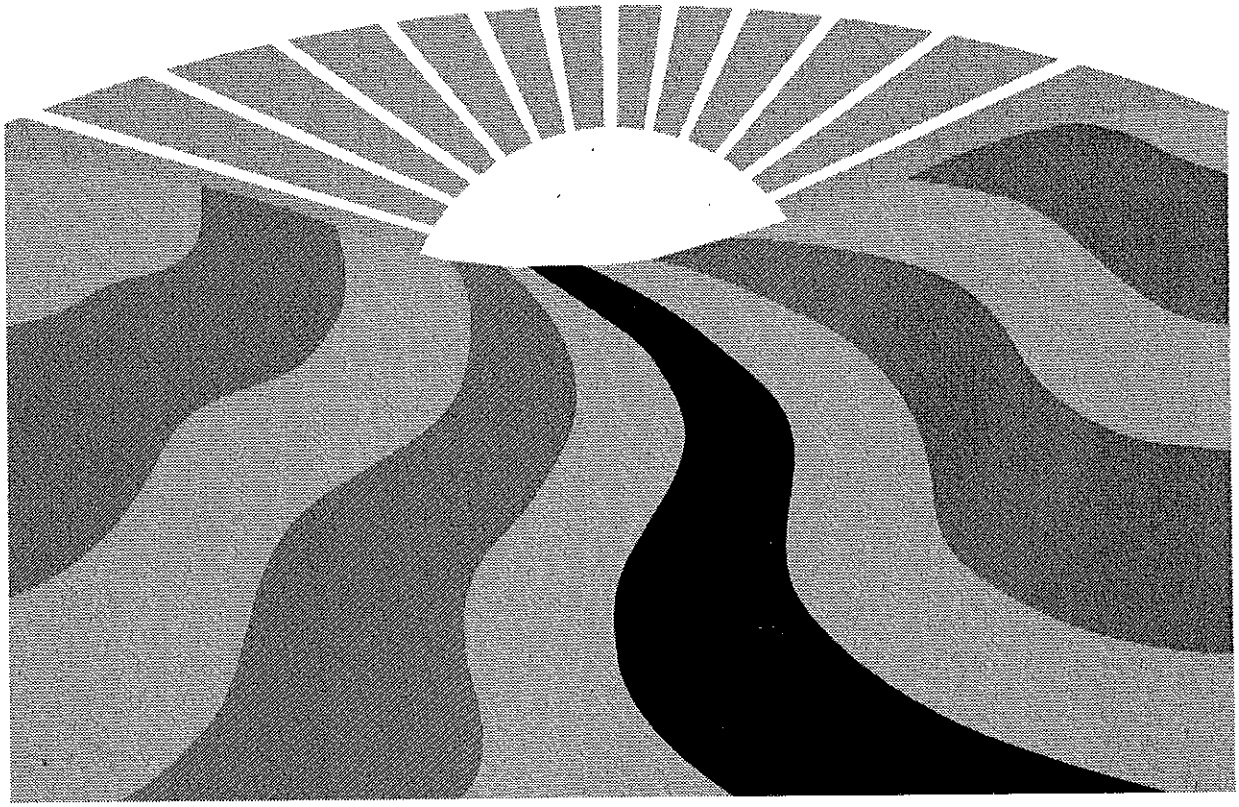
# Nonpoint Source Control Plan for the Pigeon River Priority Watershed Project



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

# Watershed Plan Organization Information

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# Nonpoint Source Control Plan for the Pigeon River Priority Watershed Project

The Wisconsin Nonpoint Source Water Pollution Abatement Program

October 1997

This Plan Was Cooperatively Prepared By:

Wisconsin Department of Natural Resources
Wisconsin Department of Agriculture, Trade and Consumer Protection
University of Wisconsin-Cooperative Extension Service
Manitowoc Soil and Water Conservation Department
Sheboygan County Land Conservation Department
and
Pigeon River Watershed Citizen's Advisory Committee

Publication WT-551-01

For copies of this document please contact:

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# Watershed Plan Credits

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# LIST OF ACRONYMS

| | |
|---|---|
| BARNY | Barnyard nutrient analysis model |
| BIM-GEO | DNR Bureau of Information Management-Geographical Unit |
| BMP | Best Management Practice |
| CAC | Citizen Advisory Committee |
| CFSA | Consolidated Farm Services Agency (United States Department of Agriculture) |
| CNPCP | Coastal Nonpoint Pollution Control Program |
| COD | Chemical Oxygen Demand |
| CRP | federal Cropland Reserve Program |
| DATCP | Wisconsin Department of Agriculture, Trade, and Consumer Protection |
| DILHR | Department of Industry, Labor, and Human Relations |
| DNR | Wisconsin Department of Natural Resources |
| EQIP | Environmental Quality Incentive Program |
| FFA | Future Farmers of America |
| FOCS | Field Offices Computing System |
| FPP | Wisconsin Farmland Protection Program |
| FSA | Food Security Act |
| GLNAC | Great Lakes Nonpoint Abatement Coalition |
| GMU | Geographic Management Unit |
| I&E | Information and Education |
| IRM | Integrated Resource Management |
| LCC | Land Conservation Committee |
| LCD | Land Conservation Department |
| LWCB | Land and Water Conservation Board |
| NPM | Nutrient and Pest Management |
| NPS | Nonpoint Source |
| NRCS | Natural Resource Conservation Service |
| RCD | Resource Conservation Department |
| SHS | Wisconsin State Historical Society |
| SIP | Stewardship Incentive Program |
| SOS | Signs of Success monitoring program |
| SWCD | Soil and Water Conservation Department |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| UWEX | University of Wisconsin-Extension |
| WAV | Water Action Volunteers |
| WCC | Wisconsin Conservation Corps |
| WDNR | Wisconsin Department of Natural Resources |
| WDOC | Wisconsin Department of Commerce |
| WGNHS | Wisconsin Geological and Natural History Survey |
| WHIP | Wildlife Habitat Incentive Program |
| WINHUSLE | sediment transfer model based on the Universal Soil Loss Equation |
| WPDES | Wisconsin Pollutant Discharge Elimination System [permit system] |
| WRP | Wetlands Reserve Program |
| WUWN | Wisconsin Unique Well Number assigned to well sample sites |

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary

Box 7921
101 South Webster Street
Madison, Wisconsin 53707-7921
TELEPHONE 608-266-2621
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January 14, 1998

IN REPLY REFER TO: 3200

Mr. Donald Markwardt, Chair
Manitowoc County Board
1110 S. 9th St.
Manitowoc, WI 54220

SUBJECT: Approval of the Nonpoint Source Control Plan for the Pigeon River Priority Watershed Project

Dear Mr. Markwardt: Don

I am pleased to approve the Pigeon River Priority Watershed Plan prepared through the Wisconsin Nonpoint Source Pollution Abatement Program. This plan meets the intent and conditions of §281.65, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative code. This plan has been reviewed by the Department of Agriculture, Trade and Consumer Protection. The plan went before the Land and Water Conservation Board on December 2, 1997 and was approved at that time. I am also approving this plan as an amendment to the Sheboygan River Basin Water Quality Management Plan.

I would like to express the Department's appreciation to the Manitowoc County Soil and Water Conservation Department (SWCD) staff that participated in preparing this plan. We look forward to working with the Manitowoc County SWCD and other units of government throughout the watershed to implement the Pigeon River Priority Watershed Plan.

Sincerely,

George

George E. Meyer
Secretary

cc: Ben Brancel, DATCP
Cindy Hoffland, CA/8
Robert Uphoff, LWCB
Tom Ward, Manitowoc County SWCD
Robert Wenzel, Manitowoc County LCC Chair
Charles Krohn, SER Annex
Keith Foye, DATCP
Craig Webster, SER HQ
Marsha Burzynski, SER HQ

No. 95/96-148

# RESOLUTION ACCEPTING THE PIGEON RIVER WATERSHED AS A WISCONSIN NON-POINT PRIORITY WATERSHED

TO THE CHAIRPERSON AND BOARD OF SUPERVISORS
OF MANITOWOC COUNTY, WISCONSIN

Supervisors:

WHEREAS, the Pigeon River Watershed was submitted by the Manitowoc County Natural Resource Committee with support of Sheboygan County Land Conservation Committee, Trout Unlimited, and area sportsman clubs as a Priority Watershed for funding of non-point pollution controls under the Wisconsin Fund Non-Point Pollution Program in May 1994;

WHEREAS, the Wisconsin Land and Water Conservation Board has selected the Pigeon River Watershed as one of four watersheds in Wisconsin as a priority project in 1995, and

WHEREAS, the Pigeon River is a locally recognized fishery and provides for a popular canoeing and scenic waterway important to the County's tourism;

WHEREAS, the next stage of the project will be to inventory the non-point and groundwater problems and develop a watershed plan identifying management practices eligible for funding, and action necessary to protect water quality and cost estimates for the project;

NOW, THEREFORE, BE IT RESOLVED by the Manitowoc County Board of Supervisors that Manitowoc County accepts the Pigeon River as a Priority Watershed through the Wisconsin Non-point Source Water Pollution Abatement Program.

BE IT FURTHER RESOLVED that the Natural Resource Committee be given the authority and responsibility to act on be half of Manitowoc County to develop a watershed implementation plan for approval by the County Board of Supervisors and Department of Natural Resources; develop a project budget and enter into Administrative Grant with DNR for reimbursement of expenses.

Dated this 20th day of February, 1996.

Respectfully submitted by the Natural Resources & Education Committee:

Robert L. Wenzel

William J. Wallander

Michael T. Cumming

Lester Koeppel

Marie B. Kohlbeck

Adopted this 20th day of February, 1996.
24 Ayes 0 Noes 1 Absent.

ATTEST: Daniel R. Fischer
Daniel R. Fischer, County Clerk

Fiscal Impact:

Estimated Annual Year Cost of $42,000. All expenses except office supplies are reimbursed 100% by the state or federal government. Office supplies are reimbursed at the rate of 70%. The County is responsible for 30% of the office supply expenses. Interest earned on the advances from the state for expenditures can be used to cover the 30% county cost of office supplies. The net effect is estimated to be an increase of $42,000. in Expenses and Revenues, with No effect on the Tax Levy.

cb\pigeon.res

LCD
Received 1-26-98


**State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES**

Tommy G. Thompson, Governor
George E. Meyer, Secretary

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Madison, Wisconsin 53707-7921
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TDD 608-267-6897


January 14, 1998

IN REPLY REFER TO: 3200

William Jens, Chair
Sheboygan County Board
615 N. 6th St.
Sheboygan, WI 53081

SUBJECT: Approval of the Nonpoint Source Control Plan for the Pigeon River Priority Watershed Project

Bill

Dear Mr. Jens:

I am pleased to approve the Pigeon River Priority Watershed Plan prepared through the Wisconsin Nonpoint Source Pollution Abatement Program. This plan meets the intent and conditions of §281.65, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative code. This plan has been reviewed by the Department of Agriculture, Trade and Consumer Protection. The plan went before the Land and Water Conservation Board on December 2, 1997 and was approved at that time. I am also approving this plan as an amendment to the Sheboygan River Basin Water Quality Management Plan.

I would like to express the Department's appreciation to the Sheboygan County Land Conservation Department (LCD) staff that participated in preparing this plan. We look forward to working with the Sheboygan County LCD and other units of government throughout the watershed to implement the Pigeon River Priority Watershed Plan.

Sincerely,

George

George E. Meyer
Secretary

cc: Ben Brancel, DATCP
Robert Uphoff, LWCB
Pat Miles, Sheboygan County LCD
Bernard Kistner, Sheboygan County LCC Chair
Charles Krohn, SER Annex
Craig Webster, SER HQ
Marsha Burzynski, SER HQ
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Cindy Hoffland, CA/8

**SHEBOYGAN COUNTY RESOLUTION NO. 25 (1997/98)**

Re: **Pigeon River Watershed Plan**

**WHEREAS**, the Pigeon River Watershed has been selected as a priority watershed by the Wisconsin Department of Natural Resources for state funding to control non-point sources of water pollution, and

**WHEREAS**, the Sheboygan County Board of Supervisors, through the Sheboygan County Land Conservation Committee, has the broad powers necessary to carry out the non-point source water quality program in unincorporated areas of Sheboygan County, and the Land Conservation Committee is responsible for providing technical assistance and administration of cost-sharing agreements for land management practices and project administration, and

**WHEREAS**, the Land Conservation Committee has reviewed the final draft of the Pigeon River Priority Watershed Plan and recommends approval of the Plan by the Board, and

**WHEREAS**, the County will be reimbursed for all costs incurred, including indirect costs, from state funds;

**NOW, THEREFORE, BE IT RESOLVED**, that the Sheboygan County Land Conservation Committee be authorized to cooperate in the planning, development, and administration of all portions of the Pigeon River Priority Watershed Plan within Sheboygan County, including administration of state funds that will be provided to implement this program, and a copy thereof be filed in the Office of the County Clerk.

Respectfully submitted this 28th day of October, 1997.

**LAND CONSERVATION COMMITTEE***

Bernard H. Kistner, Chairperson

Raymond Karsteadt, Vice-Chairperson

Judith Zimmermann, Secretary

Harold H. Laack

Frederick W. Meifert

*County Board Members signing only

# PIGEON RIVER PRIORITY WATERSHED:
## Project Summary

The Pigeon River Watershed is located in the Sheboygan River Basin geographic management unit and encompasses approximately 74 square miles of land in Manitowoc and Sheboygan Counties of eastern Wisconsin (see map 1-1). The Pigeon River originates as numerous spring-fed tributaries and flows south, entering Lake Michigan, north of the city of Sheboygan. In addition to the perennial and intermittent streams, the watershed includes Pigeon, Spring, Horseshoe and Jetzers Lakes. Water quality in the Pigeon River is generally poor. A recreational fishery for resident warm water and Lake Michigan migratory sport fishery species is present.

The Pigeon River Watershed was identified as a "priority watershed" in 1995 under the Wisconsin Nonpoint Source Water Pollution Abatement Program. It joined approximately 63 projects that are currently underway; an additional 23 are already completed. 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 in priority watersheds to reduce nonpoint source pollution and improve surface water and groundwater quality.

The purpose of the Nonpoint Source Control Plan developed for this project is to assess the nonpoint pollutants in the Pigeon River Priority Watershed and guide the implementation of control measures. Nonpoint source control measures needed to protect and enhance the surface as well as other natural resources in the Pigeon River Watershed.

Nonpoint source pollution cannot be easily traced to a single point of origin such as a point source effluent discharge from an industrial plant. Nonpoint source pollution occurs when rainwater or snowmelt flows across the land and picks up soil particles, organic wastes, fertilizers, or other pollutants and carries them to streams, lakes or groundwater. These soil particles and organic wastes contain phosphorus and nitrogen, the same compounds found in commercial fertilizers. Runoff from urban areas can contain heavy metals, toxic organic chemicals, bacteria, parasites, phosphorus, and sediment. Due to nonpoint source pollution the spring fed headwaters bear little resemblance to the lower river in surface water quality.

The predominant sources of nonpoint pollutants in the Pigeon River Watershed originate from cropland, animal barnyards, and manure spreading on high hazard acres during winter months. Croplands, barnyards, and manure spreading account for an estimated 81 percent of the total phosphorus load. Additionally, cropland contributes 62 percent of the total sediment delivered to the surface water in the watershed.

Secondary sources of nonpoint pollutants in the watershed originate from milkhouse waste, streambank erosion, gully erosion, existing urban development and construction erosion. Milkhouse waste accounts for 11 percent of the total phosphorus loading to surface waters, while construction site erosion contributes 21 percent of the sediment carried to the streams.

A Citizen's Advisory Committee (CAC) was convened in 1996 to help prepare the Nonpoint Source Pollution Control Plan for the Pigeon River Watershed. The CAC includes representatives from the farm and urban communities. Some members are leaders in agricultural and environmental education and conservation organizations. Lake interests and local governments were well represented on the committee. Businesses also represented include golf courses, crop consultants and consulting engineers. The most important role of the CAC was the development of the project goals. The Plan was prepared by the Sheboygan County Land Conservation Department, the Manitowoc County Soil and Water Conservation Department, the Department of Natural Resources (DNR), and the Department of Agriculture, Trade and Consumer Protection (DATCP).

The project is administered at the state level by the DNR and DATCP. The Sheboygan County LCD and the Manitowoc County SWCD will administer the project at the local level with assistance from the University of Wisconsin-Extension and the Natural Resource Conservation Service (USDA). This plan is primarily used by and written for the County LCD/SWCDs, local units of government, lake districts, legislators, external program evaluators, the interested public, DNR, and DATCP.

## General Characteristics

The Pigeon River Watershed is a tributary to Lake Michigan. The main branch of the Pigeon and the Meeme River are primary drainages in the watershed that flow in a generally southerly direction. The Meeme River flows into the Pigeon River just north of the Sheboygan County line. The Pigeon River continues for approximately twelve miles, through the Village of Howards Grove. Near the Village of Kohler, the Pigeon River flows for approximately four miles to Lake Michigan. Roughly half of the watershed lies in Sheboygan County and half in Manitowoc County. The watershed is divided into thirteen smaller subwatershed units for this planning effort.

Perennial and intermittent streams are the predominant surface water features of the watershed. The intermittent streams are generally spring fed and are the headwaters of the perennial streams and larger tributaries. Their small size makes them particularly susceptible to nonpoint source pollution. Larger tributaries include Meeme River, Fisher Creek, and Grandma Creek. The Pigeon River Watershed is a unique and valuable area because the rivers within the watershed are home to a wide diversity of fish species. Brook lamprey inhabit the headwater streams while important sport species such as the native smallmouth bass and migratory trout and salmon species inhabit the tributaries and the main branches of the Pigeon River.

Several lakes spot the watershed ranging in size from less than one acre to 77 acres (Pigeon Lake). Appraisal monitoring was conducted on four of the larger lakes in the watershed: Pigeon Lake, Spring Lake, Jetzers Lake, and Horseshoe Lake. All of the lakes in the Pigeon River Watershed are classified as mesotrophic to eutrophic and have the potential to support balanced warm water sport fisheries and full body contact recreation. For most Wisconsin lakes,

phosphorus is the limiting nutrient; therefore, reducing the phosphorus load carried to watershed lakes will improve lake water quality in the Pigeon River Watershed.

Wetlands area valuable natural resource in the Pigeon River Watershed. They provide wildlife habitat, fish spawning and rearing areas, recreation, storage of runoff and flood flows, removal of pollutants and groundwater recharge. Wetlands in the watershed are mainly in the Meeme and Pigeon River floodplains. Floodplain wetlands support furbearers and waterfowl populations and may provide seasonal habitat for sport fish. There are also extensive wetlands along the riparian corridor of Fisher Creek and Grandma Creek and are also scattered throughout the watershed. Many of the natural wetlands have been prior-converted or farmed.

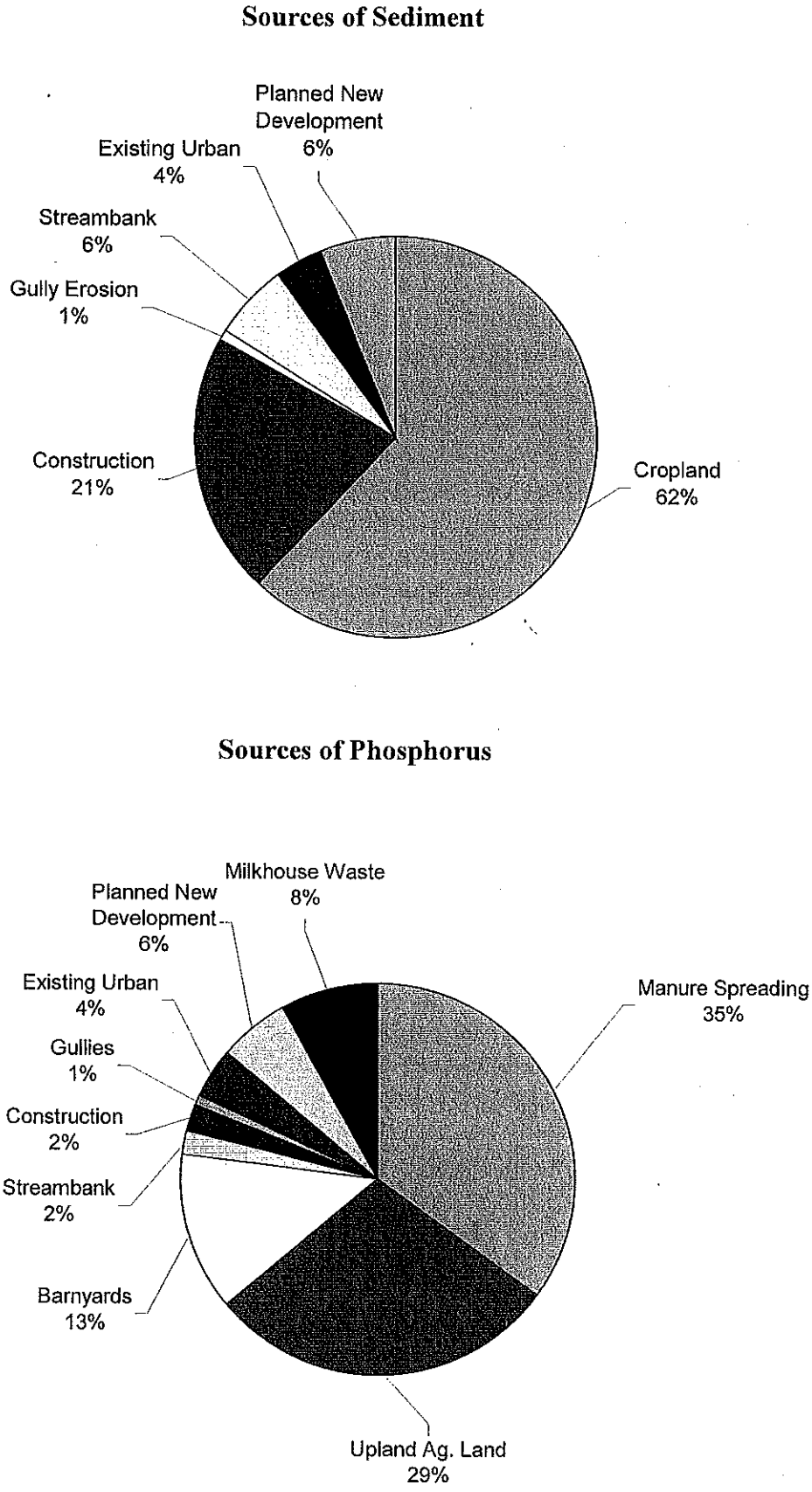
Approximately 19,000 people reside within watershed boundaries, the majority of whom live in urban land areas. Ten local governments and one lake association are incorporated in the watershed. The Village of Howards Grove and portions of the Village of Kohler, the Town of Sheboygan and the City of Sheboygan are located within the watershed. The watershed partially covers eight other townships: Liberty, Meeme, Schleswig, Centerville, Herman, Mosel, Sheboygan Falls, and Sheboygan. Refer to map 1-1 for the geographic location and boundaries of the watershed. Since 1980, the urban land area has grown between 6 and 10%. Future growth in these urban areas is a potential threat to the water quality in the watershed. As development increases the sediment load, particularly from construction site erosion, to streams will increase. An increase in urban land area will also effect the hydrologic regime in the watershed, most dramatically during high rainfall events.

Upland agriculture accounts for 69 percent of the land use area in the watershed and is a significant part of the local economy. Dairy farms in the watershed cover 60 percent of the agricultural land area. The remaining agricultural land support cash crops. While the number of farms has decreased over the past 20 years, the size of the farms has increased.

## Rural Sources of Nonpoint Pollution

The Manitowoc SWCD and Sheboygan County LCD collected data on agricultural uplands, streambanks, gullies, barnyards, high hazard acres, milkhouses, lake shores in the watershed. This data was analyzed and used to estimate the pollutant potential of these nonpoint sources. Chart S-1 displays the percentages of sediment and phosphorus loadings from each pollutant source. The following is a summary of the inventory results.

**Figure S-1. Sources of Sediment and Phosphorus**



**Upland Sediment Inventory (See Table S-1)**

- More than 29,395 acres of agricultural upland was inventoried.
- An estimated 7,061 tons of sediment are delivered from upland agricultural land to watershed streams on an annual basis, or 62 percent of the total sediment load.
- An estimated 14,800 pounds of phosphorus are delivered from upland agricultural land to the streams on an annual basis, or 29% of the total phosphorus load in the watershed.

**Streambank Erosion Inventory**

- 44 miles of intermittent and perennial streams in the watershed were inventoried.
- An estimated 679 tons of sediment is eroded from streambanks annually, or about 6 percent of the total load.
- An estimated 950 pounds of phosphorus are delivered from streambanks to the streams in the watershed.

**Gully Erosion Inventory**

- An estimated 110 tons of sediment is eroded from gullies annually, or about 1 percent of the total load.
- An estimated 165 pounds of phosphorus are delivered from gullies to the watershed streams.

**Barnyard Runoff Inventory**

- 164 barnyards in the watershed were inventoried.
- An estimated 6,700 pounds of phosphorus are delivered from barnyards to the streams on an annual basis, or 13% of the total phosphorus load.

**Manure Spreading**

- An estimated 18,000 pounds of phosphorus are delivered from winter spreading on high hazard lands to the streams on an annual basis, or 35% of the total phosphorus load.

**Milkhouse Waste**

- 54 milkhouse waste sites in the watershed were inventoried.

- An estimated 4,180 pounds of phosphorus are delivered from milkhouse waste sites to the streams on an annual basis, or 8% of the total phosphorus load.

**Table S-1. Upland Sediment Loading to Streams by Land Use**

| Subwatershed | | Cropland | Developed | Natural Areas [3] | Grazed Pasture | Totals |
|---|---|---|---|---|---|---|
| **Meeme Creek** | **Acres** | **5829** | **333** | **2128** | **83** | **8373** |
| | Sediment [2] | 1667 | 346 | 11 | 17 | 2041 |
| **Pigeon Creek** | **Acres** | **8342** | **367** | **1968** | **100** | **10777** |
| | Sediment [2] | 2123 | 481 | 2 | 3 | 2609 |
| **Howards Grove** | **Acres** | **3354** | **1704** | **385** | **55** | **5498** |
| | Sediment [2] | 704 | 306 | 0 | 11 | 1021 |
| **Jetzers Creek** | **Acres** | **2550** | **95** | **542** | **0** | **3187** |
| | Sediment [2] | 530 | 11 | 0 | 0 | 541 |
| **Fisher Creek** | **Acres** | **2661** | **611** | **251** | **73** | **3596** |
| | Sediment [2] | 676 | 138 | 0 | 0 | 814 |
| **Grandma Creek** | **Acres** | **3244** | **39** | **425** | **154** | **3862** |
| | Sediment [2] | 429 | 9 | 6 | 33 | 477 |
| **Pigeon River** | **Acres** | **3340** | **968** | **339** | **193** | **4840** |
| | Sediment [2] | 922 | 171 | 0 | 45 | 1138 |
| **Sheboygan** | **Acres** | **75** | **2218** | **199** | **0** | **2492** |
| | Sediment [2] | 10 | 157 | 0 | 0 | 167 |
| **Total** | **Acres** | **29395** | **6335** | **6237** | **658** | **42625** |
| | Sediment [2] | 7061 | 1619 | 19 | 109 | 8808 |

[1] Data was extrapolated from subarea sampling.
[2] Sediment is reported in tons/year. This area does not include loading to lakes.
[3] Natural Areas include grassland grass woodlots, and wetlands.

## Groundwater Inventory

- Well sampling was conducted in over 60 privately owned wells within the watershed. Wells were tested for nitrate and triazine levels.

- Nitrate testing revealed that five wells in the watershed were above the Preventative Action Limit (PAL) of 2 mg/L. No samples were tested over the Enforcement Standard (ES) Health Advisory Level of 10 mg/L.

- Triazine testing showed only one well sample in the PAL range of detectable to 3 mg/L. No wells tested were above the ES level of greater than 3 mg/L.

## Urban Sources of Nonpoint Pollution

The watershed project team conducted an urban nonpoint source inventory and analysis to identify and prioritize major and minor steps to achieving water quality goals in the Pigeon River Watershed. Inventories were taken for existing urban land areas, construction sites and future development areas. The following is a summary of the inventory results.

### Existing Urban Inventory

- An estimated 459 tons of sediment is carried from existing urban land to streams annually, or about four percent of the total load.

- An estimated 1,880 pounds of phosphorus are delivered from existing urban land to the streams in the watershed.

### Construction Erosion

- An estimated 2,300 tons of sediment is carried from construction site land to streams annually, or about 21 percent of the total load.

- An estimated 1,150 pounds of phosphorus are delivered from construction sites to watershed streams.

### Planned Development

- An estimated 709 tons of sediment will be carried from development planned by the year 2015 to streams annually if no management practices are implemented.

- An estimated 3,090 pounds of phosphorus will be delivered annually from planned development to the streams in the watershed if no management practices are implemented.

## Watershed Project Goals

The Citizens Advisory Committee drafted the following watershed goals as part of the project plan.

**Water Quality Improvement**

- Reduce sediments and other pollutants to create a swimmable river
- Improve stream and fish habitat ratings for all streams in the watershed to good or excellent
- Improve water quality in Jetzers Lake by reducing algae blooms
- Maintain good water quality in the other lakes in the watershed
- Encourage protection of environmentally sensitive lands through conservation easements or acquisition by land trusts

**Sediment Load Reduction**

- Reduce sediment loads by 30%
- Implement conservation systems on 75% of watershed cropland acreage in 10 years
- Expand conservation tillage equipment availability
- Work with farmers on implementing BMPs without undue financial hardship
- Provide a database to link soil test field data with watershed phosphorus delivery
- Reduce construction site runoff through stronger erosion control ordinances implemented by cities, villages, towns and county
- Develop sediment control devices for urban areas other than big ponds
- Fix eroding streambank areas

**Phosphorus and Bacteria Load Reduction**

- Lower phosphorus loadings by 50% to reduce excess plant growth
- Provide financial support to encourage rotational grazing
- Eliminate manure spreading in winter on high hazard lands
- Improve water quality and habitat by eliminating or controlling livestock access to creeks that run through barnyards
- Improve and maintain wastewater treatment facilities to consistently meet discharge permit requirements
- Update rural septic systems

**Urban Pollutant Load Reduction**

- Place nonpoint source pollution control limits on all future development and control construction site erosion
- Have all municipalities work to support the watershed plan
- Encourage local governments to develop and implement urban planning that supports water quality improvements
- Restrict building in floodplains of navigable streams
- Encourage design and maintenance of transportation systems that minimize nonpoint source pollution

- Encourage development and implementation of stormwater pollution prevention plans by businesses and industries, including those not covered by the stormwater permit program

**Flow Moderation**

- Reduce high flows and increase baseflow
- Preserve and recreate wetlands adjacent to streams for storing water and reducing high flows in the stream
- Encourage re-meandering of stream channels

**Riparian Areas and Public Access Improvement**

- Encourage management of the shoreland zone to minimize nonpoint source pollution
- Protect riparian corridors and improve public access through land purchase and conservation easements
- Involve lake associations and lakefront property owners in encouraging buffers along lakeshores
- Maintain or improve the condition of streambank habitat while not impeding stream flow
- Use high vegetation buffer strips to help reduce water temperatures
- Use partnerships between landowners, public agencies, and private groups to promote streambank stabilization

**Fish Habitat Preservation and Improvement**

- Maintain the steelhead and salmon fishery in the Pigeon River
- Increase natural reproduction of northern pike
- Maintain the northern pike and smallmouth bass fishery throughout the entire year for several years in a row
- Protect and improve fish habitat

**Wildlife Habitat Preservation and Improvement**

- Increase wildlife habitat
- Increase grassland habitat along intermittent streams to complement wildlife habitat programs
- Increase the number and size of buffers with enhanced wildlife habitat
- Control the spread of purple loosestrife, Eurasian milfoil and other exotic plants

**Public Education**

- Create a high level of awareness and involvement of landowners in water quality projects
- Develop a greater sense of public appreciation and stewardship for the pigeon River and its tributaries
- Continue public education about river preservation and improvement
- Increase public awareness of rural and urban pollution sources including hobby farms
- Further develop the volunteer monitoring program

## Sediment and Phosphorus Load Objectives

The planning team has determined sediment and phosphorus load objectives necessary to improve water quality and aquatic habitat in the Pigeon River Watershed.

- A **30%** reduction of the overall sediment load to streams is targeted to reduce the amount of sediment in the stream bottom and enhance its ability to support healthier and more diverse aquatic communities.
- A **50%** reduction in overall phosphorus loads to streams will help to eliminate excessive algal blooms in the water column, increase dissolved oxygen, and free up nutrients to support aquatic communities.

To reduce overall sediment delivered to streams in the Pigeon River Watershed by 30 percent and phosphorus delivered to streams by 50 percent, the following will need to be achieved (see Table S-2).

- Reduce sediment delivered from upland agricultural land by 25%.
- Reduce sediment delivered from streambank erosion by 25%.
- Reduce sediment delivered from gully erosion by 50%.
- Reduce phosphorus delivered from barnyards by 70%.
- Reduce phosphorus delivered from manure spreading in winter on high hazard lands by 75%.
- Reduce phosphorus delivered from milkhouse waste sites by 50%.
- Reduce sediment delivered from existing urban land by 20%.
- Reduce sediment delivered from construction sites by 75% through installation and maintenance of construction erosion control BMP's.
- Hold future pollutant loadings from developing areas in all subwatersheds to 20% of the calculated load estimates.

## Groundwater Objective

Results from the groundwater inventory show that groundwater quality is considered good. The following objectives are designed to preserve and protect the existing groundwater quality.

- Eliminate discharges of nonpoint source pollutants to areas acting as a direct conduit to groundwater, such as sinkholes, unused wells, and creviced bedrock.
- Reduce the application of winter spread manure on unsuitable cropland.
- Reduce the over application of commercial and organic fertilizers on soils with potential for leaching contaminants into groundwater supplies.
- Identify and recommend the abandonment of unused wells in the watershed.
- Provide landowners with and extensive informational and educational program to promote awareness and to accept responsibility for the groundwater resources.

## Management Actions

The Sheboygan County LCD and Manitowoc SWCD will contact all landowners who are eligible to receive cost share funds during project 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 are designated as either "critical", "eligible", or "ineligible". Designation as a critical site indicates that controlling that specific source is necessary if the pollutant reduction goals for the project are to be met. Nonpoint sources which are eligible but not critical contribute less of the pollutant load, but are included in cost sharing eligibility to further insure that the water quality objectives are met. Landowners with eligible sites need not control every eligible source to receive cost sharing.

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

## Critical Sites

Nonpoint source pollution load reduction in the Pigeon River Priority Watershed will be achieved mainly through voluntary participation. However, the state statutes require that the nonpoint source control plan contain the necessary language to ensure the reasonable likelihood of achieving water quality goals and objectives. Landowners with sites that meet the established critical site criteria are required by law to address those specific sites by reducing the nonpoint source pollutant load to an acceptable level. Table S-3 displays the Pollution Reduction Critical Criteria. Pollutant reduction can occur solely through the action of the landowner with guidance from county staff or through watershed participation. Each identified site will be field verified before receiving notification as a critical site, with findings sent to the DNR. State funding will be available to landowners of critical sites through participation in the cost sharing program in order to offset the expense of installing Best Management Practices (BMPs). Landowners will need to sign a cost share agreement with the Sheboygan County LCD or the Manitowoc County SWCD.

Notification of landowners with upland and barnyard critical sites will begin when the counties have the ability to identify individual fields for specific management categories on the WINHUSLE database. The highest ranked sites will be notified first until all landowners or land operators with critical sites are notified.

**Table S-2. Sources of Polluted Runoff and Proposed Percent Reduction**

| Source | Sediment (tons delivered) | % Total | Total P (lbs delivered) | % Reduction |
|---|---|---|---|---|
| Existing Urban Land | 459 | 4% | 1,880 | 20% |
| Construction Erosion | 2,300 | 21% | 1,150 | 75% |
| Planned Development | 709 | 6% | 3,090 | 80% |
| Upland Ag. Land | 7,061 [1] | 62% | 14,800 | 25% |
| Gullies | 110 | 1% | 165 | 50% |
| Streambank | 679 | 6% | 950 | 25% |
| Barnyards | | | 6,700 | 70% |
| Manure Spreading | | | 18,000 [2] | 75% |
| Milkhouse Waste | | | 4,180 | 50% |
| **Total** | **11,334** | **100%** | **50,915** | |

[1] This does not include loadings to lakes.

[2] This number is derived from high hazard acres only not the total acres

**Table S-3. Pollution Reduction Critical Criteria**

| Runoff Pollution Sources | Critical Criteria |
|---|---|
| Existing Urban Land | n.a. |
| Construction Erosion | Those construction sites that are not in compliance with local ordinances, building codes or NR 216 regulations. |
| Future Development | n.a. |
| Upland Ag. Land | Those fields with a sediment load of $\geq$ 0.7 tons/acre are critical. |
| Streambanks | n.a. |
| Trampled Streambanks | n.a. |
| Gullies | n.a. |
| Barnyards | Those barnyards that contribute a P load of >100 lbs / year are critical. |
| Internally Drained Barnyards | n.a. |
| Manure Spreading | n.a. |
| Milkhouse Waste | n.a. |

## Impact and Scope of Critical Sites

- Of the estimated 29,395 acres of cropland in the watershed, an estimated 800 acres are designated as critical involving 100 landowners and 100 fields.

- Of the 164 barnyards that were inventoried, 19 have been designated -as critical sites for control. This will result in achieving a minimum reduction of 62% percent of the barnyard pollution reduction objective.

- Those construction sites that are not in compliance with local ordinances or building codes or NR 216 regulations are considered critical.

## Landowner Eligibility

The following is a description of landowner eligibility criteria for technical and cost share assistance (see Table S-4). Sites that are considered eligible are not as critical to reaching water quality objectives as are those that are "critical".

Upland Agricultural Land: Upland agricultural land contributes 67% of the total sediment load; therefore, control of this sediment source is key in meeting sediment reduction objectives. In an attempt to attract a large number of landowners the project team set a lowload eligibility criteria. Those fields with a sediment load of $\geq$ 0.1 tons/acre/yr. are eligible. Cost sharing will only be available for those landowners that improve management that results in a lower sediment delivery than current conditions.

Streambanks: All sites with a delivery of $\geq$ 1 ton of sediment are eligible.

Trampled Streambanks: All sites that are trampled by livestock to the degree that vegetation cover is not maintained are eligible.

Gullies: All gullies are eligible.

Barnyards: Landowners that participate in the program must reduce phosphorus loading to 20 lbs./yr. Sites that contribute 50-100 lbs./yr. are eligible for full barnyard runoff systems. Sites that contribute 20-50 lbs./yr. are eligible for clean water diversions and roof runoff control. Sites contributing less than 20 lbs./yr. are not eligible for cost sharing.

Internally Drained Barnyards: Eligibility will be based on a site by site analysis conducted by the counties to determine the likelihood of groundwater contamination.

Manure Spreading: All landowners that own high hazard acres where manure spreading occurs in the winter are eligible to receive cost sharing.

Milkhouse Waste Sites: All milkhouse waste sites are eligible.

**Table S-4. Pollution Reduction Eligibility Criteria**

| Runoff Pollution Sources | Eligibility Criteria |
|---|---|
| Existing Urban Land | n.a. |
| Construction Erosion | n.a. |
| Future Development | n.a. |
| Upland Ag. Land | Those fields with a sediment load of $\geq$ 0.1 tons/acre are eligible. Cost-Sharing will only be available for those landowners that improve management that results in a lower sediment delivery than current conditions. |
| Streambanks | All sites delivering $\geq$ 1 ton of sediment are eligible. |
| Trampled Streambanks | All sites that are trampled by livestock to the degree that vegetation cover is not maintained are eligible. |
| Gullies | All |
| Barnyards | Those landowners that participate in the program or receive cost sharing must reduce P to 20 lbs/yr. Sites that contribute 50-100lbs./yr. are eligible for full barnyard runoff systems. Sites that contribute 20-50 lbs./yr. are eligible for clean water diversions and roof runoff control. Sites contributing less than 20 lbs./yr. Are not eligible for cost sharing. |
| Internally Drained Barnyards | Eligibility will be based on a site by site analysis conducted by the counties to determine likelihood of groundwater contamination. |
| Manure Spreading | All |
| Milkhouse Waste | All |

## Project Implementation

Project Implementation is scheduled to begin in 1998 and continue for a period of ten years. Implementation will consist of educational programming for watershed residents, individual farm conservation planning, the signing of cost share agreements, urban -pollution prevention, and practice installation.

During the first two years of project implementation, the counties will use staff hours primarily for inventory completion, landowner contacts, the information and education program and project planning. This implementation strategy is an attempt to minimize fiscal needs during the initial stage of project implementation and to set up a strong base for best management practice installation. (see Tables S-5 and S-6)

## Information and Education

An information and education program will be conducted throughout the project period. The Sheboygan County LCD and the Manitowoc SWCD will have the primary responsibility for conducting this program during the sign up and implementation phases of the project University of Wisconsin-Extension staff in the counties will provide assistance. Education activities will be directed to all residents of the Pigeon River Priority Watershed. The primary objectives are to:

- Develop awareness of the Pigeon River Watershed project, appreciation of its water resources and support for implementing and maintaining practices recommended in the plan.
- Develop widespread understanding and adoption of conservation tillage. Demonstrate that conservation tillage can be both profitable and protective of water quality.
- Develop greater understanding of the benefits of stream, lakeshore and wetland buffers and knowledge of appropriate ways to establish, construct and maintain them.
- Develop greater understanding of the effect of manure and milkhouse waste on the Pigeon River and its tributaries and increase knowledge and implementation of ways to manage manure and milkhouse waste that protect the river and farm profitability.
- Develop awareness of the need for erosion control during construction and the knowledge and skills needed to effectively control it.
- Develop awareness of the need for stormwater management in urban areas. Build the knowledge and skills needed to plan, implement and maintain stormwater management measures.
- Develop greater understanding of ways to develop land that prevent degradation of water and other natural resources.
- Develop awareness and knowledge of ways to prevent runoff pollution from urban and suburban areas.

## Conservation Planning and Contracting

Conservation planning and cost share agreements for installation of BMPs will be available to landowners throughout the implementation phase. Voluntary participation will be emphasized through out the project. Sites determined as critical will be a priority. Other sites will be targeted for pollution control using inventory information. Practices can be installed as soon as a landowner signs a cost share agreement with the counties. All practices on agreements must be installed before the project is scheduled to end. Landowners must maintain practices for at least ten years after the installation of the final practice listed on the cost share agreement.

Cost share agreements with structural BMPs are recorded with the register of deeds, and in the event of property being sold, the new landowner will be required to install and maintain the remaining BMPs.

## Project Implementation Costs

Watershed plan costs will be shared by the State of Wisconsin through the Nonpoint Source Water Pollution Abatement Program, local units of government, and individual landowners. Estimates of the financial assistance needed to implement nonpoint source controls in the Pigeon River Watershed are shown in the attached tables: Table S-7, Table S-8, Table S-9, and Table S-10. The DNR will award grants to Sheboygan and Manitowoc Counties for the cost sharing of BMPs, staff support, and education activities. Municipalities and lake districts within the watershed are eligible to receive grants to implement the plan recommendations.

The Pigeon River Watershed team will continue to seek out additional funding sources including federal and state grants, as well as public and private partnerships. Manitowoc and Sheboygan Counties have drafted budget scenarios for project implementation during the first two years (Tables S-5 and S-6).

## Project Evaluation and Monitoring

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

- Project Performance Evaluation
- Integrated Resource Management Program Review
- Water Resource Monitoring

## Integrated Resource Management Program

The Manitowoc Soil and Water Conservation Department and the Sheboygan County Land Conservation Department will convene the following focus work teams.

- Agricultural Team
- Fish and Wildlife Resource Team
- Watershed Education Team

- Landuse and Transportation Team

The work teams will include representatives from public agencies, conservation organizations, industry, and educational institutions.

The purpose and goal of the four work teams is to share information, plan watershed initiatives and activities, cultivate working partnerships and seek financial and technical assistance to achieve the project goals.

**Table S-5: Two Year Budget Scenario for the Pigeon River Priority Watershed: Manitowoc County**

| Staff Activity | # Activities | Year 1 (hours) | Year 2 (hours) |
|---|---|---|---|
| Landowner Contact | 100 | 400 | 400 |
| Farm Operators | | | |
| Critical Site Verification | 50 | 200 | 200 |
| Contracts | 10 | 400 | 500 |
| Conservation Plan Revisions | 25 | 400 | 400 |
| Reduced Tillage Demo | 10 | 200 | 100 |
| Wetland/Easement/Buffer Demo | | 200 | 100 |
| Community Group/WAV | | 100 | 100 |
| Program Promo/Planning | | 200 | 300 |
| Demo /Critical BY Installation | | 100 | 200 |
| Practice Installation | | 200 | 300 |
| GIS/I&E | | | |
| Develop Digital | | | |
| Buffer Needs/Installation | | 80 | 80 |
| BY Needs/Installation | | 40 | 40 |
| Manure Mgmt/Installation | | 150 | 40 |
| Critical Fields | | 150 | 40 |
| Contract/Plans | | 150 | 50 |
| Newsletters | 3 | 120 | 120 |
| Direct Mail | 3 | 100 | 100 |
| Network with gov./bus./edu./media | 6 | 110 | 120 |
| Information Meetings | 1 | 20 | 40 |
| Tour | 1 | 40 | 40 |
| Presentations/Events/Displays | 5 | 40 | 40 |
| Lake I&E | | 200 | 200 |
| **Total Hours** | | **3,600** | **3,335** |
| Personnel - (2) | | $83,200 | $83,200 |
| BMP Installation | | | |
| 590/95, 329,340 demos | | $7,200 | $7,200 |
| Critical BY installation | | $15,000 | $20,000 |
| **Total Cost ($)** | | **$105,400** | **$110,400** |

Note: GIS/Computer Support - 570, 250, 200 hrs.; Education - 630, 660, 540 hrs.; Nontech – 1200, 910, 740 hrs.; BMP dollars - $22,200, $27,200, $52,200.

