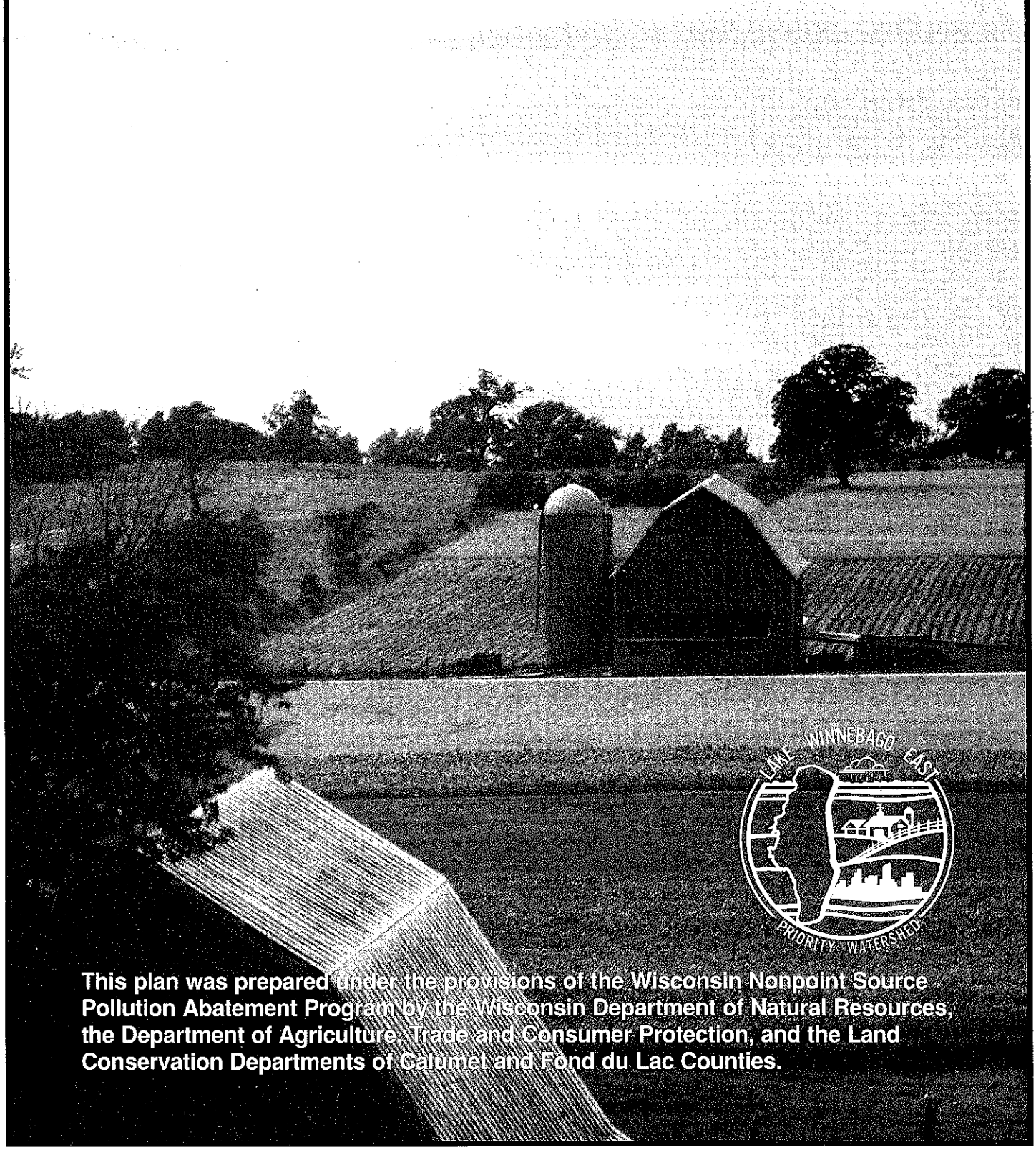
Nonpoint Source Control Plan for the Lake Winnebago East Priority Watershed Project



This plan was prepared under the provisions of the Wisconsin Nonpoint Source Pollution Abatement Program by the Wisconsin Department of Natural Resources, the Department of Agriculture, Trade and Consumer Protection, and the Land Conservation Departments of Calumet and Fond du Lac Counties.

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Nonpoint Source Control Plan for the Lake Winnebago East Priority Watershed Project

Wisconsin Nonpoint Source Water Pollution Abatement Program

January, 1994

This Plan Was Cooperatively Prepared By:

The Wisconsin Department of Natural Resources and
The Department of Agriculture, Trade, and Consumer Protection
In cooperation with
The County Land Conservation Departments of Calumet and
Fond du Lac and Counties

Publication: PUBL WR 274-94

For copies of this document please contact:

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

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APRIL 27, 1992

Wilma Springer, County Board Chair
Calumet County
206 Court Street
Chilton, WI 53014

Dear Ms. Springer:

I am pleased to approve the Lake Winnebago/East Priority Watershed Plan prepared through the Wisconsin Nonpoint Source Water Pollution Abatement Program. This plan meets the intent and conditions of s. 144.25, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. This plan has also been approved by the Department of Agriculture, Trade and Consumer Protection. I am also approving the Lake Winnebago/East Priority Watershed Plan as an amendment to the Lower Fox Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Calumet County staff that participated in preparing this plan. The implementation of the Lake Winnebago/East project will be a major step in achieving the objectives of the Lake Winnebago Comprehensive Management Plan and the Lower Green Bay Remedial Action Plan.

We look forward to assisting Calumet County, Fond du Lac County and the cities and villages in the watershed in the implementation of the Lake Winnebago/East Priority Watershed Plan.

Sincerely,

C. D. Besadny
Secretary

cc: Rock Anderson - Calumet Co. LCD
Andy Morton - SD
Dave Jelinski - DATCP
Becky Wallace - WR/2
Cindy Hoffland - CA/GEF 1

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APRIL 27, 1992

Wilbert Halbach
Fond du Lac County Board
City County Building
P. O. Box 150
Fond du Lac, WI 54936-50

Dear Mr. Halbach:

I am pleased to approve the Lake Winnebago/East Priority Watershed Plan prepared through the Wisconsin Nonpoint Source Water Pollution Abatement Program. This plan meets the intent and conditions of s. 144.25, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. This plan has also been approved by the Department of Agriculture, Trade and Consumer Protection. I am also approving the Lake Winnebago/East Priority Watershed Plan as an amendment to the Lower Fox Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the Fond du Lac County staff that participated in preparing this plan. The implementation of the Lake Winnebago/East project will be a major step in achieving the objectives of the Lake Winnebago Comprehensive Management Plan and the Lower Green Bay Remedial Action Plan.

We look forward to assisting Fond du Lac County, Calumet County and the cities and villages in the watershed in the implementation of the Lake Winnebago/East Priority Watershed Plan.

Sincerely,

C. D. Besadny
Secretary

cc: Lynn Mathias - Fond du Lac Co. LCD
Andy Morton - SD
Dave Jelinski - DATCP
Becky Wallace - WR/2
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APRIL 27, 1992

Jack Howley, City Manager
City of Fond du Lac
City-County Building
P. O. Box 150
Fond du Lac, WI 54936-0150

Dear Mr. Howley:

I am pleased to approve the Lake Winnebago/East Priority Watershed Plan prepared through the Wisconsin Nonpoint Source Water Pollution Abatement Program. This plan meets the intent and conditions of s. 144.25, Wisconsin Statutes, and Chapter NR 120, Wisconsin Administrative Code. This plan has also been approved by the Department of Agriculture, Trade and Consumer Protection. I am also approving the Lake Winnebago/East Priority Watershed Plan as an amendment to the Lower Fox Areawide Water Quality Management Plan.

I would like to express the Department's appreciation to the City of Fond du Lac staff that participated in preparing this plan. The implementation of the Lake Winnebago/East project will be a major step in achieving the objectives of the Lake Winnebago Comprehensive Management Plan and the Lower Green Bay Remedial Action Plan.

We look forward to assisting the City of Fond du Lac, Calumet County, Fond du Lac County and the other cities and villages in the watershed in the implementation of the Lake Winnebago/East Priority Watershed Plan.

Sincerely,

C. D. Besadny
Secretary

cc: Andy Morton - SD
Becky Wallace - WR/2
Dave Jelinski - DATCP
Cindy Hoffland - CA/GEF 1

State of Wisconsin
Department of Agriculture, Trade & Consumer Protection

Alan T. Tracy
Secretary

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

March 23, 1992

RECEIVED
MAR 25 1992
BUREAU OF
RESOURCES

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

Dear ~~Mr. Baker~~ Bruce:

The Department of Agriculture, Trade and Consumer Protection has received your request to approve the "Nonpoint Source Control Plan For The Lake Winnebago/East Priority Watershed Project". The Department approves the Lake Winnebago/East Watershed plan.

I am pleased to see that the local units of government have agreed to enact manure storage and construction site erosion ordinances. Putting these two ordinances in place, where required, will prevent future surface and groundwater pollution problems. The patience shown by DNR and DATCP allowed the local governmental units the time to work through their initial objections to enacting these ordinances and should strengthen local support for them.

We look forward to assisting DNR and the Land Conservation Committees in Calumet and Fond du Lac Counties in implementing the project.

Please contact Keith Foye (266-9496) if we can be of any further assistance in moving the project to implementation.

Sincerely,

Dave Jelinski

Dave Jelinski, Director
Land and Water Resources Bureau
AGRICULTURAL RESOURCE MANAGEMENT DIVISION
(608) 266-0157

cc: Becky Wallace
Rock Anderson, Calumet County Land Conservation Department
Lynn Mathias, Fond du Lac County Land Conservation Dept.

RESOLUTION NO. 144-91

RESOLUTION ADOPTING THE WINNEBAGO EAST NONPOINT SOURCE PRIORITY WATERSHED PLAN

WHEREAS, the County Land Conservation Department in cooperation with the Wisconsin Department of Natural Resources conducted a detailed inventory of the land use within the Winnebago East watershed in 1989 and 1990, and

WHEREAS, this inventory resulted in the development of a detailed Nonpoint Source Control Plan for the Winnebago East watershed, and

WHEREAS, a number of public information meetings have been conducted throughout the watershed, and an official public hearing was conducted on January 7, 1992, and

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

WHEREAS, each county within the Winnebago East watershed, wishing to receive cost-sharing grants for landowners in the watershed, must first adopt the watershed plan before grants can be awarded.

NOW, THEREFORE, BE IT RESOLVED by the Fond du Lac County Board of Supervisors that the Winnebago East Nonpoint Source Priority Watershed Plan be adopted and that implementation of the plan begin as soon as possible.

Dated February 11, 1992

Leonard Rosenbaum

Raymond Seeley

Albert Halbach

LAND CONSERVATION COMMITTEE

FISCAL NOTE: Costs to the County for implementation of the Winnebago East Watershed plan are reimbursed 100%, except for office supplies and equipment which is reimbursed at 70%. The County's share for supplies and equipment has been included in the 1992 budget.

APPROVED BY:

M Anita Anderegg

M. Anita Anderegg
COUNTY EXECUTIVE

APPROVED BY:

Kathryn J. Haupt
CORPORATION COUNSEL

RESOLUTION 1991-65

RESOLUTION ADOPTING THE LAKE WINNEBAGO EAST
NONPOINT SOURCE PRIORITY WATERSHED PLAN

To the Honorable Chairperson and Board of Supervisors of Calumet County, Wisconsin:

WHEREAS, The Lake Winnebago East Watershed was designated a "Priority Watershed" in 1989 under the Wisconsin Nonpoint Source Water Pollution Abatement Program, and

WHEREAS, A detailed inventory of the land use within the Watershed was conducted in 1989 and 1990, and

WHEREAS, This inventory resulted in the development of a detailed Nonpoint Source Control Plan for the Watershed, and

WHEREAS, Public information meetings have been conducted in the Watershed, and an official public hearing was conducted on January 7, 1992, and

WHEREAS, Pertinent public comments have been incorporated into the Plan, and

WHEREAS, Each county within the Watershed wishing to receive cost-sharing grants for landowners in the Watershed must first adopt the Lake Winnebago East Watershed Plan, and

WHEREAS, Costs to the County for implementation of the Lake Winnebago East Watershed Plan are reimbursed 100%, except for office supplies and equipment which is reimbursed at 70%, and the County's share for supplies and equipment has been included in the 1992 budget.

NOW, THEREFORE, BE IT RESOLVED By the Board of Supervisors of Calumet County herein assembled, that the Lake Winnebago East Nonpoint Source Priority Watershed Plan be adopted and that implementation of the Plan begin as soon as possible.

Dated this 18th Day of February, 1992.

Countersigned by:

Wilma Springer

Wilma Springer, Chairperson
COUNTY BOARD OF SUPERVISORS

INTRODUCED BY THE
LAND CONSERVATION COMMITTEE

W K Barribeau

William Barribeau, Chairperson

aye.

Alvin Ott

Donald Schwobe

Donald Schwobe

absent

Charles Lisowe

aye.

Peter Dorn

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SUMMARY

Introduction

The Lake Winnebago East Priority Watershed Project Plan assesses the rural and urban nonpoint sources of pollutants in the Lake Winnebago East Watershed and guides the implementation of nonpoint source control measures. These control measures are needed to meet water resources objectives for Lake Winnebago and its tributaries. This summary document provides an overview of the information contained in the plan.

Nonpoint source pollution cannot be traced to a single point such as a municipal or industrial wastewater plant discharge pipe. Nonpoint source pollution in the Lake Winnebago East Watershed has degraded surface waters and reduced opportunities for aesthetic, recreational and biological uses of Lake Winnebago.

Rural nonpoint sources of pollutants most commonly found in this watershed include: sediment from cropland erosion, polluted runoff from barnyards and feedlots, sediment from eroding streambanks, and runoff from areas winter-spread with livestock manure. Urban nonpoint pollutant sources include: construction sites, industrial areas, commercial areas, and residential areas. Major pollutants from urban sources are sediment, phosphorus and heavy metals. The purpose of this project is to reduce the amount of pollutants originating from both rural and urban nonpoint sources that reach the surface waters and groundwater within the Lake Winnebago East Priority Watershed Project area.

The plan was prepared by the Wisconsin Department of Natural Resources (DNR) and the Department of Agriculture, Trade, and Consumer Protection (DATCP); and the following:

- The Land Conservation Departments of Fond du Lac and Calumet Counties
- The City of Fond du Lac
- The University of Wisconsin Extension Service
- The Lake Winnebago East Watershed Citizen's Advisory Committee

The DNR selected the Lake Winnebago East Watershed as a priority watershed project through the Wisconsin Nonpoint Source Water Pollution Abatement Program. It joins 51 similar watershed projects statewide in which nonpoint source control measures are being planned and implemented. The Nonpoint Source Water Pollution Abatement Program was

created in 1978 by the State Legislature. The program provides financial and technical assistance to landowners and local governments to reduce nonpoint source pollution.

The project is administered on the state level by DNR and DATCP. Each county Land Conservation Department (LCD) will administer the appropriate rural portions of the project on the local level with assistance from UW-Extension and the Soil Conservation Service (U.S. Department of Agriculture). The urban portions of the project will be administered by the City of Fond du Lac. Participation is voluntary.

Watershed Characteristics

The Lake Winnebago East Watershed is located in east-central Wisconsin and drains an area of land adjacent to the east shoreline of Lake Winnebago. The watershed is a subbasin of the larger Upper Fox drainage basin which drains to the lower part of Green Bay. The Lake Winnebago East Watershed drains approximately 93 square miles of Calumet and Fond du Lac Counties. Fond du Lac County has the largest contribution to the drainage area with approximately 66% of the watershed area. Approximately the eastern half of the City of Fond du Lac is located within the Lake Winnebago East Watershed.

Land uses in the watershed are mostly rural (Table 1). Agricultural uses and related open space account for 80% of the drainage area. Woodlands occupy 9% and the remaining 11% is urban and developing areas. According to projections, the City of Fond du Lac is expected to increase at approximately 1/2% per year for the next 20 years. (City of Fond du Lac Comprehensive Management Plan, 1990).

Table 1. Land Use in the Lake Winnebago East Watershed

Land Use	Percent of Watershed
Agriculture Cropland, Grassland, Pasture	80
Woodlands	9
Urban & Developing Areas	11

The watershed can be divided into two distinct land features formed by glacial activity: the rolling lands east of the Niagara escarpment, and the more sloping lands west of the escarpment. The escarpment or "ledge," as known locally, is very prominent in most portions of the watershed. West facing outcrops of limestone bedrock are common along this formation. Soils of the watershed are characterized as heavy clay soils that tend to have poor infiltration but high fertility. Following rainfall or snow melt, the streams of the watershed are extremely turbid from suspended soil particles.

Water Resources

Lake Winnebago is a highly eutrophic lake caused to a large degree from excessive nutrient and sediment loading from urban and rural nonpoint sources. Excessive algal growths have reduced sunlight penetration which negatively impacts rooted aquatic plants. The loss of these plants further impacts other forms of life dependent upon them including aquatic insects, fish, waterfowl and other wildlife. The present lake habitat favors an unbalanced fish community and reduces fish diversity.

Many of the watershed streams flow intermittently and are subject to very wide flow extremes. Low flows during dry weather periods limit the potential for major improvements in stream fishery populations except near Lake Winnebago. Only Mill, DeNeveu and Taycheedah Creeks are classified as supporting a warmwater sport fishery. The lower reaches of DeNeveu Creek suffer from agricultural and urban sources of nonpoint source pollution. Stormwater discharges from the City of Fond du Lac are limiting certain aquatic life from heavy metal toxicity. Large areas of impervious ground are more than likely reducing the base flow of DeNeveu Creek. This condition will continue as further urbanization occurs in this subwatershed.

DeNeveu Lake is the only other lake of major significance. It is a relatively deep seepage lake with much of the shoreline in residential development.

Serious nitrate contamination of groundwater is not a widespread problem in the Lake Winnebago East Watershed. Well water samples obtained as part of the rural land use inventory and other well water sampling studies do reveal however, that groundwater is being contaminated from nitrogen-containing materials in 27% to 42% of the samples obtained. Fecal coliform bacteria have also been detected in 25% of well water samples from certain areas of the watershed.

Sources of Pollution

Rural Nonpoint Pollutant Sources

The land conservation departments collected data on all agricultural lands, barnyards, manure storage sites, and streambanks in the watershed. These data were used to estimate the pollutant potentials of these nonpoint sources. The amount of phosphorus carried in runoff from each barnyard to a receiving creek was calculated. The amount of sediment reaching streams from eroding agricultural lands and streambanks was also determined. In the Lake Winnebago East Watershed 80% of the sediment deposited in streams annually is derived from agricultural upland erosion.

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

Barnyard Runoff Inventory Results

- 181 active barnyards were assessed, of which 179 have runoff that reaches streams
- 2 barnyards were identified as being internally drained and will be further investigated for the potential to adversely impact groundwater

Manure Spreading Inventory Results

- 181 livestock operations produce approximately 93,500 tons of manure
- 3,740 acres of suitable land are needed to safely spread this manure

Streambank Erosion Inventory Results

- 160 stream miles were inventoried
- There are approximately 35 miles of eroding sites, involving 816 sites
- 3,428 tons of sediment reach streams from eroding sites
- Sediment from streambank erosion constitutes only about 33% of that from upland sources
- Stream-side and streamlined degradation resulting from cattle access amounts to about 14 miles of habitat

Upland Sediment Inventory Results

- 59,855 acres were inventoried
- 13,700 tons of sediment are delivered to streams
- The highest sediment delivery rates are found in the Mud/Roberts Creek, Lake Winnebago, and Upper Taycheedah Creek

Lake Winnebago Shoreline Erosion Inventory Results

- Shoreline erosion is a fairly common occurrence. Severe erosion sites, however, occur infrequently

Urban Nonpoint Pollutant Sources

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

An inventory of existing 1990 and planned year 2020 conditions was conducted by the City of Fond du Lac. The delivery of urban pollutants to streams from existing urban areas was calculated using an urban runoff model which uses information regarding land uses, stormwater conveyance, and urban housekeeping practices. Five pollutants (sediment, phosphorus, lead, zinc and copper) were chosen to characterize the sources and severity of urban nonpoint pollution.

The results of the investigations of urban nonpoint sources are summarized below.

Sediment

The total sediment load from the City of Fond du Lac portion of the watershed is 1,025 tons/year (about 9% of the total sediment load from both rural and urban sources).

The most important source of sediment reaching surface waters from urban areas in the watershed is erosion from construction sites (which make up less than 1% of the urban land in the watershed). It was estimated that construction erosion contributed 700 tons of sediment to surface waters in the City of Fond du Lac portion of the watershed. This is nearly 68% of the total from all urban nonpoint sources in the City of Fond du Lac.

Phosphorus, Lead, Zinc and Copper

Overall, contributions of these materials to surface waters in the watershed project area are moderate when compared with other highly urbanized areas statewide. Freeways, industrial areas, commercial areas, and high density residential areas are the greatest contributors of lead (as well as sediment) on a per-acre basis. However, as these types of land uses increase, increased levels of lead and other heavy metals may be anticipated.

Other Urban Pollutants

Medium density residential areas are significant sources of pesticides and bacteria. In addition, data from other urban areas have often identified various household or automotive maintenance products which have been dumped into the storm sewer systems. These contaminants are delivered directly to streams and lakes.

Pollutant Reduction Levels

To improve water quality in Lake Winnebago and the tributary streams, this plan calls for:

- A 50% reduction in the sediment reaching Lake Winnebago

- A 50% - 70% reduction in nonpoint source phosphorus loading to the watershed streams is needed to reduce the nutrients which cause excessive weed and algae growth in Lake Winnebago

- For the City of Fond du Lac, urban nonpoint source reduction level targets have been established:

  a. A 50% reduction in the sediment reaching Lake Winnebago,

  b. A 0 to 60% reduction of the 1990 heavy metal load (as measured in zinc or copper) to reduce the potential of violating the state water quality standards in the stormwater from existing urban areas, (the percent reduction varies for each stormsewer drainage basin),

  c. A 45% to 60% reduction in the heavy metal load (as measured in zinc or copper) from the City's planned urban growth area to reduce the potential of violating the state water quality standards in this stormwater.

Management Actions

Management actions are carried out through the installation of practices caned Best Management Practices (BMPs). In rural areas, these BMPs may range from alterations in farm management (changes in manure-spreading, crop rotations) to engineered structures (diversions, sediment basins, manure storage facilities), and they are generally tailored to specific landowner situations. The county land conservation departments will assist owners, managers, and renters of agricultural lands in constructing Best Management Practices. In urban areas, control practices may range from hydrologic alterations designed to detain pollutants or slow flows (wet detention ponds, grassed swales) to housekeeping practices (reducing sources of pet waste, road salts, lawn fertilizers and pesticides) to governmental controls (construction site erosion ordinances). The DNR and others will assist local units of government in the development of urban nonpoint pollutant source control measures.

Cost-share funds for installing pollutant control measures will be targeted at sources which contribute the greatest amounts of pollutants. Landowner and municipality eligibility for cost sharing of these practices will depend on whether pollutant loads from their lands fail into the established pollutant reduction ranges set for each nonpoint source category. Cost-share funds

will be available through the Wisconsin Nonpoint Source Water Pollution Abatement Program for certain management actions. As shown in Table 2, cost-share rates for rural BMPs range from 50% to 70%. Cost-share rates for urban BMPs are shown in Table 3 and rates for other urban activities are shown in Table 4.

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

- **Agriculture Lands**

  Almost 26,400 of the most critical upland agricultural acres have been targeted for the highest level of pollutant control. When controlled, these acres will reduce the contribution of sediment from this source by 33% to a possible 46%.

  The Best Management Practices identified by the county land conservation departments emphasize both improving farm management and controlling pollutants. Table 2 shows the eligible practices and cost-share rates.

- **Animal Lots**

  Out of 181 active barnyards inventoried, 179 were assessed for possible impacts on surface water. Of the 179 barnyards, 124 lots have been identified as needing pollutant controls.

  Two internally drained barnyards will be evaluated for groundwater pollution potential and cost sharing eligibility during the implementation phase of this project.

- **Manure-spreading**

  County LCD staff will prepare a nutrient management plan for livestock operators interested in program participation. A nutrient management plan identifies the proper spreading periods, application rates and acceptable fields for spreading manure. Farm operators who, after having a nutrient management plan completed, must spread on 23 or more "high hazard" acres are considered Category I. Category II will include those landowners who must spread on 17 to 22 "high hazard" acres, and Category III are those farms with less than 16 "high hazard" acres for spreading as part of their nutrient management plan.

- **Streambanks**

  All project participants must restrict livestock access to streams and creeks in the watershed where there is evidence of trampling along the bank, damaged streambeds, or eroded streambanks from livestock. An estimated 70,252 feet of streambank in the watershed will require restricted cattle access.

Table 2. State Cost-share Rates for Best Management Practices

Best Management Practice	State Cost-Share Rate
Contour Farming	50%[1]
Contour Strip Cropping	50%[1]
Field Strip Cropping	50%[1]
Field Diversions and Terraces	70%
Grassed Waterways	70%
Reduced Tillage	50%
Critical Area Stabilization	70%[2]
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Shoreline and Streambank Stabilization	70%[3]
Shoreline Buffers	70%[2]
Barnyard Runoff Management	70%
Animal Lot Relocation	70%
Manure Storage Facilities	70%[4]
Livestock Exclusion from Woodlots	50%
Wetland Restoration	70%[2]
Roofs for Barnyard Runoff Management and Manure Storage Management	70%
Nutrient and Pesticide Management	50%[5]

1. Flat rates for these BMPs can be found in Table 5-2 of the draft plan. Wildlife habitat restoration components of this practice are cost-shared at 70%.

2. Easements may be entered into with landowners identified in the watershed plan in conjunction with these BMPs. See Chapter 4 for where easements may apply.

3. Pasture pumps are an eligible component to this BMP.

4. Maximum cost-share amount is $10,000 including no more than $5,000 for manure transfer equipment (Legislation is proposed to change these amounts. If the legislation is adopted, the cost-share amount will correspond with the new statutory language.)

5. Spill control basins have a state cost-share rate of 70%.

Table 3. State Cost-share Rates for Urban Management Practices

Best Management Practice	State Cost-Share Rates
Critical Area Stabilization	70%[1]
Grade Stabilization Structures	50%
Shoreline & Stream Bank Stabilization	70%
Shoreline Buffers	70%[1]
Wetland Restoration	70%[1]
Structural Urban Practices	70%[2]
Upgraded Street Cleaning	50%
Land Acquisition and Storm Sewer Rerouting	50%

1. Easements may be available in conjunction with these practices.

2. Applies only to structures for established urban areas.

Source: Wisconsin Department of Natural Resources

Table 4. Urban Implementation Activities Eligible for State Funding

Activity	State Funding Rate
Develop Construction Erosion Control Ordinances	100%
Develop Stormwater Management Ordinances	100%
Engineering Feasibility Studies (Existing Urban Area)	100%[1]
Stormwater Management Studies (Planned Urban Area)	100%[1]
Design and Engineering for Structural BMPs	100%
Staff for Enforcing Construction Erosion & Stormwater Management Ordinances	100%[2]

1. Funding not available for drainage or flood control.

2. Funding limited to 5 years. Staffing level based on approved work plan.

Source: Wisconsin Department of Natural Resources

Overall, approximately 1,370 tons per year of sediment must be controlled in the Lake Winnebago East Watershed. The restriction of livestock access may achieve all or part of this goal. Land acquisition in the form of easements may be used along riparian lands under certain conditions.

- **Lake Shoreline Erosion**

Lake shore property owners with eroding shorelines meeting the eligibility criteria may receive cost sharing to stabilize their shoreline property. The determination of eligibility will be completed as needed by County Land Conservation staff.

- **Animal Waste Storage Ordinances**

Poorly sited or constructed in-ground manure storage facilities have the potential to seriously contaminate the groundwater resource. An improperly designed above-ground manure storage structure can also pose a threat to surface water quality. Currently the construction of animal waste storage facilities in Fond du Lac County are not regulated to protect surface and groundwater resources. A Calumet County ordinance for regulating animal waste storage structures was enacted in 1989. An animal waste storage ordinance is necessary in Fond du Lac County. Proposed animal waste storage structures will then be designed to prevent surface and groundwater contamination. The ordinance would only pertain to future proposed modifications or new animal waste storage facilities. Existing storage structures would not be regulated through this ordinance. County adoption of an animal waste storage ordinance will be a condition of the Fond du Lac County implementation grant.

- **Urban Practices**

The following two step approach to controlling urban pollutant sources has been devised:

1. Adopting "Core" Elements

   The "core" elements of the urban nonpoint source control program applicable to local units of government include basic measures that can be adopted without further technical study. The City of Fond du Lac is eligible to receive technical and/or financial assistance through the priority watershed project provided they commit to implementing a core program consistent with attaining pollutant reduction goals and water resource objectives for existing urban land uses within the first three years of the project. Sites that are currently undeveloped are expected to be controlled as part of the cost of development and thus are not eligible for cost sharing.

   The basic elements of the "core" program include:

   - Developing, adopting, and enforcing a construction erosion control ordinance consistent with the "model" developed jointly by the Wisconsin League of Municipalities and the DNR. Construction erosion control practices should be

consistent with the standards and specifications in the *Wisconsin Construction Site Best Management Practice Handbook*.

- Developing and implementing a community-specific program of urban "housekeeping" practices which reduce urban nonpoint source pollutants. This may include a combination of information and education efforts, adoption of ordinances regulating pet wastes, or changes in the timing and scheduling of leaf and brush collection.

- Implementing an information and education program in conjunction with the Fond du Lac county UW-Extension agent and Extension Water Quality Specialist.

2. Adopting "Segmented" Elements

The "segmented elements of the urban nonpoint source program include those requiring site-specific investigations prior to implementation (for example: the construction of detention ponds following the completion of an engineering feasibility study). Communities are eligible to receive cost sharing for "segmented" elements provided "core" elements have been developed and implementation has begun. Cost sharing will be limited to those elements of the segmented program completed within the eight-year implementation period of the project.

The higher costs of implementing this portion of the urban management program will require communities to budget expenditures over the course of several years. Best Management Practices implemented under this portion of the program may include detention ponds, infiltration devices, streambank erosion controls and other structural means for reducing urban nonpoint source pollutants. This element also includes changes in street sweeping schedules and equipment.

Eligible components of the "segmented' program include:

- Conducting detailed engineering studies to determine the best means of implementing community-specific nonpoint source control measures for identified existing land uses.

- Designing and installing structural urban Best Management Practices for existing urban areas.

- Developing management plans for planned future urban development. These plans will identify types and locations of structural urban Best Management Practices.

- Adopting and enforcing a comprehensive stormwater management ordinance encompassing current and planned future areas.

In order to reach the goals targeted for the City of Fond du Lac, the key land uses that will need controls, were identified. These land uses are industrial, commercial, multi-family residential and medium density residential. These land uses currently total 2,140 acres, with an additional 940 acres to be added by the year 2020.

- **Construction Erosion Control Ordinance**

Extensive urban growth is expected to occur in Fond du Lac and Empire Townships. Construction erosion, if not controlled, will cause large quantities of construction sediment to enter Taycheedah and DeNeveu Creeks and ultimately to Lake Winnebago. Controlling this erosion is essential to improving water quality. The affected townships or Fond du Lac County will need to adopt ordinances to ensure construction site erosion is controlled. Adoption of a construction site erosion control ordinance will be a condition of the Fond du Lac County Implementation Grant.

Calumet County is encouraged to adopt a construction site erosion control ordinance. However, a construction site erosion control ordinance is not necessary at this time. If future conditions warrant an ordinance, this plan will be amended to include such a requirement. The basis for a construction site erosion ordinance must be substantiated in water quality assessments which document the degradation of water quality.

Funds Needed for Cost Sharing, Staffing and Educational Activities

Grants will be awarded to each county or municipality by the DNR for cost sharing, staff support and educational activities. Table 5 includes estimates of the financial assistance needed to implement needed nonpoint source controls in the Lake Winnebago East Watershed, assuming a 75% participation rate of eligible landowners.

Project Implementation Schedule

Project Implementation is scheduled to begin in February, 1992. During the first three years of implementation, participants sign cost-share agreements. There is a five year period for practice installation. While an eligible landowner or operator has three years to determine whether to participate in the program, the installation of practices can begin as soon as a landowner has signed a cost-share agreement with the appropriate local governmental unit.

Table 5. Cost Estimates for the Lake Winnebago East Project

Rural	Total Cost	State Share
Management Practices:	$4,548,350	$3,035,950
Easements:	127,500	127,500
Information/Education Direct:	24,100	24,100
Staff Needs:	1,523,600	1,523,600
Archaeological Studies:	18,000	18,000
Other Direct Costs:	212,000	212,000
Subtotal:	$6,453,550	$4,941,150
Urban	**Total Cost**	**State Share**
Management Practices[1]:	$1,142,000	$ 722,850
Staff Needs & Other Costs:	200,000	200,000
Planned Lane Use Practices[2]:	1,112,500	0
Subtotal:	$2,454,500	$ 922,850
Total:	$8,908,050	$5,864,000

1. Includes estimated costs of land acquisition and storm sewer rerouting in existing urban areas.
2. These costs are an average of the recommended alternatives.

Information and Education

An information and education (I&E) program will be conducted throughout the project period with Calumet and Fond du Lac Counties serving as leaders for the multi-county educational activities in the rural areas. The City of Fond du Lac and UW-Extension will conduct the urban I&E program. University of Wisconsin-Extension staff will provide assistance to the rural program. This program will be most intensive during the first four years of the project and the activities will taper off during the rest of the project. The activities will include Best Management Practice demonstrations, tours, newsletters and public meetings.

Project Evaluation

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

1. **Administrative** - This category includes the progress in providing technical and financial assistance to eligible landowners, and carrying out education activities identified in the plan. Progress in this area will be tracked by the LCD or municipality and reported to the DNR and DATCP quarterly.

2. **Pollutant Reduction Levels** - Reductions in nonpoint source pollutant loadings resulting from changes in land use practices will be calculated by the LCD or municipality and reported to DNR and DATCP at an annual review meeting.

3. **Water Resources** - Changes in water quality, habitat, and water resource characteristics will be monitored by the DNR during the first two years of implementation at mid project (1996) and post project (2000 - 2001).

CHAPTER ONE:
Introduction, Purpose and Legal Status

Introduction

Lake Winnebago is one of Wisconsin's most significant water resources. It is the state's largest inland lake and serves as a major recreational attraction for many residents of east central Wisconsin. The lake is a highly productive warm water system encompassing nearly 6,000 square miles of a mostly agricultural watershed. The Lake Winnebago East watershed is 93 square miles of direct drainage to Lake Winnebago and is situated within Calumet and Fond du Lac Counties.

The *Winnebago Comprehensive Management Plan* and the *Lower Green Bay Remedial Action Plan* have identified the Lake Winnebago East Watershed as a high priority for control of nonpoint sources of pollution.

This project was selected in 1989 by the Department of Natural Resources (DNR) and the Department of Agriculture Trade and Consumer Protection (DATCP) as a priority watershed project through the Wisconsin Nonpoint Source Water Pollution Abatement Program.

The Lake Winnebago East watershed includes the entire east shore of Lake Winnebago and is part of the Upper Fox River Basin, which drains into Green Bay.

Nonpoint Source Water Pollution Abatement Program

The Wisconsin Nonpoint Source Water Pollution Abatement Program (NR 120) was created in 1978 by the State Legislature. The program's goal is to improve and protect the water quality of lakes, streams, wetlands and groundwater by reducing pollutants from urban and rural nonpoint sources.

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

The following is an overview of the program:

- The Program is administered by the DNR and DATCP. It focuses on critical hydrologic units called priority watersheds. The Program is implemented through priority watershed projects.

- A priority watershed project is guided by a plan prepared cooperatively by the DNR, DATCP and local units of government, with input from a local citizen's advisory committee. Project staff evaluate the conditions of surface water and groundwater, and inventory land uses and nonpoint sources of pollution throughout the area. The priority watershed plan assesses nonpoint and other sources of water pollution and identifies the Best Management Practices needed to meet specific water resource objectives. The plan guides implementation of these practices in an effort to improve water quality.

- Plan implementation by local units of government follows plan approval by counties, DNR and DATCP. Water quality improvement is achieved through the voluntary implementation of nonpoint source controls (Best Management Practices) and the adoption of ordinances. Landowners, land renters, counties, cities, villages, towns, metropolitan sewerage districts, sanitary districts, lake districts, and regional planning commissions are eligible to participate.

- Technical assistance is provided to aid in the design of Best Management Practices. 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 County Land Conservation Department(s) to determine interest in voluntarily installing the Best Management Practices or participating through other appropriate means identified in the plan.

- Informational and educational activities are offered to encourage participation.

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

Legal Status of the Nonpoint Source Control Plan

This 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 under the cooperative efforts of DNR, DATCP, the Calumet and Fond du Lac County Land Conservation Departments, local units of government, and the Lake Winnebago East Watershed Advisory Committee.

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

Other Planning Activities in the Watershed

The Lake Winnebago East Watershed is a part of several other water resource planning efforts which are summarized below.

The Upper Fox River Water Quality Management Plan (1990) prepared by the DNR, identifies water quality goals, problems, improvements and management needs for the lakes and streams in the entire Upper Fox River Basin which includes the Lake Winnebago East Project area. This priority watershed is an amendment to the above referenced water quality management plan.

The International Joint Commission (IJC), the US Environmental Protection Agency's Great Lakes National Program Office (GLNPO) and the DNR have targeted areas for restoring water quality. The lower Green Bay is one such area. *The Lower Green Bay Remedial Action Plan* (DNR, 1988), identifies specific management strategies to control and abate surface water and bottom sediment contamination due to the presence of toxic substances. It contains recommendations pertaining to the need for nonpoint source pollution controls. This priority watershed plan identifies a control strategy which complies with the reduction goals identified in the Remedial Action Plan for the Lake Winnebago East Watershed.

The *Winnebago Comprehensive Management Plan* (DNR, 1989), identifies the fish, wildlife and water resource use and management needs for the entire Winnebago system, sets objectives and lists management options. This priority watershed plan identifies a control strategy in agreement with the water quality management options identified in the above referenced plan for the Lake Winnebago East Watershed.

Relationship of the Nonpoint Source Control Plan to the Federal Storm Water Discharge Permit Program

Recent changes to the Federal Water Quality Act will play an important role in improving water quality in the Lake Winnebago East Project Area. Amendments to the Act, approved in 1987, required large cities, major industries, and other municipalities to apply for a National Pollutant Discharge Elimination System (NPDES) permit for the discharge of pollutants from separate storm water sewer systems by February 4, 1990. These permits

(called WPDES in Wisconsin) are the same as are issued by the DNR for public and private wastewater treatment plants and industrial wastewater dischargers.

The DNR in accordance with regulations issued by the US Environmental Protection Agency (EPA), will have responsibility for implementing this new program. The EPA published regulations in October 1990. Additional regulations scheduled to be issued in October 1992, which become effective in 1995, may apply to the city of Fond du Lac and other moderately sized cities statewide.

The amendments to the above referenced Federal Water Quality Act require pollutants in municipal storm water discharges to be controlled to the "Maximum Extent Practicable." Many of the probable permit requirements overlap with the management actions in this plan needed to improve water quality in the Project Area. For example, adoption and enforcement of construction site erosion control ordinances are specifically mentioned in the draft regulations and are identified in this nonpoint source plan as a critical component of the sediment control strategy. Implementation of the Lake Winnebago East nonpoint source plan will likely meet this and many other permit requirements.

Importantly, the nonpoint source plan calls for management actions not required in the federal program including stabilization of eroding stream banks. Also, the federal program will likely require activities beyond the nonpoint source plan including water quality monitoring of selected storm sewer outfall by the permittee and adoption of municipal ordinances to control storm water discharges from lands associated with industrial activities.

The coordinated implementation of the federal program and this nonpoint source control plan will help ensure that the water quality objectives for Lake Winnebago and its tributary streams will be achieved. Specific information on the relationship between implementing these two programs is presented in Chapter 5.

Plan Organization

The contents of each chapter are described below:

The Watershed Assessment

- Chapter 2, "Description of Watershed," is an overview of the cultural and natural resource features pertinent to planning and implementation efforts for the priority watershed project.

- Chapter 3, "Water Quality Conditions, Objectives and Nonpoint Sources," identifies the water quality or water resource problems and objectives that can be achieved through a nonpoint source control project. The chapter determines the level of pollutant control needed to achieve the objectives, describes the nonpoint sources and other sources of pollution.

- Chapter 4, "Management Actions," identifies the level of urban and rural nonpoint source control needed to meet the water quality objectives. The decision criteria and the nonpoint sources eligible for funding under the priority watershed project are presented.

A Detailed Program for Implementation

- Chapter 5, "Local Government's Implementation Program," describes how local units of government will administer the project, estimates a local assistance and management practice cost-share budget and identifies an information and education program.

- Chapter 6, "Integrated Resource Management Activities," presents the strategy for involving DNR resource management programs (fisheries management, wildlife etc.) in the nonpoint source pollution abatement efforts in the watershed project.

Project Evaluation

- Chapter 7, "Progress Assessments," discusses the means for assessing the amount of nonpoint source control gained through installation of best management practices.

- Chapter 8, "Evaluation Monitoring," presents a strategy and a schedule for stream and lake monitoring to determine the water quality impacts of implementing nonpoint source controls.

CHAPTER TWO: Description of the Lake Winnebago East Watershed

Location

The Lake Winnebago East watershed is located in Calumet and Fond du Lac counties as shown in Map 1. Fond du Lac County occupies approximately 62% of the watershed with Calumet County the remaining 38%. Approximately 93 square miles of surface drainage area enter Lake Winnebago from the east shore. Lake Winnebago drains to the Fox River which flows north to Green Bay. Approximately the east half of the City of Fond du Lac (1989 population 37,493 for the entire city) is located within the watershed, and the villages of Eden (1988 population 552), Stockbridge (population 579) and part of Sherwood (population 837).

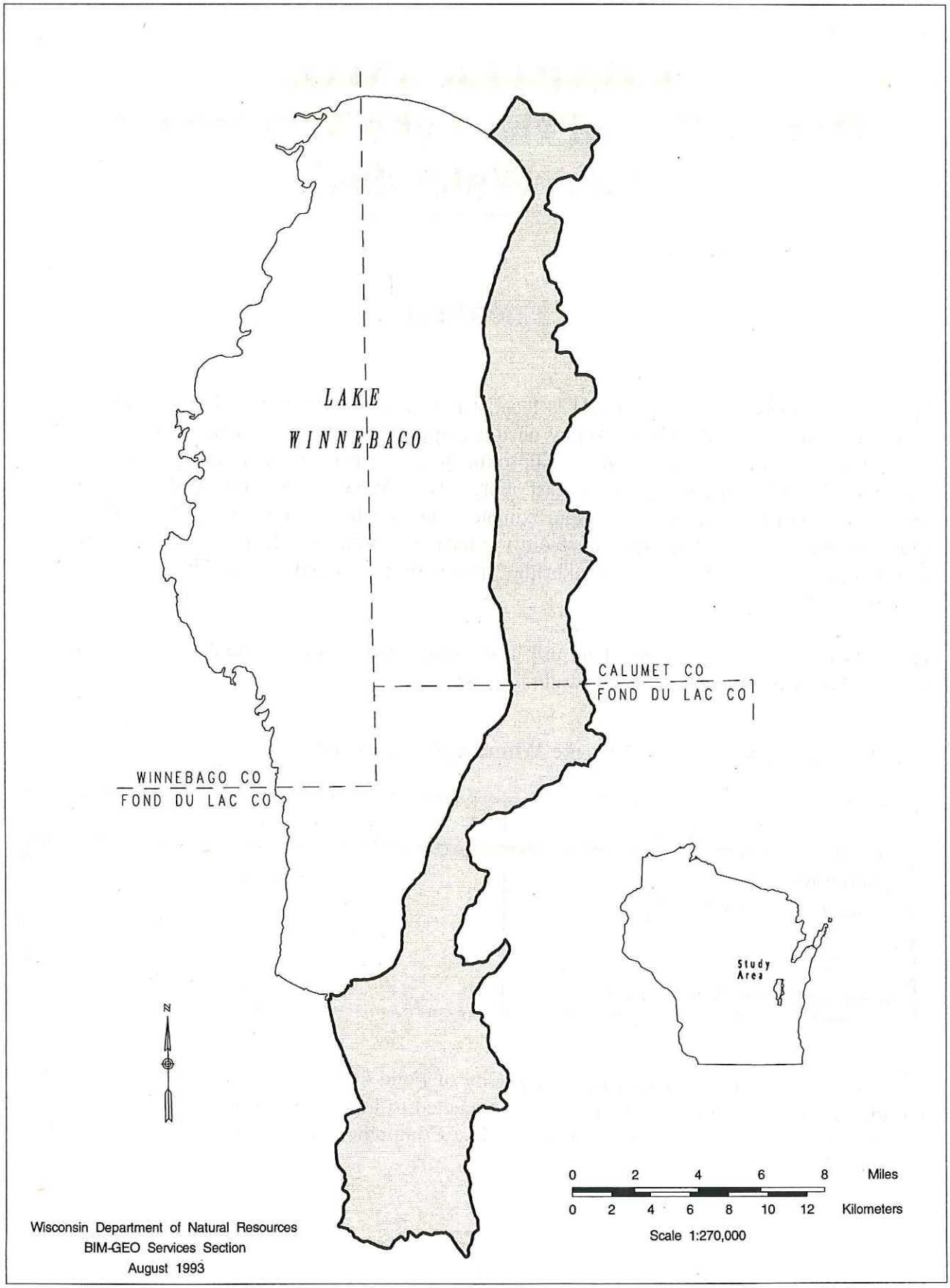
Dairy agriculture is the primary land use in the watershed. Some vegetable growing does occur. The overall land use in the watershed is:

Table 2-1. Land Use in the Lake Winnebago East Watershed

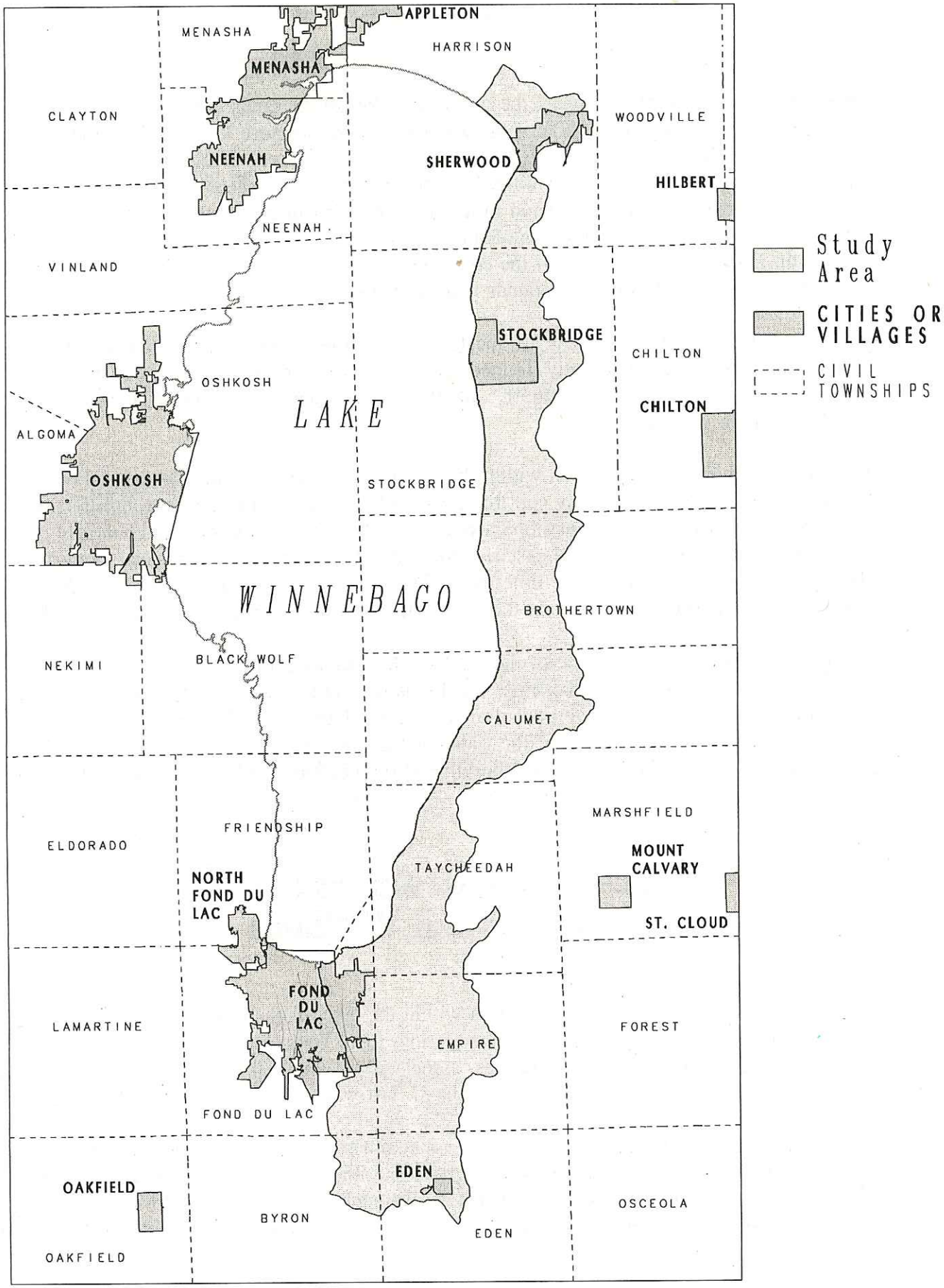
Land Use	Percent of Watershed
Agriculture: Cropland, Grassland, Pasture	80%
Woodlands	9%
Urban and Developing Areas	11%

Most of the urban land use consists of the City of Fond du Lac. According to projections, the urbanized area population of the city is expected to increase at approximately ½% per year for the next 20 years (City of Fond du Lac Comprehensive Management Plan, 1990), see Map 2.

