Nonpoint Source Control Plan for the Horse 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 Wisconsin Department of Agriculture, Trade and Consumer Protection, the Polk County Land and Water Conservation Department, and the St. Croix County Land and Water Conservation Department.

Watershed Plan Organization Information

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Nonpoint Source Control Plan for the Horse Creek Priority Watershed Project

The Wisconsin Nonpoint Source Water Pollution Abatement Program

June 2001

This plan was cooperatively prepared by:

Polk County Land & Water Resources Department
Wisconsin Department of Natural Resources
and
Wisconsin Department of Agriculture, Trade, and Consumer Protection

Publication Number WT-710-2001

For copies of this document please contact:

Department of Natural Resources
Bureau of Watershed Management
Runoff Management Section
P.O. Box 7921
Madison, WI 53707

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Watershed Plan Credits

Authors

Jacob Bellinsky, Polk County LWRD
Jane Malischke, DNR Northern Region

Principal Contributors

Dave Peterson, Polk County LWRD
James Cahow, DNR Northern Region
Cheryl Bursik, Dragonfly Consulting & Former Employee, Polk County LWRD
Lynne Hess, DATCP Soil and Water Resources Section

Additional Contributors

Jeff Timmons, Polk County LWRD
Tracy Ritcey, Polk County LWRD
Lisa Reas, Polk County LWRD
Kay Fandel, Former Employee, Polk County LWRD
Roxann Moltzer, Former Employee, Polk County LWRD
Pete Kling, St. Croix County LWCD
Ron Struss, Former Employee, University of Wisconsin Extension
Dave Rasmussen, West Central Regional Planning Commission
Craig Roesler, DNR Northern Region
Buzz Sorge, DNR West Central Region
Dan Simonson, DNR West Central Region
Mike Johnson, DNR Balsam Lake Service Center
Kevin Morgan, DNR Barron Service Center
Rick Cornelius, DNR Barron Service Center
Tim Jergenson, University of Wisconsin Extension Polk County
Keith Zygowicz, NRCS Balsam Lake
Mary Anne Lowndes, DNR Bureau of Watershed Management
Ken Baun, DNR Bureau of Watershed Management
Cindy Hoffland, DNR Bureau of Community Assistance
Laura Chern, DNR Bureau of Drinking Water and Groundwater
Mike Grinyer, DNR Balsam Lake Service Center

Editor

Jacob Bellinsky, Polk County LWRD
Brook Waalen, Polk County LWRD

Graphics / Maps

Polk County Land & Water Resources Department

TABLE OF CONTENTS

TABLES

MAPS

FIGURES

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 Resources
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
LWCB	Land and Water Conservation Board
NPM	Nutrient and Pest Management
NRCS	Natural Resource Conservation Service
SHS	Wisconsin State Historical Society
SIP	Stewardship Incentive Program
SOS	Signs of Success Monitoring Program
USEPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture
USGS	United States Geological Survey
UWEX	University of Wisconsin-Extension
WGNHS	Wisconsin Geological and Natural History Survey
WPDES	Wisconsin Pollutant Discharge Elimination System [permit system]
WUWN	Wisconsin Unique Well Number assigned to well sample sites

WISCONSIN
DEPT. OF NATURAL RESOURCES
George E. Meyer
Secretary

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

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

September 5, 1995

File Ref: 2160

Polk County Land Conservation Department
Mr. Jeff Timmons, Director
Box 460
Balsam Lake, WI 54810

SUBJECT: Nonpoint Source Pollution Program 1995 Priority Watershed Selection

Dear Mr. Timmons:

On behalf of the Land and Water Conservation Board I am pleased to offer the selection of the Horse Creek as a new priority watershed project through the Wisconsin Nonpoint Source Water Pollution Abatement Program. With this designation comes the opportunity to improve and protect the Horse Creek watershed through a long term technical and financial commitment from the Department of Natural Resources and the Department of Agriculture, Trade and Consumer Protection. We are pleased that Polk County will take a lead role in working with us on the planning and implementation of this project over the next ten years and beyond.

We hope that the project will begin soon after January 1, 1996 with development of a scope of work. Following completion and approval of the plan by the counties, any other involved units of government, and the DNR, grant funds will become available to cost share installation of nonpoint source controls with landowners and municipalities. Please review the attached fact sheet for important information about your responsibilities in the development of the Horse Creek Priority Watershed Project.

To accept this offer please provide a written response as soon as possible, but no later than October 15, 1995 to:

Ms. Rebecca Wallace, Chief
Nonpoint Source and Land Management Section
Wisconsin Department of Natural Resources
P. O. Box 7921
Madison, WI 53707

Soon after receiving your response, we will be contacting you to discuss this project in greater detail. We would like to set up a meeting with representatives of your unit of government and others concerned about the Horse Creek watershed to discuss the start-up of the project.

If you have any questions or concerns, please contact Richard Wedepohl at 608/267-0385.

Again, thank you for your leadership in improving and protecting the water quality in the Horse Creek watershed and ecosystem. We are confident this project will benefit both the citizens of your community and all the citizens of Wisconsin. We look forward to working with you!

Sincerely,

George

George E. Meyer
Secretary

Congratulations!

cc: Jane Malischke, Nonpoint Source Coordinator
Jim Bradley, Chair, Land and Water Conservation Committee
Sen. Alice Clausing
Rep. Robert M. Ducholm
Rep. Alvin Baldus
Rep. Sheila E. Harsdorf
Alan Tracy, Secretary, DATCP

OFFICE OF
POLK COUNTY CLERK

CATHERINE ALBRECHT

100 POLK COUNTY PLAZA, SUITE 110
BALSAM LAKE, WISCONSIN 54810
(715) 485-9226 FAX (715) 485-9246

STATE OF WISCONSIN)
) SS
COUNTY OF POLK)

I, Catherine Albrecht, County Clerk for Polk County do hereby certify that the attached is a true and correct copy of Resolution No. 99-99 which was adopted by the Polk County Board of Supervisors on September 21, ~~2001~~ 1999.

Catherine L Albrecht

Catherine Albrecht, County Clerk

RESOLUTION 89

APPROVING THE HORSE CREEK PRIORITY WATERSHED PROJECT PLAN

WHEREAS, the Polk County Land & Water Resources Department is required to develop a watershed project plan; and

WHEREAS, the watershed plan has been completed and approved by the Land Conservation Committee;

NOW, THEREFORE, BE IT RESOLVED, by the Board of Supervisors of Polk County to approve the Horse Creek Priority Watershed Project Plan.

EFFECTIVE DATE: ~~20th~~ 21st Day of ~~July~~ September, 1999.

Submitted at the request of the Land Conservation Committee.

Approved as to form: ______________________
Robert L. Hachey

Date Submitted to
County Board______________

County Board Action__________

SUBMITTED BY:

____

____

____

HORSE CREEK PRIORITY WATERSHED PROJECT: Summary

Introduction

The purpose of the Nonpoint Source Control Plan developed for this project is to assess the nonpoint pollutants in the Horse Creek Priority Watershed and guide the implementation of control measures. Nonpoint source control measures and education are needed to meet specific water resource objectives designed to protect and enhance the water resources of the Horse Creek Priority Watershed.

Sources of nonpoint pollution found in this watershed include: cropland, streambanks, construction sites, barnyards, livestock manure, lakeshore property, and septic systems. These sources contribute sediment, nutrients, toxins, and organic matter to the watershed. The purpose of this project is to reduce the amount of pollutants originating from these sources, thereby reducing the amount of pollution reaching surface water and groundwater in the project area.

The major land use in the watershed is agriculture. Therefore, agricultural runoff is a significant concern. The majority of the controllable nutrient and sediment loads coming from these agricultural lands will be targeted with nonpoint source control measures. However, agricultural uses are not the only land use threatening water quality. Impacts from residential lakeshore development will be addressed through the installation of buffers, diversions, settling ponds, stormwater management, and a variety of other methods. Management efforts will also include educating landowners about the importance of riparian buffers for critical habitat, wildlife, and water quality benefits.

This plan was prepared by the Polk County Land & Water Resources Department (LWRD), the Department of Natural Resources (DNR), and the Department of Agriculture, Trade and Consumer Protection (DATCP). The DNR selected the Horse Creek watershed as a priority watershed project through the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1995. It joined approximately 90 similar watershed projects statewide in which nonpoint source control measures are being planned and implemented. The Nonpoint Source Water Pollution Abatement Program was created in 1978 by the Wisconsin State Legislature. The program provides financial and technical assistance to landowners and local governments to reduce nonpoint source pollution.

The project is administered on the state level by the DNR and DATCP. The Polk County LWRD will administer the project on the local level with assistance from the University of Wisconsin Extension and the Natural Resource Conservation Service (U.S. Department of Agriculture). The towns of Alden, Farmington, Garfield, and Osceola in Polk County and the Town of Star Prairie in St. Croix County are also eligible to participate in implementation of the plan. This plan is primarily used by and written for DNR, DATCP, the Polk County LWRD, the St. Croix County Land & Water Conservation Department, local units of government, legislators, external evaluators, and the interested public.

General Characteristics

The Horse Creek watershed drains approximately 54 square miles of land in Polk (88%) and St. Croix (12%) Counties in Northwestern Wisconsin (see Map 1-1). Agriculture (including row crops and forage) is the most prevalent land use in the watershed covering 34% of the land. Much of the watershed (59%) is covered by uses grouped as open space that includes wetland, grassland/shrubs, and forest (see Table S-1). Chapter 1 further describes land use in the watershed.

Table S-1. Horse Creek Priority Watershed Land Use Classes

Land Class	Acres	Percent Cover
Barren	57.3	0.2
Forage	6,077.4	20.0
Row Crops	4,119.8	13.6
Forest	7,928.3	26.1
Grassland/Shrubs	7,267.0	23.9
Open Water	2,356.7	7.8
Wetland	2,566.7	8.5
TOTAL	**30,373.2**	**100.1**

The Horse Creek Priority Watershed is made up of fourteen subwatersheds, each with a major waterbody of focus, and is considered a small-scale watershed within the Lower Apple River Watershed of the St. Croix River Basin (see Map 1-1).

Subwatersheds in the Horse Creek Priority Watershed

Big Lake	(BL)	Mud Lake	(ML)
Cedar Lake	(CL)	Paulson Lake	(PL)
Church Pine	(CP)	Pine Lake	(PN)
Horse Creek	(HC)	Rice Lake	(RC)
Horse Lake	(HL)	Round Lake	(RL)
Lotus Lake	(LL)	Swede Lake	(SL)
Lower Pine	(LP)	Wind Lake	(WL)

Water Quality

The Horse Creek Priority Watershed contains many high value recreational lakes that are ringed with lakeshore residential development. Proximity to the Twin Cities of Minneapolis and St. Paul, Minnesota makes the watershed a target for continued development and urbanization pressure. There are 22 named lakes within the project area. Many of the lakes that Horse Creek flows through exhibit extensive nutrient related problems such as algae blooms and decreased water quality. There are also some very high quality oligotrophic lakes within the project boundaries including Lower Pine and Church Pine Lakes. The remaining lakes range from mesotrophic to eutrophic. Mesotrophic lakes have moderate nutrient levels and productivity, while eutrophic lakes have higher nutrient levels and are very productive with high concentrations of aquatic plants and algae.

There are eight named streams included in the watershed. Horse Creek is 16 miles long and is the largest stream in the project area. It flows through Lotus and Horse Lakes before emptying into Cedar Lake. Cedar Creek flows out of Cedar Lake and empties into the Apple River one and one half miles west of Star Prairie. Both Horse Creek and Cedar Creek are classified as warmwater, fish and aquatic life streams. Behning Creek and North Big Lake Creek historically supported brook trout populations. Today the brook trout fishery does not exist in either stream. The remaining smaller streams are classified as warm water forage fisheries. Wetlands are another prominent feature in this watershed both in the riparian corridors and in internally drained areas throughout the watershed. Floodplain wetlands support furbearers and water fowl populations and may provide seasonal habitat for sport fish.

Groundwater Quality

Groundwater is the main source of drinking water in the Horse Creek Priority Watershed. Nitrate analyses of private wells show human impact on groundwater. In general, however, groundwater quality is considered good in the Horse Creek Watershed. Groundwater is stored underground in pore spaces and cracks within the soil and rock layers. Unconsolidated sediments and porous rock layers that yield groundwater in usable quantities are called aquifers. Aquifers receive and store water (called recharge) and discharge groundwater to the lakes, streams and wetlands in the watershed. Naturally occurring phosphorus in glacial aquifers in the watershed is suspected to be a source of high phosphorus levels in lakes that groundwater discharges to.

Sources of Nonpoint Source Pollution

The Polk County LWRD collected data on agricultural and other rural lands, barnyards, stream banks, lake shorelines, wells, and wetlands in the watershed. The information collected was used to estimate the pollutant potentials of each nonpoint source. The results of the investigations of nonpoint sources are summarized below:

Barnyard Runoff Inventory Results

- Forty (out of 50) barnyards in the watershed were assessed.
- Twenty-nine yards were in directly drained areas.
- A subtotal of 557.5 pounds of phosphorus flows from barnyards to surface water annually.

Streambank Erosion Inventory Results

- 278,001 feet of streambank was inventoried.
- 9.56 tons of sediment (38.24 pounds of phosphorus) reaches streams from these eroding sites.
- 7.4% of streams were degraded from trampling, erosion, or slumping.

Shoreline Erosion Inventory Results

- 108,904 feet of shoreline were inventoried.
- 1.75% of shorelines were degraded from erosion.
- No cattle access has been identified.
- 12.08 tons of sediment (48.32 pound of phosphorus) reaches lakes from these eroding sites.

Upland Sediment Inventory Results

A land cover analysis and field-by-field inventory was conducted for land use and cropland erosion. A computer model was used to estimate decreases in sediment and phosphorus delivery from the implementation of management practices.

- 4,920 cropland acres were identified as having a sediment delivery > "T"
- 1,939 cropland acres were identified as having < 20 foot buffer
- 557 cropland acres were identified as > "T" and < 20 foot buffer

Wetland Inventory Results

- 193 drained wetland sites were identified--equating to 142 landowners.
- Several high quality wetlands were identified as needing protection.

Construction Sites

Construction sites were inventoried as a land cover in each of the subwatersheds. At the time of the inventory, construction sites accounted for 1.2% in Cedar Lake, 2.3% in Lotus Lake, and 0.3% in the Horse Creek subwatersheds.

Water Quality Goals & Project Objectives

The water quality goals and project objectives for this project were developed by staff from DNR Northern Region, the Polk County Land & Water Resources Department and staff from the DATCP. Goals and objectives are defined in more detail for each subwatershed and can be found in the Horse Creek Nonpoint Source Pollution Management Plan, (Bellinsky, 1999) and the Horse Creek Water Resources Appraisal Report, Draft (Cahow, 1999). Following are the overall goals for water resources.

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

Subwatershed / Lake	Water Quality Goals	Nonpoint Source Reduction Objectives
Big Lake	Reduce inlake total phosphorus (TP) from 22 to 20 ppm Restore shoreline habitat. Protect aquatic plant sensitive areas.	Total phosphorus (TP) reduction of 10% from agricultural sources
Round Lake	Reduce inlake TP from 29 to 25ppm. Form lake association or district in cooperation with Lotus Lake and Horse Lake. Protect wetlands and buffers.	TP reduction of 13% from agricultural sources
Church Pine Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
Lower Pine Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
Paulsen Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
Pine Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
Rice Lake	Maintain and protect water quality Protect shoreline buffers Protect wetlands	TP reduction of 5% from agricultural sources
Swede Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
Wind Lake	Maintain and protect water quality Reestablish shoreline buffers Protect aquatic plant sensitive areas	TP reduction of 5% from agricultural sources
Lotus Lake	Maintain existing water quality Form lake association or district in cooperation with Round Lake and Horse Lake	TP reduction of 10% from agricultural sources
Horse Lake	Maintain existing water quality Form lake association or district in cooperation with Lotus Lake and Round Lake	TP reduction of 5% from agricultural sources
Mud Lake	Maintain existing water quality	TP reduction of 5% from agricultural sources
Cedar Lake	Maintain existing water quality	TP reduction of 3% from immediate watershed (additional 12% from Horse Creek subwatershed
Horse Creek	Reduce TP export to Cedar Lake by 12% Reduce in-stream sedimentation and in-stream habitat loss Protect wetland and riparian vegetative buffers	TP reduction of 20% Reduce sediment loading to Horse Creek by 20%

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

Enhancement: Enhancement refers to a change in the overall condition of a stream or lake within its given biological and recreational use category. For example, if a stream supports a warm water 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 warm water game fish, but no longer does. This goal seeks to improve conditions allowing viable populations of forage and warm water game fish species to become reestablished.

Pollutant Reduction Goals and Project Objectives

The Horse Creek Priority Watershed Project Nonpoint Source Pollution Management Plan examines the sources of pollution in the watershed and guides the implementation of pollution control measures based on water resource goals and objectives. The following is a summary of reductions to be targeted for land uses in the watershed.

Sediment Objective: The subwatershed of Horse Creek is the only subwatershed in this project to have a specific sediment reduction objective (the remaining subwatersheds have phosphorus reduction objectives rather than sediment reduction objectives).

To reduce sediment delivered to Horse Creek by 12% the following is needed:

- 20% reduction in sediment reaching Horse Creek from agricultural uplands
- Repair of trampled and eroded streambanks along approximately 11,600 feet of stream

Phosphorus Objective: Lakes in this watershed project were grouped into three trophic categories, a meso- and oligo- trophic group (protection class), an eutrophic group (improvement class), and a highly eutrophic group (maintenance class). Specific phosphorus reduction objectives for agricultural lands were then developed dependent upon which category the lake is in. (See Table S-3 below for a summary of phosphorus reduction goals.)

Wetland Restoration Objective:

- Wetland restoration will be coordinated with existing federal and state wetland restoration funding programs and initiatives.

Groundwater Objectives:

- Identify and properly abandon unused wells in the watershed.
- Develop nutrient and pesticide management plans for farms in the watershed.

Table S-3. Lake Classification, Water Quality Goals, and Phosphorus Reduction Objectives from Cropland.

Subwatershed/Lake	Water Quality Goal	Phosphorus (P) Reduction Objective
Oligotrophic to Mesotrophic Lake Class (Protection Group)		
Church Pine Lake Lower Pine Lake Pine Lake Paulsen Lake Swede Lake Wind Lake Rice Lake	Protect and maintain existing water quality	5% Phosphorus reduction from agricultural sources
Eutrophic Lake Class (Improvement Group)		
Big Lake	20 ppm TP	10% P reduction from agricultural sources
Round Lake	25 ppm TP	13% P reduction from agricultural sources
Highly Eutrophic Lake Class (Maintenance Group)		
Lotus Lake	Maintain existing water quality	10% P reduction from agricultural sources
Horse Lake	Maintain existing water quality	5% Phosphorus reduction from agricultural sources
Mud Lake	Maintain existing water quality	5% Phosphorus reduction from agricultural sources
Cedar Lake	Maintain existing water quality	15% P reduction from agricultural sources

Management Actions

Management actions are described in terms of best management practices (BMPs) that are needed to control nonpoint sources to the pollutant levels described above. Cost-share funds for installing pollutant control measures will be targeted at operations that contribute the greatest amount of pollutants. Cost share funds will be available through the Wisconsin Nonpoint Source Water Pollution Abatement Program for certain BMPs. As shown in Table S-5, cost share rates range from 70 to 50 percent. Flat rates are illustrated in Table S-4.

The Polk County LWRD will contact all landowners who are eligible to receive cost-share funds during

the project's 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 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. Correction on these sites is required. Critical site criteria are established for some sources where no sites fit the criteria. These criteria are put in place for potential future sources. Nonpoint sources that are eligible but not critical contribute less of the pollutant load, but are included in cost sharing eligibility to ensure that water quality objectives are met. Landowners with eligible sites need not control every eligible source to receive cost-share assistance.

The Polk County LWRD will assist landowners in applying BMPs. Practices range from alterations in farm management (such as changes in manure-spreading and crop rotations) to engineered structures (such as diversions, sediment basins, and barnyards), and are tailored to specific landowner situations.

Landowner Eligibility Criteria

Barnyard Runoff

Barnyards were not found to be the most significant source of phosphorus to surface waters. *To be classified as critical, a barnyard must be in a direct drainage area and contributing greater than 100 pounds of phosphorus annually.* Currently, no critical barnyards have been identified. *Barnyards in direct drainage areas that contribute greater than 30 pounds of phosphorus annually are considered eligible for cost sharing. Internally drained barnyards exceeding 30 pounds of phosphorus annually will be evaluated for eligibility based on a site-by-site analysis.* Sites that drain to a wetland, sinkhole, creviced bedrock, wells, or gravel pits and have the potential to contaminate groundwater or impact wetlands, may be eligible for cost sharing if annual phosphorus loading is greater than 30 pounds. To confirm eligibility, field investigations may be conducted jointly by the county project staff, DNR staff, and staff from the DATCP.

Manure Spreading & Storage

Eligibility for cost sharing for manure storage practices will be based on an evaluation using NRCS Standard 590. *There is no critical designation for manure storage.* An operation is *eligible* if the evaluation demonstrates that manure cannot be feasibly managed during periods of snow covered, frozen, and saturated conditions without the installation of storage practices. The evaluation must also demonstrate that proper utilization of the manure can be achieved following adoption of the intended storage practice.

Eligibility for cost-shared practices will be based on the least cost system. These options may include manure stacks (in accordance with Std. 312), short-term storage (capacity for 30 to 100 days production in accordance with Std. 313), and long-term storage (capacity for up to 210 days; production must meet Std. 313 or 425). Cost sharing will be based upon the cost of up to seven-month storage facilities.

Nutrient & Pest Management

Nutrient loading from agricultural fields was found to be a significant source of phosphorus delivered to the surface water resources of the Horse Creek Priority Watershed. *All farms are eligible for cost sharing to develop nutrient and pest management (NPM) plans to reduce over application of nutrients and pesticides. High hazard acres will be given priority.* Twenty-four hundred acres of cropland have been identified as high hazard acres, which is defined as crop fields likely to be winter spread within one mile of a farmstead with an LS factor greater than 1 and a high or medium delivery value.

Upland Sediment

Upland erosion from intensive agricultural practices has been identified as the most significant source of sediments and phosphorus that are carried to surface waters in the Horse Creek Priority Watershed. Sediment from eroding fields and other upland sources carries phosphorus and degrades aquatic habitat where it is deposited.

A land cover analysis and field-by-field inventory conducted by the Polk County LWRD (November 1997) was used to identify and prioritize sources of phosphorus in the watershed. Because sediment and phosphorus delivery from uplands occurs with surface water runoff, only the directly drained areas of the watershed were considered in this inventory. This analysis was also used to provide an estimate of pollutant loading from each subwatershed to its major water body of focus. Because cropland is a significant land use in the watershed and delivers relatively high amounts of sediment and phosphorus, a separate crop field inventory was also conducted.

The Polk County LWRD developed a model to predict reductions in phosphorus delivery. This model was used to help set eligibility criteria, and will also be used to track progress throughout implementation of the watershed plan (refer to Ch. 6 for additional information on tracking).

The possibility of meeting water resource objectives through changes in cropping practices is generally examined first for controlling upland erosion in agricultural areas. Depending on the subwatershed, predicted reductions in sediment and phosphorus delivery range from 5 to 20 percent if crop fields are buffered and farmed to "T", the standard for conservation planning. Soils in Polk County generally have a tolerable soil loss 3 to 5 tons per acre per year. "T" is based on the Universal Soil Loss Equation (USLE), and is met through crop rotations and tillage practices designed to limit soil erosion.

Cropland Erosion

To be classified as critical, a landowner's fields must be contributing greater than 1.25 ton/acre/year of sediment (equivalent to 5.0 pounds/acre/year of phosphorus) and have less than 20 feet of buffer to surface water resources. There are currently 15 fields identified in this category. For critical fields that are found, a combination of conservation methods may be used to reduce sediment and phosphorus delivery to surface water resources from these fields.

The eligible classification includes all remaining crop fields within the Horse Creek watershed that are farmed at > T or that have a sediment delivery of > zero. Fields in this category that have less than 20 feet of buffer; or that have a sediment delivery of > 1.0 ton/acre/year will be given priority (see Table

2-3). To protect wetlands in internally drained areas, fields that exhibit high sediment delivery to a wetland and that have less than a 20 foot buffer will also be considered a priority. Owners of these eligible priority fields will be contacted first regarding participation in the program.

Producers will be able to receive cost-sharing for trial high residue management systems on individual fields for one year. A conservation plan will be used to ensure use of high residue systems if cost sharing is provided for fields on the entire farm on a longer-term basis. Fields will be eligible for cost sharing for high residue management for a total of three years.

The total number of cropland acres in the Horse Creek Priority Watershed is 12,786 acres--which equates to 1,150 individual fields. Of these acres in cropland, 38.4% are farmed above "T", 15.2% are farmed with less than a 20-foot riparian buffer, and 4.4% meet both of these descriptive criteria. Under the current management scenario, 189.1 acres of cropland (1.5%) are considered critical, 4,362.6 acres of cropland (34.1%) would be eligible for minimum tillage practices to bring soil loss to "T", and 1,381.9 acres of cropland (10.8%) would be eligible for riparian buffer installation. (See Table 2-5 below for a summary of cropland acres > "T" and with < 20 foot riparian buffer.)

Gully Erosion

During the inventory process, locations of gullies were recorded and digitized in ARCVIEW. Information about gully length, width, depth, and ground cover was also recorded at this time. Based on this information, gully erosion has not been identified as a significant source of phosphorus and sediment to the watershed. However, gullies have been known to cause significant sediment deposition to surface water resources if they become active.

Gullies that are actively eroding and accessible to machinery will be classified as eligible for cost sharing. Inactive gullies are not eligible for cost sharing. Gully erosion eligibility criteria are further outlined in Table 2-6 of Chapter 2.

Streambank Erosion

Streambank erosion was not identified as a significant contributor of the overall sediment and phosphorus to the surface water resources of the Horse Creek Priority Watershed. However, there are specific locations in the Horse Lake, Round Lake, Big Lake, and Horse Creek subwatersheds where bank erosion and trampling has been identified as a significant habitat concern.

Of the 278,001 feet of inventoried streambank, 10 sites (3,955 feet) were eroding, 13 sites (16,512 feet) were trampled by livestock, and 1 site was slumped (50 feet). (See Table 2-8 for a summary of the streambank inventory results.) Overall, 20,517 feet of streambanks inventoried (7.4 %) were degraded from erosion, trampling, and slumping. These degraded streambanks contribute approximately 9.56 tons of sediment, or 38.24 pounds of phosphorus, annually to surface waters.

Critical sites are those with severe erosion, exhibiting a lateral recession rate of greater than 0.5 feet/year. No severe erosion sites were found during the streambank inventory. If severe sites are found during the implementation of the project, the *critical* criteria will be used.

Eligible sites are those with identified moderate lateral recession rates of between 0.1 and 0.5 feet/year. Ten moderate erosion sites have been identified in this eligible management category.

Ineligible streambank sites have lateral recession rates between 0.05 and 0.10 feet/year. These sites are not eligible for cost sharing.