**Table S-6: Two Year Budget Scenario for the Pigeon River Priority Watershed: Sheboygan County**

| Staff Activity | # Activities | Year 1 (hours) | Year 2 (hours) |
|---|---|---|---|
| Landowner Contact | 150 | 600 | 600 |
| Farm Operators | 15 | 60 | 60 |
| Critical Site Verification | 50 | 200 | 25 |
| Contracts | 10 | 400 | 500 |
| Conservation Plan Revisions | 25 | 400 | 400 |
| Reduced Tillage Demo | 10 | 200 | 100 |
| Wetland/Easement/Buffer Demo | 200 | 100 | |
| Community Group/WAV | 3 | 100 | 100 |
| X Program Promo/Planning | 200 | 300 | |
| Demo/Critical BY Installation | 2 | 100 | 200 |
| Practice Installation | 200 | 300 | |
| Urban Erosion Edu. and | 440 | 128 | |
| Ordinance Development | | | |
| Newsletters | 3 | 120 | 120 |
| Direct Mail | 3 | 100 | 100 |
| Network with gov./bus./edu./media | 6 | 110 | 120 |
| Information Meetings | 6 | 25 | 35 |
| Tour | 2 | 40 | 40 |
| Presentations/Events/Displays | 7 | 55 | 55 |
| Lake I&E | | 50 | 50 |
| **Total Hours** | | **3,600** | **3,335** |
| Personnel - (2) | | $83,200 | $83,200 |
| BMP Installation | | | |
| 590/95, 329,340 demos | | $7,200 | $7,200 |
| Critical BY installation | | $15,000 | $15,000 |
| **Total Cost ($)** | | **$105,400** | **$105,400** |

**Table S-7. Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Sheboygan County**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Upland Control** | | | | | |
| Change in Crop Rotation | 8,000 ac | NA | 0 | 0 | --- [1] |
| Contour Cropping | 50 ac | 9 | 450 | 450 | --- [1] |
| Contour Strip Cropping | 20 ac | 13.5 | 270 | 270 | --- [1] |
| High Residue Management [2] | 4,500 ac | 18.5 | 249,750 | 249,750 | --- [1] |
| Cropland Protection Cover [3] (Green Manure) | 2,000 ac | 25 | 100,000 | 100,000 | --- [1] |
| Intensive Grazing Management (Rotational Grazing) | 5 ea | 7,000 | 35,000 | 17,500 | 17,500 |
| Critical Area Stabilization | 150 ac | 400 | 60,000 | 42,000 | 18,000 |
| Grass Waterways | 6 ac | 3,000 | 18,000 | 12,600 | 5,400 |
| Field Diversions and Terraces | 1,000 ft | 3 | 3,000 | 2,100 | 900 |
| Grade Stabilization | 6 ea | 4,000 | 24,000 | 16,800 | 7,200 |
| Agricultural Sediment Basin | 2 ea | 10,000 | 20,000 | 14,000 | 6,000 |
| Shoreline Buffers | 20 ac | 400 | 8,000 | 5,600 | 2,400 |
| Nutrient Management [3] | 6,700 ac | 6 | 120,600 | 60,300 | 60,300 |
| Nutrient and Pest Management [3] | 4,000 ac | 7 | 84,000 | 42,000 | 42,000 |
| Spill Control Basin | 1 ea | 10,000 | 10,000 | 7,000 | 3,000 |
| Wetland Restoration | 200 ea | 2,000 | 400,000 | 280,000 | 120,000 |
| Riparian Buffer Strips [4] | 80 ac | 100 | 40,000 | 20,000 | 20,000 |
| Livestock Exclusion, Woods | 4,000 ft | 1 | 4,000 | 2,000 | 2,000 |
| Well Abandonment | 6 ea | 500 | 3,000 | 2,100 | 900 |
| **Upland subtotal** | | | **1,180,070** | **874,470** | **305,600** |

**Table S-7 continued. Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Sheboygan County**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Barnyard Runoff Control and Manure Storage** | | | | | |
| Filter Walls and Strips | 20 ea | 25,000 | 500,000 | 350,000 | 150,000 |
| Roof Gutters | 25 ea | 2,000 | 50,000 | 35,000 | 15,000 |
| Clean Water Diversion | 23 ea | 2,500 | 57,500 | 40,250 | 17,250 |
| Roofs | 2 ea | 25,000 | 50,000 | 35,000 | 15,000 |
| Barnyard Abandonment or Relocation | 1 ea | 60,000 | 60,000 | 42,000 | 18,000 |
| Manure Storage Facility [5] | 12 ea | 30,000 | 360,000 | 228,000 | 132,000 |
| Manure Storage Facility Abandonment | 2 ea | 10,000 | 20,000 | 14,000 | 6,000 |
| Cattle Mounds | 2 ea | 1,500 | 3,000 | 2,100 | 900 |
| Milking Center Waste Control | 14 ea | 5,000 | 70,000 | 49,000 | 21,000 |
| **Barnyard subtotal** | | | **1,170,500** | **795,350** | **375,150** |
| **Streambank Erosion Control** | | | | | |
| Shape and Seeding | 15,000 ft | 10 | 150,000 | 105,000 | 45,000 |
| Fencing | 500 ft | 1 | 500 | 350 | 150 |
| Rock Riprap [6] | 300 ft | 30 | 9,000 | 6,300 | 2,700 |
| Bio-Bank Stabilization | 300 ft | 25 | 7,500 | 5,250 | 2,250 |
| Crossing | 4 ea | 2,000 | 8,000 | 5,600 | 2,400 |
| Remote Watering Systems | 2 ea | 2,000 | 4,000 | 2,800 | 1,200 |
| **Streambank subtotal** | | | **179,000** | **125,300** | **53,700** |
| **Upland, Barnyard, and Streambank Subtotal** | | | **2,529,570** | **1,795,120** | **734,450** |
| Land Acquisition | 200 ac | 2,000 | 400,000 | 200,000 | 200,000 |
| Easements | 50 ac | 1,000 | 50,000 | 50,000 | 0 |
| **Total** | | | **2,979,570** | **2,045,120** | **934,450** |

[1] Local share consists of labor and equipment costs. Also see flat rates in table 4-1.

[2] High Residue Management is cost-shared per acre per year for a maximum of six years. Total cost shown is three times the cost per year as an average cost estimate.

[3] Cropland Protection Cover and Nutrient and Pest Management are cost-shared per acre per year for a maximum of three years. Total cost shown is two times the cost per year for cover crop and three times the cost per year for nutrient and pest management.

[4] Riparian Buffer Strips are cost-shared per acre per year for a maximum of five years. Total cost shown is five times the cost per year. This practice is an interim BMP.

[5] 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.

[6] Add 300 feet rock rip rap at $60/per foot to urban budget for Howard's Grove.

Source: Wisconsin DNR, DATCP, and Sheboygan County

**Table S-8. Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Manitowoc County**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Upland Control** | | | | | |
| Change in Crop Rotation | 8,000 ac | NA | 0 | 0 | --- [1] |
| Contour Cropping | 100 ac | 9 | 900 | 900 | --- [1] |
| Contour Strip Cropping | 20 ac | 13.5 | 270 | 270 | --- [1] |
| High Residue Management [2] | 6,000 ac | 18.5 | 333,000 | 333,000 | --- [1] |
| Cropland Protection Cover [3] (Green Manure) | 2,000 ac | 25 | 100,000 | 100,000 | --- [1] |
| Intensive Grazing Management (Rotational Grazing) | 4 ea | 7,000 | 28,000 | 14,000 | 14,000 |
| Critical Area Stabilization | 500 ac | 400 | 200,000 | 140,000 | 60,000 |
| Grass Waterways | 4 ac | 3,000 | 12,000 | 8,400 | 3,600 |
| Field Diversions and Terraces | 1,000 ft | 3 | 3,000 | 2,100 | 900 |
| Grade Stabilization | 2 ea | 4,000 | 8,000 | 5,600 | 2,400 |
| Agricultural Sediment Basin | 6 ea | 10,000 | 60,000 | 42,000 | 18,000 |
| Shoreline Buffers | 250 ac | 400 | 100,000 | 70,000 | 30,000 |
| Nutrient Management [3] | 5,000 ac | 6 | 90,000 | 45,000 | 45,000 |
| Nutrient and Pest Management [3] | 10,000 ac | 7 | 210,000 | 105,000 | 105,000 |
| Spill Control Basin | 1 ea | 10,000 | 10,000 | 7,000 | 3,000 |
| Wetland Restoration | 200 ea | 2,000 | 400,000 | 280,000 | 120,000 |
| Riparian Buffer Strips [4] | 100 ac | 100 | 50,000 | 25,000 | 25,000 |
| Livestock Exclusion, Woods | 5,000 ft | 1 | 5,000 | 2,500 | 2,500 |
| Well Abandonment | 10 ea | 500 | 5,000 | 3,500 | 1,500 |
| **Upland Subtotal** | | | **1,615,170** | **1,184,270** | **430,900** |

**Table S-8 continued. Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Manitowoc County**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Barnyard Runoff Control and Manure Storage** | | | | | |
| Filter Walls and Strips | 30 ea | 25,000 | 750,000 | 525,000 | 225,000 |
| Roof Gutters | 45 ea | 2,000 | 90,000 | 63,000 | 27,000 |
| Clean Water Diversion | 45 ea | 2,500 | 112,500 | 78,750 | 33,750 |
| Roofs | 1 ea | 25,000 | 25,000 | 17,500 | 7,500 |
| Barnyard Abandonment or Relocation | 2 ea | 60,000 | 120,000 | 84,000 | 36,000 |
| Manure Storage Facility (5) | 10 ea | 30,000 | 300,000 | 190,000 | 110,000 |
| Manure Storage Facility Abandonment | 2 ea | 10,000 | 20,000 | 14,000 | 6,000 |
| Cattle Mounds | 6 ea | 1,500 | 9,000 | 6,300 | 2,700 |
| Milking Center Waste Control | 8 ea | 5,000 | 40,000 | 28,000 | 12,000 |
| **Barnyard subtotal** | | | **1,466,500** | **1,006,550** | **459,950** |
| **Streambank Erosion Control** | | | | | |
| Shape and Seeding | 15,000 ft | 10 | 150,000 | 105,000 | 45,000 |
| Fencing | 3,000 ft | 1 | 3,000 | 2,100 | 900 |
| Rock Riprap | 400 ft | 30 | 12,000 | 8,400 | 3,600 |
| Bio-Bank Stabilization | 400 ft | 25 | 10,000 | 7,000 | 3,000 |
| Crossing | 4 ea | 2,000 | 8,000 | 5,600 | 2,400 |
| Remote Watering Systems | 2 ea | 2,000 | 4,000 | 2,800 | 1,200 |
| **Streambank Subtotal** | | | **187,000** | **130,900** | **56,100** |
| **Upland, Barnyard, and Streambank Subtotal** | | | **3,268,670** | **2,321,720** | **946,950** |
| Land Acquisition | 100 ac | 2,000 | 200,000 | 100,000 | 100,000 |
| Easements | 200 ac | 1,000 | 200,000 | 200,000 | 0 |
| **Total** | | | **3,668,670** | **2,621,720** | **1,046,950** |

[1] Local share consists of labor and equipment costs. Also see flat rates in table 4-1.

[2] High Residue Management is cost-shared per acre per year for a maximum of six years. Total cost shown is three times the cost per year as an average cost estimate.

[3] Cropland Protection Cover and Nutrient and Pest Management are cost-shared per acre per year for a maximum of three years. Total cost shown is two times the cost per year for cover crop and three times the cost per year for nutrient and pest management.

[4] Riparian Buffer Strips are cost-shared per acre per year for a maximum of five years. Total cost shown is five times the cost per year. This practice is an interim BMP.

[5] 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.

Source: Wisconsin DNR, DATCP, and Manitowoc County

**Table S-9. Total Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Manitowoc and Sheboygan Counties**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Upland Control** | | | | | |
| Change in Crop Rotation | 16,000 ac | NA | 0 | 0 | --- [1] |
| Contour Cropping | 150 ac | 9 | 1,350 | 1,350 | --- [1] |
| Contour Strip Cropping | 40 ac | 13.5 | 540 | 540 | --- [1] |
| High Residue Management [2] | 10,500 ac | 18.5 | 582,750 | 582,750 | --- [1] |
| Cropland Protection Cover [3] (Green Manure) | 4,000 ac | 25 | 200,000 | 200,000 | --- [1] |
| Intensive Grazing Management (Rotational Grazing) | 14 ea | 7,000 | 98,000 | 49,000 | 49,000 |
| Critical Area Stabilization | 650 ac | 400 | 260,000 | 182,000 | 78,000 |
| Grass Waterways | 10 ac | 3,000 | 30,000 | 21,000 | 9,000 |
| Field Diversions and Terraces | 2,000 ft | 3 | 6,000 | 4,200 | 1,800 |
| Grade Stabilization | 8 ea | 4,000 | 32,000 | 22,400 | 9,600 |
| Agricultural Sediment Basin | 8 ea | 10,000 | 80,000 | 56,000 | 24,000 |
| Shoreline Buffers | 270 ac | 400 | 108,000 | 75,600 | 32,400 |
| Nutrient Management [3] | 11,700 ac | 6 | 210,600 | 105,300 | 105,300 |
| Nutrient and Pest Management [3] | 14,000 ac | 7 | 294,000 | 147,000 | 147,000 |
| Spill Control Basin | 2 ea | 10,000 | 20,000 | 14,000 | 6,000 |
| Wetland Restoration | 400 ea | 2,000 | 800,000 | 560,000 | 240,000 |
| Riparian Buffer Strips [4] | 180 ac | 100 | 90,000 | 45,000 | 45,000 |
| Livestock Exclusion, Woods | 9,000 ft | 1 | 9,000 | 4,500 | 4,500 |
| Well Abandonment | 16 ea | 500 | 8,000 | 5,600 | 2,400 |
| **Upland subtotal** | | | **2,830,240** | **2,076,240** | **754,000** |

**Table S-9 continued. Total Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Manitowoc and Sheboygan Counties**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Barnyard Runoff Control and Manure Storage** | | | | | |
| Filter Walls and Strips | 50 ea | 25,000 | 1,250,000 | 875,000 | 375,000 |
| Roof Gutters | 70 ea | 2,000 | 140,000 | 98,000 | 42,000 |
| Clean Water Diversion | 68 ea | 2,500 | 170,000 | 119,000 | 51,000 |
| Roofs | 3 ea | 25,000 | 75,000 | 52,500 | 22,500 |
| Barnyard Abandonment or Relocation | 3 ea | 60,000 | 180,000 | 126,000 | 54,000 |
| Manure Storage Facility [5] | 22 ea | 30,000 | 660,000 | 418,000 | 242,000 |
| Manure Storage Facility Abandonment | 4 ea | 10,000 | 40,000 | 28,000 | 12,000 |
| Cattle Mounds | 8 ea | 1,500 | 12,000 | 8,400 | 3,600 |
| Milking Center Waste Control | 22 ea | 5,000 | 110,000 | 77,000 | 33,000 |
| **Barnyard subtotal** | | | **2,637,000** | **1,801,900** | **835,100** |
| **Streambank Erosion Control** | | | | | |
| Shape and Seeding | 30,000 | 10 | 300,000 | 210,000 | 90,000 |
| Fencing | 3,500 ft | 1 | 3,500 | 2,450 | 1,050 |
| Rock Riprap* | 700 ft | 30 | 21,000 | 14,700 | 6,300 |
| Bio-Bank Stabilization | 700 ft | 25 | 17,500 | 12,250 | 5,250 |
| Crossing | 8 ea | 2,000 | 16,000 | 11,200 | 4,800 |
| Remote Watering Systems | 4 ea | 2,000 | 8,000 | 5,600 | 2,400 |
| **Streambank subtotal** | | | **366,000** | **256,200** | **109,800** |
| **Subtotal** | | | **5,833,240** | **4,134,340** | **1,698,900** |
| Land Acquisition | 300 ac | 2,000 | 600,000 | 300,000 | 300,000 |
| Easements | 250 ac | 1,000 | 250,000 | 250,000 | 0 |
| **Total** | | | **6,683,240** | **4,684,340** | **1,998,900** |

[1] Local share consists of labor and equipment costs. Also see flat rates in table 4-1.

[2] High Residue Management is cost-shared per acre per year for a maximum of six years. Total cost shown is three times the cost per year as an average cost estimate.

[3] Cropland Protection Cover and Nutrient and Pest Management are cost-shared per acre per year for a maximum of three years. Total cost shown is two times the cost per year for cover crop and three times the cost per year for nutrient and pest management.

[4] Riparian Buffer Strips are cost-shared per acre per year for a maximum of five years. Total cost shown is five times the cost per year. This practice is an interim BMP.

[5] 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.

[6] Add 300 feet rock rip rap at $60/per foot to urban budget for Howard's Grove.

Source: Wisconsin DNR, DATCP, Manitowoc and Sheboygan Counties

**Table S-10. Cost Share Budget Needs for Urban Management Practices**

| Item | City of Sheboygan | | Village of Howards Grove | | Town of Sheboygan | | TOTAL |
|---|---|---|---|---|---|---|---|
| | State Share | City Share[1] | State Share | Village Share | State Share | Town Share | |
| Practices within Established Urban Areas[2] | 49,000 | 21,000 | 49,000 | 21,000 | 98,000 | 42,000 | 280,000 |
| **Subtotal NPS[3]** | 49,000 | 21,000 | 49,000 | 21,000 | 98,000 | 42,000 | 280,000 |
| Construction Site Erosion Control Ordinance (CSECO) Development | 2,000 | 0 | 0 | 0 | 2,000 | 0 | 4,000 |
| CSECO Implementation[4] | 7,800 | 44,200 | 11,700 | 66,300 | 11,700 | 66,300 | 208,000 |
| Stormwater Planning | 0 | 0 | 47,000 | 20,000 | 82,000 | 35,000 | 184,000 |
| Engineering Design and Feasibility Studies | 4,900 | 2,100 | 4,900 | 2,100 | 9,800 | 4,200 | 28,000 |
| Wellhead Protection | 2,800 | 1,200 | 2,800 | 1,200 | 2,800 | 1,200 | 12,000 |
| **Subtotal LAG[5]** | 17,500 | 47,500 | 66,400 | 89,600 | 108,300 | 106,700 | 436,000 |
| **Total NPS & LAG** | 66,500 | 68,500 | 115,400 | 110,600 | 206,300 | 148,700 | 716,000 |
| **Total by Municipality** | 135,000 | | 226,000 | | 355,000 | | 716,000 |

1. The local share of the cost of practices on established urban areas and stormwater planning may be paid by private landowners or other state agencies instead of local governments where applicable.
2. BMPs for established urban areas include wet detention basins, oil-grit separators, and storm sewer outfall forebays or infiltration practices. Local governments or private landowners bear the additional cost of operation and maintenance (not included in the table).
3. Nonpoint Source Grant
4. Funding for implementation limited to three years following adoption of an ordinance at maximum 50% state share. Fees are expected to support implementation after this period.
5. Local Assistance Grant. Information and educational activities to promote pollution prevention practices will be coordinated by the local municipalities and funded through their LAG.

**Table S-11. Estimated Staff Hours Needed to Meet the Water Quality Goals in Pigeon River Watershed for 10 Years of Project Implementation [1]**

| Activity | Manitowoc County Staff Hours | Sheboygan County Staff Hours | Total Staff Hours |
|---|---|---|---|
| Project and Financial Management | 6,500 | 6,500 | 13,000 |
| Information and Education Program | 6,400 | 6,400 | 12,800 |
| Inventory and Planning [2] | 5,500 | 4,500 | 10,000 |
| Practice Design and Installation | 19,600 | 15,900 | 35,500 |
| Upland Sediment Control | (12,000) | (10,000) | (22,000) |
| Barnyard Runoff Control and Manure Storage | (5,500) | (4,000) | (9,500) |
| Streambank Erosion Control | (2,100) | (1,900) | (4,000) |
| Monitoring BMP Operation and Maintenance | 3,700 | 3,000 | 6,700 |
| Training | 2,600 | 2,100 | 4,700 |
| Leave | 4,200 | 3,600 | 7,800 |
| **Total Hours for 10 Year Period** | 48,500 | 42,000 | 90,500 |
| **Total Hours Per Year** | 4,850 | 4,200 | 9,050 |
| **Estimated Staff Required per year** | 2 | 2 | 4 |

[1] Source: DNR, DATCP, Manitowoc and Sheboygan Counties

[2] Inventory and Planning includes: Inventory, Critical Site Verification, Landowner Contacts, Conservation Planning and Plan Revisions, Cost-Share Agreement Development and Amendment and Progress Tracking.

**Table S-12. Rural Cost Estimates for the Pigeon River Priority Watershed Project**

| Item | State Share |
|---|---|
| Cost Share Funds | 4,100,000 |
| Easements and Land Acquisition | 550,000 |
| Local Assistance Staff Funding | 1,719,500 |
| Information and Education Direct | 60,000 |
| Other Direct (travel, supplies, etc.) | 110,000 |
| Engineering Assistance | 100,000 |
| **Total** | **6,639,500** |

Source: DNR, DATCP, and Manitowoc and Sheboygan Counties

## Grant Disbursement and Project Management Schedule

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

The project implementation period is ten years. Cost-share agreements with eligible landowners may be signed throughout the life of the project. Practices listed on any cost-sharing agreement must be installed by the end of the project. This project is scheduled to conclude in 2007.

The initial Nonpoint Source grant will cover the cost of practices over the entire ten year implementation phase. See Table 4-3 for a detailed explanation. This grant may be amended due to changes needed for time of performance, funding levels, or scope of work.

Local Assistance grants will be disbursed annually to Manitowoc and Sheboygan County to cover the costs of personnel, operating expenses, and equipment. The DNR will evaluate an annual workload analysis and grant application submitted by the counties.

See the appendix for an estimated annual budget for 1998 and 1999.

# CHAPTER ONE:
# Purpose and Project Goals

## Watershed Project Purpose

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 74 square-mile Pigeon River Watershed, located in Sheboygan and Manitowoc Counties, was designated a 'priority watershed" in 1995. The primary objective of this project is to reduce nonpoint source pollution loads and to enhance and protect the water quality of the streams, wetlands groundwater and lakes in the Pigeon River Watershed. The Pigeon River discharges directly to Like Michigan and is part of the Sheboygan River Basin.

See Appendix A for information on Legal Status of the Nonpoint Source Control Plan.

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

This plan was prepared through the cooperative efforts of the Sheboygan County Land Conservation Department, Manitowoc County Soil and Water Conservation Department, DNR, DATCP, UWEX, NRCS, the Village of Howards Grove, the City of Sheboygan and the Pigeon River Watershed Citizens Advisory Committee.

## Watershed Project Goals

A Citizens Advisory Committee (CAC) was convened in 1996 to help prepare the Pigeon River Priority Watershed Plan. The CAC includes representatives from both farm and urban communities. Members include representatives from the agricultural, educational and environmental organizations. Conservation and sportsman's clubs are also represented, as are lake interests and local governments. The most important role of the CAC was the development of the following project goals.

**Water Quality Improvement**

- Reduce sediments and other pollutants to create a swimmable river
- Improve stream and fish habitat ratings for all streams in the watershed to good or excellent
- Improve water quality in Jetzers Lake by reducing algae blooms
- Maintain good water quality in the other lakes in the watershed

- Encourage protection of environmentally sensitive lands through conservation easements or acquisition by land trusts

**Sediment Load Reduction**

- Reduce sediment loads by 30%
- Implement conservation systems on 75% of watershed cropland acreage in 10 years
- Expand conservation tillage equipment availability
- Work with farmers on implementing BMPs without undue financial hardship
- Provide a database to link soil test field data with watershed phosphorus delivery
- Reduce construction site runoff through stronger erosion control ordinances implemented by cities, villages, towns and county
- Develop sediment control devices for urban areas other than big ponds
- Fix eroding streambank areas

**Phosphorus and Bacteria Load Reduction**

- Lower phosphorus loadings by 5001b to reduce excess plant growth
- Provide financial support to encourage rotational grazing
- Eliminate manure spreading in winter on high hazard lands
- Improve water quality and habitat by eliminating or controlling livestock access to creeks that run through barnyards
- Improve and maintain wastewater treatment facilities to consistently meet discharge permit requirements
- Update rural septic systems

**Urban Pollutant Load Reduction**

- Place nonpoint source pollution control limits on all future development and control construction site erosion
- Have all municipalities work to support the watershed plan
- Encourage local governments to develop and implement urban planning that supports water quality improvements
- Restrict building in floodplains of navigable streams
- Encourage design and maintenance of transportation systems that minimize nonpoint source pollution
- Encourage development and implementation of stormwater pollution prevention plans by businesses and industries, including those not covered by the stormwater permit program.

**Flow Moderation**

- Reduce high flows and increase baseflow
- Preserve and recreate wetlands adjacent to streams for storing water and reducing high flows in the stream
- Encourage re-meandering of stream channels

**Riparian Areas and Public Access Improvement**

- Encourage management of the shoreland. zone to minimize nonpoint source pollution
- Protect riparian corridors and improve public access through land purchase and conservation easements
- Involve lake associations and lakefront property owners in encouraging buffers along lakeshores
- Maintain or improve the condition of streambank habitat while not impeding stream flow
- Use high vegetation buffer strips to help reduce water temperatures
- Use partnerships between landowners, public agencies, and private groups to promote streambank stabilization

**Fish Habitat Preservation and Improvement**

- Maintain the steelhead. and salmon fishery in the Pigeon River
- Increase natural reproduction of northern pike
- Maintain the northern pike and smallmouth bass fishery throughout the entire year for several years in a row
- Protect and improve fish habitat

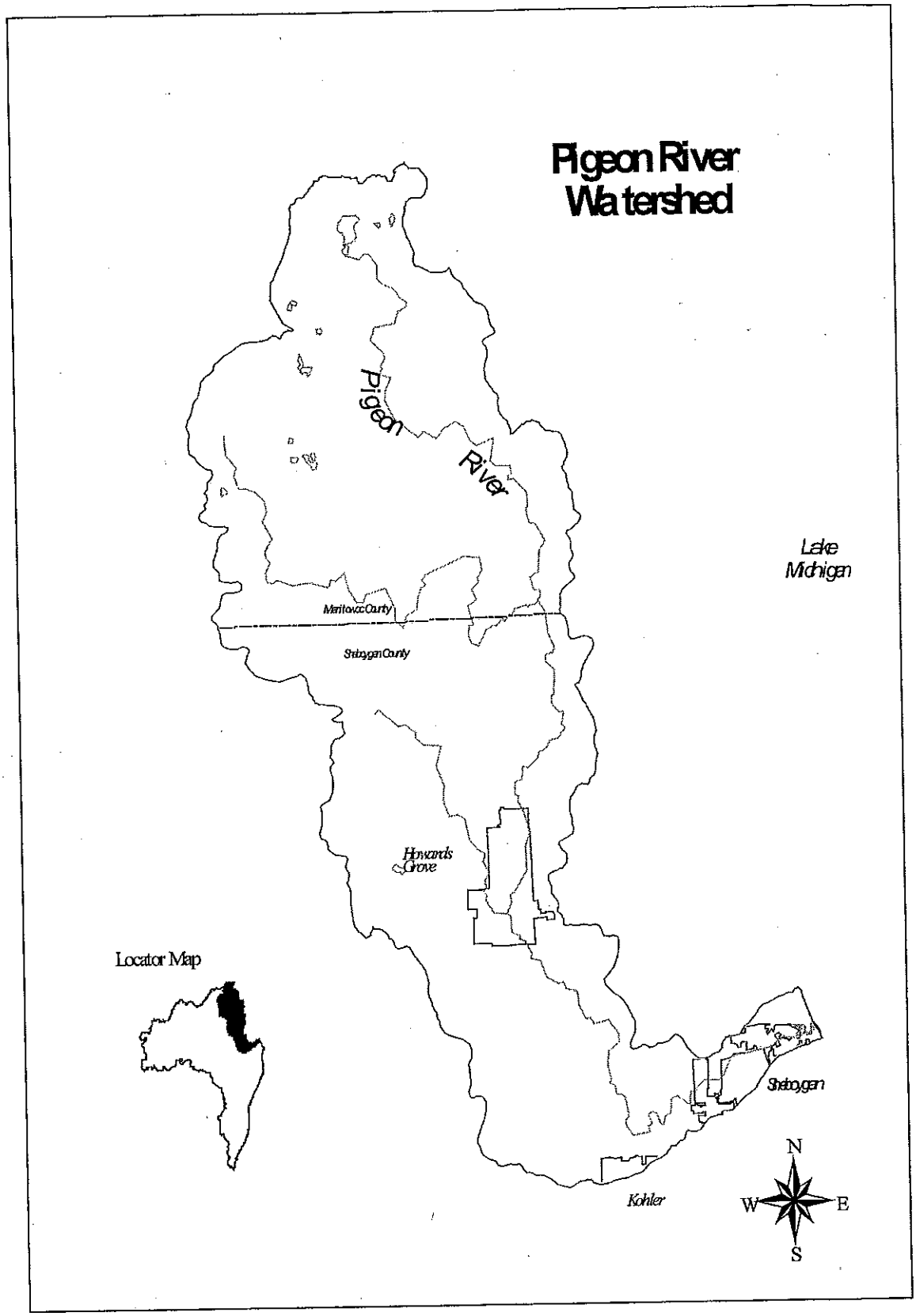
**Wildlife Habitat Preservation and Improvement**

- Increase wildlife habitat
- Increase grassland habitat along intermittent streams to complement wildlife habitat program
- Increase the number and size of buffers with enhanced wildlife habitat Control the spread of purple loosestrife, Eurasian milfoil and other exotic plants

**Public Education**

- Create a high level of awareness and involvement of landowners in water quality projects
- Develop a greater sense of public appreciation and stewardship for the Pigeon River and its tributaries
- Continue public education about river preservation and improvement
- Increase public awareness of rural and urban pollution sources including hobby farms
- Further develop the volunteer monitoring program

Map 1-1. Location of Pigeon River Priority Watershed



# CHAPTER TWO:
# Watershed Conditions and Objectives

## Cultural Features

This Chapter discusses the cultural and physical characteristics, the water resource conditions, and goals for the Pigeon River Priority Watershed.

### Location and Community Information

The Pigeon River Watershed is a 74 square mile drainage basin located in Sheboygan and Manitowoc Counties of eastern Wisconsin (map 1-1). Approximately 50% of the watershed lies within each Sheboygan and Manitowoc Counties. The Pigeon River Watershed lies within the Sheboygan River Basin geographic management unit. The Pigeon River originates as numerous spring-fed tributaries and flows south, entering Lake Michigan, north of the city of Sheboygan. In addition to the perennial and intermittent streams, the watershed includes Pigeon, Spring, Horseshoe, and Jetzers Lakes.

### Civil Divisions

The Pigeon River Watershed lies within Sheboygan and Manitowoc Counties. Incorporated areas wholly or partially in the watershed include the Village of Howards Grove, the Village of Kohler and the City of Sheboygan. The watershed covers parts of the following townships:

| Sheboygan County | Manitowoc County |
|---|---|
| Herman | Liberty |
| Mosel | Meeme |
| Sheboygan Falls | Schleswig |
| Sheboygan | Centerville |

### Population Size and Distribution

Approximately 19,000 people reside within watershed boundaries, the majority of whom live in urban land areas. Ten local governments and one lake association are incorporated in the watershed. Since 1980, the urban land area has grown between 6 and 10 percent. The population census in the watershed between the 1990 and 1996 show a 6 percent change. The population projections reveal a leveling off of the growth rate. The population increase between 1996 and 2015 is projected to be 2 percent. Future growth in these urban areas is a potential threat to the water quality in the watershed. As development increases the sediment load, particularly from construction site erosion, to streams will increase. An increase in urban land area will also effect the hydrologic regime in the watershed, most dramatically during high rainfall events (Official

Municipal Population Projections 1990-2015. Demographic Services Center, Wisconsin Department of Administration; Official Population Estimates, January 1, 1996. Department of Admin., Division of Energy and Intergovernmental Relations, Demographic Services Center, Oct. 1996).

### Land Uses

Rural Land uses predominate in both Sheboygan and Manitowoc Counties. Upland agriculture accounts for about 70 percent of the land use area in the watershed and is a significant part of the local economy. While the number of farms, has decreased over the past 20 years, the average farm size has increased. Additionally, the overall amount of agriculture land has been decreasing. Dairy farms in the watershed cover sixty percent of the agricultural land area. The remaining agricultural land supports cash crops (Soil Surveys: Sheboygan Co., 1980; Manitowoc and Calumet Co's, 1978).

### Employment

Manufacturing industries employ the majority of the population in both counties. In 1990, 36% percent of jobs in Sheboygan county and 30 % in Manitowoc County were in manufacturing. These percentages are projected to remain about the same in 2020. Jobs in service employment accounted for 20% of jobs in Sheboygan County and 21% in Manitowoc County during 1990. These percentages may increase by 1-2 percentage points by 2020. In 1990, jobs in farming accounted for 3% of employment in Sheboygan County and 6% in Manitowoc County. By 2020, the percent of jobs in farming is projected to decrease by approximately 40% (1997 State Profile; pgs. 193 and 237; Woods & Poole Economics, Inc., Washington D.C.).

## Watershed Conditions

This section discusses the physical characteristics, existing conditions, nonpoint sources, and objectives for the water resources in the Pigeon River Priority Watershed.

### 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 Pigeon River 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. Spring and fall are, at times, short and tend to be a mixture of both summer and winter.

The character of the seasons vary year to year and is influenced by the proximity to Lake Michigan. This "lake effect" creates cooler temperatures in the summer and warmer temperatures in the winter relative to inland areas. Winter months average 20 degrees (F) with a minimum of approximately 12 degrees (F) while the summer months average 70 degrees (F) with a maximum of approximately 81 degrees (F). Precipitation averages 29 inches per year, however one year in

ten will have less than 21.5 inches and more than 36 inches. In addition about 40-50 inches of snow falls per year. The majority of precipitation 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 (Soil Survey of Calumet and Manitowoc Counties, 1980; Sheboygan County Soil Survey, 1978).

**Topography**

The Pigeon River Watershed is located within the Southeastern Till Plains Eco-region. The relief in the region is largely the result of glaciation. This region is a gently rolling to rolling landscape with areas of well drained and somewhat poorly drained soils. Along the Pigeon River there are well-dissected valleys, with relatively high local relief. The watershed ranges from 900 feet above sea level in elevation at the headwaters to 100 feet above sea level where the Pigeon River enters Lake Michigan.

**Geology**

The bedrock geology of the watershed are formations underlying the unconsolidated surficial deposits. The formations, from oldest to youngest include Precambrian crystalline rocks; Cambrian sandstone; Ordovician dolomite, sandstone and shale, and Silurian dolomite. Many of these formations underlie only parts of the watershed. The beds dip to the southeast which creates the Silurian escarpment and forms the divide that is responsible for the relatively short stream systems that flow into Lake Michigan. These drainages are predominately influenced by Late Wisconsinan glacial erosional and depositional features. For example, the Meeme and Pigeon Rivers take a southerly route along a recessional moraine parallel to Lake Michigan.

The Silurian dolomite forms the top bedrock layer and is visible as outcrops throughout the watershed. The thickness of this formation varies and is approximately 700 feet in eastern Sheboygan county. It is a source of groundwater for domestic wells.

The present landscape can be primarily attributed to the Woodfordian advance(22,000-12,500 bp) and the Valderan advance 1,850-9500 bp). These episodes are responsible for the glacial landforms visible today: lake basins, drumlins, ground and end moraines and outwash plains (Paull and Paull, 1977).

**Soils**

The majority of the soils found in the watershed are grouped in the following two soil associations:

**Kewaunee-Waymor-Manawa association.** Well to somewhat poorly drained. Soils that have a subsoil of mainly clay loam to clay and are underlain by loam or silty clay loam glacial till. These soils are found in the Pigeon River floodplains. (Sheboygan Co.)

**Kewaunee-Manawa Poygon association.** Nearly level to sloping, well drained to poorly drained soils that have a dominantly clayey subsoil and substratum. These soils are found throughout the Pigeon and Meeme River valleys. (Manitowoc Co.)

Each of these associations makes up approximately 45% of their respective counties and are dominated by Kewaunee soils which are found on broad till plains. The Kewaunee soils are known to be part of the distinctive "red clay" soils deposited during the latter advances of the Wisconinan Ice age. Convex knolls and ridges are typical of Kewaunee glacial till uplands. The soils are moderate to well suited for all crops commonly grown in the county and are mostly used for corn, small grain and legumes. Dairy farm and beef cattle also graze on these soils.

Pasture, wildlife habitat and woodlands also exist. The main management concerns are controlling erosion, maintaining organic matter content, tilth, and fertility. There are severe limitations for septic tank absorption fields, trench type landfills and local roads and streets. (Soil Survey of Sheboygan County, 1978; Soil Survey of Manitowoc and Calumet Co., 1980)

The following soil associations are found in small, isolated areas (less than 5 square miles) within the watershed:

**Hocheim-Larmartine-Mayville association.** Nearly level to moderately steep, well drained to somewhat poorly drained soils that are loamy throughout. These soils are found along the western margins of the watershed. (Manitowoc Co.)

**Hortenville-Symco association.** Nearly level to moderately steep, well drained and somewhat poorly drained soils that are loamy throughout. These soils are found north of Spring Valley. (Manitowoc Co.)

**Mosel-Oakville-Hebron association.** Somewhat poorly drained to well drained soils that have a subsoil of mainly clay loam to sand and are underlain by medium and fine sand or stratified silt loam and silty clay loam. This association borders Lake Michigan at the outlet of Pigeon River and extends approximately two miles inland. (Sheboygan Co.)

**Hocheim-Lutze association.** Gently sloping to steep, well drained loamy soils. These soils formed as glacial drift. There are patches of this association in the western most region of the watershed in Manitowoc county that account for less than 2 sq. miles of the watershed. (Manitowoc Co.)

**Hocheim-Theresa association.** Well drained soils that have a subsoil of mainly clay loam or silty clay loam and are underlain by gravelly sandy loam glacial till. This association can be found around the town of Ada, near the Sheboygan-Manitowoc county lines, and makes up approximately 1 sq. miles of the watershed. (Sheboygan Co.)

## Environmental Corridors

Environmental Corridors are areas in the landscape containing especially high value natural, scenic, historic, scientific, and recreational features. They generally lie along major stream valleys, around lake shores, wetland and woodland zones, unique wildlife habitat areas and high relief or rugged topography areas.

Environmental corridors are, in effect, a composite of the best remaining elements of the natural resource base. Protection and proper management of resources found in them helps prevent serious environmental problems. Environmental corridors for the Pigeon River Watershed have not been officially mapped out. The Bay-Lakes Regional Planning Commission will identify and map environmental corridors in 1998-99.

## Natural and Scientific Area Sites

Natural and scientific area sites are sites that contain high quality examples of natural communities. Sites in the Pigeon River Watershed have not been incorporated into the database as of yet. If specific locational or other information is needed about these natural communities or individual endangered species, contact the Bureau of Endangered Resources, DNR.

## Wisconsin Endangered and Threatened 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.

A *threatened* species is one which, if not protected, has a strong probability or becoming endangered.

## 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. **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.

## Archaeological Sites

State and federal laws require preservation of archaeological resources within the framework of the NPS Program. A request has been made to the State of Wisconsin for cultural resource maps of Sheboygan and Manitowoc Counties. These maps will be available at the respective county offices to insure that cultural resources are considered during the planning of all best management practices.

# Water Resource Conditions and Goals

This section describes the general conditions of the surface and groundwater resources in the Pigeon River Watershed. It describes the classifications used for Wisconsin's waters, then describes the surface water and recreational resources in the watershed. Descriptions of subwatersheds are also included and several tables provide summaries of the watershed's resources. Appendix C also serves as a useful summary of the surface water resources in 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. Stream classification determines allowable pollutant loads to the system. Resources are classified as one of the following:

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

Trout streams carry a separate designation found in "Wisconsin Trout Streams" (DNR Publication number. 6-3600(80)) and Outstanding/Exceptional Resource Waters, Wisconsin Administrative Code NR 102.20 and NR 102.1 1. 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.

**Recreational Stream Use**

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

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

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

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

**Subwatersheds in the Pigeon River Watershed**

For the purposes of this project, the Pigeon River Watershed is subdivided into 13 individual subwatersheds. Each subwatershed conveys surface water to the Pigeon River (see map 1-1).

Fischer Creek (FC)
Grandma Creek (GC)
Horseshoe Lake (HL)
Howards Grove (HG)
Jetzers Creek (JC)
Jetzers Lake (JL)
Meeme Creek (MC)
Pigeon Creek (PC)
Pigeon Lake (PL)
Pigeon River (PR)
Sheboygan (SB)
Spring Lake (SL)
Spring Valley (SV)

### Streams

Stream are dominant surface water features in the Pigeon River Watershed. Perennial streams, which have a combined length of about 70 miles, maintain at least a small continuous flow throughout most of the year. The Pigeon River (30 miles) is the longest perennial stream in the watershed. Tributaries to the Pigeon River include Meeme River, Fisher Creek, Grandma Creek and nine unnamed tributaries (Table 2-1).

## Subwatershed Descriptions

The following sections describe the water resource conditions for stream subwatersheds in the Pigeon River Watershed. Conditions of the major named streams in each subwatershed are discussed below. Summary tables for all streams evaluated in the appraisal are located in Appendix C. More detailed information can be found in the *Pigeon River Priority Watershed. Stream Appraisal Report* (Aartila and Crone, 1997).

### Spring Valley Subwatershed

The Spring Valley subwatershed, located in Manitowoc County contains 14.1 miles of perennial and intermittent streams. The subwatershed contains 5.2 miles of the Meeme River which originates at the outlet of Pigeon Lake and flows southeast to the Spring Valley Dam inlet north of Spring Valley Road. Spring Lake Creek, located north of the Town of School Hill, originates at the outlet of Spring Lake and flows 2.2 miles southeast to its confluence with the Meeme

**Table 2-1 Streams of the Pigeon River Watershed**

| Stream | Length (miles) | Location (TRSQ) at stream Confluence |
|---|---|---|
| Pigeon River (mouth to confluence with Meeme River) | 18.1 | T15N R23E S18 NESE |
| Pigeon River (Meeme River confluence to headwaters) | 11.9 | T17N R22E S36 NWSE |
| Meeme River | 11.9 | T17N R22E S36 NWSE |
| Fisher Creek | 4.4 | T16N R22E S26 SWSE |
| Jetzers Creek | 3.1 | T16N R22E S26 NESW |
| Grandma Creek | 4.5 | T15N R23E S18 NESE |
| 9 Unnamed Tributaries | 16.5 | --- |
| **TOTAL** | **70.4** | --- |

River. Land use in this subwatershed is primarily agriculture with woodlots and wetlands concentrated in the area surrounding Spring Lake Creek.

***Meeme River:*** The Meeme River has a biological use classification of warmwater sport fish community (WWSF) with largemouth bass, white sucker, creek chub and Johnny darter as the most abundant species found. Bluntnose minnow, brook stickleback, central mudminnow, fathead minnow, blacknose dace, longnose dace, bluegill and walleye are also found in this subwatershed portion of the Meeme River.

Macroinvertebrate samples had Hilsenhoff Biotic Index (HBI) ratings of fair to very good water quality indicating fairly significant organic pollution to possible slight organic pollution. The substrates in the Meeme River are composed primarily of rubble, gravel, sand and silt. The river is heavily channelized from Pigeon Lake Road downstream to Point Creek Road. The land use along the Meeme River ranges from agricultural fields to wetlands and woodlots. Very little buffer exists along the agricultural sections of the river.

The Meeme River is negatively affected by loss of fish and invertebrate habitat, embedded substrate, turbidity, low dissolved oxygen, potential ammonia toxicity and streambank erosion which is preventing it from meeting its full biological use potential. Sources of these problems include channelization, roadside ditch erosion, cropland and barnyard runoff, drain tiles, natural low flows, wetland drainage and failing septic systems.

The Meeme River has the potential for a partial body contact (PBC) recreational use classification. The river is currently not meeting its potential because of bacterial contamination caused by barnyard runoff, floodplain pasturing and septic systems.

***Spring Lake Creek:*** No formal stream classification has been completed for Spring Lake Creek, however surveys and field observations indicate the potential for a cold water community (COLD). The most abundant fish species recovered in Spring Lake Creek fish community assessments were American brook lamprey, largemouth bass and creek chub. Other species include Iowa darter, blacknose dace, brook stickleback, central mudminnow, bluegill, and green sunfish. The presence of the intolerant American brook lamprey indicates that Spring Lake Creek has the potential for a cold water community classification.

Macroinvertebrate collections in some areas showed an imbalanced trophic community, and HBI scores ranked the water quality as fair at those sites indicating fairly substantial organic pollution likely. Bottom substrate is dominated by sand with some gravel and rubble present. Cover consists of woody debris, cobble, overhanging vegetation, undercut banks, boulders, emergent vegetation and submerged macrophytes. The corridor along the stream is primarily wooded.

This stream is a unique resource in the area as evidenced by the presence of the intolerant American brook lamprey and the megalopteran *Nigronia serricornis* (the first time these species have been documented in the Sheboygan River Basin). This stream for the most part has very high water quality, and is partially meeting its biological potential. Impacts from embedded substrates, low dissolved oxygen, excessive nutrients, streambank erosion or scour, and macroinvertebrate community imbalance limit this stream from fully meeting its potential use. Sources responsible include barnyard and cropland runoff, streambank pasturing, wetland drainage, and parent soils composition.

This stream is suitable for partial body contact recreation. Current or potential recreational activities include bait fishing, trapping, hunting, wading, and wildlife viewing.

**Meeme River Subwatershed**

The Meeme River subwatershed is located in Manitowoc County, and contains 13.3 miles of streams. The Meeme River portion of this subwatershed is 5.7 miles long and extends from the Spring Valley Dam outlet across STH 42, southeast to the confluence with the Pigeon River just north of the Manitowoc and Sheboygan County Line. The Osman Tributary is a perennial tributary stream which crosses STH 42 northeast of Spring Valley and flows south to the Meeme River confluence. This subwatershed contains two unnamed perennial tributaries and 10 unnamed intermittent tributaries. Land use in this subwatershed is dominated by agriculture. Some residential land use is concentrated in the Meeme and Spring Valley Townships.

***Meeme River:*** The Meeme River has a current and potential biological use classification of warmwater sport fish community (WWSF). The most abundant fish species found in this section of the river were common shiner, hornyhead chub, blacknose dace, creek chub and Johnny darter. Other species found include blackside darter, longnose dace, bluntnose minnow, central mudminnow, fathead minnow, white sucker, black bullhead, green sunfish, largemouth bass, northern pike, rock bass and stonecat.

Macroinvertebrate samples had HBI ratings ranging from good to fair in this portion of the Meeme River indicating some organic pollution to fairly substantial organic pollution. Bottom substrates consist of primarily rubble, gravel, sand and silt Some reaches of the river are channelized, with cover limited to overhanging vegetation. Much of the strewn corridor is in agricultural land uses with very little buffer between farm fields and the river. Some limited woodlots dot the stream corridor.

The Meeme River is only partially meeting its WWSF potential use because of the following factors: limited fish and invertebrate habitat, embedded substrates (siltation), low dissolved oxygen, imbalanced macroinvertebrate community structure, eroding streambanks, ammonia toxicity, and potential toxicity from pesticide and herbicide use. Sources include channelization, roadside ditch erosion, cropland runoff, barnyard runoff, wetland drainage, floodplain pasturing, and failing septic systems.

High fecal coliform counts are keeping the Meeme River from meeting its full recreational use potential as a partial body contact stream. Sources of bacteria include barnyard runoff, floodplain pasturing and failing septic systems.

***Osman Tributary:*** Two small streams (east and west branch Osman Tributary) come together to form the main Osman Tributary located west of the intersection of CTH X and STH 42 in Manitowoc County. The current biological use classification is limited forage fish community (LFF), however this stream has the potential to support a warmwater forage fish community (WWFF). Fish found in this stream during the appraisal include brook stickleback, central mudminnow, creek chub, fathead minnow, white sucker and blacknose dace.

Macroinvertebrate samples collected had an HBI rating of fairly poor indicating the presence of significant organic pollution. Bottom substrates are composed of sand, silt and clay with some gravel and rubble present. Cover is limited to woody debris and minimal overhanging vegetation. The stream corridor contains some wooded areas, but agricultural uses with little to moderate stream side buffers dominate the majority of adjacent land uses.

