated riparian buffer establishment. Approval from the DNR Northeast Regional (or Upper Green Bay Basin) watershed coordinator will be required to establish eligibility for streams not delineated on a USGS map.

- The measurable width of a buffer begins at the centerline of an intermittent stream, and the edge of bank of a perennial stream (ordinary high-water mark).

- Vegetated buffer widths may be extended to cover floodplain areas to meet nonpoint source program objectives. Approval from the DNR Northeast Regional (or Upper Green Bay Basin) watershed coordinator will be required for proposed buffer areas that exceed 66 feet wide.

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

   - Shawano and Oconto County LCD staff may pursue establishing a county buffer ordinance which could require longer maintenance times beyond the operation and maintenance period requirements of the priority watershed plan.

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

   - Permanent hay land established at the expense of the landowner may be harvested for forage prior to September 1 of each year during the growing season.

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

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

5. A cost-share agreement must be signed by the landowner and the granting agency.

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

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

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

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

10. As a minimum, a status review of established buffers shall be conducted by the county LCD staff every 3 years. If a riparian buffer is rendered ineffective due to circumstances beyond the cost-share recipients control during the grant period, the local unit of government may amend the cost-share agreement to make the necessary repairs.

    While conducting a status review of a riparian buffer, the county LCD staff shall inspect for the following conditions:

    - encroachment within the delineated boundary.
    - the presence of rills or gullies.
    - sparse vegetative cover or the presence of invasive species.
    - buffer degradation due to cattle or machinery access.

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

Cost Sharing Authorization

Cost sharing is authorized for the following rates, conditions and practices associated with establishing riparian vegetated buffer strips.

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

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

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

4. At a flat rate of $100/acre/year for a maximum of 5 years for buffers planted to an NRCS-approved perennial grass mixture that does not contain reed canary grass.

No Cost Sharing Authorization

Cost sharing is NOT authorized for the following situations.

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

2. The establishment of buffer areas for, or in conjunction with, another program such as the federal Conservation Reserve Program (CRP) or "set-aside" acreage.

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

4. Sites where there is no direct benefit to protecting the surface water resources.

Sediment and Phosphorus Load Reduction Credit

Establishment of vegetative riparian buffers that comply with the conditions mentioned here can be credited at a sediment and phosphorus removal rate agreeable to DNR. Due to varying soils and site conditions, the established and agreed upon removal credits and conditions will only apply in the Pensaukee River Watershed project.

Cropland within 300 feet of a vegetated riparian buffer that has a slope greater than 10 percent is not eligible for a sediment and phosphorus reduction credit.

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

APPENDIX C
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."

ALGAE:

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

AMMONIA:

A form of nitrogen (NH_3) found in human and manures. 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. There are no areas of concern designated in the Pensaukee River Watershed as of this publication.

AREAWIDE WATER QUALITY MANAGEMENT PLANS (BASIN PLANS):

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

ANTIDEGRADATION:

A policy stating that water quality will not be lowered below background levels unless justified by economic and social development considerations. Wisconsin's

antidegradation policy is currently being revised to make it more specific and meet EPA guidelines.

AVAILABILITY:

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

BACTERIA:

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

BARNY:

The Wisconsin Barnyard runoff model, a computer model used to assess the water quality impacts of barnyards or feedlots. It was developed by DNR with assistance from NRCS and DATCP.

BASIN PLAN:

See "Areawide Water Quality Management Plan."

BENTHIC ORGANISMS (BENTHOS):

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

BEST MANAGEMENT PRACTICE (BMP):

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

BIOACCUMULATION:

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

BIOASSAY STUDY:

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

BIOCHEMICAL OXYGEN DEMAND (BOD):

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

BIODEGRADABLE:

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

BIOTA:

All living organisms that exist in an area.

BUFFER STRIPS:

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

BULKHEAD LINES:

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

CARCINOGENIC:

A chemical capable of causing cancer.

CATEGORICAL LIMITS:

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

CHLORINATION:

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

CHLORORGANIC COMPOUNDS (CHLORORGANICS):

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

CHRONIC TOXICITY:

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

CLEAN WATER ACT:

See "Public Law 92-500."