Livestock Access

A streambank site may also be designated as critical if the bank is trampled by livestock to a point where an adequate sod cover is no longer present. Adequate sod cover is defined as a 90% vegetative cover that is maintained a minimum of 20 feet back from the ordinary high water mark. If a trampled streambank site in the Horse Creek watershed exceeds the adequate sod cover definition, the site will be designated as critical. The estimated number of sites that may fall into this category include 13 trampled streambanks.

Streambanks may be repaired by shaping and seeding or establishing a buffer and restricting cattle access. Banks must be managed so that adequate sod cover is maintained by restricting livestock access (although a cattle crossing may be allowed and cost shared), through the use of rotational grazing, or by significantly reducing the number of cattle allowed access. Where a crossing is approved, it is an eligible cost share practice. Remote watering is also a cost sharable practice where livestock access will be restricted.

Lake Shoreline Erosion

Lake shoreline erosion was identified as an insignificant source of the overall sediment and phosphorus carried to the surface water resources of the Horse Creek Priority Watershed. Critical sites are identified as those with severe erosion and a lateral recession rates of greater than 0.5 feet per year. Currently, no critical lakeshore erosion sites have been identified. However, if severe sites are discovered during implementation, the critical criteria will be used. Eligible management shorelines are those with identified moderate lateral recession rates of between 0.1 and 0.5 feet per year. Six moderate erosion sites have been identified as eligible during the lakeshore inventory. Ineligible lake shoreline sites with slight erosion have lateral recession rates between 0.05 and 0.1 feet per year. These sites are not eligible for cost sharing.

Lakeshore Buffers

Lack of adequate lakeshore buffers was a common problem identified throughout the lakes in the watershed. The newly adopted Shoreland Habitat Restoration BMP will be available to riparian property owners to restore lakeshore buffers. Landowners with existing shoreline vegetation that can be improved to provide greater habitat diversity will be eligible for this practice, as described in the guidelines for this BMP.

Well Abandonment

Abandoned wells are a significant threat to groundwater quality in the watershed. The Polk County LWRD will encourage all landowners to properly seal all unused or abandoned wells. Information on

the proper abandonment procedures will be provided to landowners when abandoned wells are located. All unused or abandoned wells in the watershed will be eligible for cost sharing to properly abandon the well.

Wetland Restoration & Protection

All landowners in the watershed will be eligible for restoration of drained or altered wetlands. The project will also support easements for wetland protection. Controlling sources of upland erosion will also serve to protect wetlands.

Land Easements

Nonpoint source program funds may be used to purchase land easements in order to support specified best management practices. These practices include, but are not limited to: Shoreline Buffers, Critical Area Stabilization, Wetland Restoration, Creation, or Protection, and Agricultural Sediment Basins.

In-Lake Nonpoint Source Control

Nutrient inactivation is an eligible treatment to reduce internal cycling of phosphorus from bottom sediments, thereby improving water quality conditions in a lake. Alum treatments and forms of biomanipulation are some treatment methods that may be used to achieve a lake's water quality goals that are not achievable with changes solely in land use/management. Control of rural nonpoint sources is necessary before in-lake practices will be considered eligible. Lakes where in-lake nonpoint source controls may be considered include Lotus, Horse, Mud, and Cedar.

Eligible Best Management Practices for Cost-Sharing

The best management practices listed in the following tables are used to address the pollution sources identified. Both eligible and critical sites qualify for cost sharing at the rates specified below.

Table S-4. Flat Rates for Best Management Practices

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

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

Funds Needed for Cost Sharing, Staffing, and Educational Activities

The DNR will award grants to Polk County and eligible municipalities for cost sharing, staff support, and educational activities. Table S-6 includes estimates of the financial assistance needed to implement nonpoint source controls in the Horse Creek Priority Watershed, assuming a 75 percent participation rate of eligible landowners.

Currently, 1.65 positions are being funded for the Horse Creek Priority Watershed Project. This current level includes the development of the Nonpoint Source Pollution Management Plan and an information and education program.

The total state estimated cost is $1,905,292. The total local estimated cost is $660,200. This figure includes the capital cost of practices, staff support, and easements necessary to match cost share funds. It does not include the cost of required maintenance for practices. These cost estimates are based on projections developed by agency planners and local staff. Historically, the actual expenditures for projects are less than the estimated costs.

Table S-5. State Cost Share Rates for Best Management Practices

Best Management Practices	State Cost Share Rate
Nutrient and Pesticide Management	50%
Pesticide Handling Spill Control Basins	70%
Livestock Fencing	50%
Intensive Grazing Management	50%[1]
Manure Storage Facilities	70% and 50% [2]
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 Abandonment and Relocation	70%
Roofs for Barnyard Runoff Management and Manure Storage Facilities	70%
Milking Center Waste Control	70%
Cattle Mounds	70%
Well Abandonment	70%
Shoreland Habitat Restoration	70%
Lake Sediment Treatment	70%

[1]To a maximum of $2,000 per watering system
[2]Manure storage is cost-shared at 70% for the first $20,000 of cost and at 50% for the remaining cost, not to exceed $35,000.
[3]Easements may be entered into with landowners in conjunction with these BMPs. See chapter two for an explanation of where easements may apply.

Table S-6. Watershed Project Cost Estimates for the Horse Creek Priority Watershed Project (75% Landowner Participation; $US)

Item	State Share	Local Share
Cost Share Funds: Practices	1,235,804	645,200
Cost Share Funds: Easements	75,000	1,500
Local Assistance Staff Funding	493,128	0
Information and Education Direct	32,000	10,000
Other Direct (travel, supplies, etc.)	19,360	3,500
Engineering Assistance	50,000	0
Professional Services	0	0
Subtotal	1,905,292	660,200
Total Project Cost	**$2,565,492**	

Source: DNR, DATCP, and Polk County Land & Water Resources Department

The cost estimates for table S-6 are projections based on the need to meet project goals and objectives. Based on the Financial Management Plan, dated October 30, 1998, and approved by the Land and Water Conservation Board, the plan allocates $1,134,670 for nonpoint source grant funds for this project. Should additional funds be made available in the statewide program, it is recommended that the county apply for a grant amendment to add additional needed resources.

Project Implementation

Project implementation is scheduled to begin in late 1999. Participants may sign cost-share agreements through the first eight years of the implementation phase, but all practices on the agreement must be installed before the project is scheduled to end. Landowners must maintain practices for at least ten years from the installation of the final practice on the agreement. Best Management Practices (BMPs) can be installed as soon as a landowner signs a cost-share agreement with the Polk County LWRD.

Information and Education

The Polk County LWRD will have overall responsibility for conducting an information and education program during the project. The goal of the Information and Education (I&E) Program is to help residents, property owners, public officials, and stakeholders of the watershed develop a sense of responsibility and ownership for the water resources and water resource problems in the watershed, and assume responsibility for protecting, restoring, and enhancing these aquatic resources. Residents, property owners, public officials, and stakeholders of the Horse Creek Priority Watershed will become directly engaged in activities that positively impact the water resources of the watershed.

The educational strategy is built around eight focus areas that are key to improving and protecting water quality in the Horse Creek Priority Watershed Project Area:

Shoreland Protection & Restoration
Septic System Construction & Maintenance
Construction Site Erosion Control
Agricultural Soil Erosion Control
Agricultural Nutrient & Pesticide Mgm't
Wetlands Protection & Restoration
Groundwater Quality Protection
Project Awareness & Participation

Making landowners and potential project participants aware of the project and the opportunities available will be a major focus of the I&E strategy during the first few years of the program. Prioritization of activities has been further identified in Chapter 5.

Project Evaluation and Monitoring

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

1. *Administrative Review*: This category includes the progress in providing technical and financial assistance to eligible landowners, and carrying out education activities identified in the plan. The Polk County LWRD and participating municipalities will track the progress in this area and report to the DNR and DATCP annually.
2. *Nonpoint Source Pollutant Reduction Levels*: The Polk County LWRD and participating municipalities will calculate the reductions in nonpoint source pollutant loadings resulting from changes in land use practices and report to the DNR and DATCP at an annual review meeting.
3. *Water Resource Evaluation & Monitoring*: The DNR will monitor changes in water quality, habitat, and water resource characteristics periodically during the project and at the end of the project period.
4. *Final Project Report*: The Polk County LWRD, in cooperation with DNR and DATCP, will prepare a final report for the Horse Creek Priority Watershed Project within 18 months of the end of grant period. The report will evaluate progress, provide documentation on attainment of water quality and pollutant reduction objectives, evaluate BMP effectiveness, and provide recommendations for improvement in the NPS program

CHAPTER ONE:
Purpose, Legal Status, and General Description

Wisconsin Nonpoint Source Water Pollution Abatement Program

The State Legislature created the Wisconsin Nonpoint Source Water Pollution Abatement Program in 1978. The goal of the Program is to improve and protect the water quality of streams, lakes, wetlands, and groundwater by reducing pollutants from urban and rural nonpoint sources. The 54-square-mile Horse Creek Watershed, located in Polk (88%) and St. Croix (12%) Counties, was designated a "priority watershed" in 1995. The primary objective of this watershed project is to reduce nonpoint source pollution in order to enhance and protect the water quality of the watershed's lakes, streams, wetlands, and groundwater. The Horse Creek Priority Watershed is made up of fifteen subwatersheds, each with a major waterbody of focus, and is considered a small-scale watershed within the Lower Apple River Watershed of the St. Croix River Basin (see Map 1-1).

Nonpoint sources of pollution originate from many sources including eroding agricultural lands, streambanks, roadsides, and construction sites; crop fields applied with manure, fertilizers, and pesticides; runoff from barnyards; and residential areas, which are primarily located around the watershed's lakes. Pollutants from nonpoint sources are carried to surface water resources through rainfall or snowmelt runoff or to the groundwater through seepage.

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

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

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

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

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

- Informational and educational (I & E) activities are developed to encourage participation in the watershed program. Countywide educational initiatives and special grant projects will also help to support I & E programming in the watershed.

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

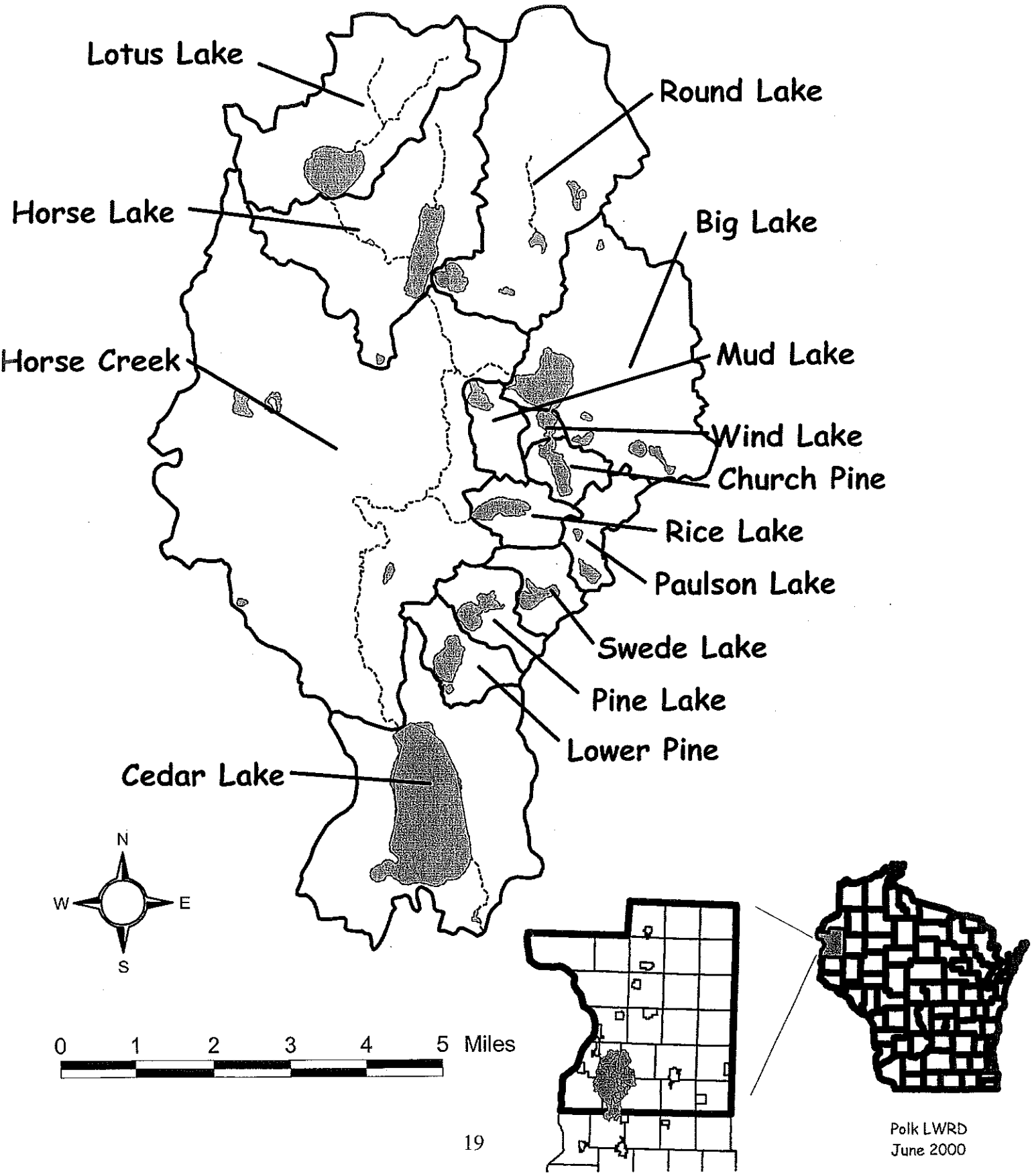
Legal Status of the Nonpoint Source Control Plan

The Horse Creek Priority Watershed Plan was prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program described in Section 144.25 of the Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code. It was prepared through the cooperative efforts of the DNR, DATCP, the Polk County LWRD, and the Horse Creek Priority Watershed Citizen Advisory Committee.

This nonpoint source pollution management plan provides the basis for the DNR to enter into cost share and local assistance grants with agencies responsible for project implementation and will be used as a guide to implement measures to achieve desired water quality conditions. If a discrepancy occurs between this plan and the statutes or the administrative rules, or if statutes or rules change during implementation, the statutes and rules will supersede the plan. This watershed plan does not in any way preclude the use by local, state, or federal governments of normal regulatory procedures developed to protect the environment. All local, state, and federal permit procedures must be followed. In addition, this plan does not preclude the DNR from using its authority under chapters 144 and 281 of the state statutes to regulate significant nonpoint pollution sources in the project area.

The plan was approved by DNR following approvals by the Polk County Board of Supervisors, the St. Croix County Board of Supervisors, and the Land and Water Conservation Board (LWCB).

Map 1-1. Horse Creek Priority Watershed



Amendments to the Plan

This plan is subject to the amendment process under NR 120.08(4) for substantive changes. The DNR will determine 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 281 of the Wisconsin Statutes. This program is separate from the Nonpoint Source Program and applies to certain classes of dischargers statewide as identified in NR 216. In cases where the programs do overlap, implementation grants may only apply to activities identified in the watershed plan. 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 only in the non-industrial parts of facilities where a problem has also been identified in the priority watershed plan as specified in NR 120.10 (1)(g).

Priority Watershed Project Planning and Implementation Phases

Planning Phase

- The planning phase of the Horse Creek Watershed project began in 1996. The following information gathering and evaluation activities were completed during this stage:
- Determine the conditions and uses of Horse Creek, area lakes, wetlands, and ground water.
- Inventory types of land uses and severity of nonpoint sources impacting water resources.
- 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 St. Croix 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 can be carried out.

Implementation Phase

The implementation phase of the Horse Creek Priority Watershed Project will begin following review of the draft Nonpoint Source Pollution Management Plan, a public hearing, and approval by the DNR, the Wisconsin Land and Water Conservation Board, the St. Croix County Board of Supervisors, and the Polk County Board of Supervisors.

Public input and review during plan development occurred primarily through the efforts of the Horse Creek Priority Watershed 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 resources and staff required for plan implementation.

- Polk County Land & Water Resources Department staff contact eligible landowners to assess their interest in installing best management practices identified in the plan.

- 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 are perpetual.

Location and Community Information

The Horse Creek Watershed is a 54-square-mile drainage basin located approximately 50 miles northeast of the Minneapolis-St. Paul Metropolitan Area in Northwestern Wisconsin (see Map 1-1). The watershed is predominantly rural with crop fields and dairy farms. Residential development is mostly scattered except for lakeshore development that is concentrated around Lotus, Cedar, Wind (Round), Church Pine, Big, Paulson, Swede, Pine and Lower Pine Lakes. The Horse Creek Priority Watershed lies within the larger Apple River Watershed of the St. Croix River Basin.

Civil Divisions

The townships of Osceola, Farmington, Alden and Garfield in Polk County, and the township of Star Prairie in St. Croix County all lie within the Horse Creek Priority Watershed. No incorporated areas are included within the watershed boundaries. There are two Lake Protection and Rehabilitation (P&R) Districts in the Watershed. The Cedar Lake P&R District includes 246 residences of which approximately 60 percent are occupied year-round. The Church Pine, Big, and Round Lake P&R District includes 245 residences of which approximately 45 percent are occupied year-round.

Population Size and Distribution

The Horse Creek Priority Watershed population resides in rural farm communities and concentrated lakeshore development, and is estimated to be about 2,600 persons. Growth rates in area townships have been strong in recent years generally exceeding those of both Polk County and the State of Wisconsin as illustrated in Table 1-1. Regional trends suggest that the watershed's population will continue to expand.

Table 1-1. Recent Population Changes

Township	1970	1980	1990	1997
	Population	Population (% Increase)	Population (% Increase)	Population (% Increase)
Osceola	769	1,066 (38.6%)	1,337 (25.4%)	1,524 (14.0%)
Farmington	1,156	1,195 (3.4%)	1,267 (6.0%)	1,343 (6.0%)
Alden	1,406	1,862 (32.4%)	2,133 (14.6%)	2,225 (4.3%)
Garfield	768	1,010 (31.5%)	1,107 (9.6%)	1,189 (7.4%)
Star Prairie	1,390	1,900 (36.7%)	2,098 (10.4%)	2,232 (6.4%)
Polk County	26,666	32,351 (21.3%)	34,773 (7.5%)	36,698 (5.5%)
Total in Wisconsin	**4,417,821**	**4,705,767 (6.5%)**	**4,891,769 (3.9%)**	**5,201,226 (6.3%)**

Source: U.S. Census Bureau and the Wisconsin Department of Administration's Demographic Services Center.

Land Uses

Rural land uses predominate in the watershed. Based on WISCLAND classification of LandSat photos taken in 1992 and 1993 (see Table 1-2), open space including forest, grassland/shrubs, and wetland comprises approximately 59 percent of the watershed land area. Agriculture including row crops and forage is the next most prevalent land use, comprising approximately 34 percent of the land area. Currently, cash grain and dairy farming are the primary agricultural enterprises. The remainder of the watershed land uses consists of residential/lakeshore development, commercial, and construction.

Table 1-2. Horse Creek Watershed Land Use Classes

Land Class	Acres	Percent Cover
Barren	57.3	0.2%
Forage	6,077.4	20.0%
Row Crops	4,119.8	13.6%
Forest	7,928.3	26.1%
Grassland/Shrubs	7,267.0	23.9%
Open Water	2,356.7	7.8%
Wetland	2,566.7	8.5%
Total	**30,373.2**	**100%**

To better estimate pollutant loads carried in surface water runoff, direct drainage and high retention areas (illustrated in Map 1-2) were included exclusively in the Horse Creek Priority watershed inventory conducted by the Polk County LWRD. Land uses specifically identified within the inventoried area of the watershed exhibit results similar to the LandSat classification of the entire watershed, with open space (woodlands, wetlands, and grassland) comprising approximately 52 percent of the land area and agriculture approximately 40 percent. The land use information gathered under the watershed inventory is generally representative of the land use throughout the entire watershed, with the exception of lakeshore residential that is concentrated around the watershed's lakes. Land uses were considered separately for each of the fourteen subwatersheds in the Horse Creek Priority Watershed and were classified in Table 1-3 by the following categories:

CR – Cropland
FM – Farmstead
WD - Woodland
LK - Lake
WT – Wetland
CN - Construction
GR - Grassland
PS – Pasture
RR - Rural Residential
CM - Commercial
LR - Lakeshore Residential

Table 1-3. Subwatershed Land Use Inventory (*Shown as a percentage of land use.*)

Watershed	CR	FM	RR	LK	WT	PS	WD	GR	CM	LR	CN
Big Lake	20.8	0.8	4.7	18.1	26.9	0.5	15.3	7.2	0	5.6	0
Cedar Lake	28.0	1.1	3.3	30.6	8.1	0.8	16.9	4.5	0.8	4.6	1.2
Church Pine	5.2	0	12.8	24.2	0.4	0	33.9	11.9	0	11.8	0
Horse Creek	50.8	1.2	3.3	0.2	17.2	1.6	20.2	4.8	0.4	0.05	0.3
Horse Lake	23.8	0.1	3.4	9.0	20.3	0.05	32.0	8.4	1.1	1.8	0
Lotus Lake	21.0	0.1	2.4	11.7	13.3	0.06	33.2	14.8	0.6	0.5	2.3
Lower Pine	11.0	0.2	2.5	28.9	8.8	0	20.6	17.8	0	10.2	0
Mud Lake	43.6	1.1	5.7	14.7	11.9	3.7	15.4	3.9	0	0	0
Paulson Lake	12.0	0	12.1	15.8	7.5	0	4.9	27.5	0	20.1	0
Pine Lake	14.1	0.4	2.5	25.2	12.0	4.2	34.9	0.8	0	5.9	0
Rice Lake	9.0	0	5.7	18.2	16.2	0	39.2	11.6	0	0.1	0
Round Lake	44.7	1.1	4.1	6.1	21.7	0.4	15.7	4.5	0	1.9	0
Swede Lake	24.9	0	1.1	18.4	17.7	0	18.0	12.7	0	7.1	0
Wind Lake	8.7	0	11.9	39.1	6.2	0	22.7	0	0	11.4	0

Because a considerable portion of the land in the watershed does not drain directly to surface water, Polk County's watershed inventory specifically focused on direct drainage and high retention areas only. Direct drainage accounts for 17,922.20 acres, high retention accounts for 1,226.34, and together they account for a total of 19,148.54 acres of land area that was inventoried by the Polk County Land & Water Resources Department. The entire watershed is 34,742.66 acres, or approximately 54 square miles. Map 1-2 illustrates internally drained, direct drainage, and high retention areas for each subwatershed. Land use results for direct drainage and high retention areas are reported in Table 1-2 and have been grouped as described below.

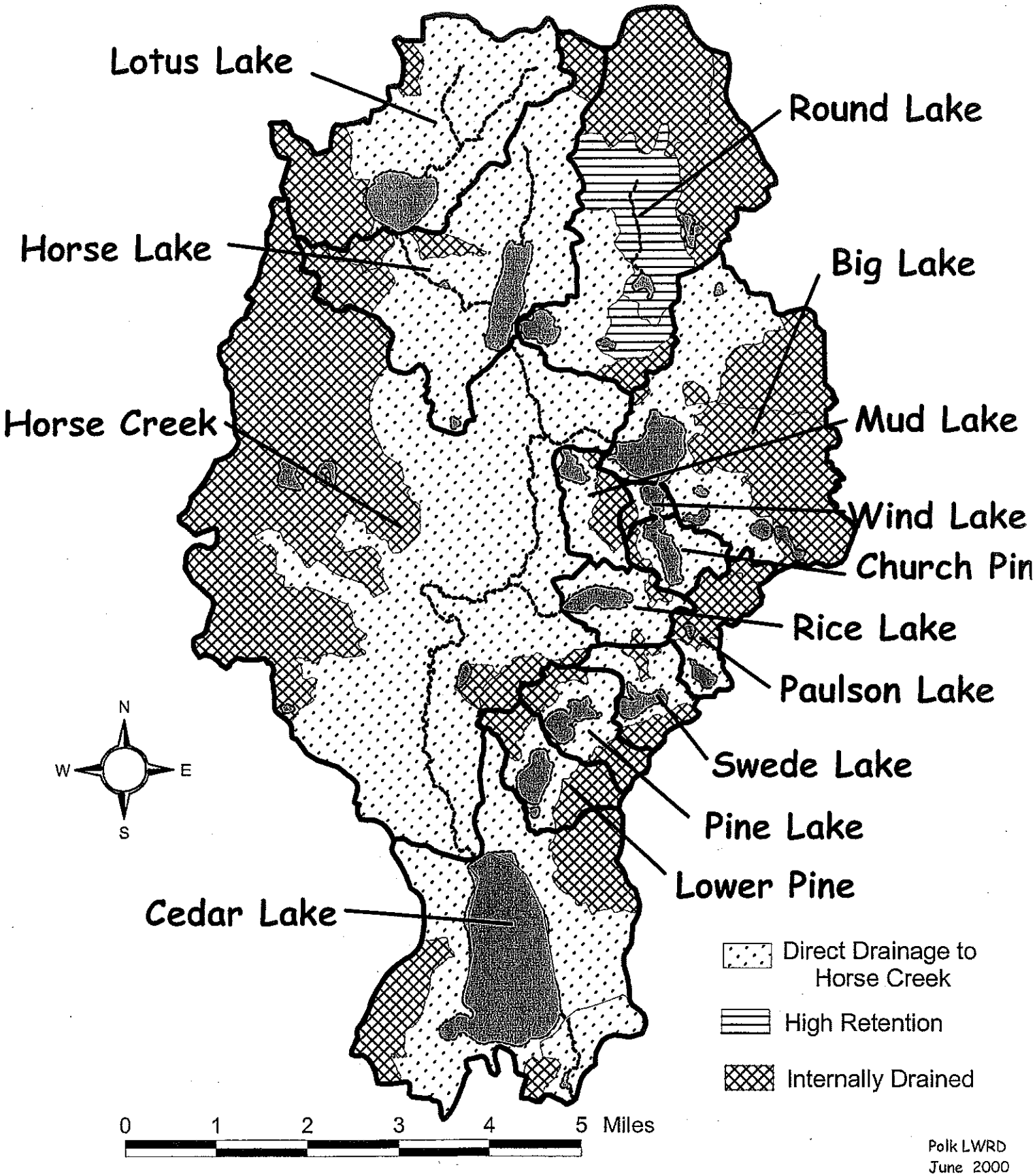
Ag related includes cropland, farmstead, and pasture.
Open space includes wetland, forestland, grassland, and golf course.
Disturbed includes construction sites.
Residential includes rural residential, lakeshore residential, and subdivisions.
Developed includes commercial land.

Table 1-4. Land Use within the Direct Drainage and High Retention Areas: 1996 [1]

Land Use	Acres	Percent
Ag. Related	**7,651.65**	**40%**
Pasture	(186.17)	(1%)
Cropland[2]	(7,295.41)	(38%)
Farmstead	(170.07)	(1%)
Open Space	**9,932.10**	**52%**
Grassland	(1,540.45)	(8%)
Woodland	(4,872.72)	(25%)
Wetland	(3,518.93)	(18%)
Residential	**1,351.72**	**7%**
Rural residential	(806.11)	(4%)
Lakeshore residential	(545.61)	(3%)
Developed	**100.82**	**1%**
Commercial	(100.82)	(1%)
Disturbed	**112.25**	**1%**
Construction sites	(112.25)	(1%)
Total	**19,148.54**	**100%**

[1]Sources: Polk County Digital Ortho Photos, DNR Wisconsin Wetland Inventory.
[2]Cropland currently in the conservation reserve program is included as grassland because it more accurately reflects ground cover and sediment delivery.