The factors keeping this stream from meeting its potential include loss of fish and invertebrate habitat, presence of nuisance vegetation, high bacteria counts, embedded substrates, low dissolved oxygen levels, and an unbalanced macroinvertebrate community. Sources include barnyard and cropland runoff, roadside ditch erosion, streambank erosion, channelization and drain tiles.

The current and potential recreational use for this stream is partial body contact. Periods of high fecal coliform. counts keep this stream from meeting its full recreational potential.

**Pigeon Creek Subwatershed**

This subwatershed is located in southern Manitowoc County and northern Sheboygan County and contains about 25 miles of perennial and intermittent streams including the upper 12 miles of the Pigeon River. The Pigeon River originates from a spring fed tributary in an area dominated by wetlands and woodlots in southern Manitowoc County. Agriculture dominates the land use in this subwatershed, with stream channelization and cattle access common throughout.

***Pigeon River:*** The Pigeon River has existing and potential biological uses capable of supporting warmwater sport fish communities. The most abundant fish species found include creek chub, Johnny darter and white sucker. Other species found include brook stickleback, central mudminnow, common shiner, fathead minnow, blacknose dace, longnose dace, pearl dace, black bullhead, black crappie, bluegill, green sunfish and largemouth bass.

Macroinvertebrate samples had HRI ratings ranged from good (some organic pollution) in the upstream sites sampled to fair fairly significant organic pollution) in the sections sampled between South Cleveland Road and County Line Road. The substrates in the upper reaches of the Pigeon River consist primarily of rubble/cobble, gravel and sand. Silt and clay begin to cover these substrates in the downstream areas in this subwatershed. A large segment of the river is channelized upstream of South Cleveland Road. Instream cover in the upper reaches consists of woody debris, boulders and overhanging vegetation. Watercress is common in the spring fed upstream areas. River corridor habitat ranges from woodlot and wetlands in the upstream areas to channelized stream reaches with very little buffer from agricultural activities downstream.

This portion of the Pigeon River is partially meeting it's potential biological use for warmwater sport fish communities. Some factors keeping the river from meeting its potential use are loss of invertebrate and fish habitat, low dissolved oxygen levels, embedded sediments, and high fecal coliform counts. Potential sources for these problems are cropland and barnyard runoff, streambank pasturing, bank erosion, channelization, wetland drainage and failing septic systems.

A recreational use classification for partial body contact is recommended for this part of the Pigeon River, however high fecal coliform counts prevent the river from meeting its full recreational use potential. Some recreational activities may include sport and bait fishing, trapping, hunting, wading and wildlife viewing.

**Howards Grove Subwatershed**

The Howards Grove subwatershed, a Pigeon River Mainstem subwatershed, encompasses a very small portion of southeastern Manitowoc County and extends south into Sheboygan County to the Village of Howards Grove. The subwatershed contains 9.95 miles of perennial and intermittent streams including 8.3 miles of the Pigeon River. This subwatershed begins at the confluence of the Pigeon and Meeme Rivers just north of the Manitowoc/Sheboygan county line and flows in a southerly direction through the Village of Howards Grove. Tributaries in this subwatershed include 1.65 miles of unnamed streams. The Village of Howards Grove is the largest urbanized area in the subwatershed. The Village of Howards Grove wastewater treatment plant (WV;TP) discharges treated wastewater to the Pigeon River in Howards Grove at T16N R22E Sec.26 NESE. For a detailed description of water quality in the Pigeon River, see the Sheboygan Subwatershed below.

**Pigeon River Subwatershed**

The Pigeon River subwatershed, a Pigeon River Mainstem subwatershed, is located in northeastern Sheboygan County and contains 10.2 miles of intermittent and perennial streams, including 5 miles of the Pigeon River. This section of the Pigeon River enters this subwatershed at the Fisher Creek confluence upstream of CTH JJ in Howards Grove, and flows south to the confluence with Grandma Creek at CTH Y in the Town of Sheboygan. Four unnamed tributaries totaling 5.2 stream miles enter the Pigeon River in this subwatershed. Agricultural and

residential areas are the major land uses in this subwatershed. For a detailed description of water quality in the Pigeon River, see the Sheboygan Subwatershed below.

**Sheboygan Subwatershed**

The Sheboygan subwatershed, a Pigeon River Mainstem subwatershed, is located in Sheboygan County and contains 6.2 miles of perennial and intermittent streams, including 4.8 miles of the Pigeon River. This segment of the Pigeon River extends from the Grandma Creek confluence and flows in a northeasterly direction to Lake Michigan on the north side of the City of Sheboygan. Urban residential and commercial development are the dominant land uses in this subwatershed.

***Pigeon River:*** The Pigeon River has existing and potential biological uses for warmwater sport fish communities. The most abundant fish species found in the appraisal were common shiner, white sucker, and smallmouth bass. Other species present include large-scale stoneroller, hornyhead chub, bluntnose minnow, sand shiner, Johnny darter, logperch, stonecat, creek chub, carp, pumpkinseed sunfish, black crappie, yellow bullhead, black bullhead, rock bass, bluegill and northern pike. The Pigeon River also experiences seasonal runs of Lake Michigan trout and salmon.

Macroinvertebrate samples had HBI ratings of fair water quality indicating fairly substantial organic pollution likely at all Pigeon River sites in these subwatersheds. Substrates consist primarily of rubble, gravel, sand and boulders. Agriculture dominates the land uses in the areas upstream of the Village of Howards Grove, and becomes increasingly urbanized downstream to the City of Sheboygan. The stream is channelized in agricultural areas, and has a fairly good buffer throughout with vegetation dominated by grass, with some wooded areas.

Water quality in this section of the Pigeon River, which is only partially meeting its WWSF biological use potential is limited by loss of fish and invertebrate habitat, embedded substrates, streambank erosion, macroinvertebrate community imbalance, high fecal coliform counts and turbidity. Sources for these problems include nutrient and manure inputs from cropland and barnyard runoff, streambank pasturing, streambank erosion, construction site erosion, wastewater treatment plant discharge, and stormwater runoff.

The recreational use classification for the Pigeon River is for partial body contact. High fecal coliform counts are keeping the river from fully meeting this use. Public access to the river is less restricted in the downstream areas. Parks in the Village of Howards Grove and the City of Sheboygan provide the public the opportunity for fishing, canoeing, nature study and hiking.

**Fisher Creek Subwatershed**

The Fisher Creek subwatershed contains the entire length of Fisher Creek, which originates in a large wetland complex upstream of CM MM in the Town of Herman in northern Sheboygan County. The creek flows 4.4 miles in a southeasterly direction to its confluence with the Pigeon

River east of Hwy 32 (and north of C7H JJ) in the Village of Howards Grove. This subwatershed also contains three unnamed intermittent tributaries to Fisher Creek.

***Fisher Creek:*** Fisher Creek has existing and potential use classifications for warmwater forage fish communities, but the stream is only partially meeting this use. Fish species historically found in Fisher Creek are blacknose dace, blundnose minnow, central mudminnow, common shiner, creek chub, hornyhead chub, large-scale stoneroller, white sucker, yellow bullhead, brook trout and northern pike.

HBI ratings from macroinvertebrate sampling show fair to fairly poor water quality in Fisher Creek indicating fairly substantial to substantial organic pollution likely. Substrates in Fisher Creek consist primarily of rubble, gravel and sand, with silt increasing downstream. Land use is primarily agriculture, with increasing residential development downstream. Many stream reaches are channelized. The stream corridor is dominated by grasses. Buffer width is very good upstream, and becomes increasing narrow downstream. Overhanging vegetation, where present, provides most of the in-stream cover.

Factors keeping Fisher Creek from fully meeting its potential include loss of fish and invertebrate habitat, imbalanced macroinvertebrate community, high fecal coliform. counts, stream flow fluctuations, siltation, excessive nutrients and turbidity. Potential sources include stream channelization, cropland and barnyard runoff, failing septic systems, streambank erosion, urban runoff, wetland drainage and filling.

Fisher Creek has existing and recreational use potential for partial body contact recreation. The river is only partially meeting this use as a result of high fecal coliform counts and natural low flows.

**Jetzers Creek Subwatershed**

The streams in this subwatershed originate in wetland areas upstream of CTH FF in the Town of Herman. The Lakeland College Tributary originates upstream of CTH FF and flows in a southeasterly direction to its confluence with Jetzers Creek (Jetzers Lake Outlet). Jetzers Creek originates at Jetzers Lake in northeastern Sheboygan County and flows south and east to its confluence with Fisher Creek near the Village of Howards Grove. This subwatershed also contains three unnamed intermittent streams. Land use in this subwatershed is primarily agricultural, with residential development increasing downstream. Lakeland College is also located in this subwatershed, and discharges effluent from its wastewater treatment plant to the Lakeland College Tributary near CTH M.

***Lakeland College Tributary:*** The Lakeland College Tributary has an existing and potential biological use classification as capable of supporting warmwater forage fish communities, although the legal classification of LFF is used for purposes of setting discharge limits for the Lakeland College WWTP. The most abundant fish species found in this stream are central mudminnow, brook stickleback, creek chub and Johnny darter.

Other species found include fathead minnow, white sucker, common carp, common shiner, pumpkinseed sunfish, green sunfish, yellow bullhead and northern pike.

Macroinvertebrate samples analyzed for the HBI rate this stream as fair for water quality, indicating fairly substantial organic pollution. Dominant substrate materials in this stream are sand, rubble, gravel and silt The stream is channelized in many areas and exhibits moderate to severe streambank erosion. In-stream habitat and cover are limited in the channelized portions of this stream.

This stream is only partially meeting its biological potential because of loss of fish and invertebrate habitat from channelization and wetland drainage, stream flow fluctuations, embedded substrates, imbalanced macroinvertebrate community, excessive nutrients and high fecal coliform counts. Sources of these problems include cropland and barnyard runoff, streambank pasturing, WWTP discharge and streambank erosion. This tributary is classified for partial body contact recreation because of limited size and depth.

***Jetzers Creek:*** Jetzers Creek (also known as the Jetzers Lake Outlet), has an existing biological use classification for warmwater forage fish communities, but has the potential to support warmwater sport fish communities. The most abundant fish species found during the appraisal were creek chub, blacknose dace and white sucker. Johnny darter, fathead minnow, common shiner, and central mudminnow were also found.

The HBI rating from macroinvertebrate sampling was fair, indicating fairly substantial organic pollution. Substrates in this river are composed primarily of rubble, gravel and sand. The buffer along the creek is fairly wide, but site surveys indicated that erosion from adjacent land and streambanks. is moderate to severe. In-stream habitat and cover is good in some stretches, but generally limited by excessive sedimentation and stream channelization.

Factors keeping Jetzers Creek from meeting its potential use are loss of fish and invertebrate habitat, loss of wildlife habitat, excessive nutrients, high fecal coliform counts, turbidity, and sedimentation. Sources of these problems include stream channelization, wetland drainage, cropland runoff, barnyard runoff and urban runoff. Jetzers Creek is classified for partial body contact recreation because of limited size and depth.

**Grandma Creek Subwatershed**

The Grandma Creek subwatershed is located in the Southwestern portion of the Pigeon River Watershed, adjacent to the Pigeon River and Fisher Creek subwatersheds. Grandma Creek originates in a large wooded wetland complex in T15N R22E Sec.2 SESE in the Town of Sheboygan Falls. The creek flows south and east to its confluence with the Pigeon River in the Town of Sheboygan near C7H Y. This subwatershed also contains four unnamed intermittent tributaries to Grandma Creek. Land use in most of the subwatershed is primarily agricultural,

with scattered residential development. The downstream section of Grandma Creek contains a mixture of urban and agricultural uses.

***Grandma Creek:*** The existing biological use classification identified for Grandma Creek is for supporting limited forage fish communities. The upstream headwaters portions of the creek are surrounded by a large wetland complex which may serve as important spawning habitat for northern pike, therefore the potential biological use of this stream is for warmwater sport fish communities. Previous fish collection efforts identified central mudminnow and northern pike as present in the creek (WDNR, 1994).

The HBI macroinvertebrate water quality rating for the stream is poor, indicating very substantial organic pollution is likely. Substrates are dominated by sand and silt, with gravel and rubble also present. Approximately 700 feet of the furthest downstream portion of Grandma Creek was relocated in the mid 1980's to allow for the expansion of C7H Y. The majority of Grandma Creek is extensively channeled. Buffers are very narrow for most of the length of the stream, and in-stream habitat is considered poor.

Factors keeping Grandma Creek from meeting its potential uses include excessive channelization leading to loss of fish and invertebrate habitat, stream flow fluctuations, loss of wildlife habitat, excessive nutrients, low dissolved oxygen, high fecal coliform counts, embedded substrates, and nuisance vegetation. Sources include cropland runoff, floodplain pasturing, barnyard runoff, failing septic systems, streambank erosion, urban runoff and wetland drainage. Grandma Creek is classified for partial body contact recreation but is limited by low flows and high fecal coliform counts.

**Pigeon River Watershed Lakes**

The purpose of the lakes water resource appraisal is to determine the existing water quality conditions of the lakes within the Pigeon River Watershed. Preliminary water resource objectives were developed for the following four large public lakes in the watershed: Pigeon Lake, Horseshoe Lake, Spring Lake and Jetzers Lake. As with the streams, the water resource objectives for lakes are determined based upon the optimal water quality potential of the lake and not the feasibility of achieving the objective with existing best management practices. *The Pigeon River Priority Watershed Lakes Water Resources Appraisal Report* (Olson and Helsel, 1997) describes the lake conditions in more detail than described below.

**Pigeon Lake Subwatershed**

Pigeon Lake is a 77-acre seepage lake with a maximum depth of 68 feet, an average depth of 35 feet and a single perennial outlet (Pigeon Lake Outlet). The area adjacent to the lake is developed with residential dwellings and a recreational camp. The residences are served by sanitary sewer which is treated at the Town of Liberty Wastewater Treatment Plant. The lake basin does stratify during the summer months during which the hypolimnion is anoxic (lack of oxygen in the bottom waters).

The Pigeon Lake subwatershed is located in southwestern Manitowoc County, and drains 216 acres of agricultural, wooded and residential land. The subwatershed has a watershed to lake ratio of 3 to 1. Based upon the average annual runoff of 7.3 inches, the lake's flushing rate is 0.06 water volumes per year, or 17 years to flush the complete lake volume.

The dominant land uses within the Pigeon Lake subwatershed are agriculture and forest. The estimated annual total phosphorus load to Pigeon Lake from the subwatershed is estimated at 133 pounds. At present agriculture is estimated to contribute the greatest percentage of external phosphorus (48%) to the lake, while no other sources contribute more than 10 percent to the annual phosphorus load.

Pigeon Lake is classified as a mesotrophic lake, with moderately clear water and relatively low nutrient and chlorophyll a concentrations and good water clarity. Recent average spring total phosphorus concentrations ranged from 14-20 g/L with surface summer phosphorus concentrations ranging from 1 I- 1 5 g/L.

The pre-development phosphorus load is estimated at 17.4 lbs/yr, while the best-managed phosphorus load is estimated at 70 lbs/yr. Pre-development water quality values for total phosphorus, Secchi disk and chlorophyll a are estimated at 2 g1l, 4.2 meter and 2 g/L respectively. The best management watershed load results in a surface spring phosphorus concentration of 10 g/L; Secchi disk reading of 2.2 meters and chlorophyll-a concentrations of 5 g/L.

**Spring Lake Subwatershed**

Spring Lake is a small seepage lake in terminal moraine encompassing approximately eight acres of surface water. The lake has a maximum depth of 23 feet, an average depth of 11 feet and lake volume of 88 acre-feet. Spring lake is located in a 48-acre direct drainage basin with a 6 to 1 watershed to lake ratio. Based upon the average annual runoff of 7.3 inches, the lake flushing rate is 0.36 water volumes per year, or about three years to flush the complete lake volume.

The dominant land uses within the Spring Lake subwatershed are agriculture and forest. The estimated annual total phosphorus load to the lake from the watershed and deposition is estimated at 13 lbs. At present, agricultural land uses contribute an estimated 46 percent of the lake's phosphorus load, and urban uses contribute about 20 percent. No other sources contribute more than 17 percent of the annual phosphorus load.

Spring Lake is classified as a mesotrophic lake with relatively low nutrient and chlorophyll a concentrations and good water clarity. The 1996 spring total phosphorus reading was 20 g/L with the average summer surface phosphorus concentrations ranging from 12-15 g/L.

The phosphorus load prior to watershed development is estimated at 3.4 lbs/yr, or approximately 26 percent of the existing watershed load. Pre-development values for total phosphorus, Secchi disk and chlorophyll a are estimated at 6 g/L, 3.1 meters and 4 g/L respectively. A 49 percent

reduction in the annual phosphorus load is required to achieve the best management watershed phosphorus load.

**Horseshoe Lake Subwatershed**

Horseshoe Lake is a small, hard water drainage lake with spring sources in terminal moraine. The lake surface area is approximately 22 acres with a maximum depth of 54 feet, an average depth of 25 feet and a lake volume of 550 acre-feet. The lake is located in a 847-acre direct drainage basin. This equates to a 39 to 1 watershed to lake ratio. Based upon the average annual runoff of 7.3 inches, the lake flushing rate is 0.95 water volumes per year or one year to flash the complete lake volume.

The primary land uses within the Horseshoe Lake subwatershed are agriculture and forest. The estimated annual phosphorus load to the lake from the watershed and deposition is estimated at 114 lbs. At present, agriculture is estimated to contribute the greatest percentage of phosphorus to the lake (82.3%), while no other sources contribute more than eight percent to the annual phosphorus load.

Horseshoe Lake is classified as a mesotrophic lake with relatively low nutrient and chlorophyll *a* concentrations and good water clarity. The 1996 spring total phosphorus concentration was 40 g/L, with summer surface phosphorus concentrations ranging from 11-16 g/L.

The phosphorus load prior to watershed development is estimated at 42 lbs/yr, or nearly 63 percent less than the existing watershed load. With best-managed land uses, the estimated phosphorus load is 43 lbs/yr. Pre-development water quality values for total phosphorus, Secchi disk and chlorophyll *a* are estimated at 14 g/L, 2.2 meters and 8 g/L respectively. The best management watershed load results in a summer surface total phosphorus concentration of 17 g/L, a Secchi depth of 2.2 meters, and chlorophyll *a* concentration of 8 g/L.

**Jetzers Lake Subwatershed**

Jetzers lake is located with a 146 acre direct drainage basin with a 10 to 1 watershed to lake ratio. The lake encompasses approximately 15 acres of surface water with a maximum depth of 42 feet, an average depth of 20 feet and a lake volume of 300 acre-feet. Based upon average annual runoff of 7.0 inches, the flushing rate of Jetzers Lake is 0.30 water volumes per year or 3.34 years to flush the complete lake volume.

The dominant land uses with the Jetzers Lake subwatershed are agriculture and forest. The estimated annual total phosphorus load to the lake from the watershed is estimated at 150 lbs/yr. At present, agriculture is estimated to contribute the greatest percentage (20%) to external phosphorus to the lake.

Jetzers Lake is classified as a nutrient rich eutrophic lake with relatively poor water clarity. The 1996 spring total phosphorus concentration was 151 g/L with summer surface phosphors

concentrations ranging from 73-248 g/L. Hypolimnetic (bottom) phosphorus concentrations ran from 387-855 g/L.

The pre-development phosphorus load is estimated at 14 lbs/yr assuming only the direct watershed drained to the lake. The models indicate best management practices should be implemented throughout the entire subwatershed and an alum treatment conducted to achieve the greatest improvements in water clarity. The estimated phosphorus load following BMP implementation in the entire subwatershed and an alum treatment is 167 lbs/yr. If BMPs are implemented only in the direct watershed, the phosphorus load is estimated at 193 lbs/yr. If no watershed BMPs were implemented, an alum treatment alone is estimated to reduce the total phosphorus load to 285 lbs/yr. The duration of effectiveness of the alum treatment is related to both dose and watershed load. At a minimum, direct watershed BMPs should be implemented prior to alum treatment.

Pre-development water quality values for total phosphorus, Secchi disk and chlorophyll a are estimated at 20 g/L, 2.1 meter and 9 g/L, respectively. The best management watershed load results in water quality values of 80 g/L for total phosphorus, 1.3 meter for Secchi disk, and 25 g/L for chlorophyll *a*.

**Water Resource Objectives and Management Recommendations by Subwatershed**

***Spring Valley and Meeme River Subwatersheds:*** Based on the data obtained through the water quality appraisal, phosphorus loading to the stream should be reduced by 67 to 71 percent to achieve a moderate level of water quality improvement for the streams in the Spring Valley and Meeme River subwatersheds. Sediment loading to the streams should be reduced by 66 percent in order to see in-stream improvement in siltation and substrate embeddedness. Prohibiting future channelization and restoring stream meanders, reducing barnyard runoff, increasing stream buffers, and eliminating streambank pasturing will help to meet these objectives.

***Pigeon Creek Subwatershed:*** Based on the data obtained through the water quality appraisal, phosphorus loading to the streams in this subwatershed should be reduced by 75 percent to achieve significant water quality improvement. Sediment inputs to the streams should be reduced by 50 percent to decrease the amount of siltation. Preventing future stream channelization and restoring meanders in channelized sections, restricting cattle access, increasing stream buffers, and reducing barnyard and cropland runoff will help the streams meet these objectives.

***Pigeon River Mainstem Subwatersheds:*** Based on the data obtained through the water quality appraisal, phosphorus loading to the streams in these subwatersheds should be reduced by 68-83 percent to achieve water quality improvement. Sediment inputs to the streams should be reduced by 30 percent to decrease the amount of siltation. Preventing future stream channelization and restoring meanders in channelized sections, restricting cattle access, increasing stream buffers, and reducing barnyard and cropland runoff are recommended in the agricultural areas.

Recommended management strategies in the urban areas include establishing and enforcing construction site erosion control ordinances, implementing stormwater management practices, and upgrading the Howards Grove WWTP to include phosphorus removal.

***Fisher Creek and Jetzers Creek Subwatersheds:*** Based on data collected for the appraisal, phosphorus loading to the streams in these subwatershed must be reduced by 83 percent and sediment loading by 66 percent in order to achieve significant water quality improvement. Reducing agricultural and urban runoff, restoring wetlands, restricting future stream channelization and establishing meanders in channelized stretches are some ways to help reach these water quality goals.

***Grandma Creek Subwatershed:*** Based on the information obtained in the stream appraisal, phosphorus loads to the streams in the Grandma Creek subwatershed must be reduced by at least 80 percent, and sediment loads reduced by 66 percent in order to achieve a significant water quality improvement. Future channelization. should be restricted, and meanders established in previously channelized sections to improve habitat for fish and invertebrates. Other ways to reach these goals include implementing agricultural and urban best management practices to reduce runoff, restrict cattle access to stream, and increase stream buffer width.

***Pigeon Lake Subwatershed:*** The water resource objectives and management recommendations for Pigeon Lake are to reduce phosphorus loading overall by 47 percent from existing conditions (133 lbs/yr) to best managed conditions (70 lbs/yr). This should result in improvements in water column phosphorus and long-term protection of water quality.

Specific best management practices should target lake protection and nutrient sources from agricultural land and residential properties. Assessment of the internal loading should be continued by collection of in-lake water quality data.

***Spring Lake Subwatershed:*** The water resource objectives and management recommendations for Spring Lake are to reduce the existing phosphorus load 50 percent overall from the existing conditions (13 lbs/yr) to best managed conditions (6.5 lbs/yr). Specific best management practices should target nutrient sources from adjacent agricultural land.

***Horseshoe Lake Subwatershed:*** The water resource objectives and management recommendations for Horseshoe Lake reduce phosphorus loading overall by 62 percent from existing conditions (114 lbs/yr) to best managed conditions (43 lbs/yr). Specific best management practices should target lake on and nutrient sources from agricultural land.

***Jetzers Lake Subwatershed:*** The water resource objectives and management recommendations for Jetzers Lake are to reduce direct watershed phosphorus loading overall by 63.6 percent from existing conditions (146 lbs/yr) to best managed conditions (53 lbs/yr). This should result in improvements in water column phosphorus and long-term protection of water quality. Specific best management practices should target lake protection and nutrient sources from agricultural land and residential riparian properties.

## Wetlands

Wetlands are valuable natural resources. They provide wildlife habitat, fish spawning and rearing areas, recreation, storage of runoff and flood flows, removal of pollutants and groundwater recharge. Wetlands are common in the Meeme and Pigeon River floodplains. Floodplain wetlands support furbearers and water fowl populations and may provide seasonal habitat for sport fish. There are extensive wetlands along the riparian corridor of Fisher and Grandma Creeks and are also scattered throughout the watershed.

A wetland and wildlife habitat inventory was done to identify existing and modified or converted wetlands for the purpose of protection from degradation or potential restoration. The focus of the inventory was on wetlands that are presently, or have been in the past, degraded through drainage, gazing, cropping, or other activities causing water storage loss, and build up of sediments. Data were collected on 3,550 total acres of wetlands, approximately 2050 acres in Sheboygan County and 1500 acres in Manitowoc County. Data were gathered from Natural Resource Conservation Service maps, air photos, and the DNR wetland inventory maps.

## Recreation

Pigeon River Watershed streams, wetlands, and lakes offer diverse and high-quality recreational opportunities. The most popular activities are fishing, boating and swimming in the area's lakes. County lake access parks are located on all of the major lakes. Other activities are hunting, trapping, snowmobiling, hiking, picnicking, camping and wildlife observation.

Public parks in the watershed make up approximately 150 acres and include Memorial Park, Riverside Park and the Howards Grove Environmental Park in the Village of Howards Grove. Evergreen Park and Quarry Park are located in the City of Sheboygan. Parks around watershed lakes include Horseshoe Lake Park, Spring Lake Park, Pigeon Lake Park, and Jetzers Lake County Park. The Fisher Creek Trail also provides for enjoyable recreation.

Private recreation lands include 461 acres and include owners such as Smerke's Sportsman's Club, Farmer's Sportsman's Conservation Club, Manitowoc County Fish and Game, Howards Grove Rod and Gun Club, and Camp Sinawa. The Sheboygan County Country Club (Pine Hills Golf Course), Sheboygan Town and Country Golf Course and Autumn Ridge Golf Course also provide 617 acres of recreation land in the watershed.

## Groundwater Resources

### Regional Aquifers

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

Since 1936, the State of Wisconsin has required well drillers to document well construction and rock and soil layers encountered during well installation. Information from geologic logs, driller construction reports and Wisconsin Geological and Natural History Survey (WGNHS) reports for Sheboygan and Manitowoc Counties has been requested and will be included in this plan.

The two principle aquifers within the watershed are the unconsolidated sand and gravel aquifer and the underlying consolidated Silurian (Niagara) Dolomite aquifer. The sand and gravel aquifer consists of glacially deposited sands and gravel which are generally less than 100 feet thick. The Silurian Dolomite aquifer is the principal aquifer and can be more than 450 feet.

Private wells in the unconsolidated sand and gravel aquifer typically range from 80 to 160 feet deep. Private wells in the Silurian Dolomite aquifer are typically 100 to 200 feet deep. In 1997 residents in the Village of Howards Grove received all of their water from private, on-site wells extracting from the Silurian Dolomite aquifer.

**Direction of Groundwater Flow**

Local groundwater flow in the Pigeon River Watershed roughly mirrors the topography of the land surface and flows "downhill" or down gradient toward the Pigeon River. The land surface to the water table depth ranges from 0 to 50 feet and varies throughout the watershed. Regional groundwater flow in the watershed is southeast toward Lake Michigan.

**Groundwater Quality**

Groundwater quality in the Pigeon River Watershed is generally considered good. 60 private well samples were collected and analyzed for nitrate ($NO_3$) + nitrite ($NO_2$) and triazine. Samples analyzed for nitrate ($NO_3$) + nitrite ($NO_2$) showed concentrations ranging from not detected to less than 10 parts per million or milligrams per liter (mg/L).

The **enforcement standard (ES) health advisory level** is defined as the concentration of a substance at which a facility regulated by DILHR, DATCP, DOT or DNR must take action to reduce the concentration of the substance in groundwater. The **preventative action limit (PAL)** is a lower concentration of a contaminant than the Enforcement Standard. The PAL serves to inform DNR of potential groundwater contamination problems, establish the level at which efforts to control the contamination should begin, and provide a basis for design codes and management criteria. The groundwater enforcement standard (ES) for nitrate is 10 mg/L.

Nitrate ($NO_3$) + nitrite ($NO_2$) concentrations above 2 mg/L exceed the states preventive action limit (PAL). The results of nitrate testing showed that no samples exceeded 10 mg/l and 5 (30 percent) of the samples exceeded 2 mg/l. Results so far do not indicate a pattern of groundwater contamination that can be linked to specific sources of nitrate.

Samples analyzed for triazine showed concentrations ranging from not detected to less than 3 micrograms per liter (ug/L). The groundwater enforcement standard (ES) for triazine is 3 ug/L.

Triazine concentrations above 0.30 ug/I exceed the states preventive action limit (PAL). Triazine testing showed only one well sample in the PAL range of 0.30 ug/l to 3 ug/l. No wells tested were above the ES level of greater than 3 ug/l.

No samples were collected for coliform bacteria or hazardous substances such as volatile organic compounds. Coliform bacteria can be a drinking water problem where septic systems, land spreading of manure or barnyards are located upgradient (generally uphill) from a private well. Bacteria can enter the drinking water supply along the well casing of improperly constructed wells. At times, wells with high levels of bacteria can be rehabilitated. In the summer of 1995, Sheboygan County UWEX tested wells within the Village of Howards Grove for coliform bacteria. Of the 96 wells tested, 6 found to be contaminated by coliform bacteria. Volatile organic compounds generally enter a well from nearby leaking underground gasoline or other fuel storage tanks and spills. Once these compounds are in the groundwater they are difficult to clean up. In general, the contaminated wells have to be abandoned and a new well drilled.

**Water Supplies**

Water supplies for domestic, agricultural, and industrial uses in the Pigeon River Watershed are obtained from both private groundwater sources and municipal systems. There are two principal aquifers lying beneath the watershed from which groundwater is obtained. Water obtained from these aquifers is either pumped from individual private wells or is through municipal facilities.

**Potential Groundwater Quality Problems**

A request has been submitted for potential groundwater quality problems in the Pigeon River Watershed. These sites are listed in DNR Publication SW-108-93, Registry of Waste Disposal Sites in Wisconsin (June, 1993) which lists superfund sites, solid and hazardous waste disposal sites, leaking underground storage tank sites and reported spill sites. This information will be included when it is available. Potential pollution associated with nonpoint sources is described in various sections throughout the remainder of this chapter.

There are 45 approved septage license sites in the Pigeon River Watershed. These are listed in the DNR Land Application Management Program (LAMP), 3/97.

Based on the type of soils and geologic characteristics, groundwater contamination susceptibility in the Pigeon River Watershed is considered low. This is a general rating that will not hold true for site specific purposes.

## Water Quality Goals and Project Objectives

The DNR staff, with assistance from the County and DATCP staff, developed water quality goals and project objectives. Water quality details can be found in the Pigeon River Project Appraisal available through DNR's Southeast District Office.

Water quality goals are commonly described by the following terms:

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

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

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

The water quality conditions needed to support the goals for streams and lakes are the basis for determining the type and level of nonpoint source control to be implemented under the priority watershed project. Project objectives are identified and listed for each subwatershed and for rural and urban nonpoint sources of pollution throughout this chapter.

# CHAPTER THREE:
# Nonpoint Source Pollutants and Management Strategy

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

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

## Pollutant Reduction Goals and Project Objectives for Nonpoint Sources

Goals for water quality in the Pigeon River Watershed were identified in Chapter Two as protection, enhancement, and restoration of water resources. These goals will be achieved through sediment and phosphorus load reduction, wetland restoration, and groundwater protection.

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

- 25 percent reduction in sediment reaching streams from agricultural uplands.
- 25 percent reduction in streambank sediment delivered streams.
- 50 percent reduction in gully erosion sediment delivered to streams.
- 20 percent reduction in sediment delivered to streams from existing urban land.
- 75 percent reduction in construction site erosion.
- Hold future pollutant loadings from developing areas in all subwatersheds to 20 percent of the calculated load estimates.

**Phosphorus Objective:** Reduce overall phosphorus load by **50** percent. To meet this objective, the following is needed:

- 70 percent reduction from barnyards.
- 75 percent reduction from manure spread on high-hazard acres in winter.
- 25 percent reduction from sediment reaching streams from agricultural uplands.
- 50 percent reduction from milkhouse wastewater discharges to streams and wetlands.

**Wetland Restoration Objective:** Restoration of **10** percent of degraded or prior converted wetlands.

**Land Easement Objective:** Approximately **250 acres** in the project area

**Land Acquisition Objective:** Approximately **300 acres** in the project area

**Groundwater Protection Objectives:**

- Eliminate discharges of nonpoint source pollutants to areas acting as a direct conduit to groundwater, such as sinkholes, unused wells, and creviced bedrock.
- Reduce the application of winter spread manure on unsuitable cropland.
- Reduce the over application of commercial and organic fertilizers on soils with a potential for leaching contaminants into groundwater supplies.
- Identify and recommend the abandonment of unused wells in the watershed.
- Provide landowners with an extensional informational and educational program to promote awareness and to accept responsibility for the groundwater resources.

## Management Categories

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. Specific sites or areas within the watershed project are designated as either *critical, eligible, or ineligible*.

Management category eligibility criteria are expressed in terms of tons of sediment delivered to surface waters from eroding uplands and streambanks and pounds of phosphorus delivered to surface water from barnyards.

The LCDs will assist landowners in applying BMPs. Practices range from alterations in farm management (such as changes in manure spreading and crop rotations) to engineered structures (such as diversions, sediment basins, and manure storage facilities), and are tailored to specific landowner situations. See Chapter 4 for a complete list of BMPs.

### Critical Management Category

When a site is designated as "critical', it is an indication that controlling that source of pollution is essential for meeting water quality objectives for the project. Nonpoint sources described as critical contribute a significant amount of the pollutants impacting surface waters and are eligible for funding and technical assistance through the priority watershed project. Landowners with

critical sites are required, by law, to address those sites by reducing the nonpoint source pollutant load to an acceptable level.

**Eligible Management Category**

Nonpoint sources of pollution in this category contribute less significantly, per site, to water quality degradation. These sites are eligible for technical and cost-share assistance but are not as critical to reaching water quality objectives.

**Ineligible Management Category**

Sites which do not contribute significant amounts of pollutants are not eligible for funding or technical assistance through the priority watershed project. Other DNR programs, such as wildlife and fisheries management, may assist county project staff to control these sources as part of the implementation of the integrated resource management plan for this watershed. Other local, state, or federal programs may also be applicable to these lands.

## Rural Nonpoint Source Pollutants and Management Strategies

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

- Runoff from barnyards and livestock feeding and pasturing areas
- Runoff from land spread with manure on high-hazard acres in winter
- Discharges from milkhouses
- Runoff from cropland
- Sediment from streambanks and gullies

In addition to the specific management strategies described below we will address the Animal Waste Advisory Committee (AWAC) four prohibitions as sources of pollution, when they are encountered. The four prohibitions are:

- No overflow of manure storage structures,
- No unconfined manure stacking (piling) within 300 feet of a stream, 1,000 feet around a lake and specific sites susceptible to groundwater contamination (Water Quality Management Areas),
- No direct runoff from feedlots or stored manure to water
- No unlimited livestock access to waters of the state where high concentrations of animals prevent adequate sod cover maintenance.

**Barnyard Runoff**

Runoff carrying a variety of pollutants from barnyards and other confined livestock areas is a source of pollution to Pigeon River and its tributaries. The 164 barnyards inventoried in the watershed are a source of 6,700 pounds of phosphorus delivered to surface water per year. The relative amounts of phosphorus measured using the BARNY model are an indicator of the amounts of organic matter entering the stream. Organic matter in manure is a pollutant because it depletes oxygen from the water and contributes bacteria and nutrients. The objective for barnyard runoff control is to reduce phosphorus loading to streams by 70 percent.

Barnyard sites contributing a phosphorus load greater than 100 pounds on an annual basis are identified as critical sites. To be eligible for cost-sharing, the barnyard system must be designed down to 20 pounds of phosphorus per year. Landowners interested in reducing their barnyard phosphorous loadings so that they are below the critical site threshold can do so at their own expense, unless they are willing to reduce phosphorus loadings down to 20 pounds.

Barnyard sites that contribute between 50 and 100 pounds of phosphorus annually are eligible for cost-sharing for full barnyard runoff systems designed to 20 pounds of phosphorus runoff. Although full systems may be cost-shared, as always, the most cost effective solution is endorsed. Barnyards contributing between 20 and 50 pounds of phosphorus annually will only be eligible for clean water diversions and roof runoff control. Barnyards contributing less than 20 pounds are not eligible for cost-sharing.

Landowners receiving cost sharing for barnyard runoff (Waste Management System, NRCS Standard 312) are required to prepare a nutrient management plan (NRCS Standard 590) for their operation. If the Waste Management System does not include waste collection, handling, or storage, it may be exempt from the nutrient management plan requirement. Such systems could consist of: Roof Runoff Management (588), Livestock Exclusion (472), and Clean Water Diversion (362). Cost sharing is available for eligible practices including the development of both nutrient (NRCS Std. 590) and pest management (NRCS Std. 595) plans, soil testing and crop scouting. A soil conservation plan is necessary for development of a nutrient management plan.

**Internally Drained Barnyards**

Internally drained barnyards drain to surface depressions rather than directly to surface waters. The key to groundwater protection is prevention of groundwater contamination. Contamination prevention is the best public policy and is more cost-effective than remediation once groundwater has been contaminated. Proper barnyard management, including nutrient management, is important for groundwater protection.

Seventeen internally drained yards were identified in the watershed. Eligibility for internally drained animal lots is based on a site by site analysis conducted by the LCD/SWCD to determine likelihood of groundwater contamination.

**Nutrient and Pest Management**

Land spread with manure on high-hazard acres in winter was inventoried at 18,000 pounds of phosphorus delivered to surface water. All cropland in the Pigeon River Watershed will be eligible for cost sharing for development of a nutrient and pest management plan. Approximately 29,395 acres are eligible.

**Table 3-1. Barnyard Phosphorus Load Eligibility Criteria**

| | Criteria | | | | Inventory Results |
|---|---|---|---|---|---|
| | **Critical Sites 100 lbs P** | **Eligible for Full Barnyard Systems 50-100 lbs P** | **Eligible for Clean Water Diversions 20-50 lbs P** | **Ineligible < 20 lbs P** | |
| # Barnyards | 19 | 43 | 50 | 62 | 174 |
| Pounds of Phos. | 2900 [1] (43%) | 1800 [1] (27%) | 500 [1] (7%) | --- | 6700 [2] |

[1] Pounds of phosphorus reduced with diversions, gutters, and filter walls and strips designed to 20 pounds.
[2] Total pounds of phosphorus recorded during inventory.

**Table 3-2. Phosphorus Reduction from Barnyards**

| Site Category | # Sites | Pounds of P Reduced | % Phos. Reduction | % of Phos. Goal |
|---|---|---|---|---|
| Critical Sites | 19 | 2900 | 43 | 62 |
| Eligible Sites | 93 | 2300 | 34 | n.a. |
| **Total** | **112** | **5200** | **77** | **n.a.** |

Manure spreading runoff and management of nutrients are addressed through Natural Resource Conservation Service (NRCS) Nutrient Management Standard 590. Pest management is addressed through NRCS Pest Management Standard 595. Nutrient and pest management plans will be developed by private consultants. Landowners will be eligible to participate for up to three years and will be responsible for paying 50 percent of the consulting fees. LCD staff will prepare soil conservation plans and materials for the nutrient and pest management plan. LCD staff will also review the nutrient and pest management plans.

Nutrient and pest management activities will result in pollutant load reductions. For this reason, fertilizer application rates must be tracked and reported. Professional services contracts developed for nutrient and pest management consulting must include a provision for reporting the required information to the LCD.

**Manure Storage**

Eligibility for a grant for manure storage practices will be based on the development of a preliminary Nutrient Management Plan, developed in accordance with NRCS, standard 590. This means that the storage facility is needed to manage manure during periods of snow-covered, frozen and saturated conditions in order to protect water quality. The nutrient management plan must also demonstrate that proper utilization of the manure can be achieved following adoption of the intended storage practice.

The eligibility for storage facilities will be based on the least cost system. These options may include, but are not limited to: properly sited, unconfined manure stacks (in accordance with Std. 312); the construction of a short term storage facility (capacity for 30 to 100 days manure production in accordance with Std. 313); the construction of a long term storage facility (capacity for up to 180 days production in accordance with Std. 313 or 425); a reduction in the number of animals; the rental of additional lands; or haul or broker manure to a neighboring farm that can use the manure in accordance with a nutrient management plan.

Landowners receiving cost sharing funds for manure storage or barnyard practices are required to develop a nutrient management plan on the farm and operated acres.

**Manitowoc and Sheboygan County Manure Storage Ordinances**

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

Ordinances require permits for the installation, modification and major repair of manure storage facilities.

To assure protection of surface and ground water from manure storage facilities throughout the watershed, the adoption of a manure storage ordinance in Manitowoc County is necessary within two years of watershed plan approval. Certain costs for the development and administration of the ordinance are eligible for reimbursement under the Priority Watershed Project. As required by State statutes, the County must repay to the State all Nonpoint Source Grant agreement funds if the ordinance is not adopted. This will be a condition of the Manitowoc County Nonpoint Source Grant Agreement. Sheboygan County enacted an manure storage ordinance in 1996.

**Milkhouse Waste**

Waste water from milking systems contains waste milk, detergents, sanitizers, and organic solids which can pollute surface water and cause disposal system failure. Waste milk consumes large quantities of oxygen during breakdown and can plug filter beds and absorption fields. Streams and lakes low in oxygen cannot support fish or other aquatic life. Milking systems were assessed to determine the pollution risk from the discharge. Staff assessed 54 systems delivering 4,180 pounds of phosphorus to surface water. All systems are eligible for cost sharing for practices to reduce waste quantity and content. Our goal is to reduce the s load 50%. Results of the inventory are shown in Table 3-3.

**Table 3-3. Milkhouse Waste Phosphorus Load Inventory**

| County | Number Inventoried | Phosphorus Load |
|---|---|---|
| Manitowoc | 26 | 2,817 |
| Sheboygan | 28 | 1,363 |

**Upland Sediment**

Agricultural practices have caused eroded soil to reach streams, ponds, and wetlands in the Pigeon River Watershed. Upland sediment sources were evaluated through subarea sampling (40%) and extrapolation for the entire watershed (74 square miles). Soil erosion was calculated using the Universal Soil Loss Equation (USLE). Sediment delivery was calculated using USLE and hydrology information using the FOCS WINHUSLE computer model. Rural uplands include cropland, grassland, pastures, and woodlots.

The results of this inventory are summarized in Table 3-4 and 3-5. Approximately 7,061 tons of soil per year are delivered to wetlands or streams in the watershed from 29,395 acres of cropland. This figure does not include runoff to lake subwatersheds. The average sediment delivery rate in the watershed is 0.4 tons/acre/year. Sediment delivery ranges from zero to 2.0 tons/acre/year.

A goal of 25 percent reduction in sediment load from fields is targeted for agricultural land. This goal can be reached by treating all fields that are contributing sediment to streams at a rate greater than 0.3 tons/acre/year.

Critical sites are those fields delivering greater than 0.7 tons/acre/year of sediment. To receive cost-sharing, fields must be brought down to 0.4 tons/acre/year. This category will control approximately 800 acres of cropland and 600 tons of soil, 6 percent of the watershed's upland sediment load. This is about 100 fields and 100 landowners.

Nineteen percent of the sediment load will be controlled through approximately 12,000 acres, controlling 1,800 tons of soil. Eligible classification includes those fields delivering sediment at a rate between 0.1 and 0.7 tons/acre/year (Table 3-6). Cost sharing will only be available if a reduction in sediment delivery can be achieved with the practice.

**Gully Erosion**

A gully erosion inventory identified 1 10 tons of sediment annually delivered to the streams of the watershed. No critical sites are identified. The reduction goal is 50 percent. All active gullies will be eligible for critical area stabilization and seeding.

**Streambank Erosion**

Streambank erosion contributes 6 percent of the total sediment to surface water in the Pigeon River Watershed. Approximately 44 miles of streams were evaluated and 166 eroding sites covering 31,329 feet were identified. Significant erosion has occurred along most of the perennial stream courses. Approximately 679 tons of sediment are eroding into streams annually.

Streambank sites eligible for cost-sharing are those eroding at greater than 1 ton per year. Sites eroding at less than 1 ton per year are not eligible (Table 3-7).

**Trampled Streambanks**

Trampled streambanks (livestock access) can lead to severe erosion and sedimentation and destruction of aquatic habitat. Where banks are repaired, they must be managed so that adequate sod cover will be maintained. Streambank sites that are trampled to the degree that vegetative cover is not maintained are eligible for cost-sharing. Two such sites were inventoried in each county.

**Table 3-4. Upland Sediment Loading to Streams by Land Use [1]**

| Subwatershed | | Cropland | Developed | Natural Areas [3] | Grazed Pasture | Totals |
|---|---|---|---|---|---|---|
| **Meeme Creek** | **Acres** | **5829** | **333** | **2128** | **83** | **8373** |
| | Sediment [2] | 1667 | 346 | 11 | 17 | 2041 |
| **Pigeon Creek** | **Acres** | **8342** | **367** | **1968** | **100** | **10777** |
| | Sediment [2] | 2123 | 481 | 2 | 3 | 2609 |
| **Howards Grove** | **Acres** | **3354** | **1704** | **385** | **55** | **5498** |
| | Sediment [2] | 704 | 306 | 0 | 11 | 1021 |
| **Jetzers Creek** | **Acres** | **2550** | **95** | **542** | **0** | **3187** |
| | Sediment [2] | 530 | 11 | 0 | 0 | 541 |
| **Fisher Creek** | **Acres** | **2661** | **611** | **251** | **73** | **3596** |
| | Sediment [2] | 676 | 138 | 0 | 0 | 814 |
| **Grandma Creek** | **Acres** | **3244** | **39** | **425** | **154** | **3862** |
| | Sediment [2] | 429 | 9 | 6 | 33 | 477 |
| **Pigeon River** | **Acres** | **3340** | **968** | **339** | **193** | **4840** |
| | Sediment [2] | 922 | 171 | 0 | 45 | 1138 |
| **Sheboygan** | **Acres** | **75** | **2218** | **199** | **0** | **2492** |
| | Sediment [2] | 10 | 157 | 0 | 0 | 167 |
| **Total** | **Acres** | **29395** | **6335** | **6237** | **658** | **42625** |
| | Sediment [2] | 7061 | 1619 | 19 | 109 | 8808 |

[1] Data was extrapolated from subarea sampling.
[2] Sediment is reported in tons/year. This area does not include loading to lakes.
[3] Natural Areas include grassland grass woodlots, and wetlands.