COMBINED SEWERS:

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

CONFINED DISPOSAL FACILITY (CDF):

A structure built to contain and dispose of dredged material.

CONGENERS:

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

CONSERVATION TILLAGE:

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

CONSUMPTION ADVISORY:

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

CONTAMINANT:

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

CONVENTIONAL POLLUTANT:

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

COST-EFFECTIVE:

A level of treatment or management with the greatest incremental benefit for the money spent.

CRITERIA:

See water quality standard criteria.

CRITICAL SITE:

A major source of polluted runoff in a watershed project for which best management practices are available but not currently being used. The watershed plan contains the description and the means of identifying critical sites for different pollution sources. Critical sites are so important to the overall success of the priority watershed project that

the state has been given authority to require site owners to install and/or use BMPs at identified critical sites.

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

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

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

DISTRICTS:
DNR field offices, now called "regions" with the DNR's recent reorganization. There are five DNR administrative regions in the state (see inside back cover for map). The Pensaukee River Watershed area is located entirely in the DNR's Northeast Region.

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

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

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

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

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

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

ENVIRONMENTAL QUALITY INCENTIVES PROGRAM (EQIP):
Formerly ACP, EQIP is a federal cost-sharing program to help landowners install measures to conserve soil and water resources. EQIP is administered by the USDA-NRCS through county committees.

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.

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

GREEN STRIPS:
See buffer strip.

GROUNDWATER:

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

HABITAT:

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

HEAVY METALS:

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

HERBICIDE:

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

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.

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.

LEACHATE:

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

LOAD:

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

MACROPHYTE:

A rooted aquatic plant.

MASS:

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

MASS BALANCE:

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

MESOTROPHIC:

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

MILLIGRAMS PER LITER (mg/1):

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

MITIGATION:

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

MIXING ZONE:

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

NONPOINT SOURCE POLLUTION (NPS):

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

OLIGOTROPHIC:

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

OUTFALL:

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

PATHOGEN:

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

PELAGIC:

Referring to open water portion of a lake.

PESTICIDE:

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

PH:

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

PHENOLS:

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

PHOSPHORUS:

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

PLANKTON:

Tiny plants and animals that live in water.

POINT SOURCES:

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

POLLUTION:

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

POLYCHLORINATED BIPHENYLS(PCBs):

A group of 209 compounds, PCBs have been manufactured since 1929 for such common uses as electrical insulation and heating/cooling equipment, because they resist wear and chemical breakdown. Although banned in 1979 because of their toxicity, they have been detected on air, land and water. Recent surveys found PCBs in every section of the country, even those remote from PCB manufacturers.

POLYCHLORINATED ORGANIC COMPOUNDS:

A group of toxic chemicals which contain several chlorine atoms.

PRETREATMENT:

A partial wastewater treatment required from some industries. Pretreatment removes some types of industrial pollutants before the wastewater is discharged to a municipal wastewater treatment plant.

PRIORITY POLLUTANT:

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

PRIORITY WATERSHED:

A drainage area roughly between 100,000 and 200,000 acres selected to receive state money to help pay the cost of controlling nonpoint source pollution. Because money is limited, only watersheds where problems are critical, control is practical, and cooperation is likely are selected for funding.

PRODUCTIVITY:

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

PUBLIC LAW 92-500 (CLEAN WATER ACT):

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

PUBLIC PARTICIPATION:

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

PUBLICLY OWNED TREATMENT WORKS (POTW):

A wastewater treatment plat owned by a city, village or other unit of government.

RECYCLING:

The process that transforms waste materials into new products.

REGIONS:

DNR field offices. There are five DNR administrative regions in the state (see inside back cover for map). The Pensaukee River Watershed area is located entirely in the DNR's Northeast Region. DNR regions were formerly called "districts" before 1997.

REMEDIAL ACTION PLAN (RAP):

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 federal Superfund project.

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA):

This federal law amends the Solid Waste Disposal Act of 1965 and expands on the Resource Recovery Act of 1970 to provide a program that regulates hazardous wastes, to eliminate open dumping and to promote solid waste management programs.

RETRO-FIT:

The placement of an urban structural practice in an existing urban area, which may involve rerouting existing storm sewers and/or relocating existing buildings or other structures.