Map 1-2. Horse Creek Subwatershed Drainage Characteristics



CHAPTER TWO:
Watershed conditions and Objectives, Program Objectives, and Eligibility Criteria

In this chapter the physical characteristics, existing conditions, nonpoint sources, objectives and management categories for the water resources in the Horse Creek priority watershed are discussed. Information is presented for each subwatershed and pollution source.

Physical Setting

Climate and Precipitation

The frequency, duration and amount of precipitation influences surface and groundwater quality and quantity, soil moisture content, runoff characteristics, and the physical condition of waterways. The Horse 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 28 inches of rain and melted snow; the majority falls in the form of thunderstorms during the growing season (May-September). Most runoff occurs in February, March, and April when the land surface is frozen and soil moisture is highest.

Topography

The watershed has a relief that is primarily the result of glacial activity. Landforms generally associated with this area include outwash plains, pitted and collapsed outwash plains, fans, terraces, and moraines. The topography is gently rolling to very hilly.

Geology

The watershed is, for the most part, underlain with sandstone, dolomite, and basalt less than thirty meters deep. The overlying deposits are primarily outwash. These deposits are the result of glacial activity from the Superior Lobe of the Laurentide Ice Sheet. The Superior Lobe flowed into the area prior to 25,000 years ago and influenced the area until about 9,500 years ago.

Soils

The soils of Polk County originate from three major sources: continental glaciations, bedrock weathering, and fluvial action. Watershed soils include the following major soil associations:

Rosholt-Cromwell-Menahga Association The Rosholt-Cromwell-Menahga Association comprises the majority of the watershed and is located throughout. It consists of nearly level to very hilly, well drained to excessively drained loamy and sandy soils on pitted and collapsed outwash plains, stream terraces, and fans. It makes up about 80 percent of the watershed.

The well-drained Rosholt soils formed in loamy deposits 20-40 inches thick over sandy and gravelly outwash. The somewhat excessively drained Cromwell soils formed in loamy deposits 10-24 inches

thick over sandy and gravelly outwash. The excessively drained Menahga soils formed in sandy outwash. Permeability in the Rosholt and Cromwell soils is moderate or moderately rapid in the loamy mantle and is rapid or very rapid in the outwash. Permeability in the Menahga soils is Rapid. Surface runoff is slow to very rapid on Rosholt soils and slow to medium on Cromwell and Menahga soils depending on slope. Mineral and organic wetland soils do occur along streams and within some depressions.

Much of the acreage is used for cultivated crops. Many areas, especially the more sloping areas, are pasture or woodland. Erosion and droughtiness are the main limitations in managing the major soils for cultivated crops. Soil blowing is an additional hazard on Menahga soils. The potential is good to poor for cultivated crops and fair or good for woodland. The potential for residential development is good, but effluent from septic tank absorption fields can potentially pollute ground water.

Amery-Santiago-Magnor Association The Amery-Santiago-Magnor Association is scattered throughout the watershed. It consists of nearly level to very hilly, well-drained and somewhat poorly drained loamy and silty soils on remnant moraines. It makes up about 15 percent of the watershed.

The well-drained Amery soils formed in loamy till. The well drained Santiago soils and the somewhat poorly drained Magnor soils formed in silty deposits 12-36 inches thick over dense loamy till. Permeability in these soils is moderate in the upper part and very slow in the lower. Surface runoff is slow to very rapid on Amery soils, medium to very rapid on Santiago soils, and very slow to medium on Magnor soils. Mineral and organic wetland soils do occur along streams and within some depressions.

Much of the acreage is used for cultivated crops or pasture. Many areas are woodland. Erosion is the main limitation in cultivated areas. Excessive wetness and impoundment of water are additional problems on Magnor soils. If adequately protected against erosion, the major soils have good potential for cultivated crops. They also have good potential for woodland. The potential for residential development is fair because limitations for septic tank absorption fields are moderate or severe.

Antigo-Rosholt Association The Antigo-Rosholt Association is located as small areas in the northern and western portion of the watershed. It consists of nearly level to sloping well-drained loamy soils on outwash plains, fans, and stream terraces. It makes up about 5 percent of the watershed.

The well-drained Antigo soils formed in silty deposits 12-40 inches thick over sandy and gravelly outwash. The well-drained Rosholt soils formed in loamy deposits 20-40 inches thick over sandy and gravelly outwash. Permeability is moderate in the silty and loamy mantles and is rapid or very rapid in the outwash. Surface runoff is slow to medium depending on slope. Mineral and organic wetland soils do occur along streams and within some depressions.

Most areas are used for cultivated crops. Maintaining tilth and fertility and controlling erosion in sloping areas are the main concerns in managing the major soils for cultivated crops. The potential for both cultivated crops and woodland is good. The potential for residential development is good, but the effluent from septic tank absorption fields can potentially pollute ground water.

Water Resource Conditions and Goals

In this section the general conditions of the surface and groundwater resources in the Horse Creek watershed are described. The classifications used for Wisconsin's waters and the descriptions of the surface water and recreational resources in the watershed are also included. Descriptions of subwatersheds are also included and several tables provide summaries of the watershed's resources. Table 2-1 should serve as a useful summary of the water quality goals and nonpoint source reduction objectives for each subwatershed. Groundwater resources and quality are also discussed.

Water Use Classifications

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

In addition to these standards, other criteria were used to assess the suitability of surface waters for recreational and biological uses. Data characterizing stream size and accessibility were used to help determine the suitability and types of recreation a stream is capable of supporting. Information on current recreational use of surface waters (provided by users at public access points and discussions with local officials) is also used to assess suitability of surface waters for recreation. Use classifications and supporting water quality standards used in evaluating water resource conditions are discussed below.

Biological Stream Use

Wisconsin streams are classified according to the biological uses desired for each stream. These classifications are listed for each stream in the water quality management plans developed for each basin in the subwatershed discussions. Resources are classified as one of the following:

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

Table 2-1. Water Quality Goals and Nonpoint Source Pollution Reduction Objectives

Subwatershed / Lake	Water Quality Goals	Nonpoint Source Reduction Objectives
Big Lake	Reduce inlake total phosphorus (TP) from 22 to 20 ppm Restore shoreline habitat. Protect aquatic plant sensitive areas.	Total phosphorus (TP) reduction of 10% from agricultural sources
Round Lake	Reduce inlake TP from 29 to 25ppm. Form lake association or district in cooperation with Lotus Lake and Horse Lake. Protect wetlands and buffers.	TP reduction of 13% from agricultural sources
Church Pine Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
Lower Pine Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
Paulsen Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
Pine Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
Rice Lake	Maintain and protect water quality Protect shoreline buffers Protect wetlands	TP reduction of 5% from agricultural sources
Swede Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
Wind Lake	Maintain and protect water quality Reestablish shoreline buffers Protect aquatic plant sensitive areas	TP reduction of 5% from agricultural sources
Lotus Lake	Maintain existing water quality Form lake association or district in cooperation with Round Lake and Horse Lake	TP reduction of 10% from agricultural sources
Horse Lake	Maintain existing water quality Form lake association or district in cooperation with Lotus Lake and Round Lake	TP reduction of 5% from agricultural sources
Mud Lake	Maintain existing water quality	TP reduction of 5% from agricultural sources
Cedar Lake	Maintain existing water quality	TP reduction of 3% from immediate watershed (additional 12% from Horse Creek subwatershed
Horse Creek	Reduce TP export to Cedar Lake by 12% Reduce in-stream sedimentation and in-stream habitat loss Protect wetland and riparian vegetative buffers	TP reduction of 20% Reduce sediment loading to Horse Creek by 20%

Water Resource Conditions and Goals

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Pine Lake	Maintain and protect water quality Reestablish shoreline buffers	TP reduction of 5% from agricultural sources
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Lotus Lake	Maintain existing water quality Form lake association or district in cooperation with Round Lake and Horse Lake	TP reduction of 10% from agricultural sources
Horse Lake	Maintain existing water quality Form lake association or district in cooperation with Lotus Lake and Round Lake	TP reduction of 5% from agricultural sources
Mud Lake	Maintain existing water quality	TP reduction of 5% from agricultural sources
Cedar Lake	Maintain existing water quality	TP reduction of 3% from immediate watershed (additional 12% from Horse Creek subwatershed
Horse Creek	Reduce TP export to Cedar Lake by 12% Reduce in-stream sedimentation and in-stream habitat loss Protect wetland and riparian vegetative buffers	TP reduction of 20% Reduce sediment loading to Horse Creek by 20%

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

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

Table 2-2, on the following page, summarizes the water resource classification and conditions for the Horse Creek Watershed.

Surface Water and Recreational Resources

For the purposes of this project, the Horse Creek Watershed is subdivided into 14 individual subwatersheds. Major tributaries, associated streams, wetlands, and subwatershed divides are shown on Map 1-1. See Table 2-2 for the general conditions of the major resources in the Horse Creek Watershed.

Subwatersheds in the Horse Creek Priority Watershed

Big Lake	(BL)	Mud Lake	(ML)
Cedar Lake	(CL)	Paulson Lake	(PL)
Church Pine	(CP)	Pine Lake	(PN)
Horse Creek	(HC)	Rice Lake	(RC)
Horse Lake	(HL)	Round Lake	(RL)
Lotus Lake	(LL)	Swede Lake	(SL)
Lower Pine	(LP)	Wind Lake	(WL)

Streams

The Horse Creek priority watershed project includes 8 named streams. Horse Creek is 16 miles long and is the largest stream in the project area. It flows through Lotus and Horse Lakes before emptying into Cedar Lake. Cedar Creek flows out of Cedar Lake and empties into the Apple River one and one half miles west of Star Prairie. Both Horse Creek and Cedar Creek are classified as warm water, fish and aquatic life streams.

Table 2-2. Water Resource Conditions

Water Body	Biological Use		Problems Related to Nonpoint Source Pollution
	Current	Potential	
Behning Creek	CW	CW, Class 1	Loss of instream habitat. Loss of fish community structure.
Cedar Creek	WWSF	WWSF	Sediment deposition instream.
Forest Creek	WWSF	WWSF	Sediment deposition instream.
Horse Creek	WWSF	WWSF	Low dissolved oxygen levels. Loss of instream habitat. Loss of fish community structure.
Marlpit Creek	WWSF	CW, Class 1	N.A.
Mud Lake Creek	WWSF	WWSF	N.A.
North Big Lake Creek	CW	CW	Low dissolved oxygen levels. Impaired temperature regime.
Rice Creek	WWSF	WWSF	N.A.

Behning Creek and North Big Lake Creek historically supported a brook trout population. Today the brook trout fishery does not exist in either stream. Marlpit Creek also is reported as having supported brook trout at one time, although due to its small size it never supported a significant fishery. The remaining smaller streams are warm water forage fisheries. The streams are discussed in more detail in the following subwatershed descriptions later in this chapter.

Lakes

Lakes are the predominant surface water features in this watershed. There are 22 named lakes within the project area. All of the lakes that Horse Creek flows through exhibit extensive nutrient related

problems such as algae blooms and decreased water quality. There are also some very high quality oligotrophic lakes within the project boundaries including Lower Pine and Church Pine Lakes. The remaining lakes range from mesotrophic to eutrophic.

Shoreline buffers have been extensively altered or eliminated on some of the lakes in the project. Other lakes within the project boundaries still have at least some of the important components of a healthy lakeshore buffer.

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 are a prominent feature in this watershed both in the riparian corridors and in internally drained areas throughout the watershed. Floodplain wetlands support furbearers and water fowl populations and may provide seasonal habitat for sport fish.

Larger wetlands were evaluated for their functional values and a number of high quality wetlands have been identified as needing protection. In particular, the wetland corridor along Marlpit Creek and a 140 acre wetland northeast of Big Lake have been noted as high quality and in need or protection. Other areas noted include the 1,180-acre wetland in the Horse Creek subwatershed, the riparian wetland buffers along Forest Creek, Cedar Creek, Mud Lake Creek, and Rice Creek.

A wetland inventory using GIS and the Wisconsin Wetland Inventory, was conducted to identify potential sites for restoration. Drained wetlands 5 acres or greater were identified by matching areas with wet soils which do not have existing wetlands. 193 sites were identified involving 142 landowners.

Recreation

The lakes, streams, and wetlands offer diverse and high-quality recreational opportunities. Water related activities range from trout fishing to large sport fish contests. Other popular activities are wildlife observation, hiking, hunting, and trapping. Many of the lake shorelines are highly developed with seasonal and year round homes. Nearly all of the lakes have public boat landings and some have private campgrounds.

Groundwater Resources

Groundwater is the main source of drinking water in the Horse Creek Priority Watershed. Groundwater is stored underground in pore spaces and cracks within the soil and rock layers. Unconsolidated sediments and porous rock layers that yield groundwater in usable quantities are called aquifers. Aquifers receive and store water (called recharge) and discharge groundwater to lakes, streams and wetlands.

Conclusions

- Nitrate analyses of private wells show human impact on groundwater; although, in general, groundwater quality is considered good in the Horse Creek Watershed.

- Naturally occurring phosphorus in glacial aquifers in the watershed may be the source of high phosphorus levels in lakes that groundwater discharges into (e.g. Horse Lake, Muldoon et.al., 1990).

Recommendations

- Nutrient management cost sharing should be available to farmers in the watershed.

- A wellhead protection plan should be written for the existing well and will be required if a new well is installed for the Village of Star Prairie. A wellhead protection ordinance is also recommended for the Village.

Geology and Hydrogeology

The geology of the watershed has been described by Mudrey and others (1987) (1990). The following is a summary of those reports. Bedrock in the Horse Creek watershed consists of Precambrian basalt overlain by a series of Cambrian sandstone and Ordovician dolomite. The Precambrian age (approximately 1.1 billion years ago) basalt forms a topographic high that runs north of the watershed. During Cambrian time, approximately 523 to 505 million years ago, a series of sandstone, shale, and dolomite was deposited over the basalt. These rocks consist of the following from oldest to youngest (deepest to shallowest):

- The Mt. Simon, a thick (>470 feet) well-sorted sandstone interbedded with shale;
- The Eau Claire (100-150 feet thick) a brownish, poorly sorted sandstone with interbedded silty layers that contains abundant fossils and glauconite, a green micaceous mineral;
- The Wonewoc (15-60 feet thick) consists of a well sorted white sandstone (the Galesville member) overlain by a poorly sorted white sandstone (the Ironton member);
- The Tunnel City group (100-185 feet thick) a well-sorted sandstone;
- The Jordan sandstone (100 feet thick) and St. Lawerance shale (less than 10 feet thick);
- The Prairie du Chien Group (90 to 110 feet thick) consists of Ordovician age (505-468 million years ago) dolomite interbedded with siltstone; and
- The Ancell group (80 feet thick) a moderately sorted, light colored sandstone.

The area was covered with glaciers several times. As recently as 15,000 years ago sediment was deposited during glacial advance. Glacial sediment in the Horse Creek watershed consists of sediments deposited in meltwater streams and undifferentiated sediment. These sediments are part of the Sylvan Lake Member of the Copper Falls formation and contain a moderate amount of phosphorus.

Direction of Groundwater Flow

Groundwater flows from recharge areas such as hills and exposed bedrock to discharge areas such as lakes, rivers and wetlands. Regional recharge areas are typically farther from discharge areas. In the Horse Creek Watershed regional groundwater flow is west toward the St Croix River. Recharge areas for local groundwater flow are generally closer to discharge areas. Local groundwater flow follows the topography in the Horse Creek Watershed.

Groundwater Quality

Fifty-six private well samples were analyzed for nitrate+nitrite and sixty well samples were analyzed for atrazine using the triazine screen. Sample analytical results show that twenty-three samples exceeded the preventive action limit (PAL) of 2 mg/L and 11 additional samples exceeded the enforcement standard (ES) for nitrate+nitrite of 10 mg/L. Twenty-two sample analytical results were below the PAL of which 3 samples showed no detection of nitrate+nitrite. The highest level of nitrate+nitrite detected was 24.3 mg/L. Sample results do not indicate a pattern of groundwater contamination.

Sixty private well samples were analyzed for the pesticide atrazine using the triazine screen. Forty-four sample analytical results showed no detection of triazine. Ten sample analytical results had detections below the PAL for atrazine plus metabolites of 0.3 ug/L. No sample analytical results exceeded the atrazine ES. Sample results do not indicate a pattern of groundwater contamination

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

High levels of naturally occurring phosphorus in groundwater have been found in northwestern Wisconsin. Muldoon and others (1990) looked at the source of phosphorus in this area and determined that some Pleistocene age sand and gravel layers contained high concentrations of phosphorus in a form available to plants. Horse Lake, which is located within the watershed, had high levels of phosphorus. Horse Lake is located in a groundwater discharge area and groundwater in the area has high phosphorus levels suggesting that Horse Lake's High phosphorus content is partially due to high phosphorus levels in the groundwater.

Water Supplies

The Village of Star Prairie is located on the southern boundary of the Horse Creek Watershed. The municipal system consists of one well constructed in 1972. The well currently serves a population of approximately 507 (Stevens Engineers, Inc., June, 1996). Well Number 1 is 315 feet deep and draws water from the Cambrian sandstone aquifer (Norwalk formation). A new well is being proposed for the

Village to insure a backup water supply and additional water for population growth and adequate water for fire. A copy of the geologic log for the existing well can be found in the appendix.

Potential Groundwater Quality Problems

Previously identified potential groundwater quality problems in the Horse Creek Watershed are provided below. These sites were listed in the DNR's Bureau for Remediation and Redevelopment Tracking System that lists Superfund sites; solid and hazardous waste disposal sites, leaking underground storage tank (LUST) sites and reported spill sites.

Site Name	Activity	Section	Township	Range
WANDEROOS GIFT & GROCERY	LUST	SEC 32	TWN33	RNG17

Water Quality Goals and Project Objectives

The water quality goals and project objectives for this project were developed by staff from DNR Northern Region, the Polk County Land & Water Resources Department and staff from the DATCP. Goals and objectives for each subwatershed are included in the next section. Details can be found in the Horse Creek Project Appraisal Report, Draft (Cahow, 1999) available through DNR's Northern Region Office in Spooner.

Following are the overall goals for water resources:

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

- ***Enhancement***: Enhancement refers to a change in the overall condition of a stream or lake within its given biological and recreational use category. For example, if a stream supports a warm water 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 warm water game fish, but no longer does. This goal seeks to improve conditions allowing viable populations of forage and warm water 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.

Subwatershed Descriptions

This section describes the physical and water quality conditions for each subwatershed in the Horse 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 goals and objectives for the subwatershed. A more detailed description of each watershed can be found in the water quality appraisal report written by the DNR and available through DNR's Northern Region Office. Table 2-2 summarizes the subwatershed conditions.

Big Lake Subwatershed (BL)

Description

The Big Lake subwatershed is approximately 3,737 acres in size, with 1,775 acres in direct drainage areas. Fifty-three percent of the land within this subwatershed is internally drained, which includes land draining to isolated wetlands and closed depressions. Predominant land use in the direct drainage areas include open space (wetland/woodland/grassland) at 878.01 acres, followed by agriculture (cropland/farmstead/pasture) at 394.01 acres. Big Lake is the last in a chain of three lakes. The chain includes Church Pine and Wind (Round) Lakes upstream of Big Lake. North Creek flows into the north end of Big Lake.

Water Quality Conditions

Big Lake is classified as a mesotrophic lake and is the major waterbody in this subwatershed. The lake is approximately 244 acres in size with a maximum depth of 26 feet. Fish species present include northern pike, walleyes, largemouth bass, bluegills, black crappies, rock bass, pumpkinseed, perch, and bullheads. The natural vegetation along the shoreline has been altered or removed with homes serving as the primary development.

To control the phosphorus release from the sediment a lake aeration system has been installed. However, results of the aeration project are varied and have had limited success due to inconsistent operation of the system.

The Horse Creek subwatershed is the major upland source of nutrients to Cedar Lake. In evaluating the entire external watershed load, cropland drainage from the Horse Creek subwatershed accounts for 33 percent of the lake phosphorus load, with barnyards and construction sites both at approximately 3 percent of the load. The shoreline of Cedar Lake has been heavily developed so that little natural buffer remains.

The poor water quality conditions in Cedar Lake have resulted in the lake being sited on the federal 303(d) list of impaired waters in Wisconsin. To make progress in removing Cedar Lake from the federal list, lake water quality improvements will have to be made through a combination of efforts in upland phosphorus reductions and additional sediment phosphorus control and carp management. This

priority watershed project is only one of the various state, federal and local programs that must be coordinated if improvements are to be made in the lake water quality.

Nonpoint Source Pollutants

- Nutrient loading to Cedar Lake from the immediate subwatershed accounts for only 14 percent of the total lake nutrient loading. Carp account for approximately 16.5 percent of the overall phosphorus budget in the lake. In lake release of phosphorus was not incorporated into the lake model used in this project as spring phosphorus concentrations were used to calibrate the models. Further modeling is needed to define current phosphorus loading from the lake sediments. Approximately 42 percent of the lake nutrient load comes from the upstream Horse Creek subwatershed.

- One barnyard in this subwatershed drains directly to surface water. Two drain to closed depressions and 6 drain to wetlands.

- Cropland phosphorus loading from the immediate subwatershed contributes 9 percent of the annual phosphorus load to Cedar Lake.

- Cropland phosphorus loading from the Horse Creek subwatershed accounts for 23 percent of the overall phosphorus budget in Cedar Lake.

Water Resource Goals and Objectives

To achieve any significant reduction in phosphorus concentrations in Cedar Lake, nutrient reduction strategies must include a plan to target the nutrient loading from the Horse Creek subwatershed and lake management practices for the reduction of in lake nutrient cycling (carp control and sediment control).

Round Lake Subwatershed (RL)

Description

The Round Lake subwatershed is approximately 3,928 acres and includes Marlpit Creek, Little Horseshoe Lake, Duck Lake and two small, unnamed lakes. Direct drainage areas account for 736.41 acres, while high retention areas account for 1,226.34 acres. The subwatershed includes a 200-acre wetland at the headwaters of Marlpit Creek and bordering a majority of the shoreline of Duck Lake. A large part of the land within this subwatershed is internally drained, which includes land draining to isolated wetlands and closed depressions. Of the total subwatershed acreage, approximately 1,573 acres drain directly to Round Lake. Predominate land use in direct drainage areas include open space (wetland/woodland/grassland) at 382.40 acres, followed by agriculture (cropland/farmstead/ pasture) at 206.84 acres. Predominate land use in the high retention area include agriculture (cropland/farmstead) 699.09, followed by open space (wetland/woodland/grassland) at 438.9 acres.

Water Quality Conditions

Round Lake is the major waterbody in this subwatershed. The lake is classified as a eutrophic lake and is approximately 67 acres in size with a maximum depth of 26 feet. Fish species present include northern pike, walleyes, largemouth bass, bluegills, black crappies, rock bass, pumpkinseed, perch, and bullheads. The shoreline is not as heavily developed as many of the lakes in this project area. Much of the natural shoreline has been maintained although there are some shoreline areas on the southwest area of the lake that lack adequate buffers and should be a focus for restoration.

Other waterbodies of concern include Marlpit Creek, which begins approximately one mile north of Duck Lake. Both Marlpit Creek and Duck Lake have bordering wetlands that are of exceptional quality and diversity.

Nonpoint Source Pollutants

- The Round Lake Subwatershed contains 2 inventoried animal lots that in total, contribute 85 pounds of the annual phosphorus load to the lake. This represents an estimated 16 percent of the phosphorus loading for Round Lake.

- Phosphorus loading from cropland in the Round Lake Subwatershed is estimated to be 114 pounds of phosphorus annually which amounts to approximately 22 percent of the annual phosphorus load to the lake.

- Streambank inventory identified 3,090 feet of eroded streambanks and 4,214 feet of trampled banks with areas of unrestricted livestock access.

Water Resource Goals and Objectives:

Improve Water Quality:
Reduce in lake mean summer total phosphorus concentrations from 29 to 25 parts per million. To reach this goal total phosphorus loading reduction of 13 percent must be achieved.

To better evaluate and manage in-lake water quality issues, the formation of a lake association or lake district including Horse Lake, Round Lake and Lotus Lake is recommended.

Protect the high quality wetlands and natural shoreline on lakes and streams:
Restore shoreline buffer and habitat, particularly in the priority areas identified in the water quality appraisal report.

Church Pine Lake Subwatershed (CP)

Description

The Church Pine Lake subwatershed is approximately 416 acres in size, with approximately 376 of those acres in direct drainage. Church Pine Lake has no inlet stream and is located at the headwaters of the Big, Wind, and Church Pine chain of lakes. The Lake has a surface area of approximately 106 acres and a maximum depth of 45 feet. Predominant land use in the direct drainage areas include open space (wetland/woodland/grassland) at 173.57 acres, followed by rural residential at 48.02 acres.
Water Quality Conditions

Church Pine Lake is the major water body in this subwatershed. The lake is classified as an oligotrophic lake and is approximately 106 acres in size with a maximum depth of 45 feet. Fish species present include northern pike, walleyes, largemouth bass, bluegills, black crappies, rock bass, pumpkinseed and bullheads. Church Pine Lake does not experience algae problems and is highly desirable for water body contact recreation as well as other recreational activities. Much of the shoreline has been altered for development, eliminating the natural buffer and valuable riparian habitat.

Nonpoint Source Pollutants

- The Church Pine Lake Subwatershed does not contain any animal lots.

- Phosphorus loading from cropland in the Church Pine Lake Subwatershed is estimated to be 35 pounds of phosphorus annually which amounts to approximately 21 percent of the annual phosphorus load to the lake.

- Runoff from rural and lakeshore residential development combined account for 22 percent of the total annual phosphorus load to Church Pine Lake.

Water Resource Goals and Objectives

Protect water quality:
Maintain the excellent water quality in Church Pine Lake.

Restore shoreline habitat and buffering capacity:
Re-establish shoreline buffers in developed areas of the lake, particularly on the southwest shoreline. Restore areas identified in the aquatic plant sensitive area report.

Lower Pine Lake Subwatershed (LP)

Description

The Lower Pine Lake subwatershed is approximately 694 acres in size, of which 352 acres are in direct drainage areas. Predominant land use in the direct drainage areas include open space (wetland/woodland/grassland) at 165.76 acres, followed by agriculture (cropland/farmstead) at 39.46 acres, and construction at 36.01 acres.

Water Quality Conditions

Lower Pine Lake is a land locked, high quality lake and is the major waterbody in this subwatershed. The lake is classified as oligotrophic and is approximately 90 acres in size with a maximum depth of 102 feet. Fish species present include northern pike, largemouth bass, bluegills and ciscos. Brown, brook and rainbow trout may also be present. Much of the shoreline is developed with homes. The lakeshore buffer has been altered in much of the developed area. The shoreline buffer on Lower Pine Lake is especially important considering the gradient of the shoreline slope. The steeper the slope, the greater the chances of increased sediment and nutrient delivery to the lake.

