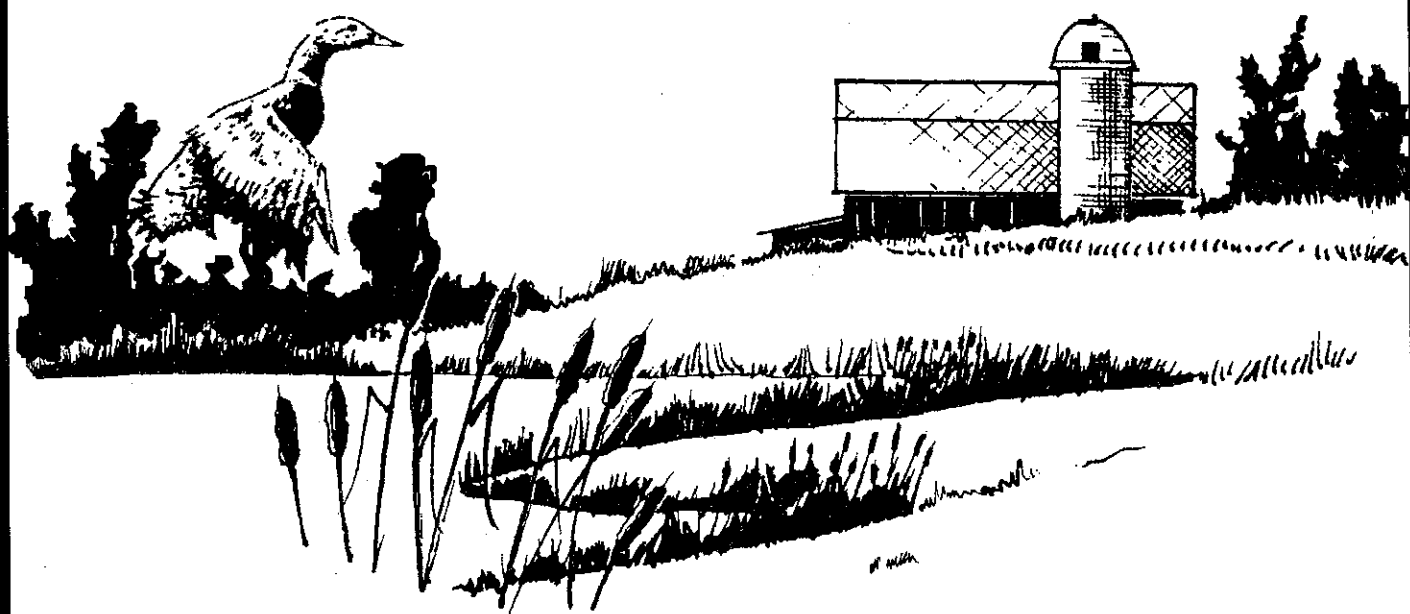


Nonpoint Source Control Plan for the Pine River / Willow Creek Priority Watershed Project



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

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Nonpoint Source Control Plan for the Pine River\Willow Creek Priority Watershed Project

The Wisconsin Runoff Management Program

October 1998

This Plan Was Cooperatively Prepared By:

The Wisconsin Department of Natural Resources
Wisconsin Department of Agriculture, Trade and Consumer Protection
Waushara County Land Conservation Department
and Winnebago County Land and Water Conservation Department

Publication WT-535-01

For copies of this document please contact:

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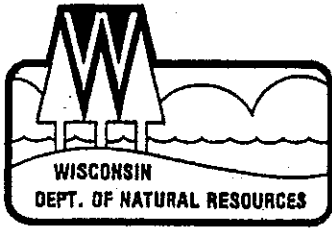
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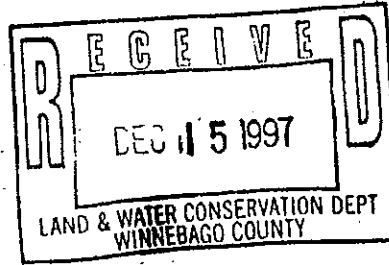
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December 2, 1997

Joseph Maehl, Chair
Winnebago County Board of Supervisors
258 Chatham Court
Neenah, WI 54956

Dear Mr. Maehl:

I am pleased to approve the Fond du Lac River Priority Watershed Plan. This plan meets the intent and conditions of s. 281.65, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. This plan has been reviewed by the Department of Agriculture, Trade and Consumer Protection. This plan went before the Land and Water Conservation Board on December 2, 1997 and was approved at that time. My approval of the watershed plan completes the plan approval process as set forth in Wisconsin Statutes and allows the granting of funds through the Runoff Management Practices Program. I am also approving the plan as an amendment to the Upper Fox River Basin Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Winnebago County staff that participated in preparing the plan. We look forward to assisting Winnebago County and other units of government in the watershed in implementing the plan.

Sincerely,

George E. Meyer
Secretary

c: ~~Pete Van Airsdale~~ - Winnebago County LWCD
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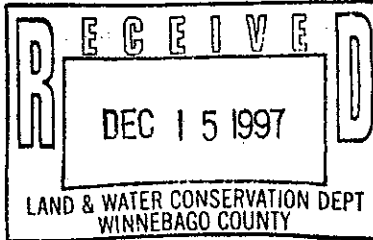
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December 2, 1997

Joseph Maehl, Chair
Winnebago County Board of Supervisors
258 Chatham Court
Neenah, WI 54956



Dear Mr. *Joe* Maehl:

I am pleased to approve the Pine River/Willow Creek Priority Watershed Plan. This plan meets the intent and conditions of s. 281.65, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. This plan has been reviewed by the Department of Agriculture, Trade and Consumer Protection. This plan went before the Land and Water Conservation Board on December 2, 1997 and was approved at that time. My approval of the watershed plan completes the plan approval process as set forth in Wisconsin Statutes and allows the granting of funds through the Runoff Management Practices Program. I am also approving the plan as an amendment to the Wolf River Basin Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Winnebago County staff that participated in preparing the plan. We look forward to assisting Winnebago County and other units of government in the watershed in implementing the plan.

Sincerely,

George
George E. Meyer
Secretary

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RES 32-10-95

AUTHORIZE ACCEPTANCE OF THE
PINE RIVER-WILLOW CREEK WATERSHED PROJECT THROUGH THE
WISCONSIN NONPOINT SOURCE POLLUTION ABATEMENT PROGRAM

WHEREAS, the Wisconsin Department of Natural Resources has notified the county of the selection of the Pine River-Willow Creek watersheds as new priority watershed projects through the Wisconsin Nonpoint Pollution Abatement Program; and

WHEREAS, through a long-term technical and financial commitment from the Department of Natural Resources and the Wisconsin Department of Agriculture, trade and Consumer Protection, this designation provides the opportunity to improve and protect the quality of the receiving waters in Lake Poyan; and

WHEREAS, the Waushara County Board has demonstrated its comment to improved water quality and assisting landowners through the Land Conservation Committee and its ongoing programs.


NOW, THEREFORE, BE IT RESOLVED, by the Waushara County Board of Supervisors, that the Land Conservation Committee be and hereby is authorized, on behalf of Waushara County, to accept the offer to designate the Pine River-Willow Creek as a new priority watershed project through the Wisconsin Nonpoint Source Water pollution Abatement Program.

Approved:



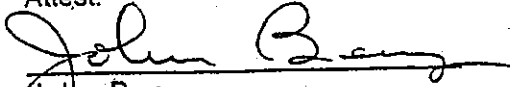
Randy TeWinkle
Corporation Counsel

Submitted by:



George Sorenson, Chairman
Waushara County Land Conservation Committee

Attest:



John Benz
Waushara County Clerk

Signed:



George Sorenson, Chairman
Waushara County Board of Supervisors

Table of Contents

	<u>Page</u>
Watershed Plan Organization Information	Inside Front Cover
Watershed Plan Credits	ii
Letters of Approval and Resolution	iii
LIST OF TABLES	xii
LIST OF MAPS	xiii
LIST OF ACRONYMS.....	xiv
PROJECT SUMMARY.....	S-1
Introduction.....	S-1
General Characteristics.....	S-2
Sources of Nonpoint Pollution	S-3
<i>Barnyard Runoff Inventory</i>	S-3
<i>Streambank Erosion Inventory</i>	S-3
<i>Shoreline Erosion Inventory</i>	S-3
<i>Upland Sediment Delivery</i>	S-3
<i>Groundwater Inventory</i>	S-4
Project Goals	S-4
<i>Sediment Objective</i>	S-4
<i>Phosphorus Objective</i>	S-5
<i>Groundwater Objective</i>	S-5
<i>Community Education and Action Objective</i>	S-5
Critical Sites	S-6
<i>Impact and Scope of Critical Sites</i>	S-7
Management Actions	S-7
Landowner Eligibility.....	S-7
<i>Barnyard Runoff</i>	S-7
<i>Upland Erosion</i>	S-8
<i>Streambank Erosion</i>	S-10
<i>Livestock Access</i>	S-10
<i>Shoreline Erosion</i>	S-10
Project Implementation	S-11
<i>Information and Education</i>	S-12
<i>Conservation Planning and Contracting</i>	S-12
<i>Project Implementation Costs</i>	S-12
Project Evaluation and Monitoring.....	S-13
<i>Administrative</i>	S-13
<i>Pollutant Reduction Levels</i>	S-13
<i>Water Resources</i>	S-13

	<u>Page</u>
CHAPTER ONE: Purpose, Legal Status and General Description	1
Legal Status of the Nonpoint Source Control Plan	2
<i>Amendments to the Plan</i>	3
<i>Relationship of the Nonpoint Source Control Plan to the Stormwater</i>	
<i>Discharge Permit Program</i>	3
Priority Watershed Project Planning and Implementation Phases	3
<i>Planning Phase</i>	3
<i>Implementation Phase</i>	4
Location and Community Information.....	5
<i>Civil Divisions</i>	5
<i>Population Size and Distribution</i>	5
<i>Land Uses</i>	5
 CHAPTER TWO: Watershed Conditions and Goals	 9
Physical Setting.....	9
<i>Climate and Precipitation</i>	9
<i>Topography</i>	9
<i>Geology</i>	9
<i>Soils</i>	9
Water Resource Conditions and Goals	10
<i>Surface Water Use Classifications</i>	10
<i>Fish and Other Aquatic Life Uses</i>	11
Surface Water Resources	11
<i>Subwatersheds in the Pine/Willow Watershed</i>	11
<i>Streams</i>	11
<i>Lakes</i>	13
<i>Wetlands</i>	14
Groundwater Resources	15
<i>Regional Aquifers</i>	15
<i>Direction of Groundwater</i>	15
<i>Groundwater Quality</i>	16
<i>Water Supplies</i>	17
Potential Groundwater Quality Problems.....	19
Water Quality Goals and Project Objectives	22
Subwatershed Descriptions	23
<i>Appraisal Methods</i>	23
<i>Upper Pine River Watershed (UP)</i>	28
<i>Middle Pine Subwatershed (MP)</i>	31
<i>Carpenter Creek Subwatershed (CC)</i>	35
<i>Lower Pine Subwatershed (LP)</i>	39
<i>Upper Willow Subwatershed (UW)</i>	42
<i>Mt. Morris Subwatershed (MM)</i>	44
<i>Bruce Creek Subwatershed (BC)</i>	47
<i>Middle Willow Subwatershed (MW)</i>	50

	<u>Page</u>
<i>Cedar Springs Creek Subwatershed (CS)</i>	53
<i>T.R. Jones Subwatershed (TR)</i>	56
<i>Pumpkinseed Creek Subwatershed (PC)</i>	58
<i>Poygan/Winneconne Subwatershed (PW)</i>	60
CHAPTER THREE: Nonpoint Source Pollutants and Management Strategy	63
Pollutant Reduction Goals and Project Objectives for Rural Nonpoint Sources	63
Management Categories	66
<i>Critical Site Management Category</i>	66
<i>Eligible Management Category</i>	67
<i>Ineligible Management Category</i>	67
Rural Nonpoint Source Pollutants and Management Strategies	68
<i>Barnyard Runoff</i>	68
<i>Cropland Spread Manure & Pesticide Runoff</i>	72
<i>Nutrient & Pest Management as Part of a Conservation</i> <i>Management Plan</i>	72
<i>Manure Storage Ordinance</i>	73
Construction Site Erosion and Stormwater Management	73
Upland Sediment Runoff	74
Gully and Streambank Sediment Runoff	75
<i>Livestock Access</i>	75
<i>Federal Program Integration</i>	76
<i>Shoreline Erosion</i>	81
Eligibility for Wetland Restoration, Easements and Land Acquisition	81
<i>Wetland Restoration</i>	81
<i>Wetland Restoration Permitting</i>	83
<i>Land Easements</i>	83
<i>Land Acquisition</i>	85
CHAPTER FOUR: Implementation	87
Introduction	87
Best Management Practices	87
<i>BMPs Eligible for Cost-Sharing and Their Rates</i>	87
<i>Interim Best Management Practices</i>	90
<i>Practices Not Cost-Shared</i>	90
Cost-Share Agreement Administration	92
Cost Containment	92
<i>Cost Containment Procedures</i>	92
Implementation Schedule	93
<i>Schedule of Critical Site Verification and Notification</i>	94
<i>Critical Site Appeals Process</i>	95

	<u>Page</u>
Cost-Share Budget.....	96
<i>Costs of Installing Rural BMPs</i>	96
<i>Easement and Land Acquisition Costs</i>	96
Budget and Staffing Needs.....	96
<i>Rural Budget and Staffing Needs</i>	96
Grant Disbursement and Project Management Schedule	97
CHAPTER FIVE: Integrated Resource Management Program.....	103
Introduction.....	103
Fisheries and Wildlife Management	103
<i>Land and Water Resource Management Plans</i>	103
<i>Wildlife Management</i>	104
Wetland Restoration	104
Groundwater Management.....	104
<i>Wisconsin Well Compensation Grants</i>	105
Private Sewage System Maintenance and Rehabilitation	105
<i>Wisconsin Fund</i>	105
Riparian Zones.....	106
Stewardship	106
Forestry Programs.....	106
<i>Stewardship Incentive Program</i>	106
<i>Managed Forest Law</i>	107
<i>Other Stewardship Programs</i>	107
Inland Lake Programs	107
<i>Wisconsin Lakes Management Program</i>	107
<i>Organizing Lake Groups</i>	108
<i>Self Help Lake Monitoring Program</i>	108
<i>Lake Management Planning Grant Program</i>	108
<i>Water Quality Trend Monitoring</i>	109
<i>Lake Protection Grant Program</i>	109
Coordinating Regulations, Permits, and Zoning.....	109
Coordination with State & Federal Conservation Compliance Programs	110
Archaeological Sites: Coordination with Historic Preservation Laws	110
<i>Practices of Concern Related to Archaeological Sites</i>	111
<i>Practices Where No Concern is Needed for Archaeological Sites</i>	111
Endangered and Threatened Resources	112
<i>Rare Species</i>	112
<i>Wisconsin Endangered Species</i>	112
<i>Wisconsin Threatened Species</i>	112
<i>Wisconsin Species of Special Concern</i>	113
<i>Natural Areas</i>	113

CHAPTER SIX: Information and Education Activities	115
Goal.....	115
Implementation Team.....	115
Strategy	115
Evaluation.....	119
CHAPTER SEVEN: Project Evaluation.....	121
Administrative Review	121
<i>Accomplishment Reporting</i>	122
<i>Financial Expenditures</i>	123
<i>Time Spent on Project Activities</i>	123
Nonpoint Source Pollutant Load Reduction	123
<i>Cropland Sources</i>	124
<i>Streambank Sources</i>	124
<i>Barryard Runoff</i>	124
<i>Construction Sites</i>	124
<i>Urban Areas</i>	124
Water Resource Monitoring.....	125
<i>Whole Stream Monitoring Sites</i>	125
<i>Signs of Success</i>	126
Final Report.....	127
APPENDIX A: Common Best Management Practices.....	129
BIBLIOGRAPHY	133

List of Tables

Table S-1	Summary of Land Uses in the Pine River / Willow Creek Watershed	S-3
Table S-2	Barnyard Runoff.....	S-8
Table S-3	Cropland Sediment Reduction Goals	S-9
Table S-4	Streambank Erosion	S-10
Table S-5	Trampled Streambanks.....	S-10
Table S-6	Shoreline Erosion.....	S-11
Table S-7	State Cost Share of Total Project Costs at 75% Landowner Participation.....	S-11
Table 1-1	Land Uses in the Pine River / Willow Creek Watershed	6
Table 2-1	Well Sampling Results: Nitrate	19
Table 2-2	High Priority Spill Sites	20
Table 2-3	High and Medium Priority LUST Sites	20
Table 2-4	Waste Disposal Sites in the Watershed or Within 2 Miles of the Watershed Boundary.....	21
Table 2-5	Surface Water Resource Conditions, Problems, and Nonpoint Sources of Pollution for Subwatersheds in the Pine River / Willow Creek Watershed.....	26
Table 3-1	Annual Sediment Reduction Objective: Pine River / Willow Creek.....	65
Table 3-2	Annual Phosphorus Reduction Objective: Pine River / Willow Creek.....	65
Table 3-3	Barnyard Inventory Results and Eligibility Criteria.....	71
Table 3-4	Summary of Upland Sediment Loading by Land Use.....	77
Table 3-5	Upland Sediment Inventory and Reduction Goals	78
Table 3-6	Streambank Erosion Inventory.....	79
Table 3-7	Streambank Erosion Eligibility.....	79
Table 3-8	Livestock Eligibility.....	80
Table 3-9	Shoreline Erosion	80
Table 3-10	Shoreline Eligibility.....	81
Table 4-1	Practices with Flat Rates for State Cost-Share Funding.....	88
Table 4-2	State Cost-Share Rates for Rural Best Management Practices.....	88
Table 4-3	Grant Disbursement Schedule at 75% Landowner Participation	98
Table 4-4a	Cost-share Budget for Rural Management Practices: Upland Nonpoint Source Pollution Control.....	99
Table 4-4b	Cost-share Budget for Rural Management Practices: Animal Waste Management	100
Table 4-4c	Cost-share Budget for Rural Management Practices: Streambank Erosion Control, Easements, and Land Acquisition	101
Table 4-5	Estimated County Staff Needs	102
Table 6-1	Educational Objectives for All Citizens	116
Table 6-2	Educational Objectives for Municipal Officials.....	116
Table 6-3	Educational Objectives for the Citizen Advisory Committee.....	117
Table 6-4	Educational Objectives for Agriculture	117
Table 6-5	Educational Objectives for Lake/Riparian Residents.....	118
Table 6-6	Educational Objectives for Teachers, Youth Group Leaders, and Youth	118

List of Maps

Map 1-1	Pine River / Willow Creek Watershed.....	7
Map 2-1	Upper Pine Subwatershed	29
Map 2-2	Middle Pine Subwatershed	33
Map 2-3	Carpenter Creek Subwatershed	37
Map 2-4	Lower Pine Subwatershed.....	41
Map 2-5	Upper Willow Subwatershed.....	43
Map 2-6	Mt. Morris Subwatershed.....	45
Map 2-7	Bruce Creek Subwatershed	49
Map 2-8	Middle Willow Subwatershed.....	51
Map 2-9	Cedar Spring Creek Subwatershed	55
Map 2-10	T. R. Jones Subwatershed	57
Map 2-11	Pumpkinseed Creek Subwatershed	59
Map 2-12	Poygan / Winneconne Subwatershed	61

List of Acronyms

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

PINE RIVER/WILLOW CREEK

PRIORITY WATERSHED

Project Summary

Introduction

The purpose of the nonpoint control plan developed for this project is to assess the nonpoint pollutants in the Pine River\Willow Creek Watershed and guide the implementation of pollution control measures. Nonpoint source control measures and education are needed to meet very specific water resource objectives designed to protect and enhance the groundwater and surface water resources.

Nonpoint source runoff cannot be easily traced to a single point of origin such as a point source effluent discharge from a wastewater or industrial treatment plant. Nonpoint source pollution occurs when rainwater or snow melt flows across the land and picks up soil particles, organic wastes, fertilizers, or other pollutants and carries them to surface and/or groundwater. These soil particles and organic wastes contain phosphorus and nitrogen, the same compounds found in commercial fertilizer. Soil particles can also cause sedimentation of the streams and the receiving water-initially Lake Poygan, and ultimately Green Bay. Nonpoint source pollution has led to a general decrease in the quality of the surface water resources in the Pine River\Willow Creek Watershed.

Secondary sources of nonpoint pollutants in the Pine River\Willow Creek Watershed originate from streambank, shoreline, and gully erosion resulting in sediment deposited in the lakes and streams. The Nonpoint Source Control Plan for the Pine River\Willow Creek Watershed was prepared by the Department of Natural Resources (DNR), the Department of Agriculture, Trade, and Consumer Protection (DATCP), the Winnebago County Land and Water Conservation Department, and the Waushara County Land Conservation Department. The Wisconsin Land and Water Conservation Board selected the watershed as a Priority Watershed Project through the Nonpoint Source Pollution Abatement Program in 1996. The Pine River\Willow Creek projects joins approximately 85 similar watershed projects statewide in which runoff control measures are being planned and implemented. The Nonpoint Source Water Pollution Abatement Program was created in 1978 by the state legislature. The program provides financial and technical assistance to landowners and local units of government to reduce nonpoint source pollution.

The project is administered at the state level by the DNR and DATCP. The Waushara County LCD and Winnebago County LWCD will principally administer the project at the local level with assistance from the University of Wisconsin-Extension and the Natural Resources Conservation Service. Secondly, qualified lake districts in the project area are eligible to receive local assistance grants to support activities that implement the plan. This plan is

primarily used by and written for County Conservation Departments, DNR, DATCP, other units of government, legislators, external program evaluators, and interested citizens.

General Characteristics

The Pine River\Willow Creek Watershed drains 308 square miles of land in Waushara, Winnebago, and Waupaca Counties in central Wisconsin, and is located in the Wolf River Basin. The Pine River, Willow Creek, and many high quality lakes are the primary surface water resources in the watershed. The watershed was divided into 12 smaller drainages called subwatersheds. This was done to target smaller areas with specific water quality goals and objectives.

Surface water in the Pine River\Willow Creek Watershed is being adversely affected by land use activities. Sediment is severely degrading stream habitat by silting in riffles, pools, and spawning areas. Lack of habitat and habitat degradation have played a major role in limiting the aquatic life in the streams of the watershed. In general, water quality declines the farther east it travels. This is due, in part, to the heavier clay soils of the region.

The lakes in the watershed can be characterized as being fairly well developed with good water quality. Lake development has increased with the conversion of seasonal residences to year-round homes. Riparian zoning enforcement and construction site erosion are important issues to riparian residents in the watershed. The protection and enhancement of lake water quality is a high priority due to the number and prominence of lakes in the watershed.

Ground water is stored in pore spaces and cracks within soil and rock layers. Principal aquifers within the watershed are glacially deposited sand and gravel. Localized groundwater problems are occurring. Samples analyzed for nitrite and nitrate showed concentrations ranging from no detect to over 10 parts per million. From the limited sampling it appears that farmstead wells have much higher nitrate levels than rural non-farm drinking water wells.

Farming is of vital importance to this area as cropland comprises over 59 percent of the overall land use in the Pine River\Willow Creek Watershed. The average size farm in the watershed is 214 acres. The year-round population of the watershed is estimated at 13,000 people. Seasonal (mostly) lake residents can increase the population fourfold. Regional trends suggest that the watershed population will increase in the next decade.

Table S-1. Summary of Land Uses in the Pine River\Willow Creek Watershed

Land Uses	Acres	Percent
Cropland	92,500	59.3
Wetland	24,063	15.4
Woodland	22,040	14.1
Grassland	2,570	1.6
Developed	3,546	2.3
Pasture	2,143	1.5
Natural Areas	9,110	5.8
Total	155,972	100

Sources of Nonpoint Pollution

The Waushara County Land Conservation Department and the Winnebago County Land and Water Conservation Department collected data on agricultural lands, barnyards, and streambanks in the watershed. The data was used to estimate the pollutant potential of these nonpoint sources. The following is a summary of the inventory results.

Barnyard Runoff Inventory

- 111 barnyards and animal lots were inventoried.
- An estimated 3,266 pounds of phosphorus are delivered to streams in the watershed every year.

Streambank Erosion Inventory

- 2,064 tons of sediment are delivered to streams.
- 57.8 miles of intermittent and perennial streams were inventoried.

Shoreline Erosion Inventory

- 584 tons of sediment are delivered to lakes.
- 55.6 miles of lake shoreline were inventoried.

Upland Sediment Delivery

- More than 21 percent of the land surface was inventoried.
- An estimated 30,190 tons of sediment are delivered to streams on an annual basis.
- This is 92 percent of the sediment load.

Groundwater Inventory

- 47 wells were sample for nitrates.
- 47 percent were over the Preventative Action Limit (PAL) of 2 PPM.

Project Goals

Goals for water quality in the Pine River\Willow Creek Priority Watershed Project were identified as protection, enhancement, and restoration of water quality and aquatic life habitat. These goals will be achieved through project objectives for sediment, phosphorus, groundwater, and community education.

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

Sediment Objective

The sediment objective is to reduce overall sediment delivered to the Pine River\Willow Creek from all sources by 34 percent. To meet this objective, the following is needed:

- Reduce sediment delivered to surface water from agricultural uplands by at least 10,188 tons, or 34 percent of the existing contribution from uplands. At a minimum, landowners with fields eroding at rates more than tolerable (T) soil loss rates, as calculated by the Universal Soil Loss Equation (USLE) and delivering sediment at rates greater than 1.0 tons per acre per year will be required to reduce soil loss to a lower level. Landowners with fields delivering more than 0.2 tons per acre per year of sediment will be eligible to for cost sharing to reduce soil delivery to surface water.
- Reduce shoreline and streambank erosion by 50 percent through implementation of shoreline and streambank protection practices such as riprap, fencing, and shaping and seeding. Additionally, efforts to maintain or develop stream woodland and grassland corridors by developing buffers that provide wildlife habitat, canopy, bank stabilization, and sediment reduction will be encouraged.
- Restore wetlands.
- Purchase streambank easements to protect riparian areas.
- Municipalities in Waushara County should adopt uniform construction site erosion control ordinances to limit sediment contributions from new construction sites.

Phosphorus Objective

The phosphorus objective is to reduce overall phosphorus delivered to the Pine River\Willow Creek by 34 percent. To meet this objective the following is needed:

- Reduce phosphorus runoff from barnyards in the watershed by approximately 28 percent through clean water diversions and /or complete system improvement.
- Promote nutrient and pest management as an economically and environmentally sound practice within the watershed.
- Reduce the phosphorus delivered to streams and lakes in the watershed from soil erosion in agricultural uplands by at least 34 percent. This can be achieved by reaching the sediment reduction objective.
- Waushara County should adopt a manure storage ordinance to protect water quality.

Groundwater Objective

The groundwater objective is to protect and enhance groundwater resources in the Pine River\Willow Creek watershed. To meet this objective, the following is needed:

- Use nutrient management plans to reduce the over application of commercial fertilizer and manure and the application of winterspread manure on unsuitable cropland.
- Implement BMPs as appropriate to protect and enhance groundwater quality.
- Encourage proper abandonment of unused wells per NR 120 and NR 812, Wis. Adm. Code.
- Reduce over application of pesticides.
- Provide landowners with extensive informational and educational materials to promote awareness and to instill responsibility for the groundwater resource.

Community Education and Action Objective

The community education and action objective is to foster understanding of runoff pollution problems and promote participation in resource protection within the Pine River\Willow Creek watershed. To meet this objective, the following is needed:

- Translate the project goals into action items by identifying target audiences and designing a program to meet those goals by working with that audience. Target audiences are those involved directly with land management, those involved directly with livestock and manure management, those who work with landowners and operators, and livestock operators, and those involved in conservation courses and activities.

Critical Sites

Nonpoint source pollutant load reductions in the Pine River\Willow Creek Watershed Project will be achieved mainly through voluntary participation. However, state statutes require that the nonpoint source control plan contain the necessary language to ensure the reasonable likelihood of achieving the water quality goals and objectives. Landowners with the sites that meet the established critical site criteria are required by law to address those specific sites by reducing the nonpoint source pollutant load to an acceptable level. Pollutant reduction can occur solely through the action of the landowner with guidance from county staff or through watershed cost sharing participation. Each identified critical site will be field verified before the land user receives notification as a critical site, with the findings sent to the DNR. Landowners interested in receiving cost-share assistance for installing best management practices will need to sign a cost-share agreement with the Waushara County Land Conservation Department or the Winnebago County Land and Water Conservation Department.

Notification of landowners with Critical Sites will begin when county staff have identified all individual fields for specific management categories on the FOCS\WINHUSLE database or through the BARNY computer model for barnyard sites. The highest ranked sites will be notified first until all landowners or land operators with critical sites are notified. Notifications will contain the following information:

- The 36-month period in which landowners are eligible for the full level of state cost sharing, after which the cost share rate decreases by 50 percent.
- The potential consequences of either Wisconsin Administrative Code Chapter NR 243 for animal waste, or s. 144.025(2)(u), (v), or (w) for sediment delivery and groundwater protection, that landowners may face if no action is taken. Some of these include notice of discharge, requiring a WPDES permit, or issuing a notice of intent.
- The right to appeal the critical site designation through written request to the County Conservation Committee within 60 days of receiving the notification letter. The county Conservation Committee shall limit its appeal consideration to whether the critical site designation is consistent with critical site criteria established in the nonpoint source plan.

Impact and Scope of Critical Sites

- Of the 111 barnyards inventoried, five were designated critical sites for control which will result in a minimum reduction of 25 percent of the barnyard phosphorus objective. At a minimum, these landowners must implement clean water diversion practices, but they are eligible for cost sharing to install full systems.
- Of the estimated 92,000 acres of cropland in the watershed, 2,418 acres have been designated as critical for sediment control which will result in 25 percent of the pollution reduction objective for sediment. This will impact an estimated 148 landowners (out of 1831) and 219 fields.

Management Actions

The county staff will contact all landowners who are eligible to receive cost sharing during the projects 10 year implementation. Management classifications are determined based on the level of pollution control needed to achieve water quality objectives in the watershed. Specific sites or areas within the watershed project are designated either "critical", "eligible", or "ineligible". Designation as a critical site indicates that controlling that specific source is necessary if the pollutant reduction goals for the project are to be met. Nonpoint sources that are eligible, but not critical, contribute less of a pollutant load, but are included in cost sharing eligibility to further ensure that water quality objectives are met. Landowners with eligible sites need not control every eligible source to receive cost share assistance.

The county staff will assist landowners in applying BMPs. Practices range from alterations in farm management (such as changes in manure spreading and cropping rotations) to engineered (such as clean water diversions, sediment basins, and manure storage facilities), and are tailored to specific landowner situations. County staff will also examine the need for wellhead protection areas for municipal drinking water supplies.

Landowner Eligibility

Barnyard Runoff

The barnyard pollution control objective is to reduce phosphorus in the streams of the Pine River\Willow Creek watershed by 28 percent (902 lbs. P/yr). Runoff carrying a variety of pollutants from barnyards and other confined livestock areas is a major source of pollutants in the streams of this watershed. One hundred eleven animal lots are a source of 3,266 pounds of phosphorus annually.

Barnyard sites contributing a phosphorus load greater than 100 lbs. on an annual basis will be designated critical for control. Those landowners with an animal lot designated as a critical site

for control are eligible for a complete barnyard system, including a nutrient management plan, but will only be required to install clean water diversion practices. Installation of these low cost, required practices alone will control nine percent (296 lbs. P/yr) of the annual phosphorus load. Barnyard sites that contribute greater than 65 lbs. and less than 100 lbs. of phosphorus annually, will be eligible for cost sharing on complete barnyard systems and clean water diversions.

Barnyard sites that contribute greater than 20 lbs. and less than 65 lbs. of phosphorus annually will only be eligible for cost sharing on clean water diversion practices. Having these livestock operations voluntarily participate in this watershed project will be the most expedient and cost effective method of controlling the manure runoff and will be essential for reducing phosphorus by 28 percent. An approximate 18 percent (576 lbs. P/yr) reduction could be obtained solely through this voluntary participation.

Barnyard sites that contribute less than 20 lbs. of phosphorus annually will not be eligible for cost sharing. There are approximately 41 landowners with animal lots in this category. It is possible that individual barnyard sites may become eligible for cost sharing if a determination is made by county staff and the DNR district biologist that corrective measures would improve water quality within a specific stream segment.

Table S-2. Barnyard Runoff

Category	No. of Sites	Pounds Reduced	% Reduction (Goal)	% Reduction (Total)
Critical Sites	5	296	33	9
Eligible	65	606	67	19
Ineligible	41	-	-	-
Total	111	902	100	28

Upland Erosion

The upland erosion reduction objective is to reduce the amount of upland sediment delivered to Pine River\Willow Creek from eroding uplands by 34 percent (10,188 tons/yr). Intensive agricultural practices have caused considerable amounts of eroded soil to reach streams and wetlands in the Pine River\Willow Creek watershed. Upland erosion is the major source of sediment and nutrients that are carried downstream, beyond individual subwatershed boundaries.

About 32,458 acres, or 21 percent of the watershed land area was inventoried in both Winnebago and Waushara Counties. Soil erosion was calculated using USLE and hydrology information using the WINHUSLE model.

An estimated 30,190 tons of sediment per year are delivered to streams and wetlands in the watershed from uplands. Uplands are the source of 92 percent of the sediment delivered to streams and wetlands.

In subwatersheds which have high sediment reduction goals, any cropland field eroding at a rate greater than the tolerable soil loss T, and delivering sediment to surface water at a rate greater than 1.0 tons/acre/year will be targeted as a cropland critical site, and subject pollution abatement action. The sediment reduction rate is in accordance with the water resource appraisal completed for the Pine River\Willow Creek Priority Watershed (Gansberg, 1997). Approximately 2,418 acres or 25 percent of cropland in the watershed meet the critical site criteria. Critical sites will affect an estimated 148 landowners who operate 219 fields within the watershed. When controlled through various management actions, these sites will account for 25 percent of the water quality objective for sediment reduction. This would reduce the sediment load delivered to Pine River\Willow Creek by an estimated 2,418 tons annually. All critical site cropland fields will need to be reduced to T or less.