RIPARIAN:

Belonging or relating to the bank of a lake, river or stream.

RIPRAP:

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

RULE:

Refers to Wisconsin administrative rules. See Wisconsin Administrative Code.

RUNOFF:

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

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% of the impurities. Sometimes "secondary treatment" refers simply to the biological part of the treatment process.

SEDIMENT:

Soil particles suspended in and carried by water as a result of erosion.

SEICHES:

Changes in water levels due to the tipping of water in an elongated lake basin whereby water is raised in one end of the basin and lowered in the other.

SEPTIC SYSTEM:

Sewage treatment and disposal for homes not connected to sewer lines. Usually the system includes a tank and drain field. Solids settle to the bottom of the tank. Liquid percolates through the drain field.

SLUDGE:

A byproduct of wastewater treatment; waste solids suspended in water.

SOLID WASTE:

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

STANDARDS:

See water quality standards.

STORM SEWERS:

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

SUPERFUND:

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

SUSPENDED SOLIDS (SS):

Small particles of solid pollutants suspended in water.

SYNERGISM:

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

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.

UNIFORM DWELLING CODE:

A statewide building code for communities larger than 2500 residents specifying requirements for electrical, heating, ventilation, fire, structural, plumbing, construction site erosion, and other construction related practices.

UNIVERSITY OF WISCONSIN-EXTENSION (UWEX):

A special outreach, education branch of the state university system.

VARIANCE:

Government permission for a delay or exception in the application of a given law, ordinance or regulation. Also, see water quality standard variance.

VOLATILE:

Any substance that evaporates at a low temperature.

WASTELOAD ALLOCATION:

Division of the amount of waste a stream can assimilate among the various dischargers to the stream. This limits the amount (in pounds) of chemical or biological constituent discharged from a wastewater treatment plant to a water body.

WASTEWATER:

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

WASTE:

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

WASTEWATER TREATMENT PLANT:

A facility for purifying wastewater. Modern wastewater treatment plants are capable of removing 95% of organic pollutants.

WATER QUALITY AGREEMENT:

The Great Lakes Water Quality agreement was initially signed by Canada and the United States in 1972 and was subsequently revised in 1978 and 1987. It proves guidance for the management of water quality, specifically phosphorus and toxics, in the Great Lakes.

WATER QUALITY LIMITED SEGMENT:

A section of river where water quality standards will not be met if only categorical effluent standards are met.

WATER QUALITY CRITERIA:

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

WATER QUALITY STANDARDS:

The legal basis and determination of the use of a water body and the water quality criteria, physical, chemical, or biological characteristics of a water body, that must be met to make it suitable for the specified use.

WATER QUALITY STANDARD VARIANCE:

When natural conditions of a water body preclude meeting all conditions necessary to maintain full fish and aquatic life and swimming, a variance may be granted.

WATERSHED:

The land area that drains into a lake or river.

WETLANDS:

Areas that are inundates or saturated by surface or groundwater at a frequency and duration sufficient to support a variety of vegetative or aquatic life. Wetland vegetation requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas.

WINHUSLE:

A computer model for evaluating sediment delivery to suface waters from agricultural lands. It was developed by DNR with assistance from NRCS.

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% of the cost of constructing wastewater treatment facilities. Most of this program's money goes for treatment plant construction, but three percent of this fund is available for repair or replacement of private, on-site sewer systems.

Nonpoint Source Water Pollution Abatement Grant Program - Funds to share the cost of reducing water pollution. Nonspecified sources are available in selected priority watersheds.

Solid Waste Grant Program - Communities planning for solid waste disposal sites are eligible for grant money. $500,000 will be available each year to help with planning costs.