Map 1. Lake Winnebago East Priority Watershed Project Area.



Map 2. Civil Divisions in the Lake Winnebago East Priority Watershed Area.



Land Resources

Two land features largely dominate the watershed, the rolling lands which encompass the eastern and extreme southern parts of the watershed, and the more level lands found in the western part of the watershed. Both areas were formed by recent glacial activity. The Niagara escarpment, or "ledge" as known locally, is a prominent geologic feature within the watershed. It extends from Sherwood in the north to Eden in the south, then westerly across the watershed. West facing outcrops of limestone bedrock are common along this formation. A drumlin region is situated east of the escarpment in the Fond du Lac County portion of the watershed. This area has more wetlands than other parts of the watershed.

Two large internally drained areas are located on the eastern edge of the watershed within Calumet County. These internally drained areas or closed depressions are areas that do not have an outlet for surface water runoff. Smaller areas of internally drained lakes are also found within the watershed.

The most common soil association within the watershed is the Kewaunee-Manawa-Poygan. It is characterized as a "heavy" clay soil that tends to have poor infiltration but high fertility. The lands west of the escarpment slope toward Lake Winnebago and consist of mostly clayey soils over a shale formation. The eastern part of the watershed is characterized as mostly clayey soils underlain by dolomite limestone. The limestone, in contact with the underlying shale, forms numerous springs along the escarpment that drain westerly to Lake Winnebago.

Soil types effect the water regime of the watershed. Increased rates of surface water runoff are characteristic of heavy surface soils. Additionally these soils are very susceptible to erosion on the uplands, and have poor drainage on level areas. Following significant rainfall, Lake Winnebago and the streams of the watershed are very turbid from eroded suspended silts and clays. The Lake Winnebago shoreline also contributes sediment from eroding areas directly into the lake.

Surface Water Resources: Lakes, Streams and Wetlands

Fourteen subwatersheds drain the land area within the lake Winnebago East Watershed. All convey surface water directly or via tributaries into Lake Winnebago, except the two internally drained areas. Major tributaries, associated streams, lakes, wetlands and subwatershed divides within the Lake Winnebago East watershed are shown in Map 3.

Lake Winnebago's 6,000 square mile watershed comprises 17% of the state's surface water acreage. The lake was bordered by shallow bays and marshes until the 1950's when two dams were built on the Fox River outlet of Lake Winnebago at Neenah and Menasha. The dams, and subsequent improvements raised the water level 2.5 - 3 feet, permanently flooding

and destroying many of the marshes. The loss of wetlands have eliminated the buffering effect they have on sediment draining to the lake.

Two natural lakes (greater than 10 acres) and two impoundments are located in the Lake Winnebago East Watershed. The two natural lakes are of glacial origin and located in the southern part of the watershed. The largest lake is DeNeveu Lake (79 acres), a deep (67 feet), lake for this region. It exhibits low productivity. The shoreline is highly developed. The other natural lake is Twin Lake, a relatively deep (26 feet) seepage lake with two distinct basins. The lake suffers from occasional winterkills of fish.

Approximately 165 miles of perennial and intermittent stream drain the Lake Winnebago East Watershed. Perennial streams, with a combined length of 51.2 miles, maintain at best a small continuous flow throughout most of the year. Of all streams in the Lake Winnebago East Watershed, DeNeveu Creek is the longest stream (11 miles). Taycheedah Creek is the other major stream with a total length of 10 miles.

Intermittent streams flow when there is runoff or when groundwater discharge is highest. Numerous intermittent and perennial streams extending from Peebles to Stockbridge flow down the Niagara escarpment and drain into Lake Winnebago. The headwaters of the intermittent streams are often contact springs that issue from the Niagara dolomite.

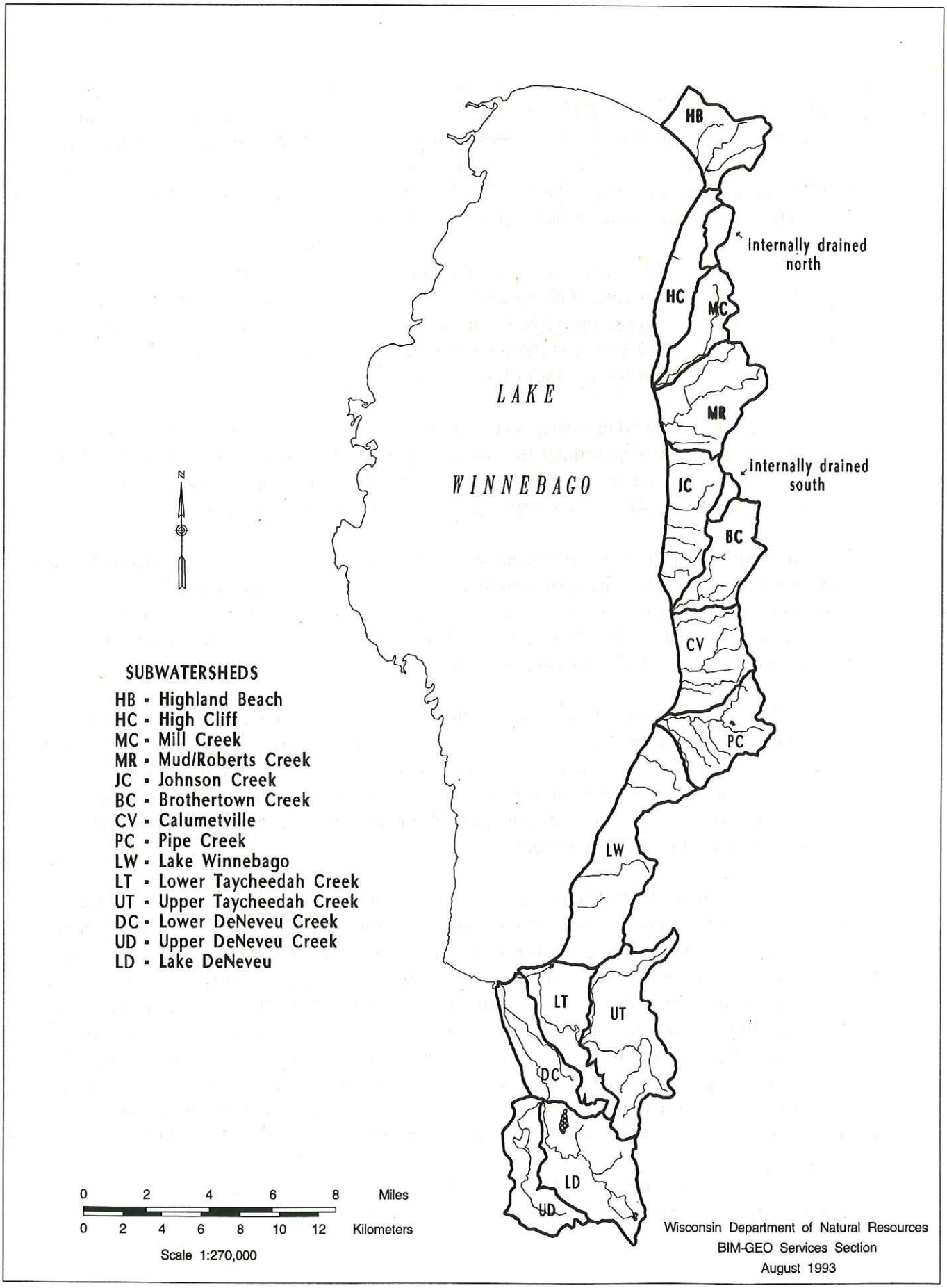
In general, major alterations in-stream habitat have resulted from streambank channelization (ditching) and erosion, deposition of sediments/siltation, and livestock trampling of streambanks. These features in turn influence nutrient availability, base flows and stream temperatures, dissolved oxygen levels, suspended solids, and the diversity and abundance of fish, macroinvertebrates and numerous wildlife species.

Wetlands play an important role as groundwater recharge and discharge areas, spawning rearing, and over-wintering areas for fish and wildlife, flood water storage, and removal and retention of sediment and nutrients contained in upland runoff. An abundance of organic material present within wetlands can also create naturally low dissolved oxygen conditions. This may influence downstream water quality and create an environment for potential waterfowl and other bird disease outbreaks.

Original acreages of wetland throughout the Lake Winnebago East Watershed have been vastly reduced by hydrologic modifications aimed at draining, and/or filling lowland areas to render them more suitable for agricultural purposes and urban development. Much of the agricultural land has been developed by surface drainage practices to quickly convey water off the land and dry the soils. Various watershed characteristics all contribute to create a "flashy" stream flow during runoff periods and an efficient delivery system for nutrients, sediment and other urban pollutants. These characteristics include wetland losses, heavy clay soils, areas of steep slope, impervious areas and a loss of buffer vegetation particularly along water courses. The conversion of wetlands, and grasslands has had a dramatic impact on the quantity, diversity, and quality of aquatic and terrestrial fish and wildlife habitat.

The Upper Taycheedah and Lake DeNeveu subwatersheds contain the largest remaining wetland acreage within the Lake Winnebago East Watershed.

Map 3. Subwatersheds and Surface Water Features in the Lake Winnebago East Priority Watershed Area.



Groundwater

Groundwater in the watershed moves within two principal systems: the water-table system and the artisan system. The water-table system is present in all parts of the project area and is recharged locally by precipitation and infiltration. The artisan system in the Lake Winnebago East Watershed is made up of parts of three aquifers lying beneath the relatively impermeable Maquoketa Shale. Artisan conditions can also exist just beneath the fine grained silts and clays of the unconsolidated surface materials.

An aquifer is simply an underground rock or sediment formation that contains water sufficient to provide water to a well. Four principal aquifers provide groundwater for this watershed. They are, in order from deepest to most near the surface:

1. the sandstone aquifer which includes sandstone and dolomite formations of the Cambrian and Ordovician periods

2. the Galena dolomite and Platteville aquifer (this layer is topped by the Maquoketa Shale confining layer)

3. the Silurian or Niagara dolomite aquifer

4. the sand and gravel aquifer

Groundwater occurs in fractures in dolomite or in sandstone formations within the pore spaces between loosely cemented grains of sand. The sandstone aquifer is the source of most potable groundwater in the Watershed. The sandstone aquifer is generally more permeable than the Maquoketa Shale formation.

The Silurian dolomite aquifer lies above the sandstone aquifer. It is separated from the sandstone aquifer by the Maquoketa Shale and is relatively close to the ground surface. This aquifer is also a source of potable water within the Watershed.

The sand and gravel aquifer is a relatively shallow aquifer consisting of permeable sediments of unconsolidated glacial deposits. Water in this aquifer is recharged locally by precipitation. This aquifer is not common within this watershed. The sand and gravel and the dolomite aquifers are the most susceptible to contamination due to the shallow depth to groundwater and permeable nature of the bedrock and other subsurface formations.

Information describing groundwater quality in northeastern Wisconsin, including the watershed, is summarized below. A number of groundwater investigations, *An Overview of Groundwater Quality Data in Wisconsin* (Kammerer, 1984), *Groundwater Quality Atlas of Wisconsin* (Kammerer), and *Ground Water Quality Data in Wisconsin* (Kammerer), provide information applicable to the watershed area.

Water in the eastern groundwater province aquifers is generally quite hard. Chloride levels in most wells sampled in this region were below the state's drinking water standards. Concentrations exceeding the state standard for dissolved solids were found in water from more than 25% of the wells sampled in the Silurian dolomite aquifer. Sulfate concentrations exceeding the standard were found in water from approximately 10% of the wells in this aquifer. At least half of the 764 wells sampled in the three geologic units equalled or exceeded the standard for iron in water.

Monitoring data suggest that nitrate contamination of ground water may not be a widespread problem in the Lake Winnebago East Watershed. Nitrate concentrations exceeding the 10 mg/l state standard were found in relatively few wells (approximately 2%) in 136 samples collected by county staff during 1990. However, approximately 27% of the wells sampled were above the preventative action limit of 2mg/l as referenced in Wisconsin Administrative Code NR 140. In another groundwater sampling study conducted during November 1990 by the Fond du Lac County UW Extension, nitrates were analyzed in 189 individual well samples in the towns of Calumet and Taycheedah. The results from this study showed approximately 11% of the wells sampled exceeded the 10 mg/l standard for groundwater nitrate-nitrogen. The preventative action limit was exceeded in nearly 42% of the samples.

Bacteria were also analyzed in this study. Approximately 25% of the samples had positive results for fecal coliform bacteria. Fecal coliform bacteria, though not itself a health concern, does indicate animal and/or human waste sources of contamination have entered the groundwater. Further site specific investigations are needed before the extent and severity is accurately defined. However, nitrogen-containing materials from waste-disposal sites, livestock waste, septic systems and agricultural fertilizers have been implicated in a general study of nitrate contamination of private rural wells (Delfino, 1977).

The heavy soils common to virtually the entire watershed are not conducive to the downward migration of surface contaminants. Despite these soils, groundwater contamination has been found and documented in the Lake Winnebago East Watershed. Most of the nitrate contamination is believed to be from the improper storage and application of waste materials and agricultural fertilizers.

A discussion of critical sites potentially affecting groundwater in the Lake Winnebago East watershed and eligibility for cost sharing is included in Chapter 4.

Endangered and Threatened Resources

Information on rare and endangered resources was obtained from the DNR Bureau of Endangered Resources (BER). It should be noted that comprehensive endangered resource surveys have not been completed for the entire Lake Winnebago East priority watershed project area. Data files may be incomplete, however the absence of known occurrences does not preclude the possibility of their presence in the project area.

Endangered Species

There are no known endangered species within the Lake Winnebago East Watershed. However, three species of endangered terns and peregrine falcon have been observed by wildlife staff and local naturalists.

Threatened Species

One state designated threatened species of plant is known to occur in the Upper Taycheedah subwatershed, the forked aster (*Aster Furcatus*). Bald eagles, ospreys and great egrets have all been observed by naturalists and wildlife staff.

Natural Communities

Several natural communities of state significance have been identified in the Lake Winnebago East Watershed. The High Cliff subwatershed contains a southern wet-mesic forest, open and shaded cliff natural communities, mounds and a consolidated outcrop natural community. Within the Lake Winnebago subwatershed a southern mesic forest natural community does occur.

Archaeological Resources

The Lake Winnebago East Watershed is rich in indian archaeological resources. An indian reservation was at one time located within the central portion of the watershed. Various archaeological studies have been published which describe these resources.

The State Historical Society of Wisconsin has been charged with ensuring the preservation of these resources. Chapter 5 outlines a procedure for use within this project to minimize the disturbance of these archaeological resources.

CHAPTER THREE: Water Quality Conditions, Objectives and Nonpoint Sources

Introduction

Nonpoint sources of pollution are significant contributors of sediment, nutrients, and other pollutants to Lake Winnebago and its tributary streams. These pollutants are contributing to a decline in water quality and degradation of aquatic habitats. Under certain conditions, they also may have the potential to impact groundwater quality. The nonpoint sources inventoried and the methods for evaluating their impact on surface and groundwater resources are discussed in Appendix B, "Watershed Planning Methods."

Activities in the watershed other than nonpoint sources have the potential to impact surface or groundwaters. These include: industrial and municipal wastewater treatment facilities, active and abandoned landfills, private septic systems, and toxic or hazardous waste spills. Many of these are regulated by the State of Wisconsin Department of Natural Resources or other governmental agencies. Permits define the conditions that must be met for each facility contributing pollutants. If the conditions are met, the adverse impacts on water quality are minimized. These other potential sources of pollution are described in the *Lake Winnebago East Watershed Appraisal Report* (Nachtwey, 1991). Also see Map 4.

The first part of this chapter presents a general overview of water quality conditions and nonpoint sources of pollution in the Lake Winnebago East Watershed. The remainder of the chapter presents a discussion of the findings (actual quantities of pollutants generated from each source) of the urban and rural nonpoint source inventories. Subwatershed specific water quality conditions, water quality objectives and other pollution sources are also discussed.

Overview of Water Quality Conditions

Lake Winnebago has probably always been a fertile lake system. The lake is now described as highly eutrophic primarily from excessive sediment and nutrient loading originating to a large degree from nonpoint sources.

Excessive algal growths have reduced sun light penetration which in turn has a negatively impacts rooted aquatic plants. The loss of these plants further impact other forms of life that depend on them, including aquatic insects, fish, waterfowl and other wildlife.

Sediment and nutrients are severely degrading aquatic habitat. The present lake habitat favors an unbalanced fish and wildlife community with less diversity.

Stream flows are subject to wide extremes. The clay soils and intense agricultural land use are conducive to rapid drainage of the land. These factors contribute to high levels of suspended particulates and extremely turbid water following runoff events. Low stream flows during dry weather limit the potential for major improvements in stream fish populations, except near Lake Winnebago.

Water Quality Objectives

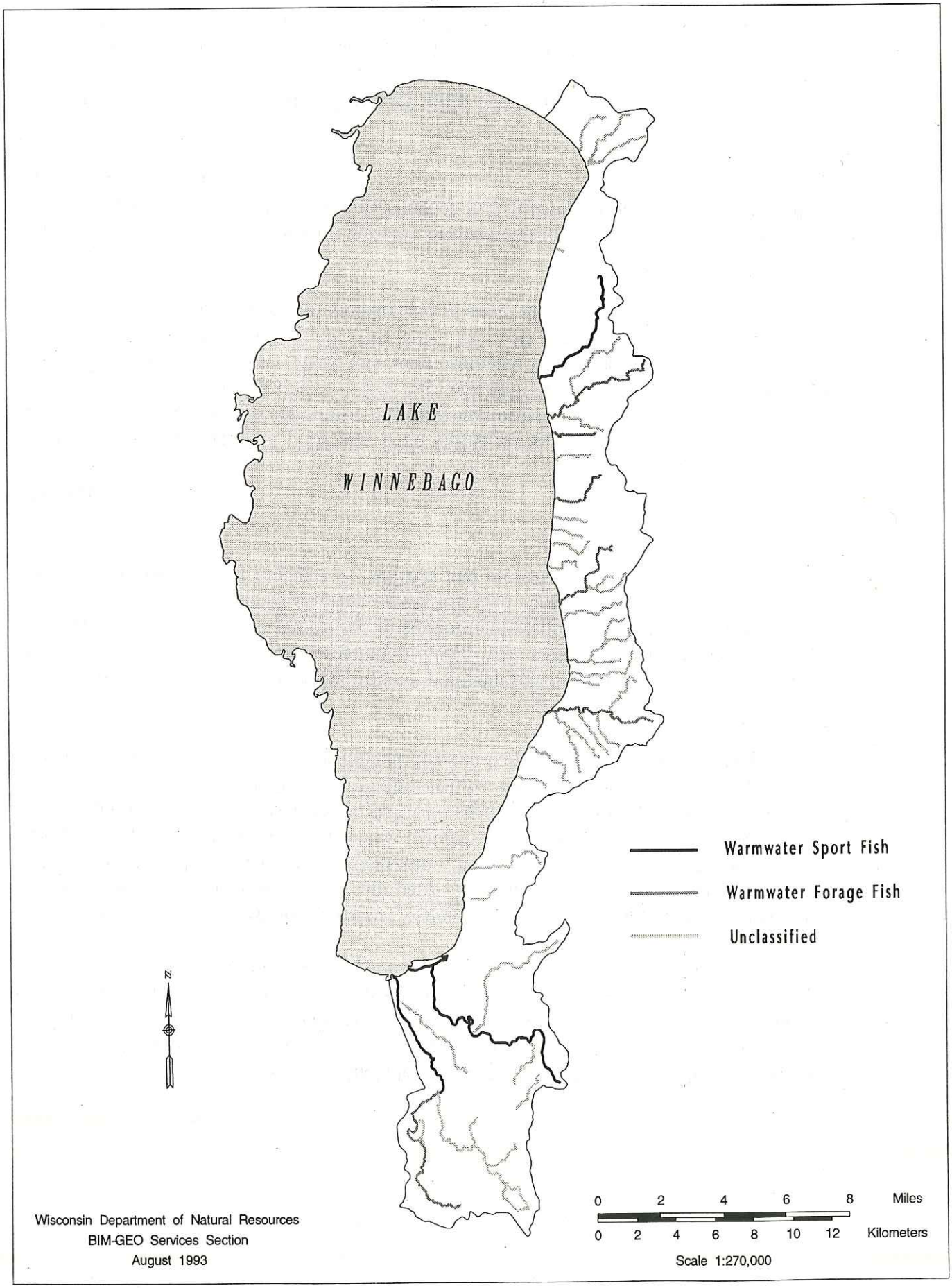
The high levels of phosphorus that enter Lake Winnebago, an estimated 1.5 million pounds annually, must be significantly reduced to improve water quality and aquatic habitat. *The Winnebago Comprehensive Management Plan* (DNR, 1989) has identified a phosphorus reduction objective of 33% from all phosphorus sources to the Lake Winnebago system. An overall phosphorus control level of 40% has been identified as necessary to improve water quality and aquatic habitat in the Fox River and Green Bay (*Lower Green Bay Remedial Action Plan*, 1988). The nonpoint source phosphorus reduction objective for this watershed is 40%. This reduction is needed to reduce the prevalence of algae and begin reestablishing a balanced aquatic community in Lake Winnebago.

Annually, on an average of 1.5 million pounds of drum (sheepshead) are removed from Lake Winnebago. A large population of this fish species is undesirable. Sport fish such as northern pike, bass, yellow perch and other panfish have experienced declines. Excessive algal growths have caused fish kills along the east shore of Lake Winnebago by reducing the availability of oxygen. Botulism outbreaks from excessive algal growth and stagnant water have reduced bird populations which utilize the lacustrine habitat.

High levels of sediment reduction (50%) are also needed to improve the clarity of Lake Winnebago. Sediment reductions will improve fish spawning habitat and the survival of eggs, improve water clarity and make light more available to rooted aquatic plants. Wildlife habitat will be enhanced with an increase of rooted aquatic plants, particularly waterfowl species.

Urban stormwater runoff and associated sediment typically contain heavy metal concentrations, particularly high levels of lead and zinc. Reducing urban sediment will reduce heavy metal loading to Lake Winnebago. The water quality improvements to Lake Winnebago and it's tributary streams will in turn benefit water quality of the Fox River and lower Green Bay.

Map 4. Stream Classifications in the Lake Winnebago East Priority Watershed.



Rural Nonpoint Analyses

Overview

Rural nonpoint sources investigated include animal lots, croplands and other uplands, stream banks, and fields winter-spread with livestock manure. The inventory and evaluation procedures are described in Appendix B. DATCP and the Fond du Lac and Calumet County Land Conservation Departments estimated the relative amount of sediment and phosphorus entering surface waters from these sources.

Most creeks in the Lake Winnebago East Watershed suffer from sedimentation derived primarily from upland, gully and stream bank erosion. Sediments have blanketed the stream bed, filling in pools and riffles, and degrading the reproductive habitat for warm water fish species and associated fauna. Cattle have extensively trampled streambanks and stream bottoms along many of the streams in the watershed. These sediments are then delivered to Lake Winnebago, affecting fish and wildlife habitat and boat navigation. The Lake Winnebago shoreline contributes sediment through bank erosion caused primarily by storm wave action.

Creeks are also locally impacted by organic pollutant loads from livestock waste runoff. It is suspected that loss of cover and vegetation, along with a shallower streambank, and oxygen-demanding organic inputs have caused in-stream temperatures to increase and lower dissolved oxygen levels. The nutrients entering creeks are then washed into Lake Winnebago causing severe algal growths that impact fish, wildlife and recreational opportunities.

Barnyard Runoff

Runoff carrying a variety of pollutants from barnyards and livestock feeding, loading, and pasturing areas is a significant source of pollutants in the creeks of the Lake Winnebago East Watershed. As shown in Table 3-1, 179 livestock operations were identified as having runoff delivered to surface waters. These lots were estimated to produce 2,269 pounds of phosphorus during a 4-inch rainfall (this storm has a 10 year-24 hour reoccurrence period). The phosphorus value is used to compare the relative water quality impact from the barnyards.

An additional two animal lots are internally drained and the runoff waters do not reach a stream or lake. These sites will require further investigation to determine susceptibility for causing groundwater contamination.

Runoff from Areas Winter Spread with Livestock Manure

The 181 livestock operations inventoried in the Lake Winnebago East Watershed produce an estimated 93,500 tons of manure from late fall through mid-spring. The most significant

water quality problems associated with land-spreading of livestock manure occur when wastes are spread on "critical" areas such as steeply sloped frozen ground, land in floodplains, and/or areas with shallow depth to groundwater. For the purpose of analysis, "critical lands" were defined as lands which deliver sediment to surface water over the sediment reduction goal for each subwatershed as described in Chapter 4. These lands have a high potential for conveying pollutants to surface and groundwater.

The most suitable fields for winter spreading manure are often not usable for a number of reasons including climate, soil condition, and proximity of croplands suitable for spreading. This results in spreading on unsuitable or "high pollution hazard" areas. In addition, individual landowners may not have enough suitable land to properly spread livestock wastes.

Table 3-1. Inventory Results: Barnyard Summary *

Subwatershed		Yards with Surface Runoff		
		Total # of Yards	Phosphorus Load (lbs)	% Total of Watershed Load
1	Brothertown Creek	25	264.1	12%
2	Calumetville	23	304.8	13%
3	High Cliff	4	33.6	1%
4	Highland Beach	5	86.1	4%
5	Johnson Creek	11	149.1	7%
6	Lake DeNeveu	19	252.1	11%
7	Lake Winnebago	14	115.0	5%
8	Lower DeNeveu Creek	1	42.7	2%
9	Lower Taycheedah Creek	1	2.8	0%
10	Mill Creek	5	52.3	2%
11	Mud/Roberts Creek	8	131.2	6%
12	Pipe Creek	18	251.1	11%
13	Upper DeNeveu Creek	16	176.5	8%
14	Upper Taycheedah Creek	29	407.1	18%
15	Internally Drained Areas	2	14.3	1%
	Totals	181	2,282.8	100.0%

*Based on the modified ARS Barnyard Runoff Model (10 year/24 hour storm)

Source: Calumet County and Fond du Lac Land Conservation Departments and Departments of Agriculture, Trade and Consumer Protection and Natural Resources.

Upland Erosion and Sediment Delivery

Intensive agricultural practices have caused considerable amounts of eroded soil to reach streams, lakes and wetlands in the Lake Winnebago East Watershed. Nutrients and pesticides are also carried along with runoff. Sediment transported in runoff from the uplands was quantified. This analysis revealed that upland erosion is the major source of sediments into surface waters.

Upland sediment sources were evaluated for the entire watershed with the exception of the City of Fond du Lac portion of the watershed. The results of this inventory are summarized in Table 3-2. An estimated 84,000 tons of soil erode annually from croplands, pastures, woodlots, grassland, and other lands. Only about 12% of this amount or 10,250 tons/year actually reach wetlands, streams, or lakes in the watershed. The remainder of the sediment settles out on fields or dry channels before reaching a surface water.

Croplands are the major source of sediment that reaches surface waters. Although croplands comprise 66% of the rural land use in the watershed, it contributes about 80% of the sediment when all sources of sediment are considered. The highest sediment delivery rates are found in the Mud/Roberts Creek, Lake Winnebago and Upper Taycheedah Creek subwatersheds. These areas together account for 3,000 tons or 37% of the sediment loading attributed to cropland erosion.

Gully Erosion and Sediment Delivery

Gully erosion occurs when surface runoff concentrates into small streams and flows over upland areas. The type of vegetative cover, topography and soil conditions are among the factors influencing the severity of gully erosion. The assessment of gully erosion was conducted as part of the above referenced upland erosion inventory. A combination of the Calumet County Soil Erosion Control Plan, aerial photographs, field work and knowledge of the watershed were used to determine the extent of gully erosion.

The results of this evaluation are summarized in Table 3-3. Gully erosion was determined to be a significant source of sediment loading to Lake Winnebago and its tributaries. An estimated 3,461 tons of soil is eroded annually from these sites. This accounts for about 20% of the sediment load in the watershed attributable to rural nonpoint sources. The greatest amount of gully erosion occurs in the Lake Winnebago, Mud/Roberts and Pipe Creek subwatersheds.

Table 3-2. Summary of Upland Sediment Loading by Land Use

Subwatershed		Cropland	%	Grassland	%	Woodlot	%	Developed **	%	Totals	%
Brothertown Creek	Acres	2,505	74	265	8	491	14	139	4	3,400	6
	Sediment *	471	92	8	2	8	2	27	5	514	5
Calumetville	Acres	2,872	78	326	9	148	4	325	9	3,671	6
	Sediment	737	88	4	0	4	0	90	11	835	8
High Cliff	Acres	1,487	52	212	0	968	34	195	7	2,862	5
	Sediment	452	79	2	0	69	12	50	9	573	6
Highland Beach	Acres	2,106	62	432	13	442	13	409	12	3,389	6
	Sediment	292	65	11	2	25	6	123	27	451	4
Johnson Creek	Acres	2,538	75	244	7	408	12	194	6	3,384	6
	Sediment	732	91	4	0	13	2	57	7	806	8
Lake DeNeveu	Acres	3,616	61	1,167	20	455	8	658	11	5,896	10
	Sediment	574	78	19	3	15	2	125	17	733	7
Lake Winnebago	Acres	5,014	63	1,116	14	796	10	1,066	13	7,992	13
	Sediment	905	76	22	2	29	2	236	20	1,192	12
Lower DeNeveu Creek	Acres	1,108	32	812	23	37	1	1,517	44	3,474	6
	Sediment	259	53	13	3	1	0	215	44	488	5
Lower Taycheedah Ck.	Acres	1,952	50	928	24	349	9	658	17	3,887	6
	Sediment	494	82	20	3	4	1	85	14	603	6
Mill Creek	Acres	1,573	74	159	7	291	14	111	5	2,134	4
	Sediment	377	92	4	1	7	2	22	5	410	4
Mud/Roberts Creek	Acres	3,487	78	225	5	411	9	340	8	4,463	7
	Sediment	1,142	90	5	0	15	1	103	8	1,265	12
Pipe Creek	Acres	3,360	83	324	8	121	3	236	6	4,041	7
	Sediment	786	93	5	1	4	1	51	6	846	8
Upper DeNeveu Creek	Acres	2,635	80	267	8	127	4	234	7	3,263	5
	Sediment	421	86	11	2	4	1	52	11	488	5
Upper Taycheedah Ck.	Acres	5,198	77	780	12	239	4	551	8	6,768	11
	Sediment	951	91	17	2	4	0	73	7	1,045	10
Internally Drained	Acres	-	-	-	-	-	-	-	-	1,231	2
TOTALS:	Acres	39,451	66%	7,257	12%	5,283	9%	6,633	11%	59,855	100%
	Sediment	8,593	84%	145	1%	202	2%	1,309	13%	10,249	100%

* Sediment is reported in tons/year.

** Developed lands includes farmsteads, roads, and communities.

Table 3-3. Inventory Results: Gully Erosion

Subwatershed	Total Sediment Loss (tons/yr)	Sediment Loss (tons/acre/yr)
Brothertown Creek	289	0.12
Calumetville	331	0.12
High Cliff	0	0
Highland Beach	109	0.05
Johnson Creek	293	0.12
Lake DeNeveu	96	0.03
Lake Winnebago	578	0.12
Lower DeNeveu Creek	128	0.12
Lower Taycheedah Creek	225	0.12
Mill Creek	181	0.12
Mud/Roberts Creek	402	0.12
Pipe Creek	387	0.12
Upper DeNeveu Creek	304	0.12
Upper Taycheedah Creek	138	0.03
Total	3,461	N/A

Source: Calumet and Fond du Lac County Land Conservation Departments.

Streambank Erosion

The streambank erosion inventory in the rural portions of the watershed is summarized in Table 3-4. The inventory included both perennial and intermittent streams. This evaluation determined that streambanks were eroded, slumping or trampled by livestock at 816 sites. Livestock access to streams was recorded at 285 locations, or about 35% of these sites.

The investigations showed that streambank erosion is a significant source of sediment to surface waters in the project area, accounting for 3,428 tons or 20% of the sediment attributable to rural nonpoint sources. Uncontrolled livestock access degrades streambank and stream bed habitat and results in direct deposition of animal waste into streams. The Mud/Roberts Creek subwatershed, with 188 sites identified as eroded or trampled, has the most serious streambank degradation problem within the watershed.

Lake Shoreline Erosion

Shoreline erosion is essentially a natural shoreline process. Severe shoreline erosion is typically caused by storm wave action, however the rate and severity are often intensified by human activity. Typically when shoreline developments are constructed, the shoreline erosion process is often ignored. Any alteration of vegetation or drainage in the shoreline area may result in the destruction of natural shoreline defenses by allowing increased erosion. Docks and other structures can interrupt the natural movement of water and redirect the erosive forces in unexpected and possibly undesirable directions.

The east shoreline of Lake Winnebago was evaluated from a boat to determine the severity of shoreline erosion. Site specific data was collected for a few areas. In general, shoreline erosion is occurring at many sites, most of these small in terms of site length. Nearly all sites were associated with shoreline development. The sediment load per site for the majority of sites was determined to be less than 10 tons per year.

Table 3-4. Inventory Results:

Streambank Erosion and Habitat Degradation					
Subwatershed	Segment Length (ft)	# of Eroding Sites	Total Length Eroding Sites (ft)	Total Sediment Loss (tons/yr)	Banks With Cattle Access (ft)
Brothertown Creek	46,900	107	30,077	452.0	26,947
Calumetville	98,350	84	19,445	272.0	10,450
High Cliff	4,400	0	0	0.0	0
Highland Beach	39,400	18	1,222	14.0	0
Johnson Creek	60,750	60	4,955	172.0	2,600
Lake DeNeveu	95,500	123	17,745	249.0	6,400
Lake Winnebago	77,050	8	18,500	593.0	4,000
Lower DeNeveu Creek	42,500	20	1,715	108	0
Lower Taycheedah Creek	49,700	8	745	10.0	0
Mill Creek	28,260	116	13,006	159.0	4,800
Mud/Roberts Creek	103,180	188	38,695	751.0	4,655
Pipe Creek	79,900	70	29,205	574.0	3,100
Upper DeNeveu Creek	37,000	6	7,500	56.0	7,300
Upper Taycheedah Creek	80,900	8	3,160	18.0	3,160
Totals	843,790	816	185,970	3,428	73,412

Source: Calumet and Fond du Lac County Land Conservation Departments.

Urban Nonpoint Source Analyses

Overview

Urban runoff carries a wide array of pollutants to surface water. Some pollutants are unique to urban runoff, while others are also found in runoff from agricultural areas. Urban stormwater runoff was recently (June 1989 to July 1990) monitored by the DNR and the U.S. Geological Survey at 5 locations in Milwaukee and Madison, Wisconsin. Problem pollutants (those above detection limits in 10% of samples and which exceed state water quality standards in at least 1 runoff event) included lead, copper, zinc, silver, cyanide, volatile organic compounds, polychlorinated biphenyls (PCB's), and several insecticides.

Substances in urban runoff that are also contained in runoff from rural areas include sediment (especially from construction sites), nutrients, bacteria and other pathogens, and pesticides. While the amount of urban land may be small in comparison to rural areas, urban areas can contribute more pollutants on a per-acre basis because they are often connected to storm sewers which convey runoff directly to lakes and/or streams.

Runoff from urban areas also impacts stream hydrology. As the landscape becomes urbanized, runoff volume increases and is produced in a short time, creating large increases in peak stream flows. In some areas, groundwater recharge is significantly reduced as concrete and other impervious surfaces prevent rainwater and snow melt from soaking into the ground. This can reduce base stream flows needed to sustain fish and aquatic life during periods of low rainfall. The quality of wildlife habitat is also compromised. Uncontrolled urban runoff can produce "flashy" streams with temperatures and chemical characteristics that limit animal life and recreational uses.

Stream bank erosion may increase as the stream tries to cut a channel in equilibrium with widely variable stream flows. Flooding of adjacent property may also occur, sometimes requiring channel modifications to accommodate flood flows or prevent flood damage. This often destroys the natural stream system and speeds the transport of pollutants downstream.

Runoff from new urban development has the potential to impact stream water quality in several ways. First, constructing roads, utilities and buildings disturbs large areas, exposing large amounts of soil to erosion. Sediment is easily carried by runoff to drainage ways, storm sewers and ultimately streams. Construction site erosion can have catastrophic impacts on urban rivers and streams, clog storm sewers causing local flooding, and accumulate on road surfaces and sidewalks. Second, newly established urban surfaces accumulate pollutants until they are carried in runoff to streams. Consequently, as new areas become urbanized, water quality problems caused by urban pollutants and excessive storm water runoff can worsen. Water quality improvements resulting from implementation of nonpoint source control practices for existing urban areas can be negated by these additional pollution sources.

An inventory of existing 1990 and planned year 2020 urban conditions in the City of Fond du Lac portion of the Lake Winnebago East Watershed was conducted by the City of Fond du Lac. Three key characteristics assessed were:

1. the type of urban land use

2. the type of stormwater conveyance system

3. urban housekeeping practices including but not limited to street sweeping and leaf collection

Each is discussed below. The Department used the information to determine urban nonpoint source loading to streams. The pollutants assessed were sediment, phosphorus, lead, copper and zinc.

Urban Land Uses

According to the 1990 urban land use inventory, approximately 12 square miles (or approximately 7,600 acres) of urban land exist in the City of Fond du Lac portion of the Lake Winnebago East Watershed. Table 3-5 summarizes the land use inventory. This is approximately 13% of all land in the watershed. An additional 10.3 square miles of developed land were identified in the rural upland inventory. The land is distributed among smaller municipalities and unincorporated areas of development scattered throughout the watershed. These lands were not included in the urban analysis, however, if they qualify, they will be eligible to receive cost share for control measures.

Table 3-5 and Maps 5 and 6 summarize the type and extent of urban land uses within the City of Fond du Lac portion of the watershed. The predominant existing land uses include parks and open spaces (62%) and residential (25%).

An additional 4600 acres of planned urban development is anticipated to occur within the Fond du Lac portion of the watershed over the next 30 years. All of this development will occur in the Lower DeNeveu Creek and Lower Taycheedah Creek subwatersheds. Residential areas are planned to show the greatest increases.

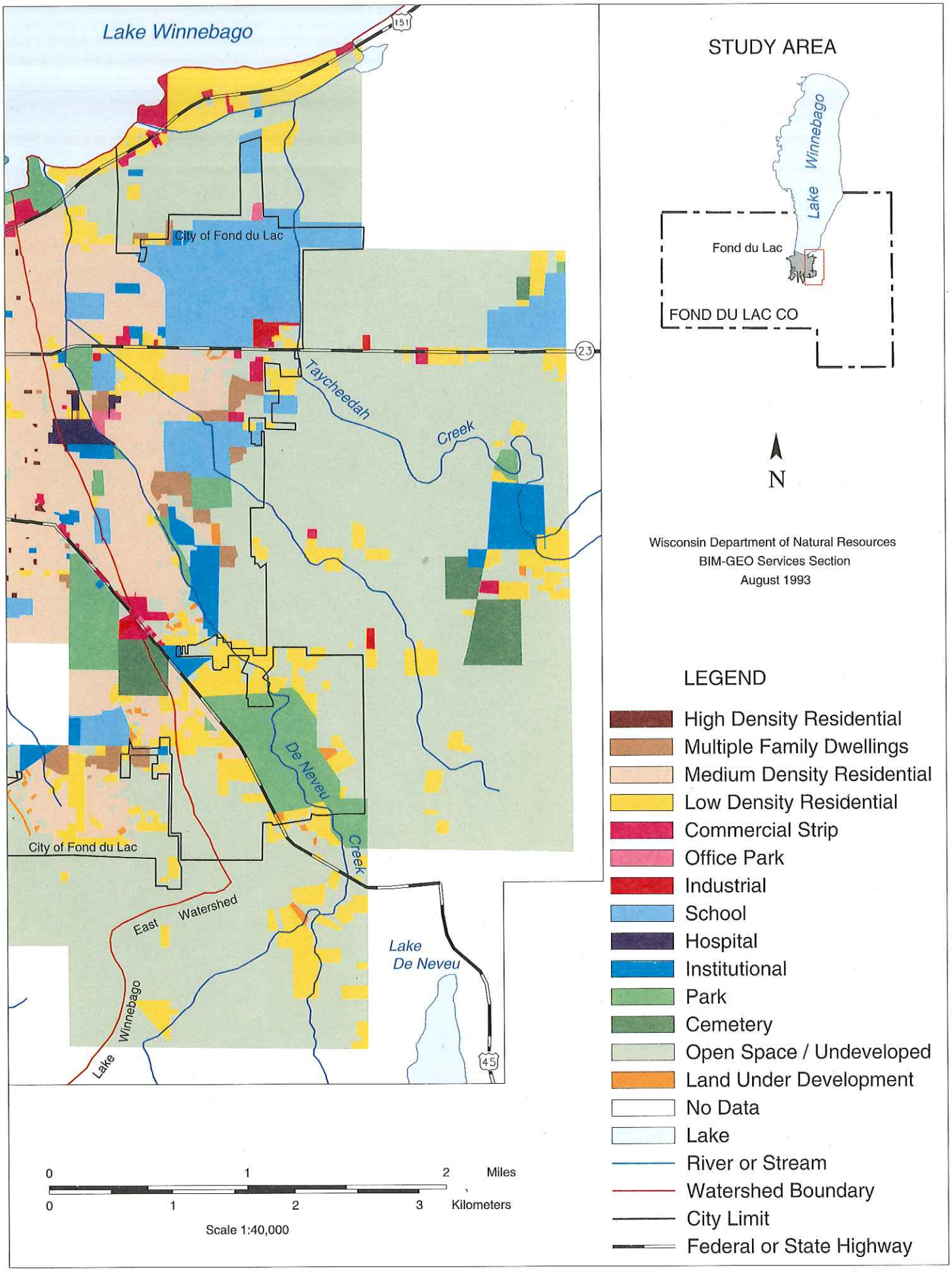
Stormwater Conveyance

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

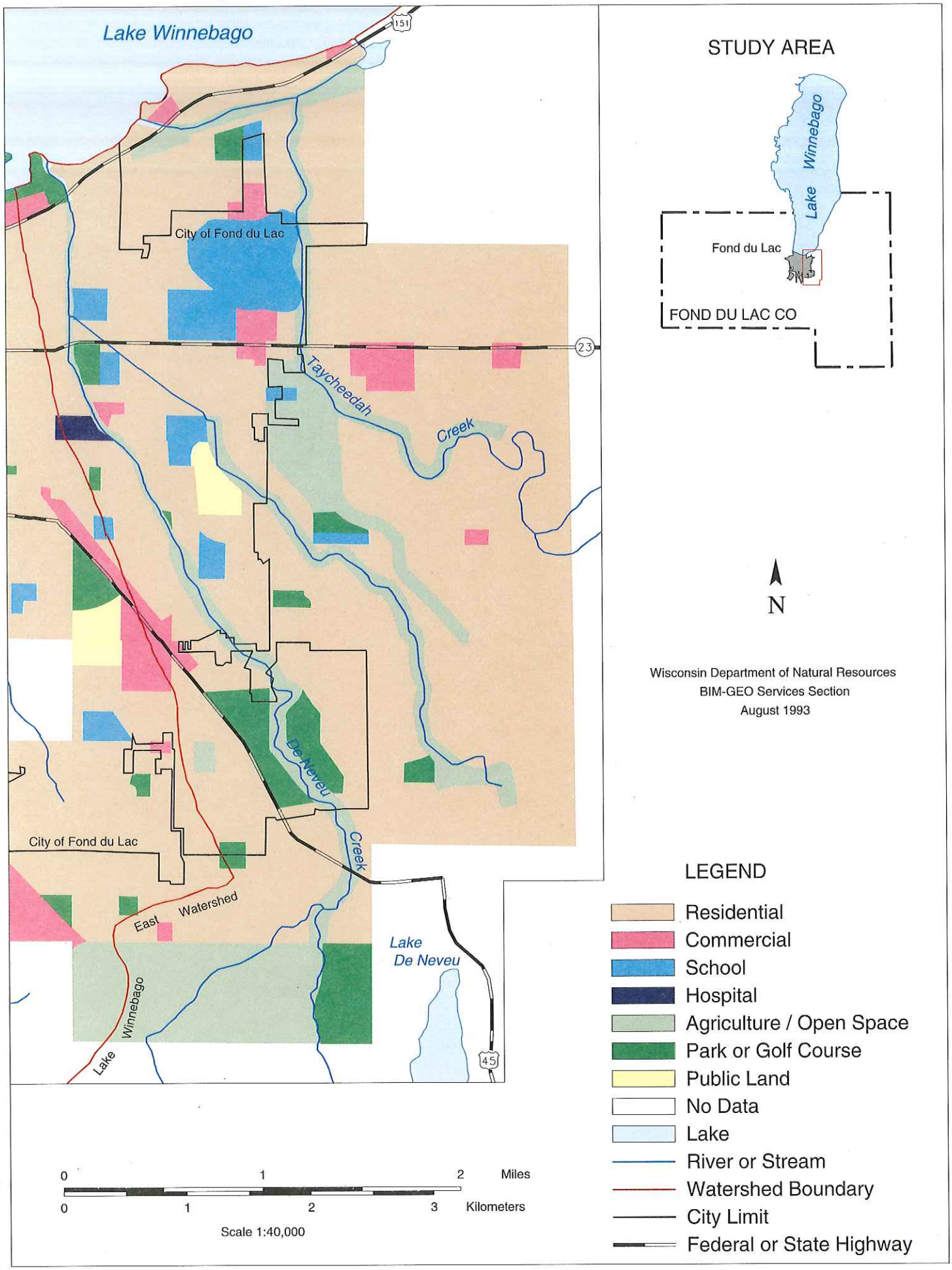
Table 3-5. **Existing (1990) Land Use in the City of Fond du Lac Portion of Lake Winnebago East Watershed**

Stormwater Sub-basin	Residential			Com-mercial (Acres)	Industrial (Acres)	Institutional (Acres)	Parks/ Open Spaces (Acres)	Total (Acres)	Percent Total Urban
	Low (Acres)	Medium (Acres)	High (Acres)						
E. Scott Street	3	31	<1	0	0	176	<1	211	3
Fourth Street	2	70	3	4	1	13	98	191	2
Gravity Flow	4	38	5	3	0	18	<1	68	1
Harbor View	2	94	<1	15	0	2	25	138	2
McDermott Park	56	127	19	9	1	47	45	304	4
Outside Stormwater Network	663	363	60	56	15	516	4484	6157	81
Reserve Avenue	3	197	11	1	0	60	0	292	4
Stow Street	0	56	0	0	0	30	0	86	1
Taft Street	0	34	0	0	0	0	1	35	<1
Western Reserve	1	48	1	<1	0	1	0	51	<1
Willow Point	27	15	0	2	0	0	52	96	1
Totals	761	1073	100	90	17	863	4726	7629	100

Map 5. Current Land Use of Eastern Fond du Lac.