**Table 3-5: Upland Sediment Loading to Lakes by Land Use [1]**

| Subwatershed | | Cropland [2] | Urban [3] | Natural Areas [4] | Grazed Pasture | Totals |
|---|---|---|---|---|---|---|
| **Pigeon Lake** | **Acres** | **556** | **57** | **679** | **15** | **1307** |
| | Sediment [5] | 142 | 167 | 8 | 2 | 319 |
| **Horseshoe Lake** | **Acres** | **650** | **24** | **310** | **0** | **984** |
| | Sediment [5] | 114 | 10 | 0 | 0 | 124 |
| **Spring Lake** | **Acres** | **18** | **8** | **13** | **0** | **39** |
| | Sediment [5] | 1 | 9 | 0 | 0 | 10 |
| **Jetzers Lake** | **Acres** | **n.a.** | **n.a.** | **n.a.** | **n.a.** | **146** |
| | Phosphorus [6] | n.a. | n.a. | n.a. | n.a. | 150 |
| **Total** | **Acres** | **1224** | **89** | **1002** | **15** | **2330** |
| | Sediment [5] | 257 | 166 | 8 | 2 | 453 |

[1] Source: WINHUSLE Data 1997, Manitowoc Co. SWCD; Pigeon River Priority Watershed Lakes Water Resources Appraisal Report prepared by J. Olson and D. Helsel, WDNR, 8/97.
[2] Cropland includes hay
[3] Urban includes headquarters
[4] Natural areas include forest.
[5] Sediment yield recorded in tons/yr.
[6] Jetzers Lake data was collected for the WINHUSLE database and will be available when processed by Sheboygan County. The dominant land uses in the subwatershed are agriculture and forest. Agriculture is estimated to contribute the greatest percentage of external phosphorus (20%).

**Table 3-6. Cropland Sediment Delivery Inventory Results**

| Subwatershed | Inventory Results [1] | | |
|---|---|---|---|
| | Acres | Sediment Delivered (tons/year) | Percent Contributed by Subwatershed |
| **Meeme Creek** | 5829 | 1667 | 24% |
| **Pigeon Creek** | 8342 | 2123 | 30% |
| **Howards Grove** | 3354 | 704 | 10% |
| **Jetzer Creek** | 2550 | 530 | 7% |
| **Fischer Creek** | 2661 | 676 | 10% |
| **Grandma Creek** | 3244 | 429 | 6% |
| **Pigeon River** | 3340 | 922 | 13% |
| **Sheboygan** | 75 | 10 | <.5% |
| **Total** | **29,395** | **7,061** | **100** |

[1] This information was extrapolated from a 40% inventory.

**Table 3-7. Streambank Inventory Results: Pigeon River Watershed Streambank Erosion**

| Subwatershed | Inventoried Streambank Length (feet) | Eroded Sites (feet) | Trampled Sites (feet) | Slumped Sites (feet) | Cattle Access | Total Sediment Loss (tons/year) |
|---|---|---|---|---|---|---|
| Meeme River | 36,000 | 640 | 60 | --- | No | 9.5 |
| Pigeon Creek | 85,625 | 4314 | 400 | 278 | Yes | 52.25 |
| Howards Grove | 33,660 | 5270 | 100 | --- | Yes | 196.98 |
| Jetzers Creek | 0 | --- | --- | --- | --- | --- |
| Fischer Creek | 21,120 | 12,180 | --- | --- | No | 19.80 |
| Grandma Creek | 0 | --- | --- | --- | --- | --- |
| Pigeon River | 78,000 | 2725 | --- | 625 | No | 112.68 |
| Sheboygan | 23,670 | 5970 | --- | 950 | No | 287.0 |
| **Totals** | **239,648** | **31,329** | **560** | **1,853** | --- | **678.2** |

Source: Manitowoc and Sheboygan County LCDs

## Urban Nonpoint Source Pollutants and Management Strategies

The watershed project team conducted an urban nonpoint source inventory and analysis to identify and prioritize major and minor steps to achieving water quality goals in the Pigeon River Watershed. This section describes the urban nonpoint source pollutants as well as the management needs and reduction objectives for each pollutant in the Pigeon River Watershed. It includes assessments for stormwater conveyance, sediment from construction site erosion and streambank erosion, pollution prevention practices, and urban toxic pollutants carried in runoff. The section ends with a summary of the pollutant reduction goals and project objectives for urban nonpoint sources.

### Description of Urban Runoff

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

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

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

The delivery of pollutants to streams from existing urban areas depends on the types of urban land uses, the types of storm water conveyance systems, and urban pollution prevention practices, such as street sweeping, yard waste collection, and waste oil recycling programs. As Table 3-8. shows, freeways, commercial and industrial areas have the highest unit/area/year pollutant loads, producing the most significant amounts of metals and other urban toxic pollutants. Medium density and multi-family residential areas also generate metals, sediment and phosphorus and include large impervious areas.

Residential areas contain more lawn area than commercial areas, while commercial areas have more rooftop, street, and parking lot surfaces. Lawns can also contribute phosphorous from grass clippings, leaves and debris that get washed into storm sewers or roadside ditches; and from fertilizer and pesticide overapplications and spills. Rooftop areas are important sources of zinc and atmospheric pollutants. Their connection to the storm drainage system may be direct or indirect, depending on the use of downspouts, grassed areas, drain tiles, etcetera.

Typical pollutant generation rates from urban land uses is shown in Table 3-8. Existing urban land uses in the Pigeon River Watershed and their respective amounts and types of pollutant

loads are shown in Table 3-9. The greatest amount of urban land in the watershed is concentrated around the Village of Howards Grove, Town of Sheboygan, City of Sheboygan and the Village of Kohler. Additional urban development surrounds some of the lakes in the watershed. Runoff from new urban areas has the potential to further degrade lake and stream water quality unless new development incorporates stormwater management controls.

**Table 3-8. Typical Pollutant Generation Rates From Urban Land Uses**

| Land Use | Unit Area Load (pounds/acre/year) | | | | |
|---|---|---|---|---|---|
| | Sediment | Phosphorus | Lead | Zinc | Other Concerns |
| **Highways/Streets** | 660 | 0.9 | 2.5 | 1.9 | Volatile Organics |
| **Industrial** | 900 | 1.5 | 2.4 | 2.1 | Volatile Organics |
| **Commercial** | 1,400 | 1.5 | 2.7 | 2.1 | Volatile Organics |
| **Shopping Centers** | 1,400 | 1.5 | 2.0 | 2.0 | Volatile Organics |
| **High Density Residential** | 420 | 1.0 | 0.8 | 0.7 | Pesticides |
| **Medium Density Residential** | 190 | 0.5 | 0.2 | 0.2 | Pesticides |
| **Low Density Residential** | 50 | 0.05 | 0.01 | 0.04 | Pesticides |
| **Parks** | 25 | 0.01 | 0.005 | --- | Pesticides |

Source: Department of Natural Resources

### Stormwater Conveyance

**Description:** Stormwater is most commonly conveyed to streams through a combination of storm sewers, roadside ditches, grassed swales, and ponds. Storm sewers transport runoff rapidly with no pretreatment or filtering of the runoff before it enters streams. Properly designed grassed swales generally reduce runoff volume because of infiltration, and sod vegetation removes some pollutants from runoff before it flows into streams and storm sewer systems. The types and amounts of pollutants transported by runoff depend on the way that pollutant bearing surfaces are connected to the storm drainage system. For example, commercial parking areas and arterial streets, deliver the highest concentrations of lead, asbestos, cadmium, and street sediment because normally these areas are drained by storm sewers that discharge to a stream or lake.

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

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

**Management Needs and Alternatives:** Watershed project staff have not conducted hydrologic analyses to investigate the effect of management alternatives on reducing and preventing streambank erosion and bed scour, or on maintaining stream base flows. Staff will conduct these studies as part of future feasibility studies for nonpoint source control in established urban areas. Table 3-10 shows the percent of grass swale drainage, street sweeping frequency and number of stormwater ponds for each municipality in the Pigeon River Watershed.

Five management alternatives were considered for each municipality. These management alternatives sent a range of practices and control effectiveness which include:

1. Do nothing.

2. Increase catch basin cleaning to at least two times each year on [1]targeted urban land uses.

3. Increase street sweeping to at least two times per month on targeted urban land uses.

4. Install and maintain construction site erosion control measures to control 75 percent of the sediment generated.

5. Detain runoff from 80 percent of future urban land uses.

Targeted urban landuses include commercial, industrial, and high density residential. The analysis of management alternatives assumes that stormwater ponds will trap all sediment particles of 20 microns or larger. This will control about 80 percent of suspended sediment and about 70 percent of phosphorus and heavy metals in urban runoff. The analysis assumes an infiltration rate of 0.5 inches per hour for infiltration basins and grassed swales. This is a moderate rate of infiltration that will provide less control of pollutants than stormwater ponds. The actual infiltration rate in the Pigeon River Watershed ranges from 0.6 to 2.0 inches per hour. Higher infiltration rates of about 2.5 inches per hour would provide excellent control of

pollutants, however, soils in this watershed do not allow this rate of infiltration. Existing levels of street sweeping and grassed swale drainage are accounted for in evaluating these alternatives.

**Table 3-9. Future Urban Land Use and Nonpoint Source Loads in the Pigeon River Watershed: 2014 [1]**

| Subwatershed / Municipality | Urban Land Use | | Sediment | | Phosphorus | | Lead [2] | |
|---|---|---|---|---|---|---|---|---|
| | Acres | % | Lbs/Yr | % | Lbs/Yr | % | Lbs/Yr | % |
| **Spring Lake** | 5 | 0.1 | 250 | 0.1 | 0.25 | 0.1 | 0.05 | 0.1 |
| **Pigeon Lake** | 180 | 2 | 12,500 | 0.9 | 20.25 | 0.8 | 6.55 | 0.3 |
| **Meeme River** | 41 | 0.5 | 13,050 | 0.9 | 16.55 | 0.6 | 25.81 | 1.4 |
| **Pigeon Creek** | 56 | 0.7 | 2,800 | 0.2 | 2.8 | 0.1 | 0.56 | 0.1 |
| **Howards Grove** | 1,702 | 20 | 305,535 | 21.5 | 560.29 | 18 | 603.99 | 32 |
| **City of Sheboygan** | 1,568 | 18 | 331,965 | 23.4 | 617.13 | 20 | 480.31 | 25 |
| **Town of Sheboygan** | 4,720 | 55 | 741,525 | 52.3 | 1,864.69 | 60 | 794.94 | 41 |
| **Kohler** | 320 | 3.7 | 10,500 | 0.7 | 7.2 | 0.3 | 2.1 | 0.1 |
| **TOTAL** | **8,592** | **100** | **1,418,125** | **100** | **3,089.16** | **100** | **1,914.31** | **100** |

[1] Source: Department of Natural Resources
[2] Lead is used as an indication of metal loadings contributed from urban land uses.

Stormwater ponds and infiltration practices should only be installed when specifically called for in detailed feasibility studies. These practices should be located where land availability and soil conditions are suitable for providing a high level of control as determined by detailed feasibility studies. Infiltration basins or trenches would provide groundwater recharge and base flow enhancement. Retrofitting existing urban areas with structural best management practices such as detention ponds is generally not a priority recommendation for the Pigeon River Watershed. These structural BMPs are recommended to be required in all new developments where land availability and sewer networks are less problematic. There may be specific instances however, where structural BMPs should be considered in existing urban areas. In these instances, feasibility studies will be needed to select the site specific stormwater detention and infiltration practices consistent with this watershed plan. The cost and complexity of studies will vary, depending on the availability of land for locating practices and the compatibility of the existing storm sewer networks with locating structures. Assistance available to communities under the priority watershed project to develop nonpoint source controls in established urban areas is presented in Chapter Four.

**Table 3-10. Grass Swale Drainage, Street Sweeping and Stormwater Ponds For Municipalities in the Pigeon River Watershed [1]**

| Municipality [2] | Acres | Percent Drained by Grass Swales | Street Sweeping (sweeps/yr) | Stormwater Ponds |
|---|---|---|---|---|
| **Howards Grove** | 1332 | 20 | 7-10 | 1 |
| **Town of Sheboygan** | 3900 | 90 | 5 | 2 |
| **City Sheboygan** | 1228 | 80 | 20-25 | None |
| **Village of Kohler** | 320 | 100 | 20 | None |

[1] Source: Department of Natural Resources
[2] Estimated infiltration rate for soils in municipalities is 0.6-2.0 (in/hr)

Cleaning catch basins to remove leaf litter, accumulated dirt and debris from catch basins for improving water quality of downstream surface waters. Catch basins can be cleaned either manually with a shovel, or by machine using a clamshell bucket, or specially designed equipment including bucket loaders, vacuum eductors or vacuum attachments to street sweepers. Cost sharing is authorized for partial support of supplementary catch basin cleaning for existing target land uses. Supplementary catch basin cleaning is defined as levels than one cleaning for each catch basin per year in target land use areas.

Cost sharing will be effective for a maximum five year period, beginning when the community first accepts cost share funds for catch basin cleaning. Eligible cost components include:

- direct and indirect staff costs to operate the cleaning equipment including wages, salaries, benefits, and overhead (Only cost of "additional staff' as defined in NR120.02 is eligible)
- fuel, equipment maintenance, and equipment depreciation
- disposal of collected materials

Costs will be supported at a cost share rate of up to 100 percent for staff costs and 50 percent for other costs listed above. Cost sharing will be on a reimbursement basis. Following the five year period of cost share eligibility, the community must maintain at its own expense a comparable catch basin cleaning schedule in those areas for which it received cost sharing. This requirement will be waived at such time the area is retrofitted with BMPs consistent with the recommendations of this watershed plan.

Street sweeping involves the use of brush or vacuum style sweepers to remove leaf litter and accumulated dirt from street surfaces on a schedule designed for improving quality of downstream surface waters. Cost sharing is authorized for partial support of supplementary street sweeping for existing target land uses. Supplementary sweeping is defined as levels above the 1996 level of street sweeping but only on targeted land uses.

Supplementary street sweeping is supported at a 50 percent cost share rate and effective for a maximum five year period, beginning when the community first accepts cost share funds for street sweeping. Eligible cost components and cost sharing rates are the same as for catch basin cleaning (see above). Following the five year period of cost share eligibility, the community is expected to maintain at its own expense a comparable street sweeping schedule in those areas for which it received cost sharing. This requirement will be waived when the area is retrofitted with BMPs consistent with the recommendations of this plan.

**Objectives:** The management goal for the existing developed urban areas is to achieve a 20 percent reduction of pollutants. The management of pollutants from existing developed areas can be accomplished through activities such as street sweeping twice a month, catch basin cleaning twice a year, replacing stormsewer inlets with catch basins and construction site erosion control. Structural best management practices including retrofitting existing stormwater ponds and construction of new stormwater ponds may be considered when specifically called for by comprehensive stormwater management plans.

The long-term management goal for future development in all subwatersheds is to achieve an 80 percent reduction of pollutants. The management of pollutants from future development requires wet detention (or a corresponding level of infiltration based on an equivalent amount of pollutant removal) for all target land use areas. Grassed swales should be considered in new developments rather than curb and gutter. Stormwater management ordinances for future development can specify criteria for these controls.

Analysis of storm water management techniques shows that certain activities such as streetsweeping, catch basin cleaning and construction site erosion control; and certain best management practices (BMPs), such as infiltration basins and storm water detention ponds, can significantly reduce sediment and other pollutant loadings to lakes and streams. Adoption of storm water management ordinances and use of storm water management practices will be a priority in the implementation of this plan.

Redeveloped urban areas should have storm water quality and flow control practices includedas part of the development.

**Construction Site Erosion**

**Description:** Construction sites are those areas in any phase of construction that involve disturbing the soil through grading or excavation. Construction projects include renovation or redevelopment, as well as new development. Examples of renovation and redevelopment activities include utility replacement, street replacement, bridge reconstruction, or rehabilitation of commercial, industrial or residential areas.

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

**Management Needs and Alternatives:** Two levels of management were evaluated for construction sites:

1. Manage construction sites, assuming control practices which are 75 percent effective in controlling off-site sedimentation.

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

Construction site erosion control throughout most of the watershed project area is critical to achieving sediment reduction goals. Without at least a 50 percent control of the sediment from these sites, construction site erosion will remain a serious barrier to desired water quality and aquatic habitat in the watershed project area.

Average annual sediment loading to streams from construction erosion for 1995 to 2015 conditions was determined by multiplying the amount of land planned for construction by an average of 23 tons per acre per year. This rate of sediment loading is based on observed land development patterns and generalized climatic conditions. It is estimated that in the years between 1995 and 2015, construction erosion will contribute about 2,303 tons per year of sediment (about 66 percent of total sediment load from nonpoint sources) to streams in the 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. It also contains guidance for administering and enforcing the ordinance.

Two municipalities in the project area have ordinance requirements for controlling construction site erosion and sedimentation. In addition, developers are governed by state building code regulations set forth by the Department of Commerce (DOC) for erosion control on sites with one and two family dwellings; and the DNR Wisconsin Pollutant Discharge Elimination S stem (WPDES) permit regulations for sites greater than five acres.

Despite these regulations, several potential impediments to effective erosion control exist. For example, developers sometimes perceive erosion control as an add-on cost and not a built-in cost of construction, enforcement is often done only in response to complaints, maintenance of erosion control is frequently 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 and maintaining erosion control practices.

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

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

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

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

**Objectives:** The management goal for all construction activities in the Pigeon River Watershed is to control 75 percent of sediment from leaving the sites. High priority items to improve compliance include more consistent issuance of citations, hiring and training of additional inspection staff where needed, new fee structures to cover the cost of improved staffing, and more effective court action when ordinance violations occur.

Because of the gaps in state agency regulations, construction erosion control is best accomplished through a local erosion control ordinance, locally administered building codes, practice standards and application guidelines, an effective administrative program and effective enforcement. Training programs are needed for staff administering ordinances and developers who are responsible for installing and maintaining the erosion control practices.

**Construction Site Erosion and Stormwater Management**

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

Chapter 236 of the Wisconsin Statutes gives cities, villages, towns, and counties authority to control erosion from developing subdivisions and smaller land divisions. This chapter establishes the minimum standards and procedures for land division in Wisconsin. The chapter enables local governments that have an established planning agency to adopt subdivision ordinances that are more restrictive than the state standards. Several of these government units

have included runoff and erosion control provisions in their ordinances. These ordinances typically require a developer to submit a detailed plan specifying control measure for minimizing erosion and runoff during and after development. Typically, before a final plat is filed the person who reviewed the erosion and runoff control plan visits the development site and certifies that the measures have been installed in accordance with the plan.

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

The DNR suggests that the Wisconsin Construction Site Erosion Best Management Handbook (DNR Publication WR-222-93) and the Wisconsin Stormwater Manual (DNR Publication WR-349-94) be used as a reference for any development that occurs in the Sugar-Honey Creeks Project.

All municipalities and counties are encouraged to adopt construction site erosion control and stormwater management zoning ordinances.

**Urban Streambank Erosion**

**Description:** Urban streambank erosion is caused primarily by channelization, upstream modifications, and increased impervious surfaces associated with new development which increases runoff from the site. These conditions result in a changing stream hydrology, which is characterized as "flashy." Increased volumes and peak flows expose and erode the banks, destroying the natural conditions needed for healthy aquatic communities. Also, the channel is scoured during heavy rainfall events, displacing in-stream cover such as rocks and logs and flushing away aquatic life as well.

Generally, the urban streams in the Pigeon River Watershed have minimal to moderate streambank erosion. A limited number of sites within urban areas were identified during the stream inventory as needing stabilization BMPs. As the municipalities continue to expand outwards and more development occurs through the watershed, however, the potential exists for these streams to experience significant erosion problems. These problems can be minimized or avoided by incorporating proper stormwater management in new development.

**Management Needs and Alternatives:** Peak flow reduction through application of upstream detention or other BMPs is needed to prevent future streambank erosion. Future inventories of urban streambank erosion should be conducted during the project implementation phase. If problem areas develop in the future, streambank stabilization techniques should be applied.

Management criteria developed for eroding streambanks are based primarily on the rate at which sediment is being released into streams by the cutting action of stream flows. Secondary considerations include stream channel obstructions and riparian habitat degradation. Eroding

streambanks contributing 1 ton or greater of sediment per year to the stream are eligible for stabilization measures through. the watershed project.

Options to control streambank erosion include structural controls such as riprap, shaping and seeding, fiber rolls and other bioengineering techniques. Less intrusive measures such as brush cutting to increase light penetration and vegetation establishment may also be effective. Foregoing control all together may be necessary if the degree of site disturbance needed to install practices offsets the benefits to the stream.

If bridges or other in-stream structures deteriorate or are removed, newly exposed streambanks may begin to erode. When this occurs, the DNR and the appropriate unit of government will jointly evaluate the severity of the erosion and assign the site a management recommendation. Eligibility of sites for technical and financial assistance will be consistent with the criteria identified for rural streambank erosion stabilization.

Easements and acquisitions, as well as preserving and creating streamside buffers, are also encouraged as a means of controlling streambank erosion.

**Objectives:** Maintain streambank stability and prevent future erosion in critical areas. Preserve and create streamside buffers.

**Pollution Prevention Practices**

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

These factors affect the amount of pollutants from urban surfaces carried to lakes and streams by runoff. Street sweeping removes some of the particulate pollutants from street and parking lot surfaces before they can be transported to surface waters. Repeated street sweeping of commercial and industrial areas in the early spring, to remove winter accumulation of sand and street dirt, and in the fall, to remove leaves, provides the greatest benefit. Proper use of lawn care chemicals will also reduce water quality problems. Fertilizer residues can enrich surface waters with nutrients and promote algae growth. Pesticides can add to toxic pollution.

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

- Control construction site erosion.
- Remove street dirt, leaves and debris from catch basins, streets and parking lot surfaces through municipal street maintenance and leaf collection programs.
- Reduce or eliminate the use of galvanized roof materials and gutters, a primary source of zinc in urban runoff.

- Remove pet wastes immediately from lawns, sidewalks, and streets to reduce bacterial contamination of urban runoff. Enforce local pet waste ordinances and familiarize pet owners with good pollution prevention practices.
- Control the timing and reduce the amount and type of fertilizer and pesticide applications in all areas.
- Dispose of automobile waste fluids such as radiator water and engine oil appropriately, keeping them out of the storm sewer system. Set up and advertise municipal recycling programs for antifreeze and waste oil. Create partnerships with car dealerships and auto maintenance shops in the watershed project area. Discourage dumping waste oil on the ground or in storm sewers.
- Control development and redevelopment through zoning which, in pad, considers on-site suitability for storm water management practices to meet water quality, habitat, and flood prevention objectives.
- Minimize use of street de-icing compounds.
- Reduce the amount of motorized traffic.
- Reduce the areal extent of parking lots.
- Restrict development in environmental corridors.
- Promote the use of cluster developments.

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

**Urban Toxic Pollutants**

**Description:** An important means for improving water quality in the Pigeon River and its tributaries is to prevent high concentrations of toxic materials in urban runoff. Four pollutants (sediment, phosphorus, zinc, lead) were chosen to characterize the type and severity of urban nonpoint pollution. The municipalities of Howards Grove, Town of Sheboygan, City of Sheboygan and Village of Kohler contribute a majority of the estimated sediment, phosphorus, zinc and lead loading to streams coming from urban sources in the watershed.

The management alternatives analysis indicates that pollution prevention activities for nonpoint source control in established areas are needed in these municipalities to achieve the previously described pollutant reduction goals. In addition, each community will be expected to conduct the "core" activities of the plan described in Chapter Four, with a primary emphasis on urban pollution prevention and educational activities.

**Objective:** Prevent loadings of heavy metals and other toxic materials that would exceed acute and chronic toxicity standards as identified in Wis. Adm. Code NR 105.

**Pollutant Reduction Goals and Project Objectives for Urban Nonpoint Sources**

A summary of the reduction goals:

- Reduce overall pollutant loading (1995 baseline) within existing urban areas by 20% by the year 2015.
- Achieve 75% sediment reduction from construction site erosion control practices.
- Hold future pollutant loadings in all subwatersheds to 20% of the calculated estimate value.
- Improve municipal pollution prevention practices including street sweeping to twice a month and catch basin cleaning to twice a year.

The adequacy of these goals will be reviewed after five years (or sooner if future water quality data indicate a need for revision as determined by the watershed project Technical Advisory Committee).

## Eligibility for Wetland Restoration, Easements, and Land Acquisition

### Wetland Restoration

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

Wetlands in the Pigeon River Watershed are primarily along stream and lake shorelines and in the headwater areas of watershed streams. There are also important wetlands that are not directly connected to streams or lakes. The Wetland Restoration Objective is to restore or rehabilitate 10 percent of all degraded or prior converted wetlands in the watershed (approximately 355 acres).

Wetlands are an important part of our ecosystem. When water enters a wetland, the wetland acts as a purifier, cleaning the water before it exits. Wetlands do this by removing, retaining, and transforming nutrients, processing wastes, and trapping sediment. Because wetlands are a principal conduit for rain water flowing to lakes and streams, their importance to water quality, water supply, flood control erosion control, flora and fauna, and the food chain is significant. Restoration of wetlands may increase base flow throughout the river, but especially in the upstream reaches of the watershed streams. Infiltration will also be increased through the use of other BMPS such as conservation tillage, riparian buffers, and sediment control basins.

Wetlands vary from areas with seasonally saturated soil conditions to areas with standing water year-round. Some of the diverse types of vegetation that can be found in wetlands include pond lilies, cattails, rush, black ash, and willow. Wetland restoration may include the plugging or breaking up of existing tile drainage systems, the plugging of open channel drainage systems, other methods of restoring the pre-development water levels of an altered wetlands and the

fencing of wetlands to exclude livestock. Restoration must be in accordance with NRCS standard 657 - Wetland Restoration and a wetland specialists recommendations. Native seed and plants will be used wherever possible and no reed canary grass will be planted.

Eligibility for cost-sharing for restoration of wetlands will be dependent on the following conditions:

- Effectiveness of a proposed restoration as determined by project staff considering sediment and nutrient filtering, flood and storm water attenuation and storage area, and infiltration. Secondary benefits such as enhancement of essential habitat for fish, waterfowl, animals, and plants, including endangered species will also be considered.

- As a minimum, all upland fields draining to the wetland must be controlled to a sediment delivery rate that is less than or equal to the soils 0.7 tons/acre/year.

A goal of this project is to restore 10 percent (355 acres) of the wetland sites inventoried. Most restorations in this area are 0.5 to 1.0 acre in size.

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

1) **Priority Restorations** - Priority wetland restorations provide at least one of the water quality benefits as described in a. through d. below ***and*** provide essential habitat for fish, waterfowl, animals, and plants, including endangered species.

a. Cultivated hydric soils with tile or open channel drainage systems discharging to a stream or tributary. Wetland restoration will reduce the amount of nutrients and pesticides draining from the altered wetland to a water resource by establishing permanent vegetation and altering the drainage system.

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

c. Wetlands down-slope or up-slope from fields identified as significant upland sediment sources. Restoration of wetlands in these situations may do two things: 1) create a wetland filter which reduces the pollutants from an up-slope field(s) to a water resource; or 2) reduces the volume and velocity of water flowing from an up-slope wetland to a down-slope critical field.

d. Wetlands providing water quality improvements through infiltration. Water stored in wetlands is filtered as it infiltrates to groundwater and increased base flow in streams.

Additionally, priority will be given to prior converted and farmed wetlands. **Prior converted** wetlands are those that have been drained, dredged, filled, leveled, or otherwise manipulated

(including removal of woody vegetation) before December 23, 1985, for the purpose of making the production of an agricultural commodity possible. **Farmed wetlands** include potholes and seasonally flooded or ponded wetlands that were not fully converted prior to December 1985 and are cropped in dry years.

2) **Eligible Restorations** - Sites that do not meet the definition of a priority site yet offer significant water quality benefits such as providing storage of storm event runoff and flood flows that significantly improve the watershed hydrology or perform the function of a filter to delay, absorb, or purify contaminated runoff before it enters watershed streams or lakes.

3) **Ineligible Restorations** - Sites where existing physical characteristics or conditions are such that the potential for restoration would not be environmentally viable or economically feasible.

**Wetland Restoration Permitting**

County LCD staff, DNR, US Fish and Wildlife, Wisconsin Waterfowl Association, and Sheboygan County Conservation Association wetland restoration experts will assist landowners in plan development including assistance in obtaining permits. Permits may be needed from three sources.

- Federal (Army Corps of Engineers) Clean Water Act §404 - Prior converted wetlands are exempt from this permit Check that this exemption is still correct.
- State (DNR) Clean Water Act §401 Water Quality Certification, Chapter 30 and 3 1, Stats.
- Local (County or Municipal Zoning Office)

**Land Easements**

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

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

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

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

Easements may also be considered for protecting municipal well heads if it can be established that vegetative cover will correct an existing groundwater quality threat. **The goal for land easements in the project area is approximately 250 acres.**

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

Easements should be considered in the following situations:

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

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

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

3. To support eligible wetland restorations.

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

5. Engineering options would require intensive management in order to continue to provide adequate pollution reduction.

6. Surrounding land use is largely agricultural and it is anticipated that it will remain so for two decades or more.

**Land Acquisition**

Units of Government, including Lake Protection and Rehabilitation Districts, (Pigeon Lake Sanitary District) within the Pigeon River Watershed Project area are eligible for nonpoint source grants of 50% to supplement the purchase of land or land in fee that is contributing or will contribute nonpoint source pollution. The goal for land acquisition in the project area is approximately 300 acres. This goal may increase after additional inventories and land acquisition strategies are developed by the individual units of government located in the project area.

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

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

# CHAPTER FOUR:
# Implementation

## Introduction

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

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

## Best Management Practices

### BMPs Eligible For Cost-Sharing And Their Rates

Best management practices control nonpoint sources of pollution and are identified in NR 120. Design and installation of all BMPs must meet the conditions listed in NR 120. Generally these practices use standard specifications included in the NRCS Field Office Technical Guide. In some cases additional specifications may apply. The applicable specifications for each BMP can be found in NR 120.14.

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

The practices eligible for cost-sharing and the cost share rates for each BMP are listed in Tables 4-1 and 4-2 below; the BMPs listed in Table 4-1 can either be cost-shared at 50% or at the flat rates listed.

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

| Best Management Practice | Maximum Flat Rate |
|---|---|
| Contour Farming | $ 9.00/ac[1] |
| Contour Stripcropping | $ 13.50/ac[1] |
| Field Stripcropping | $ 7.50/ac[1] |
| High Residue Management | $ 18.50/ac[2] |
| Riparian Buffer Strip | $100.00/ac[3,4] |
| Cropland Protection Cover | $25.00/ac[5] |

[1] Wildlife habitat restoration components of this practice are cost-shared at 70 percent.
[2] Cost-shared up to six years.
[3] Cost-shared up to five years.
[4] Cost-share payment per acre is in Interim BMP. Eligibility is pending approval.
[5] Cost-shared 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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

**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.

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

**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.

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

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

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

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

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

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

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

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

**Land Acquisition**. The purchase of land or the interest in land which is contributing or will contribute nonpoint source pollution or for the construction of an urban structural practice.

**Table 4-2. State Cost-Share Rates for Rural Best Management Practices**

| Best Management Practice | State Cost-Share Rate |
|---|---|
| Nutrient and Pesticide Management | 50% |
| Pesticide Handling Spill Control Basins | 70% |
| Livestock Exclusion from Woodlots | 50% |
| Intensive Grazing Management | 50% [1] |
| Manure Storage Facilities | 70% 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% [3] |
| Shoreline and Streambank Stabilization | 70% [3] |
| Shoreline Buffers | 70% [3] |
| Wetland Restoration | 70% [3] |
| Barnyard Runoff Management | 70% |
| Barnyard Relocation or Abandonment | 70% |
| Roofs for Barnyard Runoff Management and Manure Storage Facilities | 70% |
| Structural Urban BMPs | 70% [4] |
| Milking Center Waste Control | 70% |
| Cattle Mounds | 70% |
| Well Abandonment | 70% |
| Land Acquisition | 50% |
| 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 identified in the watershed plan in conjunction with these BMPs. See Chapter Two for an explanation of where easements may apply.

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

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

**Interim Best Management Practices**

Under some circumstances, practices may be recommended that are not included on the BMP list in Administrative Rule NR 120. NR 120.15 provides for alternative practices where necessary to meet the water resource objectives identified in the watershed plan. The Department may identify in the nonpoint source grant agreement the design criteria and standards and specifications where appropriate, cost share conditions, and cost share rates for each alternative best management practice.

**Riparian Buffer Strip:** This is an Interim BMP for the Branch River Watershed. If cost-sharing per acre is approved by the DNR for all projects, it will be an eligible practice in the Pigeon River project. Riparian Buffers are permanently vegetated areas designed and constructed to function as a filter to delay, absorb, or purify contaminated runoff before it enters a stream or wetland.

**Practices, Sources, and Activities Not Cost-Shared**

The following practices, sources, or activities are not eligible for cost-share assistance:

- Best Management practice installation, operation, or maintenance started prior to the signing of the cost-share agreement.
- Activities covered by the WPDES permit program including those identified in chs. NR 200 to 299 (except as provided in sub. (1) (g)).
- Livestock operations which have applied and are eligible for a WPDES permit, have been issued a WPDES permit, have greater than 1,000 animal units, or have greater than 1,000 animal units and have been issued a notice of discharge under ch. NR 243. Other sources on the farm, such as sediment delivered from cropland and streambanks may be eligible for cost-sharing for practices.
- Activities required as part of, or as a condition of, a license for a solid waste management plan.
- Activities funded through state or federal grants for wastewater treatment plants.
- Active mining operations.
- Pollutant control measures needed during building and utility construction, and storm water management practices for new development.
- Pollutant control measures needed during construction of highways and bridges.
- The planting, growing, and harvesting of trees associated with silviculture, except as necessary for site stabilization.
- Small scale on-site human domestic waste facility construction.
- Dredging of harbors, lakes, rivers, and ditches.
- Dams, pipes, conveyance systems, and detention basins intended solely for flood control.
- Practices normally and routinely used in growing crops.
- Practices whose purpose is to accelerate or increase the drainage of land, except where drainage is required as a component of a best management practice.

- Practices to control spills from commercial bulk storage of pesticides, fertilizers, petroleum and similar materials required by chs. ATCP 32 and 33 or other administrative rules.
- Practices needed to control sources, which were adequately managed for the specific land use at the time of cost share agreement signing.
- Practices to be fully funded through other programs.
- Practices previously installed and necessary to support cost shared practices.
- Changes in crop rotation.
- Minimum levels of street sweeping and leaf collection.
- 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 which the department determines are not necessary to achieve the objectives of the watershed project.

**Cost-Share Agreement Administration**

Cost-share funding is available to landowners and local units of government for a percent of the costs of installing BMPs to meet project objectives. This funding is distributed to landowners by the LCD/SWCD from a Nonpoint Source grant provided by the DNR. Cost-share agreements are binding contracts between landowners and the LCD and are filed as part of the property deed. To qualify for cost-sharing funds, landowners must meet eligibility criteria defined in the previous chapter. The LCD/SWCD receives additional grant money from the DNR to support its staff and other administrative responsibilities.

Cost-share agreements may be signed throughout the 10 year project implementation period of the Pigeon River project. Agreements may also be amended throughout the life of the project.

Practices included on cost-share agreements must be installed within the schedule agreed to on the cost-share agreement. Practices must be maintained by the owner for a minimum of ten years from the date of installing the final practice listed within the cost-share agreement. County LCD/SWCD staff are responsible for enforcing compliance of cost share agreements. The LCD/SWCD staff will monitor practices installed through the watershed project in conjunction with other state and federal conservation compliance programs. Practices should be monitored every 2 years or more frequently as necessary. Monitoring will insure that BMPs installed through the program are maintained in accordance with the operation and maintenance plan for the practice. Proper operation and maintenance of practices provides cost effective management of pollution sources.

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

## Cost Containment Procedures

Wis. Admin. Code Chapter NR 120 requires that cost containment procedures be identified in this plan to control the costs of installing BMPs. Both counties will use average cost and flat rates. Cost-share payments will be based on actual installation costs. If actual installation costs exceed the amount of cost-sharing determined by the average cost method, the amount paid the grantee may be increased with approval of the appropriate land conservation committee. Appropriate documentation regarding the need for changes will be submitted to DNR.

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

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

## Implementation Schedule

- During the first 12 months of the implementation period, all landowners with sites defined as "eligible" or "critical' nonpoint sources will receive correspondence from the county LCD/SWCD explaining the project and how they can become involved.

- County LCD/SWCD staff will continue to make contacts with eligible landowners until the landowners have made a definite decision regarding participation in the program. Efforts of first two years will focus on informing, educating, and determining landowner interest in practice adoption.

- Scheduling priorities for staff workload and practice installation will be examined at the annual project review meeting held each February.

- County staff 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 to encourage participation.

- An estimated annual budget for 1998 and 1999 is presented in Appendix D. A budget will be prepared for each remaining year of the project during the preceding year.

## Critical Site Notification Process

Project staff will begin to contact the highest-ranked critical sites for verification immediately after plan approval and complete the contacts within six-months. Highest-ranked is defined as the top 25 percent of the inventoried critical site load. The plan approval date 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 counties sufficient time to

verify that all sites meet the critical site criteria. The county shall make a request to DNR, in writing, which includes the reasons to support the extension.

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

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

- April-July: Conduct site visits and verification work and prepare report.
- August 1: Send report to DNR implementation coordinator.
- November 1: DNR sends notification to the critical site landowners.

At the time of notification, critical site landowners have 3 years to sign a cost-share agreement at the rates given in NR 120. After 3 years the available cost-share rates are reduced by 50 percent.

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

## 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 (LCC) of the county in which the site is located. If the site is located in more than one county, the appeal goes to the LCC of the county which contains the largest portion of the site. The site owner or operator, now called the appellant, must write to the LCC and ask for an informal hearing. The appeal 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 LCC shall:

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

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

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

(1) the DNR and DATCP reports and recommendations,
(2) the notification by the DNR and DATCP that no report or recommendations would be submitted, or
(3) the conclusion of the 60-day period following the hearing.

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

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

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

## Urban Implementation Program

### Management Program Activities

The following discussion provides guidance on how the nonpoint source control program will be implemented by participating municipalities. It considers first the activities of a "core" program for controlling nonpoint sources. Second, the implementation of more complex "segmented" activities of the management program--detention, infiltration, catch basin cleaning-are presented.

### Core Activities of the Urban Management Program

The core activities of the nonpoint source control program applicable to local units of government include basic measures that can be implemented without further study. Adopting a community-specific core program is the first step in the implementation process. Communities will need to commit to implementing the core program within the first three years of the project. This is a prerequisite to receive technical and financial assistance through the priority watershed project. This requirement applies only to the receipt of funds used directly by the municipality as

a grantee, such as where the municipality installs, owns, and operates a BMP. It does not apply to those instances where the municipality acts as a grantor, passing cost-share funds through to private landowners. This means that individual landowners could receive cost-share funds from the DNR for the installation of BMPs prior to a municipality's agreement to conduct core activities of the urban program.

The basic activities of the core program are:

- Effectively enforce the construction erosion control provisions in local ordinances based on the state model ordinance and the State building codes.

- Develop and implement a community-specific program of urban pollution prevention practices which reduce nonpoint source pollution. This would include efforts such as adoption of ordinances regulating pet wastes, changes in timing and scheduling of leaf collection, catch basin cleaning twice a year, street sweeping at least twice a month, use of phosphorus-free fertilizers, and pollution prevention at public works yards.

- Implement an information and education program consistent with the intents and purposes of Chapter 5 of this watershed plan.

- Following the completion and adoption of the DNR Stormwater Management Guidebook and Model Ordinance (in draft form), stormwater management ordinances should be incorporated into the core program.

- Establish and enforce maintenance requirements for municipal-owned vegetated riparian buffers.

**Segmented Activities of the Urban Management Program**

The segmented activities of the nonpoint source management program include those requiring site specific investigations prior to installation (example: detention ponds needing an engineering feasibility study).

The higher costs of implementing this portion of the urban management program require communities to budget expenditures over the course of several years. Best management practices implemented under this portion of the program include detention ponds, infiltration devices, streambank erosion controls and other structural means for reducing urban nonpoint source pollution. These components also include more detailed changes in schedules and equipment used for catch basin cleaning.

Furthermore, detailed studies are needed for these practices, including engineering feasibility and other site specific investigations for existing and new development. Study results will determine the best means for reducing urban nonpoint sources in a specific community by more site specific application of the plan's recommendations.

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

The basic activities of the segmented program are:

- Conduct stormwater management plans, and where needed, detailed engineering studies to determine the best means to implement nonpoint source control measures for established urban areas. These studies should identify the type and location of BMPs for existing urban areas. These studies should also set forth the allocation of local costs between municipalities where more than one municipality contributes runoff to a BMP. The allocation should result in an equitable distribution of costs based on the contribution of each municipality to the total pollutant load or stormwater runoff volume being controlled. This activity will also consider supplementary catch basin cleaning and street sweeping as components of the control strategy for established urban areas.

- Design and install BMPs for existing urban areas as called for in stormwater management plans and detailed engineering studies.

- Adopt and enforce a stormwater management ordinance consistent with the state's model stormwater ordinance (in draft form).

- Develop municipal wellhead protection plans for municipal wells constructed before August 1992.

- Establish and maintain vegetative buffers on privately owned land along the stream and riparian wetlands.

- Continue development of long range land use plans with water quality concerns in mind.

## Urban Program Participants--Roles and Responsibilities

The specific roles and responsibilities for program participants are summarized below. The primary participants include local units of government; example: cities, villages, towns, county, local public works departments), the DNR, other state agencies, landowners and land operators. Where applicable, roles and responsibilities are discussed with respect to the previously described core and segmented activities. As noted in Appendix A, "Legal Status of the Nonpoint Source Control Plan," implementation begins following approval of this priority watershed by Manitowoc County, Sheboygan County, and the DNR with input from representatives of the Pigeon River Watershed Citizen Advisory Committee.

### Local Units of Government

**Core Program Roles and Responsibilities:** The following is a schedule for implementing the core activities of the nonpoint source control strategy for the Pigeon River Priority Watershed Project. Each participating unit of government should:

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

2. Identify the roles and responsibilities of the county, cities, villages, developers, contractors, and landowners for controlling construction erosion in all areas of the watershed project area within 6 months of the start of implementation. Develop administrative procedures, and determine staff needs to enforce construction erosion control ordinances and building codes in all communities within 12 months of the start of implementation, amend current construction erosion control ordinances to address problems listed in Chapter 3.

3. Develop and implement a community-specific program of urban pollution prevention practices. This may include but is not limited to a combination of information and education efforts, adoption of ordinances regulating pet wastes, catch basin cleaning, street sweeping and public work yard pollution prevention plans, and changes to the timing and scheduling of leaf and yard waste collection. Activities and a schedule for implementation will be negotiated by the local unit of government and the DNR within 12 months of the start of implementation.

4. Implement the information and education strategy as described in Chapter 5.

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

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

7. Participate in the annual watershed project review meeting.

**Segmented Program Roles and Responsibilities:** The following is a schedule for the segmented activities of the nonpoint source control strategy for the Pigeon River Priority Watershed Project. Each participating unit of government should:

1. Within 12 months of the start of implementation, identify the high priority subbasins the community wishes to address for nonpoint source management. This list can be amended throughout the 10 year project period.

2. Conduct detailed engineering feasibility studies for urban nonpoint source control practices in high priority areas of existing urban development. A commitment to implementing the recommendations will be required as a condition for financial assistance for these studies.

3. Adopt, administer, and enforce a stormwater management ordinance within 12 months of the approval date of the state's model stormwater management ordinance (in preparation).

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

   a. For practices installed and maintained by private individual, the cost-share agreement is between the landowner and the local unit of government. The local units of government will be required to:

   - Design or contract for the design of best management practices and verify proper BMF installation.
   - Request reimbursement from the DNR for practices installed by private landowners. Eligible BMPs must be listed in the cost-share agreement signed prior to construction.
   - Reimburse landowners for the eligible amount of cost sharing.
   - Monitor landowner compliance with provisions of the cost-share agreement.

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

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

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

   - The downstream community can act as grant recipient, which includes ultimate accountability for practice maintenance. The responsibility could then be delegated, all or in part, to the upstream community through an intergovernmental agreement.
   - The upstream community can act as the grant recipient, which includes accountability for practice maintenance. The downstream community could provide, through an intergovernmental agreement, all or part of the local share of the practice installation cost.

5. Develop alternative financing and implementation plans which describe the methods for raising revenue for local stormwater pollution control programs in each municipality. These studies will be conducted concurrently with other high priority activities of the segmented program.

6. Develop information needed for project evaluation to DNR.

**DNR**

The DNR has been assigned the overall administrative responsibility for the Wisconsin Nonpoint Source Water Pollution Abatement Program in s. 144.24 Stats, and s. NR 120, Wis. Adm. Code (NR 120). This includes providing financial support for local staff and installation of management practices, assisting local units of government to integrate wildlife and fish management concerns into selection and design of BMPs and conducting project evaluation activities. The DNR's role in assisting local units of government in carrying out the core and segmented activities are as follows:

**Core Program Roles and Responsibilities:**

- Assist local governments to enforce construction erosion control provisions developed in accordance with the DNR - DOC Memorandum of Understanding.
- Review community specific program of urban pollution prevention practices for nonpoint source control.
- Review and approve annual work plans for staff and activities necessary to implement the project.
- Review and approve annual project implementation reports.
- Participate in the annual watershed project review meeting.
- Track changes in urban pollutant loads using information supplied by local units of government.

**Segmented Program Roles and Responsibilities:**

- Develop a model stormwater management ordinance. Assist communities with adoption and enforcement of stormwater management ordinances.
- Assist communities to develop priorities, schedules, and requirements for segmented activities.
- Participate in the selection of BMPs and approve practice designs. Review nonpoint source cost-share agreements signed by local units of government with eligible land owners.
- Enter into cost-share agreements with local units of government for nonpoint source controls on eligible lands owned or operated by the local government.
- Review designs of urban nonpoint source BMPs for which cost-share agreements are signed.
- Reimburse cost-share recipients for the eligible cost of installing BMPs at rates consistent with administrative rules and those established in this plan.

**Landowners and Land Operators**

In some situations, private landowners will install BMPs on their property. As such, they can be important participants in the urban implementation strategy. Eligible landowners can participate in the project by signing cost-share agreements with local units of government.

# Cost-Share Budget

## Costs of Installing Rural BMPs

The estimated quantity, type, and cost of management practices that are required to meet the water quality objectives of this project are listed in Table 4-3. The capital cost of installing the Best Management Practices is approximately $6.7 million.

- State funds necessary to cost-share this level of control would be approximately $4.7 million.

- The local share provided by landowners and other cost-share recipients would be approximately $2 million.

## Easement and Land Acquisition Costs

Chapter Three identifies where nonpoint source program funds can be used to purchase easements and land. The estimated cost of purchasing easements and land is shown in Table 4-3. State share of easements be $250,000 and $300,000 for land acquisition. Easements are funded at the 100 percent and will be purchased by the DNR or local government. Land acquisition is funded at 50% and will be purchased by local units of government. The DNR does not purchase land through this program.

## Staffing

Table 4-5 lists the total estimated staff needed to implement the project Approximately 90,000 staff hours are required to implement this plan. This includes 13,000 staff hours to carry out the information and education program.