WISCONSIN NONPOINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM:

A state cost-share program established by the state Legislature in 1978 to help pay the costs of controlling nonpoint source pollution. Also known as the nonpoint source element of the Wisconsin Fund or the Priority Watershed Program. It may also be referred to under its new name (as of DNR reorganization, effective January 1997), called the Runoff Management Practices 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: 1996 - 1997

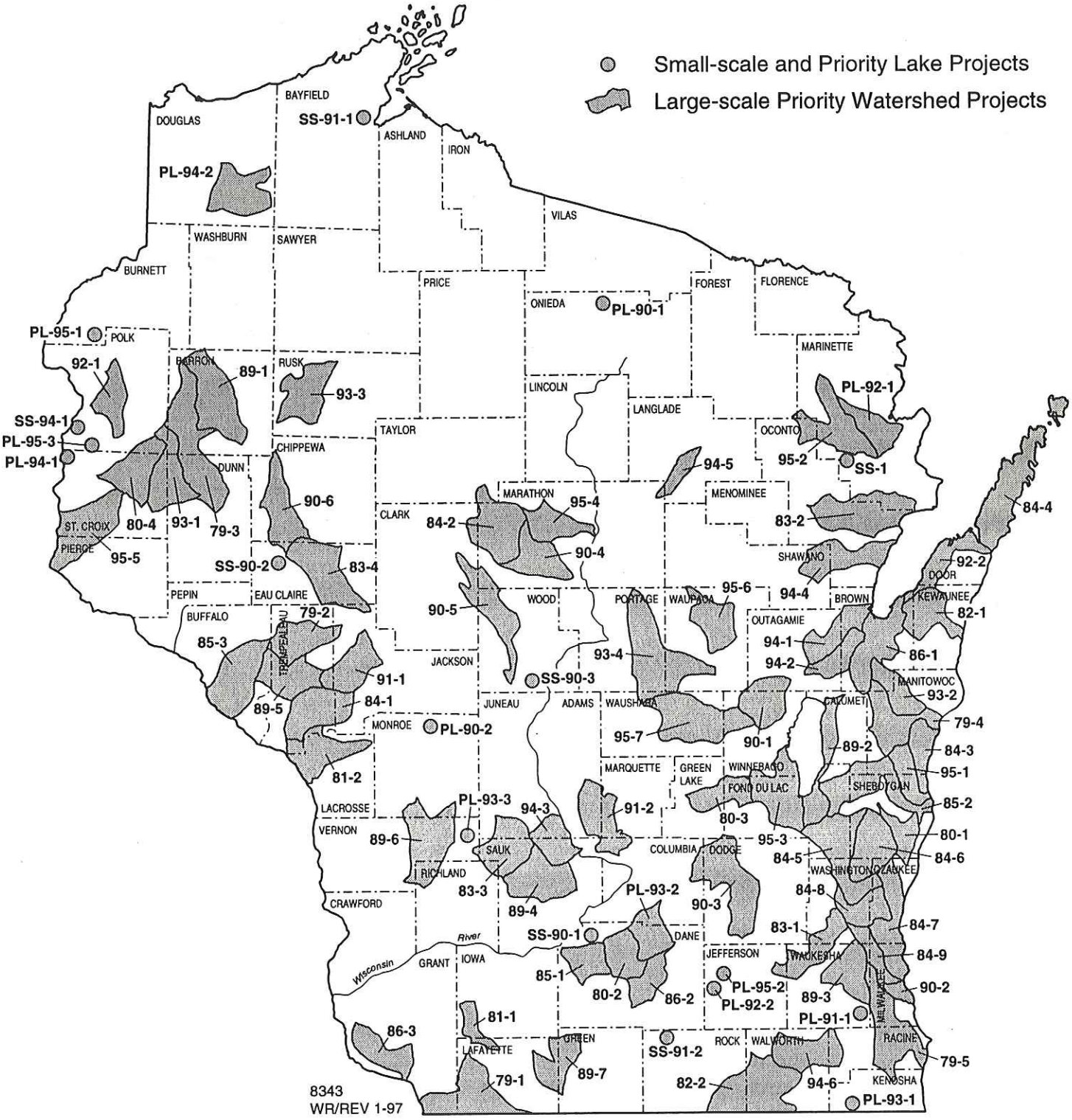
Year Selected-Map Number	Large-scale Priority Watershed Project	County(ies)
79-1	Galena River ♦	Grant, Lafayette
79-2	Elk Creek ♦	Trempealeau
79-3	Hay River ♦	Barron, Dunn
79-4	Lower Manitowoc River ♦	Manitowoc, Brown
79-5	Root River ♦	Racine, Milwaukee, Waukesha
80-1	Onion River ♦	Sheboygan, Ozaukee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