Map 6. Planned Land Use of Eastern Fond du Lac.



The types and amounts of pollutants transported by runoff, depend on the extent to which pollutant-producing surfaces are hydrologically "connected" to the storm sewer system. For example, automobile traffic density (a prime determinant in the production of lead, asbestos, cadmium, and street dirt) is highest for street surfaces in commercial areas and freeways. Normally, these areas are connected to storm sewers which may transport runoff directly to streams, lakes or wetlands. Developing sites in urban areas are often already connected to storm sewers before construction is begun. Stormwater conveyance systems within the City of Fond du Lac portion of the Lake Winnebago East Watershed were identified during the urban inventory process.

Urban Housekeeping Practices

Street sweeping practices and conveyance systems were inventoried in the City of Fond du Lac portion of the watershed. These practices affect the portion of pollutants accumulated on urban surfaces that will be carried to streams by runoff. Street sweeping removes some of the particulate pollutants from street and parking lot surfaces before they can be transported to surface waters. The most benefit is realized by weekly sweeping of commercial and industrial areas throughout the spring, summer, and fall. Benefits from sweeping in other areas are primarily cosmetic and play a minimal role in reducing urban pollutant loads.

Urban Pollutant Loads

Information regarding land uses, stormwater conveyance, and urban housekeeping practices was used to predict the existing and anticipated future delivery of nonpoint source loads from the City of Fond du Lac portion of the watershed. Five pollutants (sediment, phosphorus, lead, zinc and copper) were chosen to characterize the sources and severity of urban nonpoint pollution. Urban nonpoint sources described below include; runoff from existing urban areas including established commercial, industrial, institutional, freeways and residential land uses; and runoff from areas where new urbanization is anticipated.

Table 3-6 shows estimated current (1990) average annual urban nonpoint pollutant loads. The areas evaluated include urban land uses in the city of Fond du Lac portion of the watershed.

The total annual sediment load from the City of Fond du Lac portion of the watershed is estimated at 1,024 tons/year. This constitutes about 9% of the total annual sediment load from all rural and urban sources. The most important source of sediment reaching surface waters from urban areas is construction site erosion. A rate of 30 tons/acre/year was used to estimate the sediment load from construction sites. That analysis indicated that more than 68% of the urban sediment load originates from construction erosion (700 tons per year).

Overall, urban nonpoint contributions of phosphorus, zinc, lead and copper to streams and Lake Winnebago are relatively moderate. Freeways, industrial areas, commercial areas and high density residential areas are the greatest contributors of pollutants on a per acre basis. When compared with larger urbanized areas in the state, the relative amount of these

Table 3-6. Existing (1990) Pollutant Loads in the City of Fond du Lac Portion of the Lake Winnebago East Watershed

Stormwater Sub-basin	Acres	%	Sediment Load* tons/yr	%	Phosphorus Load lbs/yr	%	Zinc Load lbs/yr	%	Lead Load lbs/yr	%	Copper Load lbs/yr	%
E. Scott Street	212	3	22	7	118	7	29	4	8	3	4	5
Fourth Street	190	3	12	4	60	4	22	3	7	3	3	3
Gravity Flow	70	1	10	3	44	3	23	3	7	3	3	3
Harbor View	138	2	16	5	75	5	32	5	10	4	4	5
McDermot Park	306	4	27	8	137	9	53	7	17	7	7	8
Outside Stormwater Network	6081	80	180	56	880	55	452	64	170	69	54	61
Reserve Avenue	293	4	34	10	167	10	64	1	19	8	8	9
Stow Street	87	1	10	3	50	3	14	2	4	2	2	2
Taft Street	35	<1	4	1	19	1	5	1	1	<1	1	1
Western Reserve	51	1	6	1	30	1	8	1	2	<1	1	1
Willow Point	98	<1	3	2	14	2	5	1	2	<1	1	1
Totals	7561	100	324	100	1594	100	707	92	247	100	88	99

* Does not include construction site erosion sediment.

Table 3-7. Anticipated Year 2020 Pollutant Loads in the City of Fond du Lac Portion of the Lake Winnebago East Watershed and Percent Increase over Existing Load

Land Use Type	Sediment Load **		Phosphorus Load		Zinc Load		Lead Load		Copper Load	
	tons/yr	Increase %	lbs/yr	Increase %	lbs/yr	Increase %	lbs/yr	Increase %	lbs/yr	Increase %
All Critical										
Land Uses *	681	91	3290	106	1648	133	566	129	218	147

* Excludes undeveloped areas, parks, cemeteries, and urban family housing with 6 units per acre or less

** Does not include construction site erosion sediment.

intensive urban land uses is not great. However, storm water runoff and snowmelt convey these pollutants to surface water at concentrations that can be acutely toxic. Medium density residential areas can also generate significant quantities of urban nonpoint source pollution, primarily because of their predominance an urban land use. Medium density residential areas are also significant sources of pesticides, bacteria, and household or automotive maintenance products dumped into the storm sewer system. Low density residential areas are important where the improper use and disposal of pesticides, fertilizers, and automotive maintenance products occur.

Runoff from new urban areas has the potential to further degrade stream water quality unless storm water management controls are incorporated during development. Table 3-7 illustrates the increase in nonpoint source loading that will occur in the watershed by the year 2020 if future urban nonpoint sources are not controlled.

Subwatershed Conditions

The following discusses the characteristics, water quality conditions and objectives, nonpoint sources and other pollution sources for the subwatersheds comprising the Lake Winnebago East Priority Watershed. This information is the basis for the strategy presented in Chapter 4, "Management Actions" for controlling nonpoint source pollution and achieving improved water quality in the watershed.

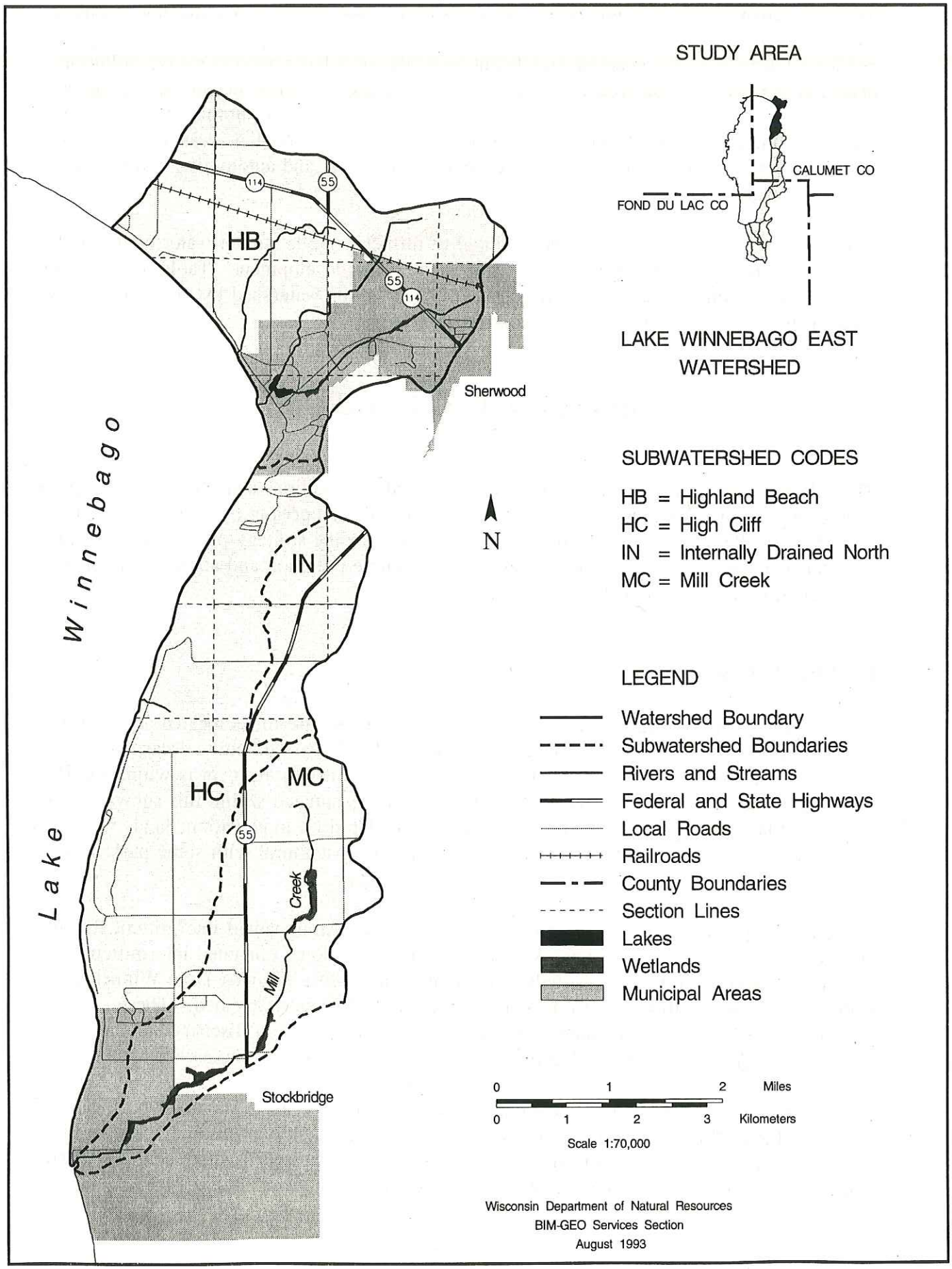
Highland Beach Subwatershed

This subwatershed includes an area of approximately four square miles located adjacent to Lake Winnebago at the north end of the watershed. The Niagara dolomite escarpment is situated at the southern end of this subwatershed. Most of the escarpment is within the High Cliff State Park. A portion of the Village of Sherwood is situated within this subwatershed. Developed lands occupy 12% of the area. After a sudden drop in elevation, lands west of the escarpment slope toward Lake Winnebago. It is mostly agricultural with some park land (see Map 7).

There are no perennial streams within this subwatershed. An unnamed intermittent stream (1.9 miles) flows directly into Lake Winnebago. Two additional unnamed intermittent streams discharge into two small shallow impoundments before entering Lake Winnebago. Habitat and water quality data are lacking for streams in this subwatershed. These impoundments may act as sediment traps and improve the quality of discharge to Lake Winnebago. A marina is located at the mouth of the stream nearest the escarpment.

Important sauger (sand pike) spawning areas are especially prevalent along the northern shores of Lake Winnebago. These areas are subject to sediment deposition and the resulting loss of spawning habitat. Botulism outbreaks have occurred in recent years near the marina and extending southward along the shore.

Map 7. Northern Subwatersheds of the Lake Winnebago East Priority Watershed.



Water Resource Objectives

- Improve the water quality of Lake Winnebago by reducing phosphorus levels. Reduce phosphorus delivery to the Highland Beach subwatershed streams by a high level (70%). This will reduce phosphorus loading to Lake Winnebago.

- Improve the aquatic habitat for fish in Lake Winnebago by reducing sedimentation. Reduce sediment delivery to the Highland Beach subwatershed by a high level (50%). This will reduce phosphorus loading into Lake Winnebago.

- Protect existing wetlands and wildlife habitat by reducing sedimentation.

Nonpoint Sources

Barnyard Runoff: Five barnyards are located within this subwatershed. An estimated 86 pounds or 4% of the phosphorus attributable to barnyard runoff drains to streams and drainage ways during a 3.5 inch rainfall event. One barnyard contributes over one-half of the phosphorus within this subwatershed.

Upland Erosion: Erosion from cropland and other rural lands contribute an estimated 292 tons of sediment annually to streams and drainage ways. This is among the lowest in the watershed. Only one other subwatershed has a lower sediment delivery. As discussed above, the amount of urban land use is relatively low (12%) yet contributes 27% of the sediment within this subwatershed.

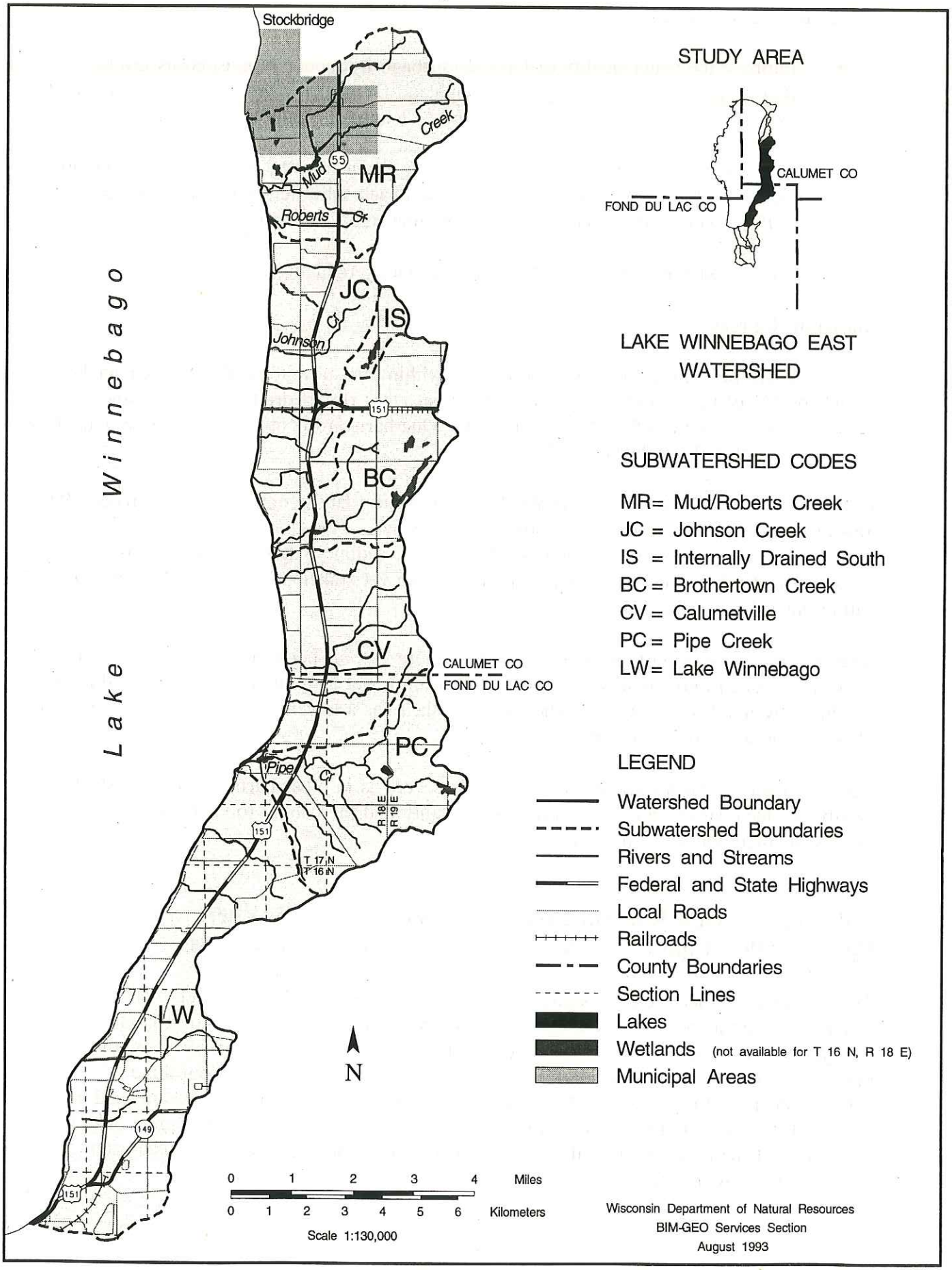
Streambank Erosion: Eighteen locations contribute 14 tons per year of sediment that is directly deposited into streams. Streambank erosion is not a significant source of sediment for this subwatershed. Only one other subwatershed has a lower rate of streambank erosion. There are no areas of cattle access.

Gully Erosion: This sediment source is not as severe as in other parts of the watershed, but locally can have significant impacts on water quality and the habitat for fish and wildlife species in small tributary streams.

Mill Creek - Mud/Roberts Creek - Johnson Creek - Brothertown Creek - Calumetville - Pipe Creek & Lake Winnebago Subwatersheds

These 7 subwatersheds, encompassing 45 square miles, occupy approximately one-half of the watersheds total area. Table 3-2 details the size of each subwatershed. Rural land use occupies approximately 92% of the area, mostly croplands. The Village of Stockbridge and 6 unincorporated areas are located along the escarpment base. Drainage from these subwatersheds is directly into Lake Winnebago via numerous intermittent streams and a small perennial stream with a total length of 91 miles. The perennial streams comprise only 17% (15 miles) of the total stream miles. Many of the intermittent streams have headwaters at contact springs within the Niagara escarpment.

Map 8. Central Subwatersheds of the Lake Winnebago East Priority Watershed.



Water quality information is limited to named streams only (Mill - Mud - Brothertown - Roberts - Johnson and Pipe Creeks). Except for Mill Creek, these streams are capable of supporting a warmwater forage fish community. Mill creek is classified as supporting a warmwater sport fish community. Following significant rainfall events, these streams are extremely turbid. Sediment-laden surface water flows down the steep west face of the escarpment and down to Lake Winnebago where sediment deposits create deltas at the mouth of most streams. These deltas limit fish movements into the streams and may hinder fish spawning. Very turbid water in the vicinity of the shoreline is a common occurrence after major runoff periods (see Map 7 and 8).

Areas of shallow soil are present along the escarpment. These pose a threat to groundwater from inappropriate agricultural practices. An internally drained area of approximately one square mile is located near Johnson Creek. A rather large wetland is located within the internally drained area.

Within the escarpment, particularly in the Lake Winnebago subwatershed, are found numerous active and inactive quarries. Exposed bedrock at these excavation sites increases the potential for groundwater contamination from surface runoff entering the site and from illegal dumping.

Various fruit orchards are found within the Johnson Creek and Lake Winnebago subwatersheds. These operations pose a threat to surface and groundwater resources through the improper storage, handling or application of pesticides.

Water Resources Objectives

- Improve the water quality of Lake Winnebago by reducing phosphorus levels. Reduce phosphorus delivery to the Mill Creek, Mud/Roberts Creek, Johnson Creek, Brothertown Creek, Calumetville, Pipe Creek & Lake Winnebago subwatershed streams by a high level (70%). This will reduce phosphorus loading to Lake Winnebago.

- Improve the aquatic habitat for fish in Lake Winnebago by reducing sedimentation. Reduce sediment delivery to the Mill Creek, Mud/Roberts Creek, Johnson Creek, Brothertown Creek, Calumetville, Pipe Creek & Lake Winnebago subwatersheds streams and to Lake Winnebago by a high level (50%).

- Protect sensitive groundwater areas from animal waste and other pollutants, where necessary.

- Protect existing wetlands and wildlife habitat by reducing sedimentation.

Nonpoint Sources

Barnyard Runoff: An estimated 1267 pounds of phosphorus (from a 3.8" rainfall) drain to the streams and tributaries within these subwatersheds. This accounts for 55% of all the barnyard phosphorus. One hundred and four barnyards are located within these

subwatersheds. The Mill Creek subwatershed accounts for only 2% of watershed's barnyard phosphorus. The Calumetville subwatershed contributes the second highest barnyard phosphorus load (13%). See Table 3-1 for each subwatershed's contribution.

Upland Erosion: Erosion from cropland and other rural land uses contribute an estimated 5,800 tons of sediment annually to streams and drainage ways. The Mud/Roberts Creek and the Lake Winnebago subwatersheds each deliver approximately 12% of the entire watershed upland sediment load. The highest of all subwatersheds. The Mill Creek and Brothertown Creek subwatersheds contribute 4% and 5% respectively, of the watershed sediment from upland sources, among the lowest in the watershed. Table 3-2 provides the details for each subwatershed.

Streambank Erosion: Approximately 31% of the perennial and intermittent streambanks within these subwatersheds are eroding, slumping or trampled by livestock (see Table 3-4). This accounts for 87% of the watershed streambank sediment. The Mud/Roberts Creek, Lake Winnebago and Pipe Creek subwatersheds together contribute 60% of the streambank sediment within the watershed. Streams within the Mill & Johnson Creek subwatersheds each contribute 5% of the watershed streambank sediment.

Gully Erosion: Seventy one percent of all gully erosion within the entire watershed occurs within these subwatersheds. Cumulatively, an estimated 2,461 tons of sediment are eroding annually from gullies within these subwatersheds, a significant water quality and aquatic habitat concern. Gullies within the Lake Winnebago subwatershed contribute nearly 17% of the watershed gully sediment and the Mill Creek subwatershed only 5%. Table 3-3 indicates approximately how much sediment is eroding from gully sources.

Other Pollution Sources

The Stockbridge Sanitary District Wastewater Treatment Plant discharges to Mud Creek. The facility has achieved excellent performance (*Upper Fox Water Quality Management Plan*, 1990). Water quality impacts from this discharge are unknown.

High Cliff Subwatershed

This subwatershed is the second smallest within the watershed. The approximate 4.5 square miles is however, quite unique within the watershed. The Niagara escarpment is especially pronounced, forming a natural cliff community along the waters edge of Lake Winnebago. The escarpment lands are almost entirely under state and county ownership. This subwatershed includes the greatest amount of forested lands (968 acres) within the watershed. Most of the wooded lands are park lands (see Map 7).

Only two short streams approximately one mile long discharge to Lake Winnebago. One is a perennial stream the other an intermittent stream. Water quality and fishery information is lacking. These streams flow through mostly wooded lands.

The threat of groundwater contamination is a major concern for this subwatershed. A Calumet County groundwater report (Hansen, 1983) and the Groundwater Contamination Susceptibility in Wisconsin Map (DNR, UWEX & WGNHS, 1987) have identified portions of this subwatershed as having natural characteristics which make these areas very susceptible to groundwater contamination. Specifically areas of thin soil (10-20 inches) over dolomitic bedrock (see Map 7).

An area of internally drained lands (no inlet or outlet for surface water drainage) of approximately one square mile lies along the subwatershed's eastern boundary. This area is one of two large internally drained areas within the watershed. This area may pose a threat to groundwater quality. Best management practices that protect groundwater should be a priority in this area.

Water Resources Objectives

- Improve the water quality of Lake Winnebago by reducing phosphorus levels. Reduce phosphorus delivery to the High Cliff subwatershed streams by a high level (70%). This will reduce phosphorus loading to Lake Winnebago.

- Improve the aquatic habitat for fish in Lake Winnebago, by reducing sedimentation. Reduce sediment delivery to the High Cliff subwatershed streams and Lake Winnebago by a high level (50%).

- Protect groundwater resources from animal waste and other pollutants where necessary.

- Protect existing wetlands and wildlife habitat by reducing sedimentation.

Nonpoint Sources

Barnyard Runoff: Five barnyards are located within this subwatershed which contribute an estimated 34 pounds of phosphorus during a 3.8 inch rainfall event. This is approximately 1% of the total phosphorus attributed to barnyard runoff within the entire watershed. One barnyard is found within the internally drained area which contributes 13 pounds of phosphorus.

Upland Erosion: Erosion from cropland and other rural land uses contribute an estimated 573 tons of sediment annually to streams and into Lake Winnebago. This sediment is approximately 5% of the total watershed sediment load within this watershed.

Streambank Erosion: No significant areas of streambank erosion were identified.

Gully Erosion: No significant areas of gully erosion were identified.

Upper Taycheedah Subwatershed

The Upper Taycheedah Subwatershed is a 10.5 square mile area located in the southeast part of the watershed. This is the largest subwatershed. The area is characterized by drumlin topography. The Niagara escarpment forms the western boundary. The predominant land uses are cropland and grassland which together account for 89%. Significant large areas of wetlands are located at many of the tributary headwaters.

Approximately 15 miles of stream are found throughout the subwatershed. Taycheedah Creek and one tributary are the only perennial streams, with a combined length of 6.1 miles. Most of Taycheedah Creek is classified as a warmwater sport fish community. Water quality evaluations revealed that Taycheedah Creek is in a degraded state. Following significant rainfall events the tributaries and streams are extremely turbid. Habitat evaluations classify Upper Taycheedah Creek as fair habitat. The tributary streams are lacking water quality or fishery information (see Map 9).

Water Resources Objectives

- Improve the water quality of Lake Winnebago by reducing phosphorus levels. Reduce phosphorus delivery to the Upper Taycheedah subwatershed streams by a high level (70%). This will reduce phosphorus loading to Lake Winnebago.

- Improve the aquatic habitat for fish in Lake Winnebago by reducing sedimentation. Reduce sediment delivery to Taycheedah Creek and its tributary streams by a high level (50%). This will reduce sedimentation to Lake Winnebago.

- Protect existing wetlands and wildlife habitat by reducing sedimentation.

Nonpoint Sources

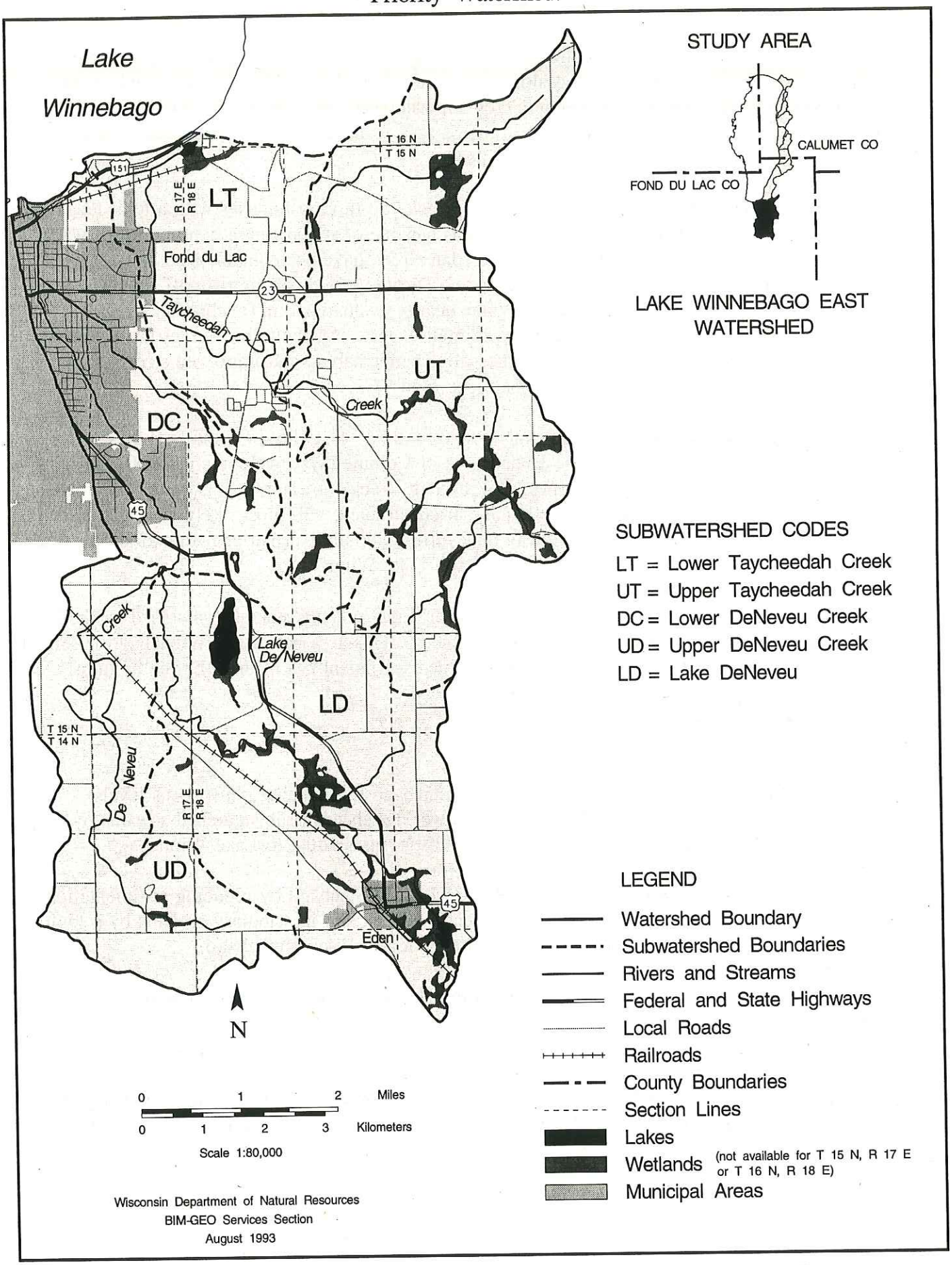
Barnyard Runoff: This area has the highest concentration of barnyards within the watershed (29). An estimated 407 pounds of phosphorus are drained from these barnyards to the streams and drainage ways during a 3.8" rainfall event. This represents 18% of the barnyard phosphorus, the largest amount within the watershed.

Upland Erosion: An estimated 1,045 tons of sediment are delivered annually to Upper Taycheedah Creek and its tributaries from cropland and other related rural lands. This accounts for approximately 10% of the total watershed sediment, the second largest.

Streambank Erosion: Streambank erosion is not a significant source of sediment in this subwatershed. Eight sites encompassing approximately 4% of the streambanks were eroding or slumping.

Gully Erosion: This sediment source is not a significant sediment problem in this subwatershed. The drumlin topography is not conducive to gully formation. This subwatershed contributes 4% of the gully sediment within the entire watershed.

Map 9. Southern Subwatersheds of the Lake Winnebago East Priority Watershed.



Lower Taycheedah Creek Subwatershed

The Lower Taycheedah Creek subwatershed is bordered to the north by Lake Winnebago. The Niagara escarpment is situated along the eastern boundary. This subwatershed receives drainage from the Upper Taycheedah Creek subwatershed, then discharges to Lake Winnebago near Roosevelt Park. The drainage area from the lower Taycheedah Creek subwatershed is approximately 6 square miles.

Perennial surface waters include Taycheedah Creek and three tributaries with a total length of 7.9 miles. Taycheedah Creek is categorized as capable of supporting a community of warm water sport fish. Lower portions of Taycheedah Creek have been channelized and a significant carp population inhabits the stream. During periods of high runoff, extensive flooding occurs near low lying areas. Water quality evaluations in Taycheedah Creek revealed very turbid conditions following rainfall events. Agricultural sources are suspected to be the major source. The upper reaches offer better habitat and improved stream flow relative to the lower portion of the stream (see Map 9).

This subwatershed includes a significant urbanized area. The City of Fond du Lac's Comprehensive Plan (Fond du Lac Department of Community Development, 1990) has identified a large portion of the Lower Taycheedah Creek subwatershed as an urban growth area. The proposed U.S. Hwy. 151 bypass, if constructed, will most likely be constructed across this subwatershed. This highway may further stimulate urban growth and an increase in pollutants delivered to Taycheedah Creek and Lake Winnebago.

The Lake Winnebago shoreline within the Lower Taycheedah Creek subwatershed is highly developed with year round and summer residences. This area near Lake Winnebago is served by sanitary sewer. Much of the land west of the escarpment has been identified as future sewer service areas.

Water Resources Objectives

- Improve the water quality of Lake Winnebago by reducing phosphorus levels. Reduce phosphorus delivery to the Lower Taycheedah subwatershed streams by a high level (70%). This will reduce phosphorus loading to Lake Winnebago.

- Improve the aquatic habitat for fish in Lake Winnebago by reducing sedimentation. Reduce sediment delivery to Taycheedah Creek and its tributary streams by a high level (50%). This will reduce sedimentation to Lake Winnebago.

- Protect existing wetlands and wildlife habitat by reducing sedimentation.

Nonpoint Sources

Barnyard Runoff: One barnyard is found within the headwaters area of this subwatershed. This barnyard contributes relatively little phosphorus and is not a major concern to water quality.

Upland Erosion: Cropland erosion and other rural sources contributes an estimated 518 tons of sediment annually to streams and to Lake Winnebago. Developed lands contribute 14% of the sediment within this subwatershed. Only two other subwatersheds have greater sediment loads from developed lands.

Stream Erosion: Less than 2% of the streambanks within this subwatershed contribute streambank erosion sediment. This sediment source is not a significant source when compared to other sediment sources within the subwatershed.

Gully Erosion: This sediment source contributes an estimated 225 tons annually. This sediment source warrants some concern when improving water quality and aquatic habitat.

Other Pollution Sources

An unnamed tributary to Taycheedah Creek receives treated wastewater from a small treatment plant which serves a private school and convent. Water quality impacts from this discharge are unknown. Two abandoned landfills are found within the subwatershed. Ground and surface water impacts, if any, are unknown.

Upper DeNeveu Creek

The Upper DeNeveu Creek subwatershed is located in the southwest portion of the watershed. This subwatershed drains to the lower DeNeveu subwatershed. Within this five square mile area is the Niagara escarpment that extends through the center of the subwatershed. Land use is mainly cropland and grassland, comprising 88% of the total area.

DeNeveu Creek is 6.2 miles long. One mile of headwater stream maintains intermittent flow the remainder has a perennial flow. The stream is classified as supporting a warmwater forage fish community. Water quality impacts are water turbidity and habitat damage or destruction from nonpoint source pollution and hydrologic modifications (Upper Fox River Water Quality Management Plan, DNR, 1990). See Map 9.

A mile long intermittent tributary stream which lacks water quality information, drains agricultural lands before entering DeNeveu Creek.

Water Resources Objectives

- Improve the water quality of Lake Winnebago by reducing phosphorus levels. Reduce phosphorus delivery to the Lower Taycheedah subwatershed streams by a high level 70%. This will reduce phosphorus loading to Lake Winnebago.

- Improve the aquatic habitat for fish in Lake Winnebago by reducing sedimentation. Reduce sediment delivery to Taycheedah Creek and its tributary streams by a high level (50%). This will reduce sedimentation to Lake Winnebago.

- Protect existing wetlands and wildlife habitat by reducing sedimentation.

Nonpoint Sources

Barnyard Runoff: Sixteen barnyards contribute an estimated 177 pounds of phosphorus during a 3.8 inch rainfall event. These sources contribute approximately 8% of the phosphorus attributed to barnyard runoff within the entire watershed.

Upland Erosion: Erosion from cropland and other rural land uses contribute an estimated 488 tons of sediment annually to streams and to Lake Winnebago. This sediment accounts for approximately 5% of total watershed sediment load.

Streambank Erosion: Streambank degradation occurs at six sites, affecting 7,500 feet of streambank, delivering an estimated 56 tons of sediment directly into surface waters annually.

Gully Erosion: This sediment source contributes approximately 304 tons annually. This accounts for approximately 36% of the sediment load originating within this subwatershed.

Lake DeNeveu Subwatershed

The Lake DeNeveu subwatershed extends north from Twin Lake near the Village of Eden to near Lake DeNeveu. DeNeveu Lake, a natural seepage lake, is the major water resource. An unnamed perennial stream begins as the outlet from Twin Lake and flows north to the confluence with DeNeveu Creek. Land use is primarily agriculture (see Map 9).

Many intermittent tributary streams originate in the escarpment, carrying sediment down the slope, to an unnamed stream flowing into Lake Winnebago. The fishery is likely forage fish.

DeNeveu Lake, a 79 acre eutrophic lake without public access, lacks recent water quality information. The mean depth is 25 feet with a maximum depth of 67 feet. Residential development is located along much of the shoreline. Past surveys revealed largemouth bass to be the primary game fish with bluegills and perch as the primary panfish.

Twin Lake is a small seepage lake with no public access. The mean depth is 11 feet. The lake consists of two distinct basins. Winterkill of fish occurs on occasion. Little else is known about the fishery.

Water Resources Objectives

- Improve the water quality of Lake Winnebago and Lake DeNeveu by reducing phosphorus levels. Reduce phosphorus delivery to the Lake Deneveu subwatershed streams by a high level (70%). This will reduce phosphorus loading to both lakes.

- Improve the aquatic habitat for fish in Lake Winnebago and Lake DeNeveu by reducing sedimentation. Reduce sediment delivery to tributary streams by a high level (50%). This will reduce sedimentation to both lakes.

- Protect existing wetlands and wildlife habitat by reducing sedimentation.

Nonpoint Sources

Barnyard Runoff: Within this subwatershed are 19 barnyards which contribute approximately 11% of the total watershed barnyard phosphorus. Only one barnyard is located upgradient of DeNeveu Lake.

Upland Erosion: Cropland and other rural lands contribute an estimated 733 tons of sediment per year to streams and Lake Winnebago. Developed lands contribute 17% of the upland sediment entering surface waters.

Streambank Erosion: Streambank degradation occurs at 123 sites, affecting 17,745 feet of streambank and delivers an estimated 249 tons of sediment annually directly into surface waters. This sediment load contributes about 23% of the sediment load originating in this subwatershed.

Gully Erosion: This subwatershed contributes an estimated 96 tons per year of sediment to surface waters, which is 9% of the subwatershed sediment load. This sediment is the second lowest from gullies within the entire watershed.

Other Pollution Sources

The Village of Eden Wastewater Treatment Plant discharges into a tributary of DeNeveu Creek. The facility is in substantial compliance with its discharge permit. The water quality impacts from this discharge are unknown.

An area of localized groundwater contamination is found just east of Lake DeNeveu in section 30. The source of contamination is believed to be from private sewage systems within a subdivision and/or animal waste spread near a bedrock outcrop.

Lower DeNeveu Creek

This subwatershed is the most developed within the watershed. Developed lands occupy 44% of the land use. Included are the lands within the City of Fond du Lac that discharge stormwater to DeNeveu Creek. The majority of the city's stormwater is pumped through stormwater sewer systems directly to DeNeveu Creek or to Lake Winnebago.

The City of Fond du Lac Comprehensive Plan (Fond du Lac Department of Community Development, 1990) has projected continued urban growth within the subwatershed. Existing land use within the City portion of the subwatershed is primarily medium density residential. The Comprehensive Plan indicates medium density residential to continue as the dominant land use as growth occurs (see Maps 5,6 and 9).

DeNeveu Creek, a perennial warmwater sport fish stream, is 4.8 miles long within this subwatershed. Fish from Lake Winnebago move into DeNeveu Creek for spawning. Fish habitat improves in the upper reaches of the stream. The stream is low gradient with much of it ditched in the lower reaches. During periods of high runoff, extensive flooding occurs near low-lying areas. Two perennial streams and two intermittent tributary streams drain to DeNeveu Creek before entering Lake Winnebago. Little water quality information is available for these tributaries.

All streams within the subwatershed become extremely turbid following moderate or significant rainfall events. This sediment originates from the Upper DeNeveu Creek, Lake DeNeveu and Lower DeNeveu Creek Subwatersheds. Agricultural sources of sediment contribute approximately 53% of the subwatershed sediment, the least of all subwatersheds.

Within the Lower DeNeveu Creek subwatershed, large areas of impervious surfaces cause an increase in runoff volume. These discharges cause flashy streamflow, increased streambank erosion, streambed scour and raise the flooding potential. This runoff causes a decrease in groundwater infiltration, and can seriously reduce the amount of groundwater needed to maintain an adequate baseflow in DeNeveu Creek.

Water Resources Objectives

- Improve the water quality of Lake Winnebago by reducing phosphorus levels. Reduce phosphorus delivery to the lower DeNeveu Creek subwatershed streams by a high level (70%). This will reduce phosphorus loading to Lake Winnebago.

- Improve the aquatic habitat for fish in Lake Winnebago by reducing sedimentation. Reduce sediment delivery to Taycheedah Creek and its tributary streams by a high level (50%). This will reduce sedimentation to Lake Winnebago.

- Protect existing wetlands and wildlife habitat by reducing sedimentation.

- Achieve State Water Quality Standards (NR 102 & 105) for acute toxicity at urban stormwater outfalls.

Nonpoint Sources

Barnyard Runoff: One barnyard is found in this subwatershed. Runoff from this barnyard contributes approximately 43 pounds of phosphorus to the streams and drainage ways during a 3.8 inch rainfall event. This source of barnyard phosphorus is a concern to water quality.

Upland Erosion: Upland sediment contributes 488 tons per year to the streams and drainageways in this subwatershed and to Lake Winnebago. This sediment constitutes 58% of the sediment within the subwatershed. The urban source of sediment attributes an estimated 44% of the subwatershed sediment load.

Streambank Erosion: Twenty sites affecting 1,715 feet of streambank deposit 108 tons of sediment per year into DeNeveu Creek, it's tributaries and Lake Winnebago. This constitutes 13% of the total sediment delivered within the subwatershed.

Gully Erosion: This source of sediment is not as severe as in most of the other subwatersheds. An estimated 128 tons of sediment per year are delivered into surface waters.

CHAPTER FOUR: Management Actions

Introduction

This chapter identifies the nonpoint source controls to be implemented under the Lake Winnebago East Priority Watershed Project. These controls are based primarily on water quality information, the results of the nonpoint source evaluations, and the identified levels of reduction for sediment and phosphorus needed to achieve the water quality objectives.

The first portion of this chapter establishes eligibility criteria and management categories for the rural nonpoint sources. The criteria and management categories determine which sources are eligible for financial and technical assistance under the priority watershed project. The second section identifies the need for and mechanisms to implement nonpoint urban nonpoint source controls.

An overall phosphorus control level of 40% was identified in Chapter 3 to improve water quality and aquatic habitat in Lake Winnebago. If this overall phosphorus objective is to be achieved, a high control level is necessary for barnyard and manure management sources. These high levels will compensate for the lower control of phosphorus from sediment sources.

Eligibility Criteria and Management Categories

Eligibility Criteria

Eligibility criteria determine which pollutant sources will receive funding under the Lake Winnebago East Priority Watershed Project. The criteria are typically expressed in terms of the severity of a pollutant source. For example in rural areas if more than four pounds of phosphorus is attributed to a particular barnyard site, then the owner may be eligible for cost-share assistance under the priority watershed. These criteria are based on watershed-wide pollutant load reductions needed to achieve downstream water quality objectives in Lake Winnebago.

Management Categories

Management categories identify the priorities for addressing nonpoint sources. Changes in management categories for pollution sources may be necessary as a result of a change in the operation of a farm, for example, or other circumstances having occurred since completion of the inventories.

Alternative funding sources for wetland and grassland restoration projects may be available regardless of the management category. The DNR's wildlife management program may provide cost sharing and technical assistance under certain conditions. This program is independent of the Priority Watershed Program.

Application of eligibility criteria necessary for changing management categories is described below.

Management Category I

Nonpoint sources in this category are eligible for funding and/or technical assistance under the priority watershed project. The sources in this category contribute a significant amount of the pollutants impacting surface and/or groundwater quality. A reduction in their pollutant load is essential for achieving the priority watershed project water quality objectives.

Control of all pollution sources in this category is required as part of any cost-share agreement. For example, if a landowner has several pollution sources on his/her property (barnyard, streambank erosion, cropland erosion) which are in this category, then all of these sources need to be controlled to meet the conditions of the agreement.

Management Category II

Nonpoint sources in this category are also eligible for funding and/or technical assistance under the priority watershed project. Sources in this category together contribute less of the pollutant load than those included in Management Category I. However their control may be essential to achieve water quality objectives because of the need to offset sources in Management Category I, which are not controlled under the voluntary approach used under the priority watershed project.

Inclusion of sources in this category on cost-share agreements is optional, although the success of the priority watershed project may depend on their control. An example would be a landowner whose cropland is in Management Category I but who also has other nonpoint sources in Management Category II. The cost-share agreement for control of the cropland erosion need not stipulate control of the other nonpoint sources. However, county project staff implementing the project should encourage control of all Management Category II sources.

Management Category III

Nonpoint sources in this category are not eligible for funding and/or technical assistance under the priority watershed project. Sources in this category do not contribute a significant amount of the pollutants impacting surface and/or groundwater quality. A reduction in their pollutant load is not essential for achieving the priority watershed project water quality objectives.

An example of a pollution source in this category would be cropland eroding at a very high rate which, because of its location, is not contributing a significant amount of sediment to a lake or stream.