Cropland fields not notified as critical sites that are delivering sediment to watershed streams at a rate greater than 0.2 tons/acre/year will be eligible for cost sharing and pollution abatement. These will be categorized as eligible sites. When controlled through various management actions, these sites account for 75 percent of the water quality objective for sediment reduction. This would reduce the sediment load to Pine River\Willow Creek by an estimated 7,770 tons, annually. These eligible site cropland fields will need to reduce the sediment delivery by at least half. Cropland fields that deliver less than 0.2 tons/acre/year will not be eligible for cost sharing of sediment reducing practices.

Table S-3. Cropland Sediment Pollution Reduction Goals

Category	Sediment Delivery	Acres	Tons Reduced	Percent Reduction
Critical	> T and > 1.0	2,981	2,418	25
Eligible	> 0.2	48,359	7,770	75
Ineligible	< 0.2	41,160	-	-
Total	-	92,500	10,188	100

Streambank Erosion

Streambank erosion contributes six percent of the total sediment load to surface waters in the watershed. Approximately 58 miles of streams were evaluated. An estimated 2,064 tons of sediment are eroding into streams annually, contributing about 2,064 pounds of phosphorus.

Table S-4. Streambank Erosion

Category	Delivery	Tons
Eligible	Sed. Delivery > 5 Tons/Year	1,032
Ineligible	Sed. Delivery < 5 Tons/Year	1,032

Livestock Access

Critical area streambanks include trampled sites greater than 400 feet per property owned. One landowner on a perennial stream is in this category.

Eligible area streambanks include any site that has trampled banks. These sites will be determined on a case by case basis ongoing throughout implementation.

Table S-5. Trampled Streambanks

Category	Criteria	Sites
Critical	Trampled Sites > 400 Feet	1
Eligible	Other Trampled Sites	To Be Determined During Implementation

Shoreline Erosion

While shoreline erosion in the watershed is essentially a natural process caused by wind and wave action, it may be affected by water level fluctuations, human trampling, and shoreline land

use practices. A shoreline erosion inventory was done during the summer of 1996. The inventory showed that moderate to mild erosion was common. Shoreline erosion is estimated to contribute 584 tons annually to watershed lakes, which is two percent of the total sediment delivered to surface waters.

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

Eligible sites are those with mild and moderate erosion. Moderate sites are defined as having a lateral recession rate of at least 0.5 feet per year. Mild erosion sites are defined as any site having a lateral recession rate of less than 0.5 feet per year.

Table S-6. Shoreline Erosion

Category	Criteria	Tons
Eligible	Lateral Recession > 0.5 Feet per Year	1,168
Ineligible	Lateral Recession < 0.5 Feet per Year	1,168

Project Implementation

Project implementation is scheduled to begin in October 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.

Table S-7. State Cost Share of Total Project Costs at 75 % Landowner Participation

Item	Costs
Cost Share Funds-Practices	\$5,769,300
Cost Share Funds-Easements	\$468,700
Local Assistance Staff Support	\$2,027,600
Information and Education Direct	\$58,500
Other Direct (Travel, Supplies, etc.)	\$208,000
Engineering Assistance	\$0
Total	\$8,532,100

Information and Education

The County Conservation Departments will take the lead responsibility for the implementation of the information and education strategy. The University of Wisconsin Cooperative Extension, the DNR, and the DATCP will provide supporting assistance. The County Conservation Departments will work with and seek support from local units of government and organizations such as lake management organizations, villages, civic groups and other community and business organizations.

Some of the primary objectives of the Information and Education plan are to:

- Increase awareness of nutrient and pesticide plan implementation.
- Educate landowners on the economic and financial benefits of legume and manure crediting.
- Increase utilization of conservation tillage techniques.
- In general, foster a stewardship ethic among watershed residents by providing the understanding, knowledge, and skills necessary to implement solutions to local water quality resource problems.

Conservation Planning and Contracting

Conservation planning and cost share agreements may be signed throughout the project. Sites determined as critical will be a priority. Other sites will be targeted for pollution control using ongoing inventory information. All practices listed on agreements must be installed before the project is scheduled to end. Landowners must maintain practices for at least 10 years from the installation of the final practice listed on the cost share agreement.

Cost share agreements are recorded with the register of deeds, and in the event of a property being sold, the new landowner will be required to install and maintain the remaining best management practices. Practices can be installed as soon as the landowner signs a cost share agreement with the County Conservation Department.

Project Implementation Costs

The DNR will award grants to Waushara and Winnebago Counties for the cost sharing of BMPs, staff support, and educational activities. Table S-7 includes estimates of the financial assistance needed to implement nonpoint source controls in the Pine River\Willow Creek Priority Watershed, assuming a 75 percent participation rate among eligible producers, and a 100 percent participation rate on critical sites.

Project Evaluation and Monitoring

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

Administrative

This category includes the progress in providing technical and financial assistance to eligible landowners, and carrying out educational activities identified in the management plan. The County Conservation Departments will track progress in this area and report to the DNR and the DATCP annually.

Pollutant Reduction Levels

The County Conservation Departments will calculate the reductions in the nonpoint source pollutant loadings resulting from changes in land use practices and report to the DNR and the DATCP during the annual review.

Water Resources

The DNR may monitor changes in water quality, habitat, and water resource characteristics periodically during the project, and at the end of the project period.

CHAPTER ONE

Purpose, Legal Status and General Description

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 308-square-mile Pine River\Willow Creek Watershed, located in Waushara, Winnebago, and Waupaca Counties, was designated a "priority watershed" in 1995 and began planning in 1996. The primary objective of this project is to reduce nonpoint source pollution loads and to enhance and protect the water quality of the streams, lakes, and groundwater within the Pine River\Willow Creek Watershed. The Pine River\Willow Creek Watershed is part of the Wolf River Basin.

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

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

- The Department of Natural Resources (DNR) administers the program in cooperation with the Department of Agriculture, Trade and Consumer Protection (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 130 eligible watersheds. Twenty-two (22) projects are completed and 86 are underway. The state legislature directed that all high ranking watersheds must be planned by 2015. 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 input from a local citizen's advisory committee. Project staff evaluate the conditions of surface water and groundwater, and inventory the types of land use and nonpoint sources of pollution throughout the watershed. The priority watershed plan assesses nonpoint and other sources of water pollution and identifies best management practices

(BMPs) needed to control pollutants to meet specific water resource objectives. The plan guides implementation of these practices in an effort to improve water quality.

- Upon approval by state and local authorities, local units of government implement the plan. Water quality improvement is achieved through mandatory and voluntary implementation of nonpoint source controls (BMPs) and the adoption of ordinances. Landowners, land renters, counties, cities, villages, towns, sanitary districts, lake districts, regional planning commissions, and other incorporated entities 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. Local staff then contacts eligible landowners and local units of government 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 for installing management practices. Municipal governments are also assisted in developing and installing BMPs to reduce urban pollutants.
- Informational and educational activities are developed to encourage participation.
- The DNR and DATCP review the progress of the counties and other implementing units of government, and provide assistance throughout the ten-year project. The DNR monitors improvements in water quality resulting from control of nonpoint sources in the watershed.

Legal Status of the Nonpoint Source Control Plan

The Pine River\Willow Creek Priority Watershed Plan was prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program described in Section 281.65 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 Conservation Departments for Winnebago and Waushara Counties, and the Pine River\Willow Creek Citizen Advisory Committee.

This watershed plan is the basis for the DNR to enter into cost-share and local assistance grants with the agencies and entities 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 281, 283, 285, 289, 291, 292, 293, 295, and 299 of the state statutes to regulate significant nonpoint pollution sources in the project area.

This priority watershed plan was approved by DNR following approvals by the Land and Water Conservation Board, and both the Winnebago and Waushara County Boards.

Amendments to the Plan

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

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

Wisconsin's Pollution Discharge Elimination System (WPDES) Storm Water Permit Program is administered by DNR's Bureau of Wastewater Management under Chapter 283 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 120.10 (1)(g) C only in the non-industrial parts of facilities where a problem has also been identified in the priority watershed plan.

Priority Watershed Project Planning and Implementation Phases

Planning Phase

The planning phase of the Pine River\Willow Creek project began in 1996. The following information gathering and evaluation activities were completed during this stage:

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

- Evaluate the types and severity of other factors that may be affecting water quality. Examples include discharges from municipal wastewater treatment plants and natural or endemic stream conditions. (This has been completed through the ongoing integrated resource management planning efforts in the Wolf River 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 Pine River\Willow Creek Priority Watershed Project will begin when NPS funds are available and following review of the draft priority watershed plan, a public hearing, and approval by the DNR, LWCB, and the Board of Supervisors for Winnebago and Waushara Counties. Public review during plan development occurred primarily through the efforts of the Pine River\Willow Creek Citizen Advisory Committee.

During the implementation phase:

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

Location and Community Information

The Pine River\Willow Creek Watershed is a 308-square-mile drainage basin on the western edge of the Wolf Basin, located approximately 20 miles west of Oshkosh in East-Central Wisconsin (Map 1-1). The Pine River\Willow Creek Watershed contains sixty-one lakes as well as 27 miles of Class 1 trout stream. The primary land use within the watershed is agricultural ranging from dairy to vegetable operations. In addition to agriculture, tourism is also very important within the area.

Civil Divisions

The Pine River\Willow Creek Watershed lies within Waushara, Winnebago, and Waupaca Counties. Incorporated areas in the watershed include the villages of Wild Rose, Redgranite, Poysippi, and Winneconne. Other communities in the watershed include Auroraville, Pine River, Saxeville, Lohrville, Borth, and Tustin. Public land within the watershed includes the Poygan Marsh State Wildlife Area as well as many other smaller DNR tracts along both the Pine and Willow Rivers. Waushara County and Waupaca County have entered into an agreement that allows Waushara County to implement the small portion of the watershed that lies in Waupaca County.

Population Size and Distribution

The Pine River\Willow Creek Watershed population is estimated to be about 13,000 persons. Most of the watershed population lives in rural unincorporated areas. Population growth rates in the watershed are increasing. Regional trends suggest that the watershed population will continue to expand.

Land Uses

Rural land uses predominate in the watershed. Agriculture is the most dominant land use, comprising 60 percent (Table 1-1). Dairy farming is the primary enterprise, with cash grain and vegetable cropping following closely behind. Woodlands and wetlands are abundant and cover 30 percent of the land area. Developed land uses occupy about 2 percent of the watershed.

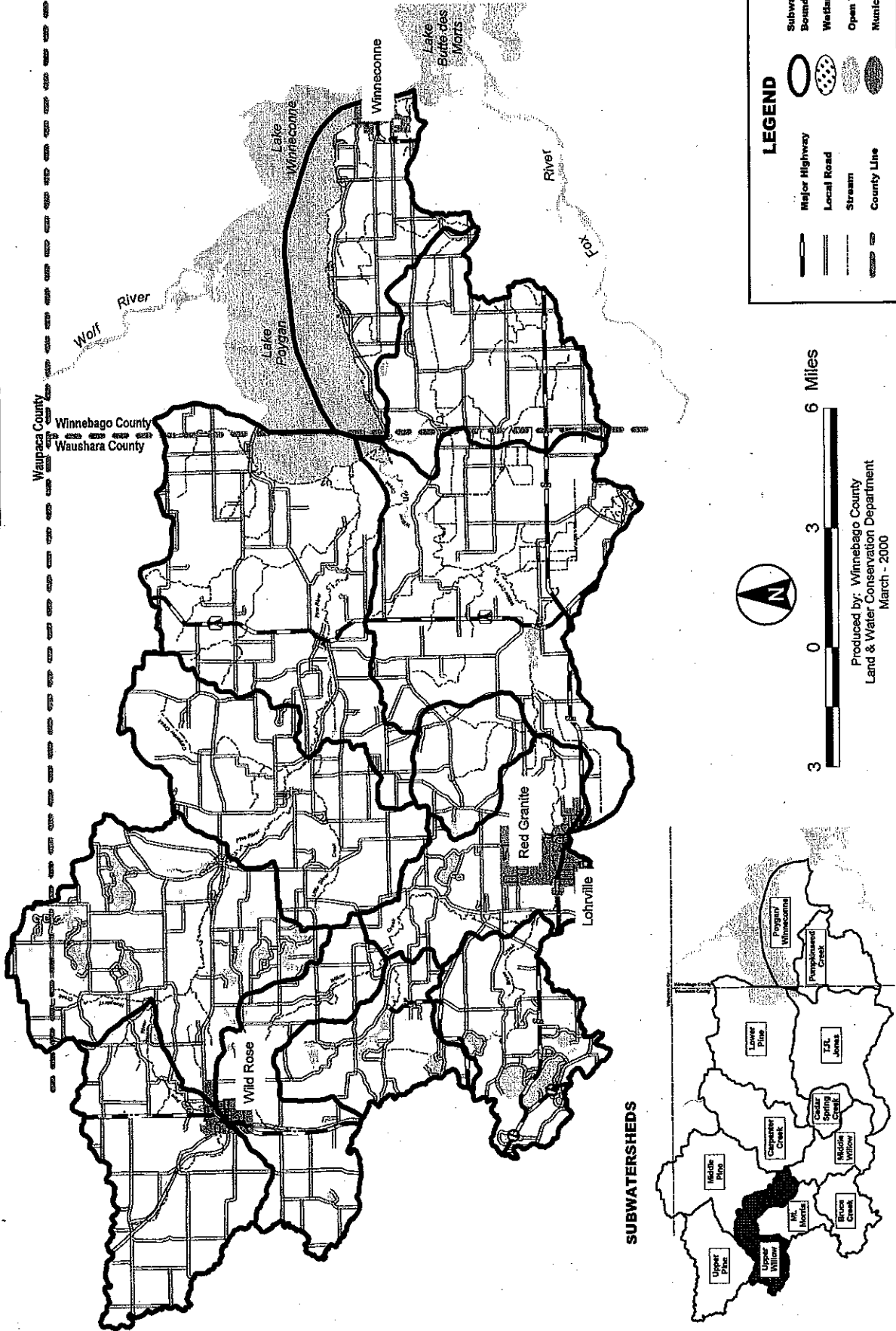
Table 1-1. Land Uses in the Pine River\Willow Creek Watershed¹

Land Uses	Acres	Percent
Agricultural	94,643	60.5%
Pasture	(2,143)	(1.5%)
Cropland	(92,500)	(59%)
Grassland	2,570	1.6%
Woodland	22,040	14.1%
Natural Areas	9,110	5.8%
Developed	3,546	2.3%
Wetland ²	24,063	15.4%
Total	155,972	---

Source: DNR & Waushara LCD and Winnebago County LWCD
These are estimates of actual wetland acres, not cropped wet fields,
based on WINHUSLE inventory data.. See the wetland section in this
chapter for a more comprehensive estimate of wetland acreage.

Pine River/Willow Creek Priority Watershed

Map 1-1.



CHAPTER TWO

Watershed Conditions and Goals

This chapter discusses the physical characteristics, existing water resources conditions, nonpoint sources of pollution, and objectives for the water resources in the Pine River\Willow Creek Priority Watershed.

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 Pine River\Willow Creek Watershed lies in the continental zone that 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 29.44 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

Glacial features largely dictate the relief in the region. Much of the Pine River\Willow Creek Watershed is located within the Central Plains Geographic Province of Wisconsin. The very western end of the watershed consists of drumlins and pitted outwash areas that have steep side slopes. The land to the east of the villages of Wild Rose and Wautoma gradually flattens into a gently rolling lake plain.

Geology

The bedrock formations within the watershed are overlain by glacial drift. Rock outcroppings occur along many valley walls. The typical land surface consists of hills and ridges on the bedrock surface, covered by only a thin layer of glacial material. Valleys that have cut into the bedrock are filled with the glacial material and now primarily make up the wetland areas.

Soils

The soils of the Pine River\Willow Creek watershed originate from three major sources: continental glaciation, bedrock weathering, and fluvial action. The majority of the soils in the watershed are grouped in the following soil associations:

- Plainfield-Okee-Richford association - Sloping to steep, somewhat excessively drained and excessively drained, sandy soils; on moraines and terraces.
- Kingsville-Meehan association - Nearly level and gently sloping poorly drained and somewhat poorly drained, sandy soils; on outwash plains and in glacial lake basins.
- Houghton-Adrian-Willete association - Nearly level, very poorly drained, mucky soils; on outwash plains, in glacial lake basins, and on moraines.
- Hortonville-Symco-Manawa association - Nearly level to sloping, well drained and somewhat poorly drained, silty, loamy, and sandy soils; on moraines and in glacial lake basins.
- Poy-Zittau-Poygan association - Nearly level and gently sloping, somewhat poorly drained and poorly drained, clayey and silty soils; in glacial lake basins and on moraines.
- Kewaunee-Manawa-Hortonville association - Well drained to somewhat poorly drained, nearly level to sloping soils that have a loamy or clayey subsoil underlain by loamy or clayey glacial till.

The natures of soils within the watershed affect the rate, amount, and quality of the surface water runoff exported from the land to the streams, rivers, and lakes. The erosion potential of soils is based on their texture, structure, organic matter content, permeability, slope, and position on the landscape.

Water Resource Conditions and Goals

This section describes the general conditions of the surface and groundwater resources in the Pine River\Willow Creek 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 and Table 2-5 provides a summary of the surface water resources in each subwatershed. Groundwater resources and quality are also discussed later in the chapter.

Surface Water Use Classifications

Surface water quality standards and criteria are an expression 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 for 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 Pine River\Willow Creek Watershed is subdivided into twelve individual subwatersheds. Major tributaries, lakes, wetlands, and subwatershed divides are shown on Map 1-1.

Subwatersheds in the Pine River\Willow Creek Watershed

Upper Pine	(UP)
Middle Pine	(MP)
Carpenter Creek	(CC)
Lower Pine	(LP)
Upper Willow	(UW)
Mt. Morris	(MM)
Bruce Creek	(BC)
Middle Willow	(MW)
Cedar Springs Creek	(CS)
T.R. Jones	(TR)
Pumpkinseed Creek	(PC)
Poygan/Winneconne	(PW)

Streams

The Pine River\Willow Creek Watershed is located in Waushara, Winnebago, and Waupaca Counties. The major streams in the watershed include the Pine River, Willow Creek, their

tributaries, and direct drainage tributaries to Lake Poygan, Lake Winneconne, and the Wolf River.

Stream habitat in the western half of the watershed is generally in good condition. Streambank erosion and cattle access appears to be minimal. Bank vegetative cover is generally good with diverse trees, shrubs, and grasses. There is adequate depth in pools and riffle areas and acceptable stream flow. Several of the streams have shifting sand substrate which somewhat limits available aquatic life habitat. Habitat in the eastern half of the watershed is generally fair to poor. Many of the tributaries, especially those with direct drainage to the Winnebago Pool Lakes, have been ditched and straightened to quickly convey water off the land and dry the soil. 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.

In some streams, the lack of riffles made macroinvertebrate sample collection impossible. However, where samples were attained, they generally indicate excellent to good water quality with some organic pollution present. Macroinvertebrate biomass was generally lower in areas with a predominantly sand substrate than a stream substrate with a mix of gravel, rubble and sand. In some stream reaches, habitat was generally limited to riffle areas below bridge abutments where rubble and gravel from rip-rap was present.

Many streams support high quality cold water Class I and II trout communities. Pumpkinseed Creek, the drainage ditches, and the lower reaches of the Pine River and Willow Creek, support warm water fish communities. As defined in NR 102.10 and NR 102.11, all the Class I portions of the streams are designated as Exceptional Resource Waters (ERW) except the Willow Creek, which is an Outstanding Resource Water (ORW). Outstanding designation means that it has the highest value as a resource, excellent water quality and high quality fisheries with no wastewater discharge. Exceptional designation means they have excellent water quality and valued fisheries but may receive wastewater discharge.

Fisheries surveys to generate index of biotic integrity (IBI) scores and evaluate habitat and sportfish populations found IBI scores ranged from 20 to 100 (poor to excellent). The low order headwater streams had the best overall IBI scores with the least environmental degradation. Upper Pine, Davis Creek, Kaminski Creek, Porters Creek, and the headwaters of Cedar Springs Creek and Willow Creek scored the best. Future best management practices should be focused on these streams to preserve their high water quality. Furthermore, land acquisition and easement projects should be given high priority for these streams. Carpenter Creek, Lower Cedar Springs Creek, Bruce Creek, and Humphrey Creek exhibited the poorest IBI scores. Agricultural activities such as wetland drainage and channel straightening have had a negative impact on the coldwater fish communities of these streams. Increased water temperature and sedimentation appear to have the greatest negative effect. Wetland mitigation and trout habitat improvement projects should be concentrated on these streams to improve water quality and fisheries. Brown trout was the dominant salmonid sampled in the watershed. Brook trout populations dominated in Kaminski Creek and upper Cedar Springs Creek and were found in low numbers in all other streams. Generally, brown trout dominated the larger slightly warmer streams with more

favorable "macro type" habitat (i.e. artificial habitat improvements and greater depth), while brook trout were primarily found in colder low order feeder tributaries (Niebur and Hitchcock-Esch, 1996).

Four of the ten sites monitored for continuous dissolved oxygen had levels below the state standard. Adequate dissolved oxygen levels are needed to maintain aquatic life in the streams. Two of the streams had depressed oxygen levels caused by rain runoff events. The other two streams had extended low levels caused by sediment oxygen demand.

Of the six sites monitored for water chemistries during runoff events, dissolved phosphorus levels were elevated consistently, total phosphorus concentrations were elevated some of the time, and ammonia and nitrates were elevated occasionally. This indicated that nutrients are entering the system either from a naturally occurring origin or nonpoint source.

Water samples were collected at 25 stream sites to represent groundwater discharge to surface water. The average nitrogen concentration of 16 samples in the Pine River drainage area was 3.42 mg/l. The range was 0.9 to 8.48 mg/l. The average of 9 samples in the Willow Creek drainage area was 2.24 mg/l, while the range was 0.82 to 3.28 mg/l. The groundwater recharge areas, especially in Humphrey Creek, Clayton Creek, and the headwaters of the Pine River and Willow Creek, are apparently influenced by land uses that increase groundwater nitrate concentrations which eventually gets discharged to surface waters.

The streams in the Pine River\Willow Creek Watershed show significant nonpoint source pollution problems in the eastern one half of the watershed. Sediment from streambank pasturing, flooding, cropland runoff, and construction along with excess nutrient loading has impaired the potential of these watershed streams. Low stream flow, shallow depths, warm water temperature caused by impoundments, excessive plant growth and low dissolved oxygen levels caused by nutrient inputs and sediment oxygen demand, loss of wetlands, and stream channelization also have negative impacts on water quality. Vegetative buffers along all the stream corridors would benefit water quality.

The western one half of the watershed has minimal impacts from nonpoint source pollution. The streams biological use is generally limited because of available habitat, not because of current nutrient and sediment loading to these streams although some sites show significant impairment from sedimentation. 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 the Winnebago Pool Lakes.

Lakes

There are 43 named and 18 unnamed for a total of 61 lakes in this watershed. Lake management organizations have been formed for several of the lakes in the watershed. Many of these

organizations have received lake planning grants to conduct water quality studies and develop lakewide management plans.

The lakes can be divided into two major categories; seepage and drainage. Several of the lakes in this watershed, including the millponds, are drainage lakes. Drainage lakes are stream fed with an outlet. Drainage lakes usually have a large drainage basin to surface acreage (DB/SA) ratio. As a rule of thumb, DB/SA greater than 10 have the greatest potential for influences from nonpoint sources of pollution. 20 of the 36 lakes evaluated have ratios greater than 10. Seepage lakes have no inlet or outlet and are groundwater and rain water fed.

Most of the lakes in the watershed, are hardwater, moderately deep, clear water, seepage lakes. They are generally characterized as mesotrophic to oligotrophic based on surface total phosphorus, secchi disk, and chlorophyll *a*. This means they have good water quality with low nutrient and algae populations that periodically bloom but do not persist the entire open water season (Rasman, 1996).

Mathematical models applied to seven lakes in the watershed predicted annual loads of total phosphorus from 363 to 896 lbs from nonpoint sources. This appears to be excessive; however, many of these lakes contain marl, which has the capacity to precipitate and bind phosphorus, thus limiting algae production. A point of saturation eventually will be reached where the lake no longer can handle the phosphorus load, although this exact point is unknown.

Soil associations around the lakes are generally excessively or well drained. This allows more infiltration and filtering of water through the soils as opposed to surface runoff to the lakes. Most of the lakes have numerous residential lots which increases the potential for pollutants in runoff from construction sites, driveways and other impermeable surfaces, lawns, and septic systems to reach the lake.

Wetlands

Wetlands are valuable natural resources. They provide wildlife habitat, fish spawning and rearing areas, recreation, storage of runoff and flood flows and removal of pollutants. Wetlands in the watershed are mainly in the Pine River and Willow Creek floodplains, particularly near their confluence with Lake Poygan. Floodplain wetlands support furbearers and waterfowl populations and may provide seasonal habitat for sport fish. There are also extensive wetland areas along the riparian corridor of all the streams in the watershed.

Wetlands, in the past, have been degraded through draining, grazing, cropping, or other activities causing water storage loss, and build up of sediments. Guidelines for wetland restoration, which will be a component of this project, are outlined later in the plan.

Groundwater Resources

Groundwater is the primary source of drinking water in the Pine River\Willow Creek\Poygan South Priority Watershed. Groundwater is stored underground in pore spaces and cracks within the soil and rock layers. Unconsolidated material and rock layers that will yield groundwater in usable quantities are called aquifers. Aquifers receive and store water and also discharge groundwater to lakes, streams, wetlands, and wells. Since 1936, Wisconsin has required well drillers to document well construction and rock and soil layers encountered during well installation. This report includes information from driller construction reports, geologic logs, and United States Geological Survey (USGS) and Wisconsin Geological and Natural History Survey (WGNHS) publications.

Regional Aquifers

Groundwater in the watershed occurs under both water table and artesian conditions. The water table -- the top of the saturated zone -- intersects the land surface at streams, lakes, and some springs, but in some areas may lie more than 50 feet below the surface. Artesian conditions occur where a low permeability layer such as a clay lens confines groundwater. Most drinking water wells in the watershed tap groundwater at depths of 50 to 350 feet. The principal aquifers within the watershed are the sand-and-gravel aquifer and the sandstone aquifer. The deeper Precambrian basement complex provides water for only a few wells, generally where the sand-and-gravel aquifer is very thin or absent. The Precambrian rock typically serves as a sump for increasing well storage capacity.

The sand-and-gravel aquifer consists of saturated sand and gravel deposits in the unconsolidated materials overlying bedrock. In the Pine River\Willow Creek Watershed, saturated sand and gravel occurs in discontinuous lenses within glacial outwash, till, alluvium, and glaciolacustrine deposits. Deposits reach their greatest extent over preglacial bedrock valleys and vary in thickness from 0 to more than 250 feet. Layers of saturated sand and gravel attain a maximum thickness of about 100 feet, but are usually less than 50 feet thick. Yields from the sand-and-gravel aquifer are highly variable, with the most productive wells providing yields upwards of 1000 gallons of water per minute.

The sandstone aquifer consists of a complex of Cambrian and Ordovician (Prairie du Chien group) age sedimentary bedrock. Although the various Cambrian and Ordovician rocks have distinct lithologies and permeabilities, all units are hydraulically interconnected and form a single aquifer. The thickness of this aquifer varies from 0 feet (at granite surface outcrops) to greater than 280 feet. The sandstone aquifer generally provides yields sufficient for most purposes, and is often capable of providing more than 500 gallons per minute.

Direction of Groundwater

Water infiltrates the soil primarily in upland areas and enclosed depressions. Due to the relatively permeable soils and a high water table, particularly in the west, a high degree of

groundwater - surface water interaction takes place in this watershed. Shallow groundwater flow roughly follows the topography of the land surface and flows "downhill" or down-gradient toward stream valleys, wetlands, and lakes. On a regional scale, groundwater flow is easterly toward Lake Poygan and the Wolf River. The watershed groundwater and surface water divides may differ by several miles, which suggests the potential for activities in adjacent watersheds to directly influence the quality of groundwater flowing into this watershed. Localized cones of depression produced by high-capacity water supply wells may also impact groundwater flow.

Groundwater Quality

Groundwater in the Pine River\Willow Creek Priority Watershed is generally of good quality. It naturally ranges from soft to very hard and is locally high in iron. The quality of groundwater resources, however, may decline due to human activity.

Nearly anything that can be spilled or spread on the ground has the potential to leach or seep through the ground and into groundwater. The physical setting of an area and the nature of the contaminant determine how easily groundwater becomes polluted if inadequate waste management or improper land uses occur. Physical setting includes soil type, characteristics of the subsurface unconsolidated material, depth to bedrock, depth to groundwater, topography, and hydrologic characteristics. Proximity to the land surface and relatively high permeability of subsurface materials increase the susceptibility of the sand-and-gravel aquifer in this watershed. Potential point sources of groundwater contamination may include spills, leaking underground storage tanks, pesticide contamination sites, old landfills, and improperly abandoned wells. Potential nonpoint sources include fertilizers and pesticides, sludge and septage spreading, livestock waste spreading, irrigation, and road salt. In the ranking of watersheds in the (WDNR PUBL-WR-287-91-REV), the Pine River\Willow Creek Watershed earned medium priority for groundwater protection due to the highly susceptible nature of its western half to contamination by poor land use practices.

High nitrate levels in groundwater in parts of Wisconsin have been linked to agricultural practices, septage spreading, and faulty septic systems. High nitrate levels are a potential health concern for pregnant women and infants, and may also impact livestock health, fish populations, and other ecosystem components. As part of the *Water Quality Appraisal* [Mary Gansberg, 2/97], 47 private well samples were collected and analyzed for nitrate (NO_3) + nitrite (NO_2). Samples analyzed for nitrate (NO_3) + nitrite (NO_2) showed concentrations ranging from not detected to 16.8 parts per million or milligrams per liter (mg/L). The Enforcement Standard (ES) Health Advisory Level is the concentration of a substance at which a facility regulated by DILHR, DATCP, DOT or DNR must take action to reduce the concentration of the substance in groundwater. The Preventive Action Limit (PAL) is a lower concentration of a contaminant than the Enforcement Standard. The PAL serves to inform DNR of potential groundwater contamination problems, establish the level at which efforts to control the contamination should begin, and provide a basis for design codes and management criteria. The groundwater enforcement standard (ES) for nitrate is 10 mg/L. The state preventive action limit (PAL) is 2 mg/L.

Seven samples or 16% exceeded 10 mg/L and 15 or 33% of the samples exceeded 2 mg/L. This sampling program is not sufficiently detailed to characterize the overall groundwater quality of the watershed or to link groundwater contamination to specific sources of nitrate. However, a high percentage of standards exceedences in samples taken from the western part of the watershed suggest consideration of measures to reduce nitrate inputs to groundwater. Best Management Practices for nitrate reduction include nutrient management, manure storage facilities, barnyard runoff management, animal lot relocation, animal waste storage abandonment, roofs for barnyard runoff management, and manure storage facilities.

Pesticides have contaminated groundwater in parts of Wisconsin, and the WDNR Groundwater Retrieval Network lists a small number of pesticide detections in past samples from this watershed. Pesticide testing, however, was not a component of the Water Quality Appraisal. Based on pesticide levels in past samples, DATCP has established three atrazine prohibition areas within the watershed, as per Chapter ATCP 30, Wisconsin Administrative Code.

- PA 93-70-02: Tn. of Saxeville - T20N R12E Sections 31, 30 south of Portage St. and Pine R., and Sec. 32 south of Pine R.
- PA 93-70-03: Tn. of Mt. Morris and Tn. of Wautoma - T19N R10E Sections 12 and 13, T19N R11E Sections 7 and 18.
- PA 96-70-01: Tn. of Warren - T18N R12E portions of Sections 16-21, and 28-30.

No samples were collected through the Water Quality Appraisal for coliform bacteria or hazardous substances such as volatile organic compounds (VOCs). The WDNR Groundwater Retrieval Network lists detections of coliform bacteria and also of VOCs in samples taken from the watershed in the past. Coliform bacteria can be a drinking water problem where septic systems, land spreading of manure, or barnyards are located upgradient (generally uphill) from a private well. Bacteria may enter the drinking water supply along the well casing of improperly constructed wells, through a cracked casing, through improperly capped wells, fracture flow in bedrock, or with insects that get into the well. Generally, wells with bacteria problems can be rehabilitated. Contact local DNR staff for further information.

Volatile organic compounds, including gasoline products such as benzene, may enter a well from nearby leaking underground gasoline or other fuel storage tanks, spills, and landfills. Once these compounds are in the groundwater they are difficult to clean up. In general, the contaminated wells have to be abandoned and a new well drilled.

Water Supplies

Water supplies in the Pine River/Willow Creek Watershed are obtained from both private wells and municipal systems. Potable water supplies are available throughout the watershed, but individual well yields and depths vary widely. High capacity wells usually tap the sandstone aquifer, although the sand and gravel aquifer also provides suitable yields in some areas. Domestic and farm wells tap either the upper part of the sandstone or the sand and gravel aquifer.

Downward percolation within the watershed and groundwater inflow from the west recharges the aquifers.

Municipal water supply systems within the watershed serve the towns of Redgranite and Winneconne. The Wautoma water supply system lies west of the watershed boundary, but may still affect watershed residents and groundwater supplies. In addition to private and municipal community water supply systems, watershed residents may also rely upon other-than-municipal community systems (mobile home parks, apartments, subdivisions, etc.) and transient or non-transient non-community systems (gasoline stations, parks, restaurants, motels, etc.). 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.

Since April 1992, the WDNR has required that a wellhead protection plan be developed for any new municipal well. The plan must include an inventory of existing potential contamination sources within a half-mile radius of the well, in addition to an assessment of existing potential sources within the recharge area. The plan also identifies the groundwater flow direction, the recharge area and zone of influence for the well, a wellhead protection area, public education and water conservation programs, a contingency plan, and a management plan. The WDNR has delineated a calculated fixed radius for every public well from the existing well construction and pumping data. Wellhead protection plans have been approved for municipal wells in Redgranite and Wautoma. Establishment of wellhead protection plans is recommended for all public water supply systems.