Nonpoint Source Pollutants

- The Lower Pine Lake subwatershed does not contain any barnyards.
- Phosphorus loading from cropland in the Lower Pine Lake Subwatershed is estimated to be 14 pounds of phosphorus annually which amounts to approximately 9 percent of the annual phosphorus load to the lake.
- Lakeshore residential development contributes approximately 16 pounds of phosphorus annually to the lake that amounts to approximately 10 percent of the annual phosphorus load
- Phosphorus contributions from the upstream watershed (Pine Lake) accounts for 43 pounds of phosphorus annually, which is 27 percent of the total annual phosphorus load to the lake.

Water Resource Goals and Objectives

<u>Protect water quality:</u>
Maintain the excellent water quality in Lower Pine Lake

<u>Restore shoreline habitat and buffering capacity:</u>
Re-establish shoreline buffers in developed areas of the lake

Pine Lake Subwatershed (PN)

Description

The Pine Lake subwatershed is approximately 661 acres in size, of which 399 acres are in direct drainage areas. Pine Lake is the major water body in this subwatershed. Predominant land use in the direct drainage areas include open space (wetland/woodland/grassland) at 190.54 acres, followed by agriculture (cropland/farmstead/pasture) at 74.37 acres.

Water Quality Conditions

Pine Lake is a land locked seepage lake with good water quality. The major water body in this subwatershed, Pine Lake is classified as mesotrophic and is approximately 82 acres in size with a maximum depth of 34 feet. Fish species present include northern pike, largemouth bass, bluegills, pumpkin seeds, and bullheads. A fairly high percentage of the Pine Lake shoreline is well buffered. There are a few areas on the lake that could benefit from enhancement of the shoreline buffer. An aquatic plant sensitive areas report has also been developed for Pine Lake which identifies three areas in the lake that are critical habitat in need of protection.

Nonpoint Source Pollutants

- The Pine Lake subwatershed contains one inventoried barnyard that is internally drained and is not a surface water phosphorus source to the lake.

- Phosphorus loading from cropland in the Pine Lake Subwatershed is estimated to be 105 pounds of phosphorus annually which amounts to approximately 43 percent of the annual phosphorus load to the lake.

Water Resource Goals and Objectives

Protect water quality:

Maintain the excellent water quality in Pine Lake. Protect aquatic plant sensitive areas identified in the aquatic plant sensitive area report.

Restore shoreline habitat and buffering capacity:

Re-establish shoreline buffers in developed areas of the lake.

Paulsen Lake Subwatershed (PN)

Description

The Paulsen Lake Subwatershed is approximately 573 acres in size, of which 172 acres are in direct drainage. Paulsen Lake is the major waterbody in this subwatershed. Predominant land use in the direct drainage areas include open space (wetland/woodland/grassland) at 68.56 acres, followed by lakeshore residential at 34.57 acres.

Water Quality Conditions

Paulsen Lake is the major waterbody in this subwatershed. It is a small seepage lake with good water quality. The lake does, however, experience mild algae blooms and is classified as mesotrophic. It is approximately 30 acres in size with a maximum depth of 32 feet. Much of the shoreline buffer on Paulsen Lake has been lost due to lakeshore development. A small percentage of the shoreline remains undeveloped on this lake.

Nonpoint Source Pollutants

- There are no barnyards in the Paulsen Lake subwatershed.

- Phosphorus loading from cropland in the Paulsen Lake Subwatershed is estimated to be 9 pounds of phosphorus annually which amounts to approximately 8 percent of the annual phosphorus load to the lake.

Water Resource Goals and Objectives

Protect water quality:
Maintain the excellent water quality in Paulsen Lake.

Restore shoreline habitat and buffering capacity:
Re-establish shoreline buffers in developed areas of the lake.

Swede Lake Subwatershed (SL)

Description

The Swede Lake Subwatershed is approximately 567 acres, of which 392 acres are in direct drainage areas. Swede Lake is the major waterbody in this subwatershed. Predominant land use in the direct drainage areas include open space (wetland/woodland/grassland) at 190.10 acres, followed by agriculture (cropland) 97.51 acres.

Water Quality Conditions

Swede Lake is a small seepage lake that is approximately 68 acres in size with a maximum depth of 32 feet. It is the major waterbody in this subwatershed and is classified as oligotrophic with good water quality. The lake does, however, experience mild algae blooms. The natural shoreline buffer on Swede Lake is still in good condition. Three areas have been identified as needing buffer restoration and should be a focus for protection on this waterbody. An aquatic plant sensitive area survey was conducted on this lake and two areas have been identified as needing protection.

Nonpoint Source Pollutants

- There are no barnyards in the Swede Lake subwatershed.

- Phosphorus loading from cropland in the Swede Lake Subwatershed is estimated to be 118 pounds of phosphorus annually which amounts to approximately 50 percent of the annual phosphorus load to the lake.

Water Resource Goals and Objectives

Protect water quality:
Protect the excellent water quality in Swede Lake.

Protect shoreline habitat and buffering capacity
Restore lakeshore buffer in three areas identified in the water quality appraisal report.

Wind Lake Subwatershed (WL)

Description

The Wind Lake Subwatershed is approximately 144 acres in size, of which 111 acres are in the direct drainage areas. Predominant land use in the direct drainage areas include open space (wetland/woodland) at 32.03 acres, followed by rural residential at 13.16 acres, and lakeshore residential at 12.6 acres.

Water Quality Conditions

Wind Lake is a relatively small lake created by two constrictions located between Church Pine Lake and Big Lake. The lake is classified as mesotrophic and is approximately 42 acres in size with a maximum depth of 27 feet. Fish species present include northern pike, walleyes, largemouth bass, bluegills, black crappies, rock bass and bullheads. Two areas on the lake have been identified as needing lakeshore buffer restoration. The entire lake is an aquatic plant sensitive area because of the

high quality of habitat and diversity and density of plants that are important to the health of the entire chain of lakes (Big, Wind and Church Pine).

Nonpoint Source Pollutants

- There are no barnyards in the Wind Lake subwatershed.
- Phosphorus loading from cropland in the Wind Lake Subwatershed is estimated to be 10 pounds of phosphorus annually which amounts to approximately 17 percent of the annual phosphorus load to the lake.
- Septic systems have been identified as a significant source of phosphorus loading to this lake.

Water Resource Goals and Objectives

Protect water quality:
Protect the excellent water quality in Wind Lake. Protect the aquatic plant sensitive area designation of the entire lake. Lakeshore property owners should work in cooperation with County zoning to evaluate adequacy of septic systems.

Protect shoreline habitat and increase buffering capacity:
Restore lakeshore buffer in two areas identified in the water quality appraisal report

Restore the wetland resources within the subwatershed.

Rice Lake Subwatershed (RL)

Description

The Rice Lake subwatershed is approximately 593 acres in size, of which 539 acres are in direct drainage areas. Predominant land use in the direct drainage areas include open space (wetland/woodland/grassland) at 361.74 acres, followed by agriculture (cropland) at 48.28 acres.

Water Quality Conditions

Rice Lake is a relatively shallow fertile lake with an extensive emergent plant community. It provides an important role as a waterfowl production area. Water quality was not monitored as a part of this watershed planning effort. The lake is subject to periodic winter freeze-out. Northern pike, largemouth bass and pan fish are present.

Nonpoint Source Pollutants

- There are no barnyards in the Rice Lake subwatershed.

- Phosphorus loading from cropland in the Rice Lake subwatershed is estimated to be 34 pounds annually which amounts to approximately 23 percent of the annual load to the lake.

Water Resource Goals and Objectives

Protect water quality:
Maintain the water quality of Rice Lake.

Protect shoreline habitat and increase buffering capacity:
Restore lakeshore buffers and wetland resources.

Lotus Lake Subwatershed (LL)

Description

The Lotus Lake subwatershed is approximately 2,825 acres in size, of which 2,125 acres are in direct drainage areas. Predominant land use in the direct drainage areas include open space (wetland/woodland/grassland) at 1,302.48 acres, followed by agriculture (cropland/farmstead/pasture) at 450.84 acres.

Water Quality Conditions

The perennial headwaters of Horse Creek begin near County Highway F and flows south approximately 1 mile before entering Lotus Lake. This portion of Horse Creek is buffered by cattail and bulrush wetlands grading into beaked hazelnut and tag alder with willow and dogwood shrubs. The wetland area includes 189 acres.

Lotus Lake is a highly eutrophic lake. The major sources of phosphorus contributing to the fertility problem in the lake are carp (29 %), cropland (27 %), and groundwater (12 %). Carp are extremely difficult to control but efforts should be made to evaluate potential management options for their control.

Nonpoint Source Pollutants

- There is one barnyard in this subwatershed that contributes approximately 115 pounds of the annual phosphorus load to the lake. This represents and estimated 7 percent of the phosphorus for Lotus Lake.

- Phosphorus loading from cropland is estimated to be 482 pounds annually which equates to approximately 27 percent of the phosphorus in Lotus Lake.

Water Resource Goals and Objectives

Protect water quality:
Reduce agricultural phosphorus contributions to Lotus Lake by 10 percent.

To better evaluate and manage in-lake water quality issues, the formation of a lake association or lake district including Horse Lake, Round Lake and Lotus Lake is recommended.

Horse Lake Subwatershed (HL)

Description

The Horse Lake subwatershed is approximately 3,404 acres in size, of which 2,738 acres are in direct drainage. The Horse Lake subwatershed begins at the outflow of Round and Lotus Lakes and includes the three-mile section of Horse Creek that flows directly into Horse Lake. This subwatershed also includes Behning Creek and two smaller unnamed lakes. Predominant land use in the direct drainage areas include open space (wetland/woodland/grassland) at 1,662.83 acres, followed by agriculture (cropland/farmstead/ pasture) at 658.27 acres.

Water Quality Conditions

Horse Lake is a shallow water body with a soft silt bottom that is readily disturbed by even moderate winds. This is a highly eutrophic lake with very poor water clarity. The fishery is dominated by carp with are a contributing factor to the bottom sediment resuspension problem and the poor water clarity. It is unlikely that any significant water quality improvements will be achieved by using best management practices on the agricultural nutrient sources to Horse Lake. A carp management strategy must be developed and implemented along with the agricultural source controls if any potential improvements in water quality are to be achieved.

Behning Creek is a cold water stream which in the past has supported a class I trout fishery. The creek currently lacks adequate habitat to support a trout fishery. It maintains very few rock riffles, lacks adequate pool depth and frequency, and experiences sedimentation problems.

Nonpoint Source Pollutants

- There are two animal lots in this subwatershed, one was inventoried and one was not. The inventoried lot contributes 138 pounds of phosphorus annually to Horse Lake that amounts to approximately 2 percent of the total annual load.

- Cropland phosphorus contribution is estimated to be 753 pounds annually which amounts to 29 percent of the annual load.

- Phosphorus loading from carp is estimated to be 722 pounds annually which amounts to 26 percent of the annual load.

- A streambank inventory was completed in this subwatershed. 47,323 feet of streambank were inventoried and 1,492 feet of trampled bank were found. The trampled streambanks are designated as critical sites in this project.

Water Resource Goals and Objectives

Protect water quality:
Reduce agricultural phosphorus contributions to Horse Lake by 5 percent.

To better evaluate and manage in-lake water quality issues, the formation of a lake association or lake district including Horse Lake, Round Lake and Lotus Lake is recommended.

Mud Lake Subwatershed (ML)

Description

The Mud Lake subwatershed is approximately 500 acres in size, of which 321 acres are in direct drainage. Forest Creek is an intermittent outlet. A small wetland complex exists at the south end of Mud Lake. There are no public lands or public access roads to this lake. Predominant land use in the direct drainage areas include agriculture (cropland/farmstead/pasture) at 155.23 acres, followed by open space (wetland/woodland/grassland) at 99.88 acre.

Water Quality Conditions

Mud Lake was not monitored during the water quality appraisal process. Fish species present include northern pike, largemouth bass and pan fish. Muskrats are common and mallards and bluewing teal nest here.

Nonpoint Source Pollutants

- There is one barnyard in this subwatershed that drains to a wetland.

- Phosphorus loading from cropland is estimated to be 62 pounds annually which amounts to approximately 45 percent of the annual phosphorus loading from the entire subwatershed.

Water Resource Goals and Objectives

Maintain water quality:

Reduce nutrient loading to the lake:
Reduce nutrient loading from cropland by 5% through the use of tillage BMPs and buffers.

Cedar Lake Subwatershed (CL)

Description

The Cedar Lake subwatershed is approximately 4,270 acres in size, of which 3,306 acres are in direct drainage. This subwatershed is the farthest downstream and actually includes the drainage of the entire project that totals approximately 34,743 acres. Cedar Lake is located on the Polk/St. Croix county line with 2/3 of the lake in Polk County and 1/3 of the lake in St. Croix County. Cedar Lake's shoreline is highly developed with homes and resorts. Lakeshore residential accounts for 168.42 acres of this subwatershed. Predominant land use in direct drainage areas include open space (wetland/woodland/grassland) at 930.65 acres, followed by agriculture (cropland/farmstead/pasture) at 921.11 acres.

Water Quality Conditions

Cedar Lake is considered a highly eutrophic lake. It has problems with over fertility due to excess phosphorus. Past studies have identified internal loading from lake sediments and carp as major contributors to the phosphorus cycling with in the lake. Summer lake phosphorus concentrations are typically 2 or more times higher than spring phosphorus concentrations. This pattern indicates that lake sediments are releasing phosphorus into the lake.

To control the phosphorus release from the sediment a lake aeration system has been installed. However, results of the aeration project are varied and have had limited success due to inconsistent operation of the system.

The Horse Creek subwatershed is the major upland source of nutrients to Cedar Lake. In evaluating the entire external watershed load, cropland drainage from the Horse Creek subwatershed accounts for 33 percent of the lake phosphorus load, with barnyards and construction sites both at approximately 3 percent of the load. The shoreline of Cedar Lake has been heavily developed so that little natural buffer remains.

The poor water quality conditions in Cedar Lake have resulted in the lake being sited on the federal 303(d) list of impaired waters in Wisconsin. To make progress in removing Cedar Lake from the federal list, lake water quality improvements will have to be made through a combination of efforts in upland phosphorus reductions and additional sediment phosphorus control and carp management. This

priority watershed project is only one of the various state, federal and local programs that must be coordinated if improvements are to be made in the lake water quality.

Nonpoint Source Pollutants

- Nutrient loading to Cedar Lake from the immediate subwatershed accounts for only 14 percent of the total lake nutrient loading. Carp account for approximately 16.5 percent of the overall phosphorus budget in the lake. In lake release of phosphorus was not incorporated into the lake model used in this project as spring phosphorus concentrations were used to calibrate the models. Further modeling is needed to define current phosphorus loading from the lake sediments. Approximately 42 percent of the lake nutrient load comes from the upstream Horse Creek subwatershed.

- One barnyard in this subwatershed drains directly to surface water. Two drain to closed depressions and 6 drain to wetlands.

- Cropland phosphorus loading from the immediate subwatershed contributes 9 percent of the annual phosphorus load to Cedar Lake.

- Cropland phosphorus loading from the Horse Creek subwatershed accounts for 23 percent of the overall phosphorus budget in Cedar Lake.

Water Resource Goals and Objectives

To achieve any significant reduction in phosphorus concentrations in Cedar Lake, nutrient reduction strategies must include a plan to target the nutrient loading from the Horse Creek subwatershed and lake management practices for the reduction of in lake nutrient cycling (carp control and sediment control).

Reduce nutrient loading to Cedar Lake:

Reduce phosphorus loading to the lake by 15 percent (20 percent reduction in the Horse Creek subwatershed will result in approximately 12 percent loading reduction to Cedar Lake). This goal has been established recognizing the current financial limitations of the priority watershed program. Should an increase in funds become available in the future the county should request a grant amendment to focus additional resources on reduction of phosphorus loading to the lake from upland sources. To achieve the lake water quality goals as established the Cedar Lake Management Plan (May 1989) a 30 percent reduction is needed from all upland sources of phosphorus.

Restore lake shoreline buffer and habitat.

Develop an in lake phosphorus reduction plan to reduce the release of phosphorus from the lake sediment and manage the carp population.

Horse Creek Subwatershed (HC)

Description

Named streams within this subwatershed include Horse Creek, Forest Creek, Mud Creek, and Rice Creek. Horse Creek begins approximately 1.5 miles above Lotus Lake. However, this subwatershed discussion includes the portions of Horse Creek between Horse Lake and Cedar Lake. The Horse Creek subwatershed is approximately 11,953 acres in size, of which 6,850 acres are in direct drainage areas. Predominate land uses in the direct drainage areas include agriculture (cropland/farmstead/ pasture) at 3,669.29 acres, followed by open space (wetland/woodland/grassland) at 2,890.87 acres.

Water Quality Conditions

Horse Creek has a good vegetative buffer for most of its length. Agricultural fields are a dominant part of the landscape however riparian vegetation is well established within at least a five-meter corridor. In-stream substrates are dominated by fine particles burying much of the existing coarser substrate that limits habitat for the support of fish and aquatic insect life. There is an absence of deep pool habitat and riffle habitat is almost non-existent. Marsh wetlands border much of the stream. They provide habitat for wildlife and also function to trap nutrients that would otherwise be transported downstream to Cedar Lake.

Forest Creek begins as an outflow from the west end of Big Lake and flows west for a half mile before receiving outflow from Mud Lake. It then flows a quarter of a mile before emptying into Horse Creek. Forest Creek has a small impoundment on it. The structure forming the impoundment was intended to prohibit the upstream migration of carp form Horse Creek into the Big Lake/Church Pine system.

Rice Creek begins as an outflow from Rice Lake. It flows west a half mile before the confluence with Horse Creek. Rice Creek is well buffered with a vegetative riparian zone. A small percentage of Rice Creek is developed.

Mud Creek begins as an outflow from Mud Lake. It flows less than a quarter mile before the confluence with Horse Creek.

Nonpoint Source Pollutants

- There are 24 barnyards in this subwatershed that contribute approximately 1300 pounds of phosphorus annually to the watershed; 6 drain to closed depressions, 11 drain to wetlands, and 7 drain to surface waters.

- Cropland phosphorus loading to Horse Creek is significant when modeling total phosphorus loading for downstream Cedar Lake. Sediment delivery to Horse Creek from developed land contributes 23 percent of the total phosphorus loading to Cedar Lake.

- Cropland contributes 725 tons of sediment annually to Horse Creek.

- A streambank inventory was completed in this subwatershed. 151,807 feet of streambank was inventoried, with 865 feet found to be eroding, 10,731 feet found to be trampled, and 50 feet were slumped. Cattle had unlimited access to sites on this stream.

Water Resource Goals and Objectives

Reduce phosphorus export from Horse Creek subwatershed into Cedar Lake:
Reduce phosphorus loading to Horse Creek from cropland by 20 percent (resulting in a 12 percent reduction in phosphorus export from Horse Creek to Cedar Lake).

Improve in-stream habitat:
Reduce sediment loading to Horse Creek from cropland by reducing cropland erosion by 20 percent.

Protect wetlands and vegetative riparian buffers along streams in the subwatershed:
Engage stakeholders in a comprehensive information and education program, followed up with technical assistance, to benefit water resources.

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

This section describes the results of the rural nonpoint source inventories, further refines objectives, and lists cost share eligibility criteria for each pollutant source. These sources include barnyard runoff, agricultural nutrients, sediments from upland areas, lakeshore and residential development, and streambank erosion.

Management Categories

Cost share funds for installing pollutant control measures will be targeted at sites which contribute the greatest amounts of pollutants (upland fields, barnyards, manure spreading, streambank and shoreline erosion or habitat degradation sites). Management categories define which nonpoint sources are eligible for financial and technical assistance. They are based on the amount of pollution generated by a source and the feasibility of controlling the source. Specific sites or areas within the watershed project are designated as either "critical," "eligible," or "ineligible." Designation as a critical site indicates that controlling that source of pollution is essential for meeting the pollutant reduction goals for the project. Nonpoint sources that are eligible, but not critical, contribute less of the pollutant load, but are included in cost sharing eligibility to further insure that water quality and pollutant reduction 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 pounds of phosphorus and tons of sediment delivered to surface waters from eroding uplands and streambanks; pounds of phosphorus delivered to surface waters from barnyard manure; feet of streambank trampled by cattle; and lateral recession rates for eroding banks. The inventory that establishes management categories for a particular site may be revised up to the point that a landowner signs a cost share agreement. Any sources requiring controls that are created after the cost share agreement is signed must be controlled at the landowner's expense.

The Polk County LWRD will assist landowners in applying Best Management Practices (BMPs). Practices range from alterations in farm management (such as changes in manure-spreading and crop rotations) to engineered structure, (such as diversions, sediment basins, and barnyard runoff controls), and are tailored to specific landowner situations.

Critical Management Category

Nonpoint sources included in this category contribute a significant amount of the pollutants impacting surface waters. Critical sites are those sites where BMPs must be applied to have a reasonable likelihood of achieving water quality objectives. These sites are designated by both numeric and descriptive criteria. Nonpoint sources designated as *critical* are eligible for funding and technical assistance through the priority watershed project.

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 but individual sites are not as critical to reaching water quality objectives.

Ineligible Sites

Other sites that do not contribute significant amounts of pollutants are *ineligible* for funding and/or technical assistance under the priority watershed project. Other programs (e.g., wildlife and fisheries management) can, if warranted, assist county project staff to control these sources as suggested in the integrated resource management plan (Chapter 4) for this watershed.

Summary of Eligibility and Critical Site Criteria

This section summarizes the criteria established for identifying critical sources of pollution and for determining landowner eligibility for cost sharing to correct the identified sources of pollution.

Barnyard Runoff

Barnyards were not found to be the most significant source of phosphorus to surface waters. *To be classified as critical, a barnyard must be in a direct drainage area and contributing greater than 100*

pounds of phosphorus annually. Currently, no critical barnyards have been identified. *Barnyards in direct drainage areas that contribute greater than 30 pounds of phosphorus annually are considered eligible for cost sharing. Internally drained barnyards exceeding 30 pounds of phosphorus annually will be evaluated for eligibility based on a site-by-site analysis* (see Table 2-3).

To maintain cost effectiveness, only those landowners with barnyard sites delivering more than 30 pounds of phosphorus to surface water on an annual basis will be eligible for a complete barnyard runoff management system. For all eligible barnyards, the emphasis will be placed on low-cost barnyard BMPs rather than full-scale systems. The need for a full-scale system on any particular site will be evaluated on a case-by-case basis by county project staff.

Sites that drain to a wetland, sinkhole, creviced bedrock, wells, or gravel pits and have the potential to contaminate groundwater or impact wetlands, may be eligible for cost sharing if annual phosphorus loading is greater than 30 pounds. If the wetland is adjacent to surface water and exhibits channelized flow to that surface water, it may also be eligible. Actual need for BMPs will be determined by county watershed staff based on pollution threat to groundwater or surface water due to depth to water table, soil texture, depth to and type of bedrock, groundwater flow, channelized flow, and other site conditions. To confirm eligibility, field investigations may be conducted jointly by the county project staff, DNR staff, and staff from the DATCP.

Table 2-3. Barnyard Eligibility Criteria [1]

Eligibility Category	Destination	Annual Phosphorus Load (pounds/year)	Number of Barnyards Inventoried	Total Annual P Load (pounds/year)
Eligible	Surface water	>30 w/direct contribution to surface waters	6	492
Eligible	Wetland/ closed depression	>30 on a site by site basis	22	1,690

[1] 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 where the waste may be spread. A conservation plan that controls erosion to the tolerable soil loss level will also be required on these acres. 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 practices, specifically the development of both nutrient management and pest management (NRCS Std. 595) plans, soil testing, and crop scouting. See "Nutrient and Pest Management" later in this chapter for additional detail.

Manure Spreading and Storage

Eligibility for cost sharing for manure storage practices will be based on an evaluation using NRCS Standard 590. *There is no critical designation for manure storage.* An operation is *eligible* if the

evaluation demonstrates that manure cannot be feasibly managed during periods of snow covered, frozen, and saturated conditions without the installation of storage practices. The evaluation must also demonstrate that proper utilization of the manure can be achieved following adoption of the intended storage practice.

Eligibility for cost-shared storage facilities will be based on the least cost system. These options may include manure stacks (in accordance with Std. 312), short-term storage (capacity for 30 to 100 days production in accordance with Std. 313), and long-term storage (capacity for up to 210 days production in accordance with Std. 313 or 425). Cost sharing will be based upon the cost of up to seven-month storage facilities.

Landowners receiving cost-sharing funds for manure storage or barnyard practices are required to develop a nutrient management plan for those acres that will receive manure applications resulting from these practices. A conservation plan that controls erosion to the tolerable soil loss level will also be required on these acres.

An animal waste management ordinance is currently under development by Polk County. All animal waste operations that are permitted under this ordinance will also be required to develop NPM and conservation plans for acres that are spread with manure.

Operations permitted under the county ordinance will be considered eligible for manure spreading and storage cost sharing practices based on the watershed project criteria outlined above in accordance with NR120.14(19)(c) standards and specifications.

Nutrient and Pest Management

Nutrient loading from agricultural fields was found to be a significant source of phosphorus delivered to the surface water resources of the Horse Creek Priority Watershed. A significant portion of the watershed's phosphorus load reaches surface water in conjunction with phosphorus-rich runoff and sediments delivered from uplands.

All farms are eligible for cost sharing to develop nutrient and pest management (NPM) plans to reduce over application of nutrients and pesticides. High hazard acres will be given priority. Twenty-four hundred acres of cropland have been identified as high hazard acres, which is defined as crop fields likely to be winter spread within one mile of a farmstead with an LS factor greater than 1 and a high or medium delivery value.

Farmers can benefit from nutrient and pest management plans by taking nutrient credits for legumes and landspread manure and reducing applications of commercial nutrients and pesticides. NPM may be addressed with the development of nutrient management (NRCS Std. 590) and pest management (NRCS Std. 595) plans, soil tests, and crop scouting. The plans may be prepared by crop consultants and must be consistent with NRCS Standard 590 and 595, and with county standards as well.

Landowners will be eligible to receive grant payments for up to three years. These plans will be submitted to and approved by the Polk County Land & Water Resources Department (LWRD). The LWRD will keep records showing progress towards reducing the use of fertilizer and pesticides.

Other practices that are singularly eligible for cost sharing are soil and manure testing, crop scouting, and spill control basins for pesticide handling. These practices may be used to assist the producer with the development of a nutrient or pest management plan. The cost share rate for all nutrient and pesticide management practices is 50% with the exception of spill control basins that have a 70% cost share rate.

Rural Sediments

Upland Sediment: Upland erosion from intensive agricultural practices has been identified as the most significant source of sediments and phosphorus that are carried to surface waters in the Horse Creek Priority Watershed. Sediment from eroding fields and other upland sources carries phosphorus and degrades aquatic habitat where it is deposited.

A land cover analysis and field-by-field inventory conducted by the Polk County LWRD (November 1997) was used to identify and prioritize sources of phosphorus in the watershed. Because sediment and phosphorus delivery from uplands occurs with surface water runoff, only the directly drained areas of the watershed were considered in this inventory. This analysis was also used to provide an estimate of pollutant loading from each subwatershed to its major water body of focus. Because cropland is a significant land use in the watershed and delivers relatively high amounts of sediment and phosphorus, a separate crop field inventory was also conducted.