Rural Nonpoint Source Management Actions

Rural nonpoint source eligibility criteria and management categories were developed for:

- sites where barnyard runoff drains to surface water and wetlands
- areas used for winter spreading manure which may impact water quality
- croplands and other rural land uses where eroded soil is washing into streams
- sites where streambank erosion affects water quality and/or aquatic and wildlife habitat
- sites where gully erosion is affecting water quality
- sites where lake shoreline erosion affects water quality or aquatic and wildlife habitat

Barnyard Runoff

Phosphorus reduction goals for the Lake Winnebago East Priority Watershed consistent with the objectives of the Lower Green Bay Remedial Action Plan and the Winnebago Comprehensive Plan were discussed in Chapter 3. Additionally, phosphorus reduction goals were established for each subwatershed consistent with the water quality objectives of the streams in those areas. Overall, a 70% reduction in phosphorus from barnyards draining to surface water is needed to achieve downstream water quality improvement. Eligibility criteria and the number of eligible barnyards are presented in Table 4-1.

A total of 124 barnyards will be eligible for funding under the priority watershed project. Subwatersheds with the greatest number of eligible barnyards are Upper Taycheedah Creek (23 sites) and Calumetville (18 sites). The Lower Taycheedah Creek subwatershed has no eligible barnyards (see Maps 10, 11 and 12).

No specific eligibility criteria were developed for barnyards draining to internally drained areas. Field investigations will be conducted jointly by the county project management staff, water resource management investigators from the DNR's Lake Michigan District Office, and staff from DATCP. DNR and county file data and/or a site visit will be used for the investigation. Information to be used includes, but is not limited to, the following: a mechanical analysis of the soil, site-specific determination of depth to bedrock or groundwater; herd size, barnyard management, location of the barnyard with respect to groundwater recharge areas, and groundwater quality information.

The DNR, DATCP, and the county project management will make a joint determination of a management category for each barnyard. Lesser cost alternatives to reduce the groundwater contamination potential will be eligible for cost share under the priority watershed project. However, if site conditions require use of high cost practices to solve the problem, further site-specific investigations including groundwater monitoring will be conducted before making a final determination of cost-share eligibility.

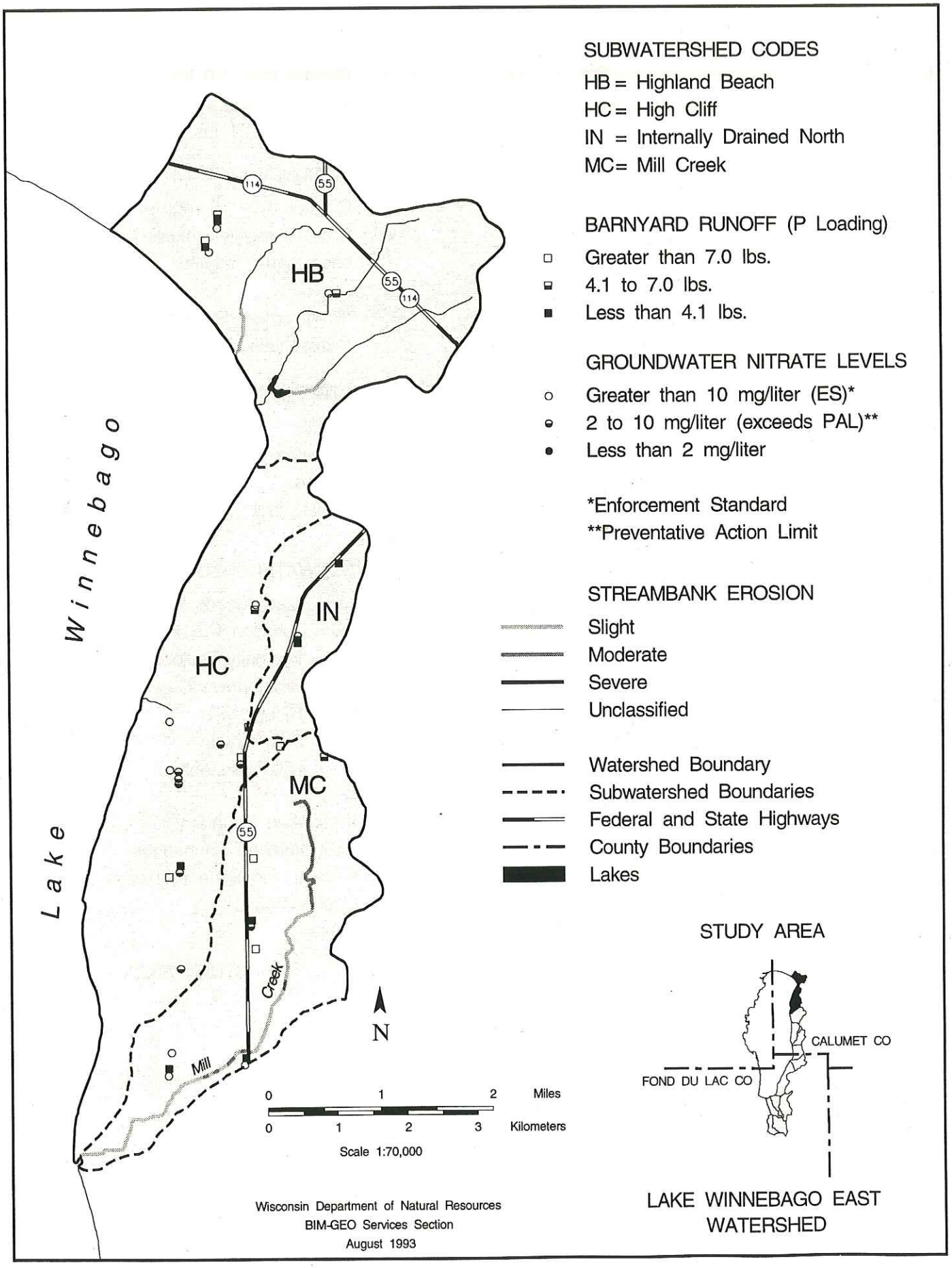
High priority animal lots located in floodplain areas pose a particular problem for control. For some of these lots, application of traditional barnyard runoff control systems may not be possible, either because of floodplain or shoreland zoning restrictions or because the practice will not operate as intended under high water conditions. Animal lot relocation is a best management practice that can address these concerns and reduce pollutant loads from these animal lots.

A nutrient management plan (SCS Standard 590 including Appendix B) will be developed for those landowners who have adequate existing storage and receive cost sharing for barnyard runoff management, or whose lands include internally drained areas and receive barnyard runoff management cost sharing. The nutrient management plan will be documented in the farm conservation plan.. See the Nutrient and Pesticide Management section elsewhere in this chapter.

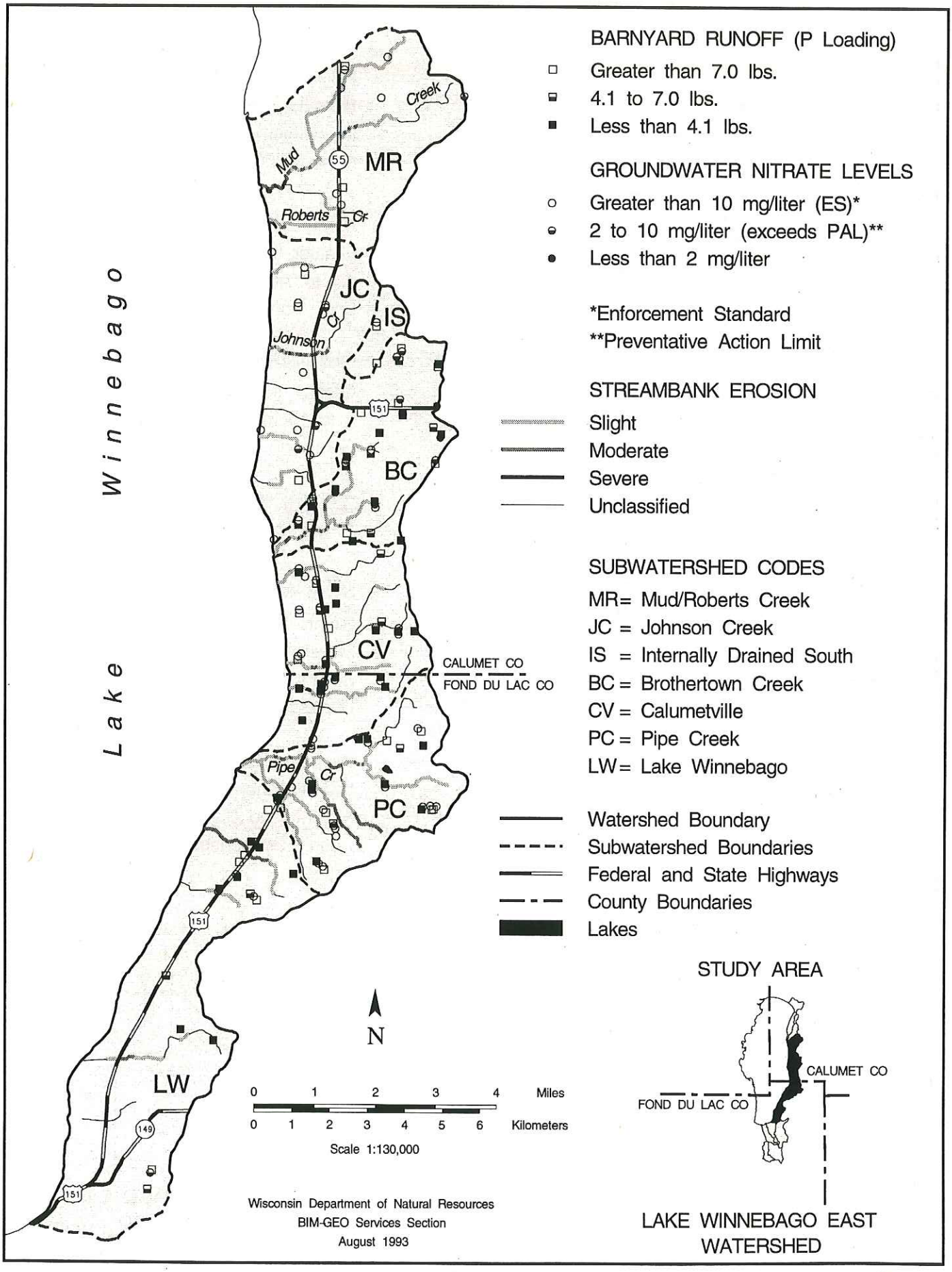
Runoff From Areas Winter Spread With Livestock Manure

A reduction in the quantity of phosphorus originating from areas used for winter spreading manure which may impact water quality is needed to achieve watershed-wide water quality objectives. Achievement of phosphorus reduction goals for the priority watershed project depends on reducing phosphorus by an amount roughly equivalent to the amount attributed to barnyard runoff (70%).

Map 10. Stream Bank Erosion and Well and Barnyard Locations in the Northern Subwatersheds.



Map 11. Stream Bank Erosion and Well and Barnyard Locations in the Central Subwatersheds.



Map 12. Stream Bank Erosion and Well and Barnyard Locations in the Southern Subwatersheds.

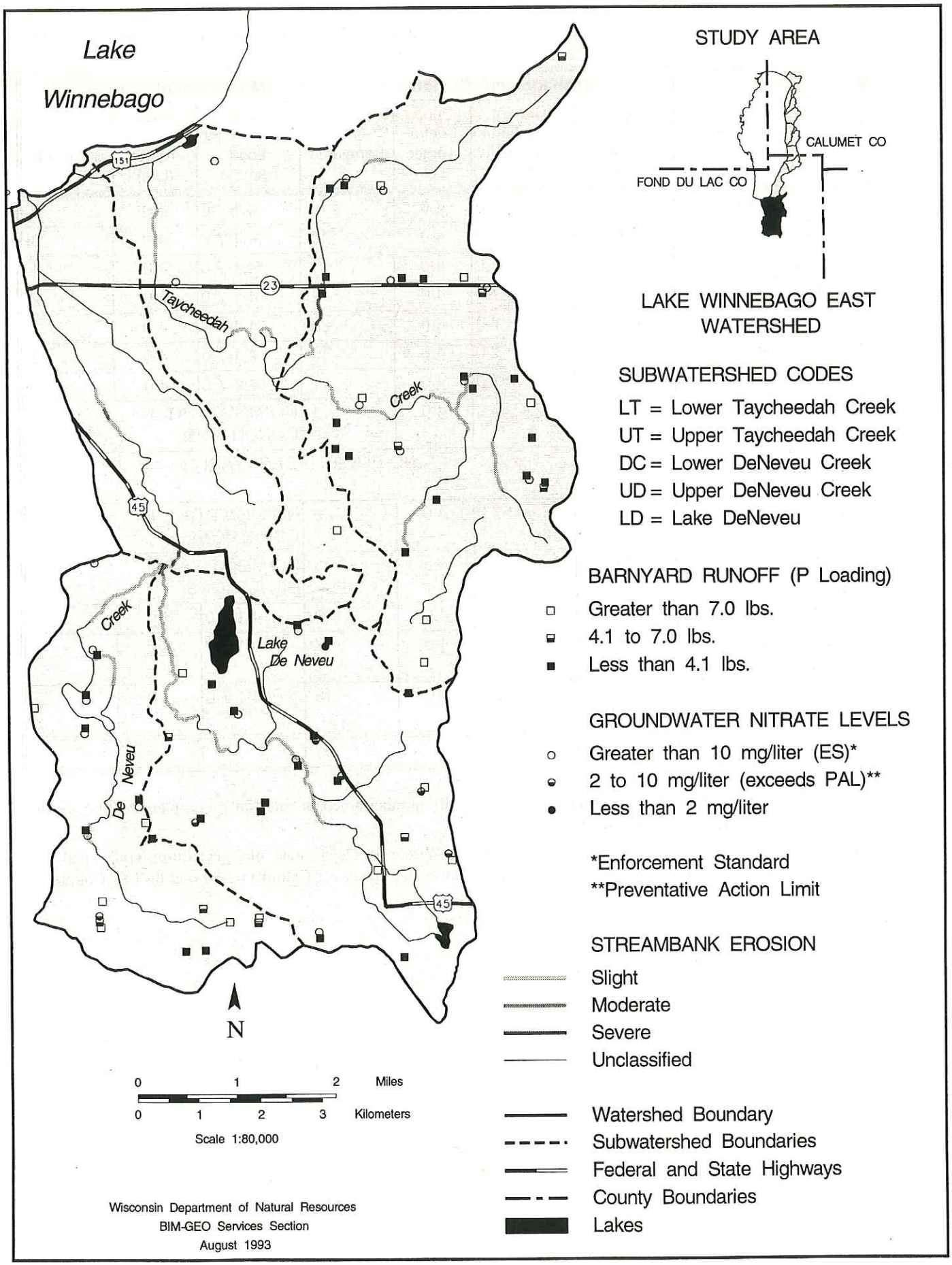


Table 4-1. Eligibility Criteria and Management Categories for Barnyards Affecting Surface Waters*

	Management Category I				Management Category II		
SUBWATERSHED	Phosphorus Control Goal (%)	Current Phosphorus Load (Lbs)	Phos. Control Target (Lbs)	# of Barnyards	Current Phosphorus Load (Lbs)	Phos. Control Target (Lbs)	# of Barnyards
Brothertown Creek	79	>7.0	4.0	10	4.1-7.0	4.0	6
Calumetville	86	>7.0	4.0	15	4.1-7.0	4.0	3
High Cliff	83	>7.0	4.0	1	4.1-7.0	4.0	1
Highland Beach	85	>7.0	4.0	2	4.1-7.0	4.0	2
Johnson Creek	81	>7.0	4.0	5	4.1-7.0	4.0	2
Lake DeNeveu	85	>7.0	4.0	13	4.1-7.0	4.0	2
Lake Winnebago	77	>7.0	4.0	7	4.1-7.0	4.0	2
Lower DeNeveu Creek	90	>7.0	4.0	1	NO MGMT CAT. II CONDITIONS		
Lower Taycheedah Creek	0	<----NO ELIGIBLE BARNYARDS---->					
Mill Creek	73	>7.0	4.0	3	NO MGMT CAT. II CONDITIONS		
Mud/Roberts Creek	84	>7.0	4.0	5	NO MGMT CAT. II CONDITIONS		
Pipe Creek	85	>7.0	4.0	9	4.1-7.0	4.0	2
Upper DeNeveu Creek	81	>7.0	4.0	7	4.1-7.0	4.0	3
Upper Taycheedah Creek	83	>7.0	4.0	18	4.1-7.0	4.0	5
Totals				96			28

* Eligibility for internally drained barnyards will be determined on site, during implementation by the County LCD, DATCP, and DNR.

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and Land Conservation Departments of: Calumet and Fond du Lac Counties

Manure runoff from areas such as steeply sloped frozen ground, flood prone areas and high sediment yield cropland have a high potential to contribute phosphorus and other pollutants to surface water. In order to approximate a manure runoff potential within the watershed for the purpose of establishing planning goals and to develop a list of landowner contacts, the following two criteria were developed:

1. the estimated acres needed to spread manure at 25 tons per acre

2. the percentage of land on a landowner basis which exceeds the sediment reduction goal for those particular lands

Applying these criteria to livestock operations to establish a priority list to contact landowners is shown in Table 4-2. Those landowners who are a high priority (66 landowners) are contacted first, followed by individuals who are a medium priority (16 landowners).

During implementation, individual landowner eligibility will be determined. This evaluation will utilize an interim procedure until a Manure Storage Rating Guide is developed and approved for use in this watershed. The following procedures and eligibility criteria for manure storage will be used until then:

1. Landowner contacts will be based on the criteria identified in Table 4-2.

2. If a landowner is willing to control nonpoint sources and sign a cost-share agreement for manure storage, a nutrient management assessment will be completed. The assessment will be consistent with SCS Field Office Technical Guide Standard 590, including Appendix B and a more restrictive 6% slope specification.

   The nutrient management assessment will include land owned by the cost-share recipient within reasonable distances of the farmstead (e.g. one mile) and considers crop rotations.

3. Based on the nutrient management assessment, the following eligibility criteria will be used initially:

   Category I: must spread on 23 or more "high pollution hazard acres"

   Category II: must spread on 17 to 22 "high pollution hazard acres"

   Category III must spread on 16 or less "high pollution hazard acres"

High pollution hazard acres are agricultural fields which, because of slope, flow type and surface conditions, are conducive to surface runoff from winter spread manure.

Annually, or as needed during the cost-share sign-up phase, eligibility categories will be reassessed for possible adjustments in order to meet water quality goals.

Table 4-2. Landowner Contact Criteria for Winter Spread Manure

Acres Needed For Manure Spreading[1]	Management Category	Estimated # of Operations[2]	Acres Over Sediment Reduction Goal[3]
23 or more acres needed	I	66	6,930
17-22 acres needed	II	16	1,536
0-16 acres needed	III	63	2,263
TOTALS		145	10,729

1. These acreages apply to individual landowners.
2. Individual landowners must have at least 30% of their acreage over the sediment reduction goal AND meet the acres needed criteria.
3. These are acres for livestock operations only.

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade and Consumer Protection; and Land Conservation Departments of Calumet and Fond du Lac Counties.

No specific criteria were developed for manure management needs within internally drained areas. During implementation, manure management practices and the potential for groundwater contamination will be assessed within internally drained areas. The manure management assessment will include, but is not limited to the following: herd size and manure production, type of manure storage, soil testing, surface water drainage, crop rotations, and existing nutrient management including commercial fertilizer, manure and other nutrient inputs. The groundwater assessment will include, but is not limited to the following: existing groundwater quality data, well boring logs, local hydrological conditions such as soil permeability and depth, groundwater elevation and bedrock type and elevation.

The DNR, DATCP, and the county involved will make a joint determination of a management category for each livestock operation. Lesser cost alternatives to reduce the groundwater contamination potential will be eligible for cost share under the priority watershed project. However, if site conditions require use of high cost practices to solve the problem, further site-specific investigations including groundwater monitoring may be conducted prior to making a final determination of cost-share eligibility.

A complete Nutrient Management Plan (SCS Standard 590) including Appendix B, and a 6% or greater slope spreading restriction will be developed for each participating landowner that receives cost sharing for manure storage. The nutrient management plan will be documented in the farm conservation plan. See the Nutrient and Pesticide Management section following this section.

Nutrient and Pesticide Management

Improperly managed crop nutrients are often a source of either groundwater or surface water degradation. These nutrients, if managed properly, can provide water quality and economic benefits.

As mentioned previously, landowners eligible for either manure storage or barnyard management systems (and have adequate existing storage) will have nutrient management plans prepared as part of the overall farm conservation plan.

A total of 82 landowners have been identified as being potentially eligible for manure storage and an additional group of landowners have existing storage and are eligible for barnyard management systems. Both groups of landowners will have nutrient management plans developed as a component of their manure storage or barnyard management systems.

Nutrient management plans are developed to address the application of plant nutrients associated with organic wastes (manure and other organic by products), commercial fertilizer, legume crops and crop residues. The nutrient plan will be updated annually and is designed to limit nitrogen and phosphorus applications to individual crop needs based on realistic yield goals. Additionally, manure field spreading criteria are included for groundwater and surface water protection.

Landowners not eligible for barnyard and manure storage practices are encouraged to include a nutrient management plan as part of their overall farming operation. Farm operations located in areas of shallow bedrock, high groundwater or internally drained areas should especially consider adopting a nutrient management plan.

Chapter 3 identified improper storage, handling or application of pesticides at fruit orchards as a potential significant source of surface and groundwater contamination. Pesticide management planning can effectively reduce the risks to both surface and groundwater resources. A comprehensive pesticide management plan is developed to address all of the on farm pesticide management concerns including: methods of storage, handling, mixing, application, calibration and maintenance of equipment, well protection, container disposal and emergency response.

Eligibility for spill control basins for the mixing and loading of pesticides and/or integrated pest management scouting, as part of a pesticide management plan, will be assessed on an individual basis, using site specific information and appropriate criteria. However, only those fruit orchards exempt from pesticide storage and spill control regulations required by Ag. 162 and 163 or other administrative rules will be assessed by county LCD staff for cost-share eligibility. Both spill control basins and pest scouting will be management Category II activities. The DNR must approve in writing all pesticide management practices prior to completing a cost-share agreement.

Design standards for spill control basins will be consistent with the DATCP technical bulletin *Nutrient and Pesticide Best Management Practices for Wisconsin Farms*, May 1989 edition or other appropriate standards.

Cropland Areas Delivering Sediment to Surface Water

Eligibility criteria were established for the 93 square miles of eroding upland areas delivering sediment to surface waters. These criteria, the number of parcels and associated acreage eligible for funding under the priority watershed project, and the total amount of sediment anticipated to be controlled are shown in Tables 4-3 and 4-4.

An estimated 7,019 acres, are eligible for funding and essential for control (Management Category I). Although the acres in Management Category I are the most likely to be controlled installing erosion control or sediment reduction practices, approximately 19,379 additional acres are eligible for control are included in Management Category II. Management Category II fields are above the sediment reduction goals outlined in Table 4-3. Maximum participation in this category is likely to be 50%. Installation of management practices will reduce the amount of sediment delivered to surface water by varying amounts in each subwatershed. A realistic control level for cropland sediment is 33% if all of the Category I fields and half of the Category II fields participate.

The design target for fields in Category I and II is 2 tons/acre/year. Participating landowners must control erosion on eligible fields to the design target or lower.

Subwatersheds with the greatest number of eligible acres in Management Category I are Upper Taycheedah Creek (1,406 acres) and Mud/Roberts Creek (1,186 acres). Together these subwatersheds contain about 10% of the eligible acres in both Category I and II. The Upper Taycheedah Creek (301 tons) and Mud/Roberts Creek (429 tons) subwatersheds are nearly 37% of the delivered sediment to be controlled under Management Category I.

The restoration of prior converted wetlands has been identified as an eligible best management practice under the NPS program for the control of critical sediment sources under certain circumstances. See the discussion of easements elsewhere in this chapter.

Wetland and grassland restorations may also be established through assistance from the Departments Wildlife Management Programs. These projects offer sedimentation control and wildlife habitat improvements.

Streambank Sites Delivering Sediment to Surface Water

Reduction goals for streambank erosion were established based on the approximately 160 miles of streams included in the subwatersheds identified as having the most severe erosion from streambanks. Eligibility criteria and management categories can be found in Table 4-5.

Table 4-3. Eligibility Criteria and Management Categories

		Criteria		
Subwatershed	**Management Category**	**Sediment Delivery (tn/ac/yr)**	**soil loss (tn/ac/yr)**	**USLE Design Target (tn/ac/yr)**
Brothertown Creek	I	over 0.13 &	over 3	2.0
	II	over 0.13 &	under 3	
Calumetville	I	over 0.12 &	over 3	2.0
	II	over 0.12 &	under 3	
High Cliff	I	over 0.15 &	over 3	2.0
	II	over 0.15 &	under 3	
Highland Beach	I	over 0.03 &	over 3	2.0
	II	over 0.03 &	under 3	
Johnson Creek	I	over 0.16 &	over 3	2.0
	II	over 0.16 &	under 3	
Lake DeNeveu	I	over 0.06 &	over 3	2.0
	II	over 0.06 &	under 3	
Lake Winnebago	I	over 0.07 &	over 3	2.0
	II	over 0.07 &	under 3	
Lower DeNeveu Creek	I	over 0.10 &	over 3	2.0
	II	over 0.10 &	under 3	
Lower Taycheedah Creek	I	over 0.09 &	over 3	2.0
	II	over 0.09 &	under 3	
Mill Creek	I	over 0.15 &	over 3	2.0
	II	over 0.15 &	under 3	
Mud/Roberts Creek	I	over 0.18 &	over 3	2.0
	II	over 0.18 &	under 3	
Pipe Creek	I	over 0.11 &	over 3	2.0
	II	over 0.11 &	under 3	
Upper DeNeveu Creek	I	over 0.07 &	over 3	2.0
	II	over 0.07 &	under 3	
Upper Taycheedah Creek	I	over 0.10 &	over 3	2.0
	II	over 0.10 &	under 3	

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and Land Conservation Departments of Fond du Lac, and Calumet Counties.

Table 4-4. Rural Uplands Targeted for Sediment Control

Subwatershed	Total Load (tons/yr)	Management Category I			Management Category II			Estimated** Control
		Acres	Control (tons/yr)	Control (%)	Acres*	Control (tons/yr)	Control (%)	
Brothertown Creek	514	304	116	23	705	109	21	33
Calumetville	836	411	100	12	1,842	276	33	28
High Cliff	573	558	259	45	213	21	4	47
Highland Beach	451	106	50	11	1,793	157	35	28
Johnson Creek	806	479	234	29	986	135	17	37
Lake DeNeveu	732	595	136	19	2,261	210	29	33
Lake Winnebago	1,192	708	248	21	3,077	287	24	33
Lower DeNeveu Creek	488	299	51	10	404	208	43	32
Lower Taycheedah Creek	603	182	53	9	367	118	20	19
Mill Creek	410	359	139	34	340	34	8	38
Mud/Roberts Creek	1,264	1,186	429	34	868	128	10	39
Pipe Creek	846	289	70	8	2,409	354	42	29
Upper DeNeveu Creek	489	137	33	7	2,106	194	40	27
Upper Taycheedah Creek	1,045	1,406	301	29	2,008	185	18	38
Totals	10,249	7,019	2,219	22%	19,379	2,416	24%	33%

It is unlikely that "Category II" parcels will have a high participation rate. Thus a more realistic control level for sediment is shown in the Control % column under "Category I" fields.

* The acres to be managed in this category do not include acres already listed in Category I that will be reduced to the sediment reduction goal.

** The estimated control is assumed to be one half of the Category II fields and all of Category I fields.

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and Land Conservation Departments of Fond du Lac and Calumet Counties.

Table 4-5. Eligibility Criteria and Management Categories for Streambank Erosion and Habitat Degradation

Subwatershed[1]	Percent Control Goal	Category I Sediment Loss (tons/yr)	Control Goal (tons/yr)	Banks With Cattle Access[2] (ft)	Category II Sediment Loss[3] (tons/yr)
Brothertown Creek	50	404.0	202.0	26,947	38
Calumetville	50	260.0	130.0	10,450	0
Johnson Creek	50	124.0	62.0	2,600	38
Lake DeNeveu	50	132.0	66.0	6,400	110
Lake Winnebago	50	589.0	294.5	4,000	0
Lower DeNeveu Creek	50	82.0	41.0	0	26
Mill Creek	50	97.0	48.5	4,800	35
Mud/Roberts Creek	50	572.0	286.0	4,655	140
Pipe Creek	50	405.0	202.5	3,100	142
Upper DeNeveu Creek	50	51.0	38.3	7,300	0
Totals		2716.0	1370.8	70,252	529

1. Does not include subwatersheds inventoried with no streambank erosion
2. Each participating landowner must restrict livestock access to all streams in the watershed where there is evidence of streambed damage or streambank erosion from livestock (young stock excluded).
3. All sites without livestock access with an estimated greater than 10 tons of erosion or more are eligible for funding (Management Category II).

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and Land Conservation Departments of Calumet and Fond du Lac Counties.

Each landowner with streambank erosion over 80 tons of sediment per year must control 50% of the erosion from their streambank sites (Management Category I). These sites produce 1,791 tons of sediment. Landowners with streambank erosion who pasture livestock (young stock excluded) at a stream and contribute greater than 10 tons of sediment per year must also control 50% of the erosion from their eroding streambank sites (Management Category I). These sites contribute 843 tons of sediment (see Maps 10, 11 and 12).

Landowners with streambank erosion sites having greater than 10 tons of sediment and no cattle access are eligible for control in Management Category II. These Category II sites produce 529 tons of sediment annually. Because they lack cattle access, these sites are typically more difficult and costly to control.

The use of wetland easements to eliminate livestock grazing within wetlands riparian to lakes, streams or tributaries are an eligible best management practice for the control of organic and sediment loading to the wetland and adjacent water resource. Easements will also benefit wildlife with improved habitat.

Gully Erosion Sites Delivering Sediment to Surface Water

Gully erosion management categories were estimated from the Category I and II eligible eroding cropland management categories. The control of gully erosion will be based on the criteria stated in Table 4-6.

The Lake Winnebago subwatershed accounts for approximately 17% of all gully erosion (578 tons) but little gully erosion (82 tons) is estimated to occur within Management Category I eroding croplands. The Mud/Roberts subwatershed accounts for 24% of all the Category I gully erosion (137 tons).

It is anticipated that Category II gullies will have a high participation rate. A 50% participation rate is a realistic achievable maximum for Category II gullies. Funding for Category II gullies is limited to low cost practices like shaping and seeding grass waterways.

Lake Shoreline Erosion

The eligibility criteria for eroding shorelines is determined on an individual site or landowner basis. This will be accomplished during project implementation as needed. Sites eroding more than 10 tons of sediment per year are eligible for lake shoreline stabilization practices. However, only moderate or severe lateral recession rates will be considered for determining eligibility. Shoreline stabilization is limited to the least costly practice provided the practice is consistent with the use and management of the land in question.

Use of 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:

- critical area stabilization
- shoreline buffers
- wetland restoration

Table 4-6. Eligibility Criteria and Management Categories for Gully Erosion

Subwatershed	Total Soil Loss (tons/yr)	Category I[1] (tons/yr)	Category II[2] (tons/yr)
Brothertown Creek	289	35	81
Calumetville	331	48	212
High Cliff	0	0	0
Highland Beach	109	6	93
Johnson Creek	293	56	114
Lake DeNeveu	96	16	60
Lake Winnebago	578	82	352
Lower DeNeveu Creek	128	35	47
Lower Taycheedah Creek	225	21	43
Mill Creek	181	42	40
Mud/Roberts Creek	402	137	100
Pipe Creek	387	34	277
Upper DeNeveu Creek	304	16	243
Upper Taycheedah Creek	138	38	54
Totals	3,461	566	1,716

1. All gully erosion sites located within cropland erosion management Category I fields are management Category I gullies.
2. Gullies located within cropland erosion management Category II fields are management Category II gullies. Category II gullies are eligible for low cost measures only, such as shaping and seeding, and grass waterways.

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and Land Conservation Departments of Calumet and Fond du Lac Counties.

Although easements are not considered a Best Management Practice, easements can help achieve desired levels of nonpoint source pollution control in specified conditions. Easements are used to support BMP's, enhance landowner cooperation, and to more accurately compensate landowners for loss or altered usage of property. The primary justification of an easement, however, must be for water quality improvement.

The benefits of using easements in conjunction with a management practice are:

- A riparian easement can provide fish and wildlife habitat along with the pollutant reduction function.
- Easements are generally perpetual, so the protection is longer term than a management practice by itself.

- An easement may allow for limited public access (depending on the situation).

Situations encountered when determining the use of easements are:

- Critical lands throughout the watershed where permanent vegetative cover provides a cost effective means of controlling a nonpoint source. There may be situations where taking a cropland out of production and providing an easement with permanent vegetative cover is less costly than constructing terraces, an agricultural sediment basin, or other high cost control measures.

- Shoreline buffers throughout the watershed where permanent vegetative cover provides cost effective pollution control when compared to other control measures. For example, if shoreline easement costs are similar or lower than practices such as reduced tillage, crop rotation changes, contour strips etc.

- Wetland restoration to control either livestock grazing within wetlands riparian to lakes, streams or tributaries, restorations of prior converted wetlands down slope or up slope from fields identified as critical upland sediment sources through the WIN Model and cultivated organic soils with field drainage to a water course. Secondary benefits may include enhancement of fish and wildlife habitat.

Wetland restoration within the nonpoint source program includes the plugging or breaking up of existing tile drainage systems, the plugging of open channel drainage systems, other methods of restoring the predevelopment water levels of an altered wetland, and the fencing of wetlands to exclude livestock access.

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

- cultivated organic 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. Establishing permanent vegetation and disabling the drainage system will control this pollutant source.

- 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.

- Prior converted wetlands down slope or up slope from fields identified as critical upland sediment sources through the WIN model.

Restoration of wetlands in these situations will do one of two things:

1. create a wetland filter which reduces the pollutants from an up slope field(s) to a water resource; or

2. reduce the volume and/or velocity of water flowing from an up slope wetland to a down slope critical field. Two eligibility conditions must be met to use wetland restoration in this situation:

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

    2. Wetland restoration costs must be the least-cost practice to reach sediment reduction goals listed in Table 4-3 for the appropriate subwatershed. However, wetland restorations that are not the least cost practice may be approved, in writing, by the DNR if the practice is cost effective in providing greater control of pollutants or providing fish and wildlife habitat.

Note: In addition, the criteria described above, landowners must control all "Management Category I" sources (through a cost-share agreement) to be eligible for an easement through the Lake Winnebago East Watershed Project.

Administration of Easements

Easements shall be for a period of no less than 20 years, although perpetual easements are preferred. The easement will be developed as an agreement separate from the cost sharing agreement for the best management practice.

Easements may be contracts between the land owner and the Department of Natural Resources, or between the land owner and the local unit of government. The local unit of government will retain responsibility for identifying how the easement will be used in controlling targeted pollution sources. Final approval of the easement rests with the DNR's Bureau of Water Resources Management.

To initiate the process, the local unit of government shall forward the easement proposal to the DNR District Nonpoint Source Coordinator. The Nonpoint Source Coordinator will be responsible for obtaining review comments from local DNR staff including those from Wildlife Management, Fish Management, and Water Regulation and Zoning. The Nonpoint Source Coordinator will then forward the proposal to DNR bureau offices for Water Resources Management, Property Management, and other disciplines as appropriate.

The number of sites or acers where easments are needed is unknown. For budgetary purposes it is estimated that 170 acres of easements will be obtained.

Animal Waste Storage Ordinance

Improperly stored manure can be a significant source of surface or groundwater contamination. Poorly sited and/or designed earthen storage facilities often contaminate groundwater near these facilities. Elevated nitrate-nitrogen is particularly common in groundwater near leaking earthen storage facilities.

The Fond du Lac County Groundwater Resource Assessment and Management Recommendation Report (Seegers, 1989) identified five land use practices regarded as the greatest threat to the Fond du Lac County groundwater resource. Animal waste handling and storage was one such land use practice. The other four land use practices: landfills, underground storage tanks, on-site waste disposal systems (septic systems), and septage disposal are all currently regulated by state and/or local regulations. In Fond du Lac County, few regulations exist to protect water resources from the threat of contamination due to animal waste storage and handling.

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

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

The need for animal waste regulation in Fond du Lac County is evident. Thirty one Wisconsin counties have already adopted ordinances to manage animal waste. Calumet County has in place an animal waste storage ordinance to protect surface and groundwater resources. To help attain surface water quality objectives and to protect the groundwater resource, the animal waste storage ordinance in Fond du Lac County is necessary within one year of completion of the Lake Winnebago East Project. Certain costs to develop and administrate the ordinance are eligible for reimbursement under the Priority Watershed Project. As required by State Statute, should Fond du Lac County fail to adopt an animal waste storage ordinance, the county must repay the State for all Lake Winnebago East Nonpoint Source Grant Agreement funding. This will be a condition of the Fond du Lac County Nonpoint Source Grant Agreement.

Urban Nonpoint Source Managment Actions

Urban pollutant loadings were calculated for The City of Fond du Lac portion of the Lake Winnebago East Priority Watershed. These results are broken down into 11 stormwater sub-basins. Within this chapter, quantitative results are given for the pollutants of suspended solids, lead, copper, zinc, and phosphorus. Qualitatively, descriptions are given for PCBs, pesticides, and PAHs.

This chapter also includes reduction goals for the quantitative pollutants, along with management alternatives and cost estimates needed to meet these goals.

Urban Nonpoint Source Pollutants

While there are many different types of pollutants in urban stormwater, certain pollutants cause more concern then others. In studies conducted in Madison and Milwaukee in 1990, a number of inorganic and organic pollutants were considered critical to water resources. Critical pollutant is defined as exceeding an acute toxicity level and an occurrence level of at least 10%. The results of these studies were used to predict quantities of pollutants from the streets of Fond du Lac.

Acute toxicity levels of the pollutants can be found in the Wisconsin Administrative Codes NR 102, 105, and 210. Suspended solids, lead, copper, zinc, and phosphorus were estimated for the 11 different sub-basins within the city. Listed below is a short description and possible sources of these estimated pollutants:

- **Lead** is a common pollutant found in most samples of urban runoff. Lead exceeded an acute toxicity at least once for all sites sampled, with Event Mean Concentrations (EMC) ranging from 3-570 ug/l, with an average EMC of 22.3 ug/l. The acute toxicity level for lead 60.9 ug/l at a water hardness of 24 mg/l. Probable sources include automobiles and industrial areas.

- **Copper** was found to be toxic in at least 45% of all samples taken. The EMCs range from 3-210 ug/l, with an average EMC of 22.3 ug/l. The acute toxicity level of Copper is 9.3 ug/l with a water hardness of 24. Sources of Copper include automobiles and industrial areas.

- **Zinc** was found to be toxic in at least 45% of all samples taken. The EMCs ranged from 50 - 1500 ug/l, with an average EMC of 179 ug/l. The acute toxicity level of Zinc is 66 ug/l with a water hardness of 24 mg/l. Probable sources of zinc include automobiles, industry, and rooftop downspouts.

- **Suspended Solids** are always found in urban runoff. Suspended Solids exceeded at least 52% of all samples taken. The WPDES permit limit is 45 mg/l. The range of EMCs was from 2 - 1660 mg/l, with an average EMC of 123 mg/l. While many

sources contribute suspended solids, the majority comes from construction site erosion.

- **Phosphorus** was found to exceed the permit level a maximum of 11% of the time. The permit level is 1 ppm for the Great Lakes. The EMCs ranged from .09 - 1.7 mg/l. The average EMC was .3 mg/l. Phosphorus comes from many different sources, but major concerns are fertilizer use, and leaves left in the street.

The pollutants listed below are not estimated for the Lake Winnebago East Watershed, but they still pose a threat and should be considered in the overall discussion of problem pollutants:

- **PCBs** are found in urban stormwater in small amounts. The EMCs range from .10 - 10 ug/l, with a median of .02 ug/l. 100% of the samples taken exceed the Human Cancer criteria found in NR 105. Sources for this pollutant include storage areas and airborne deposition.

- **Pesticides** A number of different herbicides and insecticides are found in urban stormwater. Most herbicides found in urban stormwater pose little threat to the aquatic, but insecticides may threaten groundwater sources. 26 pesticides have been detected in urban stormwater, with some of these being corn herbicides.

- **Polycyclic Aromatic Hydrocarbons (PAHs)** are formed by incomplete combustion when organic compounds are burned with insufficient oxygen. These materials can be absorbed into suspended particles and biota. At least 60% of the samples taken exceed the Human Cancer criteria found in NR 105.

- **Surface water Bacteria** guidelines were exceeded at least 90% of the time. The EMC's ranged from 60-9600 counts per 100 mg/l. The average EMC was 6466 counts per m/l, with the exceedance level of 400 mg/l.

Urban Land Use Pollutant Loads

Pollutant loadings are estimated for existing land uses within each subbasin of the City of Fond du Lac's portion of the Winnebago East Priority Watershed Project. Loadings are also estimated for the City of Fond du Lac planned land uses within the Watershed. Listed in Table 3-6 are the annual pollutant loads for lead, copper, zinc, phosphorus, and suspended sediment. Because of the various land use mixes and sizes within each subbasin, pollutant loads will vary from subbasin to subbasin. Table 3-6 clearly shows that certain subbasins will contribute more pollutants than others.

Reduction Goals

The reduction goals for urban stormwater are based on meeting the limits set forth in Wisconsin Administrative Codes NR 102 and NR 105. These codes set toxicity standards for wastewater discharge limits throughout the State.

The basic concept of the reduction goals is to take the stormwater discharges below a level of acute toxicity for the majority of storms. The pollutants of lead, copper, and zinc were used to set the reduction goals for the city. Listed in Table 4-6 are the reduction goals for existing and planned subbasins. For example, copper concentrations for existing land use in the Willow Point stormsewer subbasin need to be reduced 18% to meet this goal. If these pollutants can be reduced to levels below acute toxicity, other problem pollutants will also be reduced.

Table 4-7. Reduction Goals by Urban Areas - Winnebago East Watershed (For Levels Not To Exceed Acute Toxicity)

Stormsewer Subbasin	Existing Lead (percent)	Existing Zinc (percent)	Existing Copper (percent)
Stow Street	0	17	26
Taft Street	0	0	2
Willow Point	0	23	18
Western Reserve	0	15	20
Harbor View	0	44	45
McDermott Park	0	43	44
Reserve Avenue	0	36	46
East Scott Street	0	8	23
Fourth Street	0	34	37
Gravity Flow	0	55	62
Outside Pump Sys	0	52	50
Planned Land Use (1990-2020)	0	46	54

Another factor that needs to be addressed are the Federal Stormwater Regulations, and how this affects the watershed plan. On November 16, 1990 the United States Environmental Protection Agency (EPA) published a final rule regulating municipal and industrial stormwater discharges. Most industrial facilities and incorporated municipalities over 100,000 need to obtain a stormwater permit. This permit is a three phase process where:

1. The permit application must be submitted.

2. A monitoring program must take place for a certain period of time.

3. A control strategy must be implemented.

The permit requirements will include best management practices to prevent pollutants from entering stormwater. These practices could range from storing materials indoors to wet detention basins.

There will also be some numeric limits imposed on certain pollutants, but these have yet to be determined.

If a municipality does not fall under the EPA regulations now, it probably will in the future. In 1993, the next phase of permits will be required for municipalities under 100,000 people. At this time, the cut off limit is not known.

Management Alternatives

The urban stormwater management strategies for this watershed are broken into existing and future land uses. Listed in Table 4-8 are the management alternatives selected for this watershed. The management scenarios are done on each of the eleven subbasins. Two key concepts that must be understood is the relationship between *existing and future land use development*, and the idea of *critical nonpoint source polluting land uses*.

Existing and future land use development trys to keep the waterbody from geting worse then it is now, and hopefully improve it to the state described in the Chapter 3. This entails combining both the existing pollutant numbers along with the future pollutant loading numbers to obtain an "ultimate" loading number for a municipality. This "ultimate" loading number is for the year 2020.

The other concept that needs exploring is critical nonpoint source polluting land uses. Estimating pollutant loads relies on land use definitions. Each land use is assigned a pollutant loading number and estimates are made for a yearly pollutant load using both EMCs and lbs/year. When working through the management alternatives, the first target of control are those heaviest polluting land uses, and in some cases the lighter loading land uses will also have to be included to obtain the desired reductions needed.

Table 4-8. Winnebago East Watershed Urban Alternatives

Existing Areas
Do Nothing Street Sweeping once a week for targeted land uses Street Sweeping once a week with limited wet detention ponds Wet detention ponds on targeted land uses
Planned Areas
The alternatives listed above + Grass swales with limited wet detention ponds

The next part of this chapter will list control strategies by the 11 subbasins and for planned areas. A complete listing of all critical land uses, pollutant reductions, pollutant controls can be found in Appendix C.

Stow Street Subbasin

The Stow Street Subbasin has 86 acres of existing land use; of these 87 acres, 60 acres (about 78%) have been labeled critical.

If control alternatives are applied to the pollutant zinc, the most appropriate and cost effective control will result with street sweeping once a week and limited wet detention ponds. The other pollutant reductions can be found in Appendix C.

Recommended actions for the Stow Street Subbasin include street sweeping once a week plus limited wet detention ponds on all existing land uses and the 1/2 medium density residential areas (these are the targeted lands that will be eligible for cost sharing dollars). By controlling these land uses, reductions for lead will be 30%, copper 27%, zinc 29%, phosphorus 16%, and suspended solids 32%. Table 4-9 summarizes the control strategy needed for this subbasin. This strategy will meet the targets for acute toxicity control.

Table 4-9. Stow Street Subbasin Control Strategy

Existing Land Use - Street Sweeping once a week plus some wet pond detention for all Institutional, and 1/2 Medium Density Residential areas
Approximately .4 acres of wet ponds plus 21 additional passes of street sweeping

Taft Street Subbasin

The Taft Street Subbasin has 35 acres of existing land use. None have been labeled critical.

If control alternatives are applied to the pollutant zinc, the most appropriate and cost effective control will be no additional controls. The other pollutant reductions can be found in Appendix C.

Table 4-10, lists that no action needs to be taken, and thus no lands will be eligible for cost sharing dollars within this subbasin.

Table 4-10. Taft Street Subbasin Control Strategy

Existing Land Use - do nothing on all land uses

Willow Point Subbasin

The Willow Point Subbasin has 97 acres of existing land use. Of these 97 acres, 2.25 acres have been labeled critical, or about 2%.

If control alternatives are applied to the pollutant zinc, the most appropriate and cost effective control will result with street sweeping once a week and limited wet detention ponds. The other pollutant reductions can be found in Appendix C.

Recommended actions for the Willow Point Subbasin include street sweeping once a week and limited wet detention ponds are needed on the existing commercial areas. These are the critical lands that will be eligible for cost sharing dollars. By controlling these land uses, reductions for lead will be 23%, copper 16%, zinc 20%, phosphorus 6%, and suspended solids 17%. Table 4-11 summarizes the control strategy needed for this subbasin. This strategy will meet the targets for acute toxicity control.

Table 4-11. Willow Point Subbasin Control Strategy

Existing Land Use - Street sweeping 1 x a week and wet detention ponds on commercial areas. Approximately .1 acres of wet detention ponds plus 21 additional passes of street sweeping are needed.