Currently, 2.3 positions are being funded at $77,792 per year in Manitowoc County and 0.9 positions at $39,733 in Sheboygan County on the Pigeon River project The LCD/SWCD and agencies will determine the need for additional staff based on an annual workload analysis. The estimated cost for staff is $1.7 million.

## Total Rural Budget

The total state funding required to meet the rural nonpoint source pollution control need is presented in Table 4-5. The estimated cost to the state is $6.6 million. This figure includes the capital cost of practices, staff support, and easement costs as presented in the tables.

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

of cost sharing that is actually expended; the number of staff working on the project; and the amount of support costs.

**Urban Budget and Staffing Needs**

Funding is provided for local implementation of many of the core and segmented activities through a Local Assistance Grant from the Department. Activities eligible for funding include development and implementation of a construction site erosion control ordinance, development of a stormwater ordinance, and design of stormwater management practices.

It is estimated that $388,200 in state funds and $327,800 in local funds will be needed to implement the urban plan recommendations. See Table 4-6 for a description of how these costs were estimated.

**Grant Disbursement and Project Management Schedule**

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

The project implementation period is ten years. Cost-share agreements with eligible landowners may be signed throughout the life of the project. Practices listed on any cost-sharing agreement must be installed by the end of the project. This project is scheduled to conclude in 2007.

The initial Nonpoint Source grant will cover the cost of practices over the entire ten year implementation phase. See Table 4-3 for a detailed explanation. This grant may be amended due to changes needed for time of performance, funding levels, or scope of work.

Local Assistance grants will be disbursed annually to Manitowoc and Sheboygan County to cover the costs of personnel, operating expenses, and equipment. The DNR will evaluate an annual workload analysis and grant application submitted by the counties. See Appendix D for an estimated annual budget for 1998 and 1999.

**Table 4-3a. Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Manitowoc County**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Upland Control** | | | | | |
| Change in Crop Rotation | 8,000 ac | NA | 0 | 0 | --- [1] |
| Contour Cropping | 100 ac | 9 | 900 | 900 | --- [1] |
| Contour Strip Cropping | 20 ac | 13.5 | 270 | 270 | --- [1] |
| High Residue Management [2] | 6,000 ac | 18.5 | 333,000 | 333,000 | --- [1] |
| Cropland Protection Cover [3] (Green Manure) | 2,000 ac | 25 | 100,000 | 100,000 | --- [1] |
| Intensive Grazing Management (Rotational Grazing) | 4 ea | 7,000 | 28,000 | 14,000 | 14,000 |
| Critical Area Stabilization | 500 ac | 400 | 200,000 | 140,000 | 60,000 |
| Grass Waterways | 4 ac | 3,000 | 12,000 | 8,400 | 3,600 |
| Field Diversions and Terraces | 1,000 ft | 3 | 3,000 | 2,100 | 900 |
| Grade Stabilization | 2 ea | 4,000 | 8,000 | 5,600 | 2,400 |
| Agricultural Sediment Basin | 6 ea | 10,000 | 60,000 | 42,000 | 18,000 |
| Shoreline Buffers | 250 ac | 400 | 100,000 | 70,000 | 30,000 |
| Nutrient Management [3] | 5,000 ac | 6 | 90,000 | 45,000 | 45,000 |
| Nutrient and Pest Management [3] | 10,000 ac | 7 | 210,000 | 105,000 | 105,000 |
| Spill Control Basin | 1 ea | 10,000 | 10,000 | 7,000 | 3,000 |
| Wetland Restoration | 200 ea | 2,000 | 400,000 | 280,000 | 120,000 |
| Riparian Buffer Strips [4] | 100 ac | 100 | 50,000 | 25,000 | 25,000 |
| Livestock Exclusion, Woods | 5,000 ft | 1 | 5,000 | 2,500 | 2,500 |
| Well Abandonment | 10 ea | 500 | 5,000 | 3,500 | 1,500 |
| **Upland Subtotal** | | | **1,615,170** | **1,184,270** | **430,900** |

**Table 4-3a continued. Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Manitowoc County**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Barnyard Runoff Control and Manure Storage** | | | | | |
| Filter Walls and Strips | 30 ea | 25,000 | 750,000 | 525,000 | 225,000 |
| Roof Gutters | 45 ea | 2,000 | 90,000 | 63,000 | 27,000 |
| Clean Water Diversion | 45 ea | 2,500 | 112,500 | 78,750 | 33,750 |
| Roofs | 1 ea | 25,000 | 25,000 | 17,500 | 7,500 |
| Barnyard Abandonment or Relocation | 2 ea | 60,000 | 120,000 | 84,000 | 36,000 |
| Manure Storage Facility (5) | 10 ea | 30,000 | 300,000 | 190,000 | 110,000 |
| Manure Storage Facility Abandonment | 2 ea | 10,000 | 20,000 | 14,000 | 6,000 |
| Cattle Mounds | 6 ea | 1,500 | 9,000 | 6,300 | 2,700 |
| Milking Center Waste Control | 8 ea | 5,000 | 40,000 | 28,000 | 12,000 |
| **Barnyard subtotal** | | | **1,466,500** | **1,006,550** | **459,950** |
| **Streambank Erosion Control** | | | | | |
| Shape and Seeding | 15,000 ft | 10 | 150,000 | 105,000 | 45,000 |
| Fencing | 3,000 ft | 1 | 3,000 | 2,100 | 900 |
| Rock Riprap | 400 ft | 30 | 12,000 | 8,400 | 3,600 |
| Bio-Bank Stabilization | 400 ft | 25 | 10,000 | 7,000 | 3,000 |
| Crossing | 4 ea | 2,000 | 8,000 | 5,600 | 2,400 |
| Remote Watering Systems | 2 ea | 2,000 | 4,000 | 2,800 | 1,200 |
| **Streambank Subtotal** | | | **187,000** | **130,900** | **56,100** |
| **Upland, Barnyard, and Streambank Subtotal** | | | **3,268,670** | **2,321,720** | **946,950** |
| Land Acquisition | 100 ac | 2,000 | 200,000 | 100,000 | 100,000 |
| Easements | 200 ac | 1,000 | 200,000 | 200,000 | 0 |
| **Total** | | | **3,668,670** | **2,621,720** | **1,046,950** |

[1] Local share consists of labor and equipment costs. Also see flat rates in table 4-1.

[2] High Residue Management is cost-shared per acre per year for a maximum of six years. Total cost shown is three times the cost per year as an average cost estimate.

[3] Cropland Protection Cover and Nutrient and Pest Management are cost-shared per acre per year for a maximum of three years. Total cost shown is two times the cost per year for cover crop and three times the cost per year for nutrient and pest management.

[4] Riparian Buffer Strips are cost-shared per acre per year for a maximum of five years. Total cost shown is five times the cost per year. This practice is an interim BMP.

[5] 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.

Source: Wisconsin DNR, DATCP, and Manitowoc County

**Table 4-3b. Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Sheboygan County**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Upland Control** | | | | | |
| Change in Crop Rotation | 8,000 ac | NA | 0 | 0 | --- [1] |
| Contour Cropping | 50 ac | 9 | 450 | 450 | --- [1] |
| Contour Strip Cropping | 20 ac | 13.5 | 270 | 270 | --- [1] |
| High Residue Management [2] | 4,500 ac | 18.5 | 249,750 | 249,750 | --- [1] |
| Cropland Protection Cover [3] (Green Manure) | 2,000 ac | 25 | 100,000 | 100,000 | --- [1] |
| Intensive Grazing Management (Rotational Grazing) | 5 ea | 7,000 | 35,000 | 17,500 | 17,500 |
| Critical Area Stabilization | 150 ac | 400 | 60,000 | 42,000 | 18,000 |
| Grass Waterways | 6 ac | 3,000 | 18,000 | 12,600 | 5,400 |
| Field Diversions and Terraces | 1,000 ft | 3 | 3,000 | 2,100 | 900 |
| Grade Stabilization | 6 ea | 4,000 | 24,000 | 16,800 | 7,200 |
| Agricultural Sediment Basin | 2 ea | 10,000 | 20,000 | 14,000 | 6,000 |
| Shoreline Buffers | 20 ac | 400 | 8,000 | 5,600 | 2,400 |
| Nutrient Management [3] | 6,700 ac | 6 | 120,600 | 60,300 | 60,300 |
| Nutrient and Pest Management [3] | 4,000 ac | 7 | 84,000 | 42,000 | 42,000 |
| Spill Control Basin | 1 ea | 10,000 | 10,000 | 7,000 | 3,000 |
| Wetland Restoration | 200 ea | 2,000 | 400,000 | 280,000 | 120,000 |
| Riparian Buffer Strips [4] | 80 ac | 100 | 40,000 | 20,000 | 20,000 |
| Livestock Exclusion, Woods | 4,000 ft | 1 | 4,000 | 2,000 | 2,000 |
| Well Abandonment | 6 ea | 500 | 3,000 | 2,100 | 900 |
| **Upland subtotal** | | | **1,180,070** | **874,470** | **305,600** |

**Table 4-3b continued. Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Sheboygan County**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Barnyard Runoff Control and Manure Storage** | | | | | |
| Filter Walls and Strips | 20 ea | 25,000 | 500,000 | 350,000 | 150,000 |
| Roof Gutters | 25 ea | 2,000 | 50,000 | 35,000 | 15,000 |
| Clean Water Diversion | 23 ea | 2,500 | 57,500 | 40,250 | 17,250 |
| Roofs | 2 ea | 25,000 | 50,000 | 35,000 | 15,000 |
| Barnyard Abandonment or Relocation | 1 ea | 60,000 | 60,000 | 42,000 | 18,000 |
| Manure Storage Facility [5] | 12 ea | 30,000 | 360,000 | 228,000 | 132,000 |
| Manure Storage Facility Abandonment | 2 ea | 10,000 | 20,000 | 14,000 | 6,000 |
| Cattle Mounds | 2 ea | 1,500 | 3,000 | 2,100 | 900 |
| Milking Center Waste Control | 14 ea | 5,000 | 70,000 | 49,000 | 21,000 |
| **Barnyard subtotal** | | | **1,170,500** | **795,350** | **375,150** |
| **Streambank Erosion Control** | | | | | |
| Shape and Seeding | 15,000 ft | 10 | 150,000 | 105,000 | 45,000 |
| Fencing | 500 ft | 1 | 500 | 350 | 150 |
| Rock Riprap [6] | 300 ft | 30 | 9,000 | 6,300 | 2,700 |
| Bio-Bank Stabilization | 300 ft | 25 | 7,500 | 5,250 | 2,250 |
| Crossing | 4 ea | 2,000 | 8,000 | 5,600 | 2,400 |
| Remote Watering Systems | 2 ea | 2,000 | 4,000 | 2,800 | 1,200 |
| **Streambank subtotal** | | | **179,000** | **125,300** | **53,700** |
| **Upland, Barnyard, and Streambank Subtotal** | | | **2,529,570** | **1,795,120** | **734,450** |
| Land Acquisition | 200 ac | 2,000 | 400,000 | 200,000 | 200,000 |
| Easements | 50 ac | 1,000 | 50,000 | 50,000 | 0 |
| **Total** | | | **2,979,570** | **2,045,120** | **934,450** |

1 Local share consists of labor and equipment costs. Also see flat rates in table 4-1.

2 High Residue Management is cost-shared per acre per year for a maximum of six years. Total cost shown is three times the cost per year as an average cost estimate.

3 Cropland Protection Cover and Nutrient and Pest Management are cost-shared per acre per year for a maximum of three years. Total cost shown is two times the cost per year for cover crop and three times the cost per year for nutrient and pest management.

4 Riparian Buffer Strips are cost-shared per acre per year for a maximum of five years. Total cost shown is five times the cost per year. This practice is an interim BMP.

5 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.

6 Add 300 feet rock rip rap at $60/per foot to urban budget for Howard's Grove.

Source: Wisconsin DNR, DATCP, and Sheboygan County

**Table 4-3 c. Total Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Manitowoc and Sheboygan Counties**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Upland Control** | | | | | |
| Change in Crop Rotation | 16,000 ac | NA | 0 | 0 | --- [1] |
| Contour Cropping | 150 ac | 9 | 1,350 | 1,350 | --- [1] |
| Contour Strip Cropping | 40 ac | 13.5 | 540 | 540 | --- [1] |
| High Residue Management [2] | 10,500 ac | 18.5 | 582,750 | 582,750 | --- [1] |
| Cropland Protection Cover [3] (Green Manure) | 4,000 ac | 25 | 200,000 | 200,000 | --- [1] |
| Intensive Grazing Management (Rotational Grazing) | 14 ea | 7,000 | 98,000 | 49,000 | 49,000 |
| Critical Area Stabilization | 650 ac | 400 | 260,000 | 182,000 | 78,000 |
| Grass Waterways | 10 ac | 3,000 | 30,000 | 21,000 | 9,000 |
| Field Diversions and Terraces | 2,000 ft | 3 | 6,000 | 4,200 | 1,800 |
| Grade Stabilization | 8 ea | 4,000 | 32,000 | 22,400 | 9,600 |
| Agricultural Sediment Basin | 8 ea | 10,000 | 80,000 | 56,000 | 24,000 |
| Shoreline Buffers | 270 ac | 400 | 108,000 | 75,600 | 32,400 |
| Nutrient Management [3] | 11,700 ac | 6 | 210,600 | 105,300 | 105,300 |
| Nutrient and Pest Management [3] | 14,000 ac | 7 | 294,000 | 147,000 | 147,000 |
| Spill Control Basin | 2 ea | 10,000 | 20,000 | 14,000 | 6,000 |
| Wetland Restoration | 400 ea | 2,000 | 800,000 | 560,000 | 240,000 |
| Riparian Buffer Strips [4] | 180 ac | 100 | 90,000 | 45,000 | 45,000 |
| Livestock Exclusion, Woods | 9,000 ft | 1 | 9,000 | 4,500 | 4,500 |
| Well Abandonment | 16 ea | 500 | 8,000 | 5,600 | 2,400 |
| **Upland subtotal** | | | **2,830,240** | **2,076,240** | **754,000** |

**Table 4-3 c continued. Total Estimated Best Management Practice Cost-Share Budget Needed to Meet Watershed Goals in Manitowoc and Sheboygan Counties**

| Best Management Practice | Number | Cost/Unit | Total Cost | State Share | Local Share |
|---|---|---|---|---|---|
| **Barnyard Runoff Control and Manure Storage** | | | | | |
| Filter Walls and Strips | 50 ea | 25,000 | 1,250,000 | 875,000 | 375,000 |
| Roof Gutters | 70 ea | 2,000 | 140,000 | 98,000 | 42,000 |
| Clean Water Diversion | 68 ea | 2,500 | 170,000 | 119,000 | 51,000 |
| Roofs | 3 ea | 25,000 | 75,000 | 52,500 | 22,500 |
| Barnyard Abandonment or Relocation | 3 ea | 60,000 | 180,000 | 126,000 | 54,000 |
| Manure Storage Facility [5] | 22 ea | 30,000 | 660,000 | 418,000 | 242,000 |
| Manure Storage Facility Abandonment | 4 ea | 10,000 | 40,000 | 28,000 | 12,000 |
| Cattle Mounds | 8 ea | 1,500 | 12,000 | 8,400 | 3,600 |
| Milking Center Waste Control | 22 ea | 5,000 | 110,000 | 77,000 | 33,000 |
| **Barnyard subtotal** | | | **2,637,000** | **1,801,900** | **835,100** |
| **Streambank Erosion Control** | | | | | |
| Shape and Seeding | 30,000 ft | 10 | 300,000 | 210,000 | 90,000 |
| Fencing | 3,500 ft | 1 | 3,500 | 2,450 | 1,050 |
| Rock Riprap* | 700 ft | 30 | 21,000 | 14,700 | 6,300 |
| Bio-Bank Stabilization | 700 ft | 25 | 17,500 | 12,250 | 5,250 |
| Crossing | 8 ea | 2,000 | 16,000 | 11,200 | 4,800 |
| Remote Watering Systems | 4 ea | 2,000 | 8,000 | 5,600 | 2,400 |
| **Streambank subtotal** | | | **366,000** | **256,200** | **109,800** |
| **Subtotal** | | | **5,833,240** | **4,134,340** | **1,698,900** |
| Land Acquisition | 300 ac | 2,000 | 600,000 | 300,000 | 300,000 |
| Easements | 250 ac | 1,000 | 250,000 | 250,000 | 0 |
| **Total** | | | **6,683,240** | **4,684,340** | **1,998,900** |

[1] Local share consists of labor and equipment costs. Also see flat rates in table 4-1.

[2] High Residue Management is cost-shared per acre per year for a maximum of six years. Total cost shown is three times the cost per year as an average cost estimate.

[3] Cropland Protection Cover and Nutrient and Pest Management are cost-shared per acre per year for a maximum of three years. Total cost shown is two times the cost per year for cover crop and three times the cost per year for nutrient and pest management.

[4] Riparian Buffer Strips are cost-shared per acre per year for a maximum of five years. Total cost shown is five times the cost per year. This practice is an interim BMP.

[5] 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.

[6] Add 300 feet rock rip rap at $60/per foot to urban budget for Howard's Grove.

Source: Wisconsin DNR, DATCP, Manitowoc and Sheboygan Counties

**Table 4-4. Estimated Staff Hours Needed to -Meet the Water Quality Goals for 10 Years of Project Implementation**

| Activity | Manitowoc County Staff Hours | Sheboygan County Staff Hours | Total Staff Hours |
|---|---|---|---|
| Project and Financial Management | 6,500 | 6,500 | 13,000 |
| Information and Education Program | 6,400 | 6,400 | 12,800 |
| Inventory and Planning [1] | 5,500 | 4,500 | 10,000 |
| Practice Design and Installation Upland Sediment Control | 12,000 | 10,000 | 22,000 |
| Barnyard Runoff Control and Manure Storage | 5,500 | 4,000 | 9,500 |
| Streambank Erosion Control | 2,100 | 1,900 | 4,000 |
| Monitoring BMP Operation and Maintenance | 3,700 | 3,000 | 6,700 |
| Training | 2,600 | 2,100 | 4,700 |
| Leave | 4,200 | 3,600 | 7,800 |
| **Total for 10 Year Implementation Period:** | **48,500** | **42,000** | **90,500** |
| **Total Per Year** | **4,850** | **4,200** | **9,050** |
| **Estimated Staff Required per year** | **2** | **2** | **4** |

Source: DNR, DATCP, Manitowoc and Sheboygan Counties

[1] Inventory and Planning includes: Inventory, Critical Site Verification, Landowner Contacts, Conservation Planning and Plan Revisions, Cost-Share Agreement Development and Amendment, and Progress Tracking.

**Table 4-5. Rural Cost Estimates for the Pigeon River Priority Watershed Project**

| Item | State Share |
|---|---|
| Cost Share Funds | 4,100,000 |
| Easements and Land Acquisition | 550,000 |
| Local Assistance Staff Funding | 1,719,500 |
| Information and Education Direct | 60,000 |
| Other Direct (travel, supplies, etc.) | 110,000 |
| Engineering Assistance | 100,000 |
| **Total** | **6,639,500** |

Source: DNR, DATCP, and Manitowoc and Sheboygan Counties

**Table 4-6. Cost Share Budget Needs for Urban Management Practices**

| Item | City of Sheboygan | | Village of Howards Grove | | Town of Sheboygan | | Total |
|---|---|---|---|---|---|---|---|
| | State Share | Local Share[1] | State Share | Local Share | State Share | Local Share | |
| Practices within Established Urban Areas[2] | 49,000 | 21,000 | 49,000 | 21,000 | 98,000 | 42,000 | **280,000** |
| Subtotal NPS[3] | 49,000 | 21,000 | 49,000 | 21,000 | 98,000 | 42,000 | **280,000** |
| Construction Site Erosion Control Ordinance (CSECO) Development | 2,000 | 0 | 0 | 0 | 2,000 | 0 | **4,000** |
| CSECO Implementation[4] | 7,800 | 44,200 | 11,700 | 66,300 | 11,700 | 66,300 | **208,000** |
| Stormwater Planning | 0 | 0 | 47,000 | 20,000 | 82,000 | 35,000 | **184,000** |
| Engineering Design and Feasibility Studies | 4,900 | 2,100 | 4,900 | 2,100 | 9,800 | 4,200 | **28,000** |
| Wellhead Protection | 2,800 | 1,200 | 2,800 | 1,200 | 2,800 | 1,200 | **12,000** |
| Subtotal LAG[5] | 17,500 | 47,500 | 66,400 | 89,600 | 108,300 | 106,700 | **436,000** |
| **Total** | **66,500** | **68,500** | **115,400** | **110,600** | **206,300** | **148,700** | **716,000** |

1 The local share of the cost of practices on established urban areas and stormwater planning may be paid by private landowners or other state agencies instead of local governments where applicable.
2 BMPs for established urban areas include wet detention basins, oil-grit separators, and storm sewer outfall forebays or infiltration practices. Local governments or private landowners bear the additional cost of operation and maintenance (not included in the table).
3 Nonpoint Source Grant
4 Funding for implementation limited to three years following adoption of an ordinance at maximum 50% state share. Fees are expected to support implementation after this period.
5 Local Assistance Grant. Information and educational activities to promote pollution prevention practices will be coordinated by the local municipalities and funded through their LAG.

# CHAPTER FIVE:
# Education Strategy

This chapter describes the education strategy developed by members of the Pigeon River Citizens Advisory Committee and staff to support implementation of the water quality recommendations made in this plan. The strategy sets goals, identifies target audiences, recommends activities to reach these audiences, and estimates funding needs. Appendix E contains more specific descriptions of activities, timing and responsible parties.

## Setting Priorities

Based on preceding chapters of this plan, the major water quality problems which must be addressed by the education strategy for the Pigeon River Watershed are:

- Unusually high levels of dissolved phosphorus in runoff from farmland, primarily due to manure spreading practices.
- Sediment and nutrients from eroding cropland.
- Sediment from eroding construction sites.
- Nutrients, bacteria and decaying organic matter from barnyards.
- "Flashy" flow patterns due to wetland loss, channelization, and urban development
- Increases in sediment, nutrients and potentially toxic pollutants in runoff from expanding urban and suburban areas.

To address these water quality problems, the education strategy must support implementation of the solutions recommended in the plan. Specifically, the strategy must help build:

- Public appreciation of water resources, awareness of the watershed program, and support for water quality improvement efforts.
- Participation in pollution prevention programs for urban runoff including sound land use planning.
- Participation in the watershed cost-sharing and other agricultural programs.
- More effective construction site erosion control programs.
- Participation in watershed cost-sharing and manure management planning.
- Development and implementation of stormwater ordinances and plans.
- Participation in watershed cost-sharing for riparian buffers and wetland restoration.
- Due to limited staff and funding, information and education program cannot address all of these needs at once. Therefore, budgets and schedules for information and education programs will be based in large part on this priority list.

## Defining Audience and Watershed Characteristics

Each watershed has distinctive characteristics that must be considered when developing an information and education strategy. Land uses, fanning practices, water quality problems, and population characteristics dictate the type and content of educational programs and informational materials that are needed. The Pigeon River Watershed has characteristics that distinguish it from its neighbors and yet it also has similarities. Therefore, the strategy recommended for this watershed relies on some programs shared with neighboring watersheds and on some geared to this watershed's particular needs.

### Watershed Characteristics

**Dairy Herd Expansion:** The Pigeon River Watershed, like much of northeastern Wisconsin, is experiencing a dramatic increase in dairy herd size. Instead of herds with 50 to 100 milking cows, some farms have expanded to herds of 300 to 1000 or more milking cows. These farmers may need to work with surrounding landowners to assure adequate acres for proper manure use.

Cropping patterns also change as dairy herds expand. These large farms have larger fields and use larger equipment which may cause soil compaction. These operations may rent rather than own all of their land. They grow more corn silage for feed. Because silage leaves little residue after harvest for conservation tillage, alternatives such as cover crops may be the best way to reduce soil erosion. Also, selecting fields less prone to erosion for growing corn silage will help reduce sedimentation.

The content and target audiences for educational programs must respond to these changes. Programs must cover manure management and soil erosion control techniques suitable for modern dairies, covering both farm owners and farm renters. Because much of the field work on large farms is done by hired help, programs must also reach farm employees and commercial applicators. Potential partners in this educational effort include farm suppliers, crop consultants and co-ops.

**Upland Erosion:** Controlling erosion from upland farm fields in the watershed is an ongoing challenge. Although cool spring weather and clay soils have slowed the adoption of conservation tillage, new equipment and pesticides are now making it more practical. A large turnout at the 1997 soybean conservation tillage field day in Sheboygan County indicated an active interest by key farmers. To support more widespread adoption of conservation tillage the watershed project will need additional demonstration projects, careful documentation of profitability, and incremental approaches to implementation.

The notable lack of vegetated buffers along streams and intermittent waterways in this watershed leaves the river system unprotected from runoff carrying sediment, fertilizers, and pesticides from adjacent farm fields. Changing this pattern of farming will require special effort. A concerted program of one-on-one calls, direct mailings, neighborhood meetings and support from

local sportsmen's clubs is needed to make stream buffers the norm, rather than the exception, in this watershed.

**Urbanization Pressure:** Today, the Pigeon River Watershed is mostly undeveloped with 90 percent of the land remaining in rural land uses. However, the watershed lies just north of the City of Sheboygan and its nearby neighbors, Sheboygan Falls and Kohler. Development from this urban area is spreading into the watershed, particularly in the Town of Sheboygan. Growth is also occurring adjacent to the Village of Howards Grove which lies roughly in the center of the watershed. Since 1980, the portion of land in urban uses in the watershed has grown from six to ten percent. Because most of the urban runoff problems in this watershed are related to new development, the urban educational efforts must emphasize preventing pollution through land use planning, stormwater design for new development, and construction site erosion control.

**Neighboring Watershed Projects:** The Pigeon River Watershed adjoins two other watersheds in the Priority Watershed Program: the Sheboygan River and Seven Mile-Silver Creek. These neighboring watershed projects have already raised local awareness of NPS pollution and landowner participation in watershed projects. Because the Pigeon River and Sheboygan River Watersheds are both part of the Sheboygan River Basin, opportunities for combining newsletters, utilizing existing demonstration projects, and other joint educational activities should be explored. Coordinating information and education programs with adjacent watersheds will use staff and limited funds more efficiently and avoid sending conflicting messages. Careful coordination is especially important for the public awareness activities needed to reach urban and suburban audiences.

**Audience Characteristics:** Key audiences have been prioritized into five categories for the watershed educational strategy:

1. Rural landowners and operators.
2. Local governments and community leaders.
3. Business and industry, especially agricultural and construction.
4. Urban, suburban and lake area residents.
5. Youth.

Important characteristics of each group and information about the best ways to reach them are summarized below.

**Rural Landowners and Operators:** Agricultural land uses account for 70 percent of the area in the Pigeon River Watershed and eroding cropland is still the leading source of sediment to the lakes. Therefore, rural landowners and operators are a key audience because their action in controlling erosion is essential to meeting water quality objectives.

General characteristics of rural audiences in this watershed include the following:

- expanding dairy herds

- increased pursuit of hobby farms and large suburban agricultural activity, and
- increased use of conservation tillage.

The best strategy to reach this audience includes the use of the following:

- One-on-one contacts with tailored materials.
- Articles in farm newspapers.
- Demonstration projects, field days, and mini-tours.
- Fact sheets on recommended practices, with an emphasis on conservation tillage, nutrient and pest management and profitability.
- Presentations for special interest groups such as 4H and FFA.
- Exhibits at county fairs.

**Local Governments and Community Leaders:** Ten local governments in the watershed will have a role in implementing the watershed plan. The Pigeon Lake Watershed also includes a lake association and sanitary district. Characteristics of the local government and community leader audiences observed during the planning process include:

- Reluctance to tax more than neighboring communities, resistance to raising local taxes, and concern about economic issues such as job attraction and expanding tax base.
- Concern about protecting quality of life for residents.
- Ability of community and conservation groups to act independently and decisively about environmental issues which they support.

The most effective ways to reach these audiences are:

- Presentations at local government and community group meetings with high quality support materials.
- Workshops for local government staff.
- Working directly with local government staff to identify opportunities for implementing plan recommendations.
- Pollution prevention audits of current public works and parks activities.
- General readership articles in local newspapers.
- Targeted watershed newsletters.
- BMP tours, including demonstration projects in adjoining watersheds.

Considerable time and effort must be devoted to this audience due to the importance of their actions to plan new development, control construction erosion, manage stormwater runoff, and protect buffers adjacent to lakes and stream.

**Business and Industry:** The primary business and industry audiences who must take action to implement or support the implementation of plan recommendations are farm co-ops, private applicators, implement dealers, developers, contractors, builders, and golf courses.

Characteristics of this audience which should be considered when selecting educational methods and developing materials include:

- Economic costs and benefits.
- Customer service and satisfaction
- A sense of civic responsibility and pride in their work.
- Value placed on quality of life (including clean water for recreation)
- Subdivision marketing.
- Seasonal variations in time availability.

Effective methods for use with this audience include:

- Locally available workshops, videos, fact sheets, handbooks, and technical assistance for crop consultants, farm suppliers, co-ops, developers, contractors and builders.
- Fact sheets on recommended agricultural practices, with an emphasis on conservation tillage, nutrient and pest management, and profitability.
- Watershed speakers for business and industry associations, including builders associations and chambers of commerce.
- Articles in agricultural and building trade journals; exhibits at appropriate industry shows and meetings (e.g., home shows); recognition of good practices, possibly using these as examples for tours.

**Urban, Suburban and Lake Area Residents.** Based on surveys of urban and suburban residents conducted in other watersheds, most (50 to 60 percent) are likely to learn about water quality issues through television or newspaper reports, community newsletters, or materials received in the mail. Only a few (less than 15 percent) are very likely to attend meetings or workshops, check out video programs from their libraries or tour demonstration projects. However, most residents are supportive of water quality improvement programs and are willing to take action at home to protect their environment by recycling oil, cleaning up pet waste, separating household hazardous waste for collection, limiting use of yard chemicals, directing downspouts onto lawns, and composting leaves and grass clippings.

Characteristics of the urban and suburban audience which must be kept in mind when selecting educational techniques and developing materials include:

- Value placed on quality of life and clean neighborhoods.
- Respected leaders in the community.
- Perception that industry is the leading cause of water quality problems.
- Preference for funding sources other than property taxes.
- Reliance on television, radio, and newspapers for current information.
- Reluctance to attend meetings or workshops unless highly motivated by personal interests.

To reach the broad spectrum of urban residents information and education initiatives must revolve around media coverage. Recommended methods include:

- Coverage including news, feature articles, and targeted advertising.
- Television and radio coverage including news and talk shows.
- Water Action Volunteer (WAV) activities and other volunteer activities for interested community groups.
- Watershed newsletters sent to interested citizens and groups.
- Printed materials and signs distributed at key times and locations.
- Watershed speakers for local groups with high quality audio-visual and printed materials.
- Exhibits at local events, especially water-related ones.
- Storm drain stenciling of sewered neighborhoods

The educational approach for the urban and suburban public relies heavily on the mass media and mailings or handouts for targeted groups of residents such as waterfront property owners, pet owners, purchasers of vehicle oil and yard chemicals, and boat owners. Workshops, speakers, demonstrations, and leader training are more appropriate for interested citizens and organizations.

**Youth:** Youth are addressed by this plan because they are the ones who must support future action to reduce nonpoint source pollution. Youth also influence today's decision-makers and are a focus of media attention. The statewide movement to infuse environmental education in school curricula makes the timing for water quality education initiatives especially appropriate.

Characteristics of the youth audience include:

- Interest and participation in water-based recreation.
- Local access to rivers, wetlands, and wildlife habitat.
- Access to water resource education, including teachers having appropriate training and adequate funding for field trips.

Educational activities recommended for this audience include:

- Use or adaptation of existing water resources curricula.
- Speakers for schools, teacher in-services, and youth leader workshops.
- Expansion of the "Testing the Waters" program to include more middle and high schools in this watershed.
- Youth group projects, including storm drain stenciling, litter cleanups and other volunteer activities.

## Goals, Audience and Activities

This section is the heart of the information and education strategy for the Pigeon River Watershed. It sets goals, identifies target audiences, and recommends specific activities to reach these audiences. Appendix E includes more detailed activity descriptions.

**Public Support**

Develop awareness of the Pigeon River Watershed project, including appreciation of the water resources, and support for implementing and maintaining practices recommended in the plan.

**Target Audiences:**

- Respected leaders in the community, local government officials, and their staff.
- Farmers, rural landowners, operators.
- Businesses, especially co-ops, farm suppliers, private applicators, implement dealers, and golf courses.
- Urban and suburban residents.
- Educational institutions.
- Civic and service organizations, conservation and environmental groups, youth groups.
- General public, both adults and children.

**Ways to Reach Audience:**

- Sponsor volunteer activities such as volunteer monitoring (WAV), adopt-a-stream, adopt-a-lake, and river cleanups.
- Develop slide presentations to loan community groups and schools.
- Hold public officials tour(s).
- Expand the Testing-the-Waters Program (water quality monitoring for middle and high school students).
- Develop an interactive World Wide Web home page and CD.
- Give slide presentations of implementation progress and success stories for the Citizens Advisory Committee, farm groups, and others.
- Work on expanding newspaper coverage, during the summer and harvest seasons.
- Publish success stories in watershed newsletters.
- Write news stories featuring children, senior citizens, the WAV project.
- Involve senior citizens in watershed volunteer projects.
- Make one-on-one contacts with landowners and operators with appropriate information packets.
- Display watershed related signs such as stream identifiers signs at road crossings, watershed entry signs, and informational signs at parks.
- Encourage canoeing on the Pigeon and Meeme Rivers in newsletter articles and by finding local groups such as Boy Scouts and Maywood to sponsor canoe trips.
- Support lake area residents in organizing more lake associations in the watershed; currently, only Pigeon Lake has a lake association.

**Conservation Tillage**

Develop widespread understanding and adoption of conservation tillage. Demonstrate how conservation tillage can be both profitable and protective of water quality.

**Target Audiences:**

- Farmers
- Co-ops
- Crop consultants

**Barriers to Overcome:**

In this and other watersheds in eastern Wisconsin, farmers have been reluctant to implement conservation tillage as a soil erosion control measure for a variety of reasons. The following barriers must be considered in designing educational programs related to conservation practices:

- Perceived and real economic loss and lower yields.
- Required updates and upgrades of expensive equipment.
- Learning curve of two to seven years.
- Use of carefully timed plowing.
- Learning new techniques to manage weeds.
- Past conservation tillage failures (due to wrong equipment and poor weather).
- Poor success due to working with rough fields, clay soils, cool spring, and high water retention.
- Insufficient residue for corn silage conservation tillage.

**Audience Outreach:**

- Demonstrations, tours, plots, field days, data on profitability, especially in relation to corn.
- Start with willing participants who can afford to change machinery or are willing to rent the appropriate equipment.
- Start small (i.e., with wheat, then soybeans, then corn) or start with one field before moving to a larger area.
- Educate farmers about different weed management regimes, including use of fewer chemicals.
- Start a conservation tillage network.
- Install signs on participating farms.
- Publish a feature story on successful conservation tillage in AgriView, watershed, and county newsletters.
- Develop a self-guided tour with a map showing conservation tillage fields, including site specific information (crops planted, growing schedule, equipment and products used).
- Publish local results of PEPS contest.
- Increase availability of rental equipment.
- Publish list of implement dealers who provide conservation tillage equipment in addition to Sheboygan County UWEX.
- Present zone tillage information as simply as possible
- Contact FFA Alumni in Howards Grove and Kiel about conservation tillage programs.

**Buffers, Riparian Areas & Wetlands**

Develop a greater knowledge and understanding of the benefits and use of stream, lakeshore and wetland buffers.

**Target Audiences:**

- Conservation groups
- Pigeon Lake Association and Liberty Sanitary District
- Lake front, stream front and wetland property owners
- Developers
- Farmers and rural property owners
- Legislators and state agency staff
- Golf course owners

**Audience Outreach:**

- Make one-on-one calls, group meetings, and direct mailings to target audiences (specific owners of stream, lake, and wetland edge property) and identify appropriate buffers for specific land uses.
- Change stakeholders vision of what constitutes healthy streams and lakes, and foster an appreciation of wildlife.
- Provide alternative information to property owners promoting protective, land uses such as land trusts and conservation easements.
- Involve local sportsmen's groups in supporting buffer cost-sharing and contacting property owners.
- Involve youth groups, Trout Unlimited, and stakeholders in planting trees and shrubs in buffers.
- Involve lake associations in contacting property owners about use of buffers.

**Manure, Milkhouse Waste, and Barnyard Runoff Management**

Develop a greater stakeholder understanding and knowledge of the effects of manure and milkhouse waste on the Pigeon River and it's tributaries. Increase implementation of environmentally protective measures of manure, milkhouse waste, and barnyard runoff by linking it with profitability.

**Target Audiences:**

- Livestock farmers
- Commercial applicators

**Audience Outreach:**

- Emphasize water quality aspects of 590 plans as part of personal contacts; don't assume farmers will read the plan.

- Hold group meetings to review the 590 plans with farmers eligible for funding of storage facilities, including required three to five year performance evaluations of manure management operations.
- Update commercial applicators and farmers on manure and milkhouse waste management
- through winter meeting(s):
- Direct mailings
- Publish success stories on manure, milkhouse waste and barnyard runoff management in watershed and county newsletters
- Conduct demonstration projects, field days, tours and educational programs for farmers, operators and owners
- Install signs on participating farms

**Construction Site Erosion Control**

Develop awareness of the importance of erosion control during and after construction.

**Target Audiences:**

- Builders and contractors
- Construction foremen
- Building inspectors
- General public, especially home builders
- Town, city and village officials

**Audience Outreach:**

- Get more uniform enforcement
- Hold a countywide meeting or workshop for people who enforce erosion control.
- Distribute "how to" packets to those applying for building and grading permits.
- Work with builders associations to disseminate information, sponsor workshops, and develop new policies.
- Distribute news releases and newspaper stories on construction site erosion control.
- Publish articles in municipal newsletters about construction site erosion control.
- Hold one of the statewide erosion control workshops in Sheboygan.

**Stormwater Management**

Develop awareness of the importance of stormwater management in urban areas. Foster the knowledge and skills needed to plan, implement, and maintain stormwater management BMPs.

**Target Audiences:**

- Local government staff and officials
- Developers, contractors and builders
- Business and industry.

**Audience Outreach:**

- Conduct stormwater management and site planning techniques workshops for planning commission and zoning board members.
- Provide presentations for county towns associations.
- Hold individual town meetings covering stormwater management, site planning, and land use planning (priorities: Towns of Sheboygan, Liberty and Meeme).
- Use the City of Sheboygan's new stormwater pond near Mill Road as demonstration site for tours and news articles.

**Land Use and Site Planning**

Promote greater understanding and implementation of land development which minimizes degradation of water and other natural resources.

**Target audiences:**

- Developers
- Land managers of large facilities
- Landscape designers
- Local government officials and staff
- Regional planning commissions and local planning agencies
- Consultants

**Audience Outreach:**

- Conduct workshops for grounds maintenance staff and landscape designers on landscape design and maintenance alternatives.
- Review noxious weed ordinances and make changes necessary to allow natural landscaping.
- Work with Towns Associations to address urban sprawl and land use planning.
- Consider adding a land use element to the Sheboygan County Testing the Waters program for high school students.
- Investigate the NRCS program for preserving farmland through purchase of development rights.
- Encourage the use of computerized land information and geographic information systems to improve decision-making related to water resource protection.

**Pollution Prevention**

Develop awareness and knowledge of BMPs to prevent runoff pollution from urban and suburban areas.

**Target Audiences**

- Urban and suburban residents - adults, youth and children
- Golf course owners and ground keepers

- Local government officials and staff
- Business and industry

**Audience Outreach:**

- Stencil storm drains with a "Dump No Waste - Drains to Stream" message.
- Recruit and train long-term volunteers to coordinate storm drain stenciling programs.
- Distribute UW-Extension handouts on pollution prevention methods at public places and events.
- Promote use of the Sheboygan County permanent household hazardous waste disposal site.
- Place pollution prevention articles in municipal newsletters.
- Discuss pollution prevention at Testing the Waters and other school presentations.
- Conduct a workshop for golf course owners and ground keepers on fertilizer and pesticide use and establishment of buffers.
- Provide information on municipal pollution prevention practices to public works staff.

## Education Budget

This budget includes watershed-specific costs for the Pigeon River Watershed Project. It does not, however, reflect costs of newsletters, fact sheets, workshops, and other activities covered through contracts between DNR and UW-Extension. County staff time for educational programs is included in Chapter 4. Costs listed in this budget are based on 1997 data and will require future adjustment to reflect available funds, inflation, and activity changes.

**Table 5-1. Education Budget for the Pigeon River Priority Watershed Project**

| Responsible Party | Budget |
|---|---|
| **County Land Conservation Departments** [1] | |
| Sheboygan County ($2000/yr for 10 years) | $20,000 |
| Manitowoc County ($2000/yr for 10 years) | $20,000 |
| **Local Governments** [2] | |
| Urban Grantees | $30,000 |
| **Special Projects** | |
| Testing the Waters | $3,000 |
| Volunteer Monitoring Program | $5,000 |
| Signs | $15,000 |
| Displays | $2,000 |
| **Total** | **$95,000** |

1 Includes expenses such as postage for newsletters and news releases; costs of conducting tours, meetings and field days; assembling packets for one-on-one contacts; printing and postage for direct mailings.

2 Includes expenses such as costs of conducting tours and meetings, printing and postage for direct mailings, storm drain stenciling, and river cleanup projects.

# CHAPTER SIX:
# Integrated Resource Management Program

## Introduction

In the "spirit of cooperation", the watershed team will bring together the efforts of many people and programs to achieve the best possible protection and management for the land and water resources in the Pigeon River Watershed. The Pigeon River Watershed Citizens Advisory Committee (CAC) recommended partnerships between landowners, public agencies, and grass-roots organizations be built to achieve watershed project goals. The purpose of this chapter is to recommend a strategy to target state, federal, and local resource programs and management initiatives towards the Pigeon River Watershed.

The Manitowoc Soil and Water Conservation Department and the Sheboygan County Land Conservation Department will convene the following four work teams to develop and implement a strategy to integrate state, federal, and local initiatives which help achieve the goals of the Pigeon River Priority Watershed Project. The role of the four work teams is to plan watershed initiatives and activities, cultivate working partnerships and seek supplementary financial and technical assistance to achieve watershed goals.

## Watershed Work Teams

### 1.) Agricultural Team

USDA Representative Sheboygan County LCD
Manitowoc County SWCD
WDNR
GLNAC
UWEX
DATCP
RC&D
Farm Cooperatives
Farm Organizations
Farm Implement Dealers

### 2.) Wildlife and Fish Resources Team

USFWS
DATCP
RC&D
Sheboygan County LCD
Manitowoc County SWCD
WI Conservation Corps (WCC)
USDA
Conservation Organizations
UWEX
WDNR

### 3.) Watershed Education Team

Teachers
Sheboygan County
Manitowoc County SWCD
Editors of Local Newspapers
Naturalists
UWEX
WDNR
Volunteer monitoring

### 4.) Land Use and Transportation Team

City of Sheboygan
Village of Howards Grove
Town Representatives
County Planners
UWIEX
WI Dept. of Commerce
WDNR
Bay Lake RPC
Sheboygan County LCD
Manitowoc County SWCD
Land Conservancy Organizations
GLNAC

## Program Coordination and Integration

Success of the Pigeon River Watershed Project can only be achieved if information is shared and actions are carried out jointly with other public and private resources management agencies and organizations. The Integrated Resource Management Plan for the Pigeon River Watershed Project focuses on coordinating other people and their programs to achieve project goals. The following tables list public programs and private organizations that can provide financial, technical, and public support to achieve project goals.

**Table 6-1. Programs to Improve Wildlife and Fisheries Habitat**

| Program / People | Sponsor | Program Description |
|---|---|---|
| Wildlife Habitat Incentive Program (WHIP) | USDA | Cost-share assistance for implementation |
| Partners in Wildlife Program | USFWS | Cost-share assistance for implementation |
| Lake Protection Grant Program | WDNR | Grants for land acquisition for lake protection, ordinance |
| Stewardship Program | WDNR | Grants for land acquisition |
| Wisconsin Waterfowl, Pheasants Forever, Ducks Unlimited, Trout Unlimited, Sportsman's Clubs, Isaac Walton League | WDNR | Technical assistance, public support for financial assistance to reclaim, restore, and enhance wetlands |
| Wetland Reserve Program | USDA | Easements / restoration |
| Coastal Zone Management Program | State of WI | n.a. |
| Partners in Wildlife | USFWS | n.a. |
| WCC | USFWS | Workforce provided to construct BMPs |

**Table 6-2. Programs to Reduce Sediment and Phosphorus Load from Agricultural Land**

| Program / People | Sponsor | Program Description |
|---|---|---|
| EQIP | USDA | Technical and cost-share assistance |
| Resource Conservation and Development | USDA | Technical and cost-share assistance |
| Coastal Zone Nonpoint Source Pollution Program | WDNR | n.a. |
| Coastal Zone Management Program | WDNR | n.a. |
| Conservation Reserve Program Development | USDA | Annual payments to retire sensitive land from cropping. |
| Lake Protection Grant Program | WDNR | Cost-share grants to use BMP's |
| Conservation Compliance (FSA) | USDA | Conservation planning |
| Conservation Compliance Farmland Preservation | DATCP | Tax credits to preserve farmland |
| NR243 Program | WDNR, DATCP | Regulatory and cost-share grants for animal waste management |
| Partners in Prevention | US EPA | Planning and education |
| Farm-A-Syst | UWEX | Farm planning and education. |
| Farmland Protection Program | USDA | Planning, easements |

**Table 6-3. Programs to Reduce Urban Pollutant Loadings**

| Program / People | Sponsor | Program Description |
|---|---|---|
| Ordinances | Local Governments | n.a. |
| Construction Site Erosion Control | WDNR, WI Department of Commerce, Local Governments | n.a. |
| Stormwater Management | WDNR, Local Governments | n.a. |
| NR 216 Permits | WDNR | n.a. |
| Land Use Planning and Transportation Plans | Local Governments | n.a. |

**Table 6-4. Programs to Increase Public Awareness of Water Quality Issues in the Watershed**

| Program / People | Sponsor | Program Description |
|---|---|---|
| Maywood Environmental Education Center | Same | Public education |
| Agricultural Organizations | Same | Public education |
| Cooperatives | Same | Public education |
| Crop Consultants | Same | Public education |
| Farm-A-Syst | UWEX | Public education |
| EQIP | UWEX | Public education |
| Water Action Volunteers | UWEX | Water quality monitoring |
| Testing the Waters | Maywood Environmental Park, Local Schools | Water quality monitoring |
| Project WILD | Maywood Environmental Park, Local Schools | Water quality monitoring |
| Project WET | Maywood Environmental Park, Local Schools | Water quality monitoring |

## Coordination with Other Resource Management Programs

The Watershed Project Team will recognize other resource management issues during the implementation of the project and coordinate actions to protect groundwater, woodland resources, endangered and threatened resources, and archaeological sites. Implementation actions, such as the construction of best management practices (BMPs), must comply with federal, state and local regulations and permitting requirements. The following section provides a review of the management programs that the Project Team will target during implementation of the Pigeon River Priority Watershed Program.