Table 2-1. Well Sampling Results: Nitrate

Subwatershed	Number of Nitrate Samples per Subwatershed (% of all subwatershed samples)		
	< 2.0 mg/l	2.0-10.0 mg/l	> 10.0 mg/l
Upper Pine (UP)	1 (17%)	2 (33%)	3 (50%)
Middle Pine (MP)	1 (14%)	4 (57%)	2 (29%)
Carpenter Creek (CC)	5 (71%)	2 (29%)	0 (0%)
Lower Pine (LP)	4 (80%)	1 (20%)	0 (0%)
Upper Willow (UW)	2 (40%)	3 (60%)	0 (0%)
Mt. Morris (MM)	1 (50%)	0 (0%)	1 (50%)
Bruce Creek (BC)	3 (60%)	1 (20%)	1 (20%)
Middle Willow (MW)	2 (67%)	1 (33%)	0 (0%)
Cedar Springs Creek (CS)	1 (100%)	0 (0%)	0 (0%)
T.R. Jones (TR)	3 (75%)	1 (25%)	0 (0%)
Pumpkinseed Creek (PC)	1 (100%)	0 (0%)	0 (0%)
Poygan/Winneconne (PW)	1 (100%)	0 (0%)	0 (0%)
Total: All Subwatersheds	25 (53%)	15 (32%)	7 (15%)

Potential Groundwater Quality Problems

Previously identified potential groundwater quality problems in the Pine River\Willow Creek Watershed are provided below. This information is periodically updated and subject to change. These specific sites may not be currently polluting groundwater, but they are the types of problems associated with groundwater contamination elsewhere. Potential pollution associated with nonpoint sources is described in various sections throughout the remainder of this chapter.

The WDNR Publication SW-504-95(REV), *The Wisconsin Remedial Response Site Evaluation Report* (October 1995), lists superfund sites, sites which may cause or threaten to cause

environmental pollution, Leaking Underground Storage Tank (LUST) sites (see Table 2-3), and reported hazardous substance spill sites. This publication lists the sites in the watershed or within 2 miles of the watershed boundary as listed in Table 2-4. This watershed contains no Superfund sites and no sites or facilities which may cause or threaten to cause environmental pollution (Wisconsin Hazard Ranking System).

Table 2-2. High Priority Spill Sites

Town/City	Township	Range	Section	Quarter Section	Quarter-Quarter Section
Wautoma	19N	10E	35	SE	SE

Table 2-3. High and Medium Priority LUST Sites

Town/City	Township	Range	Section	Quarter Section	Quarter-Quarter Section
Poygan	-----				
Poysippi	19N	13E	07	SE	NW
Redgranite	18N	12E	17	NW	NE
Redgranite	18N	21E	08	SW	SE
Wautoma	19N	10E	35	NE	SW
Wautoma	18N	10E	01	SE	NE
Wautoma	19N	10E	13	SW	NE
Wautoma	19N	10E	35	NE	SW
Wautoma	18N	10E	02	NE	NE
Wautoma	19N	10E	35	NE	SW
Wautoma	19N	10E	35	NE	SW
Wild Rose	20N	10E	24	SE	NE
Wild Rose	20N	10E	25	SE	SE
Winneconne	19N	15E	21	SW	NE
Winneconne	19N	15E	16	SE	SW
Winneconne	19N	15E	21	NE	SW

Table 2-4. Waste Disposal Sites in the Watershed or Within 2 Miles of the Watershed Boundary

Town/City	Township	Range	Section	Quarter Section	Quarter-Quarter Section
Aurora	18N	13E	18	NE	NW
Bloomfield	20N	13E	26	NE	SE
Bloomfield	20N	13E	08	SE	NW
Dakota	18N	10E	01	----	NW
Dakota	18N	10E	01	-W	NW
Dakota	18N	10E	11	NW	SW
Leon	19N	12E	20	SW	NE
Leon	19N	12E	30	NE	SE
Marion	18N	11E	12	SE	NE
Mt. Morris	19N	11E	23	NE	SW
Pine River	(wood)	----	----	----	----
Pine River	(wood)	----	----	----	----
Poysippi	19N	13E	07	NE	SW
Poysippi	19N	13E	18	SE	NW
Rose	20N	10E	04	NW	SW
Rose	20N	10E	35	SW	SE
Saxeville	20N	12E	21	NE	SW
Saxeville	20N	12E	21	SW	SE
Springwater	20N	11E	29	SE	SE
Springwater	20N	11E	29	SE	SE
Springwater	20N	11E	29	SE	SE
Springwater	20N	11E	29	SE	SE
Warren	18N	12E	17	SE	NE
Warren	18N	12E	18	NE	SE
Warren	18N	12E	06	SE	SE
Wautoma	19N	10E	14	NE	SW
Wautoma	19N	10E	22	S-	SW
Wautoma	19N	10E	22	SW	SW
Wautoma	19N	10E	13	----	NE
Wautoma	(wood)	----	----	----	----
Wild Rose	(wood)	----	----	----	----

Source: WDNR publication SW-108-93, *Registry of Waste Disposal Sites in Wisconsin*.

The WDNR Wisconsin Pollution Discharge Elimination System (WPDES), lists five facilities in the watershed that were permitted to discharge wastes to groundwater in 1996. The permit numbers for these industries are as follows:

- WI-0052558 (Brushville Cheese Factory)
- WI-0057797 (Lauritzen, Inc.)
- WI-0052809 (Leach Farms, Inc.)
- WI-0043435 (Ripon Pickle Co.)
- WI-0022756 (Wild Rose Fish Hatchery)

Every public water supply facility (including municipal, other-than-municipal, and non-transient systems) must complete a WDNR Public Water Supply Contaminant Use Inventory (Form 3300-215). This form documents the type and number of all potential contaminant sources within 1200 feet of each well in the system.

Improperly abandoned wells present a significant threat to groundwater quality. Wells provide an open conduit that allows pollutants to reach drinking water aquifers directly, bypassing the ground's natural filtering process. Information on the proper procedures for abandonment will be provided to landowners with improperly abandoned wells.

Water Quality Goals and Project Objectives

The DNR, DATCP, and county watershed staff developed water quality goals and project objectives for the watershed. Goals and objectives for each subwatershed are included in the next section.

The following are the types of goals for water resources:

- **Protection:** Protection refers to maintaining the present biological and recreational uses supported by a stream, lake, or wetland. For example, if a stream supports a healthy cold water fishery and is used for full-body contact recreational activities, the goal seeks to maintain those uses. Groundwater quality and quantity also fall under the protection goals.
- **Enhancement:** Enhancement refers to a change in the overall condition of a stream, lake or wetland 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 that 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 that

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.

The overall water resources goal for the project is to protect, enhance, and restore the water quality of the streams, lakes, wetlands, and groundwater of the subwatersheds in order to improve the water quality of all the subwatersheds and ultimately the Winnebago Pool Lakes.

In addition, for the lakes in all of the subwatersheds of the Pine River/Willow Creek watershed, the goal is to protect the water resources and the fish and wildlife habitat of the watershed lakes by:

- Significantly reducing sediment and nutrient loading.
- Conducting information and education activities that focus on water quality friendly yard maintenance, septic system maintenance, and other proper riparian stewardship.
- Ensuring septic systems are functioning correctly and up to code.
- Using low phosphate fertilizers and limiting their use on lakeshore property lawns.
- Using construction site erosion control measures for development both on the lakeshore and within the lake drainage basin.
- Installing porous paving material for roads, drives, and public access.
- Stabilizing eroding shorelines.
- Incorporating vegetative buffers.
- Protecting and restoring wetlands.
- Encouraging good land use planning.
- Preserving undeveloped shoreland.

Subwatershed Descriptions

This section describes the appraisal monitoring conducted and the water quality conditions for each subwatershed in the Pine River/Willow Creek 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 2-5 summarizes the existing subwatershed conditions.

Appraisal Methods

Following is a brief description of monitoring activities conducted from January 1995 to September 1996 for the surface water resource appraisal. Monitoring procedures are consistent

with the quality assurance/quality control contained in "Field Procedures Manual" (WDNR, 1988). Previous monitoring results from the Department of Natural Resources Water Resources and Fisheries Management files are referred to in the discussion section of this report.

Macroinvertebrates: Aquatic macroinvertebrates were collected at eleven sites in the watershed using a D-frame net in Spring and Fall 1995 and Spring 1996. Sample results were evaluated using the Hilsenhoff Biotic Index (HBI) (Hilsenhoff, 1987) or Hilsenhoff Family-level Biotic Index (FBI) (Hilsenhoff, 1988) and Ephemeroptera, Plecoptera, Trichoptera (EPT) Index (Plafkin et al, 1989). The HBI and FBI provide a relative measure of organic loading to the stream. Percent EPT is the percent Ephemeroptera, Plecoptera, and Trichoptera genera out of the total number of genera in a sample. These insect orders are generally known to be intolerant of pollution.

Habitat Evaluations: Stream aquatic life habitat conditions were evaluated throughout the watershed in the summer and fall using the stream habitat evaluation guidelines developed by Ball (1982). A matrix was used to numerically rank physical habitat characteristics that may limit the quantity and quality of aquatic life.

Dissolved Oxygen/Temperature: Continuous dissolved oxygen and temperature meters were placed at 10 locations in the watershed from 5 to 9 day periods. In addition, grab samples were taken at several other locations. Wisconsin Administrative Code NR 102 establishes minimum dissolved oxygen water quality standards to maintain favorable aquatic life. For cold water streams the standard is 6 mg/l. For warm water streams the standard is 5 mg/l.

Stream Water Chemistry Samples: Water chemistry samples were collected monthly, January - December 1995 on the Pine River and Willow Creek. Also, four other streams were sampled during snowmelt and rain runoff events in 1995 and 1996. Samples were analyzed for ammonia, nitrates, total and dissolved phosphorus, suspended solids, and biochemical oxygen demand. In addition, nitrate samples were collected in mid-winter at 25 stream sites in the watershed and analyzed for nitrate nitrogen to determine the quality of the surface water recharge from groundwater.

Lake Monitoring: Existing water quality data for many of the lakes in the watershed comes from a variety of sources such as the Self-Help Lake Monitoring program, Lake Planning Grant program, and the Wolf River Basin Water Quality Management Plan. Some additional water quality data was collected for modeling seven lakes in the watershed. The models are used to predict annual phosphorus loading to the lakes. Trophic status, drainage basin to surface acreage (DB/SA) ratio, soil category, and number of lots were also calculated for several lakes (Rasman, 1997).

Fishery Surveys: Thirty-one stations were sampled in the watershed during June and July 1996. Approximately one station per five miles of stream channel was sampled. Fish were sampled using a standard WDNR-type DC stream electroshocker equipped with three electrodes and powered by a 2500 watt AC generator. At each station, all fish were captured, identified,

counted, and released; however, fish species that could not be identified were preserved for later analysis. All trout were measured and weighed. Fish assemblages were used to assess environmental degradation using the Wisconsin version of the Index of Biotic Integrity (IBI) (Lyons, 1996). Fish habitat, water temperature, and trout population assessments were also conducted (Niebur and Hitchcock-Esch, 1996).

Table 2-5. Surface Water Resource Conditions, Problems, and Nonpoint Sources of Pollution for Subwatersheds in the Pine River/Willow Creek Watershed

Sub-watershed	Stream Name	Fish and Other Aquatic Life Uses ¹	Fishery IBI ²	Habitat Rating ³	Biotic Index Rating ⁴	Chemistry ⁵	Problems/Limiting Factors ⁶	Observed or Potential Sources of Pollution/Problems ⁷
Upper Pine (UP)	Pine River	Cold	Excellent to Good	Good to Fair	Very Good	----	DO, PL, NU, SD, CH, WET	CL, PSM, PSI, IMP, BY
	Davis Creek	Cold	Good	Good	----	DO		
	Jones Creek	Cold	----	----	----	----		
Middle Pine (MP)	Lower Pine River	Cold	Fair	Good	Excellent	----	PL, CH, SD, DO, TEMP, HAB, WET	IMP, CL, SBP
	Humphrey Creek	Cold	Fair	Good to Fair	Very Good	DO		
	Kaminski Creek	Cold	Excellent	Fair	Excellent	----		
	Popple (James) Creek	Cold	----	Fair	----	----		
Carpenter Creek (CC)	Lower Pine River	Cold	Fair	Good	Excellent	----	CH, SD, DO, NU, HAB, TEMP, WET	IMP, BVD, WSM, CL
	Little Silver Creek	Cold	Good	Good to Fair	Excellent	----		
	Carpenter Creek	Cold	Fair	Fair	----	AM, TP, DP, DO		
Lower Pine (LP)	Lower Pine River	Cold/WWSF	Fair	Good	----	DO	DO, SD, CH, FL, NU, HAB, BUF	IMP, SBP, PSM, CL
	Unnamed Tributary (Mud Creek)	WWSF/WWFF	----	Fair to Poor	----	----		
Mt. Morris (MM)	Porters Creek	Cold	Good	Good	Good	----	CH, TEMP, HAB, SD, FL,	IMP, CL, DB, SB
	Rattlesnake Creek	Cold	Fair	Fair	----	----		
	Unnamed Tributary (Norwegian Creek)	----	----	Fair	----	----		
Bruce Creek (BC)	Bruce Creek	Cold	Good to Fair	Good to Fair	----	AMM, TP, DP	TEMP, CH, WET, NU, SD, HAB	IMP, CL
Middle Willow (MW)	Willow Creek	Cold	Good, Fair, to Poor	Excellent to Good	Excellent to Very Good	----	HAB	PSM, PSI, SB
Cedar Springs Creek (CS)	Cedar Springs Creek	Cold	Good to Poor	Good to Poor	----	DP, DO	CH, TEMP, DO, SD, NU, HAB, WET	CL
	Unnamed Tributary (T19N, R12E, S35)	Cold	----	Fair	----	----		

Table 2-5 Cont. Surface Water Resource Conditions, Problems, and Nonpoint Sources of Pollution for Subwatersheds in the Pine River\Willow Creek 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 Factors ⁶	Observed or Potential Sources of Pollution/ Problems ⁷
T.R. Jones (TR)	Willow Creek	WWSF	----	Good to Fair	----	----	TEMP, CH, BUF, SD, HAB	IMP, CL
Pumpkinseed Creek (PC)	Pumpkinseed Creek	WWSF/ WWFF	----	Poor	----	AMM, TP, DP, NN	CH, SD, NU, BUF, PL, FL, HAB, FLO	CL, SB
Poygan/ Winneconne (PW)	Several Unnamed Tributaries	WWSF/ WWFF	----	----	----	----	CH, SD, FLO, HAB	CL, PSM

¹ **Fish and Other Aquatic Life Uses** - this column indicates the current biological use supported by the stream.

COLD - coldwater communities

WWSF - warmwater sport fish communities

WWFF - warmwater forage fish communities

² **Fishery IBI** - this column indicates fish assemblages for assessing biotic integrity and environmental health in cold water 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

AM - Ammonia

TP - Total Phosphorus

DO - Dissolved Oxygen (less than the state standard of 5 mg/l)

NN - Nitrate & Nitrite

⁶ **Problems / Limiting Factors**

HAB - Habitat (lack of sufficient habitat)

FLO - Limited Stream Flow

SD - Sedimentation

BUF - Lacking Vegetative Buffers

FL - Flooding Streambanks

WET - Degraded Wetlands

NU - Nutrient Enrichment

PL - Aquatic Plants / Algae (abundant)

DO - Dissolved Oxygen

CH - Channelization (ditching)

TEMP - Temperature (warmth)

⁷ **Observed or Potential Sources of Pollution / Problems**

CL - Cropland Erosion

BVD - Beaver Dams

SB - Streambank Erosion

WSM - Winter-spread Manure

SBP - Streambank Pasturing

IMP - Impoundment

PSM - Point Source, Municipal Treatment Plant

DB - Dam Break

PSI - Point Source, Industrial Discharge

BY - Barnyard Runoff

Upper Pine River Subwatershed (UP)

Description (see Map 2-1): Upper Pine subwatershed consists of the Pine River from its headwater springs downstream to just above the confluence of Humphrey Creek. A dam in Wild Rose forms the Wild Rose Millpond. Another dam just upstream of CTH K forms Idlewild Millpond. The Pine River is divided into the Upper Pine (above Wild Rose Millpond) and the Lower Pine. The village of Wild Rose Municipal Wastewater Treatment Plant and the Wild Rose State Fish Hatchery discharge to the Pine River. Jones Creek and Davis Creek are the only named tributaries to the Pine River, but there are also two perennial and one intermittent unnamed tributaries in this subwatershed. Pretty Lake and the north half of the Village of Wild Rose are in this subwatershed.

Water Quality Conditions: The Upper Pine and the Lower Pine River are classified as Class I trout streams and are considered Exceptional Resource Waters (ERW) streams. The Pine River received aquatic life habitat ratings of good to fair. The Pine River, at its headwaters, is a small, sandy bottomed stream that has significant organic matter accumulated near the edges. Roughly 1300 feet of the Upper Pine River has been severely degraded due to channel widening and filling of wetlands and springs. Macrophytes, primarily Elodea, are very abundant between the Wild Rose Millpond and 19th Drive. A macroinvertebrate sample collected at CTH K received a 'very good' water quality rating with possible slight organic pollution present. The EPT was 32 percent. The annual water-cross event at the Wild Rose Millpond has the potential to cause bank erosion, sediment and nutrient re-suspension and thus, algae and plant problems.

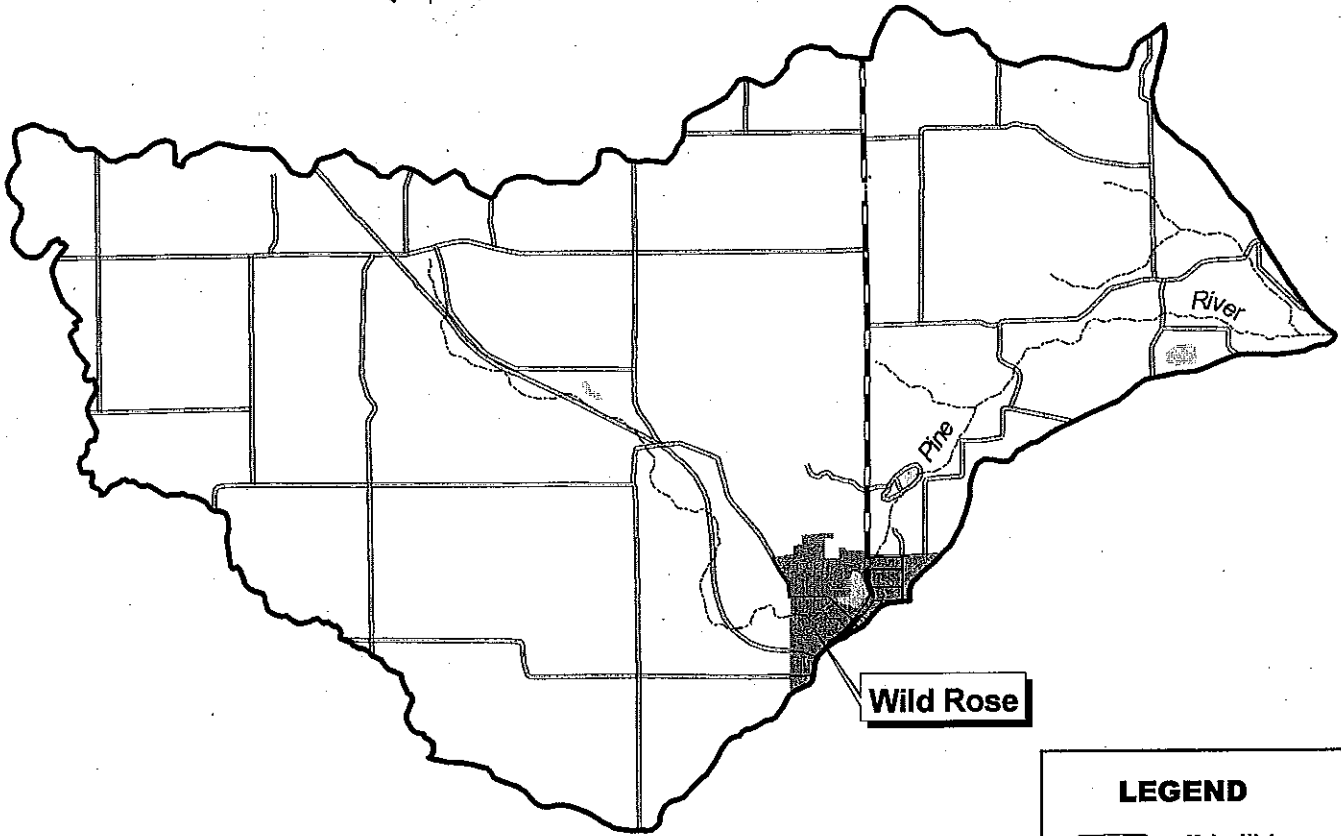
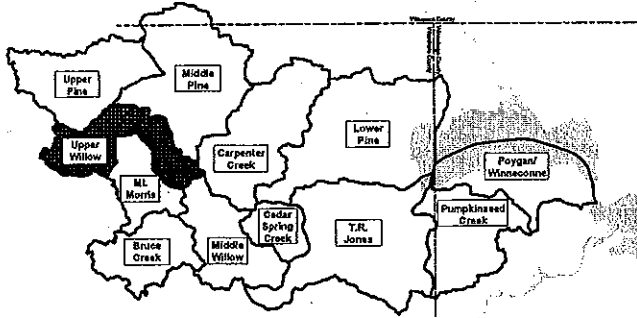
Davis Creek is classified as Class I and an ERW. Davis Creek received a good aquatic life habitat rating. The substrate is mostly sand with some accumulation of silt on the lower banks. This is a state fishery area. Davis Creek at CTH K has a dissolved oxygen problem. Continuous monitoring from July 17 to 22 showed one incident when dissolved oxygen dropped below the state standard of 6 mg/l for 9 hours then returned to normal. Oxygen demanding substances flushed into the creek during a significant rain runoff event caused this. This could have been from upland fields and/or livestock operations nearby. Water temperatures were normally cool, but did peak at 71°F during this monitoring period. Clayton Creek is a small tributary to Davis Creek.

Jones Creek is classified as Class I and an ERW. No public access prevented monitoring on this 1-mile-long creek. There are no known nonpoint source related problems on this stream.

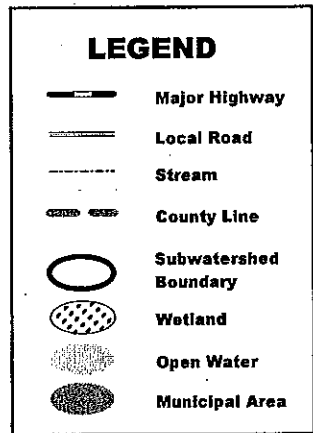
Overall, cover for fish rated good to excellent. The predominant fish species captured in the Upper Pine subwatershed included brook trout, brown trout, mottled sculpin, fathead minnows, northern brook lamprey, and white sucker. Overall, IBI scores indicate this subwatershed is in good condition. The density and condition of trout below Wild Rose was generally well above average for most trout populations sampled during this survey. This may suggest that the Pine River is a very fertile stream allowing for above average growth and carrying capacity.

Pine River/Willow Creek Priority Watershed Upper Pine Subwatershed (UP)

STUDY AREA



Produced by: Winnebago County
Land & Water Conservation Department
March - 2000



The Wild Rose Millpond is 17 acres in size with a maximum depth of seven feet. Water levels are maintained by a 14 foot high dam. The millpond has a drainage basin of 6500 acres which gives it a drainage basin to surface acreage ratio (DB/SA) of 382.4.

Idlewild Millpond is a small flowage on the Pine River created by an 8 foot high dam. Over 75 percent of the flowage is less than three feet in depth.

Pretty Lake is a 14 acre seepage lake with a maximum depth of 24 feet. The littoral bottom material is predominantly sand. A thermocline develops at 18 feet. The lake has a DB/SA of 4.6 and there are 15 lots on the lake.

The water resources of this subwatershed are generally good. A reduction of nutrients and sediment from upland fields and livestock operations to Davis Creek and the other watershed streams would protect them from low oxygen levels during runoff events and help protect valuable aquatic life habitat. Nutrient inputs cause excess vegetation growth downstream of the Wild Rose Millpond, wastewater treatment facility, and hatchery that limits aquatic life habitat. It is likely that the continuous supply of phosphorus for plant growth comes from the sediment in the stream. Stretches of the Pine River are degraded from ditching and filling in of springs.

Nonpoint Source Pollutants:

- The Upper Pine Subwatershed contains 4 animal lots, which contribute 107.4 pounds of phosphorus (organic), annually. This represents an estimated 3 percent of the phosphorus for the entire watershed.
- The upland sediment delivery in the Upper Pine Subwatershed is 744 tons, annually, or 2.5 percent of the entire watershed load.
- One percent of the sediment delivered from streambanks in the watershed comes from the Upper Pine Subwatershed.

Water Resource Goal: The goal for the water resources of the Upper Pine subwatershed is to improve aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a high level.
- Reducing the amount of nutrients reaching the watershed streams by a low level.
- Increasing cover for adult trout in the Upper Pine River and Davis Creek.
- Restoring stream channel and removing spoils from wetlands and springs.
- Continuing or expanding current land acquisition programs on streams with master plans.
- Establishing streambank protection easements on streams that currently have no projects.
- Protecting, enhancing, and creating wetlands.

Middle Pine Subwatershed (MP)

Description (see Map 2-2): The Middle Pine subwatershed consists of the Lower Pine River from the confluence of Humphrey Creek downstream to just below the confluence of Popple (James) Creek near the community of Saxeville. Humphrey Creek, Kaminski Creek, Popple Creek, and several other intermittent and perennial tributaries discharge to the Lower Pine River in this subwatershed. Gilbert, Pine, Twin (Big Twin), Long, Baitenger, Saxeville Millpond, Big Hills, Little Twin, Wilson, Kusel, Kristine, Round, Tinman, Napowan, and six unnamed lakes are in this subwatershed. The Pine River State Fishery Area borders the Pine River and wetlands are abundant. A small portion of this subwatershed is in Waupaca County.

Water Quality Conditions: The Lower Pine River in this subwatershed is classified as Class I trout water and an ERW. It received good aquatic life habitat ratings. The variety of deep riffles, pools, bends, rubble, and sand provide adequate habitat. Elodea and pondweeds are abundant and the banks are not eroding. Aquatic macroinvertebrate samples at CTH A and 24th Lane received excellent water quality ratings indicating no apparent organic pollution present. The EPT ranged from 32 to 50 percent. Continuous dissolved oxygen and temperature monitoring above the Saxeville Millpond at CTH A from September 19 to 27, 1995 showed good oxygen levels and cool water temperatures. The Saxeville dam is a trout migration barrier to upstream spawning and over summer habitat. It also has a thermal impact on the river by warming downstream receiving waters. Dam removal should be considered a future option.

Humphrey Creek is classified as Class I trout water and an ERW. It received good to fair aquatic life habitat ratings. The upstream reaches have been ditched and channelized (old legal drains) and contain large amounts of accumulated sediment. The stream has some gravelly riffle areas and dark organic matter accumulated near the banks and in slow areas. Humphrey Creek received very good water quality ratings based on two macroinvertebrate samples collected at CTH K. This indicates possible slight organic pollution present. The EPT values were 47 and 58 percent. Dissolved oxygen fell below the state standard of 6 mg/l for a 24-hour period in July 1996 then recovered to normal. This dip in oxygen was caused by oxygen demanding substances flushed into the creek during a significant rain event. This could have been caused by upland erosion from nearby fields. Temperatures ranged from 54 to 68°F during this July 17-22, 1996 monitoring period.

Kaminski Creek is classified as Class I trout water and an ERW. Kaminski Creek flows underground for some stretches. Kaminski Creek received a fair aquatic life habitat rating. The creek has some gravel and riffles, but mostly sand substrate. The trees and shrubs protect the banks from erosion and provide shade to the creek. A macroinvertebrate sample at CTH A received an excellent water quality rating indicating no apparent organic pollution present. The EPT was 40 percent.

Popple Creek (also known as James Creek) is classified as Class I trout water and an ERW. Popple Creek originates as an outlet of Baitenger Lake and is dammed just north of Saxeville to form Kristine Lake. Kristine Lake is used as a private fish hatchery. This small perennial stream which discharges to the Pine River below Saxeville Millpond received a fair aquatic life habitat rating at CTH A. Cattle access to the upstream section have destroyed the banks by trampling and erosion. Vegetation is scarce and the creek is wide and shallow.

The predominant fish species captured in the Middle Pine subwatershed included brook trout, brown trout, mottled sculpin, fathead minnows, northern brook lamprey, white sucker, creek chubs, and green sunfish. The entire population of Kaminski Creek is made up of intolerant coolwater species. It received an excellent IBI score; however, all other stations in the subwatershed rated between fair and poor.

Gilbert Lake is a 141 acre seepage lake with a maximum depth of 65 feet. Gilbert Lake is designated as an Outstanding Resource Water (ORW). It is considered mesotrophic to oligotrophic, but has a predicted average annual total phosphorus load of 670 lbs. The Gilbert Lake Association has received a lake planning grant from the DNR. The lake is heavily developed with 131 lots.

Pine Lake is a 143 acre lake with a maximum depth of 48 feet. This seepage lake has two distinct basins connected by a 200 foot waterway. There are 187 lots on the lake and it has a DB/SA of only 3.5. Pine Lake has an average annual total phosphorus load of 485 lbs. It develops a midsummer thermocline at 12 feet deep and lies in the mesotrophic to oligotrophic range. Pine Lake is designated as an ORW and has an established lake management organization.

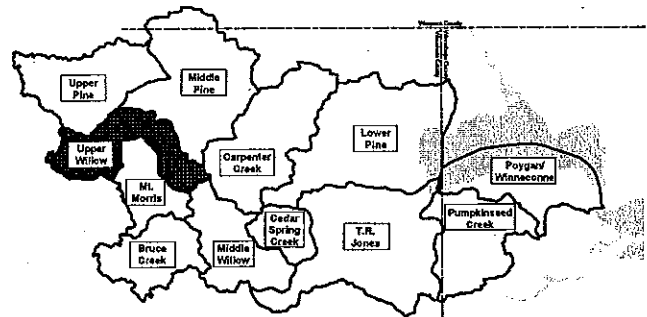
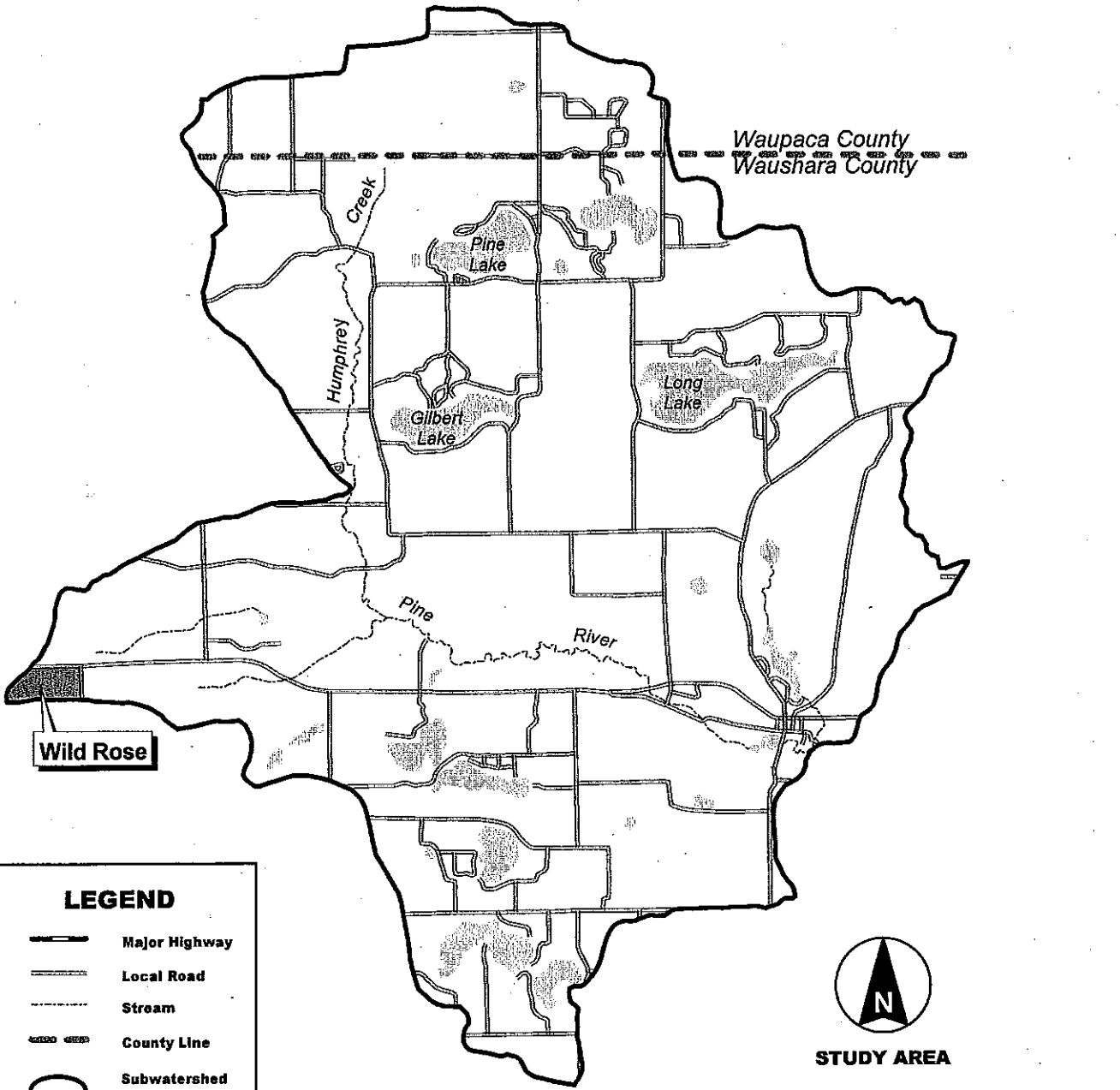
Twin Lake (Big Twin) is a 93 acre moderately hard water seepage lake with a maximum depth of 13 feet. The substrate is predominately muck and sand. It has a DB/SA of 8.6. There are 32 lots on this lake.