Western Reserve Subbasin

The Western Reserve Subbasin has 51 acres of existing land use. Of these 51 acres, 14.5 acres have been labeled critical, or about 28%.

If control alternatives are applied to the pollutant zinc, the most appropriate and cost effective control will result with street sweeping once a week and limited wet detention ponds. The other pollutant reductions can be found in Appendix C.

Recommended actions for the Western Reserve Subbasin include street sweeping once a week with limited wet detention ponds for the institutional, commercial, high density residential, and medium density residential areas. These are the critical lands that will be eligible for cost sharing dollars. By controlling these land uses, reductions for lead will be 19%, copper 16%, zinc 17%, phosphorus 7%, and suspended solids 15%. Table 4-12 summarizes the control strategy needed for this subbasin. This strategy will meet the targets for acute toxicity control.

Table 4-12. Western Reserve Subbasin Control Strategy

Existing land Use - Street Sweeping 1 x a week and limited wet detention ponds on all commercial, institutional, high density residential, and 1/4 of the medium density residential areas. Approximately .1 acres of wet detention pond and 21 additional street sweeping passes are needed.

Harbor View Subbasin

The Harbor View subbasin has 139 acres of existing land use. Of these 139 acres, 65 acres have been labeled critical, or about 46%.

If control alternatives are applied to the pollutant Zinc, the most appropriate and cost effective control will result with limited wet detention ponds. The other pollutant reductions can be found in Appendix C.

Recommended actions for the Harbor View Subbasin Include wet detention ponds for the existing institutional, commercial, high density residential, and 1/2 medium density residential areas. These are the critical lands that will be eligible for cost sharing dollars. By controlling these land uses, reductions for lead will be 64%, copper 46%, zinc 56%, phosphorus 29%, and suspended solids 61%. Table 4-13 summarizes the control strategy needed for this subbasin. This strategy will meet the targets for acute toxicity control.

Table 4-13. Harbor View Subbasin Control Strategy

Existing Land Use - Limited wet detention ponds on all commercial, institutional, high density residential, and 1/4 of the medium density residential areas. Approximately .7 acres of wet detention ponds are needed on these areas.

Mc Dermott Park Subbasin

The Mc Dermott Park Subbasin has 306 acres of existing urban land use within the watershed. Of these 306 acres, 77 acres have been labeled critical, or about 25%.

If control alternatives are applied to the pollutant zinc, the most appropriate and cost effective control will result with limited wet detention ponds. The other pollutant reductions can be found in Appendix C.

Recommended actions for the Mc Dermott Park Subbasin include wet detention ponds on the high density residential, commercial, and institutional land uses. Cost sharing dollars will be available for the land uses listed above. By controlling these land uses, reductions for lead will be 53%, copper 39%, zinc 47%, phosphorus 20%, and suspended solids 45%. Table 4-14 summarizes the control strategy needed for this subbasin. This strategy will meet the targets for acute toxicity control.

Table 4-14. Mc Dermott Park Subbasin Control Strategy

Existing land uses - limited wet detention ponds on high density residential, commercial, and institutional land uses. Approximately .7 acres of wet detention ponds are needed.

Reserve Avenue Subbasin

The Reserve Avenue Subbasin has 292 acres of existing land use. All 292 acres have been labeled critical.

If control alternatives are applied to the pollutant zinc, the most appropriate and cost effective control will result with street sweeping once a week plus limited wet detention ponds. The other pollutant reductions can be found in Appendix C.

Recommended actions for the Reserve Avenue Subbasin include street swept once a week plus limited wet detention ponds on all land uses. By controlling these land uses, reductions for lead will be 42%, copper 37%, zinc 39%, phosphorus 24%, and suspended solids 46%. Table 4-15 summarizes the control strategy needed for this subbasin. This strategy will meet the targets for acute toxicity control.

Table 4-15. Reserve Avenue Subbasin Control Strategy

Existing Land Uses - Street sweeping once a week and limited detention on all land uses. Approximately 1.3 acres of wet detention ponds plus 21 additional street sweeping passes are needed on existing lands.

East Scott Street Subbasin

The East Scott Street Subbasin has 211 acres of existing land use. All 211 acres have been labeled critical.

If control alternatives are applied to the pollutant zinc, the most appropriate and cost effective control will result with street sweeping once a week. The other pollutant reductions can be found in Appendix C.

Table 4-16 recommends actions for the East Scott Street Subbasin, this includes street sweeping once a week on all land uses. These are the critical lands that will be eligible for cost sharing dollars. By controlling these land uses, reductions for lead will be 3%, copper 13%, zinc 7%, phosphorus 1%, and suspended solids 2%. This will achieve the desired zinc reductions but not copper reductions.

Table 4-16. East Scott Street Subbasin Control Strategy

Existing Land Use - Street sweeping 21 additional passes on all land uses.

Fourth Street Subbasin

The Fourth Street Subbasin has 190 acres of existing land use. All 190 acres have been labeled critical.

If control alternatives are applied to the pollutant zinc, the most appropriate and cost effective control will result with street sweeping once a week plus limited wet detention ponds. The other pollutant reductions can be found in Appendix C.

Recommended actions for the Fourth Street Subbasin includes street sweeping once a week and limited wet detention ponds for all land uses. These are the critical lands that will be eligible for cost sharing dollars. By controlling these land uses, reductions for lead will be 46%, copper 32%, zinc 38%, phosphorus 25%, and suspended solids 48%. Table 4-17 summarizes the control strategy needed for this subbasin. This strategy will meet the targets for acute toxicity control.

Table 4-17. Fourth Street Subbasin Control Strategy

Existing Land Use - Street sweeping 1 x a week and limited detention for all land uses. Approximately 2 acres of wet detention and 21 additional passes are needed for these areas.

Gravity Flow Subbasin

The Gravity Flow Subbasin has 69 acres of existing land use. Of these 69 acres, 45 acres have been labeled critical, or 70%.

If control alternatives are applied to the pollutant zinc, the most appropriate and cost effective control will result with limited wet detention ponds. The other pollutant reductions can be found in Appendix C.

Recommended actions for the Gravity Flow Subbasin includes wet detention ponds on all land uses. These are the critical lands that will be eligible for cost sharing dollars. By controlling these land uses, reductions for lead will be 70%, copper 50%, zinc 62%, phosphorus 34%, and suspended solids 71%. Table 4-18 summarizes the control strategy needed for this subbasin. This strategy will meet the targets for acute toxicity control.

Table 4-18. Gravity Flow Subbasin Control Strategy

Existing Land Uses - Limited wet detention on all land uses.
Approximately 1.3 acres of wet detention ponds re needed on these areas.

Outside the Pumping System

Outside the pumping system has 6081 acres of existing land use. Of these 6081 acres, 673 acres have been labeled critical, or about 10%.

If control alternatives are applied to the pollutant zinc, the most appropriate and cost effective control will result with limited wet detention ponds.

Recommended actions outside the pumping system include wet detention ponds on all land uses. These are the critical lands that will be eligible for cost sharing dollars. By controlling these land uses, reductions for lead will be 58%, copper 46%, zinc 61%, phosphorus 27%, and suspended solids 66%. Table 4-19 summarizes the control strategy needed for this subbasin; this strategy will meet the targets for acute toxicity control.

Table 4-19. Side the Pumping System Control Strategy

Existing Land Uses - Limited wet detention ponds on all land uses.
Approximately 6 acres of wet ponds are needed for these areas.

Summary of Needed Control Practices

Listed below in Table 4-20 is a summary of control practices for the City of Fond du Lac portion of the Winnebago East Watershed. These control practice needs are summarized by subbasin for the city.

Table 4-20. Summary of Needed Control Practices

Subbasin	Street Sweeping?	Acres of Wet Pond
Stow Street	Yes	0.4
Taft Street	No	-
Willow Point	Yes	0.1
Western Reserve	Yes	0.1
Harbor View	No	0.7
Mc Dermott	No	0.7
Reserve Avenue	Yes	1.3
East Scott Street	Yes	-
Fourth Street	Yes	0.8
Gravity Flow	No	0.4
Outside Pump System	No	6.07

Planned (Incremental) Land Use

While the existing nonpoint pollution sources are always a concern, another aspect of concern are the lands that will be developed over the next 10-30 years within the City of Fond du Lac. A major pollution concern is uncontrolled construction site erosion. It is absolutely essential that controls be enacted to reduce the sediment erosion off these sites. Studies have shown that up to 30 tons/per acre of sediment can be washed off these sites. In terms of urban sediment loading, construction site erosion is the largest contributor to overall sediment loadings. Listed below in Table 4-21 is an estimate of the tons of potential sediment that would be loaded to the waterbodies with no controls. If controls are applied to these new land developments, a control rate of 70% can be applied to these construction sites. This will effectively reduce the potential load by 3,200 tons per year. It can not be over empathized how important construction site erosion controls are in controlling sediment loads.

Table 4-21. Urban Sediment Loading

Estimated Tons of Additional Sediment	Tons/year
Construction Site Erosion + Planned Lands	3,200

Other concerns associated with new land developments are the added generation of toxic pollutants and the volumes of water from these new land uses. The same type of analysis takes place for the planned land uses as it does existing areas. While over 4600 new acres will be developed in the next 30 years, only 941 acres will need some additional controls to meet water quality objectives, or about 20% of new land developed. Listed below in Table 4-22 are the additional pollutants the will be generated from these new land uses.

Table 4-22. Planned Pollutant Loads

Pollutant	Pounds Per Year
Lead	319
Copper	130
Zinc	941
Phosphorus	1695
Sediment	713,625

By taking the pollutant zinc and applying the desired control practices for the planned loadings, two different control strategies will meet the objectives. The first control objective is full swales with limited wet detention ponds, and the second objective would be just detention ponds but on a larger scale. Wet pond acres would range 3.5 to 10 acres depending upon the desired control option. The other pollutant reductions can be found in Appendix C.

Source Area Controls

Another type of pollution control extends from trying to control the pollution sources at there point of origin. These type of controls are meant to curb the generation of pollutants as close to the source as possible. Ideally the pollution generation is stopped, and at a minimum, the pollutants are controlled prior to entering the storm sewer system.

Source area controls are generally non-structural in practice, and instead involve changes in lifestyle. For example, trying to reduce the amount of automobile traffic by expanding the mass transit system or building more bike paths would reduce urban stormwater pollution. Current programs that remove lead from gasoline and asbestos from brake linings are also examples of source controls.

Source area controls can also be better housekeeping practices, such as pest waste control programs and judicious use of lawn and garden products. These types of controls are an inexpensive and vital component in any urban stormwater management program.

Several source area controls recommended in this watershed are:

- Disconnect rooftop downspouts form draining to driveways; rooftops are one source of zinc in stormwater runoff.
- Remove pet waste immediately form lawns, sidewalks, and streets so that bacteria contamination of the runoff can be reduced.
- Manage the timing, amount and type of fertilizer and pesticide applications in urban areas.
- Properly dispose of automobile waste fluids, such as radiator water and engine oil, to keep them out of the storm sewer system.
- Remove leaves and street dirt from the street and parking lost surfaces through municipal sweeping and leaf collection.
- Zone land use based on site suitability for stormwater management practices needed to meet water quality, habitat, and flood related objectives.
- Limit construction site erosion.
- Keep use of street de-icing compounds and sanding to a minimum.

Construction Site Erosion Control Ordinance

Uncontrolled construction site erosion is typically a very significant source of surface water degradation. Rainfall washes bare soil from construction sites on an annual per acre rate far above agricultural erosion rates. Much of this eroded soil enters area drainageways and streams. An average of 30 tons of soil per acre per year erode from construction sites in Wisconsin. Agricultural croplands within the watershed erode an average of 3 tons per acre per year. Nutrients carried by sediment to area streams or to Lake Winnebago promote nuisance algal growth. Excessive sediment also creates turbid water and hinders boating navigability.

Within the Lake Winnebago East Watershed, the City of Fond du Lac and the lands east of the city, in the towns of Fond du Lac and Empire, have been identified as areas for future growth (City of Fond du Lac Comprehensive Plan, 1990). These lands are located in the Towns of Fond du Lac and Empire. This growth will entail much construction including roads, utilities, surface water drainage, water and sanitary sewer service, housing and commercial development. This construction activity will inevitably cause large amounts of construction site erosion and the ultimate fate for much of this sediment being Lake Winnebago.

Adoption and enforcement of local construction erosion control ordinances are effective tools to reduce the extent and severity of this source of sediment. Currently, only construction projects with 5 acres or more of disturbed land are required to control construction site erosion. This is a new regulatory program which is administered by the Department of Natural Resources as part of the Federal Storm Water Regulations. These regulations will benefit water quality, but are not adequate to meet water quality objectives.

The City of Fond du Lac also requires construction site erosion control for new sewer installation. However, a comprehensive local ordinance is necessary where future construction activity will be the greatest to adequately control all sources of construction erosion to meet water quality objectives.

The City of Fond du Lac and the towns of Fond du Lac and Empire will need to adopt construction site erosion control ordinances within the boundaries of the Lake Winnebago East Watershed. If the towns of Fond du Lac and Empire fail to adopt Construction Site Erosion Control Ordinances, then Fond du Lac County must adopt the ordinance.

Certain costs for the development and administration of a construction site erosion control ordinance are eligible for reimbursement under the Priority Watershed Project. These ordinances must be adopted by the City of Fond du Lac and the County or the townships of Fond du Lac and Empire in lieu of the County, within one year of completing of the Lake Winnebago East project.

The Calumet County portion of the project is expected to experience less growth than Fond du Lac County. It is recommended that Calumet County adopt a comprehensive construction site erosion control ordinance. A construction site erosion control ordinance, however, is not necessary at this time. However, a water quality assessment on the impact of construction site erosion may be conducted by the DNR to reevaluate the need for a county erosion control ordinance in Calumet County when either of the following situations occur:

- A total of 12 or more acres of earth disturbing construction occurs within the unincorporated areas of the watershed over a one year period. This acreage does not include service or utility construction such as sewer or water extensions, highway or telephone construction.

- Service or utility construction such as highways, sewer or water extensions, etc. take place in unincorporated areas of the watershed regardless of the acreage involved.The focus of this assessment is not the erosion from the service related construction directly, rather the control of erosion in the developing area that is in response to the service or utility construction. An example would be the construction of a subdivision that resulted from a sewer/water extension.

- Identifiable water quality degradation from sediment.

The water quality assessment must document significant impairment to water quality or aquatic habitat or determine that at least 50% of the construction sites lack erosion control

practices. In either case the DNR may amend this plan to include a requirement for county adoption of a comprehensive construction site erosion control ordinance by Calumet County within the watershed portion of the County within one year of completing the Lake Winnebago East project. The watershed plan amendment may be subject to a public participation process. County Board approval for the revised plan may also be sought. However, public participation and County Board approval is not required to amend approved watershed plans (NR 120 & 121).

As stated, either Fond du Lac County or the towns of Empire and Fond du Lac will need to adopt a construction site erosion control ordinance. If both towns and Fond du Lac County fail to adopt the ordinance, Fond du Lac County must repay to the State all Nonpoint Source Grant Agreement funding. As required by State Statute (144.25), ordinance adoption will be a condition of the Fond du Lac County Nonpoint Source Grant Agreement. The Calumet County Nonpoint Source Grant Agreement will similarly require repayment to the State of Nonpoint Source Grant Agreement funds, should the approved watershed plan be amended to require County adoption of a construction site erosion control ordinance.

CHAPTER FIVE: Local Government's Implementation Program

Introduction

This chapter identifies the means for implementing the rural and urban management actions for nonpoint source control described in Chapter 4. It is divided into two major sections. The first describes the county's nonpoint source implementation strategy for rural areas. The second section contains the elements for the city Fond du Lac's nonpoint source control implementation strategy for the urban and developing portions of the watershed. Included in the implementation program for rural and urban areas is an information and education strategy. The success of this priority watershed project depends on the aggressive implementation of these three nonpoint source control strategies.

More specifically this chapter identifies:

- agencies and units of government responsible for carrying out identified tasks
- the best management practices (BMP's) necessary to control pollutants on the critical sites identified in Chapter 4
- the cost-share budget and cost containment policies
- the cost-share agreement reimbursement procedures including administrative procedures for carrying out the project
- staffing needs including total hours per year and number of staff to be hired
- schedules for implementing the project
- the involvement of other programs
- the project budget including cost-sharing expense, necessary staffing for technical assistance, administration, and the information and education program
- an urban program for implementation
- information and education activities that will be carried out in the project area

Rural Program for Implementation

Project Participants: Roles and Responsibilities

Landowners and Land Operators

Owners and operators of public and private land are important participants in the priority watershed program. They will adopt BMPs that reduce nonpoint sources of water pollution and protect and enhance fish, wildlife and other resources. Land owners and land operators in the Lake Winnebago East Watershed eligible for cost-share assistance through the priority watershed program include:

- individuals
- Calumet County, and Fond du Lac County
- other governmental units described in NR 120.02(19)
- corporations
- the State of Wisconsin

Calumet and Fond du Lac Counties are the primary units of government responsible for implementing this plan in rural areas.

The Calumet and Fond du Lac County Land Conservation Committees (LCC) will act for the respective County Boards, based on the powers delegated by the County Board to the LCC, and will be responsible contractually and financially to the State of Wisconsin for management of the project in areas with rural land uses. The County LCCs will coordinate the activities of all other local agencies involved with the rural portion of the project.

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

- Identify in writing a person to represent the county during implementation of the project.
- Contact all owners or operators of lands identified as significant nonpoint sources within one year of signing the nonpoint source grant agreement. The counties' strategies for contacting landowners are included in this chapter.
- Develop farm conservation plans consistent with the needs of the project.

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

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

- Design best management practices and verify proper practice installation.

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

- Prepare and submit annual work plans for activities necessary to implement the project. The Calumet and Fond du Lac County LCDs shall submit a workload analysis and grant application to the Department of Agriculture, Trade and Consumer Protection (DATCP) as required in s. Ag. 166.50.

- Prepare and submit to the Department of Natural Resources (DNR) and the Department of Agriculture, Trade and Consumer Protection (DATCP) the annual resource management report required under s. NR 120.21(7) to monitor project implementation by tracking changes in the nonpoint source inventory, and quantifying pollutant load reductions that result from installing BMPs.

- Participate in the annual watershed project review meeting.

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

Department of Natural Resources

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

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

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

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

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

Project Evaluation: The DNR has responsibility for priority watershed project monitoring and evaluation activities. These efforts determine if changes in water quality occur as best management practices and other pollution controls are installed or implemented. The water quality evaluation and monitoring strategy for the Lake Winnebago East Watershed are included in Chapter 8. The DNR documents the results of monitoring and evaluation activities in interim and final priority watershed project reports.

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

Other Responsibilities Including:

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

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

Department of Agriculture, Trade and Consumer Protection

The role of the Department of Agriculture, Trade and Consumer Protection (DATCP) is identified in s. 144.25, stats., ch. 92 stats., and NR 120. In summary, the DATCP will:

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

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

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

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

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

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

- Participate in the annual project review meetings.

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

- Assist county staff to evaluate the site specific practicality of implementing rural best management practices.

Other Agencies

The Lake Winnebago East Watershed Project will receive assistance from the agencies listed below.

Soil Conservation Service (SCS): This agency works through the local LCC to provide technical assistance for planning and installing conservation practices. The local SCS personnel will work with the county staff to provide assistance with technical work when requested by the Land Conservation Committee and if SCS staff time is available. Personnel from the Area SCS office will provide staff training and engineering assistance for best management practices. Efforts will be made by DATCP to assist SCS to coordinate the Winnebago East Priority Watershed Project with the conservation compliance and other conservation provisions of the 1985 and subsequent Federal Farm Bills.

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

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

Agricultural Best Managment Practices (BMPs)

BMPs Eligible For Cost share And Their Rates

Best management practices are those practices identified in NR 120 which are determined in this watershed plan to be the most effective controls of the nonpoint sources of pollution. The practices eligible for cost share and the cost-share rates under the Lake Winnebago East Priority Watershed Project are listed in Table 5-1.

Design and installation of all BMPs must meet the conditions listed in NR 120. Generally these practices use specific standard specifications included in the SCS Field Office Technical Guide. In some cases additional specifications may apply. The applicable specifications for each BMP can be found in NR 120.14.

If the installation of BMPs destroys significant wildlife habitat, NR 120 requires that habitat will be recreated to replace the habitat lost. The DNR District Private Lands Wildlife Specialist or a designee will assist the LCDs in determining the significance of wildlife habitat and the methods used to recreate the habitat.

Table 5-1. State Cost-Share Rates for Best Management Practices

Best Management Practice	State Cost-Share Rate
Contour Farming	50% [1]
Contour Strip Cropping	50% [1]
Field Strip Cropping	50% [1]
Field Diversions and Terraces	70%
Grassed Waterways	70%
Reduced Tillage	50%
Critical Area Stabilization	70% [2]
Grade Stabilization Structures	70%
Agricultural Sediment Basins	70%
Shoreline and Streambank Stabilization	70% [3]
Shoreline Buffers	70% [2]
Barnyard Runoff Management	70%
Animal Lot Relocation	70%
Manure Storage Facilities	70% [4]
Livestock Exclusion from Woodlots	50%
Wetland Restoration	70% [2]
Roofs for Barnyard Runoff Management and Manure Storage Facilities	70%
Nutrient and Pesticide Management	50% [5]

1. Flat rates for these BMPs can be found in Table 5-3. Wildlife habitat restoration components of this practice are cost-shared at 70%.
2. Easements may be entered into with landowners identified in the watershed. plan in conjunction with these BMPs. See Chapter 4 for where easements may apply.
3. Pasture pumps are an eligible component to this BMP.
4. Maximum cost-share amount is $10,000 including no more than $5,000 for manure transfer equipment (Legislation is proposed to change these amounts. If the legislation is adopted the cost-share amount will correspond with the new statutory language).
5. Spill control basins have a state cost-share rate of 70%

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

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

Contour and Field Stripcropping - Growing crops in a systematic arrangement, usually on the contour, in alternate strips of close grown crops, such as grasses or legumes, and tilled row crops.

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

Critical Area Stabilization - The planting of suitable vegetation on critical nonpoint source sites and other treatment necessary to stabilize a specific location.

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

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.

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

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

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.

Field Diversions - This purpose of this practice is primarily to divert water from areas it is in excess or is doing damage to where it can be transported safely.

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

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

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.

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

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.

Animal Lot Relocation - Relocation of an animal lot from a critical site such as a floodway to a suitable site to minimize lot pollutants going to surface or groundwater.

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

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

Nutrient Management - The management and crediting of nutrients for the application of manure and commercial fertilizers, and crediting for nutrients from legumes. Management includes the rate, method and timing of the application of all sources of nutrients to minimize the amount of nutrients entering surface or groundwater.

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.

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

BMPs Not Cost-Shared

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

- the portion of a practice to be funded through other programs
- practices previously installed and necessary to support cost-shared practices
- changes in crop rotations and other activities normally and routinely used in growing crops or which have installation costs that can be passed on to potential consumers

- changes in location of unconfined manure stacks involving no capital cost
- manure spreading management
- other activities the DNR finds necessary to achieve watershed project objectives

Activities and Sources Of Pollution Not Eligible For Cost-Share Assistance

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

- operation and maintenance of cost-shared BMPs
- actions which have drainage of land or clearing of land as the primary objective
- practices already installed
- activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) Program or covered in other ways by Chapter 147 of Wis. Stats. (including livestock operations with more than 1,000 animal units, or livestock operations issued a notice of discharge under ch. NR 243
- septic system controls or maintenance; dredging; silviculture activities
- bulk storage of fertilizers and pesticides
- activities and structures intended primarily for flood control
- practices required to control sources which were adequately controlled at the time the cost-share agreement was signed
- other practices or activities determined by the DNR not to meet program objectives

Cost-Share Budget

Costs of Installing BMPs: The quantity and type of management practices that are required to meet this project's water quality objectives are listed in Tables 5-2, 5-2a and 5-2B. The capital cost of installing the BMPs are listed in this Table assuming landowner participation rates of 100% and 75%. Also included are the units of measurement and cost-share amount per unit for the various BMPs.

The capital cost of installing the Best Management Practices in Calumet and Fond du Lac Counties is approximately $2.5 million and $3.6 million, respectively, assuming 100% participation.

- State funds necessary to cost-share this level of control would be about $1.7 million and $2.3 million for Calumet and Fond du Lac Counties, respectively.

- The local share provided by landowners and other cost-share recipients would be about $0.79 million and $1.2 million, respectively.

At a 75% level of participation, the state funds needed to cover capital installation would be about $1.3 million and $1.8 million for Calumet and Fond du Lac Counties, respectively.

Easement Costs: Chapter 4 identifies where nonpoint source program funds can be used to purchase easements. The estimated cost purchasing easements on eligible lands in Calumet and Fond du Lac Counties is shown in Table 5-2 through 5-2b. At 100% participation, the estimated purchase price of easements on eligible lands wouldbe $80,000 and $90,000 in Calumet and Fond du Lac Counties, respectively. At 75% participation, the cost would be $60,000 and $67,500; respectively. The state would pay the entire easement costs.

Cost Containment Procedures: Chapter NR 120 requires that cost containment procedures be identified in this plan. The cost containment procedures to be used by Calumet and Fond du Lac Counties are described below.

Cost-share payments will be based on actual installation costs. If actual installation costs exceed the amount of cost share determined by the bidding, range of costs and average cost methods the amount paid the grantee may be increased with the approval of the appropriate land conservation committee. Appropriate documentation regarding the need for changes will be submitted to DNR.

Bids: Competitive bids will be required in Calumet and Fond du Lac Counties for all structural BMP's with estimated total costs, as determined by the project technicians, exceeding $5,000. The bidding process requires the cost-share recipient to receive a minimum of two bids from qualified contractors in lump sum bid. The cost-share recipient must provide copies of the bids to the county prior to initiating construction. In cases where the cost-share recipient provides proof that bids were requested from a minimum of three qualified contractors but only one bid was received, the county will determine if the bid constitutes an appropriate cost for the project. If no bids are received or if the lone bid is not deemed appropriate, Calumet and Fond du Lac Counties will limit cost sharing based on average costs.

Average Costs: Average costs will be used in Calumet and Fond du Lac Counties for all structural BMPs with an estimated cost equal to or less than $5,000 and for all non-structural BMPs not using a flat rate, unless the cost-share recipient decides, and the county agrees, to bid the installation of the BMPs. The average cost list will be reviewed periodically and appropriate changes made. If changes are made the list will be forwarded to DNR and DATCP for final approval before the changes are used for calculating cost-share agreements and payments.

Flat Rates: BMPs using flat rates are shown in Table 5-3. The rates shown are the state's share of the practice installation costs.

Table 5-2. Estimated Total Cost-Share Budget Needs for Rural Management Practices

				100% Participation		75% Participation	
Management Needs	Number	Cost/Unit	Total Cost (1)	State Share	Local Share	State Share	Local Share
Upland NPS Control							
Change in Crop Rotation	16,800 ac	NA(3)	0	0	0	0	0
Contour Cropping	2,800 ac	$6	16,800	16,800	(2)	12,600	(2)
Contour Strip Cropping	1,400 ac	$12	16,800	16,800	(2)	12,600	(2)
Reduced Tillage (4)	800 ac	$45	36,000	36,000	(2)	27,000	(2)
Reduced Till.(5)	3,000 ac	$15	45,000	45,000	(2)	33,750	(2)
Critical Area Stabilization	685 ac	$150	102,750	71,925	30,825	53,944	23,119
Grass Waterways	320 ac	$3,000	960,000	672,000	288,000	504,000	216,000
Field Diversions & Terraces	35,000 ft	$3	105,000	73,500	31,500	55,125	23,625
Grade Stabilization	22 ea	$3,000	66,000	46,200	19,800	34,650	14,850
Agricultural Sediment Basin	62 ea	$3,000	186,000	130,200	55,800	97,650	41,850
Nutrient & Pest. Mgmt.	10,000 ac	$25	250,000	250,000	(2)	187,500	(2)
Shoreline Buffers(6)	200 ac	$150	30,000	21,000	9,000	15,750	6,750
Wetland Restoration	30 ac	$2,000	60,000	42,000	18,000	31,500	13,500
Spill Control Basins	3 ac	$8,000	24,000	16,800	7,200	12,600	5,400
Animal Waste Management							
Barnyard Runoff Control							
Complete System	96 ea	$20,000	1,920,000	1,344,000	576,000	1,008,000	432,000
Clean Water Diversion	28 ea	$4,000	112,000	78,400	33,600	58,800	25,200
Manure Storage Facility	60 ea	$22,000	1,320,000	600,000	720,000	450,000	540,000
Manure Spreading Mgmt.	3,002 ac	NA	0	0	0	0	0
Roofs for Barnyards	0 ea	$37,500	0	0	0	0	0
Streambank Erosion Control							
Shape and Seeding	59,283 ft	$4	237,132	165,992	71,140	124,494	53,355
Fencing	58,477 ft	$2	116,954	81,868	35,086	61,401	26,315
Rip-Rap	10,877 ft	$25	271,925	190,348	81,578	142,761	61,183
Livestock/Machinery							
Crossing	62 ea	$1,500	93,000	65,100	27,900	48,825	20,925
Shoreline Protection	1,000 ft	$120	120,000	84,000	36,000	63,000	27,000
TOTALS:			$6,089,361	$4,047,933	$2,041,428	$3,035,950	$1,531,071
Easements	170 ac	$1,000	170,000	170,000	0	127,500	0
TOTALS			$6,259,361	$4,217,933	$2,041,428	$3,163,450	$1,531,071

1. Total cost to control identified critical pollution sources.
2. Local share consists of labor and any additional equipment costs.
3. NA means that cost-share funds are not available for this practice.
4. This practice is reduced tillage on continuous row, or long rotational croplands.
5. This practice is reduced tillage, including no-till, on short rotation croplands or for establishing forage crops.
6. Maximum cost-share is $10,000 of which a maximum of $5,000 can be for waste transfer.

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade and Consumer Protection; and Land Conservation Department of Calumet and Fond du Lac Counties.

Table 5-2A. Estimated Cost-Share Budget Needs for Rural Management Practices in Calumet County

				100% Participation		75% Participation	
Management Needs	Number	Cost/ Unit	Total Cost (1)	State Share	Local Share	State Share	Local Share
*Best Management Practices							
Upland NPS Control							
Change in Crop Rotation	5,700 ac	NA(3)	0	0	0	0	0
Contour Cropping	950 ac	$6	5,700	5,700	(2)	4,275	(2)
Contour Strip Cropping	500 ac	$12	6,000	6,000	(2)	4,500	(2)
Reduced Tillage (4)	300 ac	$45	13,500	13,500	(2)	10,125	(2)
Reduced Till.(5)	1,000 ac	$15	15,000	15,000	(2)	11,250	(2)
Critical Area Stabilization	240 ac	$150	36,000	25,200	10,800	18,900	8,100
Grass Waterways	155 ac	$3,000	465,000	325,500	139,500	244,125	104,625
Field Diversions & Terraces	15,000 ft	$3	45,000	31,500	13,500	23,625	10,125
Grade Stabilization	10 ea	$3,000	30,000	21,000	9,000	15,750	6,750
Agricultural Sediment Basin	50 ea	$3,000	150,000	105,000	45,000	78,750	33,750
Nutrient & Pest. Mgmt.	5,000 ac	$25	125,000	125,000	(2)	93,750	(2)
Shoreline Buffers(6)	100 ac	$150	15,000	10,500	4,500	7,875	3,375
Wetland Restoration	10 ea	$2,000	20,000	14,000	6,000	10,500	4,500
Spill Control Basin	2 ea	$8,000	16,000	11,200	4,800	8,400	3,600
Animal Waste Management							
Barnyard Runoff Control							
Complete System	32 ea	$20,000	640,000	448,000	192,000	336,000	144,000
Clean Water Diversion	16 ea	$4,000	64,000	44,800	19,200	33,600	14,400
Manure Storage Facility	17 ea	$22,000	374,000	170,000	204,000	127,500	153,000
Manure Spreading Mgmt.	956 ac	NA	0	0	0	0	0
Roofs for Barnyards	0 ea	$37,500	0	0	0	0	0
Streambank Erosion Control							
Shape and Seeding	27,018 ft	$4	108,072	75,650	32,422	56,738	24,316
Fencing	34,872 ft	$2	69,744	48,821	20,923	36,616	15,692
Rip-Rap	5,757 ft	$25	143,925	100,748	43,178	75,561	32,383
Livestock/Machinery							
Crossing	45 ea	$1,500	67,500	47,250	20,250	35,438	15,188
Shoreline Protection	700 ft	$120	84,000	58,800	25,200	44,100	18,900
Subtotal:			$2,493,441	$1,703,169	$790,272	$1,277,377	$592,704
Easements	80 ac	$1,000	80,000	80,000	0	60,000	0
TOTALS			$2,573,441	$1,783,169	$790,272	$1,337,377	$592,704

1. Total cost to control identified critical pollution sources
2. Local share consists of labor and any additional equipment costs.
3. NA means that cost-share funds are not available for this practice
4. This practice is reduced tillage on continuous row, or long rotational croplands
5. This practice is reduced tillage, including no-till, on short rotation croplands or for establishing forage crops
6. Maximum cost-share is $10,000 of which a maximum of $5,000 can be for waste transfer

Source: Wisconsin Department of Natural Resources; Wisc. Department of Agriculture, Trade and Consumer Protection; and Land Conservation Departments of: Calumet and Fond du Lac Counties

Table 5-2B. Estimated Cost-Share Budget Needs for Rural Management Practices in Fond du Lac

				100% Participation		75% Participation	
Management Needs	Number	Cost/Unit	Total Cost (1)	State Share	Local Share	State Share	Local Share
*Best Management Practices							
Upland NPS Control							
Change in Crop Rotation	11,100 ac	NA(3)	0	0	0	0	0
Contour Cropping	1,850 ac	$6	11,100	11,100	(2)	8,325	(2)
Contour Strip Cropping	900 ac	$12	10,800	10,800	(2)	8,100	(2)
Reduced Tillage (4)	500 ac	$45	22,500	22,500	(2)	16,875	(2)
Reduced Till.(5)	2,000 ac	$15	30,000	30,000	(2)	22,500	(2)
Critical Area Stabilization	445 ac	$150	66,750	46,725	20,025	35,044	15,019
Grass Waterways	165 ac	$3,000	495,000	346,500	148,500	259,875	111,375
Field Diversions & Terraces	20,000 ft	$3	60,000	42,000	18,000	31,500	13,500
Grade Stabilization	12 ea	$3,000	36,000	25,200	10,800	18,900	8,100
Agricultural Sediment Basin	12 ea	$3,000	36,000	25,200	10,800	18,900	8,100
Nutrient & Pest. Mgmt.	5,000 ac	$25	125,000	125,000	(2)	93,750	(2)
Shoreline Buffers	100 ac	$150	15,000	10,500	4,500	7,875	3,375
Wetland Restoration	20 ea	$2,000	40,000	28,000	12,000	21,000	9,000
Spill Control Basin	1 ea	$8,000	8,000	5,600	2,400	4,200	1,800
Animal Waste Management							
Barnyard Runoff Control							
Complete System	64 ea	$20,000	1,280,000	896,000	384,000	672,000	288,000
Clean Water Diversion	12 ea	$4,000	48,000	33,600	14,400	25,200	10,800
Manure Storage Facility (6)	43 ea	$22,000	946,000	430,000	516,000	322,500	387,000
Manure Spreading Mgmt.	2,046 ac	NA	0	0	0	0	0
Streambank Erosion Control							
Shape and Seeding	32,265 ft	$4	129,060	90,342	38,718	67,757	29,039
Fencing	23,605 ft	$2	47,210	33,047	14,163	24,785	10,622
Rip-Rap	5,120 ft	$25	128,000	89,600	38,400	67,200	28,800
Livestock/Machinery							
Crossing	17 ea	$1,500	25,500	17,850	7,650	13,388	5,738
Shoreline Protection	300 ft	$120	36,000	25,200	10,800	18,900	8,100
SUBTOTAL:			$3,595,920	$2,344,764	$1,251,156	$1,758,573	$938,367
Easements	90 ac	$1,000	90,000	90,000	0	67,500	0
TOTALS:			$3,685,920	$2,434,764	$1,251,156	$1,826,073	$938,367

1. Total cost to control identified critical pollution sources.
2. Local share consists of labor and any additional equipment costs.
3. NA means that cost-share funds are not available for this practice.
4. This practice is reduced tillage on continuous row, or long rotational croplands.
5. This practice is reduced tillage, including no-till, on short rotation croplands or for establishing forage crops.
6. Maximum cost-share is $10,000 of which a maximum of $5,000 can be for waste transfer.

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade and Consumer Protection; and Land Conservation Department of Calumet and Fond du Lac Counties

Table 5-3. Practices Using a Flat Rate for State Cost-Share Funding

Best Management Practice	Flat Rate
Contour Farming	$6.00/ac.
Strip Cropping	$12.00/ac.
Field Strip Cropping	$10.00/ac.
Reduced Tillage	$15.00/ac. [1]
Reduced Tillage	$45.00/ac. [2]

1. Reduced tillage systems for short crop rotations, and establishment of forages and small grains (includes no-till)
2. Reduced tillage systems for continuous row cropping or long rotations (does not include no-till)

Cost-Share Agreement Reimbursement Procedures

Nonpoint Source Grant Agreement and Administration

General Information: The Nonpoint Source Grant Agreement is the means for transmitting funds from the DNR (through the Nonpoint Source Program) to Calumet Fond du Lac Counties for use in funding the state's share of cost-share agreements. Cost-share agreements are the means to transmit funds from the counties to the landowners.

A portion of the Nonpoint Source Grant is forwarded to Calumet and Fond du Lac Counties to allow the county to set up an "up front" account. Funds from this account are used by the county to pay landowners after practices are installed under the project. As this account is drawn down, the county will request reimbursements from DNR to replenish the account. The counties will submit reimbursement requests on a quarterly basis. This reimbursement schedule will insure that the "up front" account balance is maintained at an adequate level. The NPS Grant Agreement will be amended annually to provide funding needed for cost sharing for the year. The funds obligated under cost-share agreements must never exceed the total funds in the NPS Grant Agreement.

Fiscal Management Procedures, Reporting Requirements: Counties are required by NR 120 to maintain a financial management system that accurately tracks the disbursement of all funds used for the Lake Winnebago East Watershed Project. The records of all watershed transactions must be retained for 3 years after the date of final project settlement. A more detailed description of the fiscal management procedures can be found in NR 120.25 and NR 120.26.

Cost-share Agreement and Administration

Purpose and Responsibilities: Consistent with s. 144.25, Stats. and NR 120, Wis. Adm. Code, cost-share funding is available to landowners for a percent of the costs of installing BMP's to meet the project objectives. Landowners have three years after formal approval of

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

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

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

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

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

Counties are responsible for enforcing compliance of cost-share agreements to which they are a party. Where DNR serves as a party to an agreement with a unit of government, the DNR will take responsibility for monitoring compliance. The responsible party will insure that BMPs installed through the program are maintained in accordance with the operation and maintenance plan for the practice for the appropriate length of time. Calumet and Fond du Lac counties will check for compliance with practice maintenance provisions once every three years after the last practice has been installed. The county must check maintenance at its own expense after the Nonpoint Source Agreement has lapsed.

Landowner Contact Strategy

The following procedure will be used to make landowner contacts:

- During the first three months of the implementation period, all landowners or operators with eligible nonpoint sources will receive from the county a mailing explaining the project and how they can become involved.

- After the initial landowner mailings, county staff will make personal contacts with all landowners that have been identified as having critical nonpoint sources of pollution (Management Category I). These contacts will occur within a year of receiving the Nonpoint Source Agreement.

- The county will continue to make contacts with eligible (Management Category I and II) landowners and operators until they have made a definite decision regarding participation in the program.

- The county will contact all eligible landowners (as defined above) not signing cost-share agreements by personal letter six months prior to the end of the cost-share sign-up period.

Procedure for Developing a Cost-share Agreement

Eligibility for cost share is verified following a site visit, using the criteria described in Chapter 4.

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

Landowners which spread livestock manure on high hazard areas (defined in Chapter 3) during the winter period, and are in Management Category I, may have a manure spreading assessment developed for their livestock operation if they are eligible for manure storage or in internally drained areas. Landowners in Management Category II may have a spreading plan developed. Participants with manure storage cost-shared will be required to limit winter-spreading of livestock manure in accordance with the criteria listed in Chapter 4.

If Manure Storage Facilities are cost-shared, a manure spreading plan is required. The plan will not allow winter-spreading of manure on high hazard acres for landowners receiving cost share for manure storage facilities.

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

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

1. Landowner and county staff meet to discus the watershed project, NPS control practice needs, and coordination with conservation compliance provisions if applicable.

2. Landowner agrees to participate with the watershed project.

3. A farm conservation plan is prepared by the county.

4. The landowner agrees with the plan, a Cost-share Agreement is prepared and both documents are signed by the landowner and the county. A copy of the Cost-share Agreement (CSA) is sent to the DNR Lake Michigan District Nonpoint Source Coordinator and a copy given to the landowner. The CSA will be recorded by the county with the County Register of Deeds.

5. Practices are designed by the county, or their designee, and a copy of the design is provided to the landowner.

6. Landowner obtains the necessary bids or other information required in the cost containment policy.

7. Amendments to the CSA are made if necessary.

8. The county staff oversee practice installation.

9. The county verifies the installation.

10. The landowner submits paid bills and proof of payment (cancelled checks or receipts marked paid) to the county.

11. Land Conservation Committees or their designated representative and if required, county boards, approve cost-share payments to landowners.

12. Checks are issued by the county to the respective landowners and project ledgers are updated.

13. The county records the check amount, number, and date.

14. DNR reimburses the county for expended cost-share funds.

Identifying Wildlife and Fishery Needs

The Calumet and Fond du Lac County staffs will consult with DNR's Lake Michigan District wildlife management and fisheries management staff to optimize the wildlife and fish management benefits of nonpoint source control BMPs. Specifically, the county staff will contact DNR staff if, in the county's opinion, fence rows, rock piles, wetlands, areas of rare

or special plant communities or other wildlife habitat components will be adversely affected by installation of agricultural BMPs.

The DNR staff will assist county staff by:

- Identifying streambank protection practices that benefit fish and wildlife.
- Identifying wildlife habitat components that could be incorporated into vegetative filter strips along streams or in upland areas.
- Reviewing placement of agricultural sediment basins to assure that negative impacts on stream fish and aquatic life do not occur and recommending wildlife habitat components.
- Providing technical assistance when the installation of BMPs will require the removal of obstructions or other wildlife habitat by proposing measures to minimize impact on wildlife habitat.
- Assisting to resolve questions concerning effects of agricultural nonpoint source BMPs on wetlands.

Submittal to the Department of Natural Resources

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

- where cost-share funds are to be used for practices on land owned or controlled by the county
- for agreements or amendments where the cost-share amount for all practices for a landowner exceeds $50,000 in state funds
- for grade stabilization structures and agricultural sediment basins with embankment heights between 15 and 25 feet and impoundment capacities of 15 to 50 acre feet,
- for streambanks to be controlled using riprap or other materials with banks over 6 feet high
- for animal lot relocation
- for roofs over barnyards or manure storage facilities

Local Assistance Grant Agreement Administration

General Information: The Local Assistance Grant Agreement (LAGA) is a grant from the DNR to Calumet and Fond du Lac Counties for supporting their staffing and support costs of carrying out this watershed plan. Each county will have its own agreement. Consistent with NR 120, the counties will use funds from the LAGA for additional staff to implement the project and conduct information and education activities. Other items such as travel, training, and certain office supplies are also supported by the LAGA. Further clarification of eligible costs supported by this grant is given in NR 120.14(4) and (6).

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

Fiscal Management Procedures, Reporting Requirements: Calumet and Fond du Lac Counties are required by NR 120 to maintain a financial management system that accurately tracks the disbursement of all funds used for the Lake Winnebago East Watershed Project. The records of all watershed transactions must be retained for 3 years after the date of final project settlement. A more detailed description of the fiscal management procedures can be found in NR 120.25 and NR 120.26.

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

Budget and Staffing Needs

This section estimates the funding and staffing required to provide technical assistance for the rural portion of this project. These estimates are based on needs identified for Calumet and Fond du Lac Counties.

Staff Needs: Tables 5-4 and 5-5 list the total estimated staff needed to implement the project in Calumet and Fond du Lac Counties respectively. Figures are provided for both the 50% and 75% levels of participation. A total of about 39,000 staff hours is required in Calumet County and 54,000 staff hours in Fond du Lac County to implement this plan at a 75% landowner participation rate. This includes 1,360 staff hours in Calumet County and 1,800 staff hours in Fond du Lac County to carry out the information and education program.

The Land Conservation Departments in Calumet and Fond du Lac County will each hire two staff in each of the first three years of the project. The counties will assess the number and

type of staff required for the final five years of the project based on the actual landowner participation following the three year cost-share sign-up period.

Grant Disbursement and Project Management Schedule

Implementation will begin upon the Counties acceptance of the Nonpoint Source Grant Award.

The priority watershed project implementation period lasts eight years. It includes an initial three year period for contacting eligible landowners and signing cost-share agreements. Practices on any cost-share agreement must be installed within a five year period.

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

The disbursement of the grants (Local Assistance and Nonpoint Source) to Calumet and Fond du Lac Counties will be based on an annual workload analysis and grant application process. The estimated grant disbursement schedule based on 75% participation by eligible landowners can be found in Tables 5-6a and 5-6b; Calumet County, and Fond du Lac County, respectively.

Coordination With State and Federal Conservation Compliance Programs

The Lake Winnebago East 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 Soil Conservation Service. DATCP will assist Calumet and Fond du Lac County and the SCS offices to identify landowners within the watershed that are subject to the compliance provisions of FPP and FSA. Conservation Farm Plans were completed for all landowners in FSA on December 31, 1989. Calumet County and Fond du Lac County completed FPP plans by the end of 1987 and 1990, respectively.

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

Table 5-4. Estimated County LCD Staff Needs for Project Implementation

		CALUMET COUNTY		FOND DU LAC COUNTY	
Activity	Project Years When Work Will Be Done	75% Landowner Participation (Staff Hours)	50% Landowner Participation (Staff Hours)	75% Landowner Participation (Staff Hours)	50% Landowner Participation (Staff Hours)
Project & Financial Mgmt.	1-8	4,400	4,400	4,800	4,800
Information & Education Program	1-8	1,360	1,360	1,800	1,800
Pre-Contact Office Inventory:	1-8	4,200	2,800	6,300	4,200
Landowner Contacts, &					
Progress Tracking &					
Update Inventory					
Conservation Planning:	1-3	3,300	2,200	4,950	3,300
Cost-share Agrmt. Development					
Plan Revisions & Status Review & Monitoring	1-8	900	600	1,350	900
Practice Design & Installation	1-8				
Upland Sediment Control		9,657	6,438	11,209	7,472
Barnyard Runoff Control		4,056	2,704	7,542	5,028
Manure Spreading Mgmt. & Storage		1,455	970	5,273	3,515
Streambank & Shoreline		5,030	3,353	6,375	4,250
Erosion Control					
Archaeological Studies	1-8	240	240	200	200
Training	1-8	1,600	1,600	1,350	1,350
Leave	1-8	2,640	2,640	3,200	3,200
TOTAL LCD WORKLOAD:		38,838	29,305	54,349	40,015
Estimated Staff Required for Years 1-3:		6,689 per yr	4,930 per yr	9,538 per yr	6,880 per yr
Estimated Staff Required for Years 4-8:		3,749 per yr	2,903 per yr	5,147 per yr	3,875 per yr

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and Land Conservation Departments of Calumet and Fond du Lac Counties.