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

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

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

Priority Watershed Projects in Wisconsin
1996-1997



State of Wisconsin
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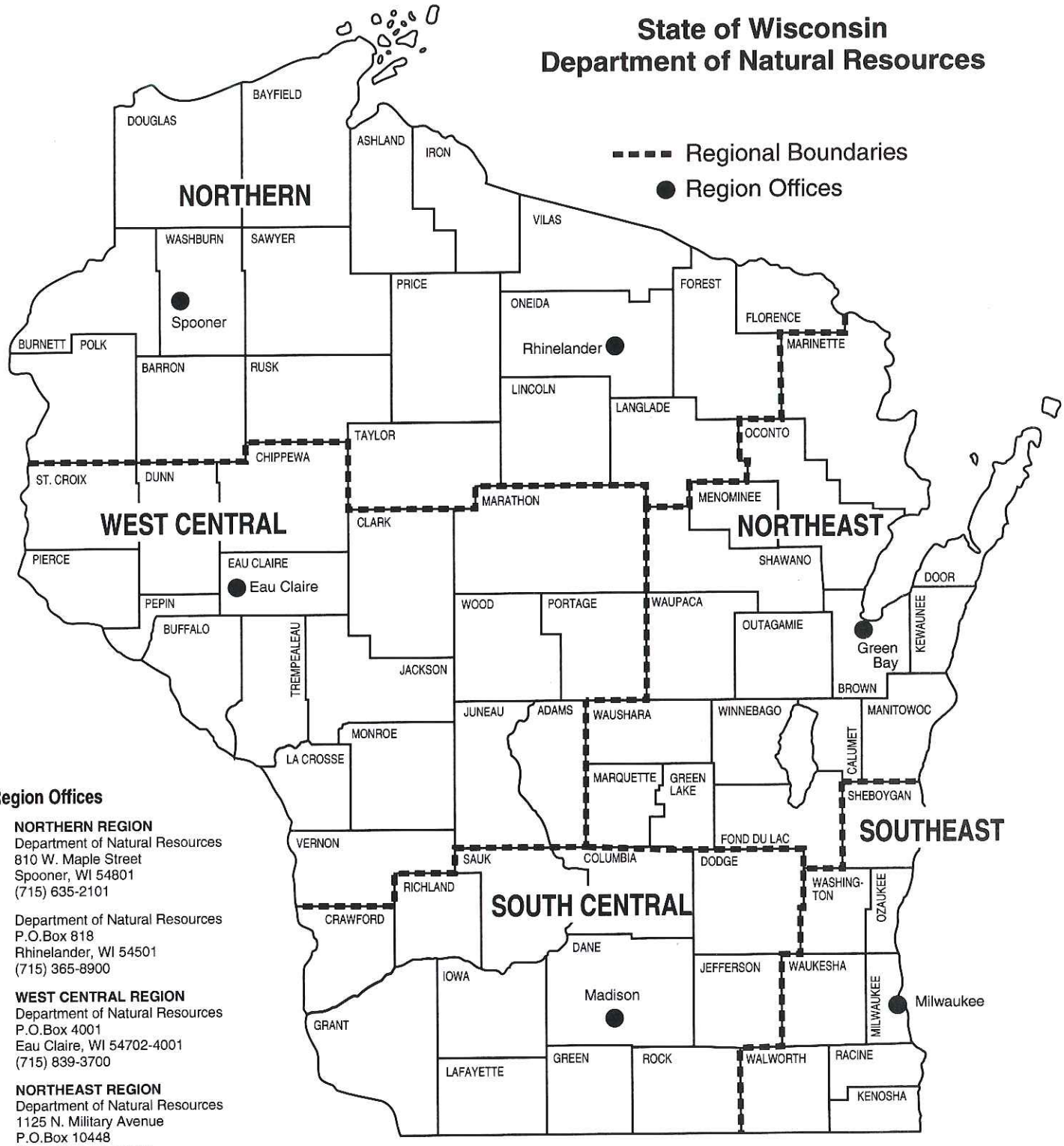

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REV 1-97

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.

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