There is a secondary, intermittent basin referred to as Little Twin Lake. This basin is connected to Big Twin only during high water periods.

Long Lake is a 272 acre hard water seepage lake with a maximum depth of 71 feet. The lake is made up of two basins, with the west basin approximately 10 feet deeper than the east basin. The littoral bottom material consists of 90 percent sand with some gravel. The lake develops a thermocline at 24 feet. Long Lake has average annual total phosphorus loading of 434 lbs and a DB/SA of 18.4. It has 195 lots on the lake and is considered mesotrophic. The Long Lake Association has received a lake planning grant from the DNR.

Baitenger Lake is a five acre seepage lake with a maximum depth of 21 feet. The lake is moderately fertile, exhibits clear water, and develops a midsummer thermocline at 13 feet. The littoral bottom materials consist of sand and marl. This small lake has nine lots on it with a DB/SA of 25.

Pine River/Willow Creek Priority Watershed Middle Pine Subwatershed (MP)



Produced by: Winnebago County
Land & Water Conservation Department
March - 2000

Saxeville Millpond is a hard water impoundment on the Lower Pine River at Saxeville. The millpond is only 13 acres in size with a maximum depth of four feet. Aquatic plants are abundant because of the large drainage area. There are 12 lots on the lake.

Big Hills Lake is a 133 acre seepage lake with a maximum depth of 22 feet. The lake is considered oligotrophic and has a DB/SA ratio of 17.3. There are 113 lots on the lake. Big Hills Lake Management Organization has received a lake planning grant from the DNR. There is a fish consumption advisory on walleye for mercury on Big Hills Lake.

Wilson Lake is an 81 acre seepage lake with a maximum depth of 12 feet. It has a small dam that raises the water level about six inches. There is a history of frequent winter fish kills. Wilson Lake has a DB/SA of 4.1. There are 77 lots on the lake. Wilson Lake has a lake management organization.

Kusel Lake is a 79 acre seepage lake with a maximum depth of 29 feet. It has a DB/SA of 6.8 and develops a midsummer thermocline at the 20 foot depth. There are 68 lots around the lake. Kusel Lake Management Organization has received a lake planning grant from the DNR. There is a fish consumption advisory on walleye for mercury on this lake.

Lake Kristine is a 26 acre flowage created by a 16 foot high dam on Popple Creek. The impoundment has a maximum depth of 20 feet and is licensed as a private fish hatchery. There are 57 lots around this lake and it has a DB/SA of 63.1. A lake management organization has been formed for Kristine Lake.

Round Lake is a 63 acre seepage lake with a maximum depth of 19 feet. It has a DB/SA of 4.1. There are 56 lots on the lake.

Tinman Lake is a nine acre hard water seepage lake with a maximum depth of 16 feet. It has a DB/SA of 66.7. There are nine lots on the lake.

Napowan Lake is a 51 acre seepage lake with a maximum depth of 18 feet. The DB/SA is 9.8. There are 54 lots on the lake.

The watershed streams have the potential for better aquatic life habitat and stable dissolved oxygen levels with the elimination of cattle access and a reduction of sediment and nutrient loading to the streams. Humphrey Creek is the most degraded stream in this subwatershed. Ditches located in the headwater reaches contribute nutrients and sediment and increase water temperature. Minimal restoration efforts would be needed to see a dramatic affect on water quality and fisheries in this stream.

Nonpoint Source Pollutants:

- The Middle Pine Subwatershed contains 2 animal lots, which contribute 18.6 pounds of phosphorus annually. This represents less than 1 percent of the phosphorus for the entire watershed.
- The upland sediment delivery in the Middle Pine Subwatershed is 1854 tons annually, or 6 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 92 percent of the load.
- One percent of the sediment delivered from streambanks in the watershed comes from the Middle Pine Subwatershed.

Water Resource Goals: The first goal for the water resources of the Middle Pine subwatershed is to improve aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a high level.
- Reducing the amount of nutrients reaching the watershed streams by a low level.
- Eliminating cattle access to the streams.
- Restoring wetlands and stream channel meanders.
- Increasing cover for adult trout in the Pine River.
- Continuing or expanding current land acquisition programs on streams with master plans.
- Establishing streambank protection easements on streams that currently have no projects.
- Study the feasibility of removing the Saxeville dam that warms downstream water and is a trout migration barrier for upstream spawning and over summer habitat.

The second goal is to obtain an IBI score of at least 80 in Humphrey Creek by installing practices that:

- Cool the stream
- Improve trout habitat
- Restore wetlands and stream channel meanders
- Trap sediment

Carpenter Creek Subwatershed (CC)

Description (see Map 2-3): Carpenter Creek subwatershed consists of the Lower Pine River from just below the confluence of Popple Creek near Saxeville downstream to just below the confluence of Little Silver Creek including Little Silver Creek and Carpenter Creek. A dam on the Lower Pine River forms Pine River Millpond. Two small unnamed lakes and the community of Pine River are in this subwatershed.

Water Quality Conditions: The Lower Pine River is classified as Class II trout water and an ERW. It received good aquatic life habitat ratings. Deep pools and good flow provide habitat for aquatic life although the substrate is largely sand. Two macroinvertebrate samples collected at 28th Court showed excellent water quality with no apparent organic pollution present. The EPT values were 31 and 44 percent. Continuous dissolved oxygen and temperature monitoring showed dissolved oxygen levels remained between 6.7 and 8.1 mg/l during a significant rain runoff event June 18-24, 1996. Temperatures ranged from 59 to 67°F during this event.

Water chemistry samples collected once every month in 1995 showed relatively low concentrations of biochemical oxygen demand and suspended solids. The only nutrient with relatively elevated levels was dissolved phosphorus. The mean concentration was 0.012 mg/l.

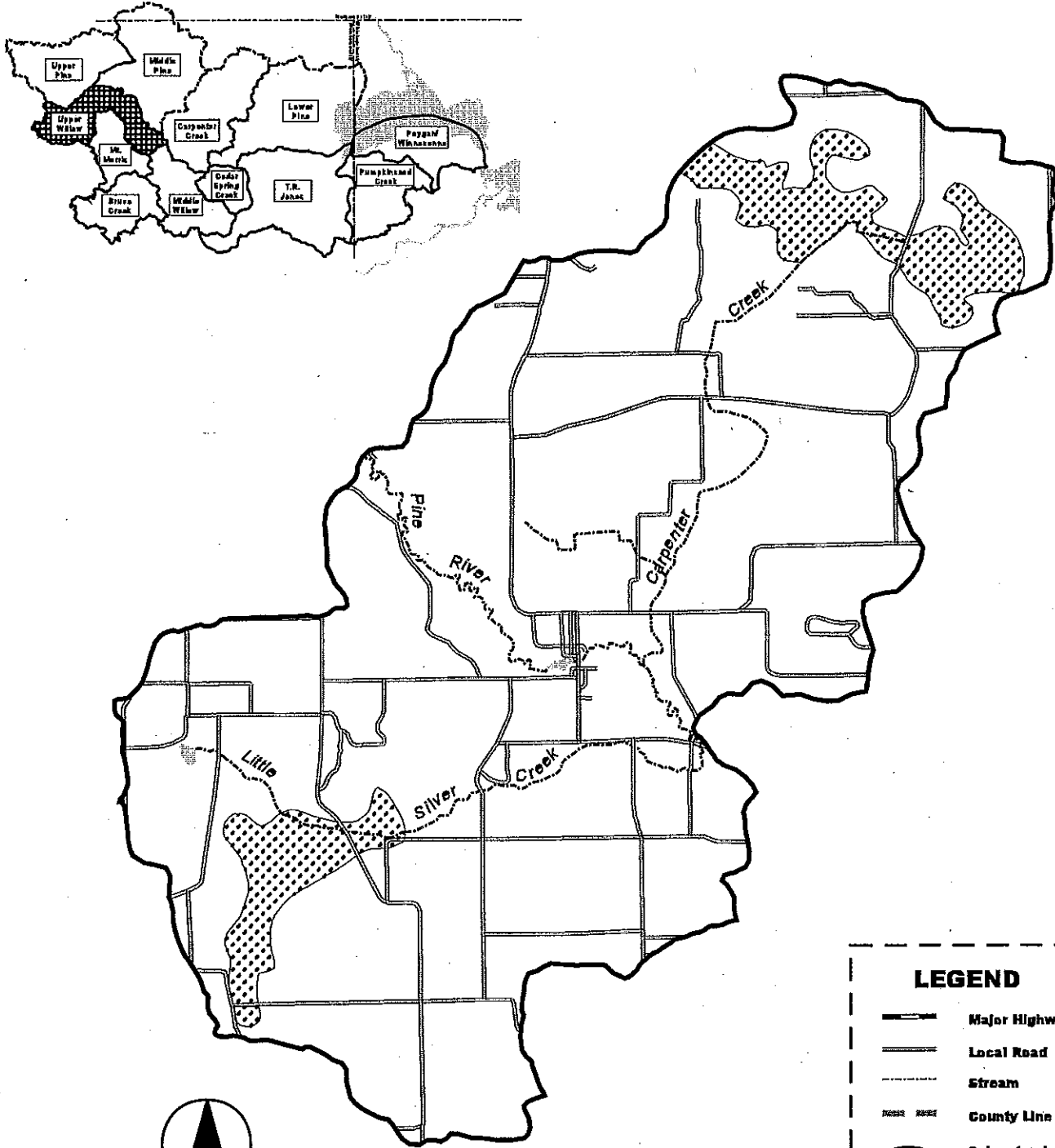
Little Silver Creek is classified as Class I cold water and an ERW for its entire 7-mile length. Aquatic life habitat is limited because of the shifting sand substrate and therefore, received good to fair ratings. The banks are not eroding. Beaver activity has been widespread in the upper portions of this stream and probably contributes to some thermal instability. Two macroinvertebrate samples at 28th Court received excellent water quality ratings indicating no apparent organic pollution present although manure spread in nearby fields impacts Little Silver Creek. The EPT values were 46 and 57 percent. A section of Little Silver Creek along CTH E and H has been channelized and severely degraded because of a road construction project. The channel should be moved away from the road and redesigned to incorporate meanders and trout cover.

Carpenter Creek is classified as Class II cold water. It received fair aquatic life habitat ratings both in the upper and lower reaches. Silt and muck have accumulated in slow areas with the remainder of the substrate sand. Carpenter Creek has severely degraded thermal stability, probably due to extensive ditching and drainage of wetlands along the entire stream channel. Carpenter Creek has significant dissolved oxygen problems. A single grab sample during a rain event in August 1995 and continuous monitoring at CTH NN from July 1 to 10, 1996 showed oxygen violations on a daily basis with oxygen concentrations some days not even reaching the 6 mg/l state standard. These low oxygen levels are likely caused by sediment oxygen demand from the excessive amounts of organic matter in the creek bed. Low dissolved oxygen levels are stressful to aquatic life in the stream. Temperatures ranged from 53 to 70.5°F. Four water chemistry samples collected at CTH NN during snowmelt and rain runoff events showed elevated ammonia and total phosphorus concentrations on two occasions, and elevated dissolved phosphorus on all four occasions. Runoff from upland fields is the most significant source of nutrients.

The predominant fish species captured in the Carpenter Creek subwatershed included brook trout, brown trout, mottled sculpin, mudminnow, finescaled dace, and white sucker. Intolerant coldwater and coolwater species dominated the assemblage in Little Silver Creek while tolerant species dominated in Carpenter Creek. IBI scores in Little Silver Creek indicate good conditions, while IBI scores indicate poor and fair conditions in Carpenter Creek.

Pine River/Willow Creek Priority Watershed Carpenter Creek Subwatershed (CC)

STUDY AREA



Produced by: Winnebago County
Land & Water Conservation Department
March - 2000

LEGEND	
	Major Highway
	Local Road
	Stream
	County Line
	Subwatershed Boundary
	Wetland
	Open Water
	Municipal Area

The Pine River Millpond is a 28 acre impoundment of the Lower Pine River in the village of Pine River. It has a DB/SA ratio of 107.1. There are 15 lots on this lake.

The aquatic life habitat in Carpenter Creek has the potential to improve with the reduction in sediment and phosphorus loading and the enhancement of wetlands. A reduction would stabilize dissolved oxygen levels, decrease sediment accumulation in the streambed, and decrease overall loading to the Pine River. Stream channelization, the shifting sand substrate, beaver activity, increased water temperature, and the dam on the Pine River also have a negative impact on the coldwater fish communities and water quality of this subwatershed.

Nonpoint Source Pollutants:

- The Carpenter Creek Subwatershed contains 5 animal lots, which contribute 75.7 pounds of phosphorus annually. This represents an estimated 2.3 percent of the phosphorus for the entire watershed.
- The upland sediment delivery in the Carpenter Creek Subwatershed is 3329 tons annually, or 11 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 93 percent of the sediment load.
- Forty percent of the sediment delivered from streambanks in the watershed comes from the Carpenter Creek Subwatershed.

Water Resource Goals: The first goal for the water resources of the Carpenter Creek subwatershed is to improve aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a high level.
- Reducing the amount of nutrients reaching the watershed streams by a high level.
- Continuing or expanding current land acquisition programs on streams with master plans.
- Establishing streambank protection easements on streams that currently have no projects.
- Redesigning the degraded section of Little Silver Creek that was channelized during road construction.
- Installing sediment traps below Saxeville to prevent filling in of valuable trout habitat.

The second goal is to obtain an IBI score of at least 60 in Carpenter Creek by installing practices that:

- Cool the stream
- Improve trout habitat
- Restore wetlands and stream channel meanders
- Trap sediment

Lower Pine Subwatershed (LP)

Description (see Map 2-4): The Lower Pine subwatershed consists of the Lower Pine River from just below the confluence of Little Silver Creek downstream to the river mouth at Lake Poygan. It includes several unnamed perennial tributaries to the Lower Pine River and direct drainages to Lake Poygan. A dam on the Pine River forms the Poy Sippi Millpond. The communities of Poy Sippi, Brushville, and Tustin are in this watershed as well as the Poygan Marsh State Wildlife Area. The Poy Sippi Sanitary District discharges treated wastewater to the Lower Pine River and the North Lake Poygan Sanitary District discharges its treated wastewater directly to Lake Poygan. Wetlands are abundant in this subwatershed.

Water Quality Conditions: The Lower Pine River in this subwatershed is classified as Class II trout water and an ERW downstream to Poy Sippi and warm water sport fish from Poy Sippi to the mouth. It received a good aquatic life habitat rating. The substrate is predominantly sand. Dissolved oxygen was below the 5 mg/l state standard on one occasion in September because of the impoundment of the river even though water temperature was 66°F.

An Unnamed Tributary (locally known as Mud Creek, T19N, R13E, S15, SENE) used to discharge to the Lower Pine River. Sedimentation near the mouth has changed the route and it now discharges directly to Lake Poygan. This tributary has not been formally classified. It is 8 miles long and flows through several miles of wetlands. The headwaters area is mostly agricultural land and most of the tributaries have been ditched and straightened (legal drains). It received poor to fair habitat ratings. Some sections of this stream have little vegetative buffer and the banks flood easily with runoff during events. Cattle have access to the headwater area.

The Lower Pine subwatershed had a low IBI score of 40 that corresponds to a rating between poor and fair. This may indicate some environmental degradation, although the Pine River at this section is probably a transitional area from coldwater to secondary coolwater fishery and the IBI measure is not the best indicator for the health of the stream. The temperatures are cold enough to support trout yet warm enough to support several coolwater species. Interestingly, several greater redhorse were sampled and observed in this section. This species is listed as a threatened species in the State of Wisconsin.

The Poy Sippi Millpond is a 57 acre impoundment of the Lower Pine River in the village of Poy Sippi. It has a DB/SA ratio of 140.4 and a maximum depth of seven feet. There are 50 lots on the lake.

Nonpoint Source Pollutants:

- The Lower Pine Subwatershed contains 46 animal lots, which contribute 1800 pounds of phosphorus annually. This represents an estimated 55 percent of the phosphorus for the entire watershed.
- The upland sediment delivery in the Lower Pine Subwatershed is 8680 tons annually, or 29 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 92 percent of the load.
- Five percent of the sediment delivered from streambanks in the watershed comes from the Lower Pine Subwatershed.

Water Resource Goal: The goal for the water resources of the Lower Pine subwatershed is to improve aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams and Lake Poygan by a high level.
- Reducing the amount of nutrients reaching the watershed streams and Lake Poygan by a high level.
- Continuing or expanding current land acquisition programs on streams with master plans.
- Establishing streambank protection easements on streams that currently have no projects.
- Protecting, enhancing, and creating wetlands.

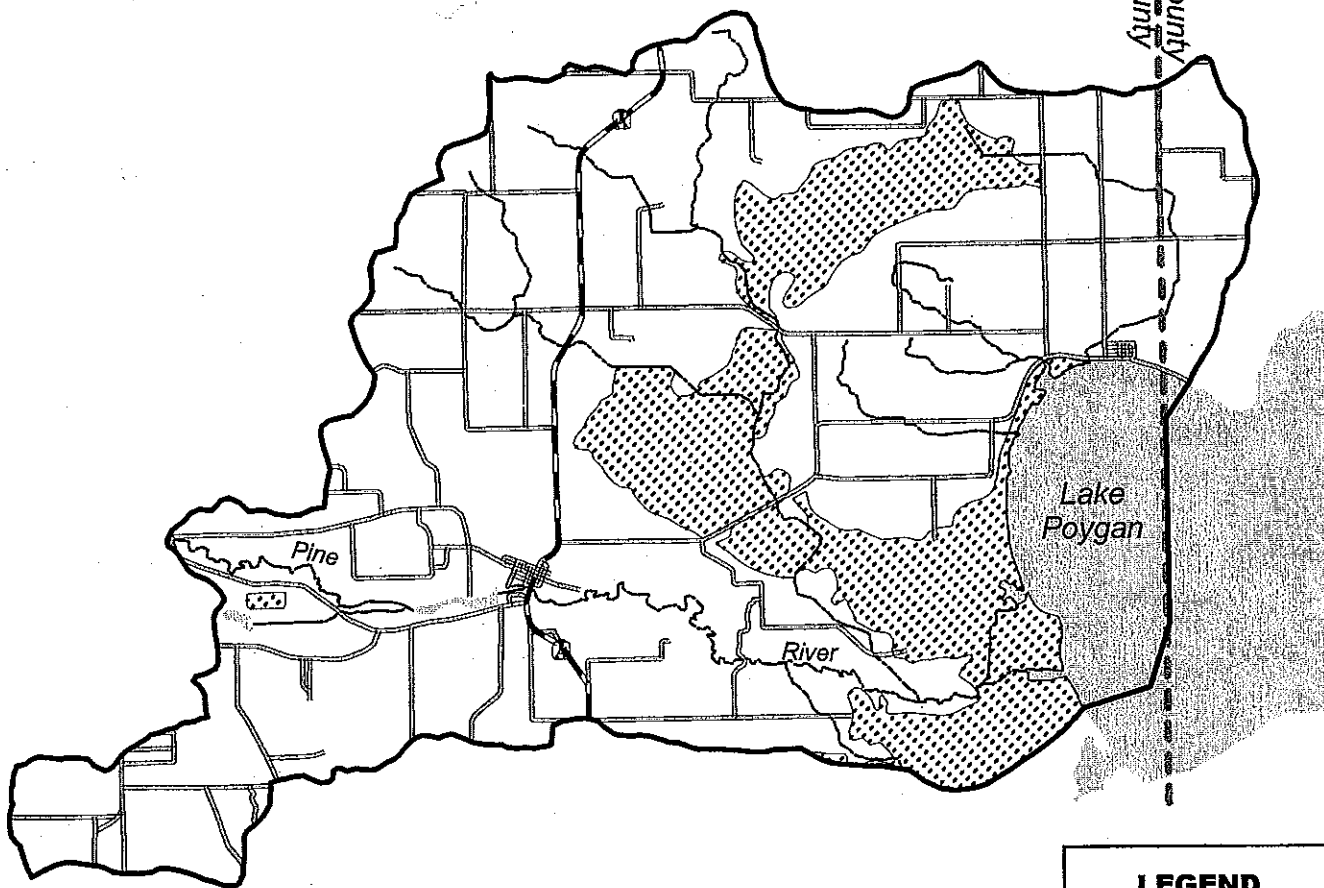
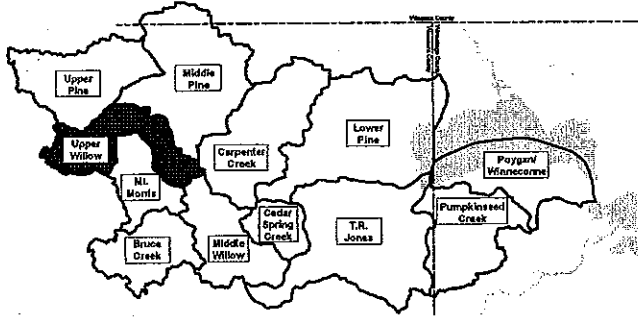
Upper Willow Subwatershed (UW)

Description (see Map 2-5): The Upper Willow subwatershed consists of the headwaters of the Willow Creek downstream to the confluence of Rattlesnake Creek. Beans Lake, Silver Lake, and three unnamed lakes are in this subwatershed. The southern one half of the community of Wild Rose and the Willow Creek State Fishery Area is in this subwatershed.

Water Quality Conditions: Willow Creek in this subwatershed is classified as Class I trout stream and an ORW. It received aquatic life habitat ratings of good at several different locations. The substrate is mostly sand with sediment bars and silt accumulation in slow areas. Although rubble and gravel areas are limited, the deep pools provide good habitat. The banks are well protected with trees and shrubs. Macroinvertebrate samples collected at Beaver Avenue found very good to excellent water quality indicating possible slight to no apparent organic pollution present. The EPT was 50 percent in fall and 40 percent in spring. Continuous dissolved oxygen and temperature monitoring from September 19 to 26, 1995 showed very good oxygen levels and cool water temperatures even during a small rain event. Oxygen remained above 8 mg/l and temperatures below 57°F with an average temperature of about 49 degrees.

Pine River/Willow Creek Priority Watershed Lower Pine Subwatershed (LP)

STUDY AREA



Winnebago County
Maushara County

LEGEND	
	Major Highway
	Local Road
	Stream
	County Line
	Subwatershed Boundary
	Wetland
	Open Water
	Municipal Area



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Land & Water Conservation Department
March - 2000

Overall, IBI scores indicate this subwatershed is in good condition. The dominance of intolerant coldwater species indicates high water quality and thermal stability.

Beans Lake is a 20 acre seepage lake with a maximum depth of 12 feet. The DB/SA for Beans Lake was 670. The lake experiences occasional winterkill. There are 18 lots on the lake.

Little Silver Lake is a 48 acre spring lake with a maximum depth of 52 feet. The DB/SA is 29.2. There are 78 lots on this lake. Eurasian watermilfoil is present in this lake. The Little Silver Lake District has received a lake planning grant from the DNR.

Nutrient and sediment loading to Willow Creek in this subwatershed does not seem to be a problem. A reduction would most significantly benefit downstream subwatersheds. Aquatic life could benefit from habitat improvement projects in Willow Creek.

Nonpoint Source Pollutants:

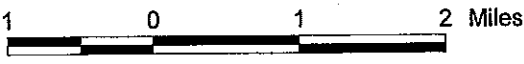
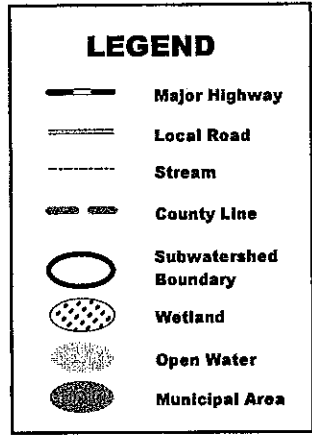
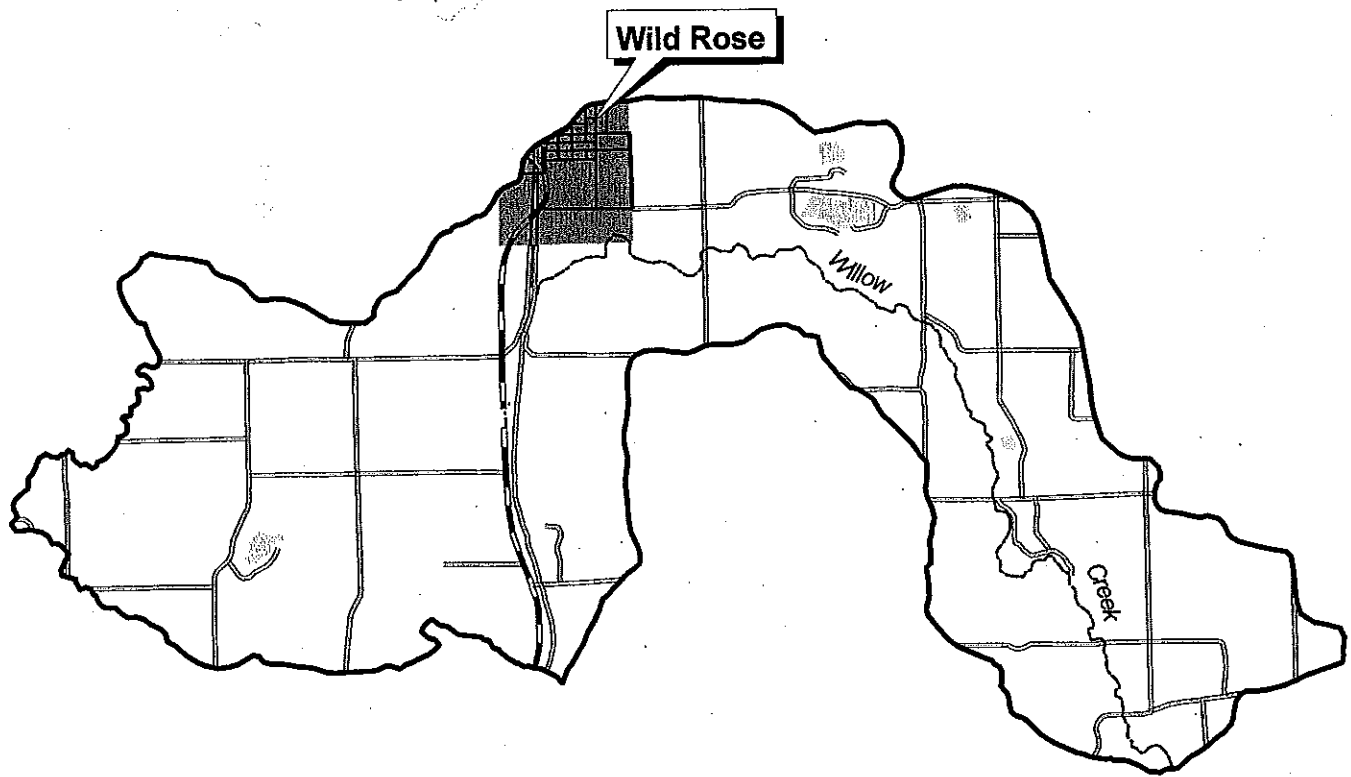
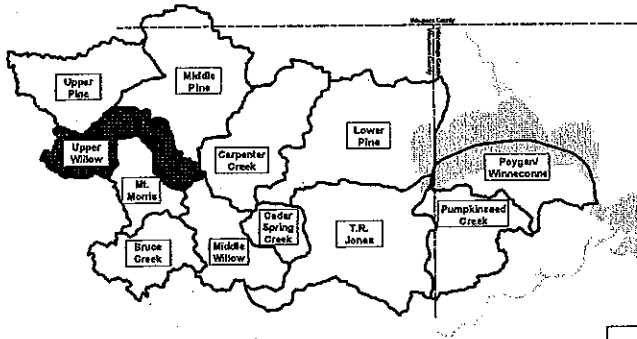
- The Upper Willow Subwatershed contains no active animal lots.
- The upland sediment delivery in the Upper Willow Subwatershed is 445 tons of sediment, annually, or 1.5 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 96 percent of the load.
- One percent of the sediment delivered from streambanks in the watershed comes from the Upper Willow Subwatershed.

Water Resource Goal: The goal for the water resources of the Upper Willow subwatershed is to protect and enhance aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a low level.
- Reducing the amount of nutrients reaching the watershed streams by a low level.
- Continuing or expanding current land acquisition programs on streams with master plans.
- Establishing streambank protection easements on streams that currently have no projects.
- Installing trout habitat improvement projects.
- Protecting, enhancing, and creating wetlands.

Pine River/Willow Creek Priority Watershed Upper Willow Subwatershed (UW)

STUDY AREA



Produced by: Winnebago County
Land & Water Conservation Department
March - 2000

Mt. Morris Subwatershed (MM)

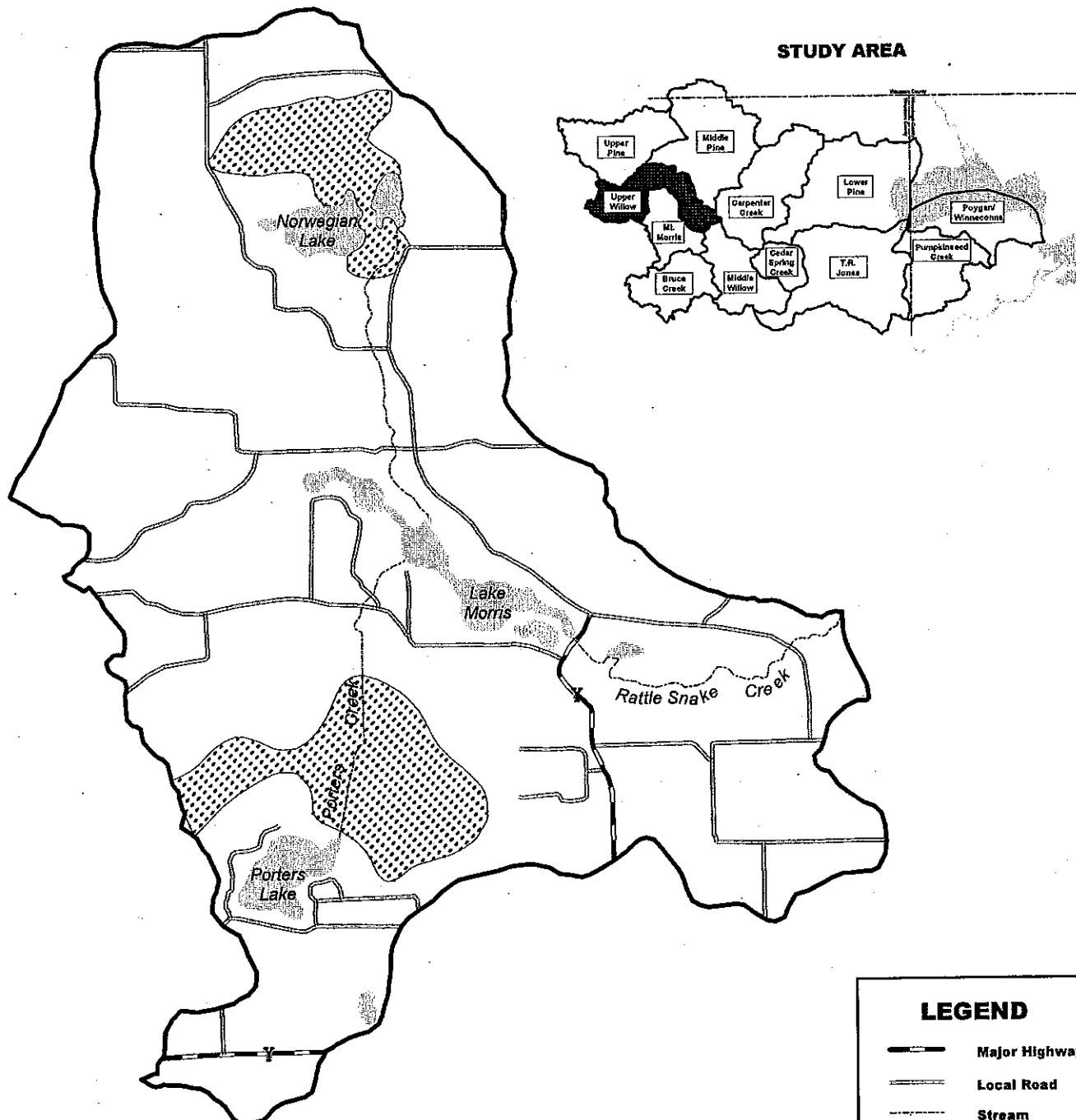
Description (see Map 2-6): The Mt. Morris subwatershed consists of Porters Creek, Rattlesnake Creek, and two Unnamed Tributaries to Lake Mt. Morris. It includes Twin Lakes, Porters Lake, Mt. Morris Lake, Emerald Lake, Little Lake, Norwegian Lake, and three unnamed lakes. The community of Mt. Morris is in this subwatershed.

Water Quality Conditions: Porters Creek begins as the outlet of Porters Lake and drains to Mt. Morris Lake. Porters Creek is 2 miles long and is classified as Class I trout water and an ERW. Much of the stream travels through the Wautoma Swamp. The variety of rocks and riffles along with the sand substrate provides good aquatic life habitat. Although the creek appears to have been ditched and straightened, it received a good water quality rating based on a macroinvertebrate sample collected at Bighorn Lane. This indicates some organic pollution present. The EPT was only 10 percent. Dissolved oxygen and temperature values were good.

Rattlesnake Creek is a 2-mile-long tributary that starts at Mt. Morris Lake and discharges to Willow Creek. This creek is classified as warm water forage fish communities; however, several cold water species were captured during the fishery survey. Aquatic life habitat was rated as fair. Most of the substrate is soft sand with silt accumulation near the edges. Stream bank erosion is a problem. The Mt. Morris Lake dam failure on August 29, 1995 caused significant flooding and tons of sediment to be washed downstream. This event significantly degraded downstream habitat not only in Rattlesnake Creek, but also in the receiving stream, Willow Creek.