Table 5-5. Technical Assistance Staff Needs

	CALUMET COUNTY			FOND DU LAC COUNTY		
Best Management Practice	BMP Needs	Hourly Rate/Unit	Total Hours	BMP Needs	Hourly Rate/Unit	Total Hours
Upland Sediment Control						
Change in Crop Rotation	5,700 ac	0.033	188	11,100 ac	0.033	366
Contour Cropping	950 ac	0.230	219	1,850 ac	0.380	703
Contour Strip Cropping	500 ac	0.400	200	900 ac	0.380	342
Reduced Tillage	300 ac	0.030	9	500 ac	0.250	125
Reduced Tillage (No-till)	1,000 ac	0.030	30	2,000 ac	0.250	500
Critical Area Stabilization	240 ac	0.250	60	445 ac	0.100	45
Grassed Waterways	155 ac	13.560	2,102	165 ac	34.000	5,610
Field Diversions and Terraces	15,000 ft	0.023	345	20,000 ft	0.060	1,200
Grade Stabilization	10 ea	50.000	500	12 ea	90.000	1,080
Agricultural Sediment Basins	50 ea	110.000	5,500	12 ea	110.000	1,320
Livestock Fencing From Woodlots	5,280 ft	0.050	264	5,280 ft	0.050	264
Nutrient & Pest. Management	5,000 ac	0.100	500	5,000 ac	0.100	500
Wetland Restoration	10 ea	40.000	400	20 ea	20.500	410
Shoreline Buffers	100 ea	24.000	2,400	100 ea	24.000	2,400
Spill Control Basins	2 ea	80.000	160	1 ea	80.000	80
Subtotals:			12,876			14,945
Animal Waste Management						
Complete System	32 ea	150.000	4,800	64 ea	150.000	9,600
Clean Water Diversion	16 ea	38.000	608	12 ea	38.000	456
Manure Storage Facility	17 ea	100.000	1,700	43 ea	150.000	6,450
Manure Spreading Management	24 ea	10.000	240	58 ea	10.000	580
Roofs for Barnyards	0 ea	25.000	0	0 ea	25.000	
Subtotals:			7,348			17,086
Streambank Erosion Control						
Shape and Seeding	27,018 ft	0.100	2,702	32,265 ft	0.130	4,194
Fencing	34,872 ft	0.040	1,395	23,605 ft	0.080	1,888
Rip-Rap	5,757 ft	0.330	1,900	5,120 ft	0.330	1,690
Livestock/Machinery Crossings	45 ea	8.000	360	17 ea	34.000	578
Shoreline Protection	700 ft	0.500	350	300 ea	0.500	150
Subtotals:			6,706			8,500
TOTALS:			19,583			40,531
Pre-contact Office Inventory	200 no.	4.000	800	300 no.	4.000	1,200
Landowner Contacts	400 no.	4.000	1,600	600 no.	4.000	2,400
Progress Tracking	400 no.	6.000	2,400	600 no.	6.000	3,600
Subtotal:			4,800			7,200
Conservation Planning	200 no.	8.000	1,600	300 no.	8.000	2,400
Cost-share Agreement Development	200 no.	8.000	1,600	300 no.	8.000	2,400
Subtotal:			3,200			4,800
Plan Revisions & Status Reviews & Monitoring	300 no.	4.000	1,200	450 no.	4.000	1,800
Subtotal:			1,200			1,800
Update Inventory	200 no.	4.000	800	300 no.	4.000	1,200
Subtotal:			800			1,200

Table 5-6A. Grant Disbursement Schedule at 75% Landowner Participation Rate for Calumet County

Item	Project Year			
	1	2	3	4 - 8
Cost-Share Funds: Practices	$244,555	$489,111	$489,111	$0
Cost-Share Funds: Easements	12,000	24,000	24,000	0
Local Assistance Staff Support	94,732	94,732	94,732	284,588
Information/Education: Direct	2,600	2,600	2,600	3,600
Other Direct: (travel, supplies, etc.)	20,000	20,000	20,000	46,000
TOTAL	$373,887	$630,443	$630,443	$334,188

Source: Wisconsin Department of Natural Resources; Wisc. Dept. of Agriculture, Trade, and Consumer Protection; and the Land Conservation Departments of: Calumet and Fond du Lac Counties

Table 5-6B. Grant Disbursement Schedule at 75% Landowner Participation Rate for Fond du Lac County

Item	Project Year			
	1	2	3	4 - 8
Cost-Share Funds: Practices	$344,575	$689,149	$689,149	$0
Cost-Share Funds: Easements	13,500	27,000	27,000	0
Local Assistance Staff Support	130,784	130,784	130,784	385,851
Information/Education: Direct	2,650	2,650	2,650	4,750
Other Direct: (travel, supplies, etc.)	20,000	20,000	20,000	46,000
TOTAL	$511,508	$869,583	$869,583	$436,601

Source: Wisconsin Department of Natural Resources; Wisc. Dept. of Agriculture, Trade, and Consumer Protection; and the Land Conservation Departments of: Calumet and Fond du Lac Counties

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

Coordination with State and Federal Historic Preservation Laws

A large part of the east shore of Lake Winnebago was formerly an area of Indian settlement and former reservation. This area, mainly along Lake Winnebago, will need special consideration when structural BMP's are being considered. Grass waterways, settling basins, manure storage structures, and streambank shaping and riprapping are likely structural practices that may impact archaeological sites. State and Federal laws require preservation of archaeological resources within the framework of the Wisconsin Priority Watershed Program.

The Lake Winnebago East Watershed project will address these concerns with the following procedures:

- Counties will use State Historical Society inventory maps with the location shown of known archaeological sites.

- Landowners interested in project participation will have their lands evaluated by County staff for the need to conduct an archaeological survey. The State Historical Society will determine the need for archaeological surveys. The Counties and the DNR District Coordinator will also be involved in this determination. A landowner questionnaire will also be used to identify additional noninventoried sites. The completed questionnaires will be sent to the State Historical Society for a determination of archaeological significance.

- If the inventory or questionnaire reveal an archaeological site and the proposed BMP may impact the site, an archaeological survey conducted by a qualified archaeologist will need to be completed. The survey will assess the potential of the BMP to significantly impact the site. Alternative BMP's may need to be considered both before and after the results of the survey.

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

Rural Project Budget

Cost-share Budget Costs: The total budget for cost share can be found in Table 5-2. The capital cost of installing the Best Management Practices in Calumet and Fond du Lac Counties is approximately $2.5 million and $3.6 million, respectively, assuming 100% participation.

- State funds necessary to cost-share this level of control would be about $1.7 million and $2.4 million for Calumet and Fond du Lac Counties, respectively.

- The local share provided by landowners and other cost-share recipients would be about $.79 million and $1.2 million, respectively.

At a 75% level of participation, the state funds needed to cover capital installation would be about $1.3 million and $1.8 million for Calumet and Fond du Lac Counties, respectively.

Easement Costs: Chapter 4 identifies where nonpoint source program funds can be used to purchase easements. The estimated cost for purchasing easements on eligible lands in Calumet and Fond du Lac Counties is shown in Table 5-2. At 100% participation, the estimated purchase price of easements on eligible lands would be $80,000 and $90,000 in Calumet and Fond du Lac Counties, respectively. At 75% participation, the cost would be $60,000 and $67,500; respectively. The state would the entire easement cost.

Staffing Costs: The estimated cost for staff at this landowner participation rate (see Table 5-7) is approximately $635,000 and $888,600; respectively, in Calumet and Fond du Lac Counties. All of these costs, except some direct cost items, would be paid for by the state.

Information and Education Costs: See Table 5-13.

Total Project Cost: The total state funding required to meet the rural nonpoint source pollution control needs at a 75% level of landowner participation is presented Table 5-7. This figure includes the capital cost of practices, staff support, and easement costs presented above. The estimated cost to the state would be $2.1 million and $2.80 in Calumet and Fond du Lac Counties, respectively.

Table 5-7. Total Project Costs at 75% Landowner Participation Rate

Item	Calumet County (State Share)	Fond Du Lac County (State Share)	Watershed Total (State Share)
Cost-share Funds: Practices	$1,277,377	$1,758,573	$3,035,950
Cost-share Funds: Easements	$60,000	$67,500	$127,500
Local Assistance Staff Support	$635,004	$888,597	$1,523,601
Information/Education Direct	$11,400	$12,700	$24,100
Other Direct (travel, supplies, etc.)	$106,000	$106,000	$212,000
Archaeological Studies	$9,000	$9,000	$18,000
TOTAL:	$2,098,781	$2,842,370	$4,941,151

* Salary + Indirect = $34,000/year

Source: Wisconsin Department of Natural Resources; Wisconsin Department of Agriculture, Trade, and Consumer Protection; and Land Conservation Departments of Calumet and Fond du Lac Counties.

Urban Program for Implementation

Timing and Sequencing of Urban Management Program

The following discussion provides guidance on how the urban nonpoint source control program will be implemented. First, it considers the relationship of the recommendations for existing and planned urban areas to the anticipated federal storm water permit program. Second, the elements of a "core" program for controlling urban nonpoint source are discussed. Finally, the contents and means for implementing the more complex elements of the urban management program (detention, infiltration, street sweeping) are presented.

Relationship of the Urban Management Program to the Federal Storm Water Permit Program

As discussed in Chapter 1, "Plan Purpose and Legal Status" a federal storm water permit program will begin during the implementation phase of this priority watershed project. The requirements of the federal storm water program will result in the issuance of permits under the Wisconsin Pollution Discharge Elimination System (WPDES) for discharging storm water to surface water and controlling construction erosion on sites 5 acres or larger. Certain industries will fall under the requirements of the federal program.

Implementation of the urban nonpoint source control recommendations in this plan will meet some of the requirements of the federal program. However, it is uncertain if financial assistance will be available for requirements specified in a storm water permit. Consequently, industries are encouraged to begin implementation of this plan's recommendations to take advantage of grant funds currently available under the nonpoint source program.

Core Elements of the Urban Management Program

The "core" elements of the urban nonpoint source control program applicable to local units of government include basic measures that can be implemented without further study. Adopting a community specific core program is the first step in the implementation process. As such, the City of Fond du Lac will need to commit within the first three years of the project to implement the core program. This is a requirement to receive technical and financial assistance through the priority watershed project.

This requirement applies only to the receipt of funds used directly by the municipality as a grantee, such as where the municipality installs, owns, and operates a management practice. It does not apply to those instances where the municipality acts as a grantor, passing cost-share funds through to private landowners. This means that individual landowners could receive cost-share funds from the DNR for the installation of management practices prior to a municipality's agreement to conduct core elements of the urban program.

The basic elements of the "core" program are:

- Develop, adopt and enforce a construction erosion control ordinance consistent with the "model" developed jointly by the Wisconsin League of Municipalities and the Department of Natural Resources. Construction erosion control practices should be consistent with the standards and specifications in the "Wisconsin Construction Site Best Management Practice Handbook."

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

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

"Segmented" Elements of the Urban Management Program

The "segmented" elements of the urban nonpoint source program include those requiring site specific investigations prior to implementation. It is anticipated that many of these segmented elements will be implemented individually as discrete nonpoint source control practices. An example would be the recently completed wet detention pond constructed in Fond du Lac with cost sharing between the Department of Natural Resources and the City of Fond du Lac. This pond is a demonstration of stormwater control to benefit water quality and wildlife in the Lower DeNeveu Creek subwatershed.

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

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

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

The basic elements of the segmented program are:

- Conduct detailed engineering studies to determine the best means to implement community specific nonpoint source control measures for existing urban areas. This element will also consider accelerated street sweeping as a component of the control strategy for existing urban areas. The effect of source reduction activities on the extent of urban structural practices needed to meet pollution reduction goals should be considered in conducting these studies. Some examples of source reduction activities that might be considered are presented in Chapter 4 in the section entitled "Source Area Controls."

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

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

- Adopt and enforce a comprehensive storm water management ordinance consistent with the State "model" storm water ordinance (under preparation). Following adoption of a Stormwater Management Guidebook, development of a stormwater management ordinance will be incorporated into the "core" program.

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

Program Participants--Roles and Responsibilities

The specific roles and responsibilities for program participants are summarized below. The primary participants include local units of government (cities, villages, towns, counties); the DNR; other agencies; landowners and land operators. Where applicable, the roles and responsibilities are discussed according to the previously described "core" and "segmented" approaches to project implementation. As noted in Chapter 1, "Plan Purpose and Legal Status," implementation begins following approval of this priority watershed plan by the Counties, DATCP, and DNR.

Local Units of Government "Core" Program Roles and Responsibilities

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

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

2. Adopt an adequate ordinance, develop administrative procedures, and determine staff needs to enforce a construction erosion control ordinance in the Fond du Lac portion of the watershed project within 12 months of the start of implementation.

3. Identify the roles and responsibilities of towns and counties for controlling construction erosion in unincorporated areas within six months of the start of implementation. Adopt adequate ordinances, develop administrative procedures, and determine staff needs to enforce a construction erosion control ordinance in unincorporated areas within 12 months of the start of implementation.

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

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

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

7. Prepare and submit to the DNR an annual report for the purposes of monitoring project implementation.

8. Participate in the annual watershed project review meeting.

Nonpoint Source Program funding for Fond du Lac County for implementing agricultural management recommendations is contingent upon county adoption of a county-wide construction site erosion control ordinance or the Towns of Fond du Lac and Empire.

Local Units of Government "Segmented" Program Roles and Responsibilities

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

1. Identify within 6 months of the start of implementation, the high priority segments the community wishes to pursue in existing and planned urban areas through the priority watershed project. This list can be amended throughout the 8 year project period.

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

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

4. Enter into cost-share agreements for eligible best management practices. For practices installed and maintained by private individuals, the cost-share agreement is between the landowner and the local unit of government.

   The local units of government will be required to:

   - Design or contract for the design of best management practices and verify proper practice installation,

   - Request reimbursement from the DNR for practices installed by private landowners, and in turn reimburse those landowners for the eligible amount of cost share,

   - Monitor landowner compliance with provisions of the cost-share agreement.

   For practices installed and maintained by the local unit of government, the cost-share agreement is between the unit of government and the DNR.

5. Submit information to DNR needed for project evaluation.

Department of Natural Resources

The DNR has been statutorily assigned the overall administrative responsibility for the Wisconsin Nonpoint Source Water Pollution Abatement Program. This includes providing financial support for local staff and installation of management practices, assisting local units of government to integrate wildlife and fish management concerns into selection and design of BMPs, and conducting project evaluation activities.

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

Core Program roles and responsibilities:

- Assist local units of government to develop and adopt construction erosion control ordinances.

- Review community specific programs of urban "housekeeping" 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:

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

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

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

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

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

- Approve stormwater management plans. Approval will be based upon the ability of the plan to meet the pollution reduction goals for the particular subwatershed.

Landowners and Land Operators

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

University of Wisconsin Extension (UWEX)

The area Extension agent and the Fond du Lac County Extension agent will provide support in developing and conducting a public information and education program aimed at increasing voluntary participation in the project. These activities are described later in this chapter in the Information and Education Implementation Program.

BMPs Eligible for Cost Sharing

Best management practices are those practices identified in NR 120 determined in this watershed plan to be the most effective in reducing nonpoint sources of pollution. Design and installation of the best management practices previously described under the rural implementation strategy must meet the conditions listed NR 120.

Generally these practices use specific standard specifications in the U. S. Soil Conservation Service Field Office Technical Guide. Specifications for the structural urban practices were described in Chapter 4, "Management Actions." Application of these practices will be guided by technical assistance provided by the DNR. Eligible practices and state cost-share rates are listed below.

Table 5-8. State Cost-Share Rates for Urban Management Practices

Best Management Practice	State Cost-share Rate
Critical Area Stabilization	70% [1]
Grade Stabilization Structures	70%
Shoreline and Stream Bank Stabilization	70%
Shoreline Buffers	70% [1]
Wetland Restoration	70% [1]
Structural Urban Practices	70% [2]
Street Sweeping	50% [3]
Land Purchases and Piping for Rerouting Stormwater	50%

1. Easements may be used in conjunction with these practices.
2. Applies only to structures for established urban areas.
3. This is an alternative best management practice not listed in NR 120, of the Wisconsin Administrative Code.

Source: Wisconsin Department of Natural Resources.

Using Easements To Support Urban Pollution Control Practices

Easements may be used to support wetland restoration, critical area stabilization, and shoreline buffers in urban areas to reduce the water quality impacts of stormwater runoff. Use of these practices as stormwater runoff control measures, and the use of easements to support these practices, must be reviewed on a case-by-case basis by the DNR. The same general rules set forth for easement use in rural areas also apply to urban stream reaches.

Activities and Sources of Pollution Not Eligible for Cost-share Assistance

Priority watershed cost-share funds cannot be used to control sources of pollution and land management activities specifically excluded in NR 120.10 and NR 120.17. The following is a partial list of ineligible activities most often inquired about for cost share in urban areas.

- Operation and maintenance of cost-shared best management practices (BMPs).
- Construction erosion control practices.
- Structural BMP's for new urban development. New urban development is construction activity commencing after the DNR approves this watershed plan.
- BMP's installed prior to signing cost-share agreement.
- Activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) Program.
- On-site septic system controls or maintenance; dredging activities.
- Activities and structures intended primarily for flood control.
- Storm water conveyance systems.
- Minimum levels of street sweeping & leaf collection.

This plan recognizes that some items not eligible for funding will be required to implement the plan recommendations. Examples include land purchase and the renovation or construction of storm sewer systems. Such activities will be needed to install structural urban practices such as wet detention ponds in many existing urban areas.

Limits on funding eligibility are meant to apply only to the priority watershed program as administered under existing administrative code. These limits are not meant to preclude separate budgetary or contractual financial assistance agreements. Such agreements might be developed under new state or federal programs, or with other units of government. This plan endorses the use of funds procured through such agreements to implement plan recommendations.

Nonpoint Source Grant Agreement and Administration

The Nonpoint Source Grant Agreement is the means for transmitting funds from the DNR to local units of government to provide cost sharing to install urban best management practices. In some cases the municipality will act only as a grantee. In this case, the municipality will use grant funds for practices it will install, own and operate.

Alternately, the municipality will play an additional role as a grantor. In these situations, the municipality will pass the cost-share funds it has received from the DNR to private landowners who install, operate and maintain the practices. When this occurs, the municipality will enter into a separate cost-sharing agreement with the private landowner receiving the state funds.

The procedures for administering Nonpoint Source Grant Agreements and Cost-share Agreements parallel those contained in this plan's rural implementation strategy prescribed in Chapter NR 120 of the Administrative Code.

Cost-share Agreement and Administration

Purpose and Responsibilities

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

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

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

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

Identifying Wildlife and Fishery Needs

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

- Stream bank or lake shoreline protection practices and critical area stabilization practices are being considered.
- Wetlands or other wildlife habitat components will be adversely affected by installation of BMPs.

The DNR staff will assist by:

- Identifying stream bank protection practices that benefit fish and wildlife.
- Identifying wildlife habitat components that could be incorporated into vegetative filter strips along streams or in upland areas.
- Providing technical assistance when the installation of BMPs will require the removal of obstructions or other wildlife habitat by proposing measures to minimize impact on wildlife habitat.
- Assisting to resolve questions concerning effects of nonpoint source BMPs on wetlands.

Cost Containment Procedures

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

Local Assistance Grant Agreement Administration

General Information

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

Activities described in the "core" and "segmented" elements of the urban implementation strategy are eligible for financial assistance. The type of eligible activities and the amount of state funds available are described in Table 5-9.

Table 5-9. Urban Administrative Costs Eligible for State Funding

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

1. Funding not available for components dealing exclusively with drainage and flooding.
2. Funding limited to 5 years. Level of staffing based on a work plan submitted by local units of government and approved by the DNR.

Source: Wisconsin Department of Natural Resources.

Grant Agreement Application Procedures

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

Fiscal Management Procedures, Reporting Requirements

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

Urban Budget and Staffing Needs

The estimated costs for implementing the urban "Core" and "Segmented" programs are discussed in the following section. The estimated cost for full implementation of the recommended practices is approximately 2.4 million, the State share being 0.7 million. These costs are shown in Table 5-10.

Table 5-10. Estimated Costs of Urban Practices in Existing and Planned Urban Areas of the Lake Winnebago East Watershed

Activity	Total Cost	State Share
Management Practices[1]	$1,142,000	$ 722,850
Staff Needs & Other Costs	$ 200,000	$ 200,000
Planned Land Use Practices[2]	$1,112,500	$ 0
Totals:	$2,454,500	$ 922,850

1. Includes estimated costs of Land acquisition and storm sewer rerouting.
2. These costs are the average of the recommended alternatives.

Engineering Feasibility/Sighting Studies

Detailed engineering feasibility studies will be needed for existing urban development to choose and site practices. Most of these studies will probably be carried out by the private sector, with most of the cost borne by the DNR. The studies are used to choose and site stormwater practices in areas of new development. Most of these studies will probably also be carried out by the private sector, with the cost borne partly by the DNR and partly by local units of government.

Detailed Engineering Designs

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

Cost of Installing Structural Practices in Existing Urban Areas

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

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

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

Table 5-11 presents cost information for installing wet detention ponds in existing urban areas. The cost information assumes 100% detention of existing critical land uses. The total cost for installing these ponds assumes $35,000 per surface acre of pond depending on the need to condemn and relocate existing structures such as homes or businesses. This cost estimate assumes that open land is available for purchase, but that extensive rerouting of the storm sewer system is required.

The state share of the cost is limited to 70% of the cost for pond excavation and development, and 100% of the design costs. This equals about $52,500 of state assistance per surface acre of detention pond. Additional costs, including land purchase and storm sewer rerouting, are not included in the table. Annual operation and maintenance costs are not eligible for cost sharing under the existing rules governing the state nonpoint source program.

There may be an inability of the local units of government to fund some components of these costs. Therefore, this financing plan recognizes that additional funding through new initiatives must be provided to improve full program implementation.

Table 5-11. Estimated Costs for Additional Street Sweeping and Wet Ponds in the Existing Urban Lands of the Lake Winnebago East Watershed

Subbasins	Street Sweeping Costs ($25/Curb Mile/Year)	Costs* ($35,000/Acre)	Total
Stow Street	$ 1,500	$ 27,000	$ 28,500
Taft Street	-	-	-
Willow Point	$ 100	$ 1,500	$ 1,600
Western Reserve	$ 750	$ 5,000	$ 5,750
Harbor View	-	$ 47,000	$ 47,000
McDermott Park	-	$ 51,000	$ 51,000
Reserve Avenue	$11,500	$107,000	$118,500
East Scott Street	$10,000	-	$ 10,000
Fourth Street	-	$ 56,500	$ 56,500
Gravity Flow	-	$ 28,500	$ 28,500
Outside Pump System	-	$436,000	$436,000
TOTAL:	$23,850	$759,500	$783,350

* Does not include land purchases or any operation and maintenance costs.

Cost of Installing Structural Practices in Planned Urban Areas

Factors which make retro-fitting so expensive should not be of concern in developing areas, as good planning can assure that land is set aside and stormwater practices are located in harmony with the conveyance systems.

An estimated $1.725 million will be required to install full wet detention in the planned urban areas and $650,000 for limited wet detention and all swales in lieu of curb and gutter. Land costs would be an additional expense. The entire cost would be borne locally, as Nonpoint Source Program funds are not used for practices in areas of new development.

Alternative Funding Sources

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

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

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

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

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

Operation and Maintenance for Structural Practices

O&M costs for detention are about 5% of the capital construction cost per year. This cost is not included the cost analysis and must be borne locally.

Cost of Street Sweeping in Existing Urban Areas

Table 5-11 indicates the estimated cost for increased street sweeping of the critical urban land uses as part of a program that phases in the required level of wet detention. The costs presented in the table assume a total cost of $25/curb mile. Principal component costs include wages and salaries (34%), indirect labor benefits and overhead (9%), maintenance and fuel (25%), equipment depreciation (16%), and litter disposal (16%). The total annual cost of improving local street sweeping programs to the accelerated level recommended in this plan is about $23,850. The annual state share would be approximately $11,925 and the annual local share also $11,925.

After five years, local units of government would need to maintain the accelerated levels of sweeping at their own expense as the Nonpoint Source Program funding is limited to a five-year period. As wet detention or other practices providing equivalent control are installed, the accelerated sweeping could be discontinued.

Cost of preparing construction site erosion control plans

This cost has not been estimated. It will be borne primarily by the private sector to meet requirements of local ordinances.

Cost of installing construction erosion control practices

It is assumed that construction site practices will average $250/acre. Using this unit cost, it will require an estimated $40,000 to install construction site erosion control practices in the watershed. All of this cost will be borne locally by the private sector to meet requirements of local ordinances.

Cost of administering construction and stormwater control ordinances

It is estimated that ½ staff year of effort will be needed in the City of Fond du Lac portion of the watershed annually. Assuming a unit cost of $40,000 per staff per year, the administrative cost is estimated to be $20,000 per year. Over the eight year life of the project, the estimated cost is $160,000. The Nonpoint Source Program will support 100% of the required staff salary, travel, etc. for five years if the local construction erosion funding fee program support falls short a in given year. The remaining three years would be funded locally, probably in part through permit fees. Each local unit of government is expected to continue supporting these administrative costs as needed in the years following the end of this watershed project.

Urban and Rural Project Cost Summary

Table 5-12 presents a summary of estimated costs for implementing the rural and urban portions of this watershed project. The estimated total project cost is $8.9 million. Rural recommendations will require 72% of this total to implement. The remainder of the cost is associated with controls in the existing and planned urban areas.

The most expensive aspects of the recommended plan include the construction of structural practices to control rural sources of pollution from nonpoint sources. This plan element is anticipated to cost about $4.5 million, or 51% of the total plan cost. This cost can be partly defrayed by state cost-share assistance through the Nonpoint Source Program.

Administrative costs for the control of construction site erosion is estimated to cost about $160,000 or about 1.8% of the total project costs, while controlling stormwater runoff from areas of new and existing development is estimated to cost $2.2 million or 25% of total project costs. These elements represent very cost-effective pro-active management actions.

In addition to these costs, an estimated $24,000 will be needed for information and education activities. These costs, in addition to those needed to support a regional education specialist are supported entirely by the DNR. A detailed discussion of the rural and urban Information and Education strategy is presented in the following section.

Table 5-12. Cost Estimates for the Lake Winnebago East Project

Rural	Total Cost	State Share
Management Practices:	$4,548,350	$3,035,950
Easements:	$127,500	$127,500
Information/Education Direct:	$24,100	$24,100
Staff Needs:	$1,523,600	$1,523,600
Archaeological Studies:	$ 18,000	$18,000
Other Direct Costs:	$212,000	$212,000
Subtotal:	$6,453,550	$4,941,150
Urban		
Management Practices:[1]	$1,142,000	$722,850
Staff Needs & Other Costs:	$200,000	$200,000
Planned Land Use Practices:[2]	$1,112,500	$0
Subtotal:	$2,454,500	$922,850
Total:	$8,908,050	$5,864,000

1. Includes estimated costs of land acquisition and storm sewer rerouting in existing urban areas.
2. These costs are an average of the recommended alternatives.

Information and Education Implementation Program

Rural Information and Education

The Lake Winnebago East Priority Watershed Information and Education (I & E) Strategy is based upon recommendations from the Lake Winnebago East Priority Watershed Urban and Rural I & E Advisory Committees. The goal of any I & E program is to change behavior or get people to adopt new behaviors. For the Lake Winnebago East Priority Watershed the goal and objectives are described below.

Goal

Have 75% or more of the eligible landowners adopt nonpoint source pollution abatement measures.

In order to reach this goal, the following objectives must be addressed:

- Increase watershed residents' awareness and understanding of nonpoint source pollution and the ecologic, economic and recreational problems associated with nonpoint source pollution.

- Increase watershed residents' awareness and use of nonpoint source pollution control measures (best management practices).

- Provide eligible landowners with enough information to help them decide if they will participate in the watershed project.

Each objective can be met using several I & E activities. Choosing the correct activity (tool) is a matter of choosing a "target" audience (those who should receive the message). Target audiences are listed in the rural and urban sections of this chapter.

For a watershed project to be successful, watershed residents (whether or not they are eligible for cost-sharing assistance) must understand what nonpoint source pollution is, how it occurs and how it can be reduced. This can be accomplished through public relation efforts. Public relations is defined as a means of creating a mutual understanding of an issue (a watershed project and nonpoint source pollution) with targeted segments of the population. The emphasis is placed on "mutual understanding" which implies two-way communication. Information and education activities should facilitate two-way communication between agency (LCD, SCS, DNR and UWEX) staff and watershed residents. Two-way communication allows watershed residents to express their interests and concerns, turning the watershed project into a community project where one group supports another. For example, environmental groups (that want clean water) can support the efforts of farmers (who can influence water quality) once they understand each other's (non-stereotyped) concerns.

Rural Information and Education Strategy

The purpose of a rural I & E strategy is to encourage watershed landowners to implement nonpoint source pollution control practices, or Best Management Practices (BMPs). The most obvious audience targeted for I & E programs is rural landowners, but there are others. Listed below are the target audiences identified in the rural portion of the watershed and a brief description of their (assumed) informational needs.

Target Audiences

Full-Time Farmers. A 1986 survey from the Milwaukee River Priority Watershed program reported that most farmers (88%) believed water quality should be protected. More than 90%, however, reported that their farms did not contribute to water quality problems. Other characteristics of this group include concerns over:

- The costs and benefits of BMPs
- public access requirements for stream buffers/conservation easements, and
- maintenance requirements for BMPs

Part-Time Farmers may be more difficult to reach than their full-time counterparts. On the other hand, since income is generated both on and off the farm, they may be more receptive to BMPs.

Absentee Landowners/Landlords. This group can be the most difficult to work with. They may be out of touch or unfamiliar with production agriculture, local regulations and agricultural (financial) programs. This audience is concerned about maintaining relationships with tenants.

Agribusinesses including fertilizer and chemical dealers, crop consultants, lenders/loan officers and machinery dealers. This audience can have a strong influence on farmers. The challenge of an I & E program is to educate agribusiness representatives about the financial benefits derived from BMPs.

Farm/Producer Groups. Farmers working with the vocational/technical school or belonging to groups such as the Holstein Breeders Association or Forage Council can be reached through these groups. The I & E program must, however, directly involve and be delivered by members of the group.

Government officials should at all times be informed about watershed activities and accomplishments. This audience includes town, county and village officials, and (although not public officials) the board of directors for local co-ops.

Organizations may have a strong interest in the watershed project and may help landowners adopt BMPs by offering financial assistance, providing labor or through moral suasion. Included in this group are conservation organizations.

I & E Activities

The following I & E activities were identified by the Rural I & E advisory committee.

Personal contacts are the most effective way to encourage participation in a watershed project and to facilitate two-way communication. Personal contacts work well when landowners are visited 2-3 times during the watershed sign-up period.

Newsletters will be used to convey information on the mechanics of the watershed, provide project updates and progress reports, generate an awareness of nonpoint source pollution problems, communicate concerns expressed by watershed residents, and introduce the readers

to BMPs. Both watershed newsletters and watershed articles in agri-business newsletters (DHI, PCA, UWEX, etc.) will be used.

Watershed Folders containing basic information about the watershed project and BMPs will be distributed to farmers and other rural landowners. The folders will also serve as a "cover piece" for educational packets distributed to the media, elected officials and other clientele groups at meetings and workshops.

Demonstrations that address specific watershed problems or unfamiliar management practices will be implemented. Potential demonstration projects include stream corridor/streambank protection, nutrient and pest management and dairy herd improvements associated with barnyard runoff controls.

Demonstration projects will be designed to answer the following questions:

- What are the economic and social costs of adopting the practice?
- What troubles (learning costs) may be encountered when adopting the new practice?
- Will the economic, social and aesthetic benefits compensate for the effort?
- What are the advantages of the practice (economic benefit, social prestige, community recognition, personal health, simplified management, etc.).

Specifically, proposed demonstrations will be evaluated according to the following criteria:

- Does practice address an identified major source of water pollution in the watershed?
- Is the practice needed in a variety of areas to achieve water quality goals?
- Is the practice unfamiliar and/or untested in the watershed or East Central Wisconsin?
- Does the practice require further research and refinement before widespread application? Would a demonstration aid this process?
- Is the proposed demonstration site highly visible--both physically and socially (involving community leaders), easily accessible, or located where there will be credibility ascribed to the practice?

Fact Sheets, Educational Workshops and Tours will be used to deliver the results of demonstration projects to farmers. They will also be used to educate farmers about the benefits and adoption of BMPs. Special tours and educational workshops on BMPs will not always be necessary. Often times a new, sometimes more captive, audience is reached when BMP information is included in educational events not directly related to water quality, such as a heifer housing tour or forage council workshop.

Public Meetings, if used as educational tools, can be the most effective means of gaining public involvement in a watershed project. When used properly, the public meeting is conducted by watershed residents to educate the "experts" (agency staff). The information acquired is then used to adjust and improve I & E activities in order to meet the needs of watershed residents.

Personal contacts, tours and workshops, demonstration projects, fact sheets and public meetings were identified as the most effective ways to increase landowner adoption of BMPs. Other I & E activities recommended by the I & E Advisory Committee include:

- **Road signs** to draw attention to the watershed project and specific BMPs.
- **Meeting** with various conservation, environmental and service organizations to describe the watershed project and learn about their water quality interests and concerns.
- **Video tapes**. A number of excellent video tapes on nonpoint source pollution are available for use at educational events.
- **Display**. Develop a portable display showing the watershed boundaries, water quality concerns, nonpoint source pollution abatement activities and water quality improvements.
- **Youth Activities**. Involve students in educational programs and field projects that relate to water quality.
- **Watershed Hats** will be given to participating landowners.
- **Watershed Awareness Week**.
- **Media Contacts**. County staff will deliver the information packets to local radio stations and newspapers and meet with the station managers and editors to introduce them to the watershed project. County UWEX staff will also cover watershed issues in their news releases, newsletters and radio programs.

Annual I & E Strategy Update

The Lake Winnebago East Priority Watershed I & E strategy will be reviewed by the I & E Advisory Committee and updated annually. Annual updates will further define educational materials and events, costs and timing, and identify additional I & E activities needed to address concerns raised by watershed residents (see Table 5-13).

Urban Information and Education

Unlike the rural portion of the watershed, most urban nonpoint source pollution control measures will be regulatory or voluntary (without cost share), placing a heavy emphasis on educational programs. There are three messages that must be delivered to urban watershed residents:

1. nonpoint source pollution is a serious water quality problem

2. urban land use activities contribute to nonpoint source pollution and

3. homeowners, municipal officials and local businesses (especially builders, contractors and realtors) can reduce urban nonpoint source pollution

Target Audiences

The Winnebago East Watershed Urban I & E Advisory Committee identified builders, contractors, realtors, youth groups, schools, service organizations, new home owners and other watershed residents as the primary target audiences. Important characteristics of each audience and the best ways to reach them are summarized below.

Home Owners and Watershed Residents

In 1989, 5,500 Milwaukee residents were surveyed to determine what educational activities were the most effective for reaching an urban audience. According to the survey, Milwaukee area residents preferred to receive water quality information from materials delivered into the home, including:

- Community newsletters
- Television news reports
- Educational materials

Other characteristics of these target audiences include:

Approximately 50-70% of the respondents reported that they are "very likely" to learn about water quality through these sources. On the other hand, less than 15% reported that they are "very likely" to attend meetings or workshops (6%), check out videotaped programs from local libraries or visit demonstration sites. Workshops, videotaped programs and demonstration projects are more appropriate for highly motivated, interested citizens and groups rather than the general public.

Table 5-13. Rural I & E Activities (sign-up phase)

Activity	Responsibility	Number	Cost
Barnyard Management Tour	UWEX/LCD	2	$ 500
Manure Management Tour	UWEX/LCD	2	$ 500
Demonstrations			
Livestock Exclusion	LCD	1	NA
Barnyard Improvement	UWEX/LCD	2	$2,000
Streambank Protection and Wetland Restoration	DOT/DNR/ UWEX/LCD	1	NA
Conservation Tillage	UWEX	4	NC
Nutrient/Pest Management	UWEX	4	NC
Fact Sheets	UWEX/LCD	6	$3,000
Where is the Watershed?			
What is a Watershed?			
Inventory Results			
Where Does the Runoff Go?			
Public Hearings/Informational Meetings	UWEX/LCD/ DNR	12	$2,400
Signage (includes hats)			$5,000
Videotapes (use)			NC
Display/Shows	UWEX/LCD	30	$ 500
School Conservation Field Day	UWEX/LCD	2/year	$ 200
Newsletters	UWEX/LCD	4/year	$10,000
News Releases	UWEX/LCD	ongoing	NC
Radio	UWEX/LCD	ongoing	NC

NA - Not Available

NC - No Cost

Other characteristics of the urban residents and interest groups audience include:

- Most urban residents (55% in the Milwaukee survey) believe that industry ("point source pollution") is the main polluter of water.
- Place a value on "quality of life" and clean neighborhoods. Pessimism about the degree of water quality improvements possible.
- Unwilling to accept any degree of risk from toxic materials.
- Unaware of the stormsewer-surface water connection.
- Unaware of "toxics" used in the home, yard, or for recreation.
- Most enjoy some type of outdoor recreation (walking or jogging, swimming, picnicking or fishing).

Builders, Contractors and Realtors. The nonpoint pollutant found most frequently in urban waterways is sediment. By using construction site erosion controls and stormwater management techniques this target audience can reduce urban nonpoint source pollution significantly. Construction site erosion and stormwater controls may not be widely used or properly used, however. Concerns that this audience may have about BMPs include cost/benefit ratios, time and labor constraints, and remaining competitive. Builders, contractors and realtors may also lack familiarity with stormwater management and construction site erosion control practices.

Service Organizations. Urban residents who may not receive urban nonpoint source pollution information at home may be reached through the organizations that they are affiliated with or organizations distributing I & E materials. Professional, service and hobby organizations are frequently searching for guest speakers who will deliver short, high-quality presentations. Meeting with these groups can help watershed staff gain an understanding of the interests and concerns people have about water quality and adjust the I & E strategy accordingly.

Youth Groups and Schools. Youth, particularly in grades 6-9, are willing to participate in activities that reduce nonpoint source pollution and be taught about water quality (such as streambank improvement work or monitoring water quality). They can also help educate the general public (including their parents) about nonpoint source pollution through community projects and projects at home. In-class lesson plans are available relating these outside activities to a science curriculum and may help teachers meet the statewide mandate for environmental education.

I & E Activities

The following I & E activities were recommended by the Urban I & E Advisory Committee to encourage the target audiences to adopt nonpoint source pollution control measures.

Demonstration Projects. Most realtors, builders and contractors are not familiar with construction site erosion controls or the benefits of stormwater management. These practices will be demonstrated during the planning and sign-up phases of the watershed.

Tours of the demonstration sites will be held for public officials, builders, realtors and contractors.

Video tapes on urban nonpoint source pollution are available. They will be used during presentations, at the Fond du Lac Home Show and broadcast on the local cable television channel. In addition, an urban stormwater management video documenting problems and benefits of detention ponds and construction site erosion controls will be developed.

Fact Sheets rather than newsletters will be used to provide target audiences with information on reducing local nonpoint source pollution problems. The fact sheets will be developed using a "how to" approach without a lot of background information. They will have a "Save the Lake" logo and be distributed at shows, the Fond du Lac County fair, area businesses, schools and at meetings held by service organizations.

Fact sheets will also be developed for the storm-water management and construction site erosion control demonstrations. These fact sheets will accompany the video tape.

Construction Site Erosion/Stormwater Management Workshops will be offered in winter or early spring to provide technical information on these subjects to local government staff, builders, contractors, engineers and consultants.

Newsletters. Rather than producing a newsletter and assembling a newsletter mailing list, articles on nonpoint source pollution abatement activities will be printed in existing newsletters. Newsletters to be used include Fond du Lac County UW-Extension's "Pathways to Homes and Gardens," the Chamber of Commerce newsletter, contractor mailings and the realtor newsletter.

A **display** showing stormwater management and construction site erosion control practices will be developed for different programs and events in the community, including the Fond du Lac Home Builders Show. This display may also be used in other urban areas such as the East River Priority Watershed project.

Radio talk shows are effective ways to disseminate information and educate people about urban nonpoint source pollution controls.

Newspaper Articles. The Fond du Lac Reporter will provide excellent coverage of urban water quality issues. The editor will be contacted to establish a monthly water quality column that will feature the "Save the Lake" logo.

Education Programs. Area and county UWEX agents will acquire water quality curricula for different age groups and introduce them to the appropriate teachers. At the same time, an Adopt-A-Waterway Program will be established at Thiesen and Sabich middle schools, Goodrich High School and Lake Shore Elementary School. Other education programs will include a water quality "station" at the annual "Outdoor Classroom," and in-class presentations.

Youth Group Programs. School water quality programs will be supplemented by youth group programs that include educational events and community service projects. Youth groups will also be asked to help with demonstration projects such as streambank improvements and waste reduction, recycling, and pollution abatement activities around the home.

Yard Care Programs. Yard care information and education activities will be provided for urban residents. These activities will include presentations, printed materials, model yard contests or demonstrations and a walking tour similar to that used in the Yahara-Monona Priority Watershed. Master gardeners and other volunteer leaders trained by the Fond du Lac County Extension Horticulture Agent will provide programs for community groups on alternative yard care practices that reduce or prevent nonpoint source pollution.

Annual I & E Strategy Review

The Lake Winnebago East Priority Watershed Urban I & E strategy will be reviewed by the Urban I & E Advisory Committee and updated annually.

Table 5-14. Urban I & E Activities

Target Audience	Note	Activity	Responsibility	Cost	Number
Homeowners/ Watershed Residents	See below	News Release	UWEX	-	NA
		Newsletter	UWEX	-	NA
		Fact Sheet		$4,500	3,000
		Radio Talk Show		-	NA
		Model Yard Demonstration		$ 250	1
		Walking Tour		$ 250	1
		Group Presentation/Master Gardeners		-	NA
		Display at Local Shows		$ 400	2
		School/Youth Programs		-	NA
		Cable TV-videotapes		$ 150	NA
Builders/ Contractors Realtors		News Release	UWEX, City of Fond Du Lac	-	NA
		Newsletter	DNR, LCD	-	NA
		Factsheet		$1,000	750
		Construction Site Erosion Control Demonstration		$1,500	1
		Radio Talk Show		-	NA
		Chamber of Commerce Tour		1	
		Presentations		$1,500	
		Display at Home Building Show		Listed Above	Listed Above
		Construction Site Erosion Control and Stormwater Mgmt. Workshops		$ 500	2
		Video		$1,000 See Rural	1 Activities
Service Organizations		News Release	DNR, UWEX	-	NA
		Newsletter	UWEX	-	NA
		Factsheet	UWEX	Same as for Homeowners	
		Presentations	City of Fond Du Lac	-	NA
		Video	LCD	-	NA
		Adopt-A-Waterway	UWEX, School Administrators	$5,000	-
		Watershed Folders		See Rural Activities	
Youth/Schools		Factsheet	UWEX, DNR	Same as for Homeowners	
		Presentations	UWEX	-	
		Shows/display	UWEX	-	
		Video	LCD	-	NA
		Adopt-A-Waterway	School Administrators	$5,000	NA -
		Watershed Folders		See Rural	
			Total:	$15,050	

* Message - The following messages will be delivered to the target audiences using the activities listed:

- What is Nonpoint Source Pollution?
- How do People Benefit from Clean Water?
- How Does Nonpoint Source Pollution Affect the Different Audiences?
- How can People Reduce Nonpoint Source Pollution?
- What is Being Done to Reduce Nonpoint Source Pollution?

CHAPTER SIX: Integrated Resource Management Activities

This portion of the plan describes how the priority watershed project will coordinate with DNR fish and wildlife management programs. The main focus will be to comply with integration issues related to improving fish and wildlife habitat through installing best management practices and developing conservation easements in eligible areas. The methods for integration are presented below.

Identifying Wildlife and Fishery Needs

The Fond du Lac and Calumet County staffs will consult with DNR's Southern and Lake Michigan District wildlife management and fisheries management staff to optimize the wildlife and fish management benefits of nonpoint source control BMP's. Specifically, the county staff will contact DNR staff if:

- Streambank protection practices, agricultural sediment basins, or critical area stabilization practices are being considered.

- The installation of BMP's will remove significant fence rows, rock piles, wetlands or other wildlife habitat. Lost wildlife habitat in these instances will be recreated.

The DNR staff will assist county staff by:

- Identifying streambank or lakeshore protection practices benefitting fish and wildlife.

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

- Reviewing placement of agricultural sediment basins to assure that negative impacts on stream fish and aquatic life do not occur and recommending wildlife habitat components.

- Providing technical assistance when the installation of BMP's will require the removal of obstructions or other wildlife habitat by proposing measures to minimize impact on wildlife habitat.

CHAPTER SEVEN: Progress Assessments

Introduction

Project evaluation has three components:

1. evaluation of project administration,
2. evaluation of reduction in pollutant loading, and
3. evaluation of changes in surface waters.

This chapter briefly summarizes how progress will be measured in carrying out the required administrative activities, and in reducing nonpoint source pollutant loads to surface waters. The surface water evaluation monitoring activities planned for the project area are set forth in Chapter 8.

Rural Administrative Review

Evaluating progress in project administration and in reducing pollutant loads will be accomplished primarily by the Fond du Lac and Calumet County Land Conservation Departments and reported on a regular basis to DNR and DATCP.

The administrative review will focus on indicators of accomplishment, financial expenditures made through the project, and staff time spent on project activities.

Accomplishment Reporting

CAMPS, the Computer Assisted Management and Planning System, is a computer data management system that has been developed by the U.S. Soil Conservation Service (SCS), and is used by SCS, DNR and DATCP to meet accomplishment reporting requirements of all three agencies. Data on administrative accomplishments will be collected by the counties using CAMPs, or an equivalent system and provided to DNR and DATCP for program evaluation. If CAMPs is not utilized, an equivalent system will need to be developed by the county or counties that provides the same information as CAMPs.

The following data will be provided quarterly by the counties to DNR and DATCP:

- status of landowner contacts
- completed I&E activities
- number of farm conservation plans prepared for the project
- number of cost share agreements signed
- number of farm conservation plan and cost share agreement status reviews completed
- number of farms and acres of cropland checked for proper maintenance of best management practices

In addition, County representatives will meet with DNR and DATCP staff annually to review progress and identify workplan objectives for the subsequent year.