The Polk County LWRD developed a model to predict reductions in phosphorus delivery. This model was used to help set eligibility criteria, and will also be used to track progress throughout implementation of the watershed plan (refer to Ch. 6 for additional information on tracking).

The possibility of meeting water resource objectives through changes in cropping practices is generally examined first for controlling upland erosion in agricultural areas. Depending on the subwatershed, predicted reductions in sediment and phosphorus delivery range from 5 to 20 percent if crop fields are buffered and farmed to "T", the standard for conservation planning. Soils in Polk County generally have a tolerable soil loss 3 to 5 tons per acre per year. "T" is based on the Universal Soil Loss Equation (USLE), and is met through crop rotations and tillage practices designed to limit soil erosion.

Sediment and Phosphorus Contribution by Land Use: The figures illustrated in this section group land use as described below:

Ag related includes cropland, farmstead, and pasture.
Open space includes wetland, forestland, grassland, and golf course.
Disturbed include construction sites.
Residential includes rural residential, lakeshore residential, and subdivisions.
Developed includes commercial land.

Figure 2-1 summarizes land use for the inventoried areas of the watershed. About 50 percent of the land included in the inventory remained as open space and 40 percent was agricultural land.

Figure 2-2 illustrates the percent of phosphorus delivery to lakes and streams from land uses within the directly drained portion of the watershed. Agricultural activities account for approximately 80 percent of the phosphorus that enter lakes and streams in runoff. Of the phosphorus that is carried in runoff from agricultural land, about 98 percent is estimated to come from cropland (see Figure 2-3). A significant percentage (about 8 percent) of phosphorus carried in runoff in the watershed is estimated to come from construction sites, depending on construction activity and location. Residential land does contribute phosphorus, in some cases at similar rates to agricultural land, but made up a significantly lower percentage of the watershed land area.

Sediment delivery results illustrated in Figure 2-4 exhibit similar trends. Agricultural land uses contributed about 80 percent of the sediment carried in runoff in the watershed. Disturbed areas were estimated to contribute about 12 percent of the sediment in runoff in 1996.

Figure 2-1. Land Use Classes (Within Direct Drainage)

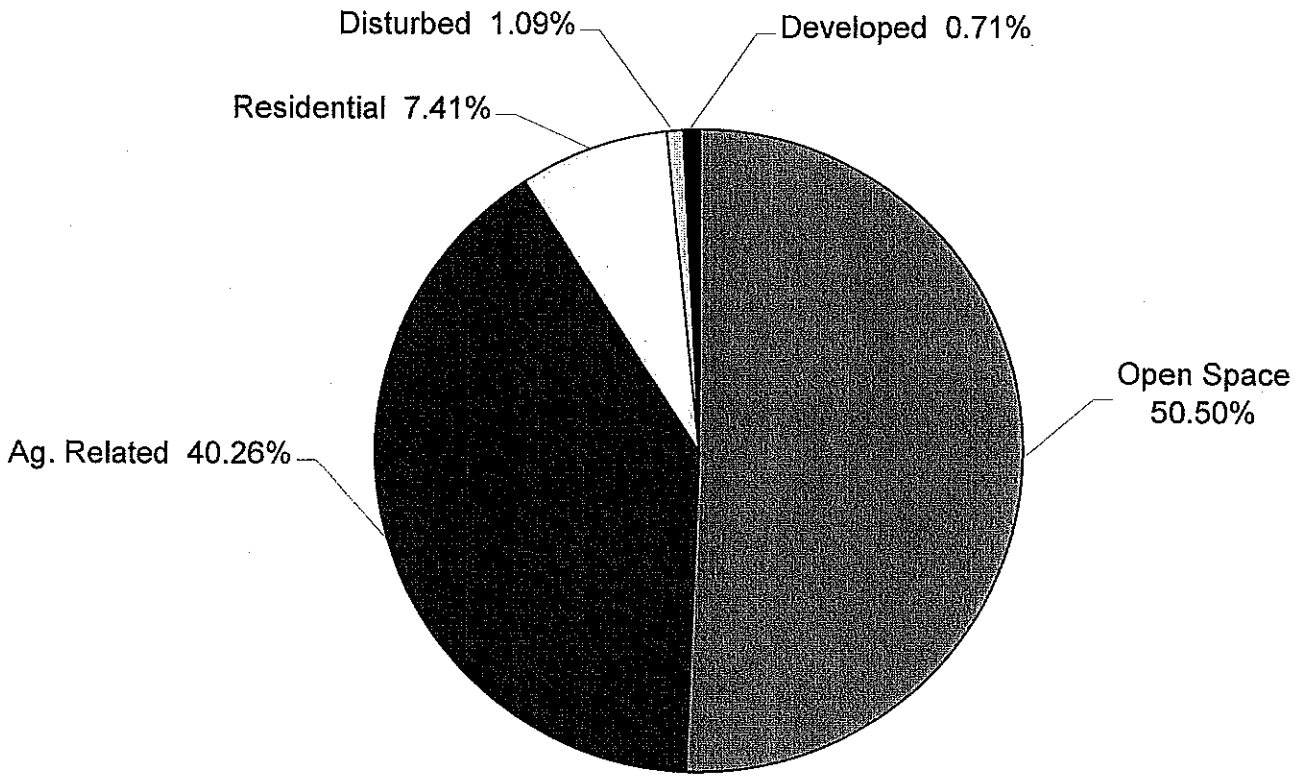


Figure 2-2. Phosphorus Delivery

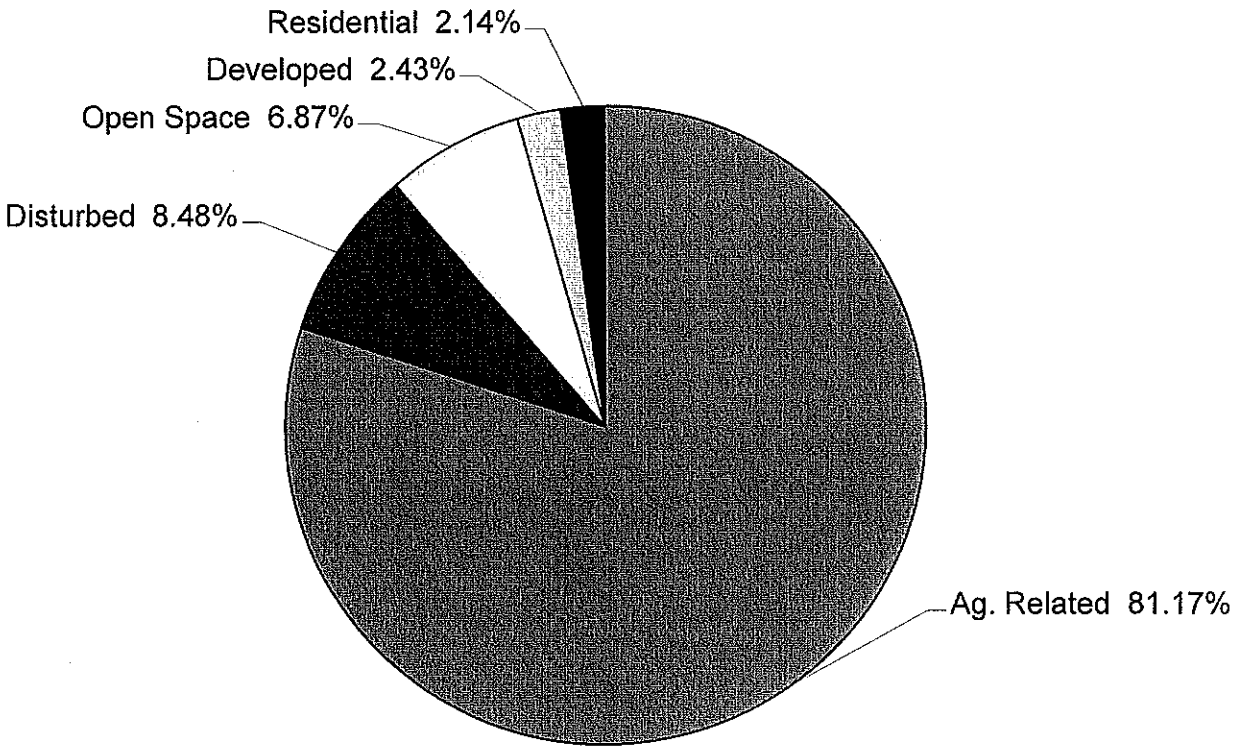


Figure 2-3. Agricultural Phosphorus Sources

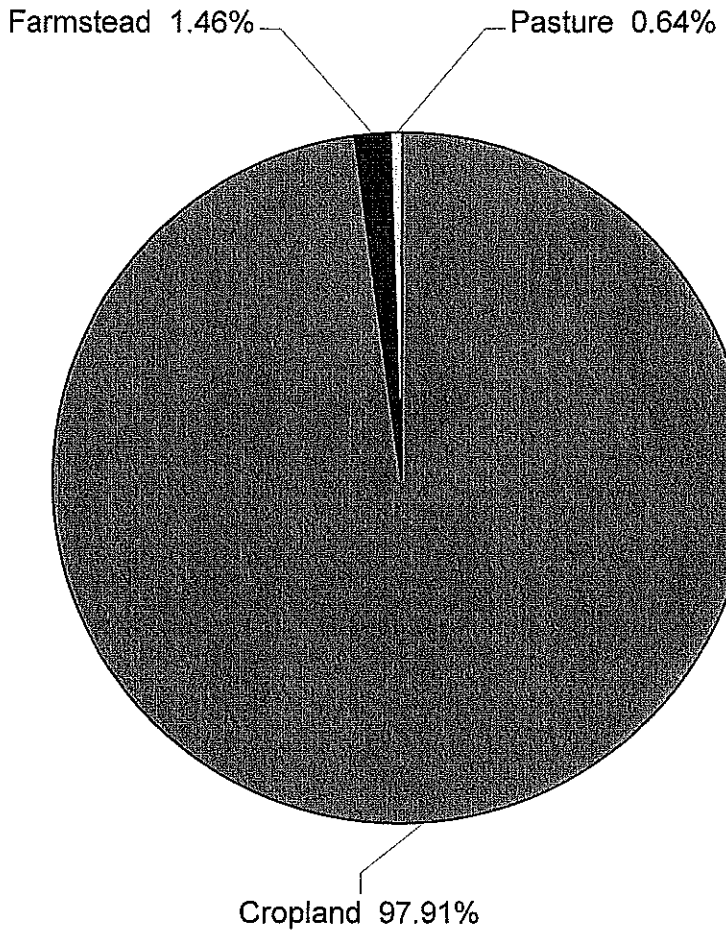
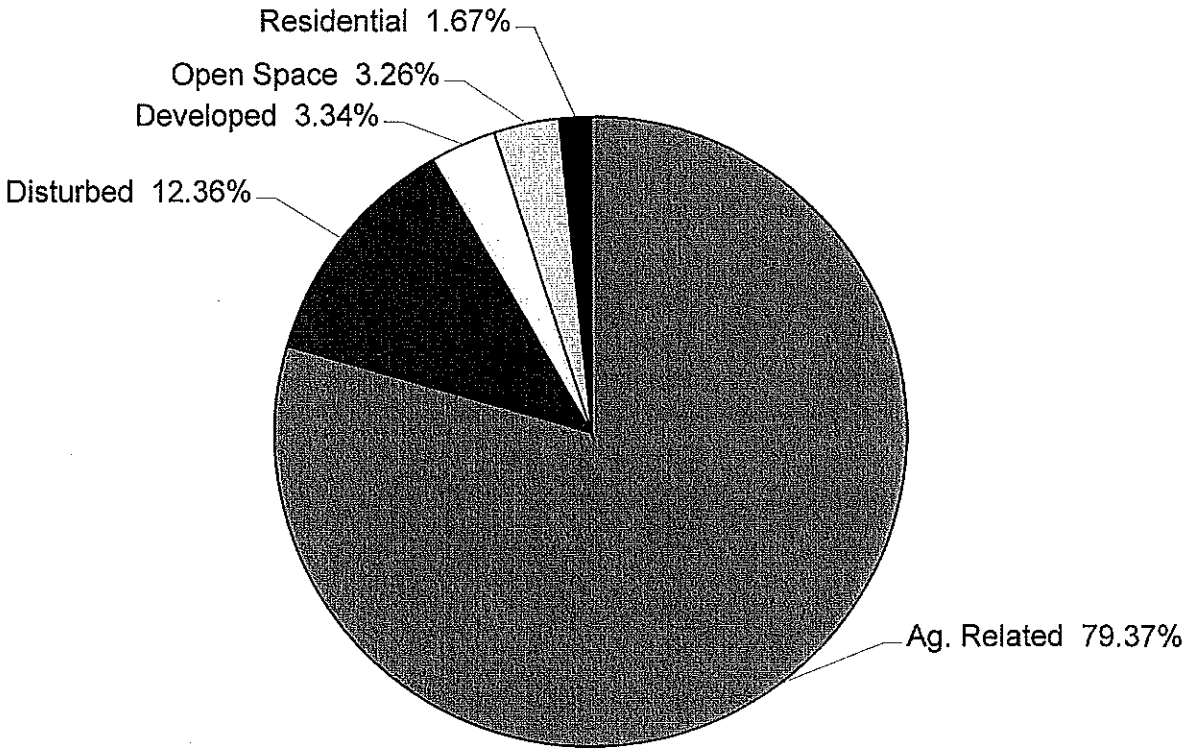


Figure 2-4. Sediment Delivery



Cropland Erosion

To be classified as critical, a landowner's fields must be contributing greater than 1.25 ton/acre/year of sediment (equivalent to 5.0 pounds/acre/year of phosphorus) and have less than 20 feet of buffer to surface water resources. There are currently 15 fields identified in this category. For critical fields that are found, a combination of conservation methods may be used to reduce sediment and phosphorus delivery to surface water resources from these fields.

The eligible classification includes all remaining crop fields within the Horse Creek watershed that are farmed at > T or that have a sediment delivery of > zero. Fields in this category that have less than 20 feet of buffer; or that have a sediment delivery of > 1.0 ton/acre/year will be given priority (see Table 2-4). To protect wetlands in internally drained areas, fields that exhibit high sediment delivery to a wetland and that have less than a 20 foot buffer will also be considered a priority. Owners of these eligible "priority" fields will be contacted first regarding participation in the program.

Producers will be able to receive cost sharing for trial high residue management systems on individual fields for one year. A conservation plan will be used to ensure use of high residue systems if cost sharing is provided for fields on the entire farm on a longer-term basis. Fields will be eligible for cost sharing for high residue management for a total of three years.

Table 2-4. Cropland Erosion Eligibility

Eligibility Category	Criteria	# of Fields	Total Acres	% of Total Cropland
Critical[1]	< 20 foot buffer to surface water resources; and > 1.25 ton/acre/year sediment delivery	15	189.1	1.5%
Eligible	All remaining fields > than T; or sediment delivery > than 0	TBD [1]	TBD	TBD
Eligible (Priority)	Fields meet eligibility criteria, and have < 20 ft buffer /or sediment delivery of > 1.0 ton/acre/year	56	557.4	4.4%

1 TBD: To be determined by watershed project staff.

The total number of cropland acres in the Horse Creek Priority Watershed is 12,786 acres--which equates to 1,150 individual fields. Of these acres in cropland, 38.4% are farmed above "T", 15.2% are farmed with less than a 20-foot riparian buffer, and 4.4% meet both of these descriptive criteria. Under the current management scenario, 189.1 acres of cropland (1.5%) are considered critical, 4,362.6 acres of cropland (34.1%) would be eligible for minimum tillage practices to bring soil loss to "T", and 1,381.9 acres of cropland (10.8%) would be eligible for riparian buffer installation. (See Table 2-5 below for a summary of cropland acres > "T" and with < 20 foot riparian buffer.)

Table 2-5. Cropland Acres > "T" and < 20 Foot Riparian Buffer

Cropland Classification	# of Fields	Total Acres	% of Total Cropland
Cropland > T	392	4,920	38.4%
Cropland < 20 foot buffer	182	1,939.3	15.2%
Cropland > T and < 20 foot buffer	56	557.4	4.4%

Gully Erosion

During the inventory process, locations of gullies were recorded and digitized in ARCVIEW. Information about gully length, width, depth, and ground cover was also recorded at this time. Based on this information, gully erosion has not been identified as a significant source of phosphorus and sediment to the watershed. However, gullies have been known to cause significant sediment deposition to surface water resources if they become active.

Gullies that are actively eroding and accessible to machinery will be classified as eligible for cost sharing. Inactive gullies are not eligible for cost sharing. Gully erosion eligibility criteria are outlined below in Table 2-6.

Table 2-6. Gully Erosion Eligibility Criteria

Eligibility Category	Criteria	Target Reduction Levels
Eligible	Gullies that are actively eroding to wetlands or surface water resources; and that are accessible to machinery	50% of the sediment load
Not Eligible	Inactive gullies	Not Applicable (NA)

If actively eroding gullies are discovered during implementation, they will be evaluated by project staff to determine if they are significant sources of sediment and phosphorus to the watershed. The presence or absence of human use impacts and the cost effectiveness of corrective measures will also be used to evaluate the feasibility and practicality of correcting the problem.

Streambank Erosion

Streambank erosion was not identified as a significant contributor of the overall sediment and phosphorus to the surface water resources of the Horse Creek Priority Watershed. However, there are specific locations in the Horse Lake, Round Lake, Big Lake, and Horse Creek subwatersheds where bank erosion and trampling has been identified as a significant habitat concern.

Of the 278,001 feet of inventoried streambank, 10 sites (3,955 feet) were eroding, 13 sites (16,512 feet) were trampled by livestock, and 1 site was slumped (50 feet). (See Table 2-8 for a summary of the streambank inventory results.) Overall, 20,517 feet of streambanks inventoried (7.4 %) were degraded from erosion, trampling, and slumping. These degraded streambanks contribute approximately 9.56 tons of sediment, or 38.24 pounds of phosphorus, annually to surface waters. Table 2-7 depicts landowner cost share eligibility criteria for stream bank erosion.

- *Critical sites are those with severe erosion, exhibiting a lateral recession rate of greater than 0.5 feet/year.* No severe erosion sites were found during the streambank inventory. If severe sites are found during the implementation of the project, the *critical* criteria will be used.

- *Eligible sites are those with identified moderate lateral recession rates of between 0.1 and 0.5 feet/year.* Ten moderate erosion sites have been identified in this eligible management category.

- *Ineligible streambank sites have lateral recession rates between 0.05 and 0.10 feet/year.* These sites are not eligible for cost sharing.

Table 2-7. Streambank Erosion Eligibility Criteria

Management Category	Lateral Recession Rate (feet/year)	Reduction Objective
Critical	> 0.50	Protect and stabilize bank. Establish vegetative cover. Limit livestock access.
Eligible	> 0.10 to 0.50	Stabilize the bank. Establish vegetative cover. Limit livestock access.
Not Eligible	< 0.10	Maintain vegetative cover.

Livestock Access

A streambank site may also be designated as critical if the bank is trampled by livestock to a point that an adequate sod cover is no longer present. Adequate sod cover is defined as a 90% vegetative cover that is maintained back a minimum of 20 feet from the ordinary high water mark. If a trampled streambank site in the Horse Creek watershed exceeds the adequate sod cover definition, the site will be designated as critical. The estimated number of sites that may fall into this category include 13 trampled streambanks.

Streambanks may be repaired by shaping and seeding or establishing a buffer and restricting cattle access. Banks must be managed so that adequate sod cover is maintained by restricting livestock access (although a cattle crossing may be allowed and cost shared), through the use of rotational grazing, or by significantly reducing the number of cattle allowed access. Where a crossing is approved, it is an eligible cost share practice. Remote watering is also a cost sharable practice where livestock access will be restricted.

Table 2-8. Streambank Inventory Results

Inventoried Streambank Length (feet)	Eroded Sites (feet)	Trampled Sites (feet)	Cattle Access (feet)	Slumped Sites (feet)	Total Sediment Loss (Tons/Year)	% Bank Degraded From E,T,S
278,001	3,955	16,512	20,517	50	9.56	7.38

Lake Shoreline Inventory

The Polk County LWRD staff worked in cooperation with DNR water resources staff to collect lake shoreline inventory data on four lakes (Paulson Lake, Swede Lake, Pine Lake, and Lower Pine Lake). Information collected included: degree of development for each lot, buffer width, extent of shoreline mowed to water's edge, and a variety of additional information.

Lake Shoreline Erosion: Lake shoreline erosion was identified as an insignificant source of the overall sediment and phosphorus carried to the surface water resources of the Horse Creek Priority Watershed. About two percent of the inventoried shorelines in the watershed have identified erosion problems. These shorelines are estimated to contribute about twelve tons of sediment to surface water resources each year. No cattle access to lakes was identified in the inventory. Table 2-9 depicts landowner cost share eligibility criteria for lake shoreline erosion and Table 2-10 reports the results of the lakeshore inventory.

- *Critical sites are identified as those with severe erosion and a lateral recession rates of greater than 0.5 feet per year.* Currently, no *critical* lakeshore erosion sites have been identified. However, if severe sites are discovered during implementation, the critical criteria will be used.

- *Eligible management shorelines are those with identified moderate lateral recession rates of between 0.1 and 0.5 feet per year.* Six moderate erosion sites have been identified as *eligible* during the lakeshore inventory. *Ineligible lake shoreline sites with slight erosion have lateral recession rates between 0.05 and 0.1 feet per year.* These sites are not eligible for cost sharing.

For sites that are in need of stabilization, the emphasis will be placed on practices such as bioengineering and establishment of vegetation rather than rock riprap. Although a popular practice among lakeshore residents over the last decade, rock riprap lacks an important habitat component. Bioengineered structures are oftentimes more cost effective than traditional stabilization approaches such as rock rip rap, and they have the benefit of blending into the shoreline landscape better--providing value for wildlife as well.

Lakeshore Development: Rapid lakeshore development has been identified as a significant land use pressure that has great potential to impact the water resources of the Horse Creek Priority Watershed. According to a recent DNR study (Meyer, 1998), plants and animals native to many of Wisconsin's northern lakes are struggling to survive as riparian habitat is cleared and altered for lakeshore development. Environmentally sound landscaping can easily be incorporated into construction plans prior to any earth moving by ensuring that proper erosion control measures are implemented, and by minimizing any impacts to the lakeshore buffer zone.

Table 2-9. Lake Shoreline Erosion Eligibility Criteria

Management Category	Lateral Recession Rate (feet/year)	Reduction Objective
Critical	> 0.50	Protect and stabilize bank. Establish vegetative cover. Limit livestock access if needed.
Eligible	> 0.10 to 0.50	Stabilize the bank. Establish vegetative cover. Limit livestock access if needed.
Not Eligible	< 0.10	Maintain vegetative cover.

Table 2-10. Lakeshore Inventory Results

Inventoried Shoreline (feet)	Eroded Sites (feet)	Trampled Sites	Cattle Access	Slumped Sites	Total Sediment Loss (Tons/Year)	% Bank Degraded From E,T,S
108,904	1,910	N/A	N/A	N/A	12.08	1.75%

Lakeshore Buffers: Lack of adequate lakeshore buffers was a common problem identified throughout the lakes in the watershed. Because many of the watershed's lakes are concentrated with established lakeshore residences, riparian landowners with existing developed lots are encouraged to evaluate the health and condition of their lake shoreline buffer and implement practices that will restore the attributes of a healthy lakeshore buffer. Areas in need of buffer restoration or protection have been identified in the subwatershed discussions outlined in the Horse Creek Priority Watershed Water Resources Appraisal Report (Cahow, 1999). Shoreline buffer recommendations and restoration procedures have also been outlined in the water resources appraisal report.

The newly adopted Shoreland Habitat Restoration BMP will be available to riparian property owners to restore lakeshore buffers. *Landowners with existing shoreline vegetation that can be improved to provide greater habitat diversity will be eligible for this practice, as described in the guidelines for this BMP* (see Appendix)

Riparian property owners in the watershed need to be made aware of the importance of protecting and restoring riparian buffers for critical habitat, wildlife, and water quality benefits. All riparian property owners in the watershed are encouraged to participate in the information and education activities identified in Chapter 5. In addition to educating the watershed community on the value and benefits derived from riparian protection, project staff will directly engage watershed residents in the resolution of this identified land use concern by offering the technical and financial support needed to implement lake shoreline BMPs. Funding and technical assistance will be made available through the watershed project, Polk County's Land & Water Resources Planning program, and through special grant-funded projects.

Well Abandonment

Wells provide a direct conduit for pollutants to reach groundwater. 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 watershed.

The Polk County LWRD will encourage all landowners to properly seal all unused or abandoned wells. Information on the proper abandonment procedures will be provided to landowners when abandoned wells are located. *All unused or abandoned wells in the watershed will be eligible for cost sharing to properly abandon the well.*

Pollutant Reduction Goals and Project Objectives

The following is a summary of reductions to be targeted for land uses in the watershed:

Sediment Objective: The subwatershed of Horse Creek is the only subwatershed in this project to have a specific sediment reduction objective (the remaining subwatershed have phosphorus reduction objectives rather than sediment reduction objectives).

To reduce sediment delivered to Horse Creek by 12% the following is needed:

- 20% reduction in sediment reaching Horse Creek from agricultural uplands
- Repair of trampled and eroded streambanks along approximately 11,600 feet of stream

Phosphorus Objective: Lakes in this watershed project were grouped into three trophic categories, a meso- and oligo- trophic group (protection class), an eutrophic group (improvement class), and a highly eutrophic group (maintenance class). Specific phosphorus reduction objectives for agricultural lands were then developed dependent upon which category the lake is in. (See Table 2-11 below for a summary of phosphorus reduction goals.)

Wetland Restoration Objective: Wetland restoration will be coordinated with existing federal and state wetland restoration funding programs and initiatives.

Groundwater Objectives:

- Identify and properly abandon unused wells in the watershed.
- Develop nutrient and pesticide management plans for farms in the watershed.

Construction Site Erosion

Description: Construction sites are those areas in any phase of construction where soil is disturbed by grading or excavation for new development or renovation. Renovation may involve utility replacement, street replacement, bridge reconstruction, or rehabilitation and remodeling of commercial, industrial, or residential areas.

Construction site erosion is a major water quality concern in the watershed. Uncontrolled sediment-laden runoff from construction sites can devastate aquatic communities. Water quality improvements that may be gained through implementation of best management practices, could easily be negated by erosion from construction sites.

Predicting rates of construction site erosion is difficult. However, erosion rates exceeding 75 tons per acre each year can occur. This rate of erosion is much greater than what occurs on the most severely eroding croplands and greatly exceeds erosion from existing commercial and industrial areas. Often the proximity of construction sites to drainage ways or water bodies results in nearly all of the sediment being delivered to streams, lakes, or wetlands.

Existing Regulatory Controls for Stormwater and Construction Site Erosion

The Uniform Dwelling Code in Wisconsin includes erosion control provisions for construction of 1 and 2 family dwellings. However, because the townships within the watershed are less than 2,500 in population, they are not required to enforce the UDC. Polk County does have the option of enforcing only the erosion control provisions of the UDC where municipalities decide not to enforce the code. This would require a builder to submit an erosion control plan to the county for review, and the county to review the plan and perform follow-up inspections. Official seals must be purchased from the state at a cost of $25 for each erosion control permit. The state would also provide forms for application and inspections. The county can issue stop work orders after a 72-hour waiting period following a notice of noncompliance an can levy fines for violations.