## Groundwater Management

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 Pigeon River Watershed. Manitowoc and Sheboygan Counties will encourage all landowners to properly seal abandoned wells. Information on the proper abandonment procedures will be provided to landowners when abandoned wells are located.

### Well Abandonment

Consolidated Farm Services Agency (CFSA), provides cost-share assistance to Pigeon River Watershed farm operators to properly seal abandoned wells to protect groundwater resources. Well abandonment is not an eligible cost-share practice under NR 120, Wis. Adm. Code.

### 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 which exceed state or federal drinking water standards. With the exception of livestock wells contaminated with more than 40 ppm of nitrate, replacement of wells contaminated with bacteria or nitrate are not eligible for cost-sharing. DNR district water supply personnel should be consulted for more information concerning income limits and other eligibility requirements.

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

## 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 Pigeon River Watershed. Pollutants from

sewage system discharge includes bacteria, viruses, household chemicals, nitrates and phosphorus. Many sewage systems located in riparian areas are out-dated and installed in soils which do not adequately filter pollutants. Failing sewage systems in riparian areas are a special concern since pollutants can enter 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.

Manitowoc and Sheboygan County staff will prepare educational materials to promote the proper maintenance of private sewage systems. Sewage system maintenance and household tips to reduce groundwater contamination will also be stressed during field visits and "home environmental audits".
It is also recommended Manitowoc and Sheboygan Counties adopt an "update at date of sale" policy to require the proper inspection, update and/or replacement of septic systems when homes are sold in Manitowoc and Sheboygan Counties.

**Wisconsin Fund**

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

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

## Stewardship

The Stewardship program assists local units of government and qualified non-profit conservation organizations purchase land or conservation 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, local units of government, and qualified non-profit conservation organizations are awarded grants to 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 stream fencing to prevent livestock access. Manitowoc and Sheboygan Counties should support the nomination of the streams in the Pigeon River Watershed for stewardship eligibility. Manitowoc and Sheboygan County staff and DNR Fisheries personnel will participate in the selection process and review watershed streams for recommendation.

# Forestry Programs

Private forest lands, which account for a large percentage of land cover within the Pigeon River Watershed, are important producers of forest products in Manitowoc and Sheboygan Counties. Private forest lands also contribute to the quality of water resources and fish and wildlife resources in the watershed. Financial assistance is available for forest management and soil and water resource protection through the Stewardship Incentive Program (SIP), the Managed Forest Law Program (NIFL) and other forest stewardship programs. Additional information can be found in DNR publication FR-093-95, Wisconsin Forestry BMPs For Water Quality, developed by DNR Bureau of Forestry.

## Stewardship Incentive Program

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

## Managed Forest Law

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

Manitowoc and Sheboygan county staff and DNR Foresters will encourage eligible forest landowners in the Pigeon River Watershed to participate in Forest Stewardship Programs to benefit water resources and forest habitat. Protection of soil and water resources should be addressed in all SIP and MFL plans where applicable.

## Coordinating Regulations, Permits, and Zoning

BMPs addressing shoreline erosion such as rip rap or vegetative shoreline stabilization require permits from the DNR. Any BMP which effects wetland value or function may require permits form the DNR, Manitowoc and Sheboygan County Zoning offices and the US Army Corps of Engineers. Manitowoc and Sheboygan County will work closely with the DNR Water Regulation and Zoning staff, Manitowoc and Sheboygan County Zoning Departments and the US Army Corps of Engineers to assume 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 disturbing or removing natural vegetation surrounding 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 their importance. Manitowoc and Sheboygan Counties will work in cooperation with the Property listing Department, Zoning Department and the DNR to provide information packets to new waterfront property owners throughout Manitowoc and Sheboygan Counties to educate residents about the existence of zoning regulations and the proper contacts to make within each agency. The guides will also educate lakefront residents about the steps they can take to become responsible lake stewards.

## Coordination with State and Federal Conservation Compliance Programs

The Pigeon River Watershed Project will be coordinated with the conservation compliance features of the Wisconsin Farmland Preservation Program (FPP) administered by DATCP, and the Federal Food Security Act (FSA) administered by the Natural Resource Conservation Service. DATCP will assist the LCD and the NRCS offices to identify landowners within the watershed subject to the compliance provisions of FPP and FSA. Conservation plans developed under state and federal programs will be reviewed and amended during the implementation phase of the watershed project. Watershed project staff will inform FPP and NRCS staff of changes in plans resulting from management decisions and the installation of needed BMPs for nonpoint source pollution abatement.

## Coordination with State and Federal Historic Preservation Laws

The Manitowoc County Soil and Water Conservation Department and the Sheboygan County Land Conservation Department will obtain maps with the known archeological sites in the Pigeon River Watershed. Landowners with project sites will be requested to complete questionnaires from the State Historic Society to locate non-inventoried sites. The Counties will request the assistance of the State Historical Society to conduct additional surveys. If the construction of a best management practice may impact a known archeological site, then an archeological survey must be conducted by a registered archeologist to asses the impact of the

site by the construction of the BMP. Alternative BMPs will be considered before and after the results of the survey.

## Endangered and Threatened Resources

Comprehensive endangered and threatened resource surveys have not been conducted for the Pigeon River Watershed. The WDNR Bureau of Endangered Resources is continuously updating records, files and maps from ongoing filed work. Manitowoc and Sheboygan Counties will coordinate activities with the Bureau to ensure BW construction will protect endangered and threatened resources known to inhabit the project area.

# CHAPTER SEVEN:
# Project Evaluation

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

- Project Performance Evaluation
- Integrated Resource Management Program Review
- Water Resource Monitoring Evaluation

The project team will meet early in the year throughout the implementation phase to review and evaluate the accomplishments of the preceding year. A reporting system that documents progress towards meeting project goals will be developed by the project team. The Water Resource Monitoring Evaluation follows guidance established by DNR's Bureau of Water Resources Management to select specific sites in the watershed to monitor resource quality changes.

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

## Project Performance Evaluation

The first component, the Project Performance Evaluation, will focus on the progress of Manitowoc and Sheboygan 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.

### Progress Towards Meeting Rural Project Goals

The LCD/SWCD will provide the following data to the DNR and the DATCP annually:

- Number, location and type of planned and completed BMPs.
- Number, location and type of planned and completed conservation plans.
- Description and evaluation information and education activities undertaken.

- Discussion and report regarding progress toward meeting CAC project goals.

Accomplishment data are summarized in the Annual Accomplishment Report prepared by DATCP and DNR, and are also discussed at watershed review meetings held annually for projects in implementation. Additional evaluation data provided by LCD/SWCD for the annual watershed review include:

- Pollutant load reductions achieved
- Status of grants and related financial activities
- Evaluation of landowner participation
- Status of project administration including data management, staff training, and BM[P monitoring
- Number and location of nutrient management plans developed Effectiveness of construction site erosion control activities
- Status of stormwater management activities for new development undertaken by
- watershed municipalities
- Number and location of conservation easement and land acquisition
- Number and location of wetland restoration projects
- Number and location of stream buffer projects
- Identify problems relating to project implementation
- Identify project priorities for the following year
- Listing of needs for the following year
- Identification of necessary plan amendments.

**Progress Towards Meeting Urban Project Goals**

Likewise, participating local units of government implementing the urban NPS management program should meet periodically with DNR staff to review progress. The DNR and local units of government will jointly evaluate the urban implementation program by reviewing activities conducted during the previous year and changes to existing procedures. Annual reports of governmental units will include:

- Information and education activities. A summary of all activities completed and individual activity reports identifying the target audience, number of people reached, and a detailed description of the activity.
- Pollutant load reductions achieved.
- Construction site erosion control ordinance and amendments adopted.
- Construction site erosion control program information including number of permits issued, land use type and size of construction sites, permit fees collected, number of inspections conducted, number of citations and stop work orders issued, and an assessment of the effectiveness of the municipalities construction erosion control program.
- Level of effort on implementation of urban pollution prevention program activities including leaf collection, street sweeping, catch basin cleaning, grass clipping and

brush collection, storm sewer cleaning, drainage ditch maintenance, snow removal and street salting, and fertilizer and herbicide use.

- Acres of existing (1995) urban development, by land use, covered by storm water management plans for controlling water quality.
- Acres of new (post-1995) urban development, by land use, covered by storm water management plans for controlling water quality.
- Stormwater management ordinance provisions and amendments adopted.
- Number, description, and level of protection for BMPs designed and constructed.
- Any other activity conducted that is not covered above.

Details of the reporting requirements are contained in DNR Publication WR-223-97 (An Evaluation Plan for the SWRM Program and the NPS Water Pollution Abatement Program), which is reviewed every two years by DATCP and DNR and revised as necessary.

**Financial Expenditures**

Manitowoc and Sheboygan Counties and other participating units of government will provide the following financial data to the DNR and the DATCP annually:

- Number of landowner cost-share agreements signed.
- Amount of money encumbered in cost-share agreements.
- Number of landowner reimbursement payments made for the installation of BMPs and the amount of money paid.
- Staff travel expenditures
- Information and education expenditures
- Expenditures for equipment, materials, and supplies
- Expenditures for professional services and staff support costs
- Total project expenditures for the LCD/SWCD staff
- Amount of money paid for installation of BMPs, and money encumbered in cost-share agreements
- Staff training expenditures
- Interest money earned and expended
- Total budget and project expenditures.

**Time Spent On Project Activities**

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

## Nonpoint Source Pollutant Load Reduction

The purpose of the second evaluation component is to estimate reductions in NPS pollutants. Key sources targeted were pollutant loads reaching surface waters in the Pigeon River Watershed. No later than one month after the approval of this plan, the counties, City of

Sheboygan, Village of Howards, Grove, DNR, and DATCP will meet to develop a reporting system to document pollution reduction goals.

**Cropland Sources**

The LCD/SWCD will use a mutually approved procedures or formats to estimate sediment reductions due to changes in upland management. The Sheboygan River Basin GMU and the NPS contact are encouraged to develop criteria to estimate sediment load reduction. Sediment load estimates will represent initial inventory loads versus historic high loadings.

**Streambank and Gully Sources**

County LCD/SWCD staff will estimate changes in streambank sediment erosion. A ledger, spreadsheet, or other format will be kept of landowners contacted, the amount of streambank sediment (in tons) generated at the time of contact, and changes in erosion levels estimated after installing BMPs.

**Barnyard Runoff (P)**

County LCD/SWCD will use the BARNY model to estimate phosphorus reductions due to the installation of barnyard control practices.

**Manure Spreading Sources**

The counties will document the development of Nutrient Management plans or BMPs resulting in the reduction or the use of high hazard acres for winter manure spreading.

**Milkhouse Waste**

The counties will document the use of BMPs resulting in the containment and safe disposal of milkhouse waste water.

**Construction Sites**

Local units of government participating in the urban implementation program will report annually to the DNR on the number of construction sites served by adequate erosion control practices, number of construction sites receiving appropriate permits, number of inspections, and enforcement actions taken. Additionally, any amendments to construction site erosion control ordinances affecting sediment loads will be reported. The local unit of government will work with the DNR to estimate sediment reductions due to the installation and maintenance of construction site erosion control measures.

### Urban Areas

Local units of government will report annually to the DNR on any activities that may result in changes in urban pollutant loadings. Such activities include urban pollution prevention practices; acres of existing (1995) and new (post-1995) urban land, by land use, served by new stormwater BMPs; new urban lands, by land use, not served by stormwater BMPs; and other information requested by the DNR concerning BMP characteristics. The local unit of government will work with the DNR to estimate sediment, nutrients, and metals reductions due to these measures.

## Integrated Resource Management Program Review

The Integrated Resource Management (IRM) Program developed for this project identified other resource management programs and opportunities which can provide benefits to the water quality, recreational use, and wildlife habitat in the Pigeon River Watershed.

The purpose of this review is to document and recognize the efforts of these programs during the implementation of the Pigeon River Priority Watershed Project. Early in the implementation phase the project team will convene the four working teams recommended in Chapter Six (IRM) and finalize a list of cooperative entities for programs specified in the IRM plan.

## Water Resource Monitoring

Significant funding and intensive staffing are needed to properly evaluate water quality changes prohibits monitoring each watershed individually. Instead, different types of evaluation monitoring are being conducted on a state-wide basis: Whole Stream Monitoring, Signs of Success, single source monitoring, and volunteer monitoring. The goal of the water resource monitoring activities is to determine the progress the Nonpoint Source Program is making towards improving the quality of Wisconsin's water resources. Water Resource monitoring activities were developed to answer five questions about the water resource objectives and the pollution reduction goals.

### Whole Stream Monitoring Sites

A Whole Stream Monitoring Program has been underway in Wisconsin since1990. Twelve streams within priority watersheds were selected for intensive chemical and biological monitoring. The stream sites represent the five major types of fishery found in agriculture and urban parts of priority watersheds, representing three of the five ecoregions in the state. The five fishery types include: high gradient cold water sport fishery, high gradient warm water sport fishery, high gradient warm water forage fishery, and low gradient cold water sport fishery. A storm sewer outfall is also being monitored. The three ecoregions 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 BMPs are installed, five years of monitoring during the practice installation phase, two years of monitoring during the response period, and two years monitoring during the post-practice installation phase, for a total of eleven years of monitoring.

State-of-the-art chemical and physical monitoring is ongoing at all stream sites; biological monitoring will be done at eight of the twelve streams. Results of the monitoring will be used to determine how well the BMPs achieve pollution reduction goals and objectives. Improving the fish community is the most important water resource objective for all of the streams. The Whole Stream Monitoring program will help the project team understand the effectiveness of BMPs on water quality and help landowners make better choices.

**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. SOS will focus on one practice such as barnyard runoff controls, manure storage, or streambank fencing 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 demonstrate BMPs benefits. Limited chemical monitoring and fish sampling will be done at some of the sites. See Appendix F for procedures and worksheet for Signs of Success Monitoring.

**Single Source Monitoring**

Single source monitoring is a more in depth look at the effects of BMPs on water quality than SOS and includes some water chemistry and covers a longer time period. Single source monitoring is dependent on the availability of suitable sites, finding cooperative landowners, the LCD level of interest, and the availability of funding.

**Volunteer Monitoring**

Water Action Volunteers (WAV) is a state-wide program that serves citizen groups working toward water resource protection. Local residents volunteered for training to collection data on for water quality, rainfall and snowmelt, stream depths, turbidity, and macroinvertabrate sampling. Training sessions have already been conducted in the Pigeon River Watershed and volunteers have been requested to collect data at least once a month. The data is then mailed to a centralized location, analyzed, and results are distributed to the community. The long term goal of the WAV program is to track stream improvements as a result of the implementation of soil and water conservation practices in place (recommended) through the Pigeon River Priority Watershed Program.

Testing the Waters Program (Linking Students and Water Through Technology) is a statewide environmental education project Students receive and education in river ecology and responsible citizenship. Students learn to collect water quality data, research land influences affecting the river, and develop measures to protect waterways. Nine physical and chemical water quality measurements are collected: biochemical oxygen demand, dissolved oxygen, fecal coliform, temperature, total phosphorus, total solids, turbidity, nitrates, and pH. Water quality data is put into a data base that can be accessed through Maywood Environmental Park.

# APPENDIX A:
# Summary of the Wisconsin Nonpoint Source Program

## Legal Status and General Description
## Wisconsin Nonpoint Source Water Pollution Abatement Program

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 333 discrete hydrologic units called watersheds. These watersheds are assessed for water quality concerns as part of a comprehensive basin planning program. Watersheds with a high degree of water quality impairment from nonpoint sources of pollution become eligible for consideration as a priority watershed project. Approximately 20 projects are completed and 70 are underway. As directed by the State Legislature, all of the high ranking watersheds, about 150, must be planned by 2015. Designation as a priority watershed project enables special financial support to local governments and private landowners in the watershed to reduce nonpoint source pollution.

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

Upon approval by state and local authorities, local units of government implement the plan.Water quality improvement is achieved through mandatory and voluntary implementation of nonpoint source controls (BMPs) and the adoption of ordinances. Landowners, land renters,

counties, cities, villages, towns, sanitary districts, lake districts, and regional planning commissions are eligible to participate.

Counties and other units of government are eligible for local assistance and NPS grants to conduct eligible activities outlined in this plan, These activities include the Information and Education Program, contracting with eligible landowners for the construction or use of eligible best management practices

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

Informational and educational activities are developed to encourage participation.

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

# Legal Status of the Nonpoint Source Control Plan

The Pigeon River Priority Watershed Plan was prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program described in Section 144.25 of the Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code. It was prepared through the cooperative efforts of the Sheboygan County Land Conservation

Department, Manitowoc County Soil and Water Conservation Department, DNR, DATCP, UWEX, NRCS, the Village of Howards Grove, the City of Sheboygan and the Pigeon River Watershed Citizens Advisory Committee.

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

This priority watershed plan was approved by DNR following approvals by the Land and Water Conservation Board, Sheboygan and Manitowoc Counties, the Pigeon River Citizen's Advisory Committee, the City of Sheboygon, and the Village of Howards Grove.

**Amendments to the Plan**

This plan is subject to the amendment process under NR120.08(4) for substantive changes. The Department of Natural Resources will make the determination with the local sponsors if a proposed change will require a formal plan amendment.

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

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

watershed plan. Practices to control construction site erosion and storm water runoff from new development are not eligible for cost sharing. In industrial areas, cost sharing is available as specified in NR 120.10 (1)(g) — only in the non-industrial parts of facilities where a problem has also been identified in the priority watershed plan.

# Priority Watershed Project Planning and Implementation Phases

## Planning Phase

The planning phase of the Pigeon River Priority Watershed project began in 1995. The following information gathering and evaluation activities were completed during the planning phase:

- Determine the conditions and uses lakes, wetlands, and groundwater in the Pigeon River and its tributaries.

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

- Evaluate the types and severity of other factors which may be affecting water quality. Examples include discharges from municipal wastewater treatment plants and natural or endemic stream conditions. (This has been completed through the ongoing integrated resource management planning efforts in the Sheboygan 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 will be carried out.

## Implementation Phase

The implementation phase of the Pigeon River Priority Watershed Project begins following a review of the draft priority watershed plan, a public hearing, and approval by the DNR, Land andWater Conservation Board (LWCB), and the Board of Supervisors for Sheboygan and Manitowoc Counties. Public review during plan development occurred primarily through the efforts of the Pigeon River 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.

- In the rural portions of the watershed, the Sheboygan Couty Land Conservation Department and the Manitowoc County Soil and Water Conservation Department contact eligible landowners to determine their interest in installing best management practices identified in the plan.

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

- In rural areas, the landowner signs a cost-share agreement with the county 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 (except where required as a component of another practice, high residue management systems, nutrient management, pesticide management, and cropland protection cover are exempt from the 10 year operation and maintenance period, and only need to be maintained during the period for which cost sharing is received). Any easements agreed upon will be perpetual.

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

# APPENDIX B:
# Planning Methods

## Watershed Planning Methods

This chapter describes the steps and procedures used to prepare this plan. These are:

- Evaluating water quality and aquatic habitat.
- Assessing pollution sources.
- Establishing water resources objectives.
- Developing pollution reduction goals.
- Developing a nonpoint source strategy.
- Involving the public and local units of government.

## Evaluating Water Quality and Aquatic Habitat

The Department of Natural Resources (DNR) is responsible for designating the biological and recreational uses that the surface waters can support under proper management; prescribing the water quality improvement measures required to sustain these designated uses; and indicating methods to implement, achieve, and maintain those conditions.

The DNR's Southeast District water resources staff conducted investigations of the existing water resource conditions for the lakes and the streams in the Pigeon River Watershed from March 1996 to 1997. Their purpose was to evaluate water quality problem and establish a basis for setting water resource management objectives. Detailed assessment results are documented in the Pigeon River Priority Watershed Surface Water Appraisal (Artilla and Crone, 1997) and the Pigeon River Priority Lakes Water Quality Appraisal Report (Helsel, 1997).

Data Collection

The following is a summary of the five elements comprising the water quality and aquatic habitat investigation.

Subwatershed Delineation and Stream Segmentation

Prior to collecting field data, the watershed was divided into 13 subwatersheds. These delineations were used to divide the perennial and intermittent stream networks into segments and each subwatershed into smaller hydrologic units. Stream segments were used to separate portions of waterways where there were pronounced differences in stream character and/or quality.

Stream Habitat Evaluation

Information characterizing stream habitat-including flow rate and depth, substrate quality, channel configuration, streambank stability, and water temperature were-were collected using techniques that the DNR developed. The data were evaluated using habitat protocols developed by Ball (1982) and Simonson et al. (1994). In conjunction with this assessment, the Fish Habitat Rating developed by Simonson, Lyons, and Kanehl (1994) was also determined.

Fish Surveys

Fish communities were assessed qualitatively using a combination of historical data and information collected during

Fish collections and habitat were assessed using the Index of Biological Integrity (IBI) protocol developed by Lyons (1992).

Water Quality Assessment

Streams

Water quality was assessed through a review of historical water chemistry data, sampling selected sites for total phosphorus, total suspended solids and fecal coliform, and sampling for fish and invertebrates. Macroinvertabrate (kick net) samples were collected in the autumn of 1995 and analyzed using the Hilsenhoff's Biotic Index (Hisenhoff 1987) and other biometric indices (Szctyko, 1988) to determine the present condition of the streams in the Pigeon River Watershed.

Lakes

In order to evaluate lake water quality, five to ten years of water quality data is typically required. Four lakes in the Pigeon River Watershed were monitored intensively in and the data

has limited use to evaluate current water quality conditions of the lakes.

Navigability and Recreational Use

The extent and degree to which streams are navigable was determined based on evidence of canoeing or boating, field data, and information from landowners and local experts. Recreational uses were determined through field observations, file data, and information from local users.

Data Interpretation

The information described above was used to determine the existing and potential biological and recreational uses for the surface waters in the Pigeon River Watershed.

Assessing Pollution Sources

Rural Nonpoint Sources

The purpose of the pollution sources assessment is to identify the rural and urban sources and quantities of pollutants impacting surface waters.

Excessive quantities of sediment, nutrients, oxygen demanding substances, pesticides and bacteria are pollutants that can be carried in runoff draining from agricultural lands. These pollutants degrade surface water quality thereby restricting recreational and biological uses. The principle rural nonpoint sources evaluated in preparing this plan include:

- Eroding croplands
- Eroding and trampled streambanks
- Barnyard and livestock area runoff
- Runoff from areas of winter spread manure

Sheboygan County Land Conservation Department and Manitowoc County Soil and Water Conservation Department conducted rural land use inventories from January 1996 to July 1997. The Counties/ in cooperation with the DNR and the Department of Agriculture, Trade, and Consumer Protection (DATCP) completed data analysis.

Upland Erosion and Sediment Delivery: The LCD/ Staffs conducted the inventory on 23 percent of the rural uplands within Pigeon River Watershed. The information obtained for each parcel included size, soil type, erodability, slope and slope length, land cover, crop rotation, present management, overland flow distance, channel type, and channel length.

Upland erosion and sediment delivery was determined using the Wisconsin Nonpoint Source (WINHUSLE) Model (Baun and Snowden).

The WINHUSLE predicts the average annual quantity of eroded soil reaching surface waters from each farm field. The determination is made based on a "typical" year of precipitation. Estimated sediment delivery was to assess the relative pollution of each farm field in the watershed.

Streambank and Shoreline Erosion: The LCD/ staffs conducted field surveys on approximately 20 miles of streams.

A modified version of the streambank erosion analysis included in the Phase II of the Inventory Monitoring process used by the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) was used to estimate the amount of sediment lost annually from each eroded streambank site. At locations where erosion was occurring, the following information was recorded:

* Length of eroded or trampled bank

* Vertical Height

* Estimated annual rate of bank recession

* Adjacent land Uses

* Potential management measures

Runoff from Areas Winter spread with Livestock Waste: This analysis was done to estimate the pollution potential associated with land spreading livestock waste in the Pigeon River Watershed. The information was collected during the barnyard and upland inventories.

The analysis included looking at the number of acres that each livestock operation needed to land spread manure and the acres of sensitive land unavailable for manure application. The relative pollution potential of each livestock operation form runoff of land spread manure was determined.

More pending.

Barnyard and Livestock Area Runoff: The Counties conducted field surveys of 164 barnyards in the Pigeon River Watershed. to collect information needed to determine their pollution potential.

The barnyard data was used in the BARNY Model (Baun, ), Information about the mass loading of total phosphorus and chemical oxygen demand (COD) generated during a 10-year, 24-hour rainfall event was used to evaluate the pollution potential of each barnyard in the watershed. The livestock operations were ranked according to their potential to impact surface and/or groundwater quality.

Urban Nonpoint Sources

Principal urban nonpoint sources evaluated in preparing this plan include:

* Existing urban lands
* Construction erosion
*Streambank and shoreline erosion

Land use data provided by the communities in the Watershed and the Sewer Service Area Plan was used to quantify urban land use and estimate the existing urban pollution loads. Construction sites in the Pigeon River Watershed were identified. The effectiveness of erosion prevention and control on each site was evaluated.

Streambanks and shorelines in the urban areas were inventoried using the same techniques used in the rural inventory.

Other Pollution Sources

Additional sources of surface water pollution included an inventory of the mineral extraction.

More pending

Well Sampling

Several private wells were sampled in the Pigeon River Watershed to determine the extent of ground water contamination. All private wells were sampled where barnyard field inventories were conducted. Other private wells were randomly selected throughout the Watershed to sample and test.

More pending

## Establishing Water Resource Objectives

Recreational and biological resources objectives were established for each of the streams and lakes in the Watershed. These objectives identify how this project is anticipated to change the quality of the aquatic environment for recreation and biological uses.

## Establishing Pollution Reduction Goals

Nonpoint source pollution reduction goals are estimates of the level of nonpoint source control needed to meet the water quality and recreational use objectives identified in this plan. Pollution reduction goals and water resource objectives are established together since they are integrally linked.

Nonpoint source goals in this plan are a refinement of the recommendations contain the the water quality management plans prepared by the WDNR or the Bay Lake Regional Planning Commission.

The nonpoint source pollution reduction goals in this plan specifically target the control of sediment and phosphorus in rural areas and the control of sediment, phosphorus, toxic materials and stream flow in the urban areas.

Water resource objectives presented in this plan recognize that pollution control and resource management efforts beyond the scope of the nonpoint source control program are needed to achieve the identified objectives. These will include implementation of other recommended management actions which the WDNR establishes in the Sheboygan River Basin Plan Water Quality Plan.

## Establishing Pigeon River Watershed Project Goals

Pending

## Developing a Nonpoint source Pollution Control Strategy

The final step in the planning process is the development of a strategy for achieving the nonpoint source pollution reduction goals for the Pigeon River Watershed. Several items are addressed in developing the control strategy:

* Critical nonpoint pollution sources.
* Effective management practices and guidelines for the use of state cost-share grants for practice installation.
* Estimated cost of using and building BMPs and supporting staff costs.
* Responsibilities, estimated workload and work schedules for local implementing agencies and guidelines for the use of state funds.
* Public Information an education needs
* Project evaluation needs.

Identification of critical nonpoint sources eligible for cost-sharing assistance, enforcement and technical assistance under the Nonpoint Source Water Pollution Abatement Program were determined by:

* Evaluating pollutant loadings for each nonpoint source in the watershed.
* Determining the relative importance of controlling each source to achieving the water resource objectives.
* Developing criteria to determine which sources need to be controlled.
* Applying the criteria to determine eligibility for participation in the Pigeon River Priority Watershed Project.

This result of this evaluation is a site specific ranking of the nonpoint sources and determination of the assistance to be made available through the Nonpoint Source Program for their control

## Involving the Public and the Local Units of Government

The WDNR, the UWEX and the Counties convened an advisory committee and several work groups for the purpose of developing this watershed plan. The advisory committee and the work groups reviewed land and water resources assessment information and assisted in the development of the the project goals. In addition the advisory committee and the work groups drafted the nonpoint source pollution control plan, the public information and education strategy, and a plan to integrate other people and their programs into the Pigeon River Watershed Project.

# APPENDIX C:
# State of Wisconsin Water Quality Standards for Streams and Lakes in the Pigeon River Watershed: Water Quality Appraisal

## *Table 7. Waterbodies of the Pigeon River Watershed. Manitowoc and Sheboygan Counties.*

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| **SPRING VALLEY SUBWATERSHED** | | | | | | | | |
| **PERENNIAL NAMED STREAMS:** | | | | | | | | |
| MEEME RIVER (SP001, SP005, SP009, SP011, SP012) T17N R22E S15 SESE | 5.2 | WWSF/5.2 | WWSF/5.2 | 5.2 | LOSS OF FISH & INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING<br>NATURAL LOW FLOWS | AGRICULTURAL USES<br>NATURAL | PROHIBIT FUTURE CHANNELIZATION |
| | | | | | EMBEDDED SUBSTRATES<br>TURBIDITY | SEDIMENT | CHANNELIZATION/SNAGGING<br>CROPLAND RUNOFF<br>ROADSIDE DITCH EROSION | PROHIBIT FUTURE CHANNELIZATION<br>REDUCE SEDIMENT INPUT BY ___% |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDES | AGRICULTURAL USES | IMPLEMENT NUTRIENT/PEST MANAGEMENT PLAN |
| | | | | | TROPHIC COMMUNITY IMBALANCE<br>LOW DISSOLVED OXYGEN | NUTRIENTS | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>DRAIN TILES<br>WETLAND DRAINAGE<br>FLOODPLAIN PASTURING | REDUCE PHOSPHORUS INPUT BY ___ % |
| | | | | | SEPTAGE SEEPS/TILE | NUTRIENTS/BACTERIA | FAILED SEPTIC SYSTEMS | ELIMINATE SEPTIC INPUTS |
| | | | | | AMMONIA TOXICITY | NH3 | CROPLAND RUNOFF<br>BARNYARD RUNOFF | REDUCE CROPLAND AND BARNYARD RUNOFF |
| | | | | | STREAMBANK EROSION AND SCOUR | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | PROHIBIT FUTURE CHANNELIZATION |
| | | RECREATIONAL USE | | | BACTERIA | SEPTAGE<br>BARNYARD RUNOFF<br>FLOODPLAIN PASTURING | RURAL DWELLINGS<br>AGRICULTURAL RUNOFF | ELIMINATE SEPTIC INPUTS<br>REDUCE AGRICULTURAL RUNOFF |
| | | FSC/5.2 | FSC/5.2 | 5.2 | SIZE AND DEPTH | NATURAL | NATURAL | |
| SPRING LAKE CREEK (SP004, SP008) T17N R22E S9 NENE | 2.2 | WWSF/2.2 | COLD/2.2 | 2.2 | TROPHIC COMMUNITY IMBALANCE | NUTRIENTS | BARNYARD RUNOFF<br>STREAMBANK PASTURING | REDUCE PHOSPHORUS INPUT BY ___ % |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENTS | BARNYARD RUNOFF<br>STREAMBANK PASTURING<br>CROPLAND RUNOFF<br>PARENT SOILS | REDUCE SEDIMENT INPUTS BY ___ % |
| | | | | | STREAMBANK EROSION OR SCOUR | SEDIMENTS | PARENT SOILS | REDUCE SEDIMENT INPUTS BY ___% |
| | | | | | POTENTIAL TOXICITY | PESTICIDES OR HERBICIDES | CROPLAND RUNOFF | REDUCE CROPLAND RUNOFF AND IMPLEMENT PEST MANAGEMENT PLAN |
| | | RECREATIONAL USE | | | FISH MIGRATION INTERFERENCE<br>LOW DISSOLVED OXYGEN | WETLAND DRAINAGE<br>NUISANCE VEGETATION | WETLAND DRAINAGE<br>WETLAND DRAINAGE | |
| | | PBC/2.2 | PBC/2.2 | 2.2 | SIZE AND DEPTH | NATURAL | NATURAL | |
| **UNNAMED PERENNIAL STREAMS:** | | | | | | | | |
| PERENNIAL STREAM A (SP004) T17N R22E S3 SENW | 0.2 | | | | NO INFORMATION IS AVAILABLE FOR THIS TRIBUTARY | | | |
| PERENNIAL STREAM B (SP010) T17N R22E S9 SWNE | 0.2 | | | | NO INFORMATION IS AVAILABLE FOR THIS TRIBUTARY | | | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART /NOT. MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| PERENNIAL STREAM C (SP010) T17N R22E S9 SEE | 0.2 | 7/0.2 | COLD/0.2 | 0.2 | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES AND ROAD CONSTRUCTION | PROHIBIT FUTURE CHANNELIZATION |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENTS | WETLAND DRAINAGE ROADSIDE DITCH EROSION | REDUCE SEDIMENT INPUT BY ___ % |
| | | RECREATIONAL USE | | | | | | |
| | | PSC/0.2 | PSC/0.2 | 0.2 | SIZE AND DEPTH | NATURAL | NATURAL | |
| PERENNIAL STREAM D (SP013) T17N R22E S15 SESW | 1.1 | LAL/1.1 | 7/1.2 | 2.2 | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | FISH MIGRATION INTERFERENCE | | | |
| | | | | | TROPHIC COMMUNITY IMBALANCE LOW DISSOLVED OXYGEN BACTERIA NUTRIENTS | NUTRIENTS MANURE | CROPLAND RUNOFF STREAMBANK PASTURING DRAIN TILES | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF | |
| | | RECREATIONAL USE | | | STREAM FLOW FLUCCUATION OR LOW FLOW | DRAIN TILES NATURAL | AGRICULTURAL USES | |
| | | PSC/1.1 | PSC/1.1 | 1.1 | SIZE AND DEPTH | NATURAL | NATURAL | |
| UNNAMED INTERMITTENT STREAMS: | | | | | | | | |
| INTERMITTENT STREAM A (SP002) T17N R22E S33 SESW | 0.8 | LAL/0.8 | LAL/0.8 | 0.8 | LOSS OF FISH AND INVERTEBRATE HABITAT FISH MIGRATION INTERFERENCE | ROADSIDE DITCH EROSION DRAIN TILE | ROAD MAINTENANCE AGRICULTURAL USES | |
| | | | | | STREAM FLOW FLUCTUATIONS OR LOW FLOW | DRAIN TILES NATURAL LOW FLOWS | AGRICULTURAL USES NATURAL | |
| | | | | | SUBSTRATE EMBEDDEDNESS | SEDIMENT | ROADSIDE DITCH EROSION CROPLAND RUNOFF | |
| | | | | | BACTERIA TROPHIC COMMUNITY IMBALANCE | MANURE NUTRIENTS | CROPLAND RUNOFF | |
| | | RECREATIONAL USE | | | LOW DISSOLVED OXYGEN | EXCESSIVE VEGETATION (ALGAE) | NUTRIENTS (AGRICULTURAL USES) | |
| | | PSC/0.8 | PSC/0.8 | 0.8 | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM B (SP003) T18N R22E S33 SWSE | 0.1 | | | | NO INFORMATION IS AVAILABLE FOR THIS TRIBUTARY | | | |
| INTERMITTENT STREAM C (SP014, SP035, SP016) T17N R22E S15 SWSE | 2.3 | 7/2.3 | WWSF/2.3 | 2.3 | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | TROPHIC COMMUNITY IMBALANCE BACTERIA | NUTRIENTS MANURE | CROPLAND RUNOFF DRAINTILES | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENTS | CROPLAND RUNOFF CHANNELIZATION/SNAGGING | |
| | | RECREATIONAL USE | | | LOW DISSOLVED OXYGEN LEVELS TEMPERATURE EXTREMES | EXCESSIVE VEGETATION (POTENTIAL) PONDING | POND | |
| | | PSC/2.3 | PSC/2.3 | 2.3 | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM D (SP017) T17N R22E S15 SWSE | 0.6 | | | | NO INFORMATION IS AVAILABLE FOR THIS TRIBUTARY | | | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART /NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| INTERMITTENT STREAM E (SP018) T17N R22E S15 SWSE | 0.7 | LAL/0.7 | LAL/0.7 | 0.7 | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | STREAM FLOW FLUCTUATIONS OR LOW FLOWS | DRAIN TILES<br>NATURAL | AGRICULTURAL USES<br>NATURAL | |
| | | | | | TROPHIC COMMUNITY IMBALANCE<br>BACTERIA | NUTRIENTS<br>MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF | |
| | | RECREATIONAL USE | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>BARNYARD RUNOFF | |
| | | PBC/0.7 | PBC/0.7 | 0.7 | SIZE AND DEPTH | NATURAL | NATURAL | |

*Table 8. Waterbodies of the Pigeon River Watershed. Manitowoc and Sheboygan Counties.*

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART/NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| **MEEME RIVER SUBWATERSHED** | | | | | | | | |
| **PERENNIAL NAMED STREAMS** | | | | | | | | |
| MEEME RIVER<br>(MR001, 009, 015)<br>T17N R22E S36 NWSE | 5.7 | WWSF/ | WWSF/ | | PONDING<br>LOW DISSOLVED OXYGEN<br>TEMPERATURE EXTREMES<br>NUISANCE VEGETATION | DAM | SPRING VALLEY IMPOUNDMENT | |
| | | | | | LOSS OF FISH & INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>LOW DISSOLVED OXYGEN<br>BACTERIA<br>PESTICIDES/HERBICIDES | NUTRIENTS | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING<br>DRAIN TILES | |
| | | | | | (POTENTIAL) AMMONIA TOXICITY | AMMONIA | BARNYARD RUNOFF | |
| | | | | | EMBEDDED SUBSTRATES<br>TURBIDITY | SEDIMENT | CROPLAND RUNOFF<br>CONSTRUCTION SITE RUNOFF | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | STREAMBANK PASTURING | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| OSMAN TRIBUTARY<br>(MR007, 006)<br>T17N R22E S14 SESE | 1.3 | LFF/ | WWFF/ | | LOSS OF FISH & INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | MIGRATION INTERFERENCE | WETLAND DRAINAGE | | |
| | | | | | TROPHIC COMMUNITY IMBALANCE<br>LOW DISSOLVED OXYGEN<br>BACTERIA | NUTRIENTS | CROPLAND RUNOFF | |
| | | | | | | MANURE | DRAIN TILES<br>BARNYARD RUNOFF | |
| | | | | | PONDING<br>NUISANCE VEGETATION | WETLAND DRAINAGE | NATURAL | |
| | | | | | PESTICIDES OR HERBICIDES (POTENTIAL) | CROPLAND RUNOFF | AGRICULTURAL USES | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>ROADSIDE DITCH EROSION<br>CHANNELIZATION/SNAGGING<br>STREAMBANK EROSION | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | BARNYARD RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| EAST BRANCH OSMAN TRIBUTARY<br>(MR003, 004, 005)<br>T17N R22E S14 NENW | 2.1 | LFF/ | WWFF/ | | LOSS OF FISH & INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING<br>DRAIN TILES | AGRICULTURAL USES<br>AGRICULTURAL USES | |
| | | | | | FISH MIGRATION INTERFERENCE | WETLAND DRAINAGE<br>CHANNELIZATION/SNAGGING<br>DRAIN TILES<br>NATURAL | NATURAL<br>AGRICULTURAL USES<br>AGRICULTURAL USES<br>NATURAL | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART/NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>LOW DISSOLVED OXYGEN<br>POTENTIAL TOXICITY | NUTRIENTS<br><br>WETLAND DRAINAGE | CROPLAND RUNOFF<br>DRAIN TILES<br>NATURAL | |
| | | | | | POTENTIAL TOXICITY | PESTICIDES OR HERBICIDES | AGRICULTURAL USES | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENTS | CROPLAND RUNOFF | |
| | | RECREATIONAL USE | | | BACTERIA | CROPLAND RUNOFF | AGRICULTURAL USES | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| WEST BRANCH OSMAN TRIBUTARY<br>(MR005)<br>T17N R22E S14 NENW | 1.7 | LAL/ | LFF or LAL/ | | LOSS OF FISH & INVERTEBRATE HABITAT<br>FISH MIGRATION INTERFERENCE | CHANNELIZATION/SNAGGING<br><br>CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>LOW DISSOLVED OXYGEN<br>BACTERIA | NUTRIENTS<br><br>MANURE | CROPLAND RUNOFF<br><br>DRAIN TILES<br>BARNYARD RUNOFF | |
| | | | | | EMBEDDED SUBSTRATES<br>HYDRAULIC SCOUR | SEDIMENT | CROPLAND RUNOFF<br>STREAMBANK EROSION<br>CHANNELIZATION/SNAGGING<br>BARNYARD RUNOFF | |
| | | | | | POTENTIAL TOXICITY | PESTICIDES/HERBICIDES | AGRICULTURAL USES | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | BARNYARD RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| **UNNAMED PERENNIAL STREAMS** | | | | | | | | |
| PERENNIAL STREAM A<br>(MR016)<br>T17N R22E S25 SESW | 0.4 | | | | NO INFORMATION IS AVAILABLE FOR THIS TRIBUTARY | | | |
| **UNNAMED INTERMITTENT STREAMS** | | | | | | | | |
| INTERMITTENT STREAM A<br>(MR002)<br>T17N R22E S14 NWSW | 0.3 | LAL/ | LAL/ | | STREAM FLOW FLUCTUATION OR LOW FLOW | NATURAL | NATURAL | |
| | | | | | FISH MIGRATION INTERFERENCE | WETLAND DRAINAGE | NATURAL | |
| | | | | | | PONDING | DAM | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>LOW DISSOLVED OXYGEN<br>NUISANCE VEGETATION<br>TEMPERATURE EXTREMES | NUTRIENTS | CROPLAND RUNOFF<br><br>DRAIN TILES<br>STREAMBANK PASTURING<br>DAM | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | STREAMBANK PASTURING | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM B<br>(MR010, 011)<br>T17N R22E S11 SWNE | 1.1 | LAL/ | LAL/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | DRAIN TILES<br>NATURAL | AGRICULTURAL USES<br>NATURAL | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PARTIAL MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>LOW DISSOLVED OXYGEN<br>BACTERIA | NUTRIENTS | BARNYARD RUNOFF<br>CROPLAND RUNOFF<br>WETLAND DRAINAGE | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>ROADSIDE DITCH EROSION | |
| | | | | | METALS | SCRAPYARD | URBAN RUNOFF | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM C (MR012, 013) T17N R22E S24 SESW | 0.7 | | | | NO INFORMATION IS AVAILABLE ON THIS TRIBUTARY | | | |
| INTERMITTENT STREAM D (MR014) T17N R22E S25 SENW | 0.7 | LAL/ | LAL/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | PONDING | POND | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>LOW DISSOLVED OXYGEN<br>BACTERIA | NUTRIENTS<br>MANURE | BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENTS | CROPLAND RUNOFF<br>ROADSIDE DITCH EROSION | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |

*Table 12. Waterbodies of the Pigeon River Watershed. Manitowoc and Sheboygan Counties.*

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART/NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| **PIGEON CREEK SUBWATERSHED** | | | | | | | | |
| **PERENNIAL NAMED STREAMS** | | | | | | | | |
| PIGEON RIVER (PC001, 002, 003, 004, 007, 011, 012, 019, 021, 022, 026) T17N R22E S30 NWSE | 11.9 | WWSF/ | WWSF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING FILLING OF WETLANDS | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>LOW DISSOLVED OXYGEN | NUTRIENTS | CROPLAND RUNOFF<br>DRAIN TILES<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING<br>WETLAND DRAINAGE | |
| | | | | | BACTERIA | MANURE | | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | AGRICULTURAL USES | |
| | | | | | EMBEDDED SEDIMENTS | SEDIMENT | CHANNELIZATION/SNAGGING<br>CROPLAND RUNOFF<br>STREAMBANK EROSION | |
| | | | | | FISH MIGRATION INTERFERENCE | CHANNELIZATION/SNAGGING<br>PONDING | AGRICULTURAL USES<br>PONDS | |
| | | | | | SEPTAGE SEEP/TILE (POTENTIAL) | FAILED SEPTIC SYSTEMS | RURAL RUNOFF | |
| | | | | | BACTERIA | MANURE<br>FAILED SEPTIC SYSTEMS | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING<br>RURAL RUNOFF | |
| | | RECREATIONAL USE | | | | | | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| **UNNAMED PERENNIAL STREAMS** | | | | | | | | |
| PERENNIAL STREAM A (PC005) T17N R22E S31 NWNE | 0.8 | LFF/ | LFF/ | | STREAM FLOW FLUCTUATION OR LOW FLOW (POTENTIAL) | NATURAL | NATURAL | |
| | | | | | LOW DISSOLVED OXYGEN (POTENTIAL) | NATURAL | WETLAND DRAINAGE | |
| | | | | | FISH MIGRATION INTERFERENCE | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | RECREATIONAL USE | | | | | | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| PERENNIAL STREAM B (PC006, 009) T17N R22E S32 SWNE | 2.1 | WWSF/ | WWSF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING<br>CROPLAND RUNOFF | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA | NUTRIENTS<br>MANURE<br>SEPTAGE (POTENTIAL) | CROPLAND RUNOFF<br>URBAN RUNOFF<br>DRAIN TILES<br>FAILED SEPTIC SYSTEMS | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | AGRICULTURAL USES<br>URBAN USES | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>CHANNELIZATION/SNAGGING<br>STREAMBAN EROSION | |
| | | | | | FISH MIGRATION INTERFERENCE | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART/NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| PERENNIAL STREAM B (CONTINUED) | | RECREATIONAL USE | | | BACTERIA | MANURE<br>SEPTAGE | AGRICULTURAL USES<br>RURAL USES | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| PERENNIAL STREAM C (PC010)<br>T17N R22E S32 SENE | 0.2 | | | | NO INFORMATION AVAILABLE ON THIS TRIBUTARY | | | |
| **UNNAMED INTERMITTENT STREAMS** | | | | | | | | |
| INTERMITTENT STREAM A (PC006)<br>T17N R22E S31 SWNE | 0.7 | LFF/ | LFF/ | | STREAM FLOW FLUCTUATION OR LOW FLOW (POTENTIAL) | CHANNELIZATION/SNAGGING<br>NATURAL | AGRICULTURAL USES<br>NATURAL | |
| | | | | | LOW DISSOLVED OXYGEN (POTENTIAL) | NATURAL | WETLAND DRAINAGE | |
| | | | | | METALS (POTENTIAL) | METALS | SCRAPYARD | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | HORSE PASTURE | |
| | | | | | BACTERIA | MANURE | | |
| | | RECREATIONAL USE | | | BACTERIA | PASTURE RUNOFF | AGRICULTURAL USES | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM B (PC013, 014, 016, 017, 018)<br>T16N,R22E S3 NWNW | 3.0 | LFF/ | LFF or WWF (for low section in stream) | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING<br>DRAIN TILES | AGRICULTURAL USES | NEED TO SHOCK THIS |
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | DRAIN TILES | |
| | | | | | LOW DISSOLVED OXYGEN<br>BACTERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>FLOODPLAIN PASTURING | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>STREAMBANK EROSION<br>CHANNELIZATION/SNAGGING | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | CROPLAND RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM C (PC020)<br>T17N R22E S34 NWNE | 1.0 | LAL/ | LAL/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | | | | BACTERIA | MANURE | CROPLAND RUNOFF | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | DRAIN TILES | |
| | | | | | PONDING | DRAINAGE OF WETLAND | AGRICULTURAL USES | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | AGRICULTURAL USES | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM D (PC023)<br>T16N R22E S2 SENW | 0.7 | LAL/ | LAL/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | CHANNELIZATION/SNAGGING<br>NATURAL | AGRICULTURAL USES | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART/NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | CROPLAND RUNOFF | |
| | | | | | BACTERIA | MANURE | | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | | |
| | | | | | PONDING | DAM - DREDGE | AGRICULTURAL USES | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | CROPLAND RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM E (PC024, 025, 026, 027) T16N R22E S2 SENW | 3.0 | LAL/ | LAL/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | LOSS OF WILDLIFE HABITAT | DRAINAGE OF WETLANDS | | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | WETLAND DRAINAGE (NATURAL) NATURAL LOW FLOWS | NATURAL | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CHANNELIZATION/SNAGGING | |
| | | | | | PONDING | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | DRAIN TILES | |
| | | | | | BACTERIA | MANURE | CROPLAND RUNOFF | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | CROPLAND RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |

*Table ___. Waterbodies of the Pigeon River Watershed. Manitowoc and Sheboygan Counties.*

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART /NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| **HOWARDS GROVE SUBWATERSHED** | | | | | | | | |
| **PERENNIAL NAMED STREAMS** | | | | | | | | |
| PIGEON RIVER (HG001, 002, 003, 006, 007) T16N R22E S26 SSE | | WWSF/ | WWSF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USE | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA | NUTRIENTS<br>MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | AGRICULTURAL USES | |
| | | | | | EMBEDDED SUBSRATES<br>STREAMBANK EROSION OR SCOUR | SEDIMENTS | CHANNELIZATION/SNAGGING<br>STREAMBANK PASTURING<br>CROPLAND RUNOFF | |
| | | RECREATIONAL USE | | | | | | |
| | | FBC/ | FBC/ | | BATERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| **UNNAMED INTERMITTENT STREAMS** | | | | | | | | |
| INTERMITTENT STREAM A (HG004) T16N R22E S13 SWNW | | LAL/ | LFF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | CHANNELIZATION/SNAGGING<br>DRAIN TILES<br>NATURAL | AGRICULTURAL USES<br><br>NATURAL | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA<br>POTENTIAL TOXICITY | NUTRIENTS<br>MANURE<br>PESTICIDE OR HERBICIDE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>CHANNELIZATION/SNAGGING | |
| | | | | | BACTERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | RECREATIONAL USE | | | | | | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM B (HG005) T16N R22E S13 SWSW | | LAL/ | LFF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | CHANNELIZATION/SNAGGING<br>DRAIN TILES<br>NATURAL | AGRICULTURAL USES<br><br>NATURAL | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA<br>POTENTIAL TOXICITY | NUTRIENTS<br>MANURE<br>PESTICIDE OR HERBICIDE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>CHANNELIZATION/SNAGGING | |
| | | | | | PONDING | DRAINGE OF WETLANDS | AGRICULTURAL USES | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART /NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| | | | | | BACTERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | RECREATIONAL USE | | | | | | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |

*Table ___. Waterbodies of the Pigeon River Watershed. Manitowoc and Sheboygan Counties.*

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART /NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| **PIGEON RIVER SUBWATERSHED** | | | | | | | | |
| **PERENNIAL NAMED STREAMS** | | | | | | | | |
| PIGEON RIVER<br>(PR001, 005, 006, 010)<br>T15N R23E S16 NESE | | WWSF/ | WWSF/ | | LOSS OF FISH AND RIVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING<br>SEDIMENTS | AGRICULTURAL USES | |
| | | | | | EMBEDDED SUBSTRATES<br>TURBIDITY | SEDIMENTS | CROPLAND RUNOFF<br>STREAMBANK EROSION<br>ROADSIDE DITCH EROSION<br>CONSTRUCTION SITE RUNOFF | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | MUNICIPAL POINT SOURCE | |
| | | | | | BACTERIA<br>AMMONIA TOXICITY (POTENTIAL) | MANURE/WASTE WATER | BARNYARD RUNOFF<br>STREAMBANK PASTURING<br>FLOODPLAIN PASTURING | |
| | | | | | SEPTAGE SEEPS/TILE | FAILED SEPTIC SYSTEMS (POTENTIAL) | URBAN/RURAL | |
| | | RECREATIONAL USE | | | | | | |
| | | PBCI | PBCI | | BACTERIA | WASTEWATER<br>BACTERIA<br>SEPTAGE SEEPS/TILE | MUNICIPAL POINT SOURCE<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING<br>FLOODPLAIN PASTURING<br>FAILED SEPTIC SYSTEMS | |
| **UNNAMED INTERMITTENT STREAMS** | | | | | | | | |
| INTERMITTENT STREAM A<br>(PR004, 003, 002)<br>T16N R22E S35 SENE | | LAU | LAU | | LOSS OF FISH AND RIVERTEBRATE HABITAT<br>LOSS OF WILDLIFE HABITAT | CHANNELIZATION/SNAGGING<br>DRAINGE OF WETLAND<br>FILLING OF WETLAND | AGRICULTURAL USES | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | CROPLAND RUNOFF | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | CHANNELIZATION/SNAGGING<br>DRAIN TILE<br>NATURAL | AGRICULTURAL USES<br>NATURAL | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA | NUTRIENTS<br>MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>DRAIN TILES | |
| | | | | | EMBEDDED SUBSTRATES<br>HYDRAULIC SCOUR<br>TURBIDITY | SEDIMENT | CROPLAND RUNOFF<br>ROADSIDE DITCH EROSION<br>CONSTRUCTION SITE RUNOFF | |
| | | | | | BACTERIA | MANURE | BARNYARD RUNOFF<br>CROPLAND RUNOFF | |
| | | RECREATIONAL USE | | | | | | |
| | | PBCI | PBCI | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM B<br>(PR005)<br>T16N R22E S36 NWSW | | | | | NO INFORMATION IS AVAILABLE FOR THIS TRIBUTARY | | | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART /NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| INTERMITTENT STREAM C (PR007) T15N R22E S1 NWNE | | LAL/ | LAL/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>URBAN RUNOFF | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | CROPLAND RUNOFF<br>URBAN RUNOFF | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA | NUTRIENTS<br>MANURE | CROPLAND RUNOFF<br>STREAMBANK PASTURING | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | CROPLAND RUNOFF<br>STREAMBANK PASTURING | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM D (PR009) T15N R23E S7 NESW | | WWFF/ | WWFF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT<br>LOSS OF WILDLIFE HABITAT | CHANNELIZATION/SNAGGING<br>DRAINGE OF WETLANDS<br>FILLING OF WETLANDS | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | CROPLAND RUNOFF | |
| | | | | | BACTERIA<br>EMBEDDED SUBSTRATES | MANURE<br>SEDIMENT | BARNYARD RUNOFF<br>URBAN RUNOFF | |
| | | | | | TEMPERATURE EXTREMES | PONDING | DRAINGE OF WETLAND | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | CROPLAND RUNOFF<br>URBAN RUNOFF | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | DRAIN TILES<br>CHANNELIZATION/SNAGGING<br>NATURAL | AGRICULTURAL USES<br>NATURAL | |
| | | | | | BACTERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF | |
| | | RECREATIONAL USE | | | | | | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |

*Table ___. Waterbodies of the Pigeon River Watershed. Manitowoc and Sheboygan Counties.*

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART /NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| **SHEBOYGAN SUBWATERSHED** | | | | | | | | |
| **PERENNIAL NAMED STREAMS** | | | | | | | | |
| PIGEON RIVER (SB001, SB003, SB004) T15N R23E S2 SESE | | WWSF/ | WWSF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING SEDIMENTS | AGRICULTURAL USES | |
| | | | | | EMBEDDED SUBSTRATES TURBIDITY | SEDIMENTS | CROPLAND RUNOFF STREAMBANK EROSION ROADSIDE DITCH EROSION CONSTRUCTION SITE RUNOFF | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | MUNICIPAL POINT SOURCE | |
| | | | | | BACTERIA AMMONIA TOXICITY (POTENTIAL) | MANURE/WASTEWATER | BARNYARD RUNOFF STREAMBANK PASTURING FLOODPLAIN PASTURING | |
| | | | | | SEPTAGE SEEPS/TILE | FAILED SEPTIC SYSTEMS (POTENTIAL) | URBAN/RURAL | |
| | | RECREATIONAL USE | | | | | | |
| | | PBC/ | PBC/ | | BACTERIA | MANURE WASTE WATER SEPTAGE SEEPS/TILE | MUNICIPAL POINT SOURCE BARNYARD RUNOFF STREAMBANK PASTURING FLOODPLAIN PASTURING FAILED SEPTIC SYSTEMS | |
| **UNNAMED INTERMITTENT STREAMS** | | | | | | | | |
| INTERMITTENT STREAM A (SB002) T15N R23E S6 SESE | | LAL/ | LAL/ | | LOSS OF FISH AND INVERTEBRATE HABITAT FISH MIGRATION INTERFERENCE | CHANNELIZATION/SNAGGING STORM SEWER | URBAN LAND USE AGRICULTURAL USES | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | URBAN RUNOFF CROPLAND RUNOFF ROADSIDE DITCH EROSION CONSTRUCTION SITE RUNOFF | |
| | | RECREATIONAL USE | | | POTENTIAL TOXICITY METALS (POTENTIAL) | PESTICIDES OR HERBICIDES METALS | URBAN RUNOFF CONSTRUCTION SITE RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM B (SB005) T15N R23E S9 SWNE | | LAL/ | LFF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT LOSS OF WILDLIFE HABITAT | CHANNELIZATION/SNAGGING FILLING OF WETLANDS | URBAN USES | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | URBAN RUNOFF CONSTRUCTION SITE RUNOFF | |
| | | RECREATIONAL USE | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | URBAN RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |

*Table ___. Waterbodies of the Pigeon River Watershed. Manitowoc and Sheboygan Counties.*

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART/NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| **FISHER CREEK SUBWATERSHED** | | | | | | | | |
| **PERENNIAL NAMED STREAMS** | | | | | | | | |
| FISHER CREEK<br>(FC009, 002, 004, 007, 006)<br>T16N R22E S26 SWSE | | WWFF/ | WWSF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT<br>LOSS OF WILDLIFE HABITAT | CHANNELIZATION/SNAGGING<br><br>DRAINAGE OF WETLANDS<br>FILLING OF WETLANDS | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA<br>SEPTAGE SEEPS/TILE | NUTRIENTS<br>MANURE<br>SEPTAGE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>FAILED SEPTIC SYSTEMS<br>MUNICIPAL POINT SOURCE | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | CHANNELIZATION/SNAGGING<br>DRAINAGE OF WETLANDS<br>DRAIN TILES<br>NATURAL | AGRICULTURAL USES<br><br><br>NATURAL | |
| | | | | | EMBEDDED SUBSTRATES<br>TURBIDITY<br>STREAMBANK EROSION OR SCOUR | SEDIMENT | CROPLAND RUNOFF<br>ROADSIDE DITCH EROSION<br>STREAMBANK EROSION<br>CHANNELIZATION/SNAGGING | |
| | | | | | POTENTIAL TOXICITY | PESTICIDES OR HERBICIDES | CROPLAND RUNOFF<br>URBAN RUNOFF | |
| | | | | | METALS<br>CHLORINE TOXICITY | METALS | URBAN RUNOFF<br>MUNICIPAL POINT SOURCE | |
| | | | | | BACTERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>FAILED SEPTIC SYSTEMS<br>MUNICIPAL POINT SOURCE<br>NATURAL | |
| | | RECREATIONAL USE | | | | | | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| **UNNAMED INTERMITTENT STREAMS** | | | | | | | | |
| INTERMITTENT STREAM A<br>(FC003)<br>T16N R22E S15 NWNE | | LFF/ | LFF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT<br>LOSS OF WILDLIFE HABITAT | CHANNELIZATION/SNAGGING<br><br>DRAINAGE OF WETLANDS | AGRICULTURAL USES | |
| | | | | | TROPHIC COMMUNITY IMBALANCE<br>BACTERIA | NUTRIENTS<br>MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>CONSTRUCTION SITE EROSION<br>CHANNELIZATION/SNAGGING | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | CHANNELIZATION/SNAGGING<br>DRAINAGE OF WETLANDS<br>NATURAL | AGRICULTURAL USES<br><br>NATURAL | |
| | | | | | POTENTIAL TOXICITY | PESTICIDES OR HERBICIDES | CROPLAND RUNOFF | |
| | | | | | BACTERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING | |
| | | RECREATIONAL USE | | | | | | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART/NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| INTERMITTENT STREAM B (FC005) T16N R22E S15 NWSE | | LFF/ | LFF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | DRAIN TILES | AGRICULTURAL USES | |
| | | | | | STREAM FLOW FLUCTUATIONS OR LOW FLOW | NATURAL | NATURAL | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | CROPLAND RUNOFF | |
| | | | | | BACTERIA | MANURE | BARNYARD RUNOFF<br>DRAIN TILES | |
| | | | | | EMBEDDD SUBSTRATES<br>STREAMBANK EROSION OR SCOUR | SEDIMENT | CROPLAND RUNOFF<br>DRAIN TILES<br>ROADSIDE DITCH EROSION | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM C (FC006) T16N R22E S22 SWNE | | | | | NO INFORMATION IS AVAILABLE FOR THIS TRIBUTARY | | | |
| INTERMITTENT STREAM D (FC009, 010, 011) T16N R22E S26 SSW | | WWFF/ | WWFF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT<br>LOSS OF WILDLIFE HABITAT | CHANNELIZATION/SHADING<br>DRAINGE OF WETLAND<br>FILLING OF WETLAND | AGRICULTURAL USES | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW<br>PONDING<br>TEMPERATURE EXTREMES | POND | PRIVATE RESIDENCE | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA | NUTRIENTS<br>MANURE | CROPLAND RUNOFF<br>DRAIN TILE<br>BARNYARD RUNOFF | |
| | | | | | EMBEDDED SUBSTRATES | SEDIEMENT | CROPLAND RUNOFF | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | CROPLAND RUNOFF<br>URBAN RUNOFF | |
| | | | | | METALS | METALS | URBAN RUNOFF | |
| | | | | | LOW DISSOLVED OXYGEN<br>NUTRIENTS | NATURAL | WETLAND DRAINAGE | |
| | | | | | BACTERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF | |
| | | RECREATIONAL USE | | | | | | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |

*Table ___. Waterbodies of the Pigeon River Watershed. Manitowoc and Sheboygan Counties.*

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART /NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| **JETZERS CREEK SUBWATERSHED** | | | | | | | | |
| **PERENNIAL NAMED STREAMS** | | | | | | | | |
| JETZERS CREEK (JC007, 008, 010) T16N R22E S25 NESW | | WWFF/ | WWSF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT<br>LOSS OF WILDLIFE HABITAT | CHANNELIZATION/SNAGGING<br>DRAINAGE OF WETLANDS | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA | NUTRIENTS<br>MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>MUNICIPAL POINT SOURCE | |
| | | | | | EMBEDDED SUBSTRATES<br>HYDRAULIC SCOUR<br>TURBIDITY | SEDIMENTS<br>INCREASE STREAM DISCHARGE | CROPLAND RUNOFF<br>DRAIN TILES<br>CHANNELIZATION/SNAGGING | |
| | | | | | POTENTIAL TOXICITY<br>METALS<br>CHLORINE TOXICITY | PESTICIDE OR HERBICIDE | CROPLAND RUNOFF<br>MUNICIPAL POINT SOURCE<br>URBAN RUNOFF | |
| | | | | | BACTERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>MUNICIPAL POINT SOURCE | |
| | | RECREATIONAL USE | | | | | | |
| | | PBCF | PBCF | | SIZE AND DEPTH | NATURAL | NATURAL | |
| **NAMED INTERMITTENT STREAMS** | | | | | | | | |
| LAKELAND COLLEGE TRIBUTARY (JC001, 003, 004) T16N R22E S28 SENW | | WWFF/ | WWFF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT<br>LOSS OF WILDLIFE HABITAT | CHANNELIZATION/SNAGGING<br>DRAINAGE OF WETLANDS | AGRICULTURAL USES | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | CHANNELIZATION/SNAGGING<br>DRAIN TILES<br>NATURAL | AGRICULTURAL USES<br>NATURAL | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA | NUTRIENTS<br>MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK PASTURING<br>DRAIN TILES<br>MUNICIPAL POINT SOURCE | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>STREAMBANK EROSION<br>ROADSIDE DITCH EROSION | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | CROPLAND RUNOFF | |
| | | | | | FISH MIGRATION INTERFERENCE | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | BACTERIA | MANURE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>STREAMBANK EROSION<br>MUNICIPAL POINT SOURCE | |
| | | RECREATIONAL USE | | | | | | |
| | | PBCF | PBCF | | SIZE AND DEPTH | NATURAL | NATURAL | |
| **UNNAMED INTERMITTENT STREAMS** | | | | | | | | |
| INTERMITTENT STREAM A (JC002) T16N R22E S20 SENE | | | | | NO INFORMATION IS AVAILABLE FOR THIS TRIBUTARY | | | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART /NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| INTERMITTENT STREAM B (JC006, JC005) T16N R22E S28 NENW | | LAL/ | LFF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING CROPLAND RUNOFF | AGRICULTURAL USES | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | DRAIN TILE NATURAL | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE BACTERIA | NUTRIENTS MANURE | CROPLAND RUNOFF DRAIN TILES | |
| | | | | | POTENTIAL TOXICITY | PESTICIDE OR HERBICIDE | CROPLAND RUNOFF | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | CROPLAND RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM C (JC009) T16N R22E S26 SWNW | | | | | NO INFORMATION IS AVAILABLE FOR THIS TRIBUTARY | | | |

*Table ___. Waterbodies of the Pigeon River Watershed. Manitowoc and Sheboygan Counties.*

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART/NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| **GRANDMA CREEK SUBWATERSHED** | | | | | | | | |
| **PERENNIAL NAMED STREAMS** | | | | | | | | |
| GRANDMA CREEK (GC001, 003, 005, 006) T15N R23E S18 NESE | | LFF/ | WWSF/ | | LOSS OF FISH AND INVERTEBRATE HABITAT<br>LOSS OF WILDLIFE HABITAT | CHANNELIZATION/SNAGGING<br>DRAINAGE OF WETLANDS<br>FILLING OF WETLANDS | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA<br>LOW DISSOLVED OXYGEN<br>NUISANCE VEGETATION | NUTRIENTS<br>MANURE<br>WETLAND DRAINAGE | CROPLAND RUNOFF<br>DRAIN TILES<br>FLOODPLAIN PASTURING<br>BARNYARD RUNOFF<br>SEPTAGE SEEPS/TILE<br>NATURAL | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF<br>STREAMBANK EROSION | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | CHANNELIZATION/SNAGGING<br>DRAIN TILES<br>DRAINAGE OF WETLANDS<br>NATURAL | AGRICULTURAL USES<br>NATURAL | |
| | | | | | FISH MIGRATION INTERFERENCE | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | POTENTIAL TOXICITY | PESTICIDES OR HERBICIDES | CROPLAND RUNOFF | |
| | | | | | METALS | METALS | URBAN RUNOFF | |
| | | | | | BACTERIA | MANURE<br>SEPTAGE | CROPLAND RUNOFF<br>BARNYARD RUNOFF<br>FLOOD PLAIN PASTURING<br>SEPTAGE SEEPS/TILE | |
| | | RECREATIONAL USE | | | | | | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| **UNNAMED INTERMITTENT STREAMS** | | | | | | | | |
| INTERMITTENT STREAM A (GC002) T15N R22E S2 SESE | | | | | NO INFORMATION IS AVAILABLE FOR THIS TRIBUTARY | | | |
| INTERMITTENT STREAM B (GC004) T15N R22E S13 NWSW | | LAL/ | LAL/ | | LOSS OF FISH AND INVERTEBRATE HABITAT<br>LOSS OF WILDLIFE HABITAT | CHANNELIZATION/SNAGGING<br>DRAINAGE OF WETLANDS | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE<br>BACTERIA | NUTRIENTS<br>MANURE | CROPLAND RUNOFF | |
| | | | | | EMBEDDED SUBSTRATES | SEDIMENT | CROPLAND RUNOFF | |
| | | | | | STREAM FLOW FLUCTUATION OR LOW FLOW | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | POTENTIAL TOXICITY | PESTICIDES OR HERBICIDES | CROPLAND RUNOFF | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | CROPLAND RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |

| SUBWATERSHED WATERBODY | LENGTH (MILES) | CURRENT USES USE/MILES | POTENTIAL USES USE/MILES | POTENTIAL USES FULL/PART/NOT MILES | PROBLEMS OR THREATS TO POTENTIAL USES | POLLUTANTS OR LIMITING FACTORS CAUSING PROBLEMS OR THREATS | OBSERVED OR POTENTIAL SOURCES | PRELIMINARY MANAGEMENT RECOMMENDATIONS |
|---|---|---|---|---|---|---|---|---|
| INTERMITTENT STREAM C (GC006) 15N 422E S13 SWSE | | LAL/ | LAL/ | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | CROPLAND RUNOFF | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | BARNYARD RUNOFF<br>CROPLAND RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |
| INTERMITTENT STREAM D (GC007) 15N R22E S13 NESE | | LAL | LAL | | LOSS OF FISH AND INVERTEBRATE HABITAT | CHANNELIZATION/SNAGGING | AGRICULTURAL USES | |
| | | | | | TROPHIC/COMMUNITY IMBALANCE | NUTRIENTS | CROPLAND RUNOFF | |
| | | RECREATIONAL USE | | | BACTERIA | MANURE | BARNYARD RUNOFF<br>CROPLAND RUNOFF | |
| | | PBC/ | PBC/ | | SIZE AND DEPTH | NATURAL | NATURAL | |

# APPENDIX D:
# Implementation Alternatives Strategies: Two Year Budget Scenario for Manitowoc and Sheboygan Counties

## Manitowoc County

| Staff Activity | # Activities | Year 1(hours) | Year 2 (hours) |
|---|---|---|---|
| Landowner Contact | 100 | 400 | 400 |
| Farm Operators | | | |
| Ctitical Site Verification | 50 | 200 | 200 |
| Contracts | 10 | 400 | 500 |
| Conservation Plan Revisions | 25 | 400 | 400 |
| Reduced Tillage Demo | 10 | 200 | 100 |
| Wetland/Easement/ Buffer Demo | | 200 | 100 |
| Community Group/ WAV | | 100 | 100 |
| X Program Promo/ Planning | | 200 | 300 |
| Demo /Critical BY Installation | | 100 | 200 |
| Practice Installation | | 200 | 300 |
| GIS/I&E | | | |
| Develop Digital | | | |
| Buffer Needs/ Installation | | 80 | 80 |
| BY Needs/ Installation | | 40 | 40 |
| Manure Mgmt./ Installation | | 150 | 40 |
| Critical Fields | | 150 | 40 |
| Contract/ Plans | | 150 | 50 |
| Newsletters | 3 | 120 | 120 |
| Direct Mail | 3 | 100 | 100 |
| Network with gov./bus./edu./media | 6 | 110 | 120 |
| Information Meetings | 1 | 20 | 40 |
| Tour | 1 | 40 | 40 |
| Presentations/ Events/ Displays | 5 | 40 | 40 |
| Lake I&E | | 200 | 200 |
| **Total Hours** | | 3,600 | 3,335 |
| **Costs** | | | |
| Personnel - (2) | | $83,200 | $83,200 |
| BMP Installation | | | |
| 590/95, 329,340 demos | | $7,200 | $7,200 |
| Critical BY installation | | $15,000 | $20,000 |
| **Total Cost** ($) | | $105,400 | $110,400 |

Note: GIS/Computer Support - 570, 250, 200 hrs.; Education - 630, 660, 540 hrs.; Nontech -1200, 910, 740 hrs.; BMP dollars - $22,200, $27,200, $52,200.

# Sheboygan County

| Staff Activity | # Activities | Year 1(hours) | Year 2 (hours) |
|---|---|---|---|
| Landowner Contact | 150 | 600 | 600 |
| Farm Operators | 15 | 60 | 60 |
| Ctitical Site Verification | 50 | 200 | 25 |
| Contracts | 10 | 400 | 500 |
| Conservation Plan Revisions | 25 | 400 | 400 |
| Reduced Tillage Demo | 10 | 200 | 100 |
| Wetland/Easement/ Buffer Demo | | 200 | 100 |
| Community Group/ WAV | 3 | 100 | 100 |
| X Program Promo/ Planning | | 200 | 300 |
| Demo /Critical BY Installation | 2 | 100 | 200 |
| Practice Installation | | 200 | 300 |
| Urban Erosion Edu.and | | 440 | 128 |
| Ordinance Development | | | |
| Newsletters | 3 | 120 | 120 |
| Direct Mail | 3 | 100 | 100 |
| Network with gov./bus./edu./media | 6 | 110 | 120 |
| Information Meetings | 6 | 25 | 35 |
| Tour | 2 | 40 | 40 |
| Presentations/ Events/ Displays | 7 | 55 | 55 |
| Lake I&E | | 50 | 50 |
| **Total Hours** | | 3,600 | 3,335 |
| **Costs** | | | |
| Personnel - (2) | | $83,200 | $83,200 |
| BMP Installation | | | |
| 590/95, 329,340 demos | | $7,200 | $7,200 |
| Critical BY installation | | $15,000 | $15,000 |
| **Total Cost** ($) | | $105,400 | $105,400 |

# APPENDIX E:
# Educational Materials and Events Supplement B:
# Education Plan for the First Two Years

This appendix is a supplement to the education strategy described in Chapter Five of this plan. The intent of the appendix is to provide a more detailed description of educational materials and events including purposes, target audiences and responsible parties for each activity.

### MEDIA CONTACTS

Editorial meetings will be held with local editors and newspaper reporters to brief them on the watershed plan and current projects. In addition, news releases will be distributed to local newspapers, television and radio stations to announce watershed events such as tours, public information meetings, demonstration project installations and grant awards.

Editorial meetings will be set up by County Land/Soil & Water Conservation staff in cooperation with the DNR Public Information Officer, and other DNR and UW-Extension staff. The lead responsible agency for the news releases will vary depending on which agency is primarily responsible for the activity being covered in the news release.

Feature stories in newspapers and television news programs will be sought to provide more in-depth coverage of the program. Special articles or features may involve direct participation by State or Regional DNR or UW-Extension staff.

### NEWSLETTERS

Newsletters will be used to convey information to targeted groups such as local government officials, civic and environmental groups, business and industry associations, interested citizens and other likely participants in the Pigeon River Watershed Project. The objectives of newsletters will be to:

- Supply basic information on the program
- Provide updates on important elements of the program including dates of upcoming events

- Improve understanding of nonpoint source pollution problems and causes
- Increase appreciation of rivers, lakes, wetlands and related natural resources in the watershed
- Introduce watershed residents to recommended management practices
- Provide information on available assistance including cost-sharing
- Build a sense of momentum by providing information on participation and implemented practices

Newsletters will be distributed to key audiences within the watershed and used as handouts at public meetings, tours and exhibits. Local organizations will also be encouraged to reprint articles in their newsletters.

The lead responsible party for watershed newsletters will be the County Land/Soil & Water Conservation staff with assistance from the UW-Extension Area Water Educators. Other UW-Extension and DNR staff may also be involved in newsletter preparation and distribution.

### Watershed Folders and Fact Sheets

Watershed folders will be used to communicate basic information about the watershed project and serve as "cover pieces" for educational packets assembled to meet the needs of rural landowners/operators, lake property owners, local government officials and libraries. Folders will contain different sets of information and education materials, including fact sheets, depending upon the audience groups to which they will be given.

Most of the fact sheets in the folders will have regional or statewide applicability and will be produced by the UW-Extension Area Water Educators. County Land/Soil & Water Conservation staff will assemble the watershed folder contents and, in conjunction with UW-Extension staff, draft fact sheets on watershed-specific subjects such as demonstrations or good local practices. State UW-Extension Specialists, DNR and DATCP staff will develop or assist with the development of fact sheets on rural and urban best management practices with statewide applicability.

### Speakers for Local Groups

County staff, DNR and UW-Extension will serve as speakers for local groups and schools interested in learning more about the watershed program. Speakers will use the state nonpoint source video programs and/or slides to develop programs keyed to the interests of the group. County, DNR, UW-Extension and UW-Sea Grant staff will provide slides of the Pigeon River watershed to supplement the state slide program. They will also select appropriate handouts from the collection of fact sheets, newsletters and brochures available through the Nonpoint Source Program.

Important groups to reach with these programs include the Pigeon Lake Association, Liberty Sanitary District, Sheboygan Conservation Association, Kiwanis, Rotary, League of Women Voters, local Chambers of Commerce, business and industry associations, agricultural organizations, teachers and school classes.

### Nutrient and Pest Management Programs

Owners of livestock operations will be encouraged to participate in nutrient and pest management programs to reduce over-application of nutrients and pesticides. The programs will include soil tests, development of nutrient and pest management plans, manure spreader calibration, winter meetings on nutrient and pest management, and follow-up evaluations.

UW-Extension and Land/Soil & Water Conservation staff will work with crop consultants, co-ops and farm suppliers to develop and implement this program. Fact sheets and other educational materials are already available through UW-Extension programs.

### Yard Care Programs

Yard care information and education activities will be provided for urban, suburban and lake area residents. These activities will include printed materials, InfoSource taped messages, and exhibits. Special needs for this watershed include new fact sheets on how to properly maintain roadside ditches, lawn watering with lake water, the importance of using low or no phosphate fertilizer in lake watersheds, and the use of aquatic plants for buffers to prevent shoreline erosion and provide fish habitat.

Materials for the yard care program, including the "Yard Care and the Environment" fact sheet series, will be developed by County and Area UW-Extension staff with state specialist assistance. Programs on yard care practices that protect water quality will be provided through local groups such as lake districts and associations, beautification and garden clubs, or service organizations.

### School Curriculum and Teacher Workshops

UW-Extension and county Land/Soil & Water Conservation staff will work with school district staff to incorporate water quality issues into their curriculum. Wherever possible, existing curricula will be used or adapted.

School activities will include the expansion of water quality monitoring programs called "Testing the Waters" for middle and high school students. This monitoring program is already underway in schools in the Sheboygan River Watershed. To increase student understanding of

the relationship between land and water, a land use planning element will be included in the expanded program.

The lead responsible parties for curriculum adaptation/development and associated teachers workshops and in-services will be school district staff and Maywood Environmental Park staff with assistance from UW-Extension, Land/Soil & Water Conservation, UW-Sea Grant and DNR staff.

### Water Action Volunteer Programs

School water quality programs will be supplemented by volunteer programs for youth and community groups including educational events and service projects. Volunteer activities such as storm drain stenciling, litter cleanup, water quality monitoring, streambank stabilization, and citizen monitoring of construction site erosion will be included.

The lead responsible party for this project will be Maywood Environmental Park. The state Water Action Volunteer Coordinator, Area UW-Extension, UW-Sea Grant, DNR and county staff will provide assistance in procuring materials and developing associated educational programs and leader training. Materials developed for other watershed projects will be used or adapted wherever possible.

Also, to raise the visibility of citizen water quality monitoring and to make collected data more accessible, UW-Extension will explore using the Pigeon River as a pilot for a Wisconsin Water Action Volunteer World Wide Web page.

### Local Exhibits

Exhibits on the Pigeon River Watershed Project, on urban and rural nonpoint source pollution and on best management practices will be used at county fairs, festivals, home shows and other special events in the watershed. Exhibits will also be placed at high visibility public locations such as libraries, banks, city halls, and schools. The purpose or focus of these exhibits will change as the program progresses. Thus interchangeable groups of exhibit components will be developed to cover a variety of themes. Ideas for exhibit themes include nutrient management, conservation tillage, construction site erosion control, stormwater management, and pollution prevention.

Arrangements for use of exhibits in local areas will be the responsibility of County UW-Extension and Land/Soil & Water Conservation staff with assistance from Area UW-Extension and District DNR staff and volunteers from local lake districts and associations. Most materials for the exhibits will be developed by county Land/Soil & Water Conservation staff in consultation with Area UW-Extension staff.

### Demonstration Projects

Demonstration projects will be used to inform local government officials, landowners eligible for cost-sharing, and local residents about appropriate best management practices. Demonstration projects will be featured in field days, news releases, newsletter articles, presentations to local groups, exhibits and tours.

Area UW-Extension staff will be responsible for developing fact sheets for each demonstration project with assistance from Land/Soil & Water Conservation and local government staff. Land/Soil & Water Conservation and UW-Extension staff will work with landowners to document the project in slides, news releases and signs. County Land/Soil & Water Conservation and UW-Extension staff will work together to develop a self-guided tour of conservation tillage demonstrations.

### Signs

Signs will be used at selected locations to increase public awareness of the program. Potential sites for signs will be selected and prioritized by the Education Work Group of the Advisory Committee. Signs will also be used to identify demonstration projects and farmers who participate in the program. The Sheboygan Land Conservation Department and Manitowoc Soil and Water Conservation Department will have primary responsibility for this project.

To raise public awareness of water resources in the Pigeon River watershed, the Manitowoc SWCD will work with Advisory Committee members to request that Manitowoc County put up road crossing signs identifying the Pigeon River, tributary streams and lakes.

### Implementation Tour

During the implementation phase in the watershed, a tour will be scheduled to update local officials on program progress, and to inform the media and the public about implemented practices and water quality improvements. Rural and urban demonstration projects and other implemented practices will be featured in the tour. The tour should be scheduled well before the end of the sign-up period for state cost-sharing. Implementation tours may be combined for adjacent watersheds where sign-up periods overlap.

The lead responsible party for arranging the implementation tour will be the County Land/Soil & Water Conservation staff. Assistance will also be provided by other DNR staff, County and Area UW-Extension staff.

### City, Village and Town Meetings

Due to the importance of preventing nonpoint source pollution through land use planning, site planning, construction site erosion control and stormwater management, DNR will schedule meetings with key municipalities to assist them in participating in the watershed program. Purposes of the meetings scheduled during the first year of the project are to: (1) present inventory results, survey results and plan recommendations for each community; (2) highlight the need for land use planning and site planning to prevent increases in urban runoff pollution, (3) develop appropriate local assistance and cost-sharing agreements for implementation of the plan in each community; (4) assist municipal staff in reviewing current pollution prevention practices and capital improvement projects related to nonpoint source pollution control; (5) assist municipal staff in developing and carrying out local information and education strategies. County Land/Soil & Water Conservation staff will assist DNR in working with municipalities on issues such as construction site erosion control, information and education, and pollution prevention.

DNR Southeast District staff will be responsible for working with municipalities on local assistance, cost-sharing grants, and urban best management practices. Other DNR and County or Area Extension staff will provide assistance as needed in information and education, staff training, and other watershed activities for municipalities.

### Best Management Practice Workshops

One specific type of technical education and training assistance offered to local governments will be workshops on best management practices such as construction site erosion control, stormwater management, land use planning, site planning, and pollution prevention. Workshops will be designed to provide technical information on these practices to local government staff, developers, builders, contractors, consultants, landscape designers and ground keepers. For more detailed engineering training, municipal and consulting engineers will be encouraged to attend multi-day workshops sponsored by UW-Madison Professional Engineering Development. For those who need less intense training and who can not attend multi-day sessions, one-day or half-day workshops will be offered in the Southeast District by UW-Extension.

Generally, UW-Extension staff will be responsible for organizing one-day or half-day workshops. Materials for use in the workshops will be developed on a basinwide or state level. DNR, UW-Sea Grant and Land/Soil & Water Conservation staff will assist with the workshops by speaking, developing handouts, evaluating results and providing publicity. County and state UW-Extension staff will assist with publicity and registration.

### Local Educational Programs

Each city, town and lake district will have an information and education element included in any local assistance agreement. These may include:

- Pollution prevention audits of parks and public works programs
- Publicity for changes in urban pollution prevention programs such as leaf collection, street sweeping, pet waste cleanup and waste oil recycling collection
- Information for the construction industry about new or changed local construction erosion control and stormwater management ordinances
- Packets on construction site erosion control for people applying for grading, street opening and building permits
- Training of local government staff for urban best management practices such as construction erosion control, stormwater management, and pollution prevention
- Short presentations for local government officials at their regular meetings on urban best management practices using the UW-Extension video, *Beyond Drainage*

City, town and lake district staff (or consultants) will be responsible for implementing their community's information and education program. DNR and Extension staff will provide information on pollution prevention audits and urban best management practices to local government officials through mail or telephone contacts, attending local government meetings, providing workshops, or other educational means.

Many of these printed materials have been initiated through the "Yard Care and the Environment" fact sheet series under the leadership of Area UW-Extension staff. Others are available through the UW-Extension Solid and Hazardous Waste Education Center, DNR Recycling Information, or county Health Departments. Wherever possible, existing materials will be used and distribution will be targeted to key audiences through direct mailings, permit counter and point-of-sale handouts.

# EDUCATION PLAN FOR FIRST TWO YEARS

This appendix to the Pigeon River Watershed plan outlines educational activities proposed for the first two years of plan implementation. During these years, the primary goals of educational activities will be to build awareness of watershed issues among residents and to move people from awareness to actions that will improve water quality.

Awareness-building activities will include tours, newsletters, mailings, signs and personal contacts. These awareness activities will be complemented by skill training for those who must implement best management practices. Skill training activities will include demonstrations, field days, fact sheet distribution and workshops.

The success of both the awareness-building and skill-training activities will be evaluated in terms of the number of people participating, number of watershed conservation plans and contracts signed, and voluntary participation in related programs sponsored by other groups and agencies.

| Educational Activity | Year 1 | | | | Year 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 |
| | | | | | | | | |
| **Awareness-Building** | | | | | | | | |
| Officials Tour | | 2 | | | | | | |
| Citizens Tour | | | 1 | | | | | |
| WAV Tour/Results Event | | 1 | | | | | | |
| Newsletter | 1 | | 1 | 1 | 1 | | 1 | 1 |
| Direct Mailing | | 1 | 1 | | 1 | | 1 | |
| Personal Contacts of Farm Operators | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| BMP Tour | | | | | | 2 | | |
| Presentations for Fish & Game Clubs | 3 | 3 | | 3 | | 4 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Farm Show/Fair | 2 | | 3 | | 2 | | 3 | |
| Stream Awareness Event | 1 | 2 | 1 | | | | | |
| Media Day | | | | 2 | | | | |
| School Presentations | 2 | 1 | | | 2 | 1 | | |
| 4H Presentations | 2 | | | | 2 | 1 | | |
| FFA Presentations | | 2 | | | | 2 | | |
| Storm Drain Stenciling | | x | x | x | | x | x | x |
| Meetings with Newspaper Editors | 4 | | | | | | | |
| | | | | | | | | |
| **Skill-Training** | | | | | | | | |
| Tillage Demo Article/Press Release | | | 2 | 2 | | 2 | | |
| Milkhouse Waste Demo Article/Press Release | 2 | | | 2 | | | 2 | |
| Land Use Planning Workshop/Meeting | | | 2 | | 2 | | | |
| Lake Property Demo/Event | | 1 | 1 | | | 1 | 1 | |
| Wildlife Habitat Demo | | | | | x | x | x | |
| Wetland /Buffer Event | | | 2 | | | | 2 | |
| Construction Site Erosion Control Workshops/Meetings | 2 | | 1 | | 1 | | 1 | |
| Testing the Waters Training & Congress | | 1 | | 1 | | 1 | | 1 |
| Establish Water Education Resource Center at Maywood | x | x | x | | | | | |

# APPENDIX F:
# Signs of Success Monitoring Procedures

When conducting any monitoring, it is important to use the same methods and equipment to collect pre-BMP and post-BMP data to insure meaningful comparisons. This includes maintaining the same season in which the data are collected. Reference and impact stations should be similar except for the source of perturbation. For the purposes of S.O.S. monitoring, the reference station should be located within the same stream reach so that improvements can be associated with the installation of BMPs at a single location. Emphasis should be placed on site selection to insure that the best sites within a watershed are used to increase the likelihood that the greatest number of instream improvements will result from the installation of BMPs and be documented using S.O.S. methodologies.

**Habitat Evaluation**

The procedures developed for evaluating stream habitat in Wisconsin priority watersheds will be used to document habitat improvements at S.O.S. sites (Simonson et al. 1993a, Simonson et al. 1994). Some of these procedures can be slightly modified if fish data will not be collected at the site. In many instances collecting fish data to demonstrate short term improvements may not be worth while (Lyons pers. comm. 1995). Considerations for when fish data should and should not be collected are listed under Fish Data in the subsection "Additional Considerations for Site Specific Monitoring Activities" of this appendix. For example, if fish data are not collected, the station does not have to start and stop at a riffle. When available riffles are used as starting and stopping points because they act as natural barriers preventing the escape of fish from capture, minimizing fish sample bias. It is still recommend that the sampling station start at a riffle and continue upstream 35 times the mean stream width (MSW). If you can reach a riffle in the next few transects continue to that end point; if not, identify a permanent landmark for a referenced end point. Even if fish are not used, the biologist should consider the following recommendations to ensure integrity of the data set. An abbreviated list is provided to emphasize important considerations. The biologist should refer directly to one of the procedural manuals used when conducting habitat assessment in Wisconsin streams (Simonson et al. 1993a, Simonson et al. 1994).

1. Reference and impact stations should each be 30-35 times the mean stream width (MSW) in length. Twenty times MSW is acceptable in particularly wide streams or where the affected area is very small. However, if a shorter distance is sampled, there should still be at least a minimum of 13 transects (Lyons, pers. comm. 1995).

2. Stations should not contain permanent tributaries or hydraulic controls (e.g., dams, bridge abutments), and should be at least 10 times MSW away from bridges.

3. Different stations should not contain significantly different natural physical features i.e., geology, depth, velocity, and substrate size, shape and type.

4. Each station should have a fairly normal meander pattern which should include pools, runs, and riffles (if present). Exceptions may be made for low gradient streams.

**Benthic Macroinvertebrates**

An emphasis should be placed on selecting sites which could demonstrate an improvement in macroinvertebrate community structure with the installation of specific BMPs. In watersheds limited in the number of potential S.O.S. sites, it may be necessary to select a site where collecting macroinvertebrates may not be worthwhile. The biologist should carefully weigh the potential of more suitable sites before selecting one where improvements in macroinvertebrate community structure are unlikely. Sites located in the headwater regions of a stream are more likely to demonstrate an improvement because of the reduced amount of surface area upstream of the site where potential runoff could obscure or compensate for any anticipated improvements or reductions that should result from specific BMPs.

The Hilsenhoff Biotic Index (HBI) and his Family level Biotic Index (FBI) will be used to assess the degree of organic stream pollution for pre-BMP and post-BMP conditions. Benthic macroinvertebrate samples will be collected at riffles located at reference and impact stations (Hilsenhoff 1982, 1987, and 1988a). EPT (Ephemeroptera-mayflies, Plecoptera-stoneflies, and Trichoptera-caddisflies) measures are valuable because of their ability to detect significant differences between impact and reference sites. These insect orders are recognized as being fairly intolerant of pollution. The Wisconsin DNR Bug computer program includes four EPT measures which can be included when the sample statistics report is printed. The EPT measures include: % EPT genera in the sample (EPTPG), % EPT individuals in the sample (EPTPC), number of EPT individuals (EPTC), and number of EPT genera (EPTG) (Gaufin 1957). A variety of paired statistical analyses are also available on the DNR Bug program and should help in detecting significant differences between impact and reference sites.

"The establishment of suitable spatial and/or temporal controls is an essential component of sampling design for any biomonitoring study and has been discussed by Green (1979), Stewart-Oaten et al. (1986), Resh et al. (1988), and Resh and Rosenberg (1989), among others" (Rosenberg and Resh 1993).

The spatial considerations when selecting reference and impact sites to compare macroinvertebrate community structure are of particular importance. The riffles selected for sampling in the reference and impact stations should be located in areas having comparable depth, velocity, geology, and substrate size, shape and type, because macroinvertebrate community structure is particularly sensitive to these variables (Minshall 1984). If comparable riffles in the stream reach of interest are not available, the biologist should consider locating a different site to conduct S.O.S. monitoring within the watershed. If there are no better sites within the watershed, the biologist may use artificial substrates to standardize comparisons between reference and impact stations. Three artificial substrates should be used at each site and placed in faster runs or above buried riffle habitat and should be left in the stream for at least 30 days. Artificial substrate samples should not be used for quantitative analysis, but should be processed and analyzed similarly to the kick-net samples collected at other S.O.S. sites. If artificial substrates are used, the collector should record the sampling device as an

artificial substrate on the Macroinvertebrate Field and Bench Sheet (Form 3200-81). If there is a high probability that better sites exist in the watershed and will become available within the appropriate time frame, sites without naturally comparable reference and impact stations within the same stream reaches should be eliminated from consideration for S.O.S. monitoring.

Several temporal factors should be considered before collecting macroinvertebrate samples. Macroinvertebrate community structure is affected by seasonal change. Some of these changes are the result of natural life cycle strategies that have evolved to help aquatic insects cope with normal summer low flows and higher temperatures. These strategies may result in the total absence of many genera from summer samples, and include egg and nymphal diapause. For this reason, Hilsenhoff recommends sampling in spring before degree day accumulations of mean air temperatures above 4.5°C reach 440° in warm-water streams, and before they reach 1050° in cold-water streams that remain below 20°C. Sampling in fall may be resumed 60 days after the 440° day accumulation in warm-water streams and 45 days after the 1050° day accumulation in cold-water streams (Hilsenhoff 1988b). Szczytko prefers that fall sampling occur in later September or October to insure that diapausing species which are absent in summer months have adequate time for recruitment (pers. comm. 1995).

The effects of NPS pollution on the macroinvertebrate community structure depend on the season and magnitude of the impacts. During summer, the lower dissolved oxygen levels that result from organic enrichment can stress intolerant organisms or force them to vacate affected stream reaches. This modifies community structure and allows determination of the degree of impact based on the presence and or absence of tolerant and intolerant organisms. During winter and early spring, lower temperatures and correspondingly higher dissolved oxygen levels allow intolerant organisms, through drift and other natural processes, to recolonize these impacted areas (Hellawell 1977). Drift is the downstream transport by current of benthic animals normally living on or in bottom substrates and is a major recolonization mechanism (Wiley and Kohler 1984).

Floods are another temporal consideration since Meade and Parker (1984) found that over 90 percent of the annual occurrences of floods are the result of runoff associated with spring precipitation and snow-melt. Sampling after a flood should be avoided because floods result in changes in the macroinvertebrate community structure which can make it difficult to determine if changes are the result of NPS pollution or the catastrophic effects of flooding (Hynes 1970). The majority of streams experience some level of spring flooding. If the flood is of average duration and intensity, the macroinvertebrate community may take several weeks to redistribute (Williams et al. 1977). Sampling should be conducted only after an adequate recovery period has elapsed.

In a previous study the reliability of 25 biotic indices and the effects of seasonal and site differences on macroinvertebrate community structure was analyzed. This was based on a study in which 500 benthic macroinvertebrate samples were collected from impact and reference sites during spring and fall (Cahow 1995). Fall sample HBI, FBI, and EPT measures values had lower variability than spring samples increasing the likelihood of detecting significant differences. Other biotic indices were also more capable of detecting significant differences between reference and impact site comparisons using fall data.