Financial Expenditures

The Counties will provide the following data quarterly to DNR and DATCP:

- money encumbered in cost share agreements
- number of landowner reimbursement payments made for installation of best management practices (BMPS), and 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 LCD staff

The counties will provide the following information annually:

- staff training expenditures,
- interest money earned and expended, and
- total county LCD budget and expenditures on the project.

Time Spent On Project Activities

The Counties will provide time summaries quarterly to DNR and DATCP for the following activities:

- project and fiscal management
- clerical assistance
- pre-design and conservation planning activities
- technical assistance: practice design, installation, cost share agreement status review, and compliance monitoring
- educational and training activities
- leave time

Rural Pollution Load Reduction

The purpose of the second evaluation component, pollution load reduction, is to calculate reductions in the amount of key pollutants as a result of installing best management practices. Four sources have been identified estimate changes in pollution loads reaching surface waters:

1. streambank erosion,
2. upland sediment,
3. runoff from barnyards, and
4. fields spread with manure.

Streambanks

Fond du Lac and Calumet Counties will calculate changes in streambank sediment in terms of tons of sediment and length of eroding sites. A tally will be kept of landowners contacted, the amount of stream bank sediment being generated at the time of contact, and changes in erosion levels estimated after installing best management practices. This information will be summarized and submitted to the DNR annually.

Upland Sediment Sources

The counties will estimate reductions in sediment delivery due to changes in cropping practices, and submit a summary annually to the DNR. Periodically, the DNR will calculate changes using the WIN model. Data for the WIN model will be provided by the Counties through the CAMPS or equivalent.

Barnyard Runoff

The Counties will use the BARNY model to estimate phosphorus reductions due to installation of barnyard control practices. This information will be summarized annually to DNR through the CAMPS or equivalent.

Manure Spreading

The Counties will identify the number of total acres where winterspreading will no longer occur as a result of implementing management practices.

Urban Administrative Review

Accomplishment Reporting

Evaluation of the urban program components will be conducted jointly by the DNR and local units of government. Local units of government will report annually to the DNR on progress for "core" program activities. Reports will cover:

- scheduled information and education activities
- completion of construction site erosion control ordinance modification or adoption
- acres of construction activity with adequate erosion control plans
- acres of construction activity monitored for compliance with provisions of ordinance and erosion control plans
- identification of needed changes in housekeeping
- implementation of housekeeping program changes

Local units of government will report annually on progress for "segmented" program activities. Reports will cover:

- existing 1990 urban acres, by land use, covered by engineering feasibility studies,

- acres of new post 1990 urban development, by land use, covered by plans for controlling urban pollutant loads and storm water flows

- acres of new post 1990 urban development, by land use, not covered by plans for controlling urban pollutant loads and storm water flows

- storm water ordinance adoption or modification

- feet and tons of eroding streambanks addressed in detailed engineering feasibility studies

Financial Expenditures, Time Spent on Project Activities

Reporting on these items will parallel reporting specified in this plan for the rural areas.

Urban Pollutant Load Changes

Local units of government will provide the following information annually to the DNR so it can evaluate changes in urban pollutant loading:

- existing 1990 urban acres, by land use, served by urban storm water practices, and information requested by the DNR concerning practice characteristics

- acres of new post 1990 urban development, by land use, served by storm water practices, and information requested by the DNR concerning practice characteristics

- acres of new post 1990 urban development, by land use not served by storm water practices

- acres of construction site activity served by adequate erosion control practices

- acres of construction site activity not served by adequate erosion control practices

- changes in stream bank erosion, in tons and feet of erosion, due to installation of erosion control and flow reduction practices.

Source reduction activities taken by a community to reduce urban pollutant loadings should also be acknowledged. Although the effect on urban pollutant loadings may not be quantifiable, accomplishments should be recognized and publicized as having a positive impact on efforts to reduce pollutant loads.

CHAPTER EIGHT: Water Resources Evaluation Monitoring Plan

Introduction

The purpose of water resource evaluations in the Lake Winnebago East Watershed is to determine if the water resource objectives of the Priority Watershed project are being met. Project objectives are to reduce sediment and phosphorus loadings to the watershed streams and ultimately to Lake Winnebago. This evaluation monitoring plan will direct the monitoring activities for the duration of the implementation phase of the Priority Watershed project so that changes in water quality, habitat, or biota can be determined. The plan identifies the monitoring locations, activities, and methods that the DNR will use. It also identifies the cost and workload for these evaluations. This monitoring plan will be received annually and updated as necessary.

Water Resources to be Monitored

Pre-project evaluation monitoring will be conducted in 1992 and 1993; mid-project monitoring in 1996; and post-project monitoring will be conducted in 2000 and 2001 for all activities except fishery inventories. This evaluation monitoring will be done at all appraisal monitoring and fish assessment sites (Table 8-1). In addition, intensive evaluation monitoring will be done at approximately four sites in the watershed where the chance for water quality improvement is greatest, based on the severity of existing pollution sources and the potential of the stream for improvement. Potential sites have preliminarily selected and are listed in Table 8-2.

The exact streams, sites and years when this intensive monitoring will take place will be determined by the District Biologist and County Land Conservation Departments so that monitoring can take place above and below and before and after installation of Best Management Practices (BMP's). A control site will also be selected to provide a measure of natural variation between years or seasons aside from those expected due to pollution reduction.

Monitoring Activities

Water quality evaluations for streams and rivers will be based on changes in chemical and bacteriological parameters as well as on changes in several resource components including; stream habitat, macroinvertebrate populations, amphibian populations and fish communities. All of the monitoring described below will be conducted by the staff of the Department of Natural Resources Lake Michigan District or volunteer groups. A recommended monitoring schedule with an estimated workload is shown in Table 8-3.

Lake Monitoring

As part of an on-going monitoring program to determine the trend in phosphorus concentrations and trophic status of Lake Winnebago, monitoring is conducted eight to nine times per year at three locations on Lake Winnebago. The northern site is 2.0 nautical miles from the public boat launch at the water tower in Neenah. The mid-lake station is 3.0 nautical miles from the mouth of the Fox River in Oshkosh. The south site is east of Long point Island, 2.4 - 2.9 nautical miles from the Town of Black Wolf public access. Sampling is done on a year around basis with monitoring frequency increased during spring runoff. This intensive monitoring began in 1989 and will hopefully continue through 1995. Total phosphorus, dissolved phosphorus, suspended solids, dissolved oxygen, temperature, kjeldahl nitrogen, ammonia-nitrogen, nitrate + nitrite, chlorophyll a, and water clarity (determined by secchi disc transparency) readings are collected.

Stream Monitoring

Macroinvertebrate / Biotic Index Sampling

Using procedures described in the Departments' Field Procedures Manual (FPM), Benthic Invertebrate Sampling - 1001, the Hilsenhoff Biotic Index (HBI) will be used to assess water quality conditions. The HBI primarily reflects long-term oxygen conditions in streams, but does not necessarily measure other habitat-related variables such as turbidity or sedimentation. One replicate macroinvertebrate sample will be collected at each of the appraisal monitoring locations in mid-April and mid-October. One replicate will also be collected at the control site at the same time samples are collected at the intensive monitoring sites. Three replicate samples will be collected upstream, downstream, before and after installation of BMP's at each of the intensive monitoring sites.

Fishery Inventories

Stream segments 35 to 40 times the mean channel width will be electrofished to determine the relative abundance of game and forage fish species. Fish will be captured with either a stream shocker or backpack shocker depending upon stream size. All fish collected will be counted and identified to species. Fish assessments will take place at the same sites as the 1990 survey

sites (Table 8-1). Pre-project surveys will be conducted in 1992; mid-project survey in 1996; and post-project surveys in 2000 and 2001. This data will be compared to the 1990 fish survey data and will be used to supplement habitat evaluation information.

Wildlife Resource Assessment (Amphibians)

Amphibian species and their populations will be assessed using calling surveys and drift nets. Amphibian (frogs, toads, and salamanders) surveys will be used to determine existing and changing water quality and land uses. Monitoring will be conducted by the Water Quality class or the Conservation organization from the Fox Valley Technical College with DNR Wildlife assistance.

Calling surveys will be done at or near each fish assessment and intensive monitoring site when the water temperatures reach 50°F, 60°F, and 70°F. The surveys will last three days and nights. Drift net monitoring will be done at the same time as the calling surveys. In addition, a forth period will be done around August 29 to September 7 to monitor for salamanders. Drift nets will be checked in the mornings and evenings.

Stream Habitat Evaluations/Sediment Depth Measurements

Physical stream habitat conditions will be evaluated concurrently with fish surveys and also in spring and fall at each appraisal monitoring site. Stream habitat evaluations will also be done at each intensive monitoring and control sites. Using the Stream Classification Guidelines (DNR Tech Bulletin. Ball, 1982.), physical factors of the stream which may limit the quantity and quality of aquatic life are ranked to give stream habitat ratings from excellent to poor.

To identify sediment build-up in the stream beds, habitat assessments will include taking cross sections of sediment depth and aquatic macrophyte coverage at each intensive monitoring site and the control site before implementation of BMP's and after the project is complete.

Flows

Flows will be determined in spring and fall at each of the appraisal monitoring sites and also at the intensive monitoring and control sites using method described in FPM, Open Channel Flow Measurement-2301.

Bacteriological / Nutrient Monitoring

Bacteriological and water chemistry samples will be collected in spring and fall at each appraisal monitoring site and also in the spring, summer, and fall at each of the intensive monitoring site and the control site using procedures described in FPM, Sample Handling and Preservation. The samples will be sent to the State Lab of Hygiene for fecal coliform, fecal streptococcus, total phosphorus, dissolved phosphorus, suspended solids, kjeldahl nitrogen, ammonia-nitrogen, nitrate + nitrite, biochemical oxygen demand, and chemical demand analysis.

Dissolved Oxygen and Temperature Monitoring

Continuous dissolved oxygen and temperature monitoring will be conducted for a two week period during the months of high macrophyte respiration (June, July, and August). Monitoring will be done at each of the four intensive monitoring stream sites in hopes to monitor one or more nonpoint source runoff events. Continuous dissolved oxygen and temperature monitoring will also be conducted at the control site for comparison. Dissolved oxygen, temperature, and pH will be collected in spring and fall at each appraisal monitoring site.

Groundwater Monitoring (Tentative)

A groundwater evaluation study to monitor changes in groundwater quality may be conducted to access the effectiveness of nutrient and pesticide management activities within an internally drained area of the watershed. The study proposal will be considered by the Department and is subject to review and approval by the Department.

Cost of Monitoring (using 1990 cost estimates)

A. Laboratory costs
   Lake nutrients - 45 samples @ $81.90 each.
   Stream nutrients/bacteria - 160 samples @ $95.95 each.

B. Contract costs
   Macroinvertebrate sorting and analysis - 156 samples @ $69 each.

C. Equipment costs
   Roughly $500 per year will be required for maintenance and replacement of monitoring equipment.

Workload Analyisis

A summary of hours needed by DNR staff to conduct proposed monitoring for the Lake Winnebago East priority watershed project is listed on Table 8-3. The workload focuses not only on monitoring activities at the appraisal monitoring locations, but also intensive monitoring above and below BMP installations on several streams and a control site. Because of the uncertainty of when and where some of the monitoring will be conducted, which depends on when and where BMPs are installed, the workload estimates may need to be revised.

Table 8-1. Lake Winnebago East Priority Watershed Evaluation Monitoring and Fish Assessment Sites

Site #	Stream	Location
1.	Mill Creek	HWY E, 30' upstream
2.	Mud Creek	Mud Creek Road, 150' upstream
3.	Brothertown Creek	Harbor Road, 25' upstream
4.	DeNeveu Creek	4th Street, 300' upstream
5.	DeNeveu Creek	HWY V, 150' upstream
6.	Taycheedah Creek	HWY T, 25' upstream
7.	Taycheedah Creek	Grandview Road, 30' upstream
8.	Roberts Creek	Artesian Road, 1/2mi from 55
9.	Johnson Creek	Lakeshore Drive, upstream
10.	Pipe Creek	HWY 151, upstream

Table 8-2. Potential Intensive Evaluation Monitoring Sites and Control Site in the Lake Winnebago East Watershed

1 Brothertown Creek at South Tower Road

This is a perennial stream with a small drainage area. There are obvious nonpoint source impacts such as soil erosion from farm fields and pastureland on the creek banks. This site is near the headwaters of this springfed creek.

2 Mill Creek at Hwy 55 and Moore Road

This perennial stream has a small drainage area and obvious nonpoint source impacts such as barnyard and pastureland next to the creek. This area preliminarily ranked high phosphorus loading rates from nonpoint sources.

3 Pipe Creek at St. Paul Road

This is an intermittent stream with its headwaters starting about one mile upstream. This area preliminarily ranked high phosphorus loading rates from nonpoint sources.

4 Upper Taycheedah Creek at Artesian Road between CTH "UU" and Tower Road

This is a perennial stream with obvious nonpoint source impacts such as barnyards and pastureland next to the creek. This site is about two miles from its headwaters and preliminarily ranked high phosphorus loading rates from nonpoint sources.

5 Roberts Creek (Control Site)

Robert Creek, located in the Mud Creek sub-watershed, is a potential control site because it has a very small drainage area, is perennial, and is relatively unimpacted by severe nonpoint source pollution. Monitoring should be conducted as close to the headwaters as possible. Monitoring at this site will provide baseline data to which other streams can be compared.

Table 8-3. Recommended Schedule and Workload Estimates (hours) for Evaluation Monitoring Activities

Activity	1991-1995	1992-1999[2]	pre-project		mid-project	post-project	
			1992	1993	1996	2000	2001
Lake Nutrients [1]	sp/su/fa/wi						
Macroinvertebrates							
Intensive monit sites		Apr/Oct					
Appraisal sites			Apr/Oct	Apr/Oct	Apr/Oct	Apr/Oct	Apr/Oct
Fisheries Assessment			su		su	su	su
Habitat Evaluation		sp/su/fa	sp/su/fa	sp/fa	sp/su/fa	sp/su/fa	sp/su/fa
Bacteriological/Nutrients		sp/su/fa	sp/fa	sp/fa	sp/fa	sp/fa	sp/fa
Flows		sp/su/fa	sp/fa	sp/fa	sp/fa	sp/fa	sp/fa
D.O./ Temp / pH		sp/fa	sp/fa	sp/fa	sp/fa	sp/fa	sp/fa
Continuous D.O./Temp		su					
Total hours [3]	192	560	200	80	200	200	200

1 Nutrients will be monitored at three locations on Lake Winnebago 8 to 9 times per year through 1995.

2 These parameters will be collected before and after and upstream and downstream of BMP installations on approximately four streams within the watershed and one control site. The exact year and location of monitoring depends upon when and where BMP's are installed.

3 Approximate hours required each year for conducting these evaluation monitoring activities.

sp - spring
su - summer
fa - fall
wi - winter
Apr - Mid April
Oct - Mid October

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APPENDIX A:
Water Quality Appraisal Methods

Introduction

A number of methods were used to assess the existing and potential water Resources conditions including:

- Hilsenhoff Biotic Index (aquatic insect)
- continuous and minimum-maximum dissolved oxygen
- stream fishery habitat assessment
- fish population
- chemical concentrations
- bacteria population.

Hilsenhoff Biotic Index (aquatic insect)

Biotic index samples were collected at sites throughout the Black Earth Creek watershed. The Hilsenhoff Biotic Index is a measure of degree or organic pollution in a stream. It is presumed to be most responsive to dissolved oxygen conditions in the stream. The method assigns tolerance and intolerance factors to different insects collected in the stream. Based on each site. a biotic index value is calculated. There are no water quality standards based on Hilsenhoff Biotic Index values. The following table shows the magnitude of organic pollution relative to Hilsenhoff Biotic Index values (prior to the recent revision to a 10-point scale).

Continuous and Minimum-Maximum Dissolved Oxgen

Dissolved oxygen concentrations directly influences the health of fish and other aquatic life. The water quality standards for Wisconsin are 5.0 mg/l for streams classified as full fish and aquatic life. Concentrations of less than 5 mg/l dissolved oxygen result in stress to some

Biotic Index Water Quality Degree of Organic Pollution

Biotic Index	Water Quality	Degree of Organic Pollution
0.00 - 1.75	Excellent	No organic pollution
1.76 - 2.25	Very good	Possible, slight organic pollution
2.26 - 2.75	Good	Some organic pollution
2.76 - 3.50	Fair	Significant organic pollution
3.51 - 4.25	Poor	Very significant organic pollution
4.26 - 5.00	Very Poor	Severe organic pollution

Reference: Hilsenhoff. William A. 1982. Using a biotic index to evaluate water quality in streams, Wisconsin Department of Natural Resources Tech. Bull. No. 132.

Stream Fishery Habitat Assessment

Various stream habitat data were collected in 1990 by the Department at 10 locations on 8 streams. These data characterize stream habitat using water quality, fish habitat information and a draft procedure developed by the department (Ball, 1982). The procedure assigns an index value and habitat rating as shown below:

Index	Habitat Rating
70	Excellent
71-129	Good
130-200	Fair
200	Poor

Reference: Ball, Joe 1982. Stream Classification Guidelines for Wisconsin. Wisconsin Department of Natural Resources Unpubl. Tech. Bull.

Fish Population

The DNR surveyed the fish population in 8 streams at 10 locations by electroshocking the stream. This was done during the summer of 1990.

APPENDIX B:
Watershed Planning Methods

This appendix 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
- Establishing pollution reduction goals
- Developing a nonpoint source control strategy
- Involving the public and local units of government

Evaluating Water Quality and Aquatic Habitat

The DNR is responsible for designating the biological and recreational uses that surface waters can support under proper management, prescribing the water quality required to sustain these designated uses, and indicating the methods to implement, achieve and maintain those conditions.

The DNR's Lake Michigan District water resources management staff conducted investigations of the existing quality and natural resource conditions for lakes and streams. Their purpose was to evaluate water quality problems and establish a basis for setting water resource management objectives. Detailed assessment results are documented in the Lake Winnebago East Watershed Water Resources Appraisal Report.

Data Collection

The following is a summary of the elements comprising the water quality and aquatic habitat investigation.

Subwatershed Delineation and Stream Segmentation

Prior to collecting field data. the watershed was divided into 14 hydrologic subwatersheds. This was accomplished using 1986 1"=400'scale aerial photographs and 1"=2.000'(7.5

minute) U.8. Geological Survey quadrangle maps. These maps were also used to divide the perennial and intermittent stream network into segments. Stream segments were used to separate portions of waterways where either natural conditions or human induced changes resulted in pronounced differences in stream character and/or water quality.

Stream Habitat Evaluation

Existing information characterizing stream habitat including flow rate and depth. substrate quality. channel configuration. streambank stability, and water temperature were evaluated using the Department's Stream Classification Guidelines (Ball. 1982).

Water Quality Assessment

Water quality was assessed through review of historical water chemistry data and an evaluation of bottom dwelling animals (macroinvertebrates) using the Hilsenhoff Biotic Index (Hilsenhoff, 1982). Bacteria (fecal coliform and fecal streptococcus) surveys were conducted to assess the suitability of surface waters for recreational use.

Fisheries Resource Assessment

Fish communities were assessed qualitatively using a combination of historical data (Fago, 1984) and information collected during this investigation. Resident fish populations in selected streams. were sampled using electrical shocking equipment.

Data Interpretation

This information was used to determine the existing and potential biological and recreational uses for surface waters. The existing uses reflect present biological and recreational conditions. Potential uses reflect biological and recreational conditions that could be achieved under prescribed types and levels of management. Even though existing and potential uses of a surface water are the same, management programs can result in significant and perceptible changes in the quality of the aquatic environment. Use classifications and supporting water quality standards used in evaluating water resource conditions are discussed below.

Biological Stream Use Classification

Biological stream use classes describe the fish species or other aquatic organisms supported by a stream system. Designation is based on the ability of a stream to provide suitable habitat and water quality conditions for fish and other aquatic life. The following biological stream use classification system is used statewide and was applied to surface waters in the Lake Winnebago East watershed.

FAL A Cold Water Communities: These streams are capable of supporting a community of cold water fish (trout, sculpin) and other aquatic life. or serve as spawning areas for cold water fish species.

WWSP Warm Water Sport Fish Communities: These streams are capable of supporting a community of warm water sport fish (bass, walleye, pike) or serve as spawning areas for warm water sport fish.

WWFF Warm Water Forage Fish Communities: These streams are capable of supporting an abundant, diverse community of forage fish (shiners. minnows) and other aquatic life (insects. clams, crayfish).

Limited Forage Fish Communities (Intermediate Surface Waters): These streams are capable of supporting small populations of forage fish tolerant of pollution, or fish and aquatic invertebrates tolerant of pollution. The aquatic community is usually limited by small physical stream size and reduced stream flow.

Limited Aquatic Life (Marginal Surface Waters): These streams are capable at best of supporting a limited community of aquatic life. These are usually small intermittent streams and ditches, or have been extensively modified through channel straightening or concrete lining.

Recreational Stream Use Classification

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

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

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

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

Water Quality Standards and Criteria

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

In addition to these standards, other criteria were used to assess the suitability of surface waters for recreational and biological uses. Data characterizing stream size and accessibility were used to help determine the suitability and types of recreation a stream is capable of supporting. Information on current recreational use of surface waters provided by users at public access points and discussions with local officials was also used to assess suitability of surface waters for recreation.

Additional information used to assess the suitability of surface waters for biological uses includes recommended maximum nutrient levels, suspended solids concentrations and the extent to which stream beds are clogged with sediment. Selected water quality standards and other evaluation criteria used in assessing surface waters are presented in Appendix A.

Assessing Pollution Sources

The purpose of the pollution source assessment is to identify the rural and urban sources and quantities of pollutants impacting surface waters. Rural and urban pollutant sources assessed for this watershed are discussed below.

Rural Nonpoint Sources

Excessive quantities of sediment, nutrients, oxygen demanding substances, pesticides and bacteria are pollutants carried in runoff draining agricultural areas. These pollutants degrade surface water quality thereby restricting recreational and biological uses. The principal rural nonpoint sources evaluated in preparing this plan include:

- barnyards and livestock area runoff
- eroding uplands delivering sediment to surface waters
- eroding. slumping, or trampled stream banks
- areas contributing runoff of winter spread livestock manure

Inventories were conducted between 1989 and 1990 by the Fond du Lac and Calumet County Land Conservation Department (LCD) staffs. Data analyses were completed by the DNR in cooperation with the DATCP and the LCD staffs. Inventory and evaluation procedures are summarized below.

Barnyard and Livestock Area Runoff

The locations of barnyards in the watershed were mapped on 1986 1"=400' scale aerial photographs by the LCD staff. A field survey of each barnyard was conducted to collect information needed to determine its pollution potential.

The barnyard data was used in the "BARNY" Model (Baun, 1987), a modification of the animal lot runoff model developed by the U.S. Department of Agriculture, Agricultural Research Service (Young, 1982). Information about the mass loading of total phosphorus and chemical oxygen demand generated during a 10 year-24 hour rainfall event was used to evaluate the relative pollution potential of each barnyard. The livestock operations were ranked according to their potential to impact surface and/or groundwater quality.

Upland Erosion and Sediment Delivery

The inventory was conducted by the LCD staff on about 93 square miles, using existing data and field investigations. Cropland, pastures, grasslands, woodlands and other open (non-urban) land uses were investigated. Existing data sources included site specific farm conservation plans, aerial photographs and U.S. Geological Survey 1"=2.000' scale quadrangle maps. The information obtained for each parcel included size, soil type and erodibility, slope percent and length, land cover, crop rotation, present management, overland flow distance and destination, channel type and receiving water.

Upland erosion and sediment delivery was determined using the Wisconsin Nonpoint Source (WIN) Model (Baun & Snowden, 1987). The WIN model calculates the average annual quantity of eroded soil reaching surface waters from each farm field. The determination is made based on a "typical" year of precipitation. Estimated sediment delivery was used to assess the relative pollution potential of each farm field in the watershed.

Stream Bank Erosion

Field surveys were conducted by the LCD staffs on about 160 miles of perennial and intermittent streams. The method used is a modification of the stream bank erosion analysis included in Phase II of the Land Inventory Monitoring process used by the U.S. Department of Agriculture Soil Conservation Service. At locations where erosion was occurring, the following information was recorded: 1) length of trampled or eroding bank, 2) vertical height, 3) estimated annual rate of recession, 4) adjacent land uses, and 5) potential management measures. The amount of sediment lost annually was calculated for each erosion site. In addition, areas adjacent to streams impacted by livestock, but which were not necessarily eroding at a high rate were also noted.

Runoff from Areas Winter Spread with Livestock Waste.

This analysis was done to estimate the pollution potential associated with winter spreading of livestock waste in the watershed. The information collected for the barnyard and upland erosion surveys was used in this evaluation.

This analysis was completed using a three-step process. First, the number of acres needed by each livestock operation to land spread manure was calculated for a six month period, approximating when manure cannot be incorporated into the ground because of frozen or saturated conditions. The amount of manure generated by each operation was based on the number and type of livestock. The area required for spreading was based on an application rate of 25 tons per acre per year.

Urban Nonpoint Sources

Nationwide investigations confirm that urban runoff can have a significant adverse impact on receiving waters. The result is that urban areas and activities can upset several important components of a stream including stream flow, habitat water quality, bottom sediment quality, and stream biology (Pitt, 1987).

Pollutants carried in urban storm water runoff include some of the same pollutants associated with rural nonpoint source runoff such as sediment, nutrients, oxygen demanding organic materials, bacteria and pesticides. Other pollutants, many of which are potentially toxic, are transmitted to surface and groundwater primarily by urban runoff. These include heavy metals (lead, zinc, chromium, copper, cadmium and arsenic) and a wide range of hazardous organic compounds. Urbanization also causes devastating hydrologic changes in streams by reducing groundwater recharge and increasing the volume and peak of streamflow during storms. This results in flashy streams into storm water conveyance channels to reduce flood damages.

Principal urban nonpoint sources evaluated in preparing this plan include:

- Existing 1990 urban land uses.
- New urban development, including the potential for construction site erosion as well as increased pollutant loading from the newly established urban surfaces,
- Eroding streambanks.

Storm water pollutant concentrations, runoff volumes and pollutant yields vary by urban land use (residential, commercial, industrial) and development characteristics (intensity of the development, storm water conveyance system). The inventory of existing and planned urban areas was designed to quantify the urban land use and development characteristics for existing and planned urban development. This information was used to estimate the existing and future urban pollutant loads.

This information on existing and planned urban development was used by the DNR in its Source Loading and Management Model (Pitt and Voorhees, 1989) to estimate urban nonpoint source loads for six pollutants (sediment, phosphorus, lead, copper, zinc and cadmium). Information on existing pollutant loads was used to identify the magnitude and distribution of the current urban nonpoint source loadings and to identify high priority land uses responsible for most of these loads. Information on planned urban development was used to estimate the future pollution potential associated with uncontrolled development. The effectiveness of applying urban management practices to existing and planned urban areas was also evaluated to determine what level of management is needed to reduce current urban pollutant loads to acceptable levels by the year 2010.

The potential for construction site impacts was assessed based on the number of acres planned for development and the adequacy of existing local construction erosion control programs.

Acres planned for development were provided to DNR by the City of Fond du Lac. The adequacy of existing local construction erosion control programs was also evaluated.

Other Pollution Sources

Additional sources of surface water pollution beyond those discussed In this plan are degrading water quality in the watershed. These pollution sources have the potential to overshadow improvements in water quality that might otherwise occur as a result of the priority watershed program.

The DNR conducted an inventory and evaluation of these other pollution sources. Inventory results and recommendations for alleviating the water quality impacts of these other pollution sources are documented in the above referenced Lake Winnebago East water quality appraisal report.

Establishing Water Resources Objectives

Recreational and biological water resources objectives were established for each of the streams and lakes in the watershed. These objectives identify how the project is anticipated to change the quality of the aquatic environment for recreational and biological uses. Factors considered in setting water resources objectives include: existing water quality and aquatic habitat, factors or pollutants that may be keeping the surface water from meeting its full potential to support biological and recreational uses, and the practicality of reducing pollutants.

Establishing Pollution Reduction Goals

Nonpoint pollution reduction goals are estimates of the level of nonpoint source control needed to meet the water quality and recreational use objectives identified in this plan. Pollution reduction goals and water resources objectives are set together since they are integrally related.

Nonpoint source pollution reduction goals contained in this plan are a refinement of recommendations contained in the Winnebago Comprehensive Management Plan and in the Lower Green Bay Remedial Action Plan. Pollution reduction goals in this plan specifically target the control of sediment and phosphorus in rural areas and the control of sediment, phosphorus, urban toxic materials and streamflow changes in urban areas. Reducing the quantity of these substances reaching surface water decreases the amount of other substances such as pesticides and bacteria which degrade water quality.

Water resources 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 set forth primarily in the Winnebago Comprehensive Management Plan and the Lower Green Bay Remedial Action Plan.

Developing a Nonpoint Source Control Strategy

The final step in the planning process is the development of a strategy for achieving the nonpoint source pollution reduction goals identified in the plan. Several items are addressed in developing the control strategy including:

- critical nonpoint pollution sources
- effective management practices and guidelines for use of state cost share funds for practice installation
- responsibilities, estimated workloads and work schedules for local implementing agencies and guidelines for use of state funds to support local implementation activities
- estimated cost of installing practices and supporting staff at the local level
- Information and education needs
- project evaluation needs.

Identification of critical nonpoint sources eligible for cost share and technical assistance under Nonpoint Source Water Pollution Abatement Program were determined by:

- Evaluating pollutant loading for each nonpoint source in each subwatershed,
- Determining the relative importance of controlling each source (barnyards, urban runoff, cropland erosion. etc.) to achieve the water resource objectives.
- Developing criteria to determine which sources need to be controlled,
- Applying the criteria to determine eligibility for participation in the priority watershed project.

This evaluation was carried out on a subwatershed and watershed basis for the rural and urban nonpoint sources. The result is a site specific ranking of nonpoint sources and a determination of assistance to be made available through the nonpoint source program for their control.

Involving the Public and Local Units of Government

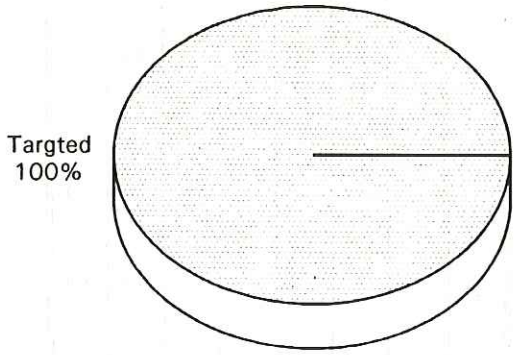
The DNR convened an advisory subcommittee and several technical work groups to assist in preparing this watershed plan. The advisory subcommittee contains representatives from the City of Fond du Lac, counties, villages, and towns in the watershed, UWEX, DATCP and interested citizens. This subcommittee primarily provided policy guidance during the planning process and reviewed preliminary drafts of the plan.

Three types of technical work groups were convened to help with developing technical aspects of the plan: a water resources appraisal work group, an agricultural work group and an urban work group. These groups reviewed land and water resources assessment information assisted in developing water resources objectives and pollution reduction goals and assisted in developing the pollution control strategy.

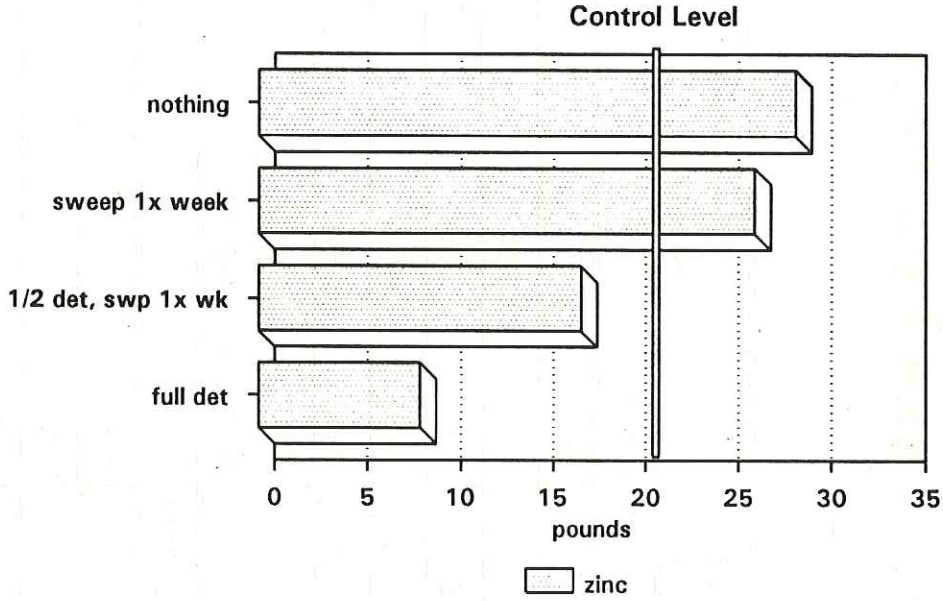
APPENDIX C:
Land Use, Pollutant Reductions and Controls

E. Scott Street All Land Uses		Existing Subbasins Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
CRITICAL AREA TOTAL								
AREA	211.61							
LEAD	8.04	8.04	7.80	3.0%	4.72	41.3%	1.69	79.0%
COPPER	3.83	3.83	3.33	13.0%	2.37	38.2%	1.61	58.0%
ZINC	28.92	2852	26.70	7.Tt	17.35	40.0%	8.68	70.0%
CADMIUM	0.49	0.49	0.45	7.7%	0.29	40.0%	0.15	69.4%
PHSO	118.17	118.17	116.80	1.2%	89.94	23.9%	64.36	45.5%
ss	44239.84	44239.84	43158.42	2.4%	23736.57	46.3%	4423.88	90.0%
GRAND TOTAL								
AREA	211.61							
LEAD	8.04	8.04	7.80	3.0%	4.72	41.3%	1.69	79.0%
COPPER	3.83	3.83	3.33	13.0%	2.37	38.2%	1.61	58.0%
ZINC	28.92	28.92	26.70	7.7%	17.35	40.0%	8.68	70.0%
CADMIUM	0.49	0.49	0.45	7.7%	0.29	40.0%	0.15	69.4%
PHSO	118.17	116.80			80.94	23.9%		45.5%
ss	44239.84	44239.84	43158.42	2.4%	23736.57	46.3%	4423.88	90.0%

East Scott Street Land Use
Existing

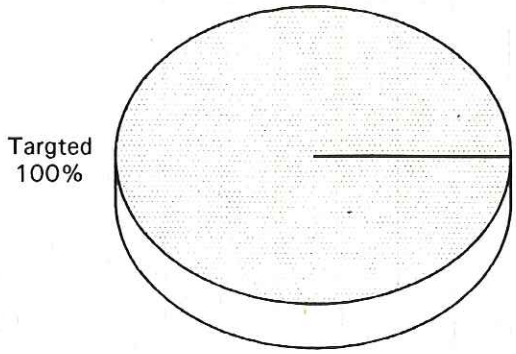


fond du lac - existing
East Scott Street

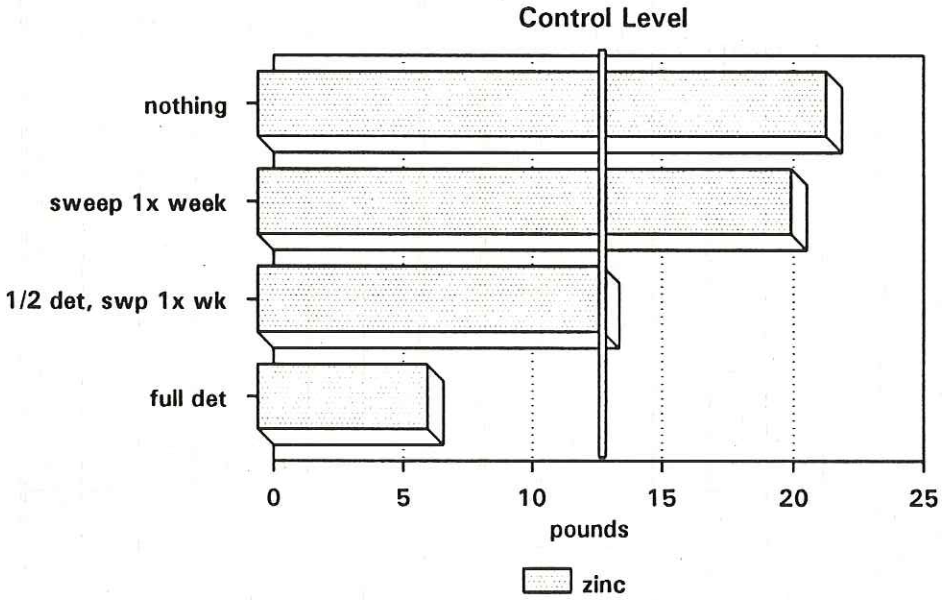


Fourth Street All Land Uses		Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
CRITICAL AREA TOTAL								
AREA	190.09							
LEAD	7.13	7.13	6.50	8.8%	3.82	46.4%	1.50	79.0%
COPPER	2.95	2.95	2.65	10.3%	1.98	32.7%	1.24	58.0%
ZINC	21.86	21.86	20.54	6.0%	13.35	38.9%	6.56	70.0%
CADMIUM	0.27	0.27	0.25	5.9%	0.17	38.9%	0.08	70.0%
PHSO	fi.2T	60.26				25.5%	32.54	46.0%
ss	237B9.25	23789.25	22589.49	5.0%	12374.77	48.0%	2378.93	90.0%
GRAND TOTAL								
190.09								
7.13	7.13	6.50	8.8%	3.82	46.4%	1.50	79.0%	
3.83	3.83	3.53	7.9%	2.86	25.2%	2.12	44.7%	
28.92	28.92	27.60	4.6%	20.41	29.4%	13.62	52.9%	
0.49	0.49	0.47	3.3%	0.39	21.4%	0.30	38.6%	
118.17	118.17	116.21	1.7%	102.80	13.0%	90.45	23.5%	
44239.84	44239.84	43040.08	2.7%	32825.36	25.8%	22829.51	48.4%	

Fourth Street Land Use
Existing

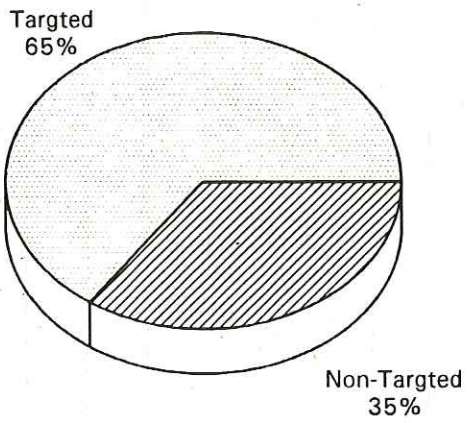


fond du lac - existing
fourth st.

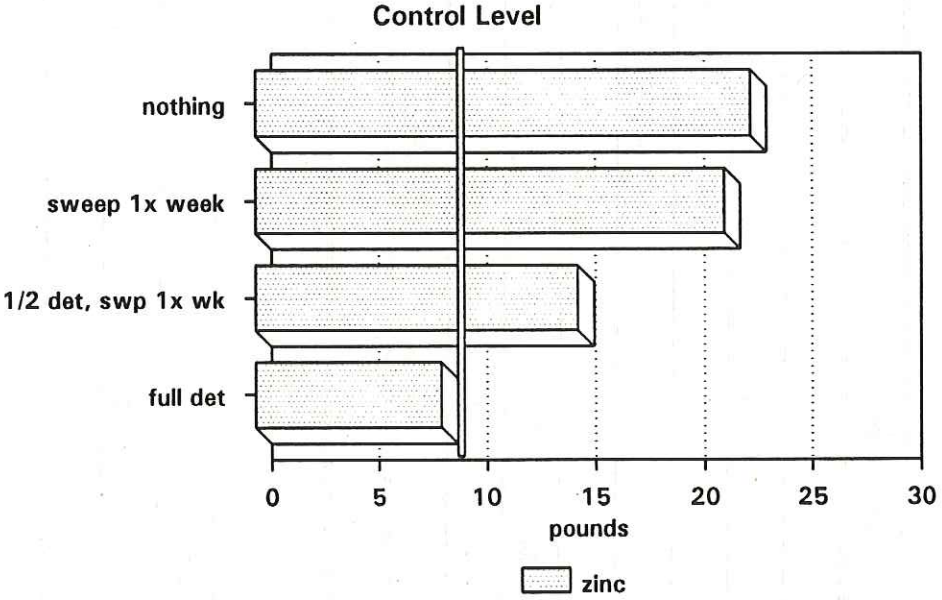


Gravity Flow All Land Uses But LR and 1/2 MR		Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
CRITICAL AREA TOTAL								
AREA	45.77							
LEAD	6.39	6.39	5.86	8.2%	3.55	44.4%	1.34	79.0%
COPPER	2.39	2.39	2.13	10.8%	1.51	36.7%	1.00	58.0%
EXISTING SUBBASINS								
ZINC	20.36	20.36	19.07	6.3%	12.40	39.1%	6.11	70.0%
CADMIUM	0.16	0.16	0.15	6.2%	0.09	39.0%	0.05	70.0%
PHSO	32.85	3225	31.86	3.0%	24.53	25.3%	17.74	46.0%
ss	15218.96	15218.96	14392.47	5.4%	7915.86	48.0%	1521.90	90.0%
GRAND TOTAL								
AREA	69.05							
LEAD	7.11	7.11	6.59	7.3%	4.27	39.9%	2.07	70.9%
COPPER	2.72	2.72	2.46	9.5%	1.84	32.2%	1.34	50.9%
ZINC	22.88	21.60	21.60	5.6%	14.92	34.8%	8.63	62.3%
CADMIUM	0.2	0.19	0.19	4.8%	0.14	30.2%	0.09	54.3%
PHSO	43.62	43.62	42.63	2.3%	35.30	19.1%	28.51	34.6%
ss	19215.59	19215.59	18389.11	4.3%	11912.49	38.0%	5518.53	71.3%

Gravity Flow Land Use
Existing

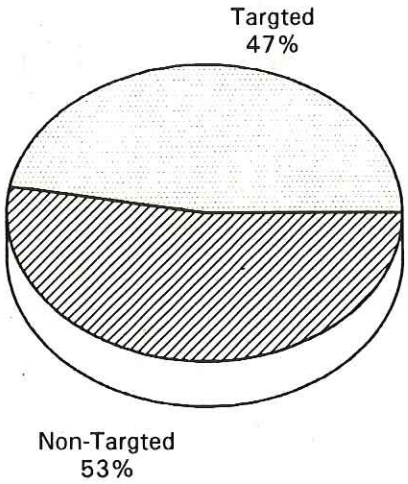


Fond Du Lac - Existing
Gravity Flow

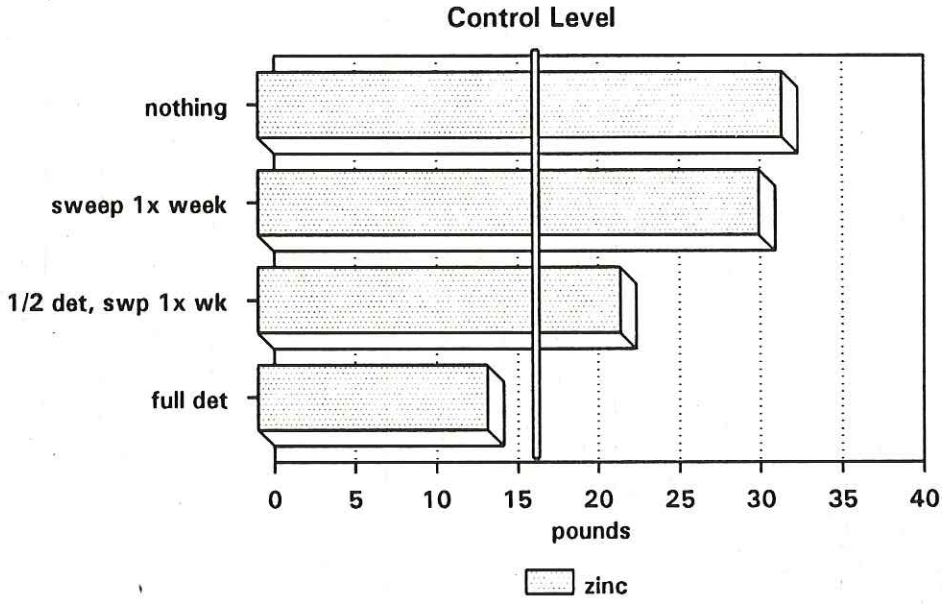


Harbor View All Land Uses But Open, Park, LR, 1/2 MR		Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
CRITICAL AREA TOTAL								
AREA	64.93							
LEAD	8.05	8.05	6.62	17.7%	4.00	50.2%	1.69	79.0%
COPPER	3.58	3.58	3.31	7.3%	2.35	34.2%	1.50	58.0%
ZINC	26.01	26.01	24.59	5.5%	15.98	38.5%	7.80	70.0%
CADMIUM	0.26	0.26	0.25	5.5%	0.16	38.6%	0.08	70.0%
PHSO	47.13	47.13	44.36	5.9%	34.16	27.5%	25.45	46.0%
ss	21737.04	21737.04	19376.98	10.9%	10657.34	51.0%	2173.70	90.0%
GRAND TOTAL								
AREA	138.64							
LEAD	9.93	9.93	8.50	14.4%	5.89	40.7%	3.57	64.0%
COPPER	4.44	4.44	4.18	5.9%	3.22	27.5%	2.37	46.7%
ZINC	32.32	32.32	30.90	4.4%	22.30			56.3%
CADMIUM	0.37	0.37	0.36	3.9%	0.27	27.1%	0.19	49.2%
PHSO	74.64	74.64	71.87	3.7%	61.67	17.4%	52.96	29.0%
ss	31772.59	31772.59	29412.53	7.4%	20692.89	34.9%	12209.25	61.6%