The 3-mile-long Unnamed Tributary (locally known as Norwegian Creek, T19N, R11E, S16, SWNW) on the north side of Mt. Morris Lake has not been formally classified. It received a fair aquatic life habitat rating at CTH G. The sandy substrate and accumulation of silt provides only limited habitat. A vegetative buffer along the stream corridor helps protect the stream from upland soil erosion.

Pine River/Willow Creek Priority Watershed Mt. Morris Subwatershed (MM)



Produced by: Winnebago County
Land & Water Conservation Department
March - 2000

LEGEND	
	Major Highway
	Local Road
	Stream
	County Line
	Subwatershed Boundary
	Wetland
	Open Water
	Municipal Area

IBI scores were good in Porters Creek (80) and fair (30) in Rattlesnake Creek. Brook trout were the dominant species present and made up 80 percent of the total fish assemblage in Porters Creek.

Porters Lake is a 68 acre spring lake with a maximum depth of 18 feet. The Porters Lake area has very poorly drained soils which means that overland runoff of surface water is high. The lake is considered mesotrophic and has a DB/SA of 8.1. There are 59 lots and a lake management organization on this lake.

Mt. Morris Lake is a drainage lake with a DB/SA of 16. It is 163 acres with a maximum depth of 40 feet. Four tributaries provide most of the water for the lake. The lake is considered mesotrophic and aquatic plants are abundant. Mt. Morris Lake has a lake management organization and has been platted into 201 lots.

Emerald Lake is an 11 acre drained lake. The outlet to the lake flows north for a short distance before entering Mt. Morris Lake. It is a clear lake with extensive development on it.

Little Lake is a 6 acre drainage lake with a maximum depth of 21 feet. The lake develops a midsummer upper thermocline at four feet. Springs are present in the lake.

Norwegian Lake is designated as an ORW. It is a seepage lake of 82 acres and a maximum depth of 43 feet. It has a DB/SA of 7.9. The littoral bottom material consists of extensive marl deposits with large sand areas along the west end. A spring pond contributes a constant flow into the lake. There are 15 lots around the lake.

Dammed streams most significantly limit the water resources of this subwatershed. Dams warm the water and alter natural stream flow. Channelization decreases available aquatic life habitat. A reduction in sediments and nutrients would most significantly protect Mt. Morris Lake and decrease loading to Willow Creek.

Nonpoint Source Pollutants:

- The Mt. Morris Subwatershed contains no active animal lots.
- The upland sediment delivery in the Mt. Morris Subwatershed is 102 tons, annually, or .3 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 95 percent of the load.
- One percent of the sediment delivered from streambanks in the watershed comes from the Mt. Morris Subwatershed.

Water Resource Goals: The first goal for the water resources of the Mt. Morris subwatershed is to protect aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a medium level.
- Reducing the amount of nutrients reaching the watershed streams by a low level.
- Continuing or expanding current land acquisition programs on streams with master plans.
- Establishing streambank protection easements on streams that currently have no projects.
- Protecting, enhancing, and creating wetlands.

The second goal is to improve degraded habitat in Rattlesnake Creek caused by the Mt. Morris dam failure by:

- Installing sediment traps
- Trout habitat improvement projects
- Stabilizing stream banks

Bruce Creek Subwatershed (BC)

Description (see Map 2-7): The Bruce Creek subwatershed consists of the entire drainage area of Bruce Creek including two intermittent and one perennial tributary to Bruce Creek. Irogami, Silver, Hills, Deer, Bugh, Johns, Tippetts, Alpine and one unnamed lake are also in this subwatershed along with the community of Silver Lake.

Water Quality Conditions: Bruce Creek (sometimes referred to as Thorstad Creek) is 7 miles long. The creek starts at Johns Lake, flows through Tippetts Lake, is dammed to form Alpine Lake then discharges to the Willow Creek. It is classified as Class II trout water from Alpine Lake dam downstream to Willow Creek. The remaining 3 miles are not classified. Aquatic life habitat rated fair to good. The substrate is mostly sand with rock and riffles rare. The stream banks appear to be well protected from erosion although the stream has been channelized. The Alpine Lake impoundment has a warming effect on water temperature of Bruce Creek. Water temperature was 6.5°F warmer right below the dam than at the confluence of Willow Creek. Dissolved oxygen was also significantly lower below the dam than downstream although levels were acceptable. Three water chemistry samples collected during snowmelt and rain runoff events found slightly elevated concentrations of ammonia and total phosphorus on one occasion and elevated dissolved phosphorus on two occasions. Suspended solids and other nutrient concentrations were low.

Overall, cover for fish is rated good to excellent. The predominant fish species captured in Bruce Creek subwatershed included brook trout, mottled sculpin, and creek chubs. Interestingly, IBI scores increased from upstream to downstream stations surveyed. The lower scores at the upstream stations are probably due to wetland ditching, channelization, and the impoundment.

Young of the year were not sampled at any stations, which may indicate limited reproductive success. This is surprising, since all stations had some gravel for spawning habitat. This may indicate other problems such as sedimentation or thermal instability which inhibits egg survival in the redds and/or young of year overwinter survival.

Irogami Lake is a 289 acre seepage lake with a maximum depth of only five feet. Irogami Lake is mesotrophic and has an average annual total phosphorus load of 363 lbs. It has a DB/SA of 3.1. Irogami Lake Association received a lake planning grant from the DNR.

Silver Lake (Big Silver) is a 344 acre seepage lake with a maximum depth of 45 feet. Silver Lake has 330 lots around the lake and a predicted average annual total phosphorus load of 499 lbs. The lake shore is highly developed within 1000 feet from shore and is sewered with no conventional septic systems. It is considered mesotrophic. Silver Lake Association received a lake planning grant from the DNR.

Hills Lake (Little Hills) is 81 acres in size with a maximum depth of 23 feet. The DB/SA of Hills Lake is 11.9. It has a predicted annual loading of total phosphorus of 515 lbs. It is a seepage lake and is considered mesotrophic to oligotrophic. There are 105 lots on the lake.

Deer Lake is a 15 acre seepage lake with a maximum depth of 14 feet. It frequently winterkills and has a DB/SA of 18.7. There are 41 lots around this lake.

Bugh Lake is 30 acres in size and has a maximum depth of 18 feet. This seepage lake has a DB/SA of 24. An early summer thermocline develops in the lake at approximately eight feet. A lake management organization has been formed for the 52 lots on Bugh Lake.

Johns Lake is a 73 acre seepage lake. The outlet of the lake forms the headwaters of Bruce Creek. The DB/SA is 24.5. The lake is considered oligotrophic. Johns Lake District will receive cost share dollars for purchasing land along the shoreline to maintain it in a natural way. There are currently 61 lots on this lake.

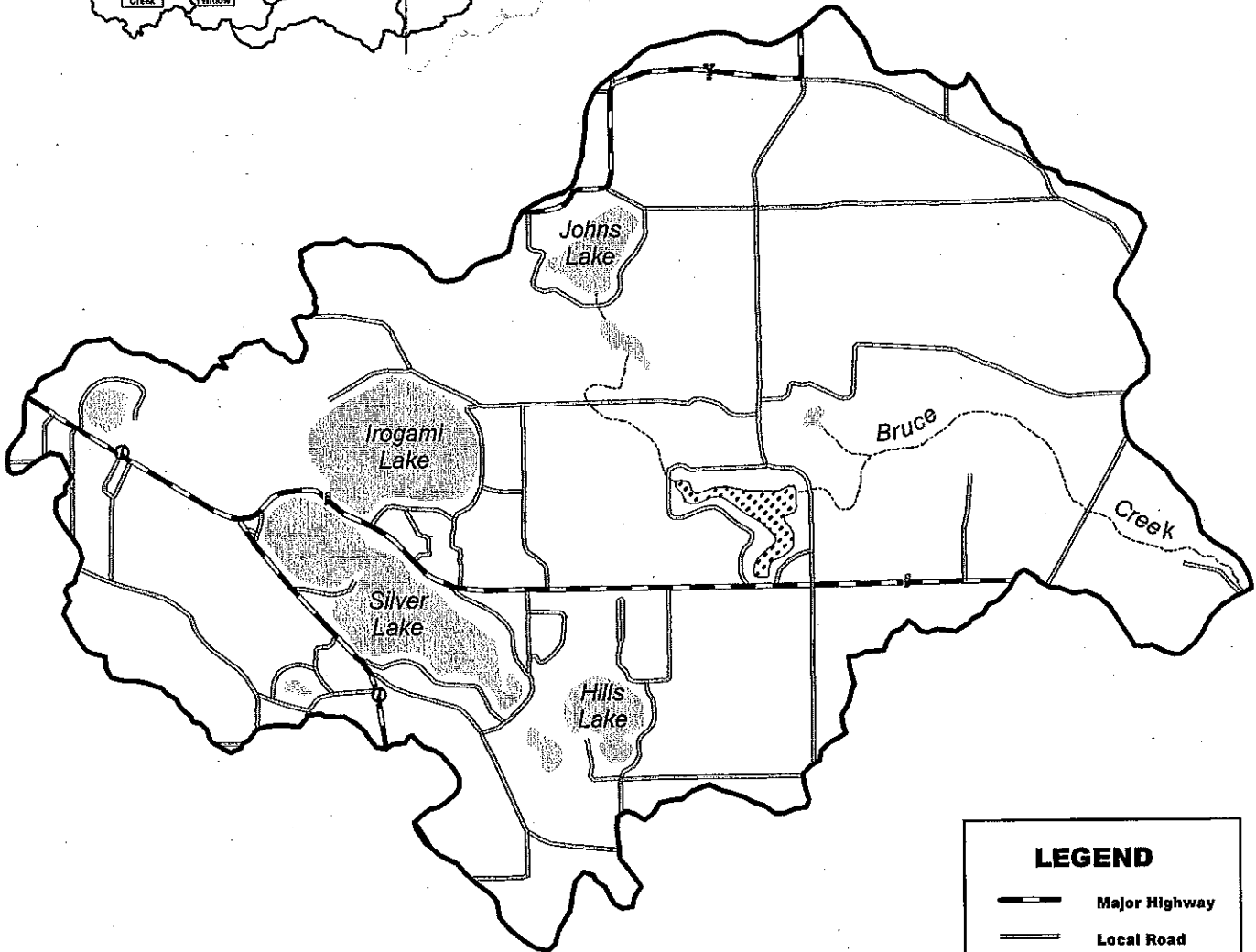
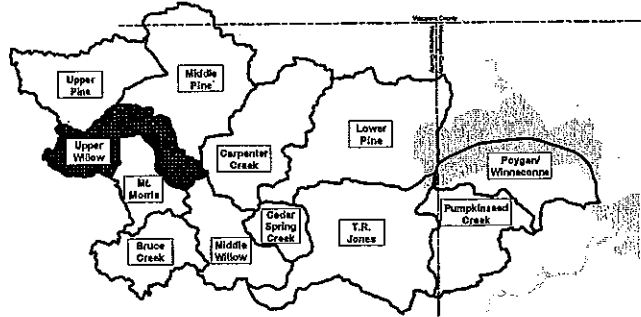
Tippetts Lake is an 11 acre drainage lake with a maximum depth of 17 feet. There are 11 lots on the lake and it has a DB/SA of 0.5.

Alpine Lake is a 56 acre impoundment on Bruce Creek. It has a maximum depth of 18 feet. Because of the large watershed to Alpine Lake, it receives a predicted annual load of total phosphorus of 896 lbs. It is considered mesotrophic and receives large amount of sediment from upstream. This lake has significant aquatic plant problems. Alpine Lake Owner's Association received a lake planning grant from the DNR.

The impoundment of Bruce Creek, loss of wetlands, and stream channelization appear to have the most significant negative impact on the coldwater fish communities and water quality of Bruce Creek. A sediment and nutrient loading reduction would most significantly benefit Alpine Lake and Willow Creek.

Pine River/Willow Creek Priority Watershed Bruce Creek Subwatershed (BC)

STUDY AREA



Produced by: Winnebago County
Land & Water Conservation Department
March - 2000

LEGEND	
	Major Highway
	Local Road
	Stream
	County Line
	Subwatershed Boundary
	Wetland
	Open Water
	Municipal Area

Nonpoint Source Pollutants:

- The Bruce Creek Subwatershed contains 1 animal lots which contributes 16.6 pounds of phosphorus [organic], annually. This represents less than one percent of the phosphorus for the entire watershed.
- The upland sediment delivery in the Bruce Creek Subwatershed is 346 tons annually, or 1.1 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 96 percent of the load.
- One percent of the sediment delivered from streambanks in the watershed comes from the Bruce Creek Subwatershed.

Water Resource Goals: The first goal for the water resources of the Bruce Creek subwatershed is to improve aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a medium level.
- Reducing the amount of nutrients reaching the watershed streams by a low level.
- Protecting, enhancing, or creating wetlands.
- Continuing or expanding current land acquisition programs on streams with master plans.
- Establishing streambank protection easements on streams that currently have no projects.

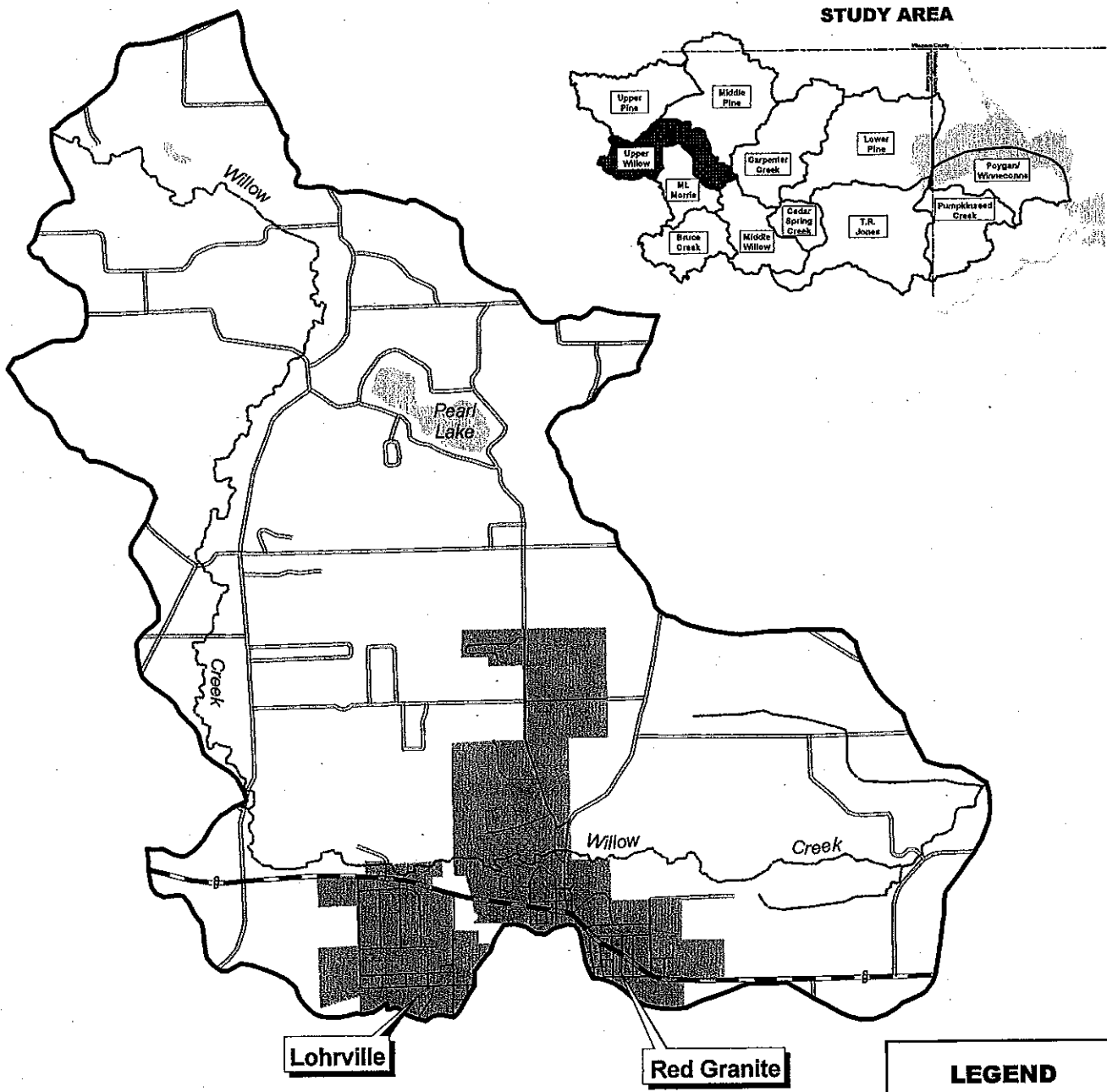
The second goal is to obtain an IBI score of at least 60 in Bruce Creek by:

- Installing practices that cool the stream, improve trout habitat, and restore wetlands and stream channel meanders.
- Installing sediment traps.

Middle Willow Subwatershed (MW)

Description (see Map 2-8): The Middle Willow Subwatershed consists of Willow Creek from the confluence of Rattlesnake Creek downstream to the confluence of Cedar Springs Creek including three unnamed perennial tributaries. Cooks Lake, Pearl Lake, Redgranite Quarry, and an unnamed lake are also in this watershed. The communities of Redgranite and Lohrville are in this subwatershed. The Redgranite Municipal Wastewater Treatment Plant and Ripon Pickle Company discharge to Willow Creek.

Pine River/Willow Creek Priority Watershed Middle Willow Subwatershed (MW)



LEGEND

-  Major Highway
-  Local Road
-  Stream
-  County Line
-  Subwatershed Boundary
-  Wetland
-  Open Water
-  Municipal Area



Produced by: Winnebago County
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March - 2000

Water Quality Conditions: Willow Creek, in this subwatershed, is classified as Class I trout water from the confluence of Rattlesnake Creek downstream to Blackhawk Road (T19N, R11E, S24) and Class II trout water for the remainder. Willow Creek is designated as an ORW upstream of the Redgranite Sewage Treatment Plant. The rock, riffle, and sand substrate provides a variety of habitat for aquatic life. Habitat ratings were excellent to good at several locations. However, bank erosion is occurring in some areas.

Macroinvertebrate samples at CTH S received an excellent water quality rating with an EPT of 50 percent. At CTH EE, water quality averaged excellent in Spring 1995 with an EPT of 41 percent, good in Fall 1995 with an EPT of 51 percent, and very good in Spring 1996 with an EPT of 48 percent. There was a significant change in the macroinvertebrate community that suggests that the failure of the Lake Mt. Morris dam on August 29, 1995 affected the habitat and macroinvertebrate community in Willow Creek (Robaidek 1996, Johnson 1996).

Monthly water chemistry samples collected at CTH EE in 1995 showed good to very good water quality. All parameters normally associated with poor or declining water quality came back with "no detect" or very low readings. Dissolved oxygen was recorded below 6 mg/l (4.5 mg/l) on August 17, 1995 during a significant runoff event. The mean summer water temperature was 69°F.

Overall, habitat for fish rated good to fair. The predominant fish species captured in the Middle Willow subwatershed included brown trout, mottled sculpin, northern brook lamprey, white suckers, largemouth bass (mainly young of year), and weed shiners. All stations had diverse fish communities consisting of intolerant and tolerant species. IBI scores varied from good in the upstream portion to poor in the lower stations. The poor rating is probably because there is a change from coldwater to coolwater progressing downstream and the coldwater IBI is not the best indicator for environmental quality for cool water.

Cooks Lake is a small, five acre drainage lake with a maximum depth of only seven feet.

Pearl Lake is a 92 acre seepage lake with a maximum depth of 50 feet. It is considered oligotrophic. The deep cool water lake supports rainbow trout. The DB/SA is 2.7. There are 141 lots on this lake. Pearl Lake Management Organization has received a lake planning grant from the DNR.

The Redgranite Quarry is a small hard water quarry located within the city limits of Redgranite. The contour is regular and the sides slope almost vertically.

Sediment and nutrient control measures installed in this subwatershed would likely prevent nonpoint source pollution from becoming a problem in an otherwise high quality stream. The fishery would benefit from trout habitat improvement projects.

Nonpoint Source Pollutants:

- The Middle Willow Subwatershed contains 4 animal lots, which contribute 73.1 pounds of phosphorus annually. This represents an estimated 2 percent of the phosphorus for the entire watershed.
- The upland sediment delivery in the Middle Willow Subwatershed is 1771 tons annually, or 6 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 97 percent of the load.
- Fifty-one percent of the sediment delivered from streambanks in the watershed comes from the Middle Willow Subwatershed.

Water Resource Goal: The goal for the water resources of the Middle Willow subwatershed is to protect and enhance aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a high level.
- Reducing the amount of nutrients reaching the watershed streams by a low level.
- Installing stream bank stabilization and trout habitat improvement projects.
- Continuing or expanding current land acquisition programs on streams with master plans.
- Establishing streambank protection easements on streams that currently have no projects.
- Protecting, enhancing, or creating wetlands.

Cedar Springs Creek Subwatershed (CS)

Description (see Map 2-9): The Cedar Springs Creek Subwatershed consists of the entire drainage area of Cedar Springs Creek. It includes Middle Lake, Taylor Lake, and two small, unnamed lakes.

Water Quality Conditions: Cedar Springs Creek is classified as Class I trout stream and an ERW for its entire 4-mile length. The clear, cold headwater springs just north of CTH Q provide habitat for cold water fish and plant communities. This hard water spring pond has excellent water quality (Reif, 1984). Aquatic life habitat is rated good in the headwaters, but poor at Chicago Road and Chicago Lane. The lower reaches are slow and turbid with a silt and sand bottom substrate. The high percent of sediment is probably due to the combination of drainage ditches, farmed wetlands next to the stream, and past channel straightening. A large amount of fine sediment comes from eroded ditch banks and adjacent tilled fields. The lower reaches are significantly warmer than the headwaters. From July 1 to 10, 1996, dissolved oxygen did not even reach the cold water standard of 6 mg/l. Dissolved oxygen ranged from 2.2 to 4.8 mg/l during the entire 10 day period at Chicago Road. Water temperature ranged from 58 to 77°F. These low oxygen levels are caused by the accumulation of organic matter in the creek bed.

These low dissolved oxygen levels and warm temperatures are stressful to aquatic life in the stream. A water chemistry sample collected at Chicago Lane in August, 1995 during a rain event showed an elevated concentration of dissolved phosphorus.

Aquatic life habitat of the Unnamed Tributary (mouth T19N, R12E, S35, SWSW) to Cedar Springs Creek received a fair rating at 29th Lane. The sandy substrate and small size limits available habitat for aquatic life.

Cover for fish was excellent in the upper reaches of Cedar Springs Creek and very poor in the lower reaches. IBI scores rated the headwater area as good to excellent, while the lower reaches rated very poor to poor. Brook trout were the only salmonid species sampled in Cedar Springs Creek and this was in the headwater area.

Middle Lake is a 20 acre landlocked seepage lake with a maximum depth of 14 feet. The littoral zone is quite extensive and consists of sand and muck. The lake frequently winterkills. There are seven lots on this lake and the DB/SA is 30.

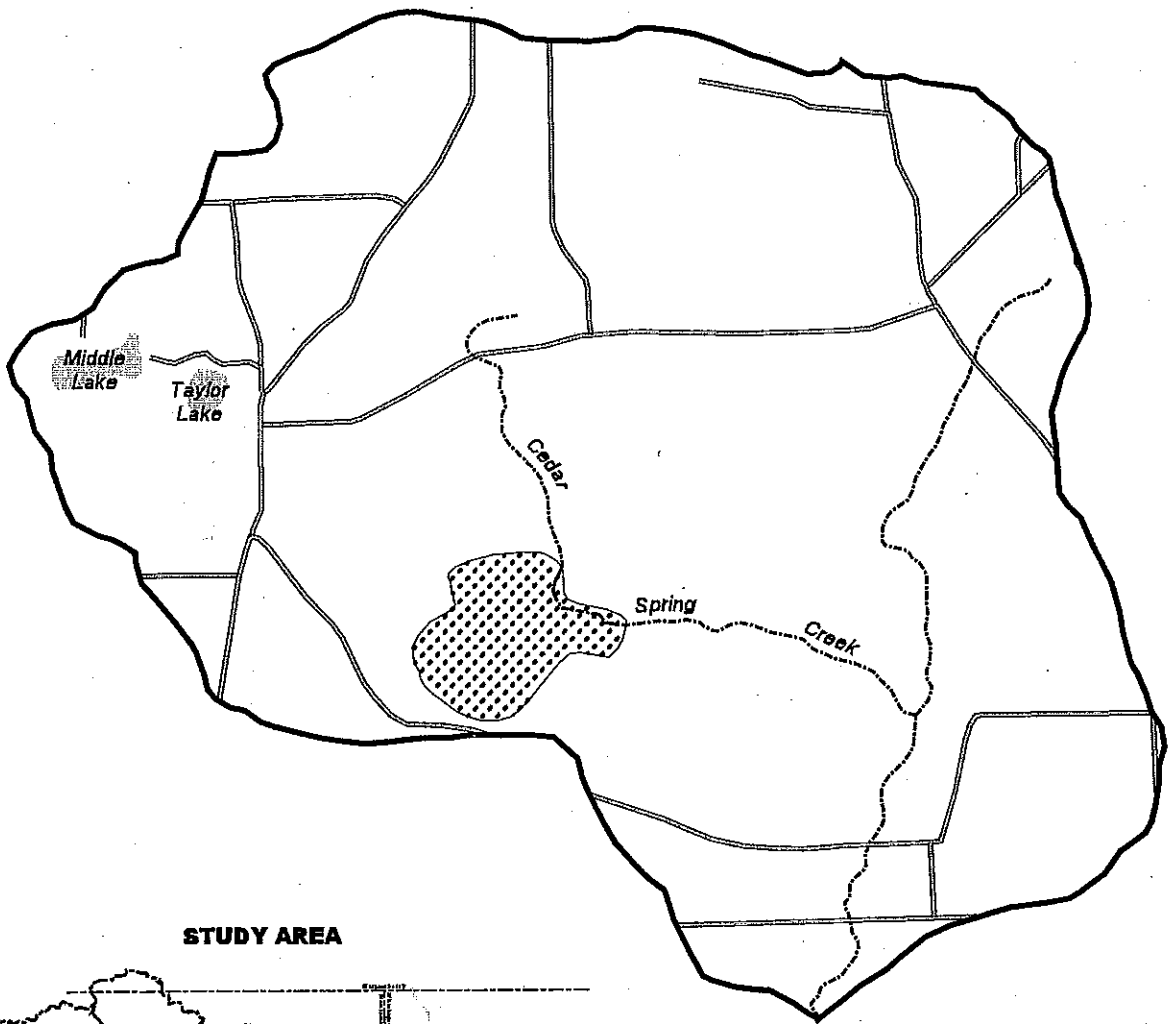
Taylor Lake is a small 11 acre seepage lake with a maximum depth of only five feet. The lake basin is shallow with littoral bottom material consisting completely of muck. It frequently winterkills. There are four cottages on this lake and the DB/SA is 32.7.

Sediment and nutrients significantly impact Cedar Springs Creek. The headwater area is in excellent condition while the lower reaches are severely degraded. Low dissolved oxygen levels, increased water temperatures, silt and sediment covered substrate, loss of wetlands, and channelization are factors limiting the Cedar Springs Creek from meeting its full potential to support more diverse and abundant cold water aquatic life.

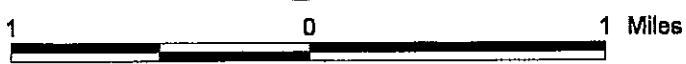
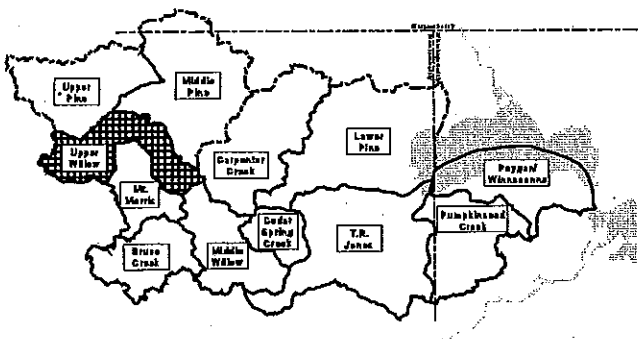
Nonpoint Source Pollutants:

- The Cedar Springs Subwatershed contains 1 animal lot, which contributes 6.8 pounds of phosphorus annually. This represents less than 1 percent of the phosphorus for the entire watershed.
- The upland sediment delivery in the Cedar Springs Subwatershed is 1655 tons annually, or 5.5 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 92 percent of the load.
- Less than 1 percent of the sediment delivered from streambanks in the watershed comes from the Cedar Springs Subwatershed.

Pine River/Willow Creek Priority Watershed Cedar Spring Creek Subwatershed (CS)



STUDY AREA



Produced by: Winnebago County
Land & Water Conservation Department
March - 2000

LEGEND	
	Major Highway
	Local Road
	Stream
	County Line
	Subwatershed Boundary
	Wetland
	Open Water
	Municipal Area

Water Resource Goals: The first goal for the water resources of the Cedar Springs Creek subwatershed is to improve aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a high level.
- Reducing the amount of nutrients reaching the watershed streams by a high level.
- Continuing or expanding current land acquisition programs on streams with master plans.
- Establishing streambank protection easements on streams that currently have no projects.

The second goal is to obtain an IBI score of at least 60 in Cedar Springs Creek by installing practices that:

- Cool the stream
- Improve trout habitat
- Restore wetlands and stream channel meanders
- Trap sediment

T.R. Jones Subwatershed (TR)

Description (see Map 2-10): The T.R. Jones subwatershed consists of the Willow Creek from Cedar Springs Creek downstream to Lake Poygan. Willow Creek is dammed at the community of Auroraville to form the Auroraville Millpond. The mouth of Willow Creek is in the Poygan Marsh. The community of Fountain Valley is also in this subwatershed.

Water Quality Conditions: In this subwatershed, Willow Creek is classified as Class II trout water down to 29th Lane then warmwater sport fish for the remainder. Aquatic life habitat rated good just above the Auroraville Millpond and fair below. Below the millpond, the creek is wide and shallow with sandy substrate and significant aquatic plant growth. Silt has accumulated in slow areas. Vegetative buffers along the stream corridor are minimal. Continuous monitoring above and below the Auroraville Millpond from July 10 to 17, 1996 found the average water temperature to be 7°F warmer below the millpond than above. Temperature ranged from 62 to 72°F above and 68 to 78°F below the millpond. Dissolved oxygen values were good at both locations and ranged from 6.3 to 10 mg/l.

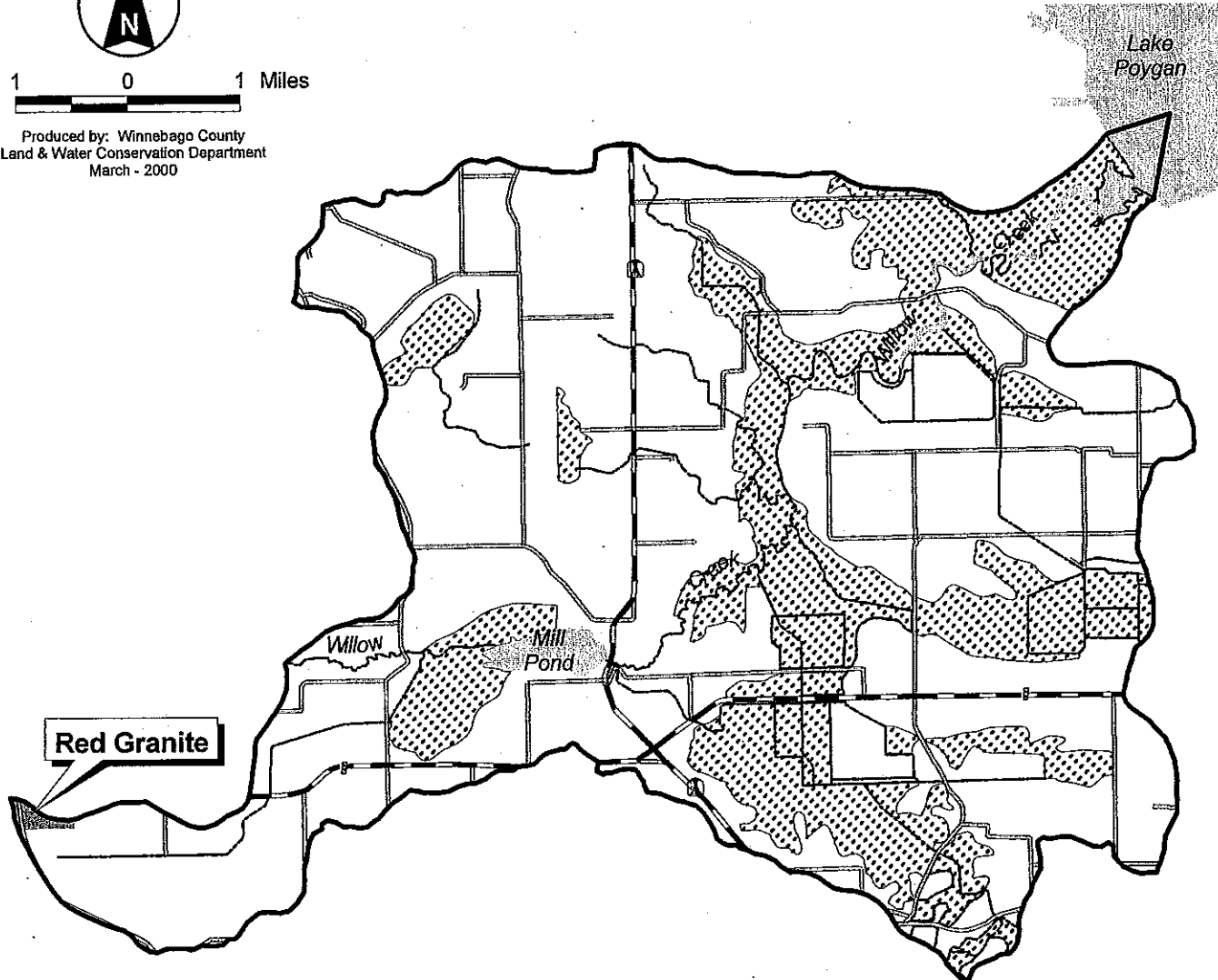
Most of the tributaries to Willow Creek have been ditched and straightened and only flow during runoff events. Cranberry bogs and wetland are abundant.