For the above reasons, sampling in September or October is recommended. If spring sampling is necessary sampling should occur in May to allow the macroinvertebrate community structure time to recover from spring floods and yet still meet Hilsenhoff's guidelines concerning degree day accumulations (Hilsenhoff 1988b). If significant flooding occurs at other times of the year, sampling should be postponed until 30 days after the return to base flow. Pre-BMP and post-BMP sampling should be conducted on approximately the same calendar dates to avoid introducing seasonal variability among samples. Three replicate samples will be collected at each site for each sampling period. A standard WDNR Macroinvertebrate Field and Bench Sheet (Form 3200-81) should be filled out for each sampling site during each sampling period. The riffles selected for sampling should have a minimum width of 100cm (40"), depth of at least 15cm (6") and a minimum velocity of at least 30cm/sec. (12"/sec.) (Hilsenhoff 1987). The preferred substrate should include a dominant portion of coarse gravel and rocks 3-15cm (1-6"). Studies have demonstrated that finer homogenous substrates make it difficult to collect adequate sample sizes (Minshall 1984). Substrates larger than 15cm (6") are difficult to adequately disturb when attempting to dislodge lithophilic organisms. Larger homogenous substrates may also lack the diversity and density of macroinvertebrates found in moderate sized heterogenous substrates (Minshall 1984).

Collection of the samples should begin at the downstream end of the riffle. Each subsequent sample should be collected slightly above (upstream of) the former to avoid collecting from previously disturbed substrates. Efforts should be taken to avoid sampling laterally near stream margins since the addition of macroinvertebrates from a stream margin community can result in biased water quality ratings. The addition of stream margin taxa to riffle samples also result in increased sample variability, decreasing the ability to detect significant spatial and temporal differences between samples. The collector should avoid having the net so close to their feet that gravel is washed into the net. Generally, disturbing the substrate in an area approximately 50cm wide and 100cm long for approximately two minutes provides a sufficient sample.

After collecting, the sample contents should be thoroughly rinsed to flush any silt and fine sand from the sample. Large sticks and debris should be rinsed off and discarded after removing attached invertebrates. The sample should fill at least one-quarter to one-third of a 1-quart mason jar. If the sample does not contain at least eight ounces of debris containing 100 invertebrates with assigned tolerance values, the biologist should attempt to collect an additional two minutes and add these contents to the sample and note it on the bench sheet. If an insufficient sample size still exists after additional sampling efforts, preserve the sample and note on bench sheet. Insufficient numbers can be an indication of large scale impacts. If the sample contains more debris than half the volume of the sample jar, the collector should dump the sample back into the net and attempt to rinse and discard enough remaining organic material (leaves, twigs, large gravel, and macrophytes) to reduce sample volume to half of the container. Larger samples are difficult to preserve properly and are time-consuming in the sorting process.

Samples should be preserved in the field with 90-95% ethanol or isopropyl alcohol. Samples should be preserved again 24 to 48 hours after collection to account for dilution with the sample contents. When represerving the samples, 80% ethanol or isopropyl alcohol should be used to eliminate rigidity problems associated with stronger concentrations, which make manipulation for identification purposes

difficult. Weaker concentrations may not stop decomposition of the sample.

Statistical analysis will include testing for significant differences between impact and reference sites and before and after data using either the Detectable Difference method or a Student's paired t-test of the differences (Narf 1982). Other statistical analyses may be used to demonstrate the effectiveness of BMPs in controlling NPS pollution.

**Photographic Documentation**

Photographic evidence provides good documentation of the effectiveness of BMPs. When evaluating barnyards, photographs also provide an effective medium to promote the desirability of the practice along with the reductions in delivery. When documenting the improvements that result from streambank improvements or fencing operations, they provide a good indication of the percent ground cover which is directly correlated with the amount of sediments and nutrients that reach the surface waterbody. The following recommendations were written cooperatively with the DNR photographer Bob Queen.

1. Film - A high quality negative print film, such as Fujicolor or Kodacolor should be used because it is more forgiving than slide film (Fujichrome & Kodachrome) when it comes to over-exposing or under-exposing the film. Film should be 100 ASA under normal outdoor conditions, or 200 ASA if overcast. Film with higher ASA numbers appear grainy or fuzzy in enlargements. Photographs will be enlarged to 8" X 12" or larger for the display board used at the demonstration day.

2. Lenses - If available, or when considering the purchase of future photographic equipment, a single 28-70mm or 28-80mm lens can greatly improve the quality of photographs taken under a wide range of conditions. A frequent problem encountered is the inability to incorporate adequate field of view when documenting land use. A lens having 28mm capabilities should be able to capture most of your wide-angle photographic needs. The upper limit isn't as important but should be at least 70-80mm to provide some zoom capabilities. Try to avoid lenses which give greater upper ranges without a f-stop lower than 3.9 - 4.2, making it difficult for the camera to gather adequate light. If your camera has a depth of field preview button, test the different aperture settings. Slower aperture settings may require a tripod to stabilize the camera during the longer exposure period. If the only lens available is a standard 50mm the photographer should take special precautions to avoid too many distance shots and take more photographs of smaller (tighter) increments to document riparian conditions.

3. Lighting - Expose your photographs for the streambank or shaded areas because, in order to properly document ground conditions, the sky will usually have to be overexposed. One of the first things the biologist should do when arriving at an S.O.S. site to collect field data is to determine what photographs are needed to properly document the impacts and the time of day when sun location could be a hinderance or a help. The sun should be located behind and slightly oblique to the photographer. The sun should never be in front of the photographer.

4. Reference points - Reference points should be used to orient the viewer when looking at pre-BMP and post-BMP conditions at a specific location. Photos should include some portion of the stream for reference as well as buildings and other permanent physical features. If no reference points appear in a specific picture, the distance and direction from a known reference point should be recorded in the photographic log/journal (see 6, below) with the corresponding frame number from the roll of film.

5. Vantage points - Photographs taken from an elevated point of view may be the only way to properly document the condition of riparian vegetative cover. A short ladder may make a considerable difference in being able to discern the magnitude of the impacts or recovery. Other possible vantage points may include buildings, trees, vehicles, hilltops and other available elevated areas.

6. Photographic log/journal - Documentation for each photograph should include: stream name, date, station (reference or impact), frame number, location description within the station with specific reference to any permanent physical features used for orientation, and direction photograph was capturing (upstream, downstream, east bank, west bank, north of, south of, . . .) and any other pertinent information.

7. Necessary Photographs

A. The following pictures should be taken at both reference and impact sampling stations.

1. The first photograph taken at each station should be of the station summary data sheet, so that subsequent photographs can be identified as to location.

2. Start of impact site sampling station looking upstream and downstream with specific reference to any marking or flagging placed at the start of station.

3. If possible, successive photographs should be taken from start of station to station end point, preferably during similar light conditions and at the same time of the day and year for both pre-BMP and post-BMP photo shoots.

4. Riffle used to collect benthic samples within impact site sampling station.

5. Riparian land use photographs.

6. Any unusual stream features which occur within the station such as tile drains, cattle crossings, bank erosion, evidence of ditching, rock rip rap, habitat work, lost meanders, drainage ditches, other potential sources of impact or pollution, and features which may impede natural flow.

7. End of station photographs looking upstream and downstream.

B. Photographs of the area to be controlled by BMPs are particularly important if improvements are to be properly documented.

1. Several photographs of the stream overlooking the affected area towards the source should be included.

2. Additional photographs of the area to be controlled by the BMP may have to be taken to get the desired resolution necessary to discern the degree of impact and control.

3. Adjacent land use photographs may capture the degree of improvement.

**Additional Considerations for Site Specific Monitoring Activities**

A. Fish Data - In many situations, collecting fish data may not be worth while. To discern between those instances, John Lyons, Fisheries Biologist and Rivers and Streams Research Group Leader with the Wisconsin DNR Bureau of Research, has provided some situations in which he felt collecting fish data would be worth while and distinguished those from situations when it would not be worthwhile (pers. comm. 1995).

1. Situations when collecting fish data may be worth while.

a. There must be a neighboring fish community from which fish can migrate to recolonize the affected stream reaches, once NPSs have been controlled.

b. Streams with barnyards that result in the direct addition of large amounts of manure runoff to the stream, yet have very little in the way of upstream sources of pollution that remain uncontrolled after the implementation of BMPs, are likely to demonstrate an improvement.

c. In areas where cattle have broken down the streambanks, eliminated vegetative cover, and trampled instream habitat in a large area, fencing and streambank BMPs can result in improvements if minimal upstream impacts exist.

d. NPS impacts that result in an intense localized problem, when controlled, result in the elimination or reduction of a majority of the loading problems for the affected stream reach. Minimal upstream impacts should exist if attempting to demonstrate localized improvements.

e. Coldwater fish communities are more likely to demonstrate improvements than warmwater fish communities if the impacts to be controlled by BMPs are localized.

e. Collecting fish data - A single upstream pass should be used to collect all stunned fish (> 26mm in total length) observed throughout each sampling station. Procedures have been modified to eliminate the collection of crayfish because crayfish do not appear to be a good indicator group. A conscious effort should be made to avoid the natural tendency of selecting the larger fish over the smaller ones. At the end of the pass, all fish are counted and weighed, in aggregate, by species. Some gamefish species should be measured for length (Simonson et al. 1993b). Identification should be accomplished through the use of appropriate keys and reference specimens. If taxonomically difficult specimens are encountered, a representative for each major size class should be preserved for laboratory identification. John Lyons will be available for help in identifying limited numbers of the more challenging taxa that cannot be solved with additional laboratory efforts. Remember that fish should be handled carefully to minimize mortality and released back into the station. All fish data should be recorded on the appropriate data sheets (Station Summary, Catch Summary, and Individual Fish Data).

B. Water Chemistry Data - The requirements necessary for collecting useful water chemistry data limit the applicability in developing an easy cost-effective method for demonstrating the short term improvements that result from the installation of specific BMPs. Most water chemistry data, to be useful in demonstrating the improvements that result in controlling NPS pollution associated with runoff, must be collected at a specific point in time during a runoff event. This places large demands upon the collector to be available to collect samples from an adequate number of events to document pre-BMP and post-BMP conditions. To properly document water chemistry problems related to runoff, a minimum of 5-6 runoff events should be captured during both pre-BMP and post-BMP sampling periods. If the biologist feels capable of meeting these requirements within appropriate time budgets, a determination still has to be made on what data will be collected. The standard water quality parameters used for barnyard or manure storage problems are ammonia, fecal coliform, and BOD. If there are significant amounts of sediments entering the stream during runoff events, phosphorus levels may be greatly elevated. If the BMPs will result in a significant reduction of sediments entering the stream, chemical analysis may be worthwhile. In situations where cattle densities are high, affecting large portions of the stream and resulting in high turbidity problems, suspended solids or turbidity should be evaluated. Fencing BMPs should be extensive enough to allow the recovery of a protected vegetative corridor along the stream and limit the additions from runoff.

In streams targeted for fencing, temperature impairment may be a concern because of the lack of appropriate vegetative cover. Before and after temperature conditions may be more easily and cost-effectively documented than water chemistry. A variety of thermal data loggers exist on the market for a little over a hundred dollars, with accompanying software for another fifty dollars.

2. Situations when collecting fish data may not be worth while.

a. Short-term improvements are unlikely to develop if there are no adjacent fish communities available to act as seed stock from which migration can occur to recolonize the affected stream reaches once BMPs are installed.

b. If there is already a relatively healthy, diverse and productive fish community in the stream reach of interest, installation of BMPs at a single location will probably not result in any noticeable improvements in fish community structure.

c. If significant upstream impacts will remain uncontrolled after the installation of BMPs in the stream reach of interest, improvements are unlikely to result.

3. Sampling methodology

a. Seasonal considerations for collecting fish data - Fish data should be collected during summer months. Fall and early spring sampling is discouraged because of the highly variable seasonal migration patterns that occur at these times of the year. It is important that pre-BMP and post-BMP data be collected on or about the same calendar dates to minimize seasonal variability within the data. Sampling should be conducted when streams are at or near base flow. If the water level appears to be above normal (> 0.15 m) or unusually turbid, sampling should not be conducted.

b. Equipment considerations - A stream shocker is recommended. If stream size limits the collection technique to backpack shockers, two backpack shockers should be used because the overlapping effect of electrical fields make them more effective, reducing the number missed fish. If a single backpack shocker is used, the collector should carefully consider possible escape routes from critical habitat and attempt to strategically cut off escape routes. It is important to use the same equipment and output settings to collect pre-BMP and post-BMP data to insure comparability.

c. Sampling stations - The length of the sampling stations should be at least be 35 times the mean stream width (MSW) or 100 meters, which ever comes last. If fish numbers become overwhelming in larger streams, the sampling station length can be shortened to 20-25 times MSW.

d. Use of the correct IBI - Different IBIs exist for warmwater streams and coldwater streams. It may be difficult to apply any specific IBI to streams that do not fall clearly into one of these categories. Another problem has been applying IBI scores to very small or intermittent warmwater streams; for this reason efforts are under way to develop an IBI for these streams.

C. Wildlife habitat improvements can be significant with fencing BMPs. Area wildlife biologists may be interested in helping coordinate or document these improvements, which should increase the desirability of the practices significantly.

# GLOSSARY

ACUTE TOXICITY: Any poisonous effect produced by a single short-term exposure to a chemical that results in a rapid onset of severe symptoms.

ADVANCED WASTEWATER TREATMENT: The highest level of wastewater treatment for municipal treatment systems. It requires removal of all but 10 parts per million of suspended solids and biological oxygen and/or 50 percent of the total nitrogen. Advanced wastewater treatment is also known as "tertiary treatment."

AGRICULTURAL CONSERVATION PROGRAM (ACP): A federal cost-sharing program to help landowners install measures to conserve soil and water resources. ACP is administered by the USDA ASCS through county ACP committees.

ALGAE: A group of microscopic, photosynthetic water plants. Algae give off oxygen during the day as a product of photosynthesis and consume oxygen during the night as a result of respiration. Therefore, algae effect the oxygen content of water. Nutrient-enriched water increases algae growth.

AMMONIA: A form of nitrogen ($NH_3$) found in human and manures. Ammonia can be toxic to aquatic life.

ANAEROBIC: Without oxygen.

AREA OF CONCERN: Areas of the Great Lakes identified by the International Joint Commission (IJC) as having serious water pollution problems.

AREAWIDE WATER QUALITY MANAGEMENT PLANS (208 PLANS): A plan to document water quality conditions in a drainage basin and make recommendations to protect and improve basin water quality. Each basin in Wisconsin must have a plan prepared for it, according to section 208 of the Clean Water Act.

ANTIDEGRADATION: A policy stating that water quality will not be lowered below background levels unless justified by economic and social development considerations. Wisconsin's antidegradation policy is currently being revised to make it more specific and meet EPA guidelines.

AVAILABILITY: The degree to which toxic substances or other pollutants are present in sediments or elsewhere in the ecosystem and are available to affect or be taken up by organisms. Some pollutants may be "bound up" or unavailable because they are attached to clay particles or are buried by sediment. Oxygen content, pH, temperature and other conditions in the water can affect availability.

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

BARNY: The Wisconsin Barnyard runoff model, a computer model used to assess the water quality impacts of barnyards or feedlots. It was developed by DNR with assistance from NRCS and DATCP.

BASIN PLAN: See "Areawide Water Quality Management Plan".

BENTHIC ORGANISMS (BENTHOS): Organisms living in or on the bottom of a lake or stream.

BEST MANAGEMENT PRACTICE (BMP): The most effective, practical measures to control nonpoint sources of pollutants that runoff from land surfaces.

BIOACCUMULATION: The uptake and retention of substances by an organism from its surrounding medium and food. As chemicals move through the food chain, they tend to increase in concentration in organisms at the upper end of the food chain such as predator fish, or in people or birds that eat these fish.

BIOASSAY STUDY: A test for pollutant toxicity. Tanks of fish or other organisms are exposed to varying doses of treatment plant effluent. Lethal doses of pollutants in the effluent are then determined.

BIOCHEMICAL OXYGEN DEMAND (BOD): A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. $BOD_5$ is the biochemical oxygen demand measured in a five day test. The greater the degree of pollution, the higher the $BOD_5$.

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

BIOTA: All living organisms that exist in an area.

BUFFER STRIPS: Strips of grass or other erosion-resisting vegetation between disturbed areas and a stream or lake.

BULKHEAD LINES: Legally established lines that indicate how far into a stream or lake an adjacent property owner has the right to fill. Many of these lines were established many years ago and allow substantial filling of the bed of the river and bay. Other environmental laws may limit filling to some degree.

CARCINOGENIC: A chemical capable of causing cancer.

CATEGORICAL LIMITS: All point source discharges are required to provide a basic level of treatment. For municipal wastewater treatment plants this is secondary treatment (30 mg/l effluent limits for SS and BOD). For industry the level depends on the type of industry and the level of production. More stringent effluent limits are required, if necessary, to meet water quality standards.

CHLORINATION:
The application of chlorine to wastewater to disinfect it and kill bacteria and other organisms.

CHLORORGANIC COMPOUNDS (CHLORORGANICS):
A class of chemicals that contain chlorine, carbon and hydrocarbon. This generally refers to pesticides and herbicides that can be toxic. Examples include PCB's and pesticides such as DDT and dieldrin.

CHRONIC TOXIcity:
The effects of long-term exposure of organisms to concentrations of a toxic chemical that are not lethal, but is injurious or debilitating in one or more ways. An example of the effect of chronic toxicity is reduced reproductive success.

CLEAN WATER ACT:
See "Public Law 92-500."

COMBINED SEWERS:
A wastewater collection system that carries both sanitary sewage and stormwater runoff. During dry weather, combined sewers carry only wastewater to the treatment plant. During heavy rainfall, the sewer becomes swollen with stormwater. Because the treatment plant cannot process the excess flow, untreated sewage is discharged to the plant's receiving waters, i.e., combined sewer outflow.

CONFINED DISPOSAL FACILITY (CDF):
A structure built to contain and dispose of dredged material.

CONGENERS:
Chemical compounds that have the same molecular composition, but have different molecular structures and formula. For example, the congeners of PCB have chlorine located at different spots on the molecule. These differences can cause differences in the properties and toxicity of the congeners.

CONSERVATION TILLAGE:
Planting row crops while only slightly disturbing the soil. In this way a protective layer of plant residue stays on the surface. Erosion rates decrease.

CONSUMPTION ADVISORY:
A health warning issued by DNR and WDHSS that recommends people limit the fish they eat from some rivers and lakes based on the levels of toxic contaminants found in the fish.

CONTAMINANT:
Some material that has been added to water that is not normally present. This is different from a pollutant, which suggests there is too much of the material present.

CONVENTIONAL POLLUTANT:
Refers to suspended solids, fecal coliforms, biochemical oxygen demand, and pH, as opposed to toxic pollutants

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

CRITERIA:
See water quality standard criteria.

DIOXIN (2,3,7,8-tetrachlorodibenso-p-dioxin):
A chlorinated organic chemical which is highly toxic.

DISINFECTION:
A chemical or physical process that kills organism that cause disease. Chlorine is often used to disinfect wastewater.

DISSOLVED OXYGEN (DO):
Oxygen dissolved in water. Low levels of dissolved oxygen cause bad smelling water and threaten fish survival. Low levels of dissolved oxygen often result from inadequate wastewater treatment. The DNR considers 5 ppm DO necessary for fish and aquatic life.

DISTRICTS:
DNR field offices. There are six DNR administrative districts in the state (see inside back cover for map).

DREDGING:
Removal of sediment from the bottom of water bodies.

ECOSYSTEM:
The interacting system of biological community and its nonliving surrounding.

EFFLUENT:
Solid, liquid or gas wastes (byproducts) that are disposed on land, in water or in air. As used in the RAP, effluent generally means wastewater discharges.

EFFLUENT LIMITS:
The DNR issues WPDES permits establishing the maximum amount of pollutant to be discharged to a receiving stream. Limits depend on the pollutant and the water quality standards that apply for the receiving waters.

EMISSION:
A direct (smokestack particles) or indirect (busy shopping center parking lot) release of any contaminant into the air.

ENVIRONMENTAL PROTECTION AGENCY (USEPA):
The federal agency responsible for enforcing federal environmental regulations. The Environmental Protection Agency delegates some of its responsibilities for water, air and solid waste pollution control to state agencies.

ENVIRONMENTAL REPAIR FUND:

A fund established by the Wisconsin Legislature to deal with abandoned landfills.

EPIDEMIOLOGY:
The study of diseases as they affect populations rather than individuals, including the distribution and incidence of a disease mortality and morbidity rated, and the relationship of climate, age, sex, race and other factors. EPA uses such data to establish national air quality standards.

EROSION:
The wearing away of the land surface by wind or water.

EUTROPHIC:
Refers to a nutrient-rich lake. Large amounts of algae and weeds characterize a eutrophic lake (see also "Oligotrophic" and "Mesotrophic").

EUTROPHICATION:
The process of nutrient enrichment of a lake loading to increased production of aquatic organisms. Eutrophication can be accelerated by human activity such as agriculture and improper waste disposal.

FACILITY PLAN:
A preliminary planning and engineering document that identifies alternative solutions to a community's wastewater treatment problems.

FECAL COLIFORM:
A group of bacteria used to indicate the presence of other bacteria that cause disease. The number of coliform is particularly important when water is used for drinking and swimming.

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

FLOURANTHENE:
A polyaromatic hydrocarbon (PHA) with toxic properties.

FLY ASH:
Particulates emitted from coal burning and other combustion, such as wood burning, and vented into the air from stacks, or more likely, collected by electrostatic precipitators.

FOOD CHAIN:
A sequence of organisms where each uses the next as a food source.

FURANS (2,3,7,8-tetra-chloro-dibenzpfurans):
A chlorinated organic compound which is highly toxic.

GREEN STRIPS:
See buffer strip.

GROUNDWATER:

Undergroundwater-bearing areas generally within the boundaries of a watershed, which fill internal passageways of porous geologic formations (aquifers) with water that flows in response to gravity and pressure. Often used as the source of water for communities and industries.

HABITAT:
The place or type of site where a plant or animal naturally lives and grows.

HEAVY METALS:
Metals present in municipal and industrial wastes that pose long-tern environmental hazards if not properly disposed. Heavy metals can contaminate ground and surface waters, fish and other food stuffs. The metals of most concern are: arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium and zinc (see also separate listings of these metals for their health effects).

HERBICIDE:
A type of pesticide that is specifically designed to kill plants and can also be toxic to other organisms.

HYDROCARBONS:
Any chemical of a large family of chemicals containing carbon and hydrogen in various combinations.

INCINERATOR:
A furnace designed to burn wastes.

INFLUENT:
Influent for an industry would be the river water that the plant intakes for use in its processing. Influent to a municipal treatment plant is untreated wastewater.

IN-PLACE POLLUTION:
As used in the RAP, refers to pollution from contaminated sediments. These sediments are polluted from post discharges from municipal and industrial sources.

INTERNATIONAL JOINT COMMISSION (IJC):
An agency formed by the United States and Canada to guide management of the Great Lakes and resolve border issues.

ISOROPYLBIPHENYL:
A chemical compound used as a substitute for PCB.

LANDFILL:
A conventional sanitary landfill is "a land disposal site employing an engineered method of disposing of solid wastes on land in a manner that minimizes environmental hazards by spreading solid wastes in thin layers, materials at the end of each operating day". Hazardous wastes frequently require various types of pretreatment before they are disposed of, i.e., neutralization chemical fixation encapsulation. Neutralizing and disposing of wastes should be considered a last resort. Repurifying and reusing waste materials or recycling them for another use may be less costly.

LC-1:
The concentration that results in 1% mortality of the test animal populations exposed to the contaminant.

$LC_{50}$:
Lethal concentration for 50% of the test population exposed to a toxicant substance.

$LD_{50}$:
Lethal dose for 50 percent of the test population exposed to a toxicant substance.

LEACHATE:
The contaminated liquid which seeps from a pile or cell of solid materials and which contains water, dissolved and decomposing solids. Leachate may enter the groundwater and contaminate drinking water supplies.

LOAD:
The total amount of materials or pollutants reaching a given local.

MACROPHYTE:
A rooted aquatic plant.

MASS:
The amount of material a substance contains causing it to have weight in a gravitational field.

MASS BALANCE:
A study that examines all parts of the ecosystem to determine the amount of toxic or other pollutant present, its sources, and the processes by which the chemical moves through the ecosystem.

MESOTROPHIC:
Refers to a moderately fertile nutrient level of a lake between the oligotrophic and eutrophic levels. (See also "Eutrophic" and "Oligotrohpic.")

MILLIGRAMS PER LITER (mg/1):
A measure of the concentration of substance in water. For most pollution measurement this is the equivalent of "parts per million".

MITIGATION:
The effort to lessen the damages caused, by modifying a project, providing alternatives, compensating for losses or replacing lost values.

MIXING ZONE:
The portion of a stream or lake where effluent is allowed to mix with the receiving water. The size of the area depends on the volume and flow of the discharge and receiving water. For streams the mixing zone it is one-third of the lowest flow that occurs once every 10 years for a seven day period.

NONPOINT SOURCE POLLUTION (NSP):
Pollution whose sources cannot be traced to a single point such as a municipal or industrial wastewater treatment plant discharge pipe. Nonpoint sources include eroding farmland and construction sites, urban streets, and barnyards. Pollutants from these sources reach water bodies in runoff, which can best be controlled by proper land management.

OLIGOTROPHIC:
Refers to an unproductive and nutrient-poor lake. Such lakes typically have very clear water. (See also "Eutrophic" and "Mesotrophic.")

OUTFALL:
The mouth of a sewer, drain, or pipe where effluent from a wastewater treatment plant is discharged.

PATHOGEN:
Any infective agent capable of producing disease. It may be a virus, bacterium, protozoan, etc.

PELAGIC:
Referring to open water portion of a lake.

PESTICIDE:
Any chemical agent used to control specific organisms, such as insecticides, herbicides, fungicides, etc.

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

PHENOLS:
Organic compounds that are byproducts of petroleum refining, textile, dye, and resin manufacture. High concentrations can cause taste and odor problems in fish. Higher concentration can be toxic to fish and aquatic life.

PHOSPHORUS:
A nutrient that, when reaching lakes in excess amounts, can lead to overfertile conditions and algae blooms.

PLANKTON:
Tiny plants and animals that live in water.

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

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

POLYCHLORINATED BIPHENYLS(PCBs):
A group of 209 compounds, PCBs have been manufactured since 1929 for such common uses as electrical insulation and heating/cooling equipment, because they resist wear and chemical breakdown. Although banned in 1979 because of their toxicity, they have been detected on air, land and water. Recent surveys found PCBs in every section of the country, even those remote from PCB manufacturers.

POLYCHLORINATED ORGANIC COMPOUNDS:
A group of toxic chemicals which contain several chlorine atoms.

PRETREATMENT:
A partial wastewater treatment required from some industries. Pretreatment removes some types of industrial pollutants before the wastewater is discharged to a municipal wastewater treatment plant.

PRIORITY POLLUTANT:
A list of toxic chemicals identified by the federal government because of their potential impact in the environment and human health. Major dischargers are required to monitor all or some of these chemicals when their WPDES permits are reissued.

PRIORITY WATERSHED:
A drainage area about 100,000 acres in size selected to receive Wisconsin Fund money to help pay the cost of controlling nonpoint source pollution. Because money is limited, only watersheds where problems are critical, control is practical, and cooperation is likely are selected for funding.

PRODUCTIVITY:
A measure of the amount of living matter which is supported by an environment over a specific period of time. Often described in terms of algae production for a lake.

PUBLIC LAW 92-500 (CLEAN WATER ACT):
The federal law that sets national policy for improving and protecting the quality of the nation's waters. The law set a timetable for the cleanup of the nation's waters and stated that they are to be fishable and swimmable. This also required all dischargers of pollutants to obtain a permit and meet the conditions of the permit. To accomplish this pollution cleanup, billions of dollars have been made available to help communities pay the cost of building sewage treatment facilities. Amendments in the Clean Water Act were made in 1977 by passage of Public Law 95-217, and in 1987.

PUBLIC PARTICIPATION:
The active involvement of interested and affected citizens in governmental decision-making.

PUBLICLY OWNED TREATMENT WORKS (POTW):
A wastewater treatment plat owned by a city, village or other unit of government.

RECYCLING:
The process that transforms waste materials into new products.

REMEDIAL ACTION PLAN:
A plan designed to restore beneficial uses to a Great Lakes Area of Concern.

REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RF/FS):
An investigation of problems and assessment of management options conducted as part of a superfund project.

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA):
This federal law amends the Solid Waste Disposal Act of 1965 and expands on the Resource Recovery Act of 1970 to provide a program that regulates hazardous wastes, to eliminate open dumping and to promote solid waste management programs.

RETRO-FIT:
The placement of an urban structural practice in an existing urban area, which may involve rerouting existing storm sewers and/or relocating existing buildings or other structures.

RIPARIAN:
Belonging or relating to the bank of a lake, river or stream.

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

RULE:
Refers to Wisconsin administrative rules. See Wisconsin Administrative Code.

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

SECONDARY IMPACTS:
The indirect effects that an action can have on the health of the ecosystem or the economy.

SECONDARY TREATMENT:
Two-stage wastewater treatment that allows the coarse particles to settle out, as in primary treatment, followed by biological breakdowns of the remaining impurities. Secondary treatment commonly removes 90% of the impurities. Sometimes "secondary treatment" refers simply to the biological part of the treatment process.

SEDIMENT:
Soil particles suspended in and carried by water as a result of erosion.

SEICHES:
Changes in water levels due to the tipping of water in an elongated lake basin whereby water is raised in one end of the basin and lowered in the other.

SEPTIC SYSTEM:
Sewage treatment and disposal for homes not connected to sewer lines. Usually the system includes a tank and drain field. Solids settle to the bottom of the tank. Liquid percolates

through the drain field.

SLUDGE:
A byproduct of wastewater treatment; waste solids suspended in water.

SOLID WASTE:
Unwanted or discharged material with insufficient liquid to be free flowing.

STANDARDS:
See water quality standards.

STORM SEWERS:
A system of sewers that collect and transport rain and snow runoff. In areas that have separated sewers, such stormwater is not mixed with sanitary sewage.

SUPERFUND:
A federal program that provides for cleanup of major hazardous landfills and land disposal areas.

SUSPENDED SOLIDS (SS):
Small particles of solid pollutants suspended in water.

SYNERGISM:
The total effect is greater than the sum of the individual effects. For example, the characteristic property of a mixture of toxicants that exhibits a greater-than-additive cumulative toxic effect.

TERTIARY TREATMENT:
See advanced wastewater treatment.

TOP-DOWN MANAGEMENT:
A management theory that uses biomanipulation, specifically the stocking of predator species of fish to improve water quality.

TOTAL MAXIMUM DAILY LOADS:
The maximum amount of a pollutant that can be discharged into a stream without causing a violation of water quality standards.

TOXIC:
An adjective that describes a substance which is poisonous, or can kill or injure a person or plants and animals upon direct contact or long-term exposure. (Also, see toxic substance.)

TOXIC SUBSTANCE:
A chemical or mixture of chemicals which, through sufficient exposure, or ingestion, inhalation of assimilation by an organism, either directly from the environment or indirectly by ingestion through the food chain, will, on the basis of available information cause death, disease, behavioral or immunologic abnormalities, cancer, genetic mutations, or development of physiological malfunctions, including malfunctions in reproduction or physical deformations, in organisms or their offspring.

TOXICANT:
See toxic substance.

TOXICITY:
The degree of danger posed by a toxic substance to animal or plant life. Also see acute toxicity, chronic toxicity and additivity.

TOXICITY REDUCTION EVALUATION:
A requirement for a discharger that the causes of toxicity in an effluent be determined and measures taken to eliminate the toxicity. The measures may be treatment, product substitution, chemical use reduction or other actions that will achieve the desired result.

TREATMENT PLANT:
See wastewater treatment plant.

TROPHIC STATUS:
The level of growth or productivity of a lake as measured by phosphorus content, algae abundance, and depth of light penetration.

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

UNIFORM DWELLING CODE:

a statewide building code for communities larger than 2500 residents specifying requirements for electrical, heating, ventilation, fire, structural, plumbing, construction site erosion, and other construction related practices.

UNIVERSITY OF WISCONSIN-EXTENSION (UWEX):
A special outreach, education branch of the state university system.

VARIANCE:
Government permission for a delay or exception in the application of a given law, ordinance or regulation. Also, see water quality standard variance.

VOLATILE:
Any substance that evaporates at a low temperature.

WASTELOAD ALLOCATION:
Division of the amount of waste a stream can assimilate among the various dischargers to the stream. This limits the amount (in pounds) of chemical or biological constituent discharged from a wastewater treatment plant to a water body.

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

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

WASTEWATER TREATMENT PLANT:
A facility for purifying wastewater. Modern wastewater treatment plants are capable of removing 95% of organic pollutants.

WATER QUALITY AGREEMENT:
The Great Lakes Water Quality agreement was initially signed by Canada and the United States in 1972 and was subsequently revised in 1978 and 1987. It proves guidance for the management of water quality, specifically phosphorus and toxics, in the Great Lakes.

WATER QUALITY LIMITED SEGMENT:
A section of river where water quality standards will not be met if only categorical effluent standards are met.

WATER QUALITY CRITERIA:
A measure of the physical, chemical or biological characteristics of a water body necessary to protect and maintain different water uses (fish and aquatic life, swimming, etc.).

WATER QUALITY STANDARDS:
The legal basis and determination of the use of a water body and the water quality criteria, physical, chemical, or biological characteristics of a water body, that must be met to make it suitable for the specified use.

WATER QUALITY STANDARD VARIANCE:
When natural conditions of a water body preclude meeting all conditions necessary to maintain full fish and aquatic life and swimming, a variance may be granted.

WATERSHED:
The land area that drains into a lake or river.

WETLANDS:
Areas that are inundates or saturated by surface or groundwater at a frequency and duration sufficient to support a variety of vegetative or aquatic life. Wetland vegetation requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas.

WINHUSLE:
A computer model for evaluating sediment delivery to suface waters from agricultural lands. It was developed by DNR with assistance from NRCS.

WISCONSIN ADMINISTRATIVE CODE:
The set of rules written and used by state agencies to implement state statutes. Administrative codes are subject to public hearing and have the force of law.

WISCONSIN FUND:
A state program that helps pay the cost of reducing water pollution. Funding for the program comes from general revenues and bonds and is based on a percentage of the state's taxable property value. The Wisconsin Fund includes these programs:

Point Source Water Pollution Abatement Grant Program - Provides grants for 60% of the cost of constructing wastewater treatment facilities. Most of this program's money goes for treatment plant construction, but three percent of this fund is available for repair or replacement of private, on-site sewer systems.

Nonpoint Source Water Pollution Abatement Grant Program - Funds to share the cost of reducing water pollution. Nonspecified sources are available in selected priority watersheds.

Solid Waste Grant Program - Communities planning for solid waste disposal sites are eligible for grant money. $500,000 will be available each year to help with planning costs.

WISCONSIN NONPOINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM:
A state cost-share program established by the State Legislature in 1978 to help pay the costs of controlling nonpoint source pollution. Also known as the nonpoint source element of the Wisconsin Fund or the Priority Watershed Program.

WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES):
A permit system to monitor and control the point source dischargers of wastewater in Wisconsin. Dischargers are required to have a discharge permit and meet the conditions it specifies.

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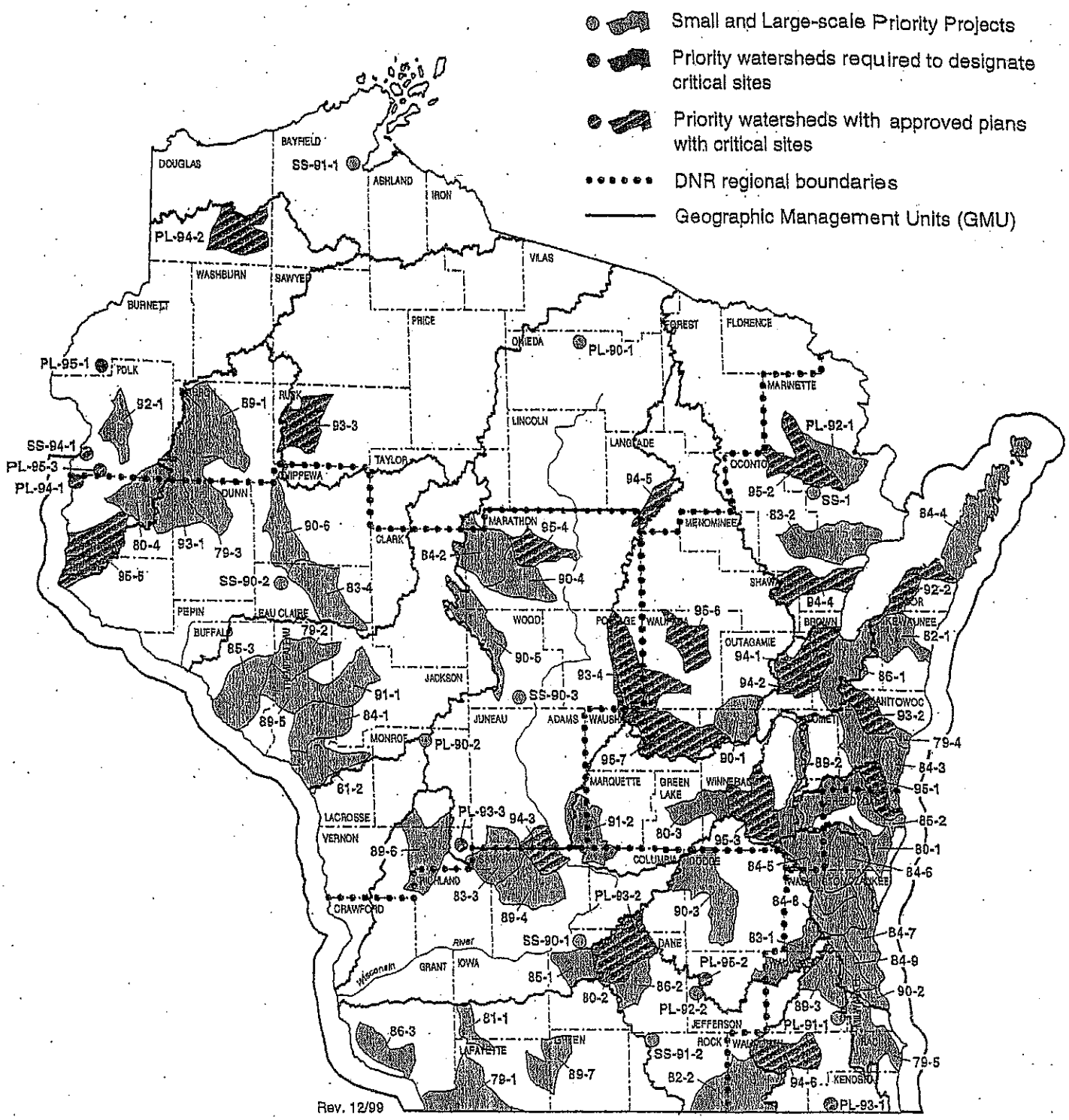
# Priority Watershed Projects in Wisconsin



# Priority Watershed Projects in Wisconsin: 1999

REV. 12/99

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

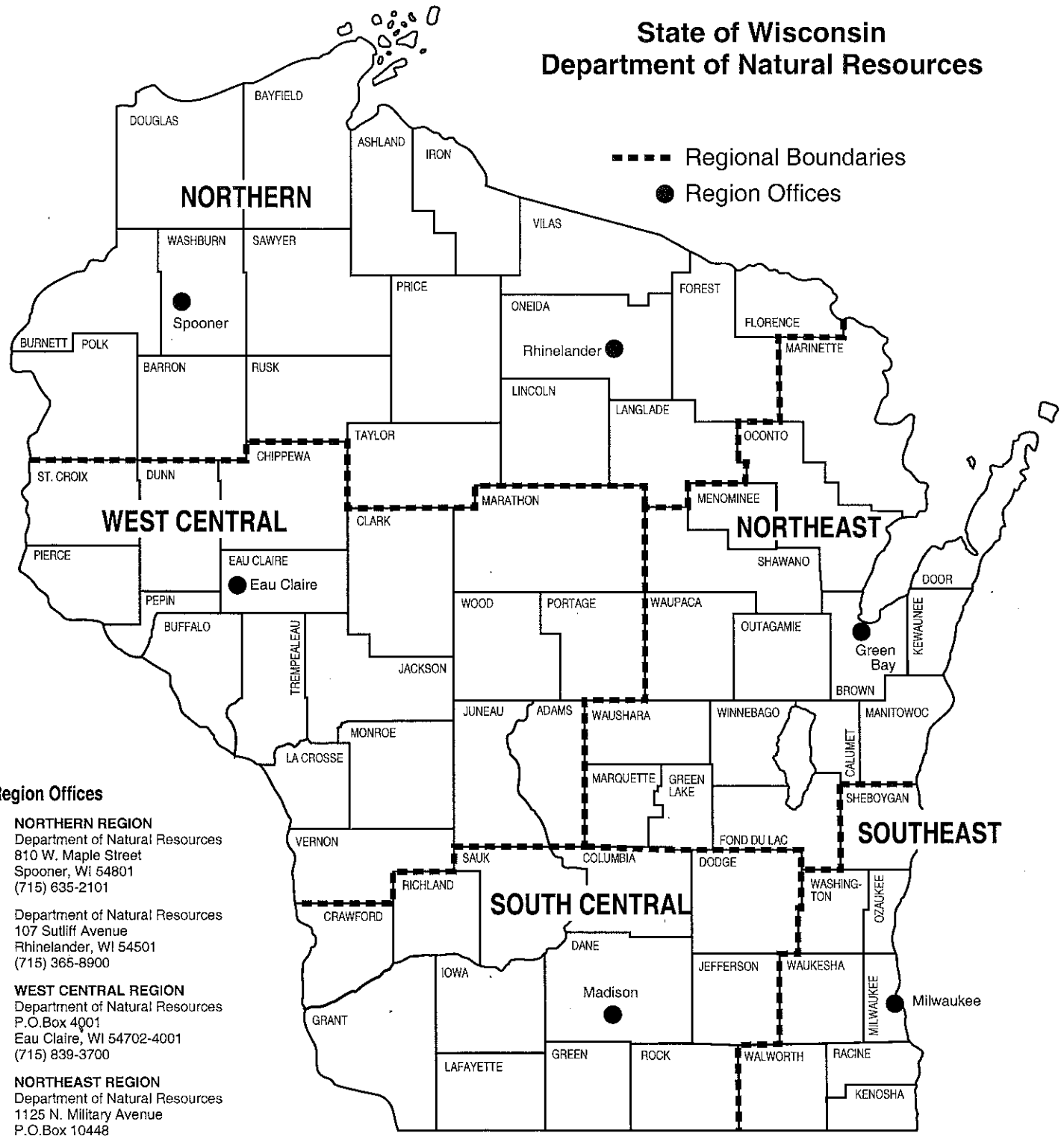
| Year Selected-Map Number | Small-scale Priority Watershed Project | County(ies) |
|---|---|---|
| SS-1 | Bass Lake ♦ | Marinette |
| SS-90-1 | Dunlap Creek | Dane |
| SS-90-2 | Lowes Creek | Eau Claire |
| SS-90-3 | Port Edwards - Groundwater Prototype ♦ | Wood |
| SS-91-1 | Whittlesey Creek | Bayfield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

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

♦ *Project completed*

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

# State of Wisconsin
# Department of Natural Resources

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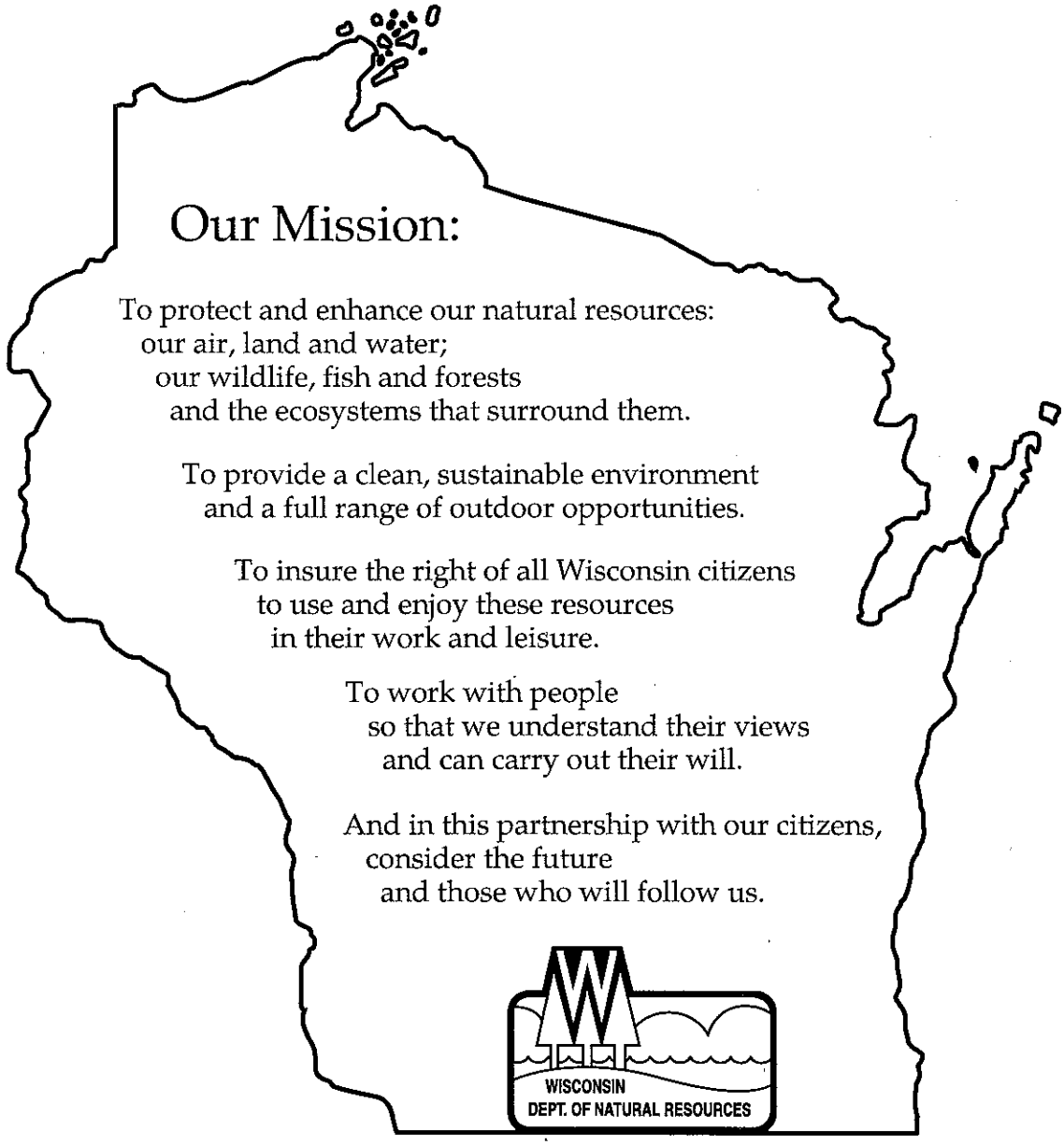

# Our Mission:

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

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

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

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

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

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