Table 2-11. Lake Classification, Water Quality Goals, and Phosphorus Reduction Objectives from Cropland

Lake Class & Subwatershed	Water Quality Goal	Phosphorus (P) Reduction Objective
Oligotrophic to Mesotrophic Lake Class (Protection Group)		
Church Pine Lake Lower Pine Lake Pine Lake Paulsen Lake Swede Lake Wind Lake Rice Lake	Protect and maintain existing water quality	5% Phosphorus reduction from agricultural sources
Eutrophic Lake Class (Improvement Group)		
Big Lake	20 ppm TP	10% P reduction from agricultural sources
Round Lake	25 ppm TP	13% P reduction from agricultural sources
Highly Eutrophic Lake Class (Maintenance Group)		
Lotus Lake	Maintain existing water quality	10% P reduction from agricultural sources
Horse Lake	Maintain existing water quality	5% Phosphorus reduction from agricultural sources
Mud Lake	Maintain existing water quality	5% Phosphorus reduction from agricultural sources
Cedar Lake	Maintain existing water quality	15% P reduction from agricultural sources

The Polk County Subdivision Ordinance requires submission of erosion control data and plans with the preliminary plat application. The plans are to be based on the publication "Wisconsin Construction Site Handbook, DNR Publication WR-222-93." Erosion control plans for public and private roads shall follow the standards of Section 107.2 of the publication "Wisconsin Department of Transportation Standard Specifications for Road and Bridge Construction." The registered engineer or surveyor, under whose seal the plans are submitted, shall certify that the storm water and erosion control conditions "as built" conform to the approved plans. DNR issues stormwater permits for sites greater than 5 acres.

Enforcing existing provisions of the Polk County Shoreland Protection Zoning Ordinance would assist in controlling construction site erosion in the shoreland zone. The ordinance (Article 9.1A) requires that filling, grading, lagooning, ditching, or excavating is done in a manner designed to minimize erosion, but does not require a permit unless the following conditions are met within 300 feet of the ordinary high water mark: (1) Any filling or grading on slopes > 20 percent, (2) Filling or grading of more than 1,000 square feet on slopes of 12 percent to 20 percent, (3) Filling or grading of more than 2,000 square feet on slopes of 12 percent or less.

A permit may attach erosion control requirements. In addition, where no permit is required, there is a provision for zoning office approval of an excavation plan prior to construction. (Article 9.3B). This excavation plan could include an erosion control plan written according to state standards. Currently, a permit for filling and grading in the shoreland zone is required only where slopes are greater than 20 percent. Permits should be required for the three conditions listed above. The zoning office does not generally review an excavation plan when a permit is not required.

The Shoreland Protection Zoning Ordinance also regulates cutting of shrubs and trees along the shoreline to protect scenic beauty, control erosion, and reduce effluent and nutrient flow from the shoreland. Generally, no more than 30 percent or 30 feet of shrubs and trees in a 35 foot wide stretch along the shore are allowed to be cut. This provision is generally not enforced in Polk County, but must be enforced to protect the resource. The LWRD will work with the zoning office to increase enforcement efforts under this provision.

St. Croix County's Shoreland Zoning Ordinance also places restrictions on the extent of filling and grading activities on lands within 300 feet of the high water mark of a water body, depending upon the degree of slope of the land. The ordinance also requires erosion control practices, as needed to prevent excessive runoff, sedimentation or pollution. St. Croix County's Subdivision Ordinance requires stormwater and erosion control plans for any subdivisions of less than 35 acres. Control measures apply to the whole subdivision, but not to individual home site development. The St. Croix County Land Conservation Department reviews subdivision plans for compliance.

Road and Bridge Construction Erosion Control

Highway and bridge construction projects are often next to streams and water conveyance structures where erosion control is critical. Wisconsin State Statute 89.19 requires the Department of Transportation (DOT) in consultation with the Department of Natural Resources (DNR), to establish

standards for the control of erosion related to highway and bridge construction, and establish a training program for persons who prepare plans for, review plans for, conduct inspections of, or engage in highway or bridge construction activities. Highway and bridge construction projects funded in whole or in part by state or federal funds are covered under this statute.

Highway or bridge construction that is not state or federally funded is not covered under the provisions of State Statute 89.19.1. As part of the Horse Creek Priority Watershed Plan, the DNR strongly recommends that areas of road and bridge construction not covered under State Statute 89.19 abide by the guidance standards for erosion control as specified by the DOT's Facilities Development Manual and the DNR's Wisconsin Construction Site BMP Handbook. The Polk County LWRD will work with county and township road departments to inform them about these requirements and educational opportunities related to these standards.

Land Use Management Planning

Land use management planning is another tool that can be used to protect surface water quality, groundwater, and wetlands in the watershed. Stormwater management planning is an important component of land use planning efforts. Poorly planned development without adequate erosion and stormwater control measures can have a devastating impact on water quality. Implementation measures of land use plans may include stormwater management ordinances, subdivision ordinances, zoning ordinance revisions, and preservation of natural sites or corridors that protect water quality.

Polk County is currently undertaking a comprehensive land use planning effort. Under this effort, the county is developing a lakes classification system for all Polk County lakes. The classification scheme utilizes a combination of natural resource factors that determine lake vulnerability or sensitivity and the amount of development on the lake. Once developed, the lakes classification system may be used to set regulations or restrictions on lakeshore development, lot sizes, set backs, etc., and has the potential to assist in protecting the water quality of the watershed's lakes.

Polk County's Comprehensive Land Use Ordinance was adopted in 1971 and most recently has been revised in 1993. Components of this ordinance are currently under development with the land use planning effort underway in the county. At the time of the writing of this plan, the current revised version of the Comprehensive Land Use Ordinance has been adopted by Osceola and Alden Townships. Garfield and Farmington Townships, however, have not adopted the ordinance and are currently not zoned. Farmington and Osceloa Townships have completed land use plans. Alden Township has adopted and Exclusive Agriculture Ordinance and are working on a land use plan

Management Needs and Alternatives

Because development and construction activity is expected to remain steady in the future, construction site erosion control throughout the watershed project area is important to achieving sediment and phosphorus reduction goals. Development is expected to continue within the unincorporated areas of the watershed, especially around area lakes and streams. Without a high level of control, sediment and

phosphorus from construction site erosion could significantly impair water quality and aquatic life in the watershed project area.

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

Townships in the project area are governed by Polk County's ordinance requirements for controlling construction site erosion and sedimentation. In addition, state regulations (Ch. 144 Wis. Stats.) set forth by the Department of Industry, Labor and Human Relations (DILHR) for erosion control on sites with one and two family dwellings are not enforced in the project area. The DNR Wisconsin Pollutant Discharge Elimination System (WPDES) permit regulations for sites greater than five acres are in place.

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

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

Recommendations

The following is a list of specific recommendations that units of government and developers should address in developing an effective construction site erosion control program (an erosion control information and education strategy is described in chapter five).

- Watershed townships should consider adopting and enforcing the UDC. These provisions will apply to one and two family homes once a building permit is issued. The townships should also develop a means to regulate erosion from grading, clearing, and excavation that may occur before a building permit is issued.

- Municipalities should evaluate staffing and training needs for effective ordinance administration and enforcement.

- Municipalities should evaluate their permit fee schedule to investigate ways to raise revenue to support effective enforcement activities.

- Developers and contractors should be informed of erosion control requirements and have access to technical information through seminars and other educational activities and materials.

- Erosion control inspectors should have specific guidelines for documenting ordinance violations in order to provide for more consistent and effective legal action.

Eligibility for Wetland Restoration and Easements

Wetland Restoration

Wetland restoration is considered a best management practice for the purpose of controlling nonpoint sources of pollution. Wetland restoration involves 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/or the fencing of wetlands to exclude livestock. Enhancement of fish and wildlife habitat is frequently a secondary benefit of wetland restoration.

There will be no critical areas designated for the restoration of wetlands in the Horse Creek Priority Watershed. Wetland restoration will be coordinated with existing state and federal agency programs. However, if these funding sources become unavailable, the following criteria will be used to prioritize wetland restorations.

Wetland restoration will be a priority where:

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

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

3. Pastured wetlands are riparian to streams or tributaries.

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

5. Prior converted wetlands are down slope or up slope from crop fields.

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

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

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

Land Easements

Nonpoint source program funds may be used to purchase land easements in order to support specified best management practices. These practices include:

- Shoreline Buffers: vegetative areas which minimize nonpoint source impacts and other direct impacts to streams;

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

- 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 wellheads 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:

- Riparian easements can provide fish and wildlife habitat along with the pollutant reduction function;

- Easements are generally perpetual, so the protection is longer term than a management practice by itself; and,

- An easement may allow for limited public access (depending on the situation). However, the primary justification of an easement must be for water quality improvement.

Easements should be considered in the following situations:

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

   i) There is any grazing of wetlands.
   ii) Livestock density is so great that areas of bare soil are within 60 feet of streams or intermittent streams.
   iii) More than 100 feet of streambank are severely trampled and eroding.
   iv) Channel erosion is exacerbated by livestock grazing such that unvegetated stream banks are two feet or more in height.

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

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

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

   i) The eligible wetland restoration is greater than one acre in size.

4) When a barnyard or animal feedlot is located within the flood plain and:

   i) A permanent easement is the least-cost alternative to provide adequate pollution reduction; or,
   ii) 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.

5) To protect the stream and riparian wetlands from urban runoff.

In-Lake Nonpoint Source Control

Nutrient inactivation is an eligible treatment to reduce internal cycling of phosphorus from bottom sediments, thereby improving water quality conditions in a lake. Alum treatments and forms of biomanipulation are some treatment methods that may be used to achieve lake water quality goals that is not achievable with just changes in land use or management. In-lake nonpoint source control

practices should be conducted only after significant progress toward the upland pollutant reduction goals and objectives have been achieved. Control of rural nonpoint sources is necessary before in-lake practices will be considered eligible. Lakes where in-lake nonpoint source controls may be considered include Lotus, Horse, Mud, and Cedar. Eligibility and adequacy of progress in controlling other nonpoint sources will be evaluated by the DNR Nonpoint Source Coordinator, Lake Management Coordinator, and Basin Water Quality Biologist.

Relevant Statutes and Ordinances

Animal Waste Advisory Committee (AWAC) Prohibitions

Act 27 of the State Statutes outlines four Animal Waste Advisory Committee (AWAC) prohibitions * (Ch. 281 Water and Sewage, 281.16(3)(a)1.-4.). The prohibitions include: 1) No overflow of manure storage structures; (2) No unconfined manure pile (stacking) within a water quality management area (defined as land within 300 feet of a stream and 1000 feet of a lake); (3) No direct runoff from feedlots or stored manure into the waters of the state; (4) No unlimited livestock access to waters of the state where high concentrations of animals prevent the maintenance of adequate sod cover.

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. Polk County enacted an animal waste storage ordinance in 1985. However, this ordinance applied only to earthen pits. The ordinance has since been revised in late 1996 to encompass all pits, earthen and concrete. Currently, Polk County is developing a comprehensive animal waste management ordinance that will supersede the manure storage ordinance and will contain manure storage provisions within its content. St. Croix County enacted an animal waste storage ordinance in 1985.

Animal Waste Management Ordinance

A comprehensive animal waste management ordinance is currently under development by Polk County. The ordinance applies to the unincorporated areas of Polk County for impoundments, and to Water Quality Management Areas within the unincorporated areas for feedlots, mismanaged pastures and unconfined stacks. Under the draft language, Polk County LWRD will accept permit applications for feedlots, impoundments and livestock operations greater than 300 animal units. All animal waste operations that are permitted under this ordinance will be required to develop NPM and conservation plans for acres that are spread with manure. The draft ordinance includes the four Animal Waste Advisory Committee (AWAC) prohibitions (Ch. 281 Water and Sewage, 281.16(3)(a)1.-4.).

* An owner or operator of an agricultural facility or practice that is in existence before October 14, 1997, may not be required to comply with the prohibitions unless cost-sharing is available to the owner or operator.

Construction Site Erosion

Chapter 236 of the Wisconsin Statutes gives cities, villages, towns, and counties authority to control erosion from developing subdivisions and smaller land divisions. This chapter establishes the minimum standards and procedures for land division in Wisconsin. The chapter enables local governments that have an established planning agency to adopt subdivision ordinances that are more restrictive than the state standards. A more detailed discussion on construction site erosion control ordinances is included earlier in this chapter.

The adoption of a construction site erosion control ordinance is not required as a condition of grant funding for Polk County. Financial assistance is available to the county and other local units of government through the priority watershed program for the development and early implementation of a construction site erosion control ordinance.

Other Pollution Sources

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

Industrial Point Sources of Pollution

Discharges of wastewater from permitted municipal and industrial sources are important considerations for improving and protecting surface water resources. Chapter 281, Wis. Stats., requires any person discharging pollutants into the waters of the state to obtain a Wisconsin Discharge Elimination System (WPDES) Permit issued by the DNR.

Sewage Treatment Systems

Sanitary sewer service is not available to homeowners in this watershed project. Wastewater generated by the watershed residents is disposed of through private on-site systems.

Private Sewage Systems

Septic systems consist of a septic tank and a soil absorption field. Septic systems fail due to soil type, location of system, poor design or maintenance such as tanks that go unemptied. Pollutants from septic system discharges are nitrates, bacteria, viruses and hazardous materials from household products. Generally, in the Horse Creek Watershed, the majority of soils are suitable for conventional septic tank soil absorption systems.

Counties have been using the Wisconsin Fund since 1981. The Wisconsin Fund is a Private Sewage System Replacement Grant Program offering financial assistance designed to help eligible homeowners and small business operators offset the costs of replacing a failing septic system. The

program is administered by the Polk County Zoning Department. The grant program applies to principle residences and small businesses built prior to July 1, 1978 and is subject to income and size restrictions. Seasonal homes are not eligible for participation in this program. Interested individuals should contact their county zoning department for more information.

Land Application of Municipal and Industrial Wastes

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

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

Municipal: There are no sites in the watershed that accept and spread municipal sludge.

Industrial: There are no sites in the watershed that accept and spread industrial sludge.

Solid Waste Disposal Sites

There are no active landfill sites in the Horse Creek Priority Watershed.

Petroleum Storage: Leaking Underground Storage Tank (LUST) Sites

The Wisconsin Remedial Response Site Evaluation Report (DNR publication number SW-144-91) lists the sites identified through the LUST (leaking underground storage tank) program. There is one site listed within the watershed.

Site Name	Activity	Section	Township	Range
WANDEROOS GIFT & GROCERY	LUST	32	33	17

Other Contaminated Sites

The Wisconsin Remedial Response Site Evaluation Report also has the Inventory of Sites or Facilities Which May Cause or Threaten to Cause Environmental Pollution and the Spills Program List which includes sites or facilities identified under the Hazardous Substance Spill Law. No additional spill sites have been identified.

CHAPTER THREE:
Implementation Program

Introduction

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

- Best management practices (BMPs) needed to control nonpoint sources of pollution;
- Cost containment policies;
- Cost share agreement procedures;
- Schedules for implementing the project; and
- 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 that control nonpoint sources of pollution are identified in Chapter NR 120 of the Wisconsin Administrative Code. 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 a BMP will destroy significant wildlife habitat, NR 120 requires that habitat be recreated to replace the habitat lost. The DNR District Private Lands Wildlife Specialist or a designee will assist the Polk County LWRD in determining the significance of wildlife habitat and the methods used to recreate the habitat. Every effort shall be made during the planning, design, and installation of BMPs to prevent or minimize the loss of existing wildlife habitat. Wildlife habitat restoration components of the practice are cost shared at 70 percent.

The practices eligible for cost sharing and the cost share rates for each BMP are listed in tables 3-1 and 3-2 below; the BMPs listed in table 3-1 can either be cost-shared at 50% or at the flat rates listed.

Table 3-1. Flat Rates for Best Management Practices

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

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

Following is a brief description of the most commonly used BMPs. More detailed descriptions can be found in NR 120.14.

Agricultural Sediment Basin: A structure designed to reduce the transport of sediment or 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 to surface or groundwater; or abandonment of the lot without relocation.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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: Manage 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 roofs and supporting structures constructed specifically to prevent rain and snow from contacting manure.

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

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

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

Terraces: A system of ridges and channels with suitable spacing, 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.

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

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

[1]To 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 in conjunction with these BMPs. See chapter two for an explanation of where easements may apply.

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 determined necessary to achieve the objectives of the watershed project.

Activities and Sources of Pollution Not Eligible for Cost Share Assistance

Priority watershed cost share funds cannot be used to control sources of pollution and land management activities specifically excluded in NR 120.10(2). The following is a partial list of those ineligible activities:

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

Rural Implementation Program

Rural Area Roles and Responsibilities

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

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

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

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

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

Rural Cost Share Budget

Costs of Installing Best Management Practices

The quantity and type of management practices that are required to meet the water quality objectives of this project are listed in table 3-3. Units of measurement and cost per unit for the various BMPs are also included.

The cost of installing the Best Management Practices is approximately $ 2,576,000 assuming 100 percent participation. At 75 percent participation the capital cost is $1,881,004.

- State funds necessary to cost-share this level of control would be approximately $1,235,804
- The local share provided by landowners and other cost-share recipients would be approximately $645,200.

Easement Costs

Chapter two identifies where nonpoint source program funds can be used to purchase easements. The estimated cost of purchasing easements on eligible lands is shown in table 3-3. At 75 percent participation, the estimated purchase price of easements on eligible lands would be $75,000. Easements are funded at 100 percent and will be purchased by DNR or Polk County.

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 procedure to be used by Polk County is described below. The bidding procedure and average cost and flat rate lists can be obtained from the county LWRD.

Bids: Competitive bids will be used for structural BMPs with estimated total costs above $5,000. The bidding process requires a minimum of two bids from qualified contractors in itemized bid format. In cases where one bid was received, the county will determine if the bid constitutes an appropriate cost for the project. If no bids are received or if the lone bid is not deemed appropriate, the county will limit cost sharing based on average costs. Where average costs and range of costs are well established, the LWRD may authorize use of average costs on project estimated to cost more than $5,000.

Average Costs: Average costs will be used for structural BMPs with an estimated cost of less than $5,000 and for non-structural BMPs not using a flat rate, unless the cost share recipient decides, and the county agrees, to bid the installation of the BMPs. If the cost share recipient or county decides to bid a structural BMP under $5,000, the above bid procedure will apply. Individual projects below $5,000 may be pooled by the county and bid together.

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

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

Payments for in kind contributions will be based on the county's guidelines. Cost share payments will be based on actual installation costs. If actual installation costs exceed the amount estimated on the cost share agreement, the amount paid the grantee may be increased. Approval from the Polk County Land Conservation Committee is required where cost estimates are exceeded by the lesser of 20% or $3,000. Appropriate documentation regarding the need for the changes will be submitted to DNR

Table 3-3. Cost-Share Budget Needs for Rural Management Practices in Polk County

BMP	Number	Cost/unit ($)	Total Cost	75 % Participation	
				State Share	Local Share[1]
Upland Control					
Agricultural Sediment Basin	10 ea	12,500	125,000	65,625	28,125
Change in Crop Rotation	3,000 ac	NA	0	0	0
Critical Area Stabilization	60 ac	500	30,000	15,750	6,750
Cropland Protection Cover[1] (Green Manure)	500 ac	25	12,500	9,375	0
Field Diversions and Terraces	1,200 ft	15	18,000	9,450	4,050
Grade Stabilization	10 ea	8,000	80,000	42,000	18,000
Grass Waterways	20 ac	3,500	70,000	36,750	15,750
High Residue Management [1,2]	3,000 ac	18.5	277,500	208,125	0
Intensive Grazing Management (Rotational Grazing)	1 ea	4,000	4,000	1,500	1,500
Lake Sediment Treatment (TBD)	TBD	TBD	0	0	0
Livestock Fencing	5,000 ft	1	5,000	1,875	1,875
Nutrient Management[3]	36,000 ac		648,000	243,000	243,000
Pest Management[3]	36,000 ac	4	432,000	162,000	162,000
Shoreline Buffers	175 ac	300	52,500	27,563	11,813
Shoreland Habitat Restoration	50 ea	2,000	100,000	52,500	22,500
Spill Control Basin	1 ea	15,000	15,000	7,875	3,375
Wetland Restoration	10 ea	500	5,000	2,625	1,125
Animal Waste Control					
Complete Barnyard System or Barnyard Abandonment or Relocation	5 ea	25,000	125,000	65,625	28,125
Roof Gutters	15 ea	2,500	37,500	19,688	8,438
Clean Water Diversion	20 ea	5,000	100,000	52,500	22,500
Manure Storage Facility[4]	2 ea	65,000	130,000	27,250	19,250
Manure Storage Facility Abandonment	10 ea	10,000	100,000	52,500	22,500
Cattle Mounds	2 ea	3,000	6,000	3,150	1,350
Milking Center Waste Control	2 ea	7,000	14,000	7,350	3,150
Streambank Erosion Control					
Shape and Seeding	2,000 ft	12	24,000	12,600	5,400
Fencing	16,000 ft	1	16,000	8,400	3,600
Crossing	5 ea	2,500	12,500	6,563	2,813
Remote Watering Systems	10 ea	2,000	20,000	10,500	4,500
Miscellaneous					
Well Abandonment	30 ea	550	16,500	8,663	3,713
Subtotal	0	0	2,476,000	1,160,804	645,200
Easements	40 ac	2500	100,000	75,000	0
Total			**2,576,000**	**1,235,804**	**645,200**

[1]Local share includes labor and equipment costs. Also see flat rates in table 3-1.
[2]High residue management is cost shared per acre over a six-year period.
[3]Nutrient and pest management is cost shared per acre over a three-year period.
[4]Manure storage is cost shared at 70% for the first $20,000 of cost and at 50% for the remaining cost, not to exceed $35,000.

Cost Share Agreement and Contact Strategy

Money for cost share agreements is distributed by the LWRD from a Nonpoint Source Grant provided by the DNR. The LWRD receives additional grant money to support administrative responsibilities. Cost share agreements are binding contracts between landowners and the LWRD. Landowners must meet eligibility requirements defined in chapter two.

Landowner Contact Schedule

The following procedure will be used to make landowner contacts.

- During the first year of the implementation period, all landowners or operators with eligible nonpoint sources will receive a mailing from the county explaining the project and how they can become involved.
- During the first year of implementation, county staff will make personal contacts with all landowners that have been identified as having critical nonpoint sources of pollution.
- 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 cost-share sign-up period.

Critical Site Notification Process

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

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

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

- Critical site notification must be completed within 5 years of the plan approval.

Critical Site Appeals Process

The owner or operator of a site designated as a critical site may appeal the critical site designation to the Land Conservation Committee of Polk County. 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 notification letter was received by the owner or operator.

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.
- Hold the hearing in a place that is convenient for the appellant.

The appellant and project staff will present information about the site so the 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.

The LCC shall:

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

The LCC may support or overturn the designation of the 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 the verification of the site and the site 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 Polk 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.

Rural Budget and Staffing Needs

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

Staff Needs and Costs

Table 3-4 lists the total estimated staff needed to implement the project assuming a 75 percent level of participation by eligible landowners. Approximately 27,396 staff hours are required to implement this plan. This includes 7,500 staff hours to carry out the information and education program.

Currently, 1.65 positions are being funded by the Horse Creek Priority Watershed Project. This current level includes the development of the Nonpoint Source Pollution Management Plan and an information and education program. If significant progress is to be made in the elimination of Cedar Lake from the federal 303(d) list, additional staff and implementation funds will be necessary to allow for an increase focus in the Horse Creek subwatershed and Cedar Lake subwatershed. Should additional funds be made available in the statewide program the county should apply for a grant amendment to add the additional needed resources.

The estimated cost for staff at the 75 percent participation rate is $493,128. These costs will be paid by the state through the Local Assistance Grant Agreement.

Activities and Sources of Pollution Not Eligible for Cost Share Assistance

Priority watershed cost share funds cannot be used to control sources of pollution and land management activities specifically excluded in NR 120.10 and NR 120.17.

Some items not eligible for funding will be required in order to implement the plan recommendations. An example is the renovation of storm sewers, which may be required to install a wet detention basin. Limits on funding eligibility are meant to apply only to the priority watershed program as administered under existing administrative code. These limits are not meant to preclude separate budgetary or contractual financial assistance agreements. Such agreements might be developed under new state or federal programs, or with other units of government. The plan endorses the use of funds procured through such agreements to implement plan recommendations.

Table 3-4. Estimated Polk County Staff Needs for Eight Years of Project Implementation (75% Landowner Participation)

Activity	Polk County Staff Hours
Project and Financial Management	3,500
Information and Education Program	7,500
Pre-Contact Office Inventory; Landowner Contracts and Progress Tracking	832
Conservation Planning and Cost-Share Agreement Development	480
Plan Revisions and Monitoring	280
Upland Sediment Control	8,226
Animal Waste Management	2,960
Streambank Erosion Control	618
Easements	2,500
Training	500
Total	**27,396**
Estimated Staff Required per year	1.84
Hours per year	3,835

Source: Wisconsin DNR, DATCP, and the Polk County LWRD

Cost Share Agreement and Administration

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

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

Local, state, or federal permits may be needed prior to installation of some BMPs. The areas most likely to need permits are zoned wetlands and the shoreline areas of lakes and streams. These permits

are needed whether the activity is a part of the watershed project or not. The cost share recipient is responsible for acquiring the needed permits prior to installation of practices.

Local units of government are responsible for enforcing compliance of cost share agreements to which they are a party. Where DNR serves as 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.

Implementation Schedule

Project Cost

The state funding required to meet the rural nonpoint source pollution control needs at 75 percent level of landowner participation is presented in table 3-7. The estimated cost to the state for practices is $1,863,892. The estimated cost to landowners and others is $660,200. This figure includes the capital cost of practices, staff support, and easement costs as presented above. The total cost of plan implementation is expected to be $2,565,492.

These cost estimates are projections developed by agency planners and local staff based on the need to meet project goals and objectives. 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.

Based on the Wisconsin Land and Water Conservation Board's approved Financial Management Plan, dated October 30, 1998, 1,134,670 has been allocated from the state nonpoint source program budget for nonpoint source grant funds for this project. Should additional funds be made available in the statewide program, it is recommended that the county apply for a grant amendment to add additional needed resources.

Grant Disbursement and Project Management Schedule

Implementation of this priority watershed project shall begin following approval of this plan and receipt of the Nonpoint Source Grant. The plan has been approved by DNR, Polk County Board of Supervisors, St. Croix County Board of Supervisors, and the Wisconsin Land and Water Conservation Board.

The project implementation period is from October 1999 to December 2008. Cost share agreements may be signed with eligible landowners during implementation, and will end on December 31, 2007. Practices listed on any cost share agreement must be installed before the end of the implementation phase. The implementation phase of this project is scheduled to conclude in 2008.

The initial rural Nonpoint Source Grant will cover the cost of practices over the entire implementation phase. The amount of the rural Nonpoint Source Grant is calculated at 75 percent participation by eligible landowners; see table 3-3 for a detailed explanation. Grants 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 Polk County to cover the costs of personnel, operating expenses, and equipment. The DNR will evaluate each annual workload analysis and grant application.