The Auroraville Millpond is 209 acres in size with a maximum depth of six feet. Shallow water and dense aquatic plants limit boating and swimming in this impoundment of Willow Creek. The DB/SA is 62.2.

Pine River/Willow Creek Priority Watershed T.R. Jones Subwatershed (TR)



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March - 2000

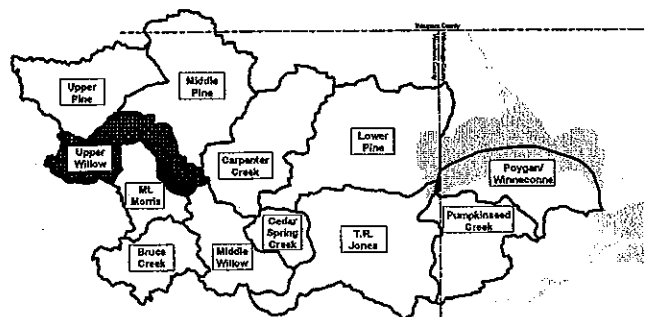


Lake Poygan

LEGEND

- Major Highway
- Local Road
- Stream
- County Line
- Subwatershed Boundary
- Wetland
- Open Water
- Municipal Area

STUDY AREA



Although dissolved oxygen levels remained good, the Auroraville Millpond warms the water of Willow Creek. Channelization of the tributary streams decreases habitat and speeds the rate of runoff during events. A reduction of sediment and nutrients will improve aquatic life habitat in the tributary streams and reduce the overall loading to Willow Creek and Lake Poygan.

Nonpoint Source Pollutants:

- The T.R. Jones Subwatershed contains 27 animal lots, which contribute 747.5 pounds of phosphorous annually. This represents an estimated 22.8 percent of the phosphorus for the entire watershed.
- The upland sediment delivery in the T.R. Jones Subwatershed is 3919 tons annually, or 13 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 90 percent of the load.
- Two percent of the sediment delivered from streambanks in the watershed comes from the T.R. Jones Subwatershed.

Water Resource Goal: The goal for the water resources of the T.R. Jones subwatershed is to improve aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a high level.
- Reducing the amount of nutrients reaching the watershed streams by a high level.
- Protecting, enhancing, or creating wetlands.

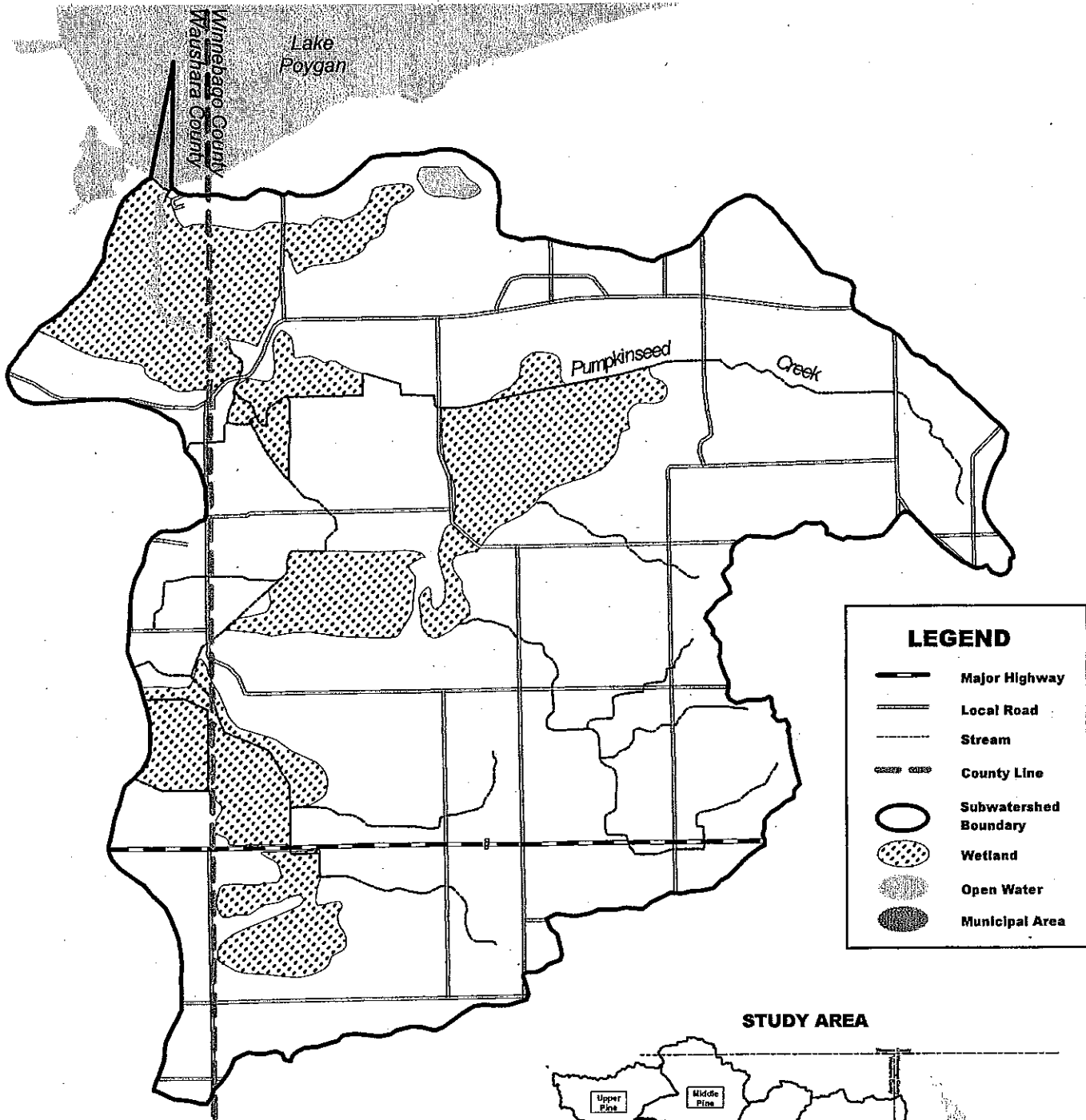
Pumpkinseed Creek Subwatershed (PC)

Description (see Map 2-11): The Pumpkinseed Creek subwatershed consists of the entire drainage area of Pumpkinseed Creek including several perennial and intermittent drainage ditches. The community of Borth, the Deppe Marsh State Wildlife Area, and the Poygan Marsh are in this subwatershed.

Water Quality Conditions: Pumpkinseed Creek is classified as a warmwater sport fish stream from its mouth at Lake Poygan upstream for three miles. It's considered warmwater forage fish for the remaining four miles. The upper reaches flow intermittently. Pumpkinseed Creek received a poor aquatic life habitat rating. The ditched and straightened creek has little rubble substrate or other desirable habitat. Huge deposits of sediment cover the bottom. Filamentous algae growth is abundant and the banks have little vegetative buffer. The banks flood easily during runoff events. Recreational boat activity in the lower reaches of Pumpkinseed Creek causes bank erosion problems.

Continuous monitoring of dissolved oxygen and temperature during a significant rain runoff event from June 18 to 24, 1996 at Rushford Avenue found cool water temperatures and good

Pine River/Willow Creek Priority Watershed Pumpkinseed Creek Subwatershed (PC)



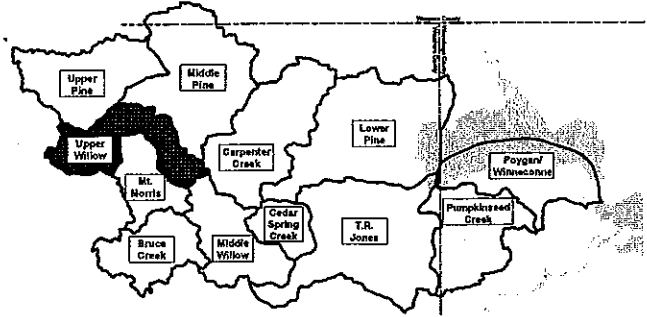
LEGEND

- Major Highway
- Local Road
- Stream
- County Line
- Subwatershed Boundary
- Wetland
- Open Water
- Municipal Area



Produced by: Winnebago County
Land & Water Conservation Department
March - 2000

STUDY AREA



oxygen levels. This indicates that high oxygen demanding substance runoff to Pumpkinseed Creek is probably not a problem when water temperatures remain cool.

Three water chemistry samples collected at Rushford Avenue during snowmelt and rain runoff events found elevated concentrations of ammonia, nitrate & nitrite, total phosphorus, and dissolved phosphorus. Biochemical oxygen demand and suspended solids values were relatively low.

- Aquatic life is most significantly limited by the lack of available habitat and intermittent stream flow of Pumpkinseed Creek and its tributaries. The channelized creek accelerates runoff rates and only supplies adequate aquatic life habitat during snowmelt and rain events. Poor vegetative buffers, extreme sediment accumulation, dense algae growth, and motor boat activity are factors limiting aquatic life in this subwatershed. A reduction in sediment and nutrient loading would not only benefit Lake Poygan, but also provide better habitat in the streams.

Nonpoint Source Pollutants:

- The Pumpkinseed Creek Subwatershed contains 12 animal lots, which contribute 263.8 pounds of phosphorus annually. This represents an estimated 8 percent of the phosphorus for the entire watershed.
- The upland sediment delivery in the Pumpkinseed Creek Subwatershed is 4034 tons annually, or 13.4 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 88 percent of the load.
- Less than 1 percent of the sediment delivered from streambanks in the watershed comes from the Pumpkinseed Creek Subwatershed.

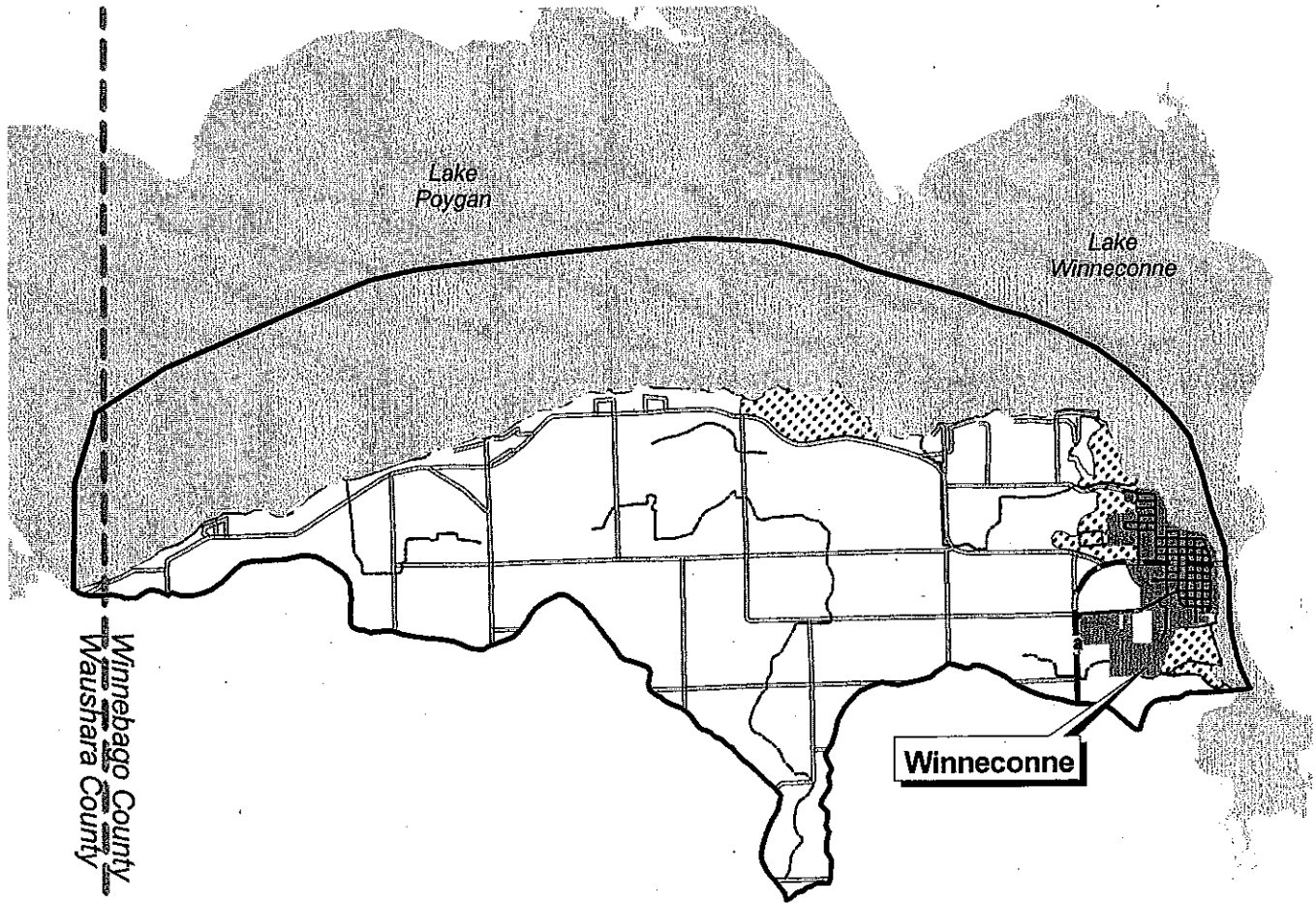
Water Resource Goal: The goal for the water resources of the Pumpkinseed Creek subwatershed is to improve aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a high level.
- Reducing the amount of nutrients reaching the watershed streams by a high level.
- Develop and maintain vegetative buffers along the stream corridors to filter runoff, provide bank stabilization, and provide cover for fish.
- Protecting, enhancing, or creating wetlands.

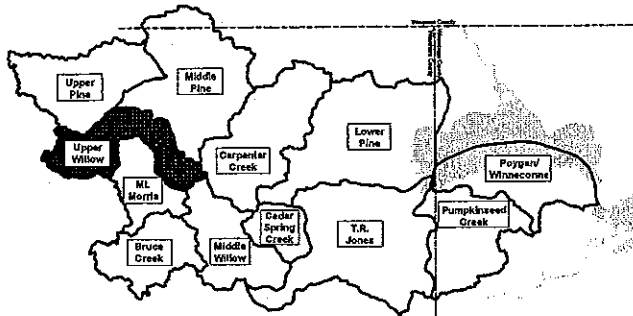
Poygan/Winneconne Subwatershed (PW)

Description (see Map 2-12): The Poygan/Winneconne subwatershed consists of several intermittent and perennial direct drainage ditches to Lake Winneconne, Lake Poygan, and the Wolf River. Bays and channels from the lakes are common and numerous homes are located

Pine River/Willow Creek Priority Watershed Poygan/Winneconne Subwatershed (PW)



STUDY AREA



Produced by: Winnebago County
Land & Water Conservation Department
March - 2000

LEGEND	
	Major Highway
	Local Road
	Stream
	County Line
	Subwatershed Boundary
	Wetland
	Open Water
	Municipal Area

along these shores. The west side of the community of Winneconne is included in this subwatershed. The Poygan Sanitary District #1 discharges treated wastewater directly to Lake Poygan.

Water Quality Conditions: None of the perennial or intermittent tributaries in this subwatershed are named. These tributaries drain extensive areas of agricultural lands. Most of the tributaries have been ditched and straightened. Wetlands are extensive along shorelines of Lake Winneconne and Lake Poygan.

A lake management organization has been formed for Lake Poygan.

The straightening, ditching, and resulting sediment accumulation in the tributary streams decrease the available year-round habitat for aquatic life. Although certain species of fish use the streams for spawning and nursery areas, the water quality of the ditches is poor. The Winnebago Pool Lakes would most significantly benefit from a reduction of sediment and nutrient loading, although in-stream habitat and water quality would also benefit.

Nonpoint Source Pollutants:

- The Poygan/Winneconne Subwatershed contains 10 animal lots, which contribute 157.5 pounds of phosphorus annually. This represents an estimated 4.8 percent of the phosphorus for the entire watershed.
- The upland sediment delivery in the Poygan/Winneconne Subwatershed is 3311 tons annually, or 11 percent of the entire watershed load. Cropland is the major source in this subwatershed, contributing 90 percent of the load.
- Less than 1 percent of the sediment delivered from streambanks in the watershed comes from the Poygan/Winneconne Subwatershed.

Water Resource Goal: The goal for the water resources of the Poygan/Winneconne subwatershed is to improve aquatic life habitat and water quality by:

- Reducing the amount of sediment reaching the watershed streams by a high level.
- Reducing the amount of nutrients reaching the watershed streams by a high level.
- Protecting, enhancing, or creating wetlands

CHAPTER THREE

Nonpoint Source Pollutants and Management Strategy

This section describes the nonpoint source inventories, objectives, and cost-share eligibility criteria for each pollutant source. These sources include barnyard runoff and sediment from upland, gully, streambank, and construction site erosion. Cost-share funds for installing pollution control measures, known as best management practices (BMPs), will be targeted at sites that contribute the greatest amounts of pollutants. This section is organized in the following manner.

- Pollutant Reduction Goals and Project Objectives for Nonpoint Sources
- Management Categories
- Rural Nonpoint Pollution Sources and Management Strategy

Pollutant Reduction Goals and Project Objectives for Rural Nonpoint Sources

Goals for water quality in the Pine River\Willow Creek priority watershed project were identified in the preceding chapter as protection, enhancement, and restoration of water quality, aquatic life habitat and groundwater resources. These goals will be achieved through project objectives for reductions in delivery of sediment and phosphorus, groundwater protection, and community education. Goals were derived based on achievable pollution reduction levels and most cost-effective methods for reducing nonpoint source pollution.

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

Sediment Objective: Reduce overall sediment delivered to Pine River\Willow Creek from all sources by 34 percent. To meet this objective, the following is needed:

- Reduce sediment delivered to surface water from agricultural uplands by at least 10,188 tons or 34 percent of the existing contribution from uplands. At a minimum, landowners with soil erosion rates greater than tolerable (T) soil loss rates, as calculated by the Universal Soil Loss Equation (USLE) and with sediment delivery rates greater than 1.0 ton/acre/year, will be required to reduce soil loss and sediment delivery below these critical limits. Landowners with fields delivering more than 0.2 tons/acre/year will be eligible for cost sharing to install BMPs to reduce soil delivery to surface water.

- Reduce shoreline and streambank erosion by 50 percent through the implementation of shoreline and streambank protection practices such as riprap, fencing, and shaping and seeding. Additionally, efforts to maintain or develop stream woodland and grassland corridors by developing buffers that provide wildlife habitat, canopy, bank stabilization, and sediment reduction will be encouraged.
- Establish and/or restore wetland areas in the watershed.
- Municipalities in Waushara County should adopt uniform construction site erosion control ordinances to limit sediment contributions from construction sites.

Phosphorus Objective: Reduce overall phosphorus delivered to Pine River\Willow Creek Watershed by 34 percent. To meet this objective, the following is needed:

- Reduce phosphorus runoff from barnyards in the watershed by approximately 28 percent primarily through clean water diversions and/or complete system improvement (if determined to be necessary by county staff).
- Promote nutrient and pest management as an economically and environmentally sound practice within the watershed.
- Reduce the phosphorus delivered to streams and lakes in the watershed from soil erosion in agricultural upland by at least 34 percent. This can be achieved by reaching the sediment reduction objective.
- Waushara County should adopt a manure storage ordinance for the protection of ground and surface water resources.

Groundwater Objective: Protect and enhance groundwater resources in the Pine River\Willow Creek watershed. To meet this objective, the following is needed:

- Use nutrient management plans to reduce the over-application of commercial fertilizer and manure and minimize the application of winterspread manure on unsuitable cropland.
- Implement BMPs as appropriate to protect and enhance groundwater quality.
- Encourage proper abandonment of unused wells per NR 120 and NR 812, Wisconsin Administrative Code.
- Reduce over-application of pesticides.

- Provide landowners with extensive informational and educational materials to promote awareness and instill responsibility for the groundwater resource.

Community Education and Action Objective: Foster understanding of runoff pollution problems and promote participation in resource protection within the Pine River\Willow Creek watershed. To meet this objective, the following is needed:

- Translate the project goals into action items by identifying target audiences and designing a program to meet those goals by working with that audience. Target audiences are those involved directly with land management, those involved directly with livestock and manure management, those who work with landowners/operators and livestock operators, and those involved in conservation courses/activities.

Tables 3-1 and 3-2 summarize the sediment and phosphorus reduction goals for the Pine River\Willow Creek Priority Watershed Project.

Table 3-1. Annual Sediment Reduction Objective: Pine River\Willow Creek

Source	Inventoried Sediment Load (tons)	Percent of Total	Planned Reduction
Upland	30,190	92%	34% (10,188 tons)
Streambank	2,064	6%	50% (1,032 tons)
Lake Shoreline	584	2%	50% (292 tons)
Total	32,838	100%	35% (11,512 tons)

Table 3-2. Annual Phosphorus Reduction Objectives: Pine River\Willow Creek

Nonpoint Source	Inventoried Phosphorus Load (lbs)	Percent of Total	Planned Reduction
Upland	90,570	94%	34% (30,564 lbs)
Streambank	2,064	2%	50% (1,032 lbs)
Shoreline	584	1%	50% (292 lbs)
Barnyards	3,266	3%	28% (902 lbs)
Total	96,484	100%	34% (32,790 lbs)

Management Categories

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

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

The Waushara County LCD and the Winnebago County LWCD will assist landowners in applying BMPs. They range from alterations in farm management (such as changes in manure-spreading and crop rotations) to engineered structures (such as clean water diversions, sediment basins, and manure storage facilities), and are tailored to specific landowner situations.

Critical Site Management Category

Nonpoint source pollutant load reduction in the Pine River\Willow Creek Watershed project will be achieved mainly through voluntary participation. Nonpoint sources included in the critical category contribute a significant amount of the pollutants impacting surface waters. State statutes require that the nonpoint source control plan designates the necessary activities to ensure the reasonable likelihood of achieving water quality goals and objectives. Landowners with sites that meet the established critical sites criteria 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 participation. Each site will be field verified before receiving notification as a critical site, with the findings sent to the DNR Regional Office. Landowners interested in receiving cost-share assistance for the installation of Best Management Practices will need to sign a cost-share agreement with their respective County Land Conservation Department.

Notification of landowners with known critical sites will begin 6 months following plan approval and will continue through the completion of the inventory. The first to begin the process shall be those highest ranked critical sites based on estimated pollutant contribution. Critical sites will provide at least 25 percent of the pollutant reduction goal. On-site visits will be conducted within a 6 month period. The purpose of the visit will be to verify that the location still meets the criteria for critical sites. The notification will include the following information:

- The 36 month period in which landowners are eligible for the full level of state cost-sharing, after which the cost-share rate decreases by 50 percent.
- The potential consequences that a landowner may face if no action is taken as defined in either Chapter NR 243 for animal waste, or 281.20 (1)(3), or (5) for sediment and streambank delivery and streambank erosion.
- The right to appeal the designation of a critical site through a written request to the Land Conservation Committee of Waushara or Winnebago County within 60 days of receipt of the notification letter. (Economic hardship will only be considered as a factor for a structural Best Management Practice funding levels.)

Eligible Management Category

Specific nonpoint sources of pollution in this category contribute less significantly to surface and groundwater impacts. These sites are eligible for technical and cost-share assistance and are important to reaching water quality objectives.

Other sites and practices that do not contribute pollution, but reduce pollutant loads, protect groundwater, or improve and protect habitat for wildlife and fish, will be eligible for cost-share assistance.

Ineligible Management Category

Sites that do not contribute significant amounts of pollutants are not eligible for funding under the priority watershed project. However, the site may be eligible under other DNR or Federal Programs, and can, if practical, be assisted by a county staff person.

Rural Nonpoint Source Pollutants and Management Strategies

Sediment, nutrients, oxygen demanding substances, pesticides, and bacteria are pollutants carried in runoff from rural land. These pollutants degrade water quality and impair recreational and biological uses of surface water. The principal rural nonpoint sources of pollution in the Pine River/Willow Creek watershed include:

- Runoff from barnyards and livestock feeding and pasturing areas
- Discharges from milkhouses
- Runoff from land spread with manure
- Runoff from cropland
- Sediment from streambanks and gullies

In addition to the specific management strategies described below, the Animal Waste Advisory Committee's (AWAC) recommendations will be incorporated when they are applicable. These recommendations include four prohibitions on basic activities associated with the raising of livestock:

- No overflow of manure storage structures
- No unconfined manure stacking (piling) within 300 feet of a stream, 1000 feet of a lake, and specific sites susceptible to groundwater contamination (Water Quality Management Areas).
- No direct runoff from feedlots or stored manure to waters of the state.
- No unlimited livestock access to waters of the state where high concentrations of animals prevent adequate sod cover maintenance.

Barnyard Runoff

Surface drained barnyards: The barnyard pollution control objective is to reduce phosphorus in the streams of the Pine River/Willow Creek Watershed by 28% (902 lbs. P/yr). Runoff carrying a variety of pollutants from barnyards and other confined livestock areas is a major source of pollutants in the streams of this watershed. One hundred eleven animal lots are a source of 3,266 pounds of phosphorus annually (Table 3-3).

The relative amounts of phosphorus are measured using the BARNY model. It is an indicator of the amounts of phosphorus entering the stream. Phosphorous and the organic matter in manure is a pollutant because it causes accelerated growth of aquatic plants and algae. Dense aquatic plant growth causes severe dissolved oxygen fluctuations during plant photosynthesis (daytime), and respiration (nighttime), that can stress aquatic life. When these plants and other organic waste decompose, dissolved oxygen is depleted and water quality is further degraded.

Barnyard sites contributing a phosphorus load greater than 100 lbs. on an annual basis will be designated as critical for control. Those landowners with an animal lot designated as a critical site for control are eligible for a complete barnyard system, including a nutrient management plan, but will only be required to install clean water diversion practices. Installation of these low-cost, required, practices alone will control 9% (296 lbs. P/yr) of the watershed's total annual phosphorus load. It will also control about 25% of the barnyard phosphorus goal.

Barnyard sites that contribute greater than 65 lbs. and less than 100 lbs. of phosphorus annually, will be eligible for cost-sharing on complete barnyard systems and clean water diversions.

Barnyard sites that contribute greater than 20 lbs. and less than 65 lbs. of phosphorus annually, will only be eligible for cost-sharing on clean water diversion practices. Having these livestock operations voluntarily participate in this watershed project will be the most expedient and cost effective method of controlling the manure runoff and will be essential for reducing phosphorus by 28 percent. An approximate 18 percent (576 lbs. P/yr) reduction could be obtained solely through this voluntary participation.

In order to use cost-share dollars effectively, county staff will assess eligible livestock operations for the applicability and long-term usefulness of these practices prior to the development of the cost share agreement.

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

Barnyard sites that contribute less than 20 lbs. of phosphorus annually will not be eligible for cost-sharing. There are approximately 41 landowners with animal lots in this category. It is possible that individual barnyard sites may become eligible for cost sharing if a determination is made by county staff and the DNR district biologist that corrective measures would improve water quality within a specific stream segment.

The development and implementation of a nutrient management plan will be a requirement for landowners receiving cost share dollars for the installation of a barnyard runoff management system. A certified crop consultant will develop all nutrient and pest management plans. Those landowners installing low cost clean water diversions and or roof gutters will be encouraged to develop a nutrient pest management plan, but not required.

Internally drained barnyards: drain to surface depressions or creviced bedrock rather than directly to surface waters or wetlands. Five internally drained yards were identified in the Pine

River\Willow Creek watershed. Eligibility for internally drained animal lots is based on a site by site analysis where significant groundwater contamination was determined to be likely. Field investigations will be conducted jointly by the county project staff, watershed management staff from the Department's Regional Office, and staff from the DATCP.

Table 3-3. Barnyard Inventory Results and Eligibility Criteria
(Goal: 28% Reduction in Phosphorus Loading = 902 Pounds)

Subwatershed	Inventory Results			Eligibility Criteria					
	# of Barnyards	Pounds of Phos.	% of Barnyard Phos.	Critical Sites >100 lbs. P			Eligible Sites <100 & >20 lbs. P assuming 75% participation		
				# Barnyards	Target (lbs reduced)	% of goal	# Barnyards	Target (lbs reduced)	% of goal
Upper Pine (UP)	4	107	3%	-	-	-	4	38	4%
Middle Pine (MP)	2	19	1%	-	-	-	-	-	-
Carpenter Creek (CC)	5	76	2%	-	-	-	2	20	2%
Lower Pine (LP)	46	1800	55%	4	237	26%	32	319	35%
Upper Willow (UW)	0	-	-	-	-	-	-	-	-
Mt. Morris (MM)	0	-	-	-	-	-	-	-	-
Bruce Creek (BC)	1	17	1%	-	-	-	-	-	-
Middle Willow (MW)	4	73	2%	-	-	-	2	20	2%
Cedar Springs Creek (CS)	1	7	-	-	-	-	-	-	-
T.R. Jones (TR)	26	745	23%	1	59	7%	18	113	12%
Pumpkinseed Creek (PC)	12	264	8%	-	-	-	3	57	6%
Poygan/Winneconne (PW)	10	158	5%	-	-	-	4	40	4%
Total (Goal: 28% Control)	111	3266 (902)	100%	5	296 (296)	9% (33%)	65	606 (606)	19% (67%)

Cropland Spread Manure & Pesticide Runoff

Mismanagement of manure spread on cropland, stored manure, and fertilizers will be targeted for control through the adoption of nutrient management plans. Development of nutrient management plans allow landowners an opportunity to meet the needs of water quality while maintaining a sustainable agricultural system that reduces excessive nutrient applications and reduces the costs associated with it. Reduced nutrient runoff is achieved by taking nutrient credits for legumes and landspread manure, in turn reducing applications of commercial nutrients. NRCS Std.590 plans also require landowners to reduce nutrient runoff by lowering their soil erosion rates to the tolerable soil loss (T) as a minimum to qualify for nutrient management planning.

Nutrient & Pest Management as Part of a Conservation Management Plan

In order to reduce over application of nutrients and pesticides, livestock and cash grain operations will be eligible and encouraged to participate in an on-farm nutrient and pest management educational program. This program is intended to reduce over application of nutrients and pesticides through implementing a nutrient management plan, and in some cases an additional pest management plan, using NRCS Standards 590 and 595. Up to 34,000 acres of cropland will be eligible for soil testing and nutrient and pest management plan development by certified crop consultants. Landowners will be eligible to participate for up to three years and may receive 50% cost-sharing of the consultant's fee for plan development. These plans will be submitted to and approved by the Waushara County Land Conservation Department and the Winnebago County Land and Water Conservation Department. Records should be kept showing progress towards reducing the use of fertilizers and pesticides in the watershed.

Eligibility for manure storage cost sharing will be based on the nutrient management plan, developed in accordance with NRCS Std. 590, demonstrating that manure cannot be practically managed during periods of snow covered, frozen, or saturated conditions without the use of storage practices. The nutrient management plan must also demonstrate that proper utilization of manure can be achieved following adoption of the intended storage practice.

Cost sharing for manure storage facilities will also be based on the least cost system. These options may include manure stacks (in accordance with Std. 312), short term storage (capacity for 30 to 100 days production in accordance with Std. 313), and long term storage (capacity for up to 365 days production in accordance with Std. 313). Least cost analysis will also include evaluation of alternatives to storage. Alternatives to manure storage for reducing the surface water quality impact from the over application of manure to cropland are to:

- Reduce on-farm animal numbers
- Rent or purchase additional land that is suitable for winter spreading
- Haul manure or broker manure to a neighboring farm

Cost sharing will not be provided to landowners for manure storage or manure spreading if a nutrient management plan demonstrates that sufficient land is available for winter spreading.

Landowners receiving cost sharing to install a manure storage structure or implement a spreading program will be required to develop a nutrient management plan with a certified crop consultant.

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 groundwater 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.

To assure protection of surface and groundwater from animal waste storage facilities throughout the watershed, the adoption of an animal waste storage ordinance in Waushara County is required within 2 years of plan approval by the Waushara County Land Conservation Committee. Currently, Winnebago County has a manure storage ordinance. Certain costs for the development and administration of the ordinance are eligible for reimbursement under the Priority Watershed Project. As required by State Statutes, the County must repay the State all nonpoint source grant agreement funds if the ordinance is not adopted. This will be a condition of the Waushara County Nonpoint Source Grant Agreement.

Construction Site Erosion and Stormwater Management

Cost for the development and administration of land use ordinances which are related to water quality are eligible for reimbursement under the priority watershed project.

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 stormwater and erosion control requirements for developing land areas.

Chapter 236 of the Wisconsin State Statutes gives cities, towns, villages, and counties the 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 governmental units have included runoff and erosion control provisions in their ordinances. These ordinances typically require a developer to submit a detailed plan specifying what control measures will be installed to minimize 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 site and certifies that the measures have been installed in accordance with the plan.

Similar to erosion control, Wisconsin cities, villages, towns, and counties have the authority to adopt stormwater management zoning ordinances. A draft Model Stormwater Management Zoning Ordinance was developed by the DNR in 1995. This model ordinance is meant to be complimentary to the model construction site erosion control ordinance prepared in 1987 by the DNR, in conjunction with the Wisconsin League of Municipalities

It is recommended that the Wisconsin Construction Site Erosion Best Management Handbook (DNR Publication WR-222-93) and the Wisconsin Stormwater Manual (DNR Publication WR-349-94) be used as a reference for any development that occurs in the Pine River\Willow Creek Watershed.

All municipalities in Waushara County and Winnebago County are encouraged to adopt construction site erosion control and stormwater management zoning ordinances.