Table 3-5. Cost Estimates for the Horse Creek Priority Watershed Project (75% Landowner Participation)

Item	State Share	Local Share
Cost Share Funds: Practices	1,235,804	645,200
Cost Share Funds: Easements	75,000	1,500
Local Assistance Staff Funding	493,128	0
Information and Education Direct	32,000	10,000
Other Direct (travel, supplies, etc.)	19,360	3,500
Engineering Assistance	50,000	0
Professional Services	0	0
Total	**1,905,292**	**660,200**
Total Project Cost	**2,565,492**	

Source: Wisconsin DNR, DATCAP, Polk County LWRD

CHAPTER FOUR:
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 Horse 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

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 quality of the fishery in the Horse Creek watershed. When rock riprap is installed, it should be sized so that the placement and size of rock will positively benefit fish habitat. Emergent aquatic vegetation that enhances wildlife habitat should be used for shoreline erosion control whenever feasible. Wildlife habitat components should be incorporated into vegetative filter strips along streams, lakes or wetlands within the project area.

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, propose measures to minimize impact on wildlife habitat when BMPs are installed, and assist in resolving questions concerning effects of agricultural nonpoint source BMPs on wetlands.

Wetland Restoration, Protection, and Enhancement

Restorable wetlands have been identified within the Horse Creek Priority Watershed. Several funding sources for restoring and enhancing impacted wetlands in the project area will be used. They include, but are not limited to, Partners for Fish & Wildlife, the Wetland Reserve Program (WRP), Wetland Habitat Incentives Program (WHIP), Conservation Reserve Program (CRP), Conservation Reserve Enhancement Program (CREP) in a limited project area, and the North American Conservation Act funding (NACA).

Watershed staff will work cooperatively with NRCS, USFWS, and DNR staff to contact eligible landowners and promote wetland restoration.

The watershed also lies within what has been identified as the Wisconsin Northwest Focus Area of the North American Waterfowl Management Plan. This area is a small part of a much larger area being targeted under this plan. Work associated with this plan will include fee title and easement acquisition,

restoration and enhancement of wetlands and associated uplands to increase the populations of waterfowl and nongame birds, and to provide the benefits of an extensive wetland-upland complex.

The general guidelines for wetland restoration, easement acquisition and shoreline buffers to protect existing wetlands should be followed. Shoreline buffer easements may be acquired adjacent to wetlands that have been identified as important wildlife habitat in consultation with DNR Wildlife Management and Water Management personnel, to offer better protection from sedimentation and other nonpoint source pollution.

Groundwater Management

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

Private Sewage System Maintenance and Rehabilitation

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

Polk County staff will distribute educational materials to promote the proper maintenance of private sewage systems. Sewage system maintenance and household tips to reduce groundwater contamination will be stressed during visits with landowners. It is also recommended that Polk County 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 a Polk County Sanitary Inspector and determined to be failing by discharging waste to the groundwater or surface water. Only permanent residences qualify, and there are income restrictions. Applications for Wisconsin Fund assistance are made through the Polk County Zoning Department.
Polk County LWRD staff will inform watershed residents about the benefits of the Wisconsin Fund grant program and encourage eligible landowners to apply.

Riparian Zones

Cattle access to streams and lakes has not been identified as a problem in limited areas in the watershed. Any sites impacted by cattle access that are identified during the implementation phase of the project will be evaluated to determine if they are a critical site (see definition of critical sites in chapter 3). Sensitive riparian areas can be acquired through easements so they receive lasting protection.

Shoreline Habitat Restoration: The new shoreline habitat restoration BMP will be used in this project to restore wildlife and fishery shoreline habitat as well as enhance shoreline aesthetics and reduce nutrient loading from runoff on developed lake lots.

Polk County LWRD staff will promote the protection of riparian areas where possible.

Lake Management

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

The Lake Management Planning Grant program has two funding cycles in each calendar year. Grant applications must be received by the region lake management coordinator in Spooner by February 1 or by August 1 of each year. The Lake Management Protection Grant program has one funding cycle each calendar year. Grant applications must be received by the region lake management coordinator in Spooner by May 1 annually.

Stewardship Program

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

Forestry Programs

Based on the Landsat classification of land cover described in Chapter 1, forest lands account for 7,928 acres or 26 percent of the total watershed area. These forestlands contribute to the quality of water resources and fish and wildlife habitat 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 forestlands 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 nonindustrial private forest land of 10 acres or more on forested or forest related (i.e., prairie, wetlands) lands. Practices that are cost-shared by SIP include: development of a landowner forest stewardship plan; site preparation and tree planting; timber stand improvement; windbreak and hedgerow establishment; soil and water protection and improvement; riparian and wetland protection and improvement; fisheries habitat enhancement; wildlife habitat enhancement; and forest recreation enhancement.

Managed Forest Law

The goal of the Managed Forest Law (MFL) program is to encourage long-term sound forest management. MFL is a tax incentive program for industrial and nonindustrial private woodland owners who manage their woodlands for forest products while also managing for water quality protection, wildlife habitat and public recreation. In return for following an approved management plan, property taxes are set at a lower rate than normal. At a later time when the landowner receives an income from a timber harvest, some of the deferred tax is collected in the form of a yield tax. Management plans are based on the 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. Grazing is not allowed under this program. Contracts are generally in place for 25 to 50 years.

Other Forestry Stewardship Programs

Some other forest stewardship programs available to watershed landowners include the Forest Improvement Program (FIP) and the Agricultural Conservation Program (ACP). These programs provide funding for the establishment of timber stands.

Polk County staff and DNR Foresters will encourage eligible forest landowners in the watershed to participate in forest stewardship programs to benefit water resources and forest habitat. Protection of soil and water resources shall be addressed in all SIP and MFL plans where applicable.

Coordinating Regulations, Permits, and Zoning

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

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

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

The Polk County LWRD will work in cooperation with the Property Listing Department, Zoning Department and the DNR to provide information packets to new waterfront property owners in the watershed.

Coordination With State and Federal Conservation Compliance Programs

The Horse Creek Priority 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 LWRD 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 developed by NRCS staff in 1989 for all landowners with highly erodable land in the Horse Creek Priority Watershed. Implementation and amendment of these conservation plans will be necessary during the implementation phase of the watershed project. County administered programs, which include FPP, County Land & Water Planning, and NR 243, will be administered according to county policies and standards. Watershed project staff will inform FPP and NRCS staff of changes in conservation plans resulting from management decisions and the installation of needed BMPs for nonpoint source pollution abatement.

Archaeological Sites: Coordination with State and Federal Historic Preservation Laws

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

Archaeological sites within the Horse Creek Watershed will need special consideration when structural best management practices are being considered. Settling basins, manure storage structures, and

streambank or shoreline shaping and riprapping are likely practices that may impact archaeological sites. As discussed above, state and federal laws require preservation of archaeological resources within the framework of the NPS Program.

Before finalizing the cost-share agreement with the landowner, project staff should review maps showing known archaeological and historic sites. Polk County will obtain a supply of landowner questionnaires from the historical society that will be used to identify additional non-inventoried 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. Any costs incurred as part of a site review *will not be passed on to the landowner*. The DNR's Nonpoint Source Pollution Abatement Program will pick up the costs of professional historic and/or archaeological site reviews. In some cases, a representative from the U.S. Natural Resources Conservation Service (NRCS) may conduct the review.

Practices of concern

Archaeological Sites

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

Buildings

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

Practices - No Concern Needed for Cultural 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 Horse 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 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:

Lanius ludovicianus, loggerhead shrike (Endangered Bird Species)

Wisconsin Threatened Species

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

Clenmys insculpta, wood turtle
Emydoidea blandingii, Blandings turtle

Wisconsin Special Concern Species

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

Haliaeetus leucocephalus, bald eagle
Fundulus diaphanus, banded killfish
Cardamine pratensis, cockoo flower

Natural Areas

Natural areas are sites that contain high quality examples of natural communities. Information about natural areas in the Horse Creek Priority Watershed Project area may be obtained by contacting DNR's 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 FIVE:
Information and Education Program

Goals

The goal of the Horse Creek Priority Watershed Project's Information and Education (I&E) Program is to help residents, property owners, public officials, and stakeholders of the watershed develop a sense of responsibility and ownership for the water resources and water quality problems in the watershed, and assume responsibility for protecting, restoring, and enhancing these aquatic resources. The I&E Program will also serve as an especially vital component in helping to meet the watershed project's water quality goals and overall project objectives.

Objectives

- Promote the awareness, appreciation and stewardship of local water resources, and build awareness of local water resource problems.

- Help local residents, property owners, public officials, and stakeholders of the watershed acquire the knowledge and skills necessary to implement solutions to water resource problems.

- Build awareness of the priority watershed project, the best management practices available for water quality protection and improvement, and the associated technical and financial assistance available to watershed property owners.

- Engage residents, property owners, public officials, and stakeholders of the watershed project area in activities that positively impact the water resources of the watershed, and that help to meet the water quality goals and objectives of the project.

Delivery Team

The Polk County LWRD staff will take the lead role in implementing the I&E Program. When applicable, supporting assistance will be provided by University of Wisconsin-Extension, Department of Natural Resources, and the Department of Agriculture, Trade & Consumer Protection. The LCC Committee, Citizen Advisory Committee, private industry representatives, and local volunteers may also assist with activities whenever possible. The LWRD will also work with and seek support from local units of government, community organizations, clubs, and businesses.

Strategy

The Citizen Advisory Committee and project staff developed the following I&E Program based on eight focus areas key to improving and protecting water quality in the Horse Creek Priority Watershed

Project Area. For each of the eight focus areas below, the following have been identified: topics, target audiences and key messages.

Shoreland Protection and Restoration	***Agricultural Nutrients and Pesticide Mgm't***
Septic System Construction and Maintenance	***Wetlands Protection and Restoration***
Construction Site Erosion Control	***Groundwater Quality Protection***
Agricultural Soil Erosion Control	***Project Awareness and Participation***

Making landowners and potential project participants aware of the project and the opportunities available will be a major focus of the I&E Program during the first few years of the project. A list of specific methods for reaching key target audiences has been further identified, and follows the section on focus areas. A list of priority activities has also been developed to help guide information and education activities for the first few years of the program.

Focus Areas

Shoreland Protection & Restoration

Topics: Restore shoreland habitat where it has been lost.
Protect existing shoreland habitat during new development or renovation.

Target audiences:

Property owners:
- Shoreland property owners
- Wetland property owners
- Lake district and lake association members

Local government:
- County Zoning Committee and Board of Adjustment members
- County Zoning Department staff
- Long Range Planning Committee members
- County Board members
- Village and Town Board members

Building trades and real estate:
- Home builders / contractors
- Landscapers
- Architects / home designers
- Real estate agents
- Developers

Building supply companies
Garden shops and hardware stores

Key messages:

1. Don't use phosphorous lawn fertilizer and pesticides if you don't need to!
2. Edit shoreland vegetation for views instead of clearing large areas.
3. Shoreland vegetation is important habitat for land and water wildlife.
4. Infiltrate and filter runoff as much as possible.
5. Disturb the minimal amount of land when building.
6. Maximize construction site erosion control.
7. Certain wildlife need large blocks of habitat - avoid fragmentation.
8. Deed restrictions can assure shoreland protection after property is sold.
9. Cost sharing may be available to help restore your shoreline.

Septic System Construction & Maintenance

Topics:

Identify signs of a failing system.
Care for and maintain septic systems.
Know the septic system codes.

Target audiences:

Property owners:
- Those owning or upgrading an existing system
- Those installing a new septic system
- Lake District and Lake Association members
- Riparians with noticeable septic problems

Local government:
- Town Board members
- County Zoning Department staff

Real estate agents:
- Those selling lakefront property
- Those selling property for development
- Those selling older homes with septics

Construction and maintenance businesses:
- Certified soil testers
- Plumbing contractors
- Tank pumpers

Key messages:

1. Improperly constructed or maintained systems put phosphorous into the lake.
2. Improperly sited septic systems can put nitrates into well water supplies.
3. Septic systems need attention and maintenance to keep operating properly.

Construction Site Erosion Control

Topics: Home construction
Commercial construction
Road and bridge construction

Target audiences:

Property owners:
- Those building homes
- Businesses having buildings built
- Lake district and association members

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

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

Citizens concerned with lake protection

Key messages:

1. Sediment clogs streams and fills in lakes bottoms.
2. Sediment is a source of nutrients that "greens up" lakes.
3. Sediment directly and indirectly damages fish and wildlife.
4. Erosion control is not complicated, but requires diligence and dedication.
5. Those having construction being done should make erosion control a priority.
6. Keys to effective construction site erosion control is keeping the soil covered and trapping sediment before it leaves the site.
7. Construction site erosion control on home sites is the law that, depending on the locality, is enforced on the municipal, county, or state level.

Agricultural Soil Erosion Control

Topics: Erosion from cropland

Target audiences:

Property owners:

Farm owners and renters

Ag-business:

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

Youth:

FFA/Vo-Ag Classes (Amery, Osceola, New Richmond Districts)

Key messages:

1. Sediment clogs streams and fills in lakes bottoms.
2. Sediment is a source of nutrients that "greens up" lakes.
3. Sediment directly and indirectly damages fish and wildlife.
4. Erosion control is not complicated, but requires diligence and dedication.
5. Growing close grown crops and pasture reduces erosion.
6. Keeping soil covered with crop residue reduces erosion.
7. Erosion caused by concentrated flow can be reduced through the use of waterways, diversions, and water control structures.
8. Buffer strips help settle out sediment before it can reach streams.

9. Cost-sharing is available to reduce erosion from cropland.

Agricultural Nutrient & Pesticide Management

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

Target audiences:

Property owners:
Farm owners and renters

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

Youth
FFA/Vo-Ag Classes (Amery, Osceolla, New Richmond Districts)

Key messages:

1. Make full and proper use of "home grown" nutrients.
2. Apply fertilizer according to soil tests and crop need.
3. Excess manure can be stored, traded to another farm or applied to newly cut hay.
4. Apply pesticides based on scouting information and crop tolerance thresholds.
5. Scraped manure from barnyards should be stored safely and applied to cropland to make best use of nutrients.
6. Barnyard runoff systems need to be maintained in order to remain effective.
7. Cost-sharing is available to reduce runoff of agricultural nutrients and pesticides.

Wetlands Protection & Restoration

Topics: Protecting existing wetlands
Restoring drained wetlands

Target audiences:

Property owners:
- Landowners with existing wetlands
- Landowners with drained wetlands

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

Building Trades and Real Estate:
- Builders / contractors / engineering consultants
- Landscapers
- Developers, real estate agents, and land speculators

Key messages:

1. Wetlands capture, store, and infiltrate runoff water.
2. Wetlands filter runoff water.
3. Wetlands provide special and needed habitats.
4. Wetlands should be protected and restored.
5. Cost-sharing is available to restore wetlands.

Groundwater Quality Protection

Topics: Protect private water supplies

Target audiences:

Landowners with private wells
Well drillers
Town and Village Board members
Real estate agents

Key messages:

1. We all depend on groundwater for our drinking water.
2. The source of our drinking water is beneath our feet - what we do on the ground surface impacts groundwater quality.
3. Activities that have potential to contaminate groundwater should not be permitted in well recharge areas.
4. Cleaning up groundwater is difficult - protection of groundwater is key.
5. Owners of private wells should have them tested annually.
6. Owners of manure pits no longer in use should properly abandon them with cost-sharing assistance available
7. Unused wells should be closed off to prevent groundwater contamination.
8. Landowners that store fuel, pesticides and other hazardous materials on their property should take precautions to avoid spills and leakage.
9. Cost-sharing is available to close unused wells.

Project Awareness & Participation

Topics: Water resource awareness (streams, lakes, wetlands, groundwater)
Watershed awareness (what happens on the land impacts the quality of water)
Nonpoint source pollution (runoff pollution)
Quality of water and quality of life

Target audiences:

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

Key messages:

1. Quality of life is dependent on quality water.
2. Protection of property value and local economy is dependent on quality water.
3. How we carry out our daily activities impacts water quality.
4. We are community members of the watershed in which we live.

5. The Horse Creek Watershed Project can offer assistance on activities that will improve and protect water quality and water habitats.
6. The Horse Creek Watershed Project is a state funded effort, run locally through the County Land Conservation Committee.

Specific Methods for Reaching Key Target Audiences

Shoreland Property Owners

1. Presentations at lake district and association meetings.
2. Place articles in lake district and association newsletters.
3. Create self-help property assessment guide with listing of zoning codes.
4. Placemat for use in area restaurants.
5. Door-to-door neighbor visits with lake protection information.
6. Implement and promote demonstration projects and workshops.
7. Coordinate tours of best management practices.
8. Use of shoreland habitat restoration video.
9. "Lake friendly" recognition signs for landowners doing a good job.
10. Information inserts in tax statement mailings.

Wetland Property Owners

1. Mail out wetland owners manual to those with existing wetlands.
2. Mail out guide to wetland restoration to those with drained wetlands.
3. One-on-one visits to wetland owners by project staff.
4. Tours of restored wetlands
5. Programs on the importance of wetlands habitat

Farmers & Agricultural Businesses

1. One-to-one visits from project staff and committee members.
2. Practice demonstrations, including demos with equipment dealers.
3. Display and/or present at dealer open houses: John Deere dealership, Coop.
4. Display at county fair.
5. Small group meetings and tours.
6. Direct mail announcing events and activities.

Local Government Officials

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

Builders, Contractors, Developers, etc.

1. Small group meetings followed by field tour.
2. Information packets shared when building permits are pulled.
3. Presentations at Home Builder Association meetings.
4. Participate in annual home show.
5. Training and certification programs

Lawn Care Centers, Garden Shops, Hardware Stores, etc.

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

General Public Awareness

1. Newspaper coverage, especially regular column in summer issues.
2. Watershed project signs.
3. Develop project brochure and Internet web site.
4. Develop project logo, possibly through a contest.
5. Develop project mascot, e.g., Bobby Bass, Claire Droplet, etc.
6. Placemat for use at restaurants and civic events.
7. Solicit radio coverage.
8. Participate in Lake Fair and Community Fairs.
9. Personal contacts from project staff and committee members.

Youth

1. Project WET (Water Education for Teachers) training for watershed teachers
2. Student field days.
3. Involve FFA, 4-H, biology classes in water quality monitoring and protection projects.
4. Solicit involvement in poster contest
5. On-going water quality monitoring program
6. Displays at schools.
7. Take-a-kid-fishing programs with Star Prairie Fish and Game Club.

Priority Activities

Brochures

A brochure will be revised and mass printed for the Horse Creek Priority Watershed Project. The brochure will help build awareness for the project, identify water quality problems, available solutions, and will outline the best management practices available and cost share rates. The brochure will be used as a promotional piece throughout the life of the project. Updates and reprints will be conducted as needed.

Citizens Advisory Committee

The Horse Creek Priority Watershed Project Citizen Advisory Committee (CAC) has been instrumental with the development of the Nonpoint Source Pollution Management Plan and outreach activities to the various constituents. The CAC will continue to serve as a vehicle for informing the local public on watershed project plans and activities. The CAC will meet on an annual basis throughout the life of the project to review accomplishments and to act on various watershed project issues.

Building Partnerships

The Polk County LWRD will cooperate with a variety of community organizations on various activities over the duration of the project to help meet the goals and objectives of the watershed project and its educational strategy. These organizations have a vested interest in protecting the water quality of the watershed and may include lake associations and lake districts, fishing and hunting clubs, civic organizations, private industry, and environmental groups.

Demonstrations & Workshops

Innovative practices will be demonstrated that reduce run-off pollution and/or restore fish and wildlife habitat. A variety of workshops and demonstrations will be held over the duration of the project. The workshops/demonstrations will be used to create awareness for area water quality problems and to develop an understanding of the available solutions. Target audiences will include farmers, agricultural businesses, shoreland property owners, wetland property owners, developers, contractors, local public officials, youth, and the general public. At least one workshop/demonstration will be held each year during the first five years of the project. Workshop/demonstration subjects will revolve around the eight focus areas identified and may include:

- Shoreline Protection and Management
- Riparian Buffer Zone Establishment
- Wetland Protection and Restoration
- Septic System Maintenance
- Construction Site Erosion Control
- Road Maintenance and Construction

- Nutrient and Pesticide Management
- Barnyard Runoff and Manure Management
- Agricultural Soil Erosion Control
- Well Abandonment
- Certification Program for Landscapers
- Continuing Education for Crop Consultants

Direct Mailings

Key facts and information related to the project must be passed on to local stakeholders. Direct mailings to selected groups of target audiences and individuals will be conducted on an as needed basis throughout the duration of the project.

Exhibit Development

An informational exhibit will be developed, utilized and updated throughout the project. The exhibit will explain the watershed project, create interest and show results. It will include text, photographs, and graphics to help inform a variety of audiences about the project, water quality problems, and available solutions. The exhibit will be designed to serve as a stand alone display at area banks, libraries, town halls, and other public locations. It will also be designed so it can be staffed during speaking engagements, presentations, workshops, demonstrations, fairs, and other public events.

Educational Literature

Brochures and/or fact sheets will be developed by the LWRD to provide information on water quality stewardship, best management practices, and available cost sharing. Local water resource protection and stewardship will be the central theme of the educational literature and will be included in the landowner I & E packets described later. Existing fact sheets from other states, agencies, and groups will be used whenever applicable for the watershed project.

Promotional Items

A variety of promotional items including pencils, magnets, and restaurant placements will be designed and purchased during the first few years of the project. These items will help to provide recognition and awareness for the watershed project in combination with presentations, displays, I&E packets, educational activities, and demonstrations.

Landowner Information and Education Packets

A packet of information concerning a variety of water quality and pollution prevention topics will be developed, printed and assembled for distribution to watershed landowners. Topics in the packet will include the watershed project, best management practices, zoning requirements, riparian buffers, septic system maintenance, lake management, and pollution prevention. Educational literature and promotional items developed through the watershed project may also be included in these packets. A

series of packets will be developed to target specific audiences and will be used during project meetings, presentations, events, and during one-on-one landowner visits by the LWRD project staff. Packets may also be distributed through lake association and lake district contacts, real estate agents, and private industry representatives.

Media Coverage

News releases will be used for watershed project events and will be released through local newspapers and radio stations. Television coverage will be sought from the Twin Cities of Minneapolis and St. Paul, Minnesota when appropriate. Media coverage is a low cost method to increase awareness of the project objectives, teach the general public skills needed to control nonpoint source pollution, and increase participation in project activities.

Watershed Signs

Four to six high quality informational signs will be developed and installed at a variety of locations along the border of the Horse Creek Priority Watershed Project Area. The signs will read: ?Now entering the Horse Creek Priority Watershed Project Area. They will be placed in highly visible locations along roadsides and will help increase awareness and visibility of the watershed project to the general public. Property owner "lake friendly" signs may also be developed to recognize farmers and lakeshore residents who are doing their part to help protect or improve water quality. Additional signs may be developed for specific educational demonstration projects and possibly for other promotional watershed project activities.

Newsletters & Flyers

Watershed project staff will write, edit and arrange printing of a watershed newsletter to be mailed to all farmers, lakefront property owners, and interested residents and businesses within the watershed. The newsletter will be published a minimum of once per year for the first three years during the implementation phase. The newsletter will be designed to increase project awareness, cost sharing availability, and to help celebrate positive accomplishments being made through the watershed project. Special promotional flyers may also be developed to target specific audiences on a variety of nonpoint source pollution and water quality related topics.

One-On-One Landowner Visits

Watershed project staff will make one-on-one site visits with critical and as many eligible landowners in the watershed as possible. These landowners will include farmers, shoreline property owners, and others. Landowner I&E packets will be distributed during these visits. Site visits will also include property management recommendations for items such as shoreline buffers, soil testing and fertilizer application, water drainage characteristics, shoreline erosion and stabilization, conservation best management practices, and water quality stewardship tips. Project staff will also work in cooperation with private consultants to undertake site visits.

Presentations

Presentations will be delivered to interested community groups and organizations, to local units of government, and to others throughout the duration of the watershed project. Speaking engagements may include slide, video, multimedia, and exhibit presentations. Landowner I&E packets and other promotional materials will be distributed at these presentations. This is one effective way to distribute information and rally support for the project and its goals.

Youth Education Activities

Project staff will work with local school districts or specific classes to build water resource education and assist them with projects, activities, and educational program delivery. School programs and presentations will be developed by watershed project staff to generate awareness and knowledge on water resource related issues. Project staff will accommodate as many schools and school groups as feasible.

Photography

LWRD staff will use photography to keep track of progress being made in the watershed and to demonstrate nonpoint source pollution problems. The images collected will be kept on file and will be used in press releases and newsletters. A slide presentation may also be produced and updated for use at meetings, demonstrations, workshops and speaking engagements.

Evaluation

An evaluation report of information and education activities will be prepared annually and will be based on a variety of evaluation techniques used to track I&E Program progress. A survey will be used every few 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. Qualitative and quantitative project interest tracking information will also be collected for this purpose. A qualitative assessment will be documented based on the feedback from project partners, the media, and other sources. A quantitative assessment will be documented based on the number of requests for information, office visits, and calls that are received from interested watershed stakeholders. Activities will also be evaluated through recording the number of attendees at a function, the number of target audience members reached, event surveys, or other methods.

Budget & Staffing Needs

The estimated budget for the Horse Creek Priority Watershed Project I&E Program over the eight-year implementation period is $42,000. The state share is $32,000 with a local match of $10,000. Staff hours required to implement the I&E Program over the life of the project is estimated at 7,500 hours. Table 5-1 shows a break down of the I&E Program budget and staff hours estimate.

Table 5-1. I&E Program Budget and Staff Hours Estimate

Activities	Total Number	Total Cost	Staff Hours	
			Years 1-3	Years 4-8
Brochures	5,000	$2,000	100	50
Citizens Advisory Committee	Ongoing	$500	20	30
Building Partnerships	Ongoing	$2,000	500	300
Demonstrations & Workshops	10	$7,000	1,500	500
Direct Mailings	10	$3,000	350	150
Exhibit Development	Ongoing	$1,000	100	50
Educational Literature	Ongoing	$2,500	300	100
Promotional Items	1,000 ea.	$6,000	100	50
Landowner I&E Packets	1,000	$3,500	400	200
Media Coverage	Ongoing	0	300	150
Watershed Signs	6-8 Primary	$4,500	150	50
Newsletters & Flyers	Ongoing	$5,000	500	200
One-On-One Landowner Visits	100	$500	350	100
Presentations	As Needed	$500	250	100
Youth Education Activities	Ongoing	$2,000	200	100
Photography	Ongoing	$2,000	150	100
Totals		**$42,000**	**5,270hrs**	**2,230hrs**

CHAPTER SIX:
Project Evaluation and Monitoring

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

- Administrative Review
- Accomplishment Reporting
- Financial Expenditures
- Time Spent On Project Activities
- Nonpoint Source Pollutant Load Reduction
- Water Resource Evaluation Monitoring
- Whole Stream Monitoring Sites
- Signs of Success
- Final Project Report

Information on the first two components will be collected by the Polk County LWRD and reported on a regular basis to the DNR and the DATCP. The project team will meet early in the year throughout the implementation phase to review and evaluate the accomplishments of the preceding year. Additional information on the numbers and types of practices on cost-share agreements, funds encumbered on cost-share agreements, and funds expended will be provided by the DNR's Bureau of Community Assistance.

The third component, watershed resource evaluation monitoring, will be conducted by DNR Water Quality Biologists. Watershed resource evaluation monitoring follows guidance established by DNR's Bureau of Watershed Management to select and monitor specific sites in the watershed. Monitoring will be conducted to demonstrate changes in water quality and/or habitat conditions resulting from the installation of BMP's. Signs of Success (SOS) monitoring at specific sites will follow guidelines established by DNR's Bureau of Watershed Management.

A final report will be prepared for the 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 DNR will work jointly with Polk County in the preparation of the final report.

Administrative Review

Project administration will be reviewed annually as county watershed staff will report a variety of information to the DNR and the DATCP. The administrative review will focus on the progress of Polk County and other units of government in implementing the project. The project will be evaluated with respect to accomplishments, financial expenditures, and staff time spent on project activities as well as landowner participation, and progress toward achieving the water quality, aquatic habitat, and pollutant load reduction objectives of the watershed project.

The information listed above is described in more detail in the following sections and will be analyzed and discussed at an annual review meeting. During the annual review meeting, reduction goals, landowner contact strategy modifications, progress with critical sites, and work planning needs will be jointly developed for each subsequent year. Each year Polk County LWRD, DNR, and DATCP staff will compare actual performance to the annual goals. Local assistance grant recommendations and awards will, in part, be determined by annual pollution reduction objectives.

Accomplishment Reporting

Polk County will use their data system to collect data for administrative accomplishments and will provide the information to the DNR and the DATCP for program evaluation. Polk County will keep the Department appraised of the changing status of critical site landowners.

The following data will be included within the annual accomplishment report:

- Number of acres within the project with conservation and nutrient management plans
- Number and type of conservation practices/BMP's planned and number installed by project
- Progress toward contacting landowners, including critical site landowners
- Pollutant load reductions
- Information and education activities completed

Details of the reporting requirements are contained within the jointly published evaluation plan for the Soil and Water Resource Management Program and the Nonpoint Source Water Pollution Abatement Program (DNR Publication WR-223094). The publication is reviewed every two years by the DATCP and the DNR and revised as necessary.

Likewise, participating local units of government implementing portions of the watershed program will meet periodically with DNR staff to review progress. Local units of government eligible for participation in this project are identified in Chapter 4. The DNR and local units of government will jointly evaluate the implementation program with the summary information to be included in the project annual report.

Accomplishments 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.

Financial Expenditures

The Polk County LWRD and other participating units of government will provide the following financial data to the DNR and the DATCP on an annual basis unless otherwise directed:

- 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 money encumbered in cost share agreements
- Staff travel and training expenditures

- Information and education expenditures
- Expenditures for equipment, materials, and supplies
- Expenditures for professional services and staff support costs
- Interest money earned and expended
- Total project expenditures for staff

Time Spent On Project Activities

The Polk County LWRD and other participating governmental units with local assistance grants will provide time summaries to both departments for the following activities on an annual basis:

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

Nonpoint Source Pollutant Load Reduction

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

Cropland Sources

The Polk County LWRD will use a spreadsheet that estimates sediment reductions due to changes in cropping practices to track pollutant reductions from cropland. Notification to landowners with critical sites will begin within six months following department plan approval, as stated within administrative code NR 120.09. The department may grant up to three ninety-day extensions in addition to the initial six-month period to allow the county time for site verification. The Polk County LWRD will submit a written request to the Department within four months after plan approval for extension consideration.

Streambank Sources

The total length of trampled streambank that has been repaired will be tracked by the Polk County LWRD and reported to the DNR on an annual basis. Streambank critical site landowners will be contacted by the Polk County LWRD within six months following department plan approval; critical site verification will occur at that time

Barnyard Runoff

The Polk County LWRD will use the BARNY model to estimate phosphorus reductions due to the installation of barnyard control practices. The LWRD will report the information to the DNR in the annual report.

Wetland Restoration

The number of wetland areas restored and acreage of wetlands created will be tracked. A method to track reductions in sediment delivery from restored wetlands will be developed.

Water Resource Evaluation Monitoring

Limited funds and the intensive staffing needed to properly evaluate water quality changes prohibits monitoring each watershed individually. Instead, two types of evaluation monitoring are being conducted on a statewide basis: Whole Stream Monitoring and Signs of Success.

The goal of the evaluation monitoring activities is to determine the progress the Nonpoint Source Program is making towards improving the quality of Wisconsin's water resources.
Evaluation monitoring activities were developed to answer five questions about the water resource objectives and the pollution reduction goals:

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

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

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

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

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

A team of experts from state and federal agencies, and the University of Wisconsin was formed to develop and direct the evaluation monitoring activities at the 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.

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 the Horse Creek Watershed are still being identified and will be established shortly after the implementation stage begins.

Final Project Report

A final report will be prepared for the Horse 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 reductions objectives, evaluate BMP effectiveness, and provide recommendations which target key areas needing improvement the NPS program. The Polk County LWRD will prepare the final report in cooperation with DNR and DATCP.

APPENDIX A:
Shoreline Habitat Restoration for Developed Areas

Best management Practice Description, Purpose and Criteria

Karen Voss, DNR
March 8, 1999

Description

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

Purpose

Benefits of shoreline habitat restoration include:

- Reduction of the intensity and impact of human activities in the near shore area;
- Deduction of the near-shore use of pesticides and fertilizers;
- Holding soil in place and filtering and absorbing runoff water;
- Providing food, shelter, nesting sites, and over-wintering cover for aquatic and terrestrial fauna;
- Enhancing littoral zone (shallow water) habitat function for a broad range of vertebrate and invertebrate species by providing shade and cover with overhanging vegetation, and woody and vegetative debris contributions to the littoral zone structure.

Practice Eligibility

Cost sharing for shoreline habitat restoration will be approved when:

- This practice is consistent with the watershed plan;
- Existing shoreline vegetation lacks the structure or complexity to support the habitat functions described above for littoral and riparian areas; and,
- The conditions for shoreline habitat restoration described below are met.

Definitions

Natural Recovery: This restoration method is preferred where native vegetation will recover naturally when a site is protected from disturbance, due to the presence of existing native plants, and adequate seed sources and site conditions. Wet margins of lakes or rivers where turf grasses are not well established are particularly suited to natural recovery. Results may be slower than for planted buffers, but there is virtually no cost, and the end result may be more natural. This method will also be applied to shallow water areas adjacent to shoreland restoration areas.

Accelerated Recovery: This restoration method is used in areas not suited for natural recovery. Seeding and planting establish native vegetation. Areas where dense turf grasses have been maintained for several years usually require accelerated recovery due to the competition of the turf grasses give native vegetation and the lack of native seed sources.

No-touch Zone: Once a buffer is established, vegetation removal and land disturbing activities are prohibited in these areas, as described in this document

Conditions for Shoreline Habitat Restoration

The following conditions apply to shoreland habitat restoration areas for cost-share eligibility. If all conditions cannot be met, the landowner may still be eligible for technical assistance from project staff.

1. Conditions Applying to Entire Property

- No known violations of county and local shoreland zoning requirements are present on the property.
- Runoff from roofs, driveways or other hard surfaces shall be maintained in sheet flow (no channels or gullies) to the greatest extent possible. This can be accomplished with downspout runoff spreaders, directing runoff to flat or gently sloping grassy areas and minor landscaping to temporarily pond or spread out runoff. There shall be no channelized flow through the restoration area.
- Where fertilizers are desired outside the buffer area, zero-phosphorus types will be used unless soil tests specifically indicates a need for phosphorus, and its use is approved by the project manager.
- No changes in land use or managemen5 shall occur that cause increased pollution to surface water from sources that were controlled prior to installing a shoreline habitat restoration practice.

2. Conditions Applying to Restoration Area Dimensions

- A viewing and access corridor may extend from the lake inland, more or less perpendicular to the shore. It may be up to 30 feet wide, but no more than 30% of the property frontage for lots less than 100 feet wide. Clear cutting, filling, grading and other land disturbing activities are not allowed in this area. Limited tree removal, pruning and mowing are allowed. Walkways, stairs, piers, lifts, and boathouses should be located in this corridor.
- Buffer length: The buffer created by shoreline habitat restoration should extend the entire length of the lot along the shoreline except that a viewing and access corridor is allowed.
- Buffer width: where buildings are set back 50 feet or more, the buffer must extend at least 35 feet inland from the ordinary high water mark. Where buildings are set back less than 50 feet, the no-touch zone must extend to within 15 feet of the structure. Wider buffers provide much greater benefit, and are encouraged.
- Areas lakeward of buffer: Shallow water areas (areas capable of supporting aquatic vegetation) lakeward of the ordinary high water mark shall be managed as a no-touch zone. Areas lakeward of the viewing/access corridor are exempt from this condition.

3. Conditions Applying to Restoration Area Design

An evaluation of existing vegetation on the site is necessary prior to the selection of plan materials and restoration method. The natural vegetation that occurs in the region or vicinity of the restoration site should also be considered in developing restoration plans.

- ***Vegetative layers***: In order to restore the functional values of the vegetative buffer, it must consist of three layers: a ground cove, a shrub layer, and a tree canopy. Vegetation in all three layers should be vigorous, diverse, and structurally complex. The only exception to this requirement should be where natural conditions in the region lack these characteristics.
- ***Species Selection***: Vegetation should be adapted to the local soils, climate, and the surrounding vegetation. Project managers are encouraged to develop their own local species lists. UW Extension Publication GWQ014, *Shoreline Plants and Landscaping,* DNR Publication PUBL-WM-228, *Home on the Range – Restoring and Maintaining Grasslands for Wildlife,* or similar publications may be helpful. Watershed staff must approve the plants chosen. Native species are required, and certain invasive species such as reed canary grass and purple loosestrife are prohibited.
- ***Restoration method***: Where appropriate, natural recovery is the preferred method. A combination of natural and accelerated recovery methods may be appropriate on some sites.
- ***View and access corridor***: The restoration area design may include providing water access, enhancing desirable views, screening unwanted views, and enhancing privacy. These goals may be incorporated into the site design if they do not conflict with other requirements of this practice.

4. Conditions Applying to Installation

- ***Planting dates***: Please refer to local NRCS planting recommendations to determine recommended planting dates for ground covers, shrubs and trees.
- ***Erosion control***: Exposure of bare soils will be kept to an absolute minimum by using methods such as black plastic covers to remove competing weeds. All exposed soils must be mulched until the following year. A temporary or companion seeding is required on any exposed slopes exceeding 12%. Mulching and netting or erosion control matting is required on slopes exceeding 20%. Chapter three of the *Wisconsin Construction Site best Management Practices Handbook* provides additional guidelines.
- ***Fertilizers***: Zero-phosphorus start-up fertilization is permitted. Phosphorus application is only permitted where soil test indicates a deficiency.
- ***Herbicides***: Herbicides approved for use near water may be used only where essential and with the approval of the project manager.
- ***Heavy equipment***: Heavy equipment is prohibited except where specifically approved by the project manager to prevent soil compaction. If heavy equipment is used, tree roots should be protected by not driving on the root zone that can extend well beyond a tree's canopy cover area.

5. Conditions Applying to Operation and Maintenance

- All buffer areas are to be managed as no-touch zones.
- Fertilizers: Fertilizers are prohibited after the buffer is established.

- Herbicides: Herbicides are prohibited except as approved by the project manager – where this is the best method to control undesirables invasive species.
- Burning: Burning to clear or maintain buffer areas must be approved by project staff and is limited to regions where prairies are the natural habitat. Burning may release nutrients to the water and inhibit or kill shrub and tree layers.
- Vegetative removal – trees and shrubs: Cutting trees and shrubs may be done only to prevent safety hazards or to remove undesirable competitive species and must be approved by the project manager. Dead or windblown trees provide cover and refuge for fish, amphibians, birds and other species and should be left in place where possible.
- Vegetative removal – leaf litter: The forest floor duff layer and leaf litter must remain intact to provide a continuous ground cover and meet habitat functions of this practice.
- Vegetative removal – mowing: Lawn mowing in permitted in the viewing/access corridor. Elsewhere, mowing is prohibited except in established prairie buffer areas and in accordance with a mowing plan approved by the project manager. In these areas it is recommended that mowing be allowed to a minimum height of ten inches and only as needed to reduce competition from undesirable species. Mowing is recommended only between August 1 and September 1 to avoid disturbance of nesting birds and allow regrowth before winter. Mowing is generally not needed more than once every several years. Vehicles, boats, equipment storage: Vehicles, boats, docks or other equipment storage shall be exclude from the restoration area to prevent soil compaction and damage to the buffer vegetation. Boats and docks may be temporarily stored during non-growing seasons as long as vegetative cover is unaffected.
- Viewing and access Corridor: The access corridor should not channel runoff to the lake and should be located to avoid areas of high runoff or erodible soils. Grass or other cover that will hold the soil is recommended for the access corridor.
- Areas lakeward of buffer: Except for lakeward of the access corridor, these areas will be managed as no-touch zones.

Cost Share Eligibility

1) The maximum cost share rate for eligible activities is 70% and includes:
   - Plants, seed, mulch, and erosion control materials.
   - Labor and services for installation, but not to exceed 40% of total costs or not to exceed a cost containment policy developed by the county for this practice

2) Items not cost shared include but are not limited to:
   - Design costs. Design assistance will be provided or contracted out by watershed staff or paid for by the landowner.
   - Plants, seed mulch or other materials not approved by watershed staff.
   - Shoreline erosion control materials such as rip rap or biologs. These materials may be eligible for cost sharing under another Best Management Practice.
   - Materials for stairs, walkways, paths, or other access structures (because these are not considered part of the buffer area).

BIBLIOGRAPHY

Mudrey, M.G., Jr., LaGerge, G.L., Meryers, P.E., and Cordura, W.S. 1987. *Bedrock Geology of Wisconsin, Northwest Sheet: Wisconsin Geological and Natural History Survey Regional Map Series*. Maps 87-11a&b.

Muldoon, M.A., F.W. Madison, and M.D. Johnson. 1990. Eutrophic Lakes in Northwestern Wisconsin, A Coordinated Soils, Geologic, and Hydrogeologic Investigation. *Wisconsin Geological and Natural History Survey*.

Stevens Engineers Inc. 1996. *Village of Star Prairie, Wisconsin Water Systems Study and Report*.

Priority Watershed Projects in Wisconsin: 1999

REV. 12/99

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

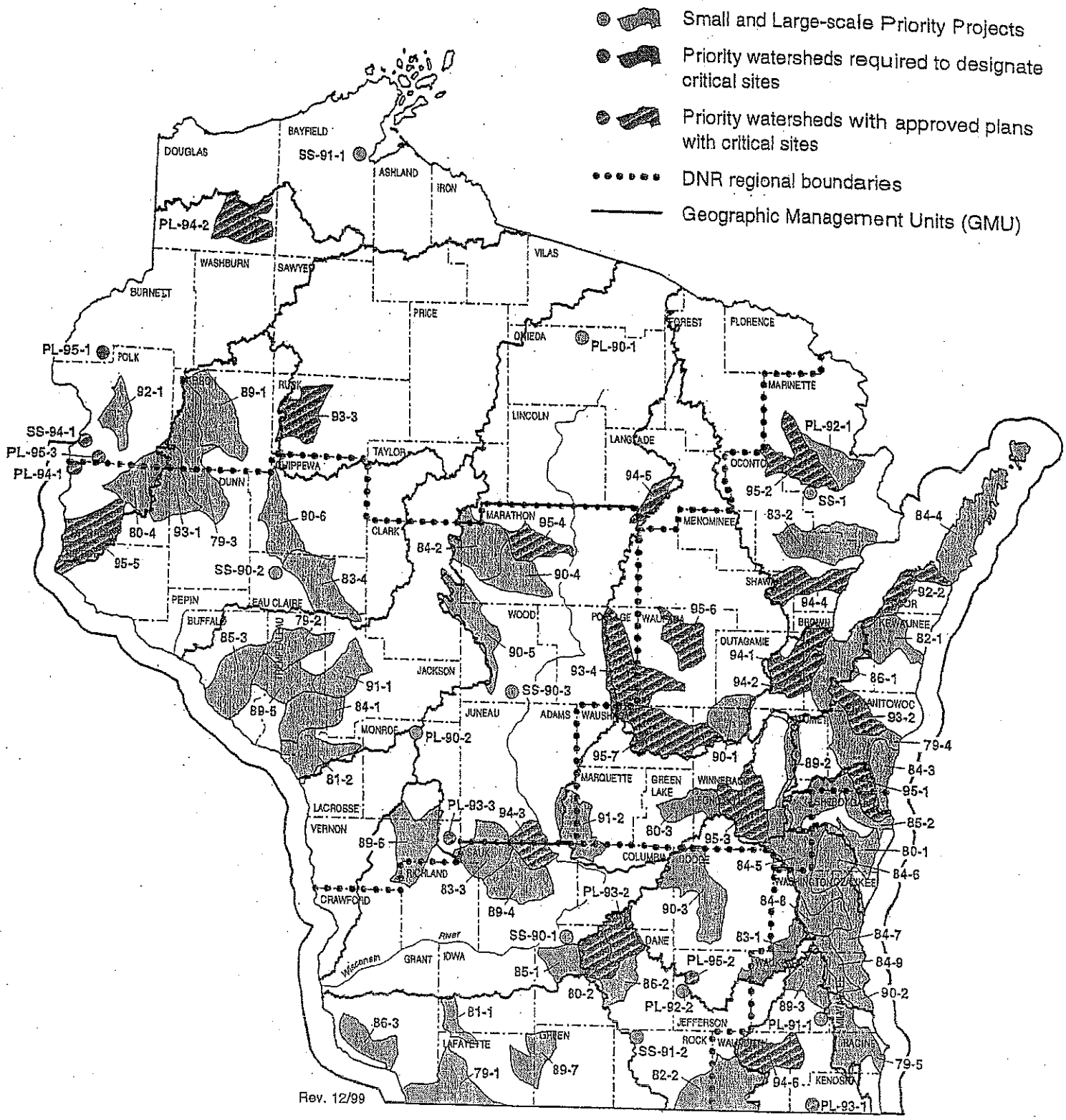
Year Selected-Map Number	Small-scale Priority Watershed Project	County(ies)
SS-1	Bass Lake ♦	Marinette
SS-90-1	Dunlap Creek	Dane
SS-90-2	Lowes Creek	Eau Claire
SS-90-3	Port Edwards - Groundwater Prototype ♦	Wood
SS-91-1	Whittlesey Creek	Bayfield
SS-91-2	Spring Creek	Rock
SS-94-1	Osceola Creek	Polk

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

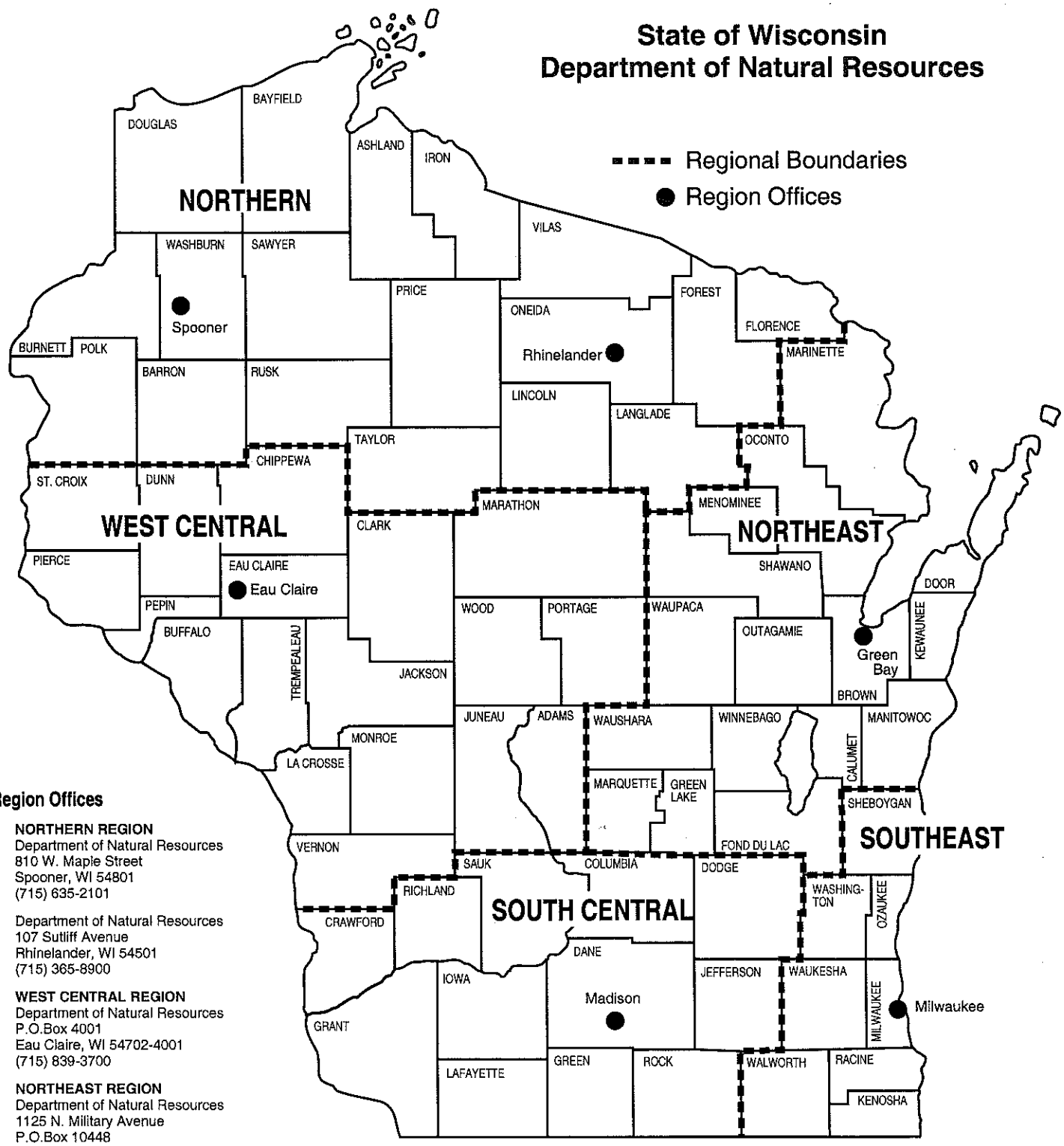
♦ *Project completed*

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

Priority Watershed Projects in Wisconsin



State of Wisconsin
Department of Natural Resources



Region Offices

NORTHERN REGION
Department of Natural Resources
810 W. Maple Street
Spooner, WI 54801
(715) 635-2101

Department of Natural Resources
107 Sutliff Avenue
Rhinelander, WI 54501
(715) 365-8900

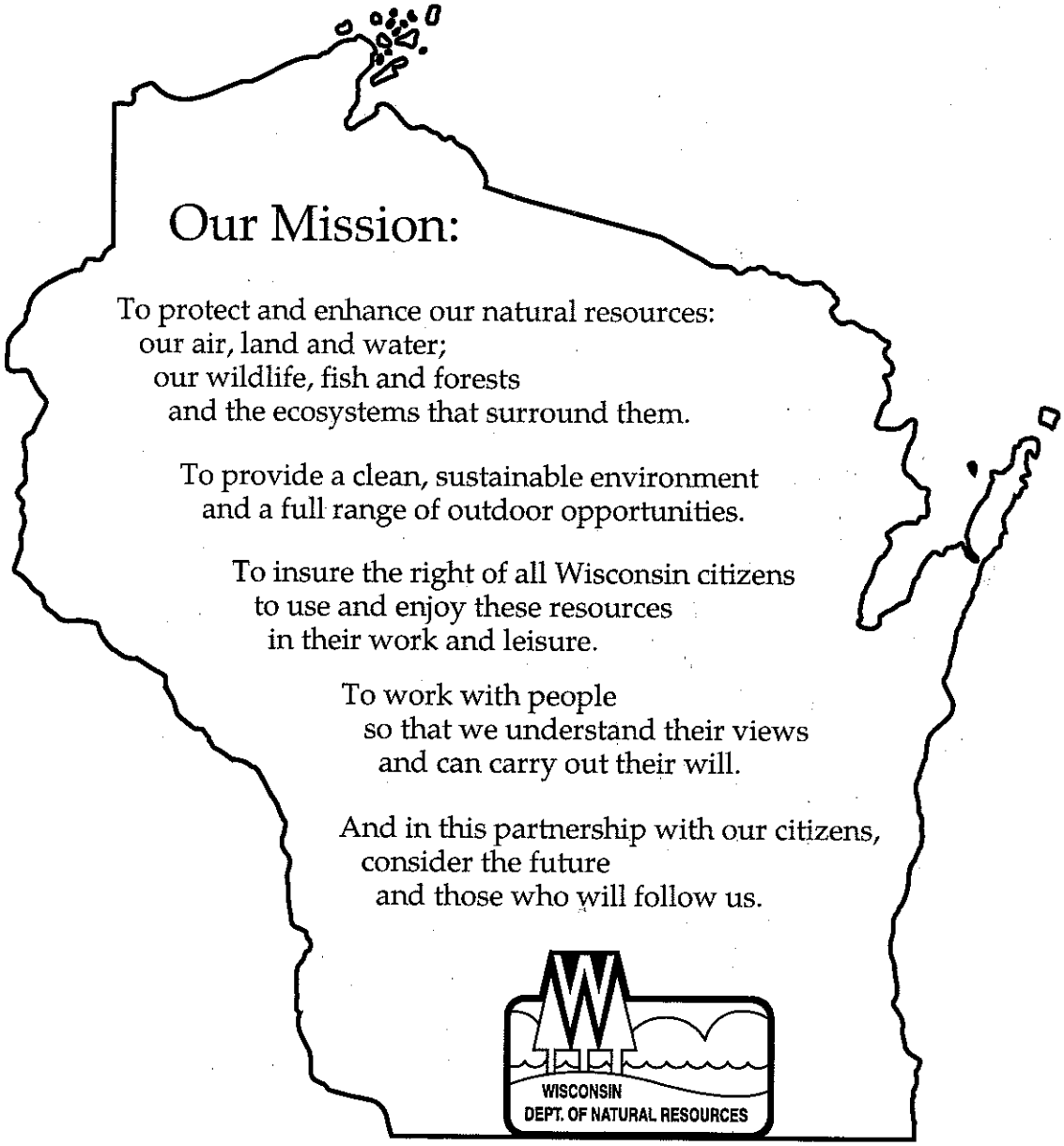
WEST CENTRAL REGION
Department of Natural Resources
P.O.Box 4001
Eau Claire, WI 54702-4001
(715) 839-3700

NORTHEAST REGION
Department of Natural Resources
1125 N. Military Avenue
P.O.Box 10448
Green Bay, WI 54307
(920) 492-5800

SOUTHEAST REGION
Department of Natural Resources
2300 N. Dr. Martin Luther King Jr. Dr.
P.O.Box 12436
Milwaukee, WI 53212
(414) 263-8500

SOUTH CENTRAL REGION
Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg, WI 53711
(608) 275-3266

REV 8-98



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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