Upland Sediment Runoff

The cropland sediment reduction objective is to reduce the amount of cropland sediment delivered to Pine River\Willow Creek Watershed from eroding cropland by 34 percent (10,188 tons/acre/year). Intensive agricultural practices have caused considerable amounts of eroded soil to reach streams and wetlands in the Pine River\Willow Creek watershed. Upland erosion is the major source of sediment and nutrients that are carried downstream beyond individual subwatershed boundaries.

About 32,458 acres, or 21 percent, of the watershed land area was inventoried in both Winnebago and Waushara Counties. Soil erosion was calculated using the Universal Soil Loss Equation (USLE). Sediment delivery was calculated using USLE and field hydrology routing information and the WINHUSLE computer model.

The results of the inventory and reduction goals are summarized in Table 3-5. An estimated 30,190 tons of soil per year are delivered to streams and wetlands in the watershed from uplands. Uplands are the source of 92 percent of the sediment delivered to streams and wetlands. Table 3-4 summarizes upland sediment loading by land use for all subwatersheds.

In subwatersheds which have high sediment reduction goals (see Table 3-5), any cropland field eroding at a rate greater than the tolerable soil loss T, and delivering sediment at a rate greater than 1.0 ton/acre/year will be targeted as cropland critical sites and subject to pollution abatement action. The sediment reduction rate is in accordance with the water resource appraisal

completed for the Pine River\Willow Creek Priority Watershed (Gansberg, 1997). Approximately 2,418 acres or 25% percent of cropland in the Pine River\Willow Creek watershed meet the critical site criteria. Critical sites will affect an estimated 148 landowners (out of 1,831) who operate 219 fields within the watershed. When controlled through various management actions, these sites will account for 25 percent of the water quality objective for sediment reduction. This would reduce the sediment load delivered to Pine River\Willow Creek by an estimated 2,418 tons annually. All critical site cropland fields will need to be reduced to T or less.

The critical site verification contact strategy, as explained in Chapter 4 Implementation Schedule, will focus on the development of cost share agreements with landowners that have cropland fields that meet the critical site criteria. The Farmland Preservation Program and USDA cross-compliance activities will be used to maintain erosion levels below the tolerable soil loss (T).

Cropland fields not notified as critical sites that are delivering sediment to watershed streams at a rate greater than the tolerable soil loss T, or greater than 0.2 tons/acre/year sediment delivery will be eligible for cost-sharing and pollution abatement. These will be categorized as eligible sites. When controlled through various management actions, these sites will account for 75 percent of the water quality objective for sediment reduction. This would reduce the sediment load delivered to Pine River\Willow Creek by an estimated 7,770 tons annually. These eligible site cropland fields will need to reduce the sediment delivery by at least half. Cropland fields that deliver less than 0.2 tons/acre/year will not be eligible for cost sharing of sediment reducing practices.

Gully and Streambank Sediment Runoff

The gully and streambank sediment reduction objective is to reduce the amount of sediment delivered to Pine River\Willow Creek Watershed from these sources by 50 percent (Table 3-7). Gully erosion has not been determined to be a significant nonpoint pollution source in the Pine River\Willow Creek watershed. Therefore, an inventory of gully erosion was not done. Critical site designation will not be a component of the sediment control strategy for gullies or streambanks in this watershed. All active gullies identified during implementation will be eligible to receive cost share assistance to abate the runoff of sediment into intermittent or perennial streams.

Streambank erosion contributes 6 percent of the total sediment to surface waters in the Pine River\Willow Creek Watershed. Approximately 58 miles of streams were evaluated. An estimated 2,064 tons of sediment are eroding into streams annually contributing about 2,064 pounds of phosphorus. See Table 3-6 for streambank inventory results.

Livestock Access

Critical area streambanks include trampled sites greater than 300 feet per property owned. One landowner on a perennial stream falls into this category (Table 3-8).

Eligible streambanks include any site that has trampled banks. These sites will be determined on a case by case basis ongoing throughout implementation.

Federal Program Integration

Landowners with high sediment delivery fields will be encouraged to participate in federal programs like the Conservation Reserve Program (CRP) and Wetland Reserve Program (WRP).

Table 3-4. Summary of Upland Sediment Loading¹ By Land Use²

Sub-watershed		Cropland	Developed	Grassland	Pasture	Natural Areas	Woodlot	Wetland	Totals
Upper Pine	Acres	7,142	297	446	148	1,488	4,464	895	14,880
	Sediment	688	56	0	0	0	0	0	744
Middle Pine	Acres	8,829	310	0	45	942	2,833	2,833	15,792
	Sediment	1,706	148	0	0	0	0	0	1,854
Carpenter Creek	Acres	10,460	387	0	387	1,550	3,874	2,712	19,370
	Sediment	3,096	233	0	0	0	0	0	3,329
Lower Pine	Acres	16,966	553	809	273	812	1,087	6,175	26,675
	Sediment	7986	694	0	0	0	0	0	8,680
Upper Willow	Acres	4,981	195	98	391	1,270	2,148	683	9,766
	Sediment	432	83	0	0	0	0	0	445
Mt. Morris	Acres	859	0	21	0	0	194	0	1,074
	Sediment	102	0	0	0	0	0	0	102
Bruce Creek	Acres	2,005	140	0	0	280	1,492	746	4,663
	Sediment	332	14	0	0	0	0	0	346
Middle Willow	Acres	5,310	226	0	0	791	2,599	2,373	11,299
	Sediment	1,718	53	0	0	0	0	0	1,771
Cedar Springs	Acres	3,158	200	0	0	201	100	1,354	5,013
	Sediment	1,523	132	0	0	0	0	0	1,655
T. R. Jones	Acres	14,448	488	1,,196	488	488	1,196	4,946	23,250
	Sediment	3,527	353	39	0	0	0	0	3,919
Pumpkinseed Creek	Acres	10,901	471	0	318	916	1,215	1,067	14,888
	Sediment	3,550	484	0	0	0	0	0	4,034
Poygan / Winneconne	Acres	7,441	279	0	93	372	838	279	9,302
	Sediment	2,980	331	0	0	0	0	0	3,311
Totals	Acres	92,500	3,546	2,570	2,143	9,110	22,040	24,063	155,972
	Sediment	27,645	2,516	39	0	0	0	0	30,190

¹ Sediment is reported in tons/year.

² Data was extrapolated from subarea sampling.

Table 3-5. Upland Sediment Inventory and Reduction Goals

Sub-watershed	Inventory Results				Goal- 34 % Reduction in Sediment Delivered (10,188 tons)					
	Acres	Sediment delivered to Pine River Willow Creek (tons/yr)	% from each sub-watershed	Reduction objective (percent)	Critical (>T soil loss & >1.0 sediment delivered)		Eligible (>T soil loss or > 0.2 sediment delivered)		Target (tons reduced)	% of Goal
					# Acres	Target (tons reduced)	# Acres	% of Goal		
Upper Pine	14,880	744	2.5	34	34	36	0.4	2,027	141	1.4
Middle Pine	15,792	1,854	6.1	34	34	0	0	1,770	344	3.4
Carpenter Creek	19,370	3,329	11.0	34	34	0	0	2,777	708	6.9
Lower Pine	26,675	8,680	28.8	34	34	789	7.7	11,153	2165	21.3
Upper Willow	9,766	445	1.5	34	34	0	0	1,103	78	0.8
Mt. Morris	1,074	102	0.3	34	34	0	0	382	15	0.1
Bruce Creek	4,663	346	1.1	34	34	15	0.1	900	82	0.8
Middle Willow	11,299	1,771	5.9	34	34	0	0	3,079	334	3.3
Cedar Springs	5,013	1,655	5.5	34	34	200	2.0	2,228	576	5.7
T.R. Jones	23,250	3,919	13.0	34	34	269	2.6	8,613	1113	10.9
Pumpkinseed Creek	14,888	4,034	13.4	34	34	821	8.1	8,121	1120	11.0
Poygan/Winneconne	9,302	3,311	11.0	34	34	288	2.8	6,206	1094	10.7
Total	155,972	30,190	100	NA	2,981	2,418	23.7	48,359	7770	76.3

Table 3-6. Streambank Erosion Inventory

Subwatershed	Inventory Results		
	Inventoried stream length (ft)	Total Sediment Loss (tons/yr)	% of Total
Upper Pine	21,060	1.5	0
Middle Pine	12,385	31	1
Carpenter Creek	30,030	825	40
Lower Pine	60,374	100	5
Upper Willow	15,180	20	1
Mt. Morris	*	*	*
Bruce Creek	*	*	*
Middle Willow	54,845	1,042.7	51
Cedar Springs	*	*	*
T.R. Jones	73,260	43.8	2
Pumpkinseed Creek	37,866	0	0
Poygan/Winneconne	*	*	*
Total	305,000	2,064	100

* No inventory conducted due to headwater, low CFS nature of streams.

Table 3-7. Streambank Erosion Eligibility

Category	Sediment Delivery	Tons
Eligible	> 5 Tons/Year	1,032
Ineligible	<5 Tons/Year	1,032

Table 3-8. Livestock Eligibility

Category	Delivery	Sites
Critical	Trampled Sites Longer Than 300 Feet	1
Eligible	Any Other Trampled Site	To be Determined During Implementation

Table 3-9. Shoreline Erosion

Subwatershed	Inventory Results		
	Inventoried Length (ft)	% of Total Shoreline	Total Sediment Loss (tons/yr)
Upper Pine	*	*	*
Middle Pine	102,855	50	167
Carpenter Creek	*	*	*
Lower Pine	30,640	50	12
Upper Willow	*	*	*
Mt. Morris	38,544	50	27
Bruce Creek	41,184	50	122
Middle Willow	11,616	50	27
Cedar Springs	*	*	*
T.R. Jones	3,792	50	*
Pumpkinseed Creek	605	50	*
Poygan/Winneconne	64,410	50	229
Total	293,646	50%	584

* Not inventoried due to lack of lakes or public access.

Table 3-10. Shoreline Eligibility

Category	Lateral Recession	Tons
Eligible	> 0.5 ft/yr	1,168
Ineligible	< 0.5 ft/yr	1,168

Shoreline Erosion

While shoreline erosion in the watershed is essentially a natural process caused by wind and wave action, it may be affected by water level fluctuations, human trampling, and shoreline land use practices. A shoreline erosion inventory was done during the summer of 1996. The inventory showed that moderate to mild erosion was common. Shoreline erosion is estimated to contribute 1,168 tons annually to watershed lakes, which is two percent of the total sediment delivered to surface waters. See Table 3-9 for inventory results.

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

Eligible sites are those with mild and moderate erosion. Moderate sites are defined as having a lateral recession rate of at least .5 feet per year. Mild erosion sites are defined as any site having a lateral recession rate of less than .5 feet per year. See Table 3-10 for eligibility criteria.

Eligibility for Wetland Restoration, Easements, and Land Acquisition

Wetland Restoration

Prior to European settlement, Wisconsin had an estimated 10 million acres of wetlands. Today, slightly more than 5.3 million acres remain. Many thousands of pre-development wetlands have been converted to cropland. Thousands more have been filled for highways and urban development.

Wetlands are an important part of our ecosystem. When water enters a wetland, the wetland acts as a purifier, cleaning the water before it exits. Wetlands do this by removing, retaining, and transforming nutrients; processing wastes; and trapping sediment. Because wetlands are a principal conduit for rain water flowing to lakes and streams, their importance to water quality, water supply, flood control, erosion control, flora and fauna, and the food chain is significant. Wetlands also act as groundwater recharge areas by allowing water to infiltrate rather than runoff. In the Pine River\Willow Creek Watershed much of the yearly or base flow is derived from groundwater. Fortunately, baseflow is not a concern in this watershed.

Wetlands vary from areas with seasonally saturated soil conditions to areas with standing water year-round. Some of the diverse types of vegetation that can be found in wetlands include pond lilies, cattails, rush, black ash, and willow. Wetland restoration may include 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. Restoration must be in accordance with NRCS Standard 657 - Wetland Restoration and a wetland specialist's recommendations. Native seed and plants will be used wherever possible and no reed canary grass will be planted.

Restoration of wetlands provides primary and secondary benefits to water quality:

- **Primary:** The use of wetland restoration as a best management practice for the purpose of controlling nonpoint sources of pollution. To control runoff pollution, the wetland must act as a sediment and nutrient filter, flood and storm water attenuation and storage area, and provide infiltration.
- **Secondary:** The use of wetland restorations to enhance fish and wildlife habitat. Wetlands provide essential habitat for fish, waterfowl, animals, and plants, including endangered species.

One of the goals of this project is to restore and enhance any wetlands or former wetlands. Wetland restorations will most often be used in conjunction with other BMPs such as reduced tillage and buffers.

Wetland restorations may be considered over lower cost practices to control nonpoint source pollutants because the coldwater streams of this watershed are high priority water resources.

Cost-share eligibility for wetland restoration is divided into 3 categories:

- 1) **Priority Restorations** - Priority wetland restorations provide at least one of the water quality benefits as described in a. through d. below and provide essential habitat for fish, waterfowl, animals, and plants, including endangered species.
 - a. 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 by establishing permanent vegetation and altering the drainage system.
 - b. Pastured riparian wetlands 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 reduce delivery the pollutants and restore the wetland.

- c. Wetlands down-slope or up-slope from fields identified as significant upland sediment sources. Restoration of wetlands in these situations may do two things: 1) create a wetland filter which reduces the pollutants from an up-slope field(s) to a water resource; or 2) reduces the volume and velocity of water flowing from an up-slope wetland to a down-slope critical field.
- d. Wetlands providing water quality improvements through infiltration. Water stored in wetlands is filtered as it infiltrates to groundwater and increases base flow in streams.

Additionally, priority will be given to prior converted and farmed wetlands. Prior converted wetlands are those that have been drained, dredged, filled, leveled, or otherwise manipulated (including removal of woody vegetation) before December 23, 1985, for the purpose of making the production of an agricultural commodity possible. Farmed wetlands include potholes and seasonally flooded or ponded wetlands that were not fully converted prior to December 1985 and are cropped in dry years.

- 2) **Eligible Restorations** - Sites that do not meet the definition of a priority site, yet offer significant water quality benefits, such as providing storage of storm event runoff and flood flows that significantly improve the watershed hydrology. The sites may also perform the function of a filter to delay, absorb, or purify contaminated runoff before it enters watershed streams or lakes.
- 3) **Ineligible Restorations** - Sites where existing physical characteristics or conditions are such that the potential for restoration would not be environmentally viable or economically feasible.

Wetland Restoration Permitting

County Conservation Staff, DNR, US Fish and Wildlife, and private organizations like Ducks Unlimited and Wisconsin Waterfowl Association have restoration experts who can assist landowners in plan development including assistance in obtaining permits. Permits may be needed from three sources:

- Federal (Army Corps of Engineers) Clean Water Act §404
- State (DNR) Clean Water Act §401 Water Quality Certification, Chapter 30 and 31
- Local (County or Municipal Zoning Office)

Land Easements

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

- **Shoreline Buffers:** vegetative areas that 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.

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 four situations:

- 1) To exclude livestock from grazed wetlands or from along eroding streambanks within the watershed. Easements are strongly recommended whenever:
 - There is any grazing of wetlands.
 - Livestock density is so great that areas of unvegetated soil are within 60 feet of streams or intermittent streams.
 - Any of the streambank is severely trampled and eroding.
 - Livestock grazing exacerbates channel erosion such that unvegetated streambanks are two feet or more in height.

- 2) When elimination of row cropping and the establishment of permanent vegetative cover will stabilize a critical area. Easements are strongly recommended whenever:
 - Row cropping is occurring within 60 feet or less of streams or intermittent streams.
 - Row cropping is being practiced on slopes greater than 6 percent.
- 3) To support restoration of eligible wetlands, 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.

Land Acquisition

Units of Government, including Lake Protection and Rehabilitation Districts, within the Pine River\Willow Creek Priority Watershed Project area are eligible for nonpoint source grants of 50% to supplement the purchase of land or land in fee that is contributing or will contribute nonpoint source pollution. The goal for land acquisition in the project area is approximately 1,000 acres. This goal may increase after additional inventories and land acquisition strategies are developed by the individual units of government located in the project area.

Eligibility Criteria - Eligibility for land acquisition must meet one of the following items.

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

- The acquisition of the property must complement other watershed management efforts
- Any acquisition proposal must meet the goals of the watershed project.

CHAPTER FOUR

Implementation

Introduction

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

- The Best Management Practices (BMPs) needed to control nonpoint sources of pollution as described in Chapter Two;
- The cost containment policies;
- The cost-share agreement procedures;
- Schedules for implementing the project, including the critical sites notification schedule;
- The critical site designation appeal process;
- The estimated project budget for cost sharing, staffing, and 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 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.

If the installation of BMPs destroys significant wildlife habitat, NR 120 requires that habitat will be recreated to replace the habitat lost. The DNR Regional 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 4-1 and 4-2 below; the BMPs listed in Table 4-1 can either be cost-shared at 50% or up to the maximum flat rates listed.

Table 4-1. Practices with Flat Rates for State Cost-Share Funding

Best Management Practice	Maximum 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
Riparian Buffer Strip	\$125.00/ac ³
Cropland Protection Cover	\$25.00/ac ⁴

¹ Wildlife habitat restoration components of this practice are cost-shared at 70 percent.

² Cost-shared up to six years.

³ Cost-shared up to five years. This practice is currently an interim BMP. When approved for statewide use, it will be cost shared in this project.

⁴ Cost-shared up to three years.

A brief description of the most commonly used BMPs can be found in Appendix A. Cost-share rates for these BMPs are listed in Table 4-1. More detailed descriptions can be found in NR 120.14.

Table 4-2. State Cost-Share Rates for Rural 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% & 50% ²
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%
Barnyard Relocation	70%
Roofs for Barnyard Runoff Management & Manure Storage Facilities	70%
Structural Urban BMPs	70% ⁴
Milking Center Waste Control	70%
Cattle Mounds	70%
Land Acquisition	50% ⁵

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 storm sewer rerouting and removal of structures necessary to install structural urban BMPs is 50%.

⁵ Cost-sharing is available to acquire land for the construction of an urban structural practice or to acquire land that is contributing or will contribute nonpoint source pollution.

Interim Best Management Practices

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

Practices Not Cost-Shared

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

- 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 collection.
- Operation and maintenance of cost-shared BMPs.
- Practices already installed, with the exception of repairs to the practices that 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 283 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 Chapter 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 control 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 Agreement Administration

Cost-share funding is available to landowners and local units of government for a percent of the costs of installing BMPs to meet project objectives. Funding is distributed to landowners by the Waushara County LCD and the Winnebago County LWCD from a Nonpoint Source grant provided by the DNR. The County Conservation Department receives additional grant money from the DNR to support its staff and other administrative responsibilities. Cost-share agreements are binding contracts between landowners and the county conservation department. To qualify for cost-sharing funds, landowners must meet eligibility criteria defined in Chapter Three.

Cost share agreements must be initiated within eight years after formal approval of the watershed plan and are filed as part of the property deed. Agreements may be amended throughout the ten-year project period.

Practices included on cost share agreements must be installed within the schedule agreed to on the cost share agreement. Practices must be maintained for a minimum of ten years from the date of installing the final practice that is listed within the cost share agreement with the exception of conservation tillage and nutrient management that has no term specified.

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

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

Cost Containment

Cost Containment Procedures

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

Bids: Competitive bids will be required for all structural BMPs with estimated total costs, as determined by the project technician, exceeding \$5,000. The bidding process requires a minimum of two bids from qualified contractors in itemized bid format. In cases where only one bid is received, the Waushara and Winnebago County Conservation Departments will determine if the bid constitutes an appropriate cost for the project. If no bids are received or if the lone bid is not deemed appropriate, the project may be placed back out for bids or counties may limit cost sharing based on average costs. The County Conservation Departments and landowners reserve the right to refuse any bids that are not deemed appropriate for the practice.

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

Flat Rates: BMPs using flat rates are shown in Table 4-1. The rates shown are the State's share of the practice installation costs.

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

The Winnebago County Wisconsin Conservation Corps Crew may be used to install BMPs for cost share recipients.

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

Implementation Schedule

The following procedure will be used to make landowner contacts:

- During the first twelve months of the implementation period, all landowners or operators with known eligible non-point sources will receive a mailing from the county explaining the project and how they can become involved. During the first 5 years of the implementation period, county staff will complete the inventory of land resources (16% per year). Additional eligible landowners or operators will receive a county mailing as they are identified.

- After the initial landowner mailings, county staff will make personal contacts with all landowners that have been identified as having Critical non-point sources of pollution. These contacts will occur within the cost-share sign-up period.
- The county will continue to make contacts with eligible landowners and operators until they have made a definite decision regarding participation in the program.
- The county will contact all eligible landowners not signing cost-share agreements by personal letter six months prior to the end of the eight-year sign-up period.

Schedule of Critical Site Verification and Notification

Within six months following plan approval and the award of a nonpoint source funds, the process of notification to landowners and operators with critical site barnyards and upland will begin as stated in NR 120.09. The first to begin the process will be the highest ranked barnyards, defined as the top 25% of the inventoried critical load. Watershed staff will continue to locate upland sites that meet the critical sites criteria during the five year inventory period following plan approval. Site visits on individual sites meeting the critical site criteria will be conducted in order to verify the findings. Our goal will be to contact critical site landowners and operators and allow them an opportunity to voluntarily participate before receiving a critical site notice within 60 days following verification. A site is no longer considered a critical site if the site no longer meets the criteria, it has implemented BMPs, or if the department determines that the watershed objectives have been met.

By the end of the six month verification period, the project staff will send a report to DNR that states each site meets the critical sites criteria or has changed status according to NR 120.09 (6). The reasons for these conclusions will be included. Documentation of site visits and additional information will be maintained at the appropriate county offices and will be made available upon request.

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

The county staff will complete the verification of the remaining critical sites at the rate of 25% per year according to the following schedule for 1999, 2000, 2001, and 2002. Critical site notification will be completed by December 2002.

- April-July: Conduct site visits and verification work.
- August 1st: Send status report to DNR Implementation Coordinator
- November 1st: DNR sends notification to the critical site landowners.

At the time of notification, critical site landowners have three years to sign a cost share agreement at the rates given in NR 120. After three years, the available cost share rates are reduced by 50%.

The notification schedule may be modified and revised at the annual watershed review meeting when progress on critical sites is discussed.

At the time of critical site verification, any uninventoried sites on the farm must be inventoried. This would determine all critical sites on a farm so the landowner would receive only one critical sites notice.

Critical Site Appeals Process

The owner or operator of a site designated as a critical site may appeal the critical site designation to the Land Conservation Committee of the county in which the site is located. If the site is located in more than one county, the appeal goes to the LCC of the county that 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 request must be received by the LCC within 60 days of the day that the owner or operator receives the notification letter.

The Land Conservation Committee shall:

- provide the appellant with a hearing and give reasonable notice of the hearing to the appellant, the DNR and the DATCP.
- conduct the hearing as an informal hearing. Chapter 68.11(2), Wis. Stats., does not apply to this hearing. This language describes the conduct of the hearing.
- hold the hearing in a place that is convenient for the appellant. The appellant and project staff will present information about the site so that LCC members may make a decision. Representatives of DNR and DATCP may attend the hearing. DNR is required to submit a report and recommendation to the LCC within 60 days after the hearing. DATCP has the option to submit a report and recommendation within 60 days.
- provide a decision, in writing, within 45 days of receiving the DNR and DATCP reports and recommendations, the notification by the DNR and the DATCP that no report or recommendations would be submitted, or the conclusion of the 60-day period following the hearing.

The LCC may support or overturn the designation of the site as a critical site. To make its decision, the LCC shall consider whether or not the critical site designation is consistent with the critical site criteria established in the project's priority watershed plan. The LCC shall also consider whether governmental representatives erred in their verification of the site conditions or

management. Loss of profit is not grounds for support of an appeal. Violations by, or appeals granted to, other appellants shall not justify support of an appeal.

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

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

Cost-Share Budget

Costs of Installing Rural BMPs

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

The capital cost of installing the Best Management Practices is approximately \$ 10.0 million, assuming 100 percent participation. At 75 percent participation the capital cost is \$7.5 million. State funds necessary to cost-share this level of control would be approximately \$ 6.3 million. The local share provided by landowners and other cost-share recipients would be approximately \$1.2 million.

Easement and Land Acquisition Costs

Chapter Three identifies where nonpoint source program funds can be used to purchase easements and land. The estimated cost of purchasing easements and land is shown in Table 4-4. At 75 percent participation, the estimated purchase price of easements on eligible lands would be \$468,000 and \$0 for land acquisition. Easements are funded at 100 percent and will be purchased by the State.

Budget and Staffing Needs

Rural Budget and Staffing Needs

Table 4-5 lists the total estimated staff needed to implement the project assuming a 75 percent level of participation by eligible landowners. Approximately 85,460 staff hours are required to

implement this plan. This includes 1200 staff hours to carry out the information and education program.

Currently, 2.7 positions are being funded on the Pine River\Willow Creek Priority Watershed, 2.2 in Waushara County and 0.5 in Winnebago County. The County Conservation Departments and state agencies will determine the need for additional staff based on an annual workload analysis.

The estimated cost for staff at the 75 percent cost share rate is \$ 2.0 million. These costs will be paid by the state through the Local Assistance Grant Agreement.

The total state funding required to meet the rural nonpoint source pollution control needs at 75 percent level of landowner participation is presented Table 4-3. The estimated cost to the state is \$9.0 million. The estimated cost to landowners and others is \$1.2 million for a total project cost of \$10.2 million. This figure includes the capital cost of practices, staff support, and easement costs as presented above.

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.

Grant Disbursement and Project Management Schedule

Implementation of this Priority Watershed project shall begin upon both approval of this plan and receipt of the Nonpoint Source grant. The plan must be approved by the DNR, the Waushara and Winnebago County Boards, and the Wisconsin Land and Water Conservation Board.

The project implementation period is ten years. During the first 8 years of implementation, cost-share agreements with eligible landowners may be signed. Practices listed on any cost-sharing agreement must be installed before the end of the implementation phase. The implementation phase of this project is scheduled to conclude in 2007.

The amount of the Nonpoint Source grant is calculated at 75 percent participation by eligible landowners; see Table 4-3 for a detailed explanation. This grant may be amended due to changes needed for time of performance, funding levels, or scope of work.

Local Assistance Grants will be disbursed annually to Waushara and Winnebago Counties to cover the costs of personnel, operating expenses, and equipment. The DNR will evaluate an annual workload analysis and grant application submitted by each county.

Table 4-3. Grant Disbursement Schedule at 75% Landowner Participation (State Share)

Item	Waushara County Costs	Winnebago County Costs	Total Costs
Cost-Share Funds: Practices	\$4,347,000	\$1,422,200	\$5,769,200
Cost-Share Funds: Easements	\$450,000	\$18,800	\$468,800
Local Assistance Staff Support ¹	\$1,770,400	\$257,200	\$2,027,600
Information/Education: Direct	\$50,500	\$8,000	\$58,500
Other Direct: (travel, supplies, etc.)	\$187,200	\$20,800	\$208,000
Engineering Assistance	\$0	\$0	\$0
TOTAL	\$6,805,100	\$1,727,000	\$8,532,100

¹ Salary + Indirect = \$43,430 / year (\$20.88 / hour)

Table 4-4 a. Cost-share Budget for Rural Management Practices: Upland Nonpoint Source Pollution Control (75% Landowner Participation)

Best Management Practices	Winnebago County	Unit	Waushara County	Cost/Unit	Total Cost ¹	State Share	Local Share
Change in Crop Rotation ¹	-	acres	25,206	\$0	0	0	0
Contour Cropping ¹	100	acres	-	\$9	900	700	0
Contour strip-cropping ¹	100	acres	-	\$14	1,400	1,000	0
High Residue Management ^{1,2}	63,204	acres	139,356	\$19	3,747,400	2,810,500	0
Cropland Protection Cover ^{1,3}	3,000	acres	20,000	\$25	575,000	431,300	0
Intensive Grazing Management	1	each	3	\$4,000	16,000	6,000	1,500
Critical Area Stabilization	5	acres	150	\$300	46,500	24,400	10,500
Grass Waterways	50	acres	120	\$3,000	510,000	267,800	114,800
Field Diversions and Terraces	1,000	feet	5,000	\$3	19,500	10,200	4,400
Grade Stabilization	4	each	30	\$4,000	136,000	71,400	30,600
Agricultural Sediment Basin	3	each	30	\$10,000	330,000	173,300	74,300
Nutrient Management only ³	7,200	acres	56,000	\$6	379,200	142,200	142,200
Nutrient and Pest Management. ³	4,500	acres	42,000	\$10	465,000	174,400	174,400
Infield Buffers	15	acres	15	\$150	4,500	2,300	1,000
Wetland Restoration	5	each	25	\$10,000	300,000	157,500	67,500
Riparian Veg. Buffer Strips ⁴	20	acres	2,000	\$125	252,500	189,400	0
Livestock Exclusion from Woodlots	2,000	feet	3,000	\$1	5,000	2,600	1,100
Spill Control Basins	1	each	-	\$15,000	15,000	7,900	3,400

Table 4-4 b. Cost-share Budget for Rural Management Practices: Animal Waste Management (75% Landowner Participation)

Management Needs: Best Management Practices	Winnebago County	Unit	Waushara County	Cost / Unit	Total Cost ¹	State Share	Local Share
Barnyard Runoff Control:							
Complete system	3	each	13	\$35,000	560,000	294,000	126,000
Roof Gutters	6	each	53	\$3,500	206,500	108,400	46,500
Clean Water Diversion	2	each	35	\$5,000	185,000	97,100	41,600
Roofs	-	each	5	\$25,000	125,000	65,600	28,100
Cattle Mounds	1	each	-	\$3,000	3,000	1,600	700
Manure Storage Facility ⁵	3	each	6	\$40,000	360,000	168,000	112,000
Animal Waste Storage Abandonment	1	each	2	\$10,000	30,000	15,800	6,800
Well Abandonment	10	each	15	\$500	12,500	6,600	2,800
Animal Lot Abandonment	1	each	2	\$60,000	180,000	94,500	40,500
Milking Center Waste Control	2	each	10	\$7,000	84,000	44,100	18,900

Table 4-4 c. Cost-share Budget Needs for Rural Management Practices: Streambank Erosion Control, Easements, and Land Acquisition (75% Participation)

Management Needs: Best Management Practices	Winnebago County	Unit	Waushara County	Cost / Unit	Total Cost ¹	State Share	Local Share
Streambank Erosion Control:							
Shape and seed	500	feet	1,500	\$7	13,000	6,800	2,900
Shoreline Buffers	10	acres	300	\$400	124,000	65,100	27,900
Streambank Fencing	5,000	feet	1,800	\$2	10,200	5,400	2,300
Rock Riprap/ Lunkers	7,500	feet	8,000	\$30	465,000	244,100	104,600
Bio Riprap	500	feet	2,900	\$25	85,000	44,600	19,100
Livestock/Machinery Crossing/ Watering Ramp	2	each	10	\$2,000	24,000	12,600	5,400
Remote Watering Systems	2	each	10	\$3,500	42,000	22,100	9,500
Easements	25	acres	600	\$1,000	625,000	468,700	0
Land Acquisition	-	acres	-	\$2,500	0	0	0
Total: Tables 4-4 a - 4-4 c					\$9,938,100	\$6,238,000	\$1,221,300

¹ Local share consists of labor and equipment costs. Also see flat rates in Table 3-1.

² Number of acres shown reflects 6 times the eligible acres.

³ Number of acres shown reflects 3 times the eligible acres.

⁴ Number of acres shown reflects 5 times the eligible acres. This is currently an interim BMP.

⁵ When it is approved for statewide use, this BMP will be cost shared in this project.

⁶ Maximum cost-share is \$35,000. 70 % for the first \$20,000 and 50 % for the remaining cost.

Source: Wisconsin DATCP, DNR, Waushara County, and Winnebago County

Table 4-5. Estimated County Staff Needs (75% Landowner Participation)

Activity	Project Years When Work Will Be Done	Waushara County Staff Hours	Winnebago County Staff Hours
Project & Financial Mgmt.	1-10	1,250	400
Information & Education Program	1-5	1,000	200
Pre-Contact Office Inventory:			
Landowner Contact and Progress Tracking	1-5	1,000	400
Conservation Planning & Cost-share Agreement Development	1-5	1,300	750
Plan Revisions and Monitoring	1-10	950	600
Practice Design & Installation:			
Upland Sediment Control	1-10	53,926	11,954
Animal Waste Management	1-10	2,206	520
Streambank Erosion Control	1-10	2,301	1,553
Easements	1-10	3,600	150
Training	1-10	1,000	400
Subtotal of Estimated Staff Hours and # of Positions Per Year:			
Years 1-5	1-5	7,383 (3.5 staff positions)	2,028 (1.0 staff position)
Years 6-10	6-10	6,723 (3.2 staff positions)	1,758 (0.8 staff position)
Total LCD Workload		68,533	16,927

Source: WI Department of Natural Resources; WI Department of Agriculture, Trade and Consumer Protection; Land Conservation Departments of Waushara and Winnebago Counties.

CHAPTER FIVE

Integrated Resource Management Program

Introduction

The purpose of this chapter is to identify existing state, federal and local resource management programs that provide benefits for water quality and/or fish and wildlife resources in the Pine River\Willow Creek 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

Land and Water Resource Management Plans

County Land and Water Resource Management (LWRMP) Plans are a locally developed idea that was proposed in the fall of 1996 by county conservation professionals in response to draft state agency recommendations for redesigning Wisconsin's nonpoint programs. The idea was promoted by the Wisconsin Land & Water Conservation Association during state legislative deliberations in spring and summer of 1997. The idea became the central theme to landmark legislation signed into law in October 1997 as part of the state budget bill (WI Act 27). This created a County Land and Water Resource Management Planning Program that is intended to

- Rely on a locally driven process for plan development and implementation;
- Maximize flexibility in how program funds are used;
- Foster comprehensive watershed based efforts without excessive planning;
- Support innovative and cost effectiveness toward achieving objectives;
- Foster the "seamless" integration of programs and funding sources; and
- Establish a credible means to measure the extent to which planned objectives are achieved.

Waushara County's Land and Water Resource Management Plan was approved in October of 1999. The goals set in the Pine River/Willow Creek Priority Watershed plan are referred to in the LWRMP. Everything that is accomplished through the Pine River/Willow Creek Priority Watershed Project will serve to achieve the overall goals set in Waushara County's LWRMP.

Winnebago County was one of the original seven pilot counties to develop a Land and Water Resource Management Plan, which was approved in December of 1998. The goals established for the Pine River/Willow Creek Priority Watershed were included in this plan. All accomplishments achieved by the Pine River/Willow Creek Watershed Project will help to reach the overall goals set in the Winnebago County Land and Water Resource Management Plan.

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 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 filter strips along streams or in upland areas.

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

Wetland Restoration

The general guidelines for wetland restoration, easement acquisition and shoreline buffers to protect existing wetlands should be followed. Wetlands that are important wildlife habitats will be identified in consultation with DNR Wildlife Management and Watershed Management personnel. Shoreline buffer easements may be acquired adjacent to these wetlands to offer better protection from sediment and other nonpoint source pollution.

Groundwater Management

Wells provide a direct conduit for pollutants to reach groundwater resources. Preventing well contamination and sealing abandoned wells are important steps for protecting these resources. If not properly sealed, abandoned wells can directly channel contaminated surface water or shallow groundwater into deeper drinking water aquifers, 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 Pine River\Willow Creek Watershed.

Project Staff 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 and assistance will be available upon request.

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 nitrates are not eligible for cost-sharing, with the exception of livestock wells contaminated with more than 40 ppm of nitrate. DNR Regional Water Supply Staff 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.

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 Pine River\Willow Creek Watershed. Pollutants from sewage systems include bacteria, viruses, household chemicals, nitrates, and phosphorus. Many sewage systems located in riparian areas are out-dated and installed in soils that do not adequately filter pollutants and/or have 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.

It is recommended that Winnebago and Waushara Counties adopt an "update at date of sale" policy to require the proper inspection, update and/or replacement of septic systems when homes are sold.

Wisconsin Fund

The Private Sewage System Replacement & Rehabilitation Grant Program (Wisconsin Fund) provides financial incentives to protect and improve groundwater quality in Wisconsin. The Wisconsin Fund provides funds to update private sewage systems installed before 1978. To be eligible, the septic system must have been inspected by the Winnebago or Waushara 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 assistance can be made through the Winnebago County Zoning and Solid Waste Department and the Waushara County Zoning Office.

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

Riparian Zones

Cattle access to streams and lakes have 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. Watershed staff will promote the protection of riparian areas where possible.

Stewardship

The Stewardship Program enables the purchase of land or easements to protect sensitive environmental areas. The Streambank Protection Program under Stewardship is an important additional means of protecting water quality. Under this program, the DNR may obtain an easement on both sides of streams in the watershed (generally 66 feet wide on each side). If needed, the DNR will financially support the fencing of the stream to protect it from livestock access. There are currently ten miles of stream in the watershed eligible for purchase through the stewardship program with more areas being considered.

Forestry Programs

Private forests, which account for over 52,000 acres within the Pine River\Willow Creek watershed, are important producers of forest products in Waushara and Winnebago Counties. Private forests also contribute to the quality of water resources and fish and wildlife resources in the watershed. Financial assistance is available for forest management and soil and water resource protection through the 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.

Stewardship Incentive Program

The Stewardship Incentive Program (SIP) was developed to stimulate enhanced management of forests by cost-sharing approved management practices. SIP provides cost share funding of up to 75% for practices that provide soil and water protection. The SIP program applies to non-industrial 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 non-industrial private woodland owners who manage their woodlands for forest products while also managing for water quality protection, wildlife habitat, and public recreation. In return for following an approved management plan, property taxes are set at a lower rate than normal. At a later time when the landowner receives an income from a timber harvest, some of the deferred tax is collected in the form of a yield tax. Management plans are based on the landowner's objectives. These plans may address harvesting, planting, thinning, release, and soil erosion on a mandatory basis while addressing other practices such as wildlife and aesthetic activities on a voluntary basis.

Other Stewardship Programs

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

Watershed staff and DNR Foresters will encourage eligible forest landowners in the Pine River\Willow Creek watershed to participate in Forest Stewardship Programs to benefit water resources and forest habitat. Protection of soil and water resources should be addressed in all SIP and MFL plans where applicable.

Inland Lake Programs

Wisconsin Lakes Management Program

Wisconsin's 15,000 inland lakes are under increasing pressure from the activities of people who live and recreate near them. Increasing development and recreational use of lakes has led to user conflicts, the introduction of exotic species, and the disruption of lake ecology. Land use changes in lake dominated watersheds have resulted in the nutrient enrichment of many Wisconsin lakes, leading to nuisance growths of aquatic plants and algae, sedimentation, and the loss of native plant communities. The Wisconsin Lakes Management Program is a cooperative program between the Wisconsin DNR, UW-Extension, the Wisconsin Association of Lakes (WAL), and lake organizations to assist local governments and inland lake management organizations in the long-term management and protection of their lakes. The Wisconsin Lakes

Management Program provides technical assistance, information, and education to lake groups and lake residents, and planning, protection, and implementation grants to qualified lake organizations and local units of government.

Organizing Lake Groups

Lake groups range from informal groups of concerned property owners to lake districts that have the power to levy taxes against property owners for the operation of lake management programs. Most of the DNR grant programs designed to help lake residents become better lake stewards require that lake organizations meet certain minimum standards relating to membership, dues, and by-laws. At a minimum, a lake group must be a legal lake association incorporated under Chapter 181 Wisconsin Statutes.

In addition to the ability to apply for lake assistance grants, qualified lake organizations have much to offer lake residents. A unified lake association or lake district can lobby towns for changes in zoning laws and lake use restrictions and may join the Wisconsin Association of Lakes. WAL lobbies at the state-level for lake stewardship, cooperatively with the DNR, to express their concerns and the opportunity to educate residents about proper lake stewardship. Many Wisconsin counties have formed county lake associations to further assist in these efforts.

Self Help Lake Monitoring Program

The goal of the Self Help Monitoring Program is to educate lake property owners about lake ecology and water quality while building a long-term information base on a large number of Wisconsin lakes. The Self Help Monitoring Team consists of volunteers who collect lake water quality data on a regular basis to track lake health and guide Wisconsin's Lake Management Program.

Lake Management Planning Grant Program

The Wisconsin Lake Management Planning Grant Program was developed to provide financial assistance to qualified lake organizations or local governments to collect and analyze data concerning the physical, chemical, and biological health of their lakes. Grant money can also be used to investigate watershed conditions, review ordinances, and conduct social surveys to gauge local concerns and perceptions as they relate to lake use and water quality. The end product of most lake management planning grants is a comprehensive lake management plan that addresses local concerns and analyzes alternatives for lake and watershed management. The DNR pays 75% of the cost of planning the project, not to exceed \$10,000 during each two-year state budget period. The remaining 25% of the project costs are paid by the grant recipient.

Lake organizations in the watershed will be encouraged to apply for lake management grants to collect detailed water quality information and develop comprehensive lake management plans.

Water Quality Trend Monitoring

Lake management planning grants are available through the Wisconsin DNR to conduct water quality trend monitoring on Wisconsin lakes. In many cases, previous Environmental Protection Agency (EPA) and DNR funded research projects may have provided a wealth of baseline water quality information on lakes and their tributaries. Continuing water quality trend monitoring is an important step in evaluation the effectiveness of watershed management techniques and adjusting lake management activities.

Project staff will encourage lake organizations to apply for additional lake management planning grants to continue water quality trend monitoring of lakes and inlets during the implementation phase of the priority watershed project.

Lake Protection Grant Program

Through the Lake Protection Grant Program qualified lake organizations can apply for funds to carry out a variety of lake protection projects. The state-share is 75%. Eligible projects include the purchase of lands critical to a lake ecosystem, restoration of important wetlands and the development of regulations and ordinances designed to protect and enhance lake water quality. Funding is limited to \$200,000 per grant.

Qualified lake organizations will be encouraged to apply for lake protection grant funding where applicable.

Coordinating Regulations, Permits, and Zoning

Best management practices that address shoreline erosion such as riprap or vegetative shoreline stabilization will require permits from the DNR. Any BMP that affects a wetland's form or function may require permits from the DNR, the Waushara or the Winnebago County Zoning offices, and the US Army Corps of Engineers.

Watershed staff will work closely with the DNR Water Management Staff, the Waushara and Winnebago County Zoning Departments, and the US Army Corps of Engineers to assure that necessary permits are received prior to the installation of shoreline stabilization practices.

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

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

Coordination with State and Federal Conservation Compliance Programs

The Pine River\Willow Creek 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 completed for all landowners in FSA by December 31, 1989.

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

Archaeological Sites: Coordination with State and Federal Historic Preservation Laws

Projects using state and federal funding, assistance, licenses, and permits are required by law to consider the effects of their actions on archaeological and historical sites and historical structures. The watershed project is a joint cooperative effort between federal, state, and county agencies as well as the private landowners that 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.

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 Runoff Management Program.

Before finalizing the cost-share agreement with the landowner, project staff should review the maps showing known archaeological and historic sites. If a known site occurs in the vicinity of a

proposed BMP, this does not necessarily mean the BMP needs to be moved or altered. In some cases, the specific location of the BMP will not actually be near enough to the location of the known site to warrant further review. Project staff should visit the area and conduct a "pre-review" to ensure that the specific location of the proposed BMP will not disturb the known archaeological or historic site. Instructions and Cultural Resource Site Review Documentation forms are available in the Implementation Manual.

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 point of contact for archaeological review (DNR-Madison) 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 Runoff Management Program will pick up the costs of professional historic and/or archaeological site reviews. In some cases, the archaeologist from the U.S.D.A. Natural Resources Conservation Service (NRCS) may conduct the review.

Practices of Concern Related to Archeological Sites

Field Locations:

- Field Diversions
- Terraces
- Grade Stabilization Structures
- Agricultural Sediment Basins
- Streambank and Shoreline Stabilization
- Sediment Retention, Erosion or Water Control Structures
- Structural Urban Practices
- Wetland Restoration

Building Site Locations:

- Barnyard Runoff Management Systems
- Animal Lot Relocation
- Manure Storage Facilities
- Roofs for Barnyard/Manure Storage Facilities

Practices Where No Concern is Needed for Archaeological Sites

- Contour Farming
- Contour Strip-cropping
- Field Strip-cropping
- Reduced Tillage
- No-till Systems
- Permanent Vegetative Cover
- Cropland Protective Cover

- Critical Area Stabilization
- Nutrient Management
- Pesticide Management
- Shoreline Buffers
- Livestock Exclusion from Woodlots
- Grass Waterways

Endangered and Threatened Resources

Information on threatened and endangered resources was obtained from the Bureau of Endangered Resources of the DNR. Endangered resources include rare species and natural communities. It should be noted that comprehensive endangered resource surveys have not been completed for the entire Pine River\Willow Creek 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 fieldwork. There may be other records of rare species and natural communities that 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 within the watershed are:

LUXILUS CHRYSOCEPHALUS, Striped Shiner
 OPHISAURUS ATTENUATUS, Western Slender Glass Lizard
 STERNA FORSTERI, Forster's Tern
 ASCLEPIAS PURPURASCENS, Purple milkweed

Wisconsin Threatened Species

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

LYTHRURUS UMBRATILIS, Redfin Shiner
 LEPOMIS MEGALOTIS, Longear Sunfish

OPUNTIA FRAGILIS, Brittle Prickly-pear
MOXOSTOMA VALENCIENNISI, Greater Redhorse
PSILOCARYA SCIRPOIDES, Long-beaked Baldrush
PLATANThERA FLAVA VAR HERBIOLA, Pale Green Orchid
NOTROPIS ANOGENUS, Pugnose Shiner
EMYDOIDEA BLANDINGII, Blanding's Turtle

Wisconsin Species of Special Concern

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:

ERIMYZON SUCETTA, Lake Chubsucker
ACIPENSER FULVESCENS, Lake Sturgeon
BARTONIA VIRGINICA, Yellow Screwstem
PENSTEMON PALLIDUS, Pale Beardtongue
NOTROPIS TEXANUS, Weed Shiner
ARABIS MISSOURIENSIS VAR DEAMII, Deam's Rockcress
AESHNA VERTICALIS, Green-Striped Darner
ELEOCHARIS QUINQUEFLORA, Few-Flower Spikerush
NOTROPIS TEXANUS, Weed Shiner
OPSOPOEODUS EMILEAE, Pugnose Minnow
AESHNA TUBERCULIFERA, Black-tipped Darner
LYCAEIDES MELISSA SAMUELIS, Karner Blue Butterfly
ERIMYZON OBLONGUE, Creek Chubsucker

Natural Areas

Natural areas are sites that contain high-quality examples of natural communities. The following areas are located throughout the Pine River/Willow Creek Priority Watershed.

Shallow, Soft, Seepage Lakes	Shrub-Carr Communities
Deep, Hard, Seepage Lakes	Northern Mesic Forest
Fast, Hard, Cold Water Streams	Northern Wet Forest
Springs and Spring Runs	Northern Sedge Meadow
Spring Ponds	Southern Sedge Meadow
Alder Thickets	Southern Dry-Mesic Forest
Emergent Aquatics	

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

CHAPTER SIX

Information and Education Activities

Goal

The goal of the Information and Education (I & E) Program is to educate landowners and influence participation by the general public in the Pine River\Willow Creek Watershed.

Implementation Team

The education strategy was developed by the Waushara County Land Conservation Department and the Winnebago County Land and Water Conservation Department with assistance from the UW Extension, and the Department of Natural Resources (DNR).

The Waushara County Land Conservation Department and the Winnebago County Land and Water Conservation Department will take lead responsibility for the implementation of the information and education strategy. The University of Wisconsin Cooperative Extension (UW-EX), the DNR, and the Department of Agriculture, Trade, and Consumer Protection (DATCP) will provide supporting assistance. The watershed staff will work with and seek support from local units of government and organizations such as lake rehabilitation districts, villages, lake associations, and other community groups and businesses.

Strategy

The Strategy for the I & E Program is designed to target six individual audiences from the watershed and focus goals and educational objectives around their specific needs. In Tables 6-1 through 6-6 objectives are divided in the following manner:

- Activity: Activity best suited to inform the public about the watershed
- Who: Designates the lead office for each activity
- Cost: Estimated cost of each activity

Table 6-1. Educational Objectives for All Citizens

Activity	Who	Cost
Develop Brochure w/ Logo, Map, and Timeline	UWEX, LCD	\$500
Newsletters w/ General Watershed Information	UWEX, LCD	\$1,000
Demonstration Sites	LCD, UWEX	\$50,000
Displays	LCD	\$1,000
Presentations on Critical Issues/Topics	LCD, UWEX	---
Media Releases	UWEX	---
Promotional Items	LCD	\$1,500
Watershed Tours	LCD	---
Conservation Landowner of the Year Award	LCD, UWEX	\$100
Lake Association Council Within Watershed	LCD, UWEX	---
Provision of Nitrate Testing	LCD, UWEX	---
One-on-One Meetings with Landowners	LCD, UWEX	---

Table 6-2. Educational Objectives for Municipal Officials

Activity	Who	Cost
Regular Written Updates of Activities	LCD, UWEX	---
Advertise Appropriate Workshops	LCD, UWEX	\$200
Develop Handbook for Local Officials	UWEX, LCD	\$200
Provide Updates At Town\County Board Meetings	LCD	---
Topical Presentations	UWEX, LCD	---

Table 6-3. Educational Objectives for the Citizen Advisory Committee

Activity	Who	Cost
Network w/ other Watershed CAC's	LCD, UWEX	---
Periodic Meetings	LCD	\$100 ea.
Workshops, as Identified by CAC Members	LCD, UWEX	\$100 ea.
Tours	LCD, UWEX	\$200 ea.
One-on-One w/ CAC Members	LCD, UWEX	---
Surveys/Questionnaires	LCD, UWEX	---
Topical Presentations	LCD, UWEX	---
Regular Written Updates	LCD	---
Staff Profiles	LCD, UWEX	---

Table 6-4. Educational Objectives for Agriculture

Activity	Who	Cost
One-on-One	LCD, UWEX	---
Newsletters on Ag-related Topics	UWEX, LCD	---
Demonstration Sites/Open Houses	LCD, UWEX	\$20,000
Topical Presentations	UWEX, LCD	---
Landowner Packets/Staff Portfolio	UWEX, LCD	---
Provision of Soil Testing	UWEX, LCD	---
Nutrient Crediting Note Pads from UW-NPM	UWEX	---
Media Presentation/Releases	UWEX, LCD	---
Provision of Extension Bulletins	UWEX	---

Table 6-5. Educational Objectives for Lake/Riparian Residents

Activity	Who	Cost
Shoreline Demonstration Project	LCD, UWEX	\$14,000
Topical Presentations	LCD, UWEX	---
Lake Information Signs	LCD, UWEX	\$600
Newsletters w/ lake-related articles	UWEX, LCD	---
Lake Fair	UWEX, LCD	\$500
Assist In Formation Of Watershed Lake Council	LCD, UWEX	---
Presentations At Annual Association Meetings	LCD	---
Provide Lake Leader Handbook, Life on the Edge	UWEX, LCD	\$500

Table 6-6. Educational Objectives for Teachers, Youth Group Leaders, and Youth

Activity	Who	Cost
Hold Project WET Workshops	UWEX, LCD	---
Work Individually w/ Teachers	UWEX, LCD	---
Develop Local Water Education Resource Center	UWEX, LCD	\$1500
Provide Presentations at Inservices	UWEX, LCD	---
Student Volunteer Help Installing Practices	LCD, UWEX	---
Conservation Youth Day	LCD, UWEX	---
Placemat, Poster Design Contests	LCD, UWEX	---

Evaluation

An evaluation report of information and education activities will be prepared annually. Evaluation will be built into program activities where feasible. Activities may be evaluated through recording the number of attendees at a function, the number of target audience members reached, event surveys, or other methods. A survey will be used every two years to assess how watershed residents are getting information about the program and how effective the activities are at delivering messages, and where behavioral changes have occurred

CHAPTER SEVEN

Project Evaluation

This chapter summarizes the plan for evaluating the progress and effectiveness of the Pine River/Willow Creek Watershed Project. The evaluation plan includes these components:

- Administrative review
- Pollution reduction evaluation
- Water resource monitoring

Information on the first two components will be collected by the County Conservation Departments and reported on a regular basis to the DNR and 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 and Financial Assistance. The Water Resource Monitoring plan follows guidance established by DNR's Bureau of Watershed Management to select specific sites in the watershed to monitor resource quality changes.

A final report will be prepared for the Pine River/Willow Creek 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 Waushara County LCD and Winnebago County LWCD will prepare the final report.

Administrative Review

The first component, the administrative review, will focus on the progress of Waushara and Winnebago 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.

Accomplishment Reporting

The County Conservation Departments 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 in the Annual Accomplishment Report prepared by DATCP and DNR, and are also discussed at watershed review meetings held annually for projects in implementation. Additional evaluation data provided by the County Conservation Departments for the annual watershed review include:

- Pollutant load reductions (described below)
- Status of grants and related financial activities
- Evaluation of landowner participation
- Status of project administration including data management, staff training, and BMP monitoring
- Status of nutrient management planning and easement acquisition and development
- Effectiveness of construction site erosion control activities
- Status of stormwater management activities for new development undertaken by watershed municipalities

Likewise, participating local units of government implementing the urban nonpoint source management program meet periodically with DNR staff to review progress. The DNR and local units of government will jointly evaluate the urban implementation program. Annual reports of governmental units will include:

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

Details of the reporting requirements are contained in DNR Publication WR-223-97, "An Evaluation Plan for the Soil and Water Resource Management Program" and the "Nonpoint source Water Pollution Abatement Program" which is reviewed every two years by DATCP and DNR and revised as necessary.

The Field Offices Computing System (FOCS) is a computer data management system that has been developed by the U.S.D.A. Natural Resources Conservation Service (NRCS). The NRCS, the DNR and the DATCP use FOCS to meet the accomplishment reporting requirements of all three agencies.

Financial Expenditures

Waushara and Winnebago Counties and any other participating units of government 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 best management practices (BMPs), and the amount of money paid
- Staff travel expenditures
- Information and education expenditures
- Expenditures for equipment, materials, and supplies
- Expenditures for professional services and staff support costs
- Total project expenditures for county staff
- Amount of money paid for installation of BMPs, and money encumbered in cost-share agreements
- Staff training expenditures
- Interest money earned and expended
- Total budget and expenditures on the project

Time Spent On Project Activities

The LCD will provide time summaries to DNR for each employee by project on an annual basis.

Nonpoint Source Pollutant Load Reduction

The purpose of the second evaluation component, pollutant 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 the surface waters in the Pine River/Willow Creek Priority Watershed. Data collected for the evaluation includes sediment load reduction

from uplands; streambanks and gullies; reduced winter spreading of manure, and streambank habitat protection. Chapter Two of this plan describes target pollution reductions for each of the subwatersheds.

WINHUSLE will be used in the Pine River/Willow Creek Priority Watershed Project to evaluate cropped fields based on their sediment delivery rates. Eligibility and critical sites cutoffs will be based on the sediment delivery numbers for a partial inventory (20%). The inventory is to be completed within a maximum of four years after plan approval. Progress towards completing this inventory should be identified and discussed as part of the annual evaluation meetings with county staff, DNR, and DATCP.

Cropland Sources

The County Conservation Departments will use the WINHUSLE computer model in FOCS to estimate sediment reductions due to changes in cropping practices. County staff will use FOCS to provide data for the WINHUSLE model on an annual basis, as described above.

Streambank Sources

The County Conservation Department 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 Conservation Departments will use the BARNY model to estimate phosphorus reductions resulting from the installation of barnyard control practices. The County Conservation Departments will report the information to the DNR through FOCS. In the event FOCS is replaced, the replacement system will be used for all project tracking.

Construction Sites

Local units of government participating in the urban implementation program will report annually to the DNR on the number of construction sites served by adequate erosion control practices, number of construction sites receiving appropriate permits, and any amendments to construction site erosion control ordinances that affect sediment loads.

Urban Areas

Local units of government 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 storm water BMPs; new urban lands, by land use, not served by storm water BMPs; and other information requested by the DNR concerning BMP characteristics.

Water Resource Monitoring

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

- 1) Do the levels and types of best management practices recommended in the watershed plans achieve the water resource objectives?
- 2) Do the types and levels of best management practices recommended in the watershed plans achieve the pollutant reduction goals?
- 3) Does any level of practice installation below 100 percent achieve the water resource objectives or the pollutant reduction goals?
- 4) Do we need to adjust the pollutant load reduction goals to achieve the water resource objectives?
- 5) Can we use simple environmental indicators in many of the watershed projects to provide some early evidence that the practices might achieve the water resource objectives and pollutant reduction goals?

A team of experts from state and federal agencies, and the University of Wisconsin was formed to develop and direct the evaluation monitoring activities of 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 ecoregions in the state. The five fishery types are: high gradient cold water sport fishery, high gradient warm water sport fishery, high gradient warm water forage fishery, low gradient warm water forage fishery, and low gradient cold water sport fishery. A stormsewer 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 ten square miles or less). The schedule involves two years of monitoring before any best management practices are installed, five years of monitoring during the practice installation phase, 2 years of monitoring during the response period, and two years of monitoring during the post-practice installation phase, for a total of eleven years of monitoring.

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

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

SOS sites for Pine River/Willow Creek Priority Watershed Project are still being identified and will be established shortly after the implementation stage begins.

Final Report

A final report will be jointly prepared for the Pine River/Willow Creek Priority Watershed Project within 18 months of the end of the grant period. This report will include information on pollutant load reduction achieved, the effectiveness at addressing nonpoint threats to groundwater, landowner participation, project management, grant management, and technical assistance provided to landowners. It will also serve as the final evaluation of special approvals and innovative approaches. The report will summarize findings from SOS Monitoring and conclusions drawn from comparisons made with the Master Monitoring Site.

The final report will be developed to evaluate progress made toward attaining water quality and pollution reduction objectives, evaluate BMP effectiveness, and provide recommendations that target key areas needing improvement in the Runoff Management Program. It will be jointly prepared by the Waushara County Land Conservation Department and the Winnebago County Land and Water Conservation Department, with review by the DNR and DATCP.

APPENDIX A

Common Best Management Practices

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

Barnyard Abandonment or Relocation. Relocation of an animal lot from a critical site such as a floodway to a suitable site to minimize the amount of pollutants from the lot delivered to surface or groundwater.

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

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

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

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

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

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

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

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

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

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

High Residue Management (Conservation Tillage). A system that leaves at least 30 percent of the ground covered with crop residue after crops are planted.

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.

Land Acquisition. The purchase of land or the interest on land which is contributing or will contribute nonpoint source pollution. The purchase of land for the construction of urban structural practices to reduce nonpoint source pollution.

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

Manure Storage Facility. A structure for the storage of manure for a period of time 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 the bottom at or below groundwater level; a system whose pit fills with groundwater; a system whose pit leads into the bedrock; a system that has documented reports of discharging manure into surface or groundwater due to structural failure; and a system where there is evidence of structural failure. The practice includes proper removal and disposal of wastes, liner materials, and saturated soil as well as shaping, filling, and seeding of the area.

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

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

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

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

Shoreline 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.

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

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

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

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

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Priority Watershed Projects in Wisconsin: 1999

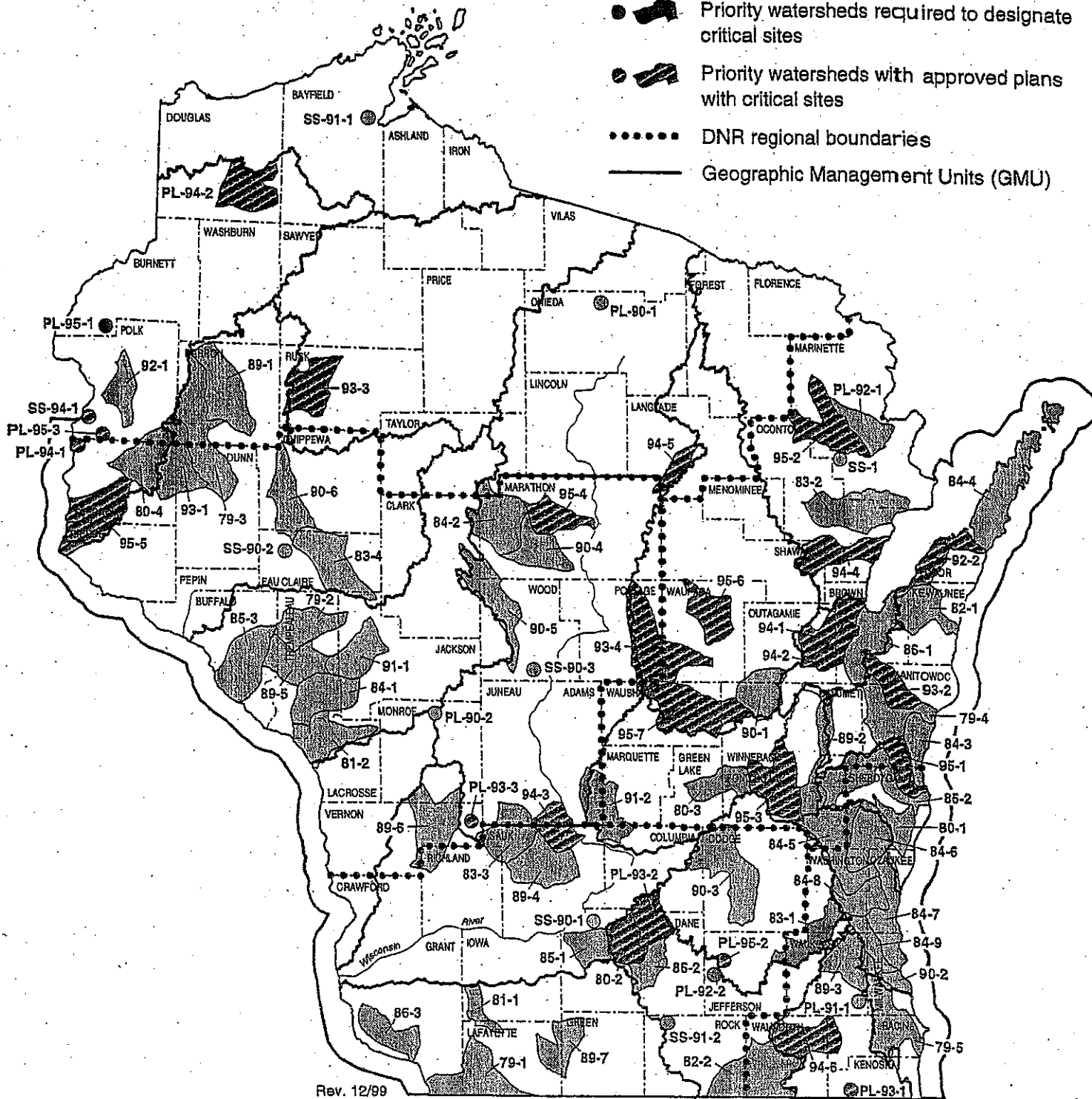
Year Selected- Map Number	Large-scale Priority Watershed Project	County(ies)	Small-scale Priority Watershed Project	County(ies)
79-1	Galena River ♦	Grant, Lafayette	Duncan Creek	Chippewa, Eau Claire
79-2	Elk Creek ♦	Trempealeau	Upper Trempealeau River	Jackson, Trempealeau
79-3	Hay River ♦	Barron, Dunn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

♦ Project completed

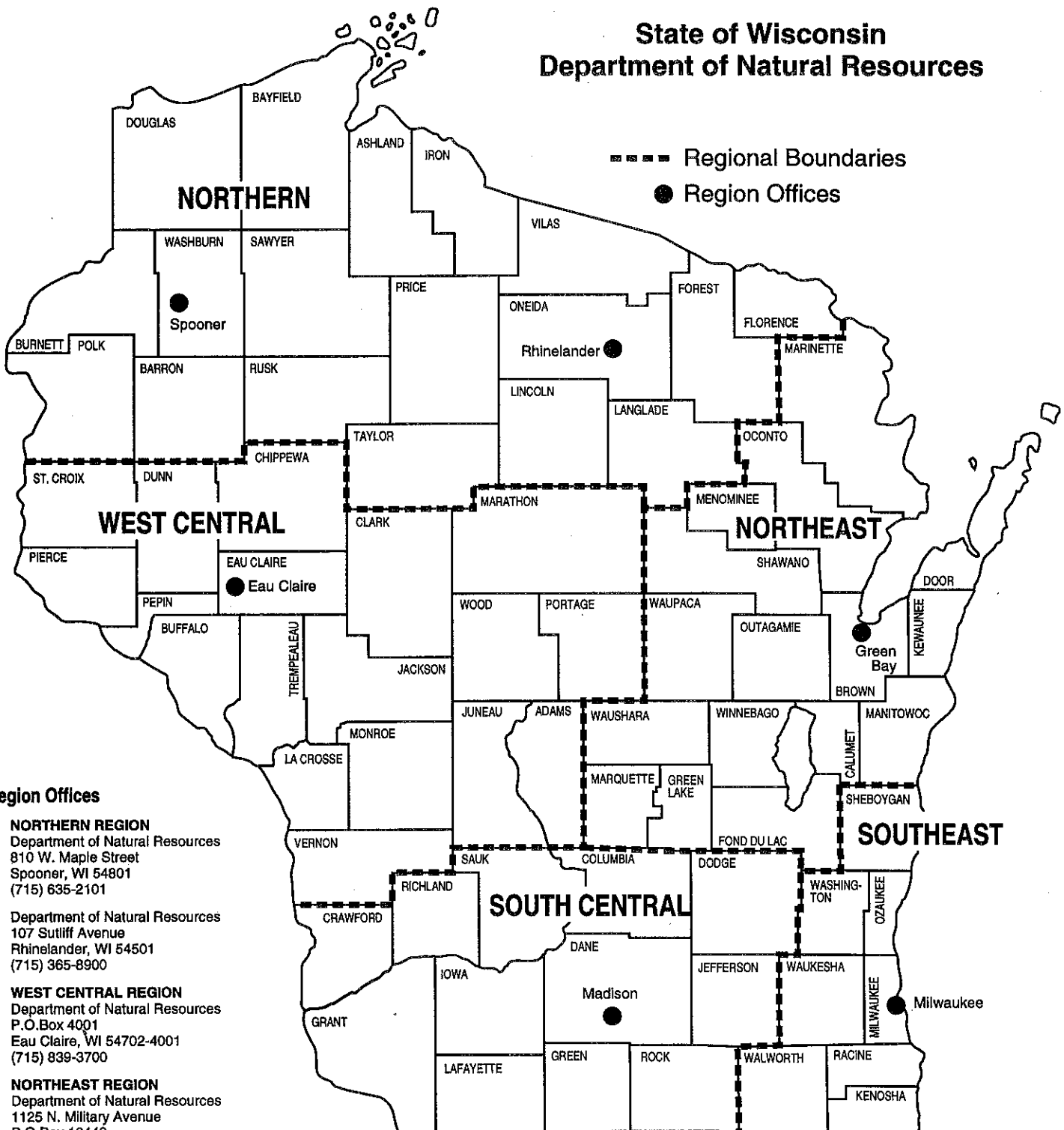
† Sixmile-Pheasant Branch is being redone as part of the Lake Mendota project (PL-93-2).

Priority Watershed Projects in Wisconsin

- Small and Large-scale Priority Projects
- Priority watersheds required to designate critical sites
- Priority watersheds with approved plans with critical sites
- DNR regional boundaries
- Geographic Management Units (GMU)



State of Wisconsin Department of Natural Resources



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Our Mission:

To protect and enhance our natural resources:
our air, land and water;
our wildlife, fish and forests
and the ecosystems that surround them.

To provide a clean, sustainable environment
and a full range of outdoor opportunities.

To insure the right of all Wisconsin citizens
to use and enjoy these resources
in their work and leisure.

To work with people
so that we understand their views
and can carry out their will.

And in this partnership with our citizens,
consider the future
and those who will follow us.



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