Harbor View Land Use
Existing

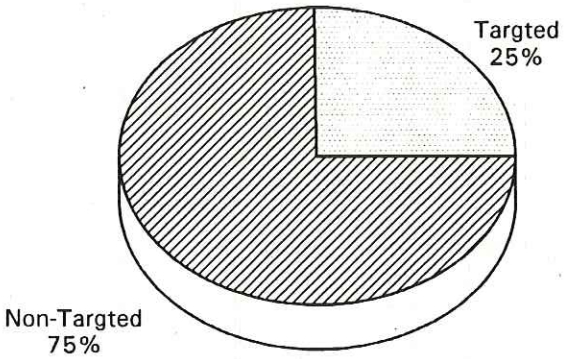


Fond Du Lac - Existing
Harbor View

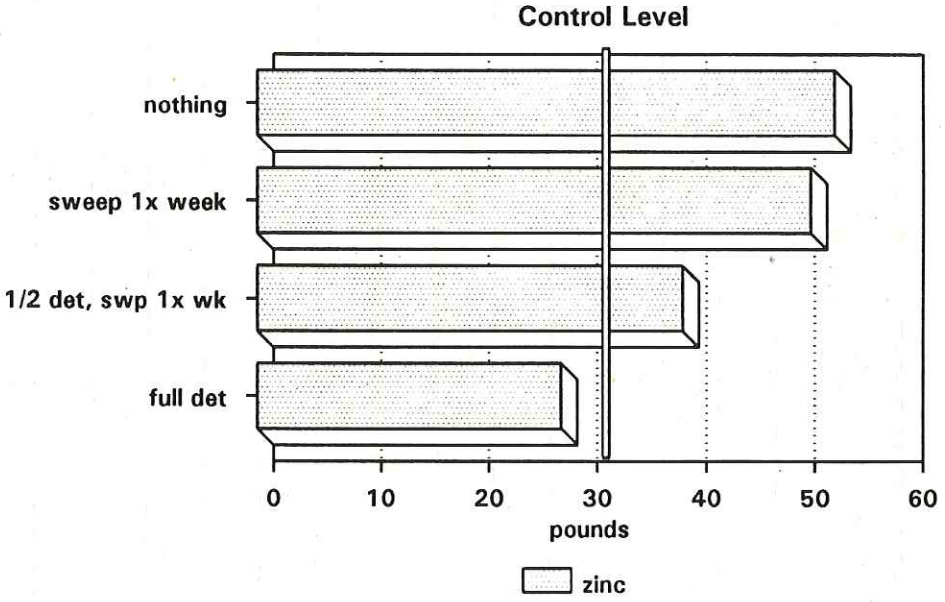


Mc Dermott Park All Land Uses But Open, Park, LR, MR		Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
CRITICAL AREA TOTAL								
AREA	77.44							
LEAD	11.54	11.54	10.42	9.7%	6.30	45.4%	2.42	79.0%
COPPER	4.97	4.97	4.48	9.8%	3.18	36.0%	2.09	58.0%
ZINC	35.96	35.96	33.76	6.1%	21.94	39.0%	10.79	70.0%
CADMIUM	0.31	0.31	0.29	6.5%	0.19	39.2%	0.09	70.0%
PHSO	61.72	61.72	59.30	3.9%	45.66	26.0%	33.33	46.0%
ss	27428.70	27428.70	25244.61	8.0%	13884.54	49.4%	2742.87	90.0%
GRAND TOTAL								
AREA	306.38							
		EXISTING SUBBASINS						
LEAD	16.99	16.99	15.87	6.6%	11.75	30.8%	7.87	53.7%
COPPER	7.33	7.33	6.84	6.6%	5.54	24.4%	4.45	39.3%
ZINC	53.33	53.33	51.13	4.1%	39.31	26.3%	28.16	47.2%
CADMIUM	0.62	0.62	0.60	3.2%	0.50	19.&K	0.40	35.0%
PHSO	137.19	137.19	134.77	1.8%	121.13	11.7%	108.80	20.7%
ss	54970.77	54970.77	52786.68	4.0%	41426.61	24.6%	30284.94	44.9%

Mc Dermott Park Land Use
Existing

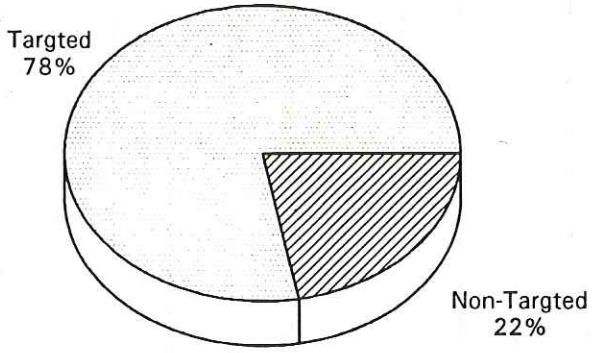


Fond Du Lac - Existing
Mc Dermott Park

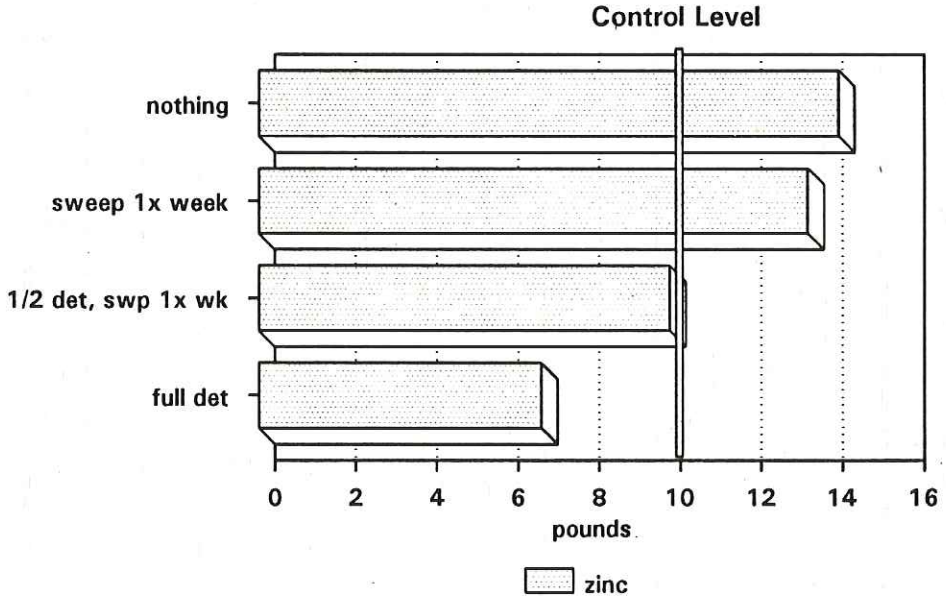


Stow Street All Land Uses But 1/2 MR		Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
CRITICAL AREA TOTAL								
AREA	58.94							
LEAD	3.01	3.01	2.89	3.7%	1.75	41.8%	0.63	79.0%
COPPER	1.25	1.25	1.08	13.0%	0.77	38.2%	0.52	58.0%
ZINC	10.47	10.47	9.7n	7.3%	6.31	39.7%	3.14	70.0%
CADMIUM	0.15	0.15		7.1%	0.09		0.05	70.0%
PHSO	34.15	34.15	33.65	1.5%	25.91	24.1%	18.44	46.0%
ss	13357.33	13357.33	13053.74	2.3%	7179.56	46.3%	1335.73	90.0%
GRAND TOTAL								
AREA	87.76							
LEAD	4.06	4.06	3.95	2.8%	2.81	30.9%	1.69	58.5%
COPPER	1.76	1.76	1.60	9.2%	1.28	27.0%	1.04	41.0%
ZINC	14.3	14.3	13.54	5.3%	10.14	29.1%	6.97	51.2%
CADMIUM	0.22	0.22	0.21	4.8%	0.16	27.0%	0.12	47.7%
PHSO	50.45	50.45	49.95	1.0%	42.21	16.3%	34.74	31.1%
ss	19426.82	19426.82	19123.23	1.6%	13249.05	31.8%	7405.22	61.9%

Stow Street Land Use
Existing

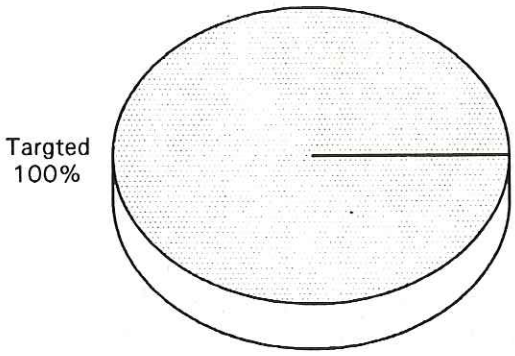


Fond Du Lac - Existing
Stow Street

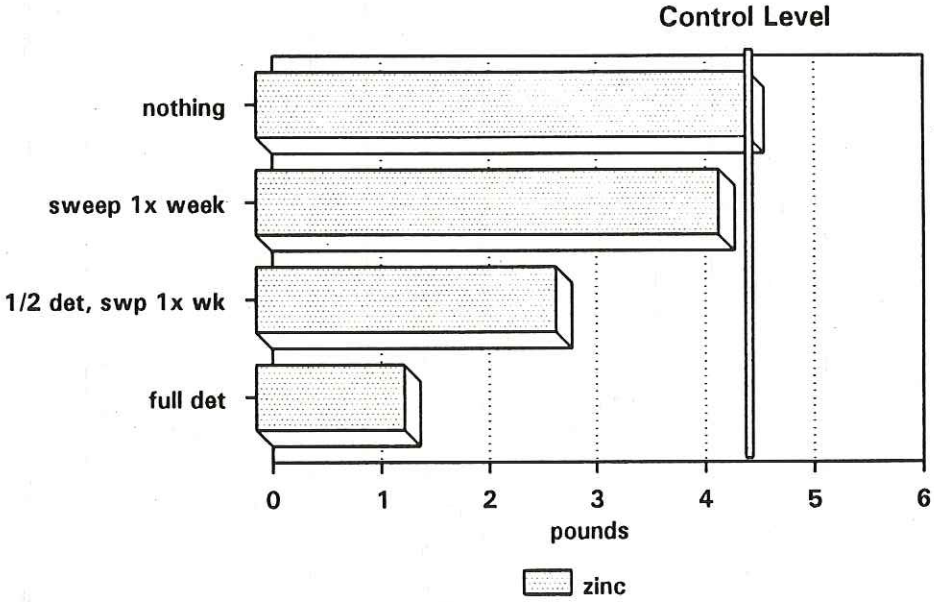


Taft Street All Land Uses But 1/2 MR		Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
CRITICAL AREA TOTAL								
AREA	34.85							
LEAD	1.25	1.25	1.18	6.0%	0.71	43.1%	0.26	79.0%
COPPER	0.61	0.61	0.53	13.0%	0.38	38.2%	0.26	58.0%
ZINC	4.54	4.54	4.27	6.0%	2.77	3A.Vt	1.36	70.0%
CADMIUM	0.08	0.08	0.08	6.0%	0.05	38.9%	0.02	70.0%
PHSO	19.29	19.29	18.90	2.0%	14.56	24.5%	10.42	46.0%
ss	7177.44	7177.44	7033.91	2.0%	3867.41	46.1%	717.74	90.0%
GRAND TOTAL								
AREA	34.85							
LEAD	1.25	1.25	1.18	6.0%	0.71	43.1%	0.26	79.0%
COPPER	0.61	0.61	0.53	13.0%	0.38	38.2%	0.26	58.0%
ZINC	4.54	4.54	4.27	6.0%	2.77	38.Vt	1.36	70.0%
CADMIUM	0.08	0.08	0.08	6.0%	0.05	38.9%	0.02	70.0%
PHSO	19.29	19.29	18.90	2.0%	14.56	24.5%	10.42	46.0%
ss	7177.44	7177.44	7033.91	2.0%	3867.41	46.1%	717.74	90.0%

Taft Street Land Use
Existing

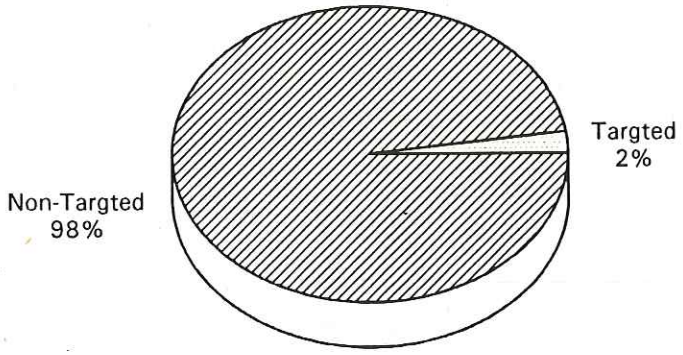


Fond Du Lac - Existing
Taft Street

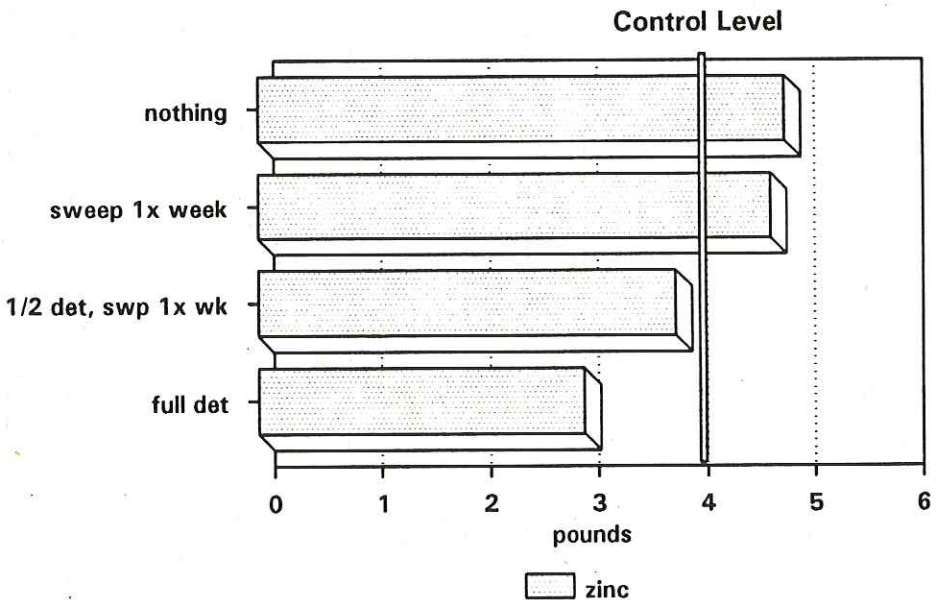


Willow Point All Land Uses But Park, Open, LR, MR		Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
CRITICAL AREA TOTAL								
AREA	2.25							
LEAD	0.84	0.84	0.65	23.0%	0.39	53.4%	0.18	79.0%
COPPER	0.38	0.38	0.36	5.0%	0.26	32.6%	0.16	58.0%
ZINC	2.64	2.64	2.51	5.0%	1.63	38.3%	0.79	70.0%
CADMIUM	0.02	0.02	0.02	5.0%	0.01	38.3%	0.01	70.0%
PHSO	2.73	2.73	2.40	12.0%	1.85	32.2%	1.47	46.0%
ss	1582.64	1582.64	1266.11	20.0%	696.36	56.0%	158.26	90.0%
GRAND TOTAL								
AREA	97.57							
LEAD	1.94	1.94	1.75	10.0%	1.49	23.1%	1.28	34.2%
Copper	0.73	0.73	0.71	2.6%	0.61	16.9%	1.51	30.2%
ZINC	4.87	4.87	4.74	2.7%	3.86	20.7%	3.02	37.9%
CADMIUM	0.06	0.06	0.06	1.7%	0.05	12.7%	0.05	23.3%
PHSO	13.85	13.85	13.52	2.4%	12.97	6.4%	12.59	9.1%
ss	5201.67	5201.67	4885.14	6.1%	4315.39	17.0%	3777.29	27.4%

Willow Point Land Use
Existing

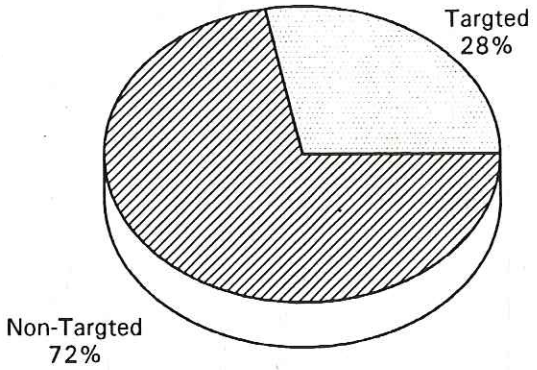


Fond Du Lac - Existing
Willow Point

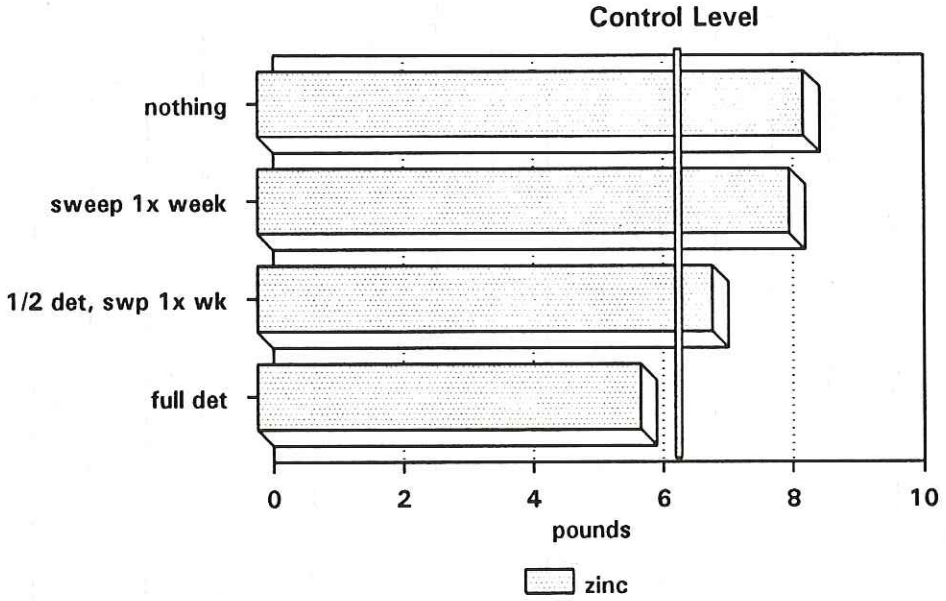


Western Reserve All Land Uses But Park, Open, LR, 3/4, MR		Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
CRITICAL AREA TOTAL								
AREA	14.43							
LEAD	1.09	1.09	1.03	5.9%	0.62	43.0%	0.23	79.0%
COPPER	0.48	0.48	0.42	12.0%	0.30	37.5%	0.20	58.0%
ZINC	3.59	3.59	3.37	6.2%	2.19	39.0%	1.08	70.0%
CADMIUM	0.04	0.04	0.04	6.Vt	0.02	38.9%	0.01	70.0%
PHSO	9.26	9.26	9.03	2.4%	6.96	24.9%	5.00	46.0%
ss	3717.05	3717.05	3600.21	3.1%	1980.12	46.7%	371.70	90.0%
GRAND TOTAL								
AREA	51.7							
LEAD	2.42	2.42	2.36	2.6%	1.95	19.4%	1.56	35.6%
COPPER	1.12	1.12	1.06	5.1%	0.94	15.9%	0.84	24.6%
ZINC	8.41	8.41	8.19	2.6%	7.01	16.7%	5.90	29.9%
CADMIUM	0.12	0.12	0.12	1.9%	0.11	12.2%	0.09	21.9%
PHSO	29.72	29.72	29.50	0.8%	27.42	7.7%	25.46	14.3%
ss	11334.84	11334.84	11218.00	1.0%	9597.91	15.3%	7989.50	29.5%

Western Reserve Land Use
Existing

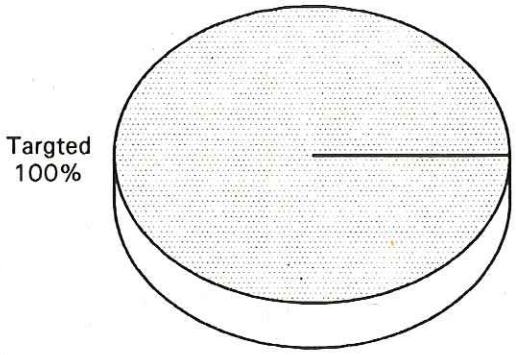


Fond Du Lac - Existing
Western Reserve

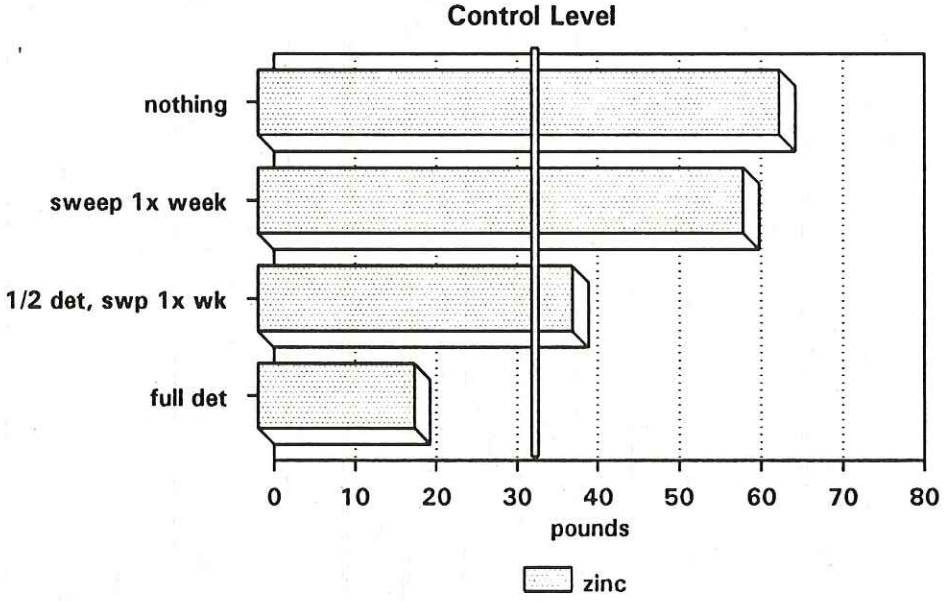


Reserve Avenue All Land Uses		Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
EXISTING SUBBASINS								
CRITICAL AREA TOTAL								
AREA	292.61							
LEAD	19.34	19.34	18.46	4.5%	11.15	42.3%	4.06	79.0%
COPPER	7.63	7.63	6.67	12.6%	4.75	37.7%	3.20	58.0%
ZINC	64.15	64.15	59.78	6.8%	38.86	.39.4%	19.25	70.0%
CADMIUM	0.73	0.73	0.68	6.6%	0.44	39.3%	0.22	70.0%
PHSO	166.53	166.53	163.42	1.9%	125.83	24.4%	89.93	46.0%
ss	67594.34	67594.34	65835.63	2.6%	36200.85	46.4%	6759.43	90.0%
GRAND TOTAL								
AREA	292.61							
LEAD	19.34	19.34	18.46	4.5%	11.15	42.3%	4.06	79.0%
COPPER	7.63	7.63	6.67	12.6%	4.75	37.7%	3.20	58.0%
ZINC	64.15	64.15	59.78	6.8%	38.86	39.4%	19.25	70.0%
CADMIUM	0.73	0.73	0.68	6.6%	0.44	39.3%	0.22	70.0%
PHSO	166.53	166.53	163.42	1.9%	125.83	24.4%	89.93	46.0%
ss	67594.34	67594.34	65835.63	2.6%	36200.85	46.4%	6759.43	90.0%

Reserve Avenue Land Use
Existing

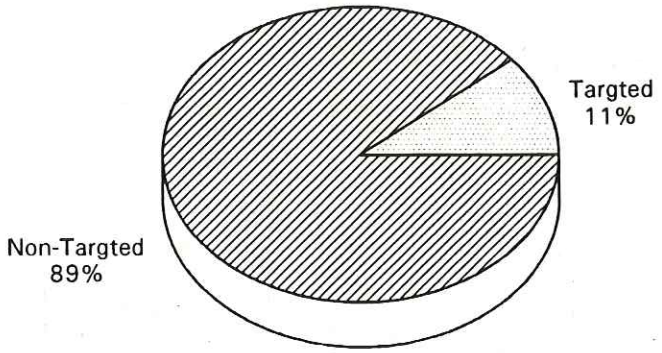


Fond Du Lac - Existing
Reserve Avenue

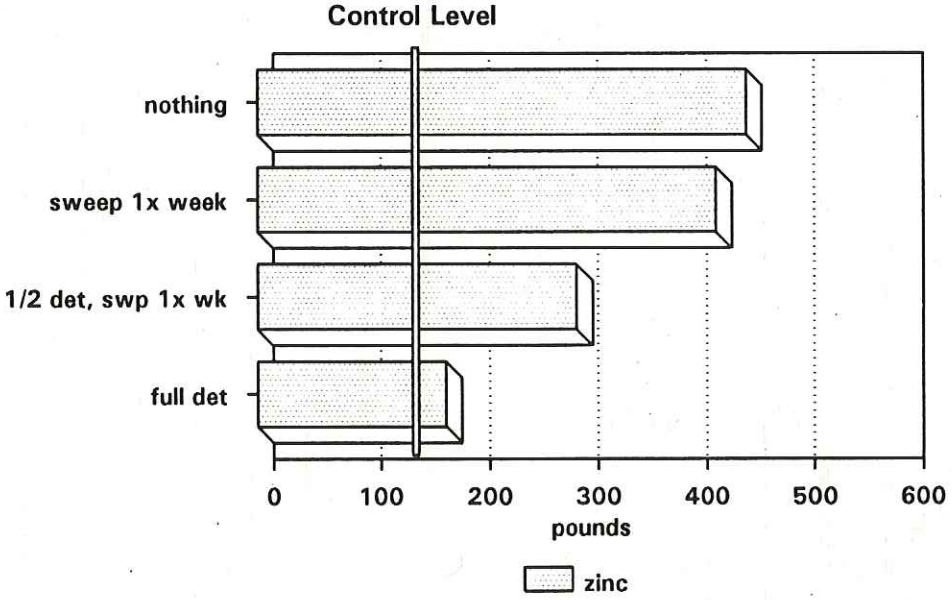


Outside Subbasins All Land Uses But OSUD, CEM, Park, LR, MR		Do Nothing	SWP 1X WE % red.		1/2 DET % red. +SWP 1X WEEK		FULL DET % red.	
CRITICAL AREA TOTAL								
AREA	673.29							
LEAD	125.58	125.58	117.18	6.7%	70.89	43.6%	26.37	79.0%
COPPER	43.15	43.15	38.55	10.7%	27.37	36.6%	18.12	58.0%
ZINC	395.72	395.72	367.69	7.1%	239.00	39.6%	118.71	70.0%
CADMIUM	2.85	2.85	2.65	7.1%	1.72	39.6%	0.86	70.0%
PHSO	522.58	522.58	503.89	3.6%	387.99	25.8%	282.19	46.0%
ss	364454.06	264454.06	248125.33	6.2%	136468.93	48.4%	26445.41	90.0%
GRAND TOTAL								
AREA	6081.71							
LEAD	169.55	169.55	161.14	5.0%	114.86	32.3%	70.34	58.5%
COPPER	54.37	54.37	49.77	8.5%	38.59	29.0%	29.34	46.0%
ZINC	451.73	451.73	423.70	6.2%	295.01	34.7%	174.73	61.3%
CADMIUM	4.18	4.18	3.98	4.9%	3.05	27.0%	2.18	47.7%
PHSO	880.02	880.02	861.33	2.1%	745.44	15.3%	639.63	27.3%
ss	359600.92	359600.92	343272.20	4.5%	231615.80	35.6%	121592.27	66.2%

Outside Pumping System Land Use
Existing

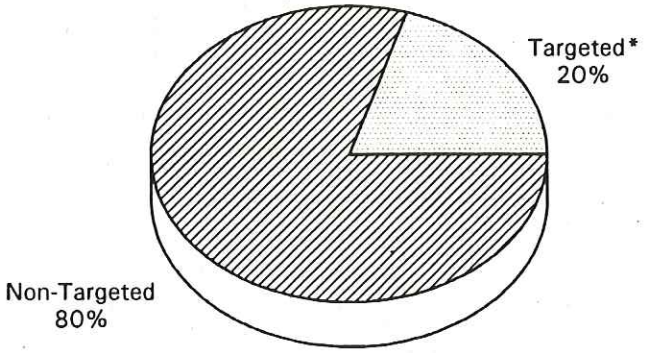


Fond Du Lac - Existing
Outside Pumping System



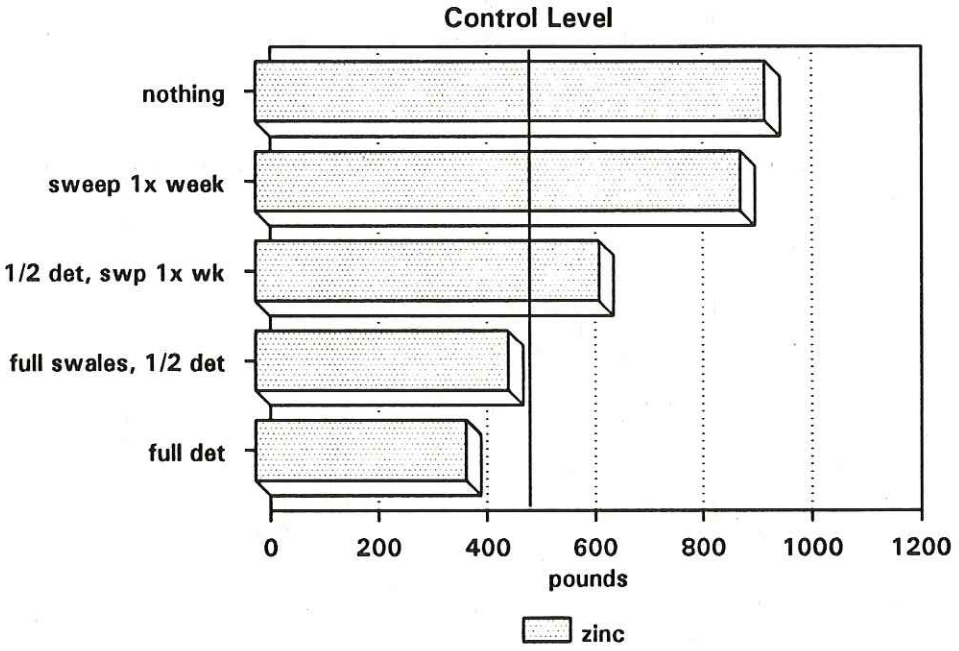
Planned Land Use			Do Nothing	SWP 1X WEEK		5 Micron CT 1/2 Det Full Swales +			
All Land Uses But Farmland, Osud, Park						SWP 1X WEEK		20 Micron CRT Pond	
lr, cem, mr, subr									
CRITICAL AREA TOTAL					% red.		% red.		% red.
AREA	941.00	ACRES.							
LEAD	262.30	lbs.	262.30	241.75	7.8%	146.26	44.2%	73.85	71.8%
COPPER	109.26	lbs.	109.26	97.63	10.6%	69.32	36.6%	52.65	51.8%
ZINC	790.00	tbs.	790.00	744.16	5.8%	483.70	38.8%	315.38	60.1%
CADMIUM	5.05	lbs.	5.05	4.75	5.8%	3.09	38.7%	1.69	66.5%
PHSO	1016.04	lbs.	1016.04	979.57	3.6%	754.27	25.8%	522.51	48.6%
ss	472914.18	lbs.	472914.18	436784.67	7.6%	240231.57	49.2%	127953.34	72.9%
GRAND TOTAL									
AREA	4647.78	ACRES.							
LEAD	319.47	Lbs.	319.47	298.93	6.4%	203.43	36.3%	131.02	59.0%
COPPER	130.45	Lbs.	130.45	118.83	8.9%	90.51	30.6%	73.84	43.4%
ZINC	941.16	Lbs.	941.16	895.32	4.9%	634.86	32.5%	466.53	50.4%
CADMIUM	7.88	lbs.	7.88	7.59	3.7%	5.92	24.8%	4.52	42.&X
PHSO	1695.82	ttm.	1695.82	12935	22%	1434.05	15.4%	1202.28	29.1%
ss	713625.96	tbs.	713625.96	677496.46	5.1%	480943.35	32.6%	368665.12	48.3%

Planned Land Use



* Includes Com, Ind, Inst, High Res

Fond Du Lac - Planned



	Full DET	
	5 Mictron CRT Pond	
		% red.
LEAD	112.26	64.9%
COPPER	67.08	48.6%
ZINC	388.16	58.8%
CADMIUM	4.35	44.8%
PHSO	1228.44	27.6%
ss	288003.20	59.6%

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 animal wastes. Ammonia can be toxic to aquatic life.

ANAEROBIC:
Without oxygen.

AREA OF CONCERN:
Areas of the Great Lakes identified by the International Joint Commission (IJC) as having serious water pollution problems.

AREAWIDE WATER QUALITY MANAGEMENT PLANS (208 PLANS):
A plan to document water quality conditions in a drainage basin and make recommendations to protect and improve basin water quality. Each basin in Wisconsin must have a plan prepared for it, according to section 208 of the Clean Water Act.

ANTIDEGRADATION:
A policy 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.

BASIN PLAN:
See "Areawide Water Quality Management Plan".

BENTHIC ORGANISMS (BENTHOS):
Organisms living in or on the bottom of a lake or stream.

BEST MANAGEMENT PRACTICE (BMP):
The most effective, practical measures to control nonpoint sources of pollutants that runoff from land surfaces.

BIOACCUMULATION:
The uptake and retention of substances by an organism from its surrounding medium and food. As chemicals move through the food chain, they tend to increase in concentration in organisms at the upper end of the food chain such as predator fish, or in people or birds that eat these fish.

BIOASSAY STUDY:
A test for pollutant toxicity. Tanks of fish or other organisms are exposed to varying doses of treatment plant effluent. Lethal doses of pollutants in the effluent are then determined.

BIOCHEMICAL OXYGEN DEMAND (BOD):
A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water. BOD_5 is the biochemical oxygen demand measured in a five day test. The greater the degree of pollution, the higher the BOD_5.

BIODEGRADABLE:
Waste that can be broken down by bacteria into basic elements. Most organic wastes such as food remains and paper are biodegradable.

BIOTA:
All living organisms that exist in an area.

BUFFER STRIPS:

Strips of grass or other erosion-resisting vegetation between disturbed areas and a stream or lake.

BULKHEAD LINES:

Legally established lines that indicate how far into a stream or lake an adjacent property owner has the right to fill. Many of these lines were established many years ago and allow substantial filling of the bed of the river and bay. Other environmental laws may limit filling to some degree.

CARCINOGENIC:

A chemical capable of causing cancer.

CATEGORICAL LIMITS:

All point source discharges are required to provide a basic level of treatment. For municipal wastewater treatment plants this is secondary treatment (30 mg/1 effluent limits for SS and BOD). For industry the level depends on the type of industry and the level of production. More stringent effluent limits are required, if necessary, to meet water quality standards.

CHLORINATION:

The application of chlorine to wastewater to disinfect it and kill bacteria and other organisms.

CHLORORGANIC COMPOUNDS (CHLORORGANICS):

A class of chemicals that contain chlorine, carbon and hydrocarbon. This generally refers to pesticides and herbicides that can be toxic. Examples include PCB's and pesticides such as DDT and dieldrin.

CHRONIC TOXICITY:

The effects of long-term exposure of organisms to concentrations of a toxic chemical that are not lethal, but is injurious or debilitating in one or more ways. An example of the effect of chronic toxicity is reduced reproductive success.

CLEAN WATER ACT:

See "Public Law 92-500."

COMBINED SEWERS:

A wastewater collection system that carries both sanitary sewage and stormwater runoff. During dry weather, combined sewers carry only wastewater to the treatment plant. During heavy rainfall, the sewer becomes swollen with stormwater. Because the treatment plant cannot process the excess flow, untreated sewage is discharged to the plant's receiving waters, i.e., combined sewer outflow.

CONFINED DISPOSAL FACILITY (CDF):

A structure built to contain and dispose of dredged material.

CONGENERS:

Chemical compounds that have the same molecular composition, but have different molecular structures and formula. For example, the congeners of PCB have chlorine located at different spots on the molecule. These differences can cause differences in the properties and toxicity of the congeners.

CONSERVATION TILLAGE:

Planting row crops while only slightly disturbing the soil. In this way a protective layer of plant residue stays on the surface. Erosion rates decrease.

CONSUMPTION ADVISORY:

A health warning issued by WDNR 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.

DDT:

A chlorinated hydrocarbon insecticide that was banned because of its persistence in the environment.

DIOXIN (2,3,7,8-tetrachlorodibenso-p-dioxin):

A chlorinated organic chemical which is highly toxic.

DISINFECTION:

A chemical or physical process that kills organism that cause disease. Chlorine is often used to disinfect wastewater.

DISSOLVED OXYGEN (DO):

Oxygen dissolved in water. Low levels of dissolved oxygen cause bad smelling water and threaten fish survival. Low levels of dissolved oxygen often result from inadequate wastewater treatment. The Department of Natural Resources considers 5 ppm DO necessary for fish and aquatic life.

DREDGING:
Removal of sediment from the bottom of water bodies.

ECOSYSTEM:
The interacting system of biological community and its nonliving surrounding.

EFFLUENT:
Solid, liquid or gas wastes (byproducts) that are disposed on land, in water or in air. As used in the RAP, effluent generally means wastewater discharges.

EFFLUENT LIMITS:
The Department of Natural Resources 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:
Underground water-bearing areas generally within the boundaries of a watershed, which fill internal passageways of porous geologic formations (aquifers) with water that flows in response to gravity and pressure. Often used as the source of water for communities and industries.

HABITAT:
The place or type of site where a plant or animal naturally lives and grows.

HEAVY METALS:
Metals present in municipal and industrial wastes that pose long-tern environmental hazards if not properly disposed. Heavy metals can contaminate ground and surface waters, fish and other food stuffs. The metals of most concern are: arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium and zinc (see also separate listings of these metals for their health effects).

HERBICIDE:

A type of pesticide that is specifically designed to kill plants and can also be toxic to other organisms.

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.

NPS:
See nonpoint source pollution.

OLIGOTROPHIC:

Refers to an unproductive and nutrient-poor lake. Such lakes typically have very clear water. (See also "Eutrophic" and "Mesotrophic.")

OUTFALL:

The mouth of a sewer, drain, or pipe where effluent from a wastewater treatment plant is discharged.

PATHOGEN:

Any infective agent capable of producing disease. It may be a virus, bacterium, protozoan, etc.

PELAGIC:

Referring to open water portion of a lake.

PESTICIDE:

Any chemical agent used to control specific organisms, such as insecticides, herbicides, fungicides, etc.

PH:

A measure of acidity or alkalinity, measured on a scale of 0 to 14 with 7 being neutral and 0 being most acid, and 14 being most alkaline.

PHENOLS:

Organic compounds that are byproducts of petroleum refining, textile, dye, and resin manufacture. High concentrations can cause taste and odor problems in fish. Higher concentration can be toxic to fish and aquatic life.

PHOSPHORUS:

A nutrient that, when reaching lakes in excess amounts, can lead to overfertile conditions and algae blooms.

PLANKTON:

Tiny plants and animals that live in water.

POINT SOURCES:

Sources of pollution that have discrete discharges, usually from a pipe or outfall.

POLLUTION:

The presence of materials or energy whose nature, location, or quantity produces undesired environmental effects.

POLYCHLORINATED BIPHENYLS(PCBs):

A group of 209 compounds, PCBs have been manufactured since 1929 for such common uses as electrical insulation and heating/cooling equipment, because they resist wear and chemical breakdown. Although banned in 1979 because of their toxicity, they have been

detected on air, land and water. Recent surveys found PCBs in every section of the country, even those remote from PCB manufacturers.

POLYCHLORINATED ORGANIC COMPOUNDS:
A group of toxic chemicals which contain several chlorine atoms.

PRETREATMENT:
A partial wastewater treatment required from some industries. Pretreatment removes some types of industrial pollutants before the wastewater is discharged to a municipal wastewater treatment plant.

PRIORITY POLLUTANT:
A list of toxic chemicals identified by the federal government because of their potential impact in the environment and human health. Major dischargers are required to monitor all or some of these chemicals when their WPDES permits are reissued.

PRIORITY WATERSHED:
A drainage area 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.

RAP:
See Remedial Action Plan.

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, snow melt, or irrigation that flows over the ground surface and returns to streams. Runoff can collect pollutants from air or land and carry them to receiving waters.

SECONDARY IMPACTS:
The indirect effects that an action can have on the health of the ecosystem or the economy.

SECONDARY TREATMENT:
Two-stage wastewater treatment that allows the coarse particles to settle out, as in primary treatment, followed by biological breakdowns of the remaining impurities. Secondary treatment commonly removes 90% 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.

TACs:
Technical advisory committees that assisted in the development of the Remedial Action Plan.

TERTIARY TREATMENT:
See advanced wastewater treatment.

TOP-DOWN MANAGEMENT:
A management theory that uses biomanipulation, specifically the stocking of predator species of fish to improve water quality.

TOTAL MAXIMUM DAILY LOADS:
The maximum amount of a pollutant that can be discharged into a stream without causing a violation of water quality standards.

TOXIC:
An adjective that describes a substance which is poisonous, or can kill or injure a person or plants and animals upon direct contact or long-term exposure. (Also, see toxic substance.)

TOXIC SUBSTANCE:
A chemical or mixture of chemicals which, through sufficient exposure, or ingestion, inhalation of assimilation by an organism, either directly from the environment or indirectly by ingestion through the food chain, will, on the basis of available information cause death, disease, behavioral or immunologic abnormalities, cancer, genetic mutations, or development of physiological malfunctions, including malfunctions in reproduction or physical deformations, in organisms or their offspring.

TOXICANT:
See toxic substance.

TOXICITY:
The degree of danger posed by a toxic substance to animal or plant life. Also see acute toxicity, chronic toxicity and additivity.

TOXICITY REDUCTION EVALUATION:
A requirement for a discharger that the causes of toxicity in an effluent be determined and measures taken to eliminate the toxicity. The measures may be treatment, product substitution, chemical use reduction or other actions that will achieve the desired result.

TREATMENT PLANT:
See wastewater treatment plant.

TROPHIC STATUS:
The level of growth or productivity of a lake as measured by phosphorus content, algae abundance, and depth of light penetration.

TURBIDITY:
Lack of water clarity. Turbidity is usually closely related to the amount of suspended solids in water.

UNIVERSITY OF WISCONSIN-EXTENSION (UWEX):
A special outreach, education branch of the state university system.

VARIANCE:
Government permission for a delay or exception in the application of a given law, ordinance or regulation. Also, see water quality standard variance.

VOLATILE:
Any substance that evaporates at a low temperature.

WASTELOAD ALLOCATION:
Division of the amount of waste a stream can assimilate among the various dischargers to the stream. 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.

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, onsite sewer systems.

Nonpoint Source Water Pollution Abatement Grant Program - Funds to share the cost of reducing water pollution. Nonspecified sources are available in selected priority watersheds.

Solid Waste Grant Program - Communities planning for solid waste disposal sites are eligible for grant money. $500,000 will be available each year to help with planning costs.

WISCONSIN NONPOINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM:

A state cost-share program established by the State Legislature in 1978 to help pay the costs of controlling nonpoint source pollution. Also known as the nonpoint source element of the Wisconsin Fund or the Priority Watershed Program.

WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES):

A permit system to monitor and control the point source dischargers of wastewater in Wisconsin. Dischargers are required to have a discharge permit and meet the conditions it specifies.

Priority Watershed Projects in Wisconsin
1993

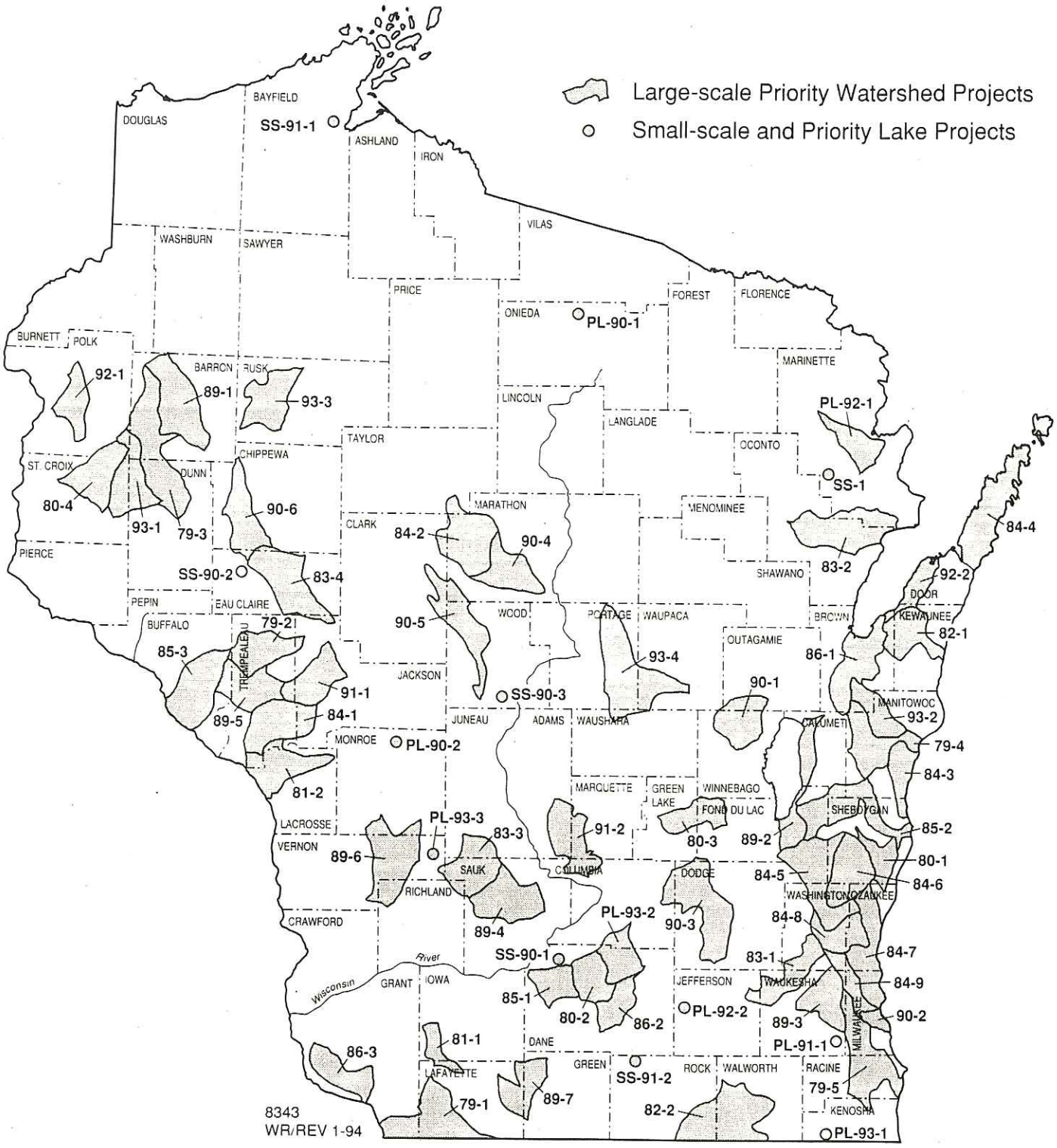
Year Selected-Map Number	Large-scale Priority Watershed Project	County(ies)
79-1	Galena River*	Grant, Lafayette
79-2	Elk Creek*	Trempealeau
79-3	Hay River*	Barron, Dunn
79-4	Lower Manitowoc River*	Manitowoc, Brown
79-5	Root River*	Racine, Milwaukee, Waukesha
80-1	Onion River*	Sheboygan, Ozaukee
80-2	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
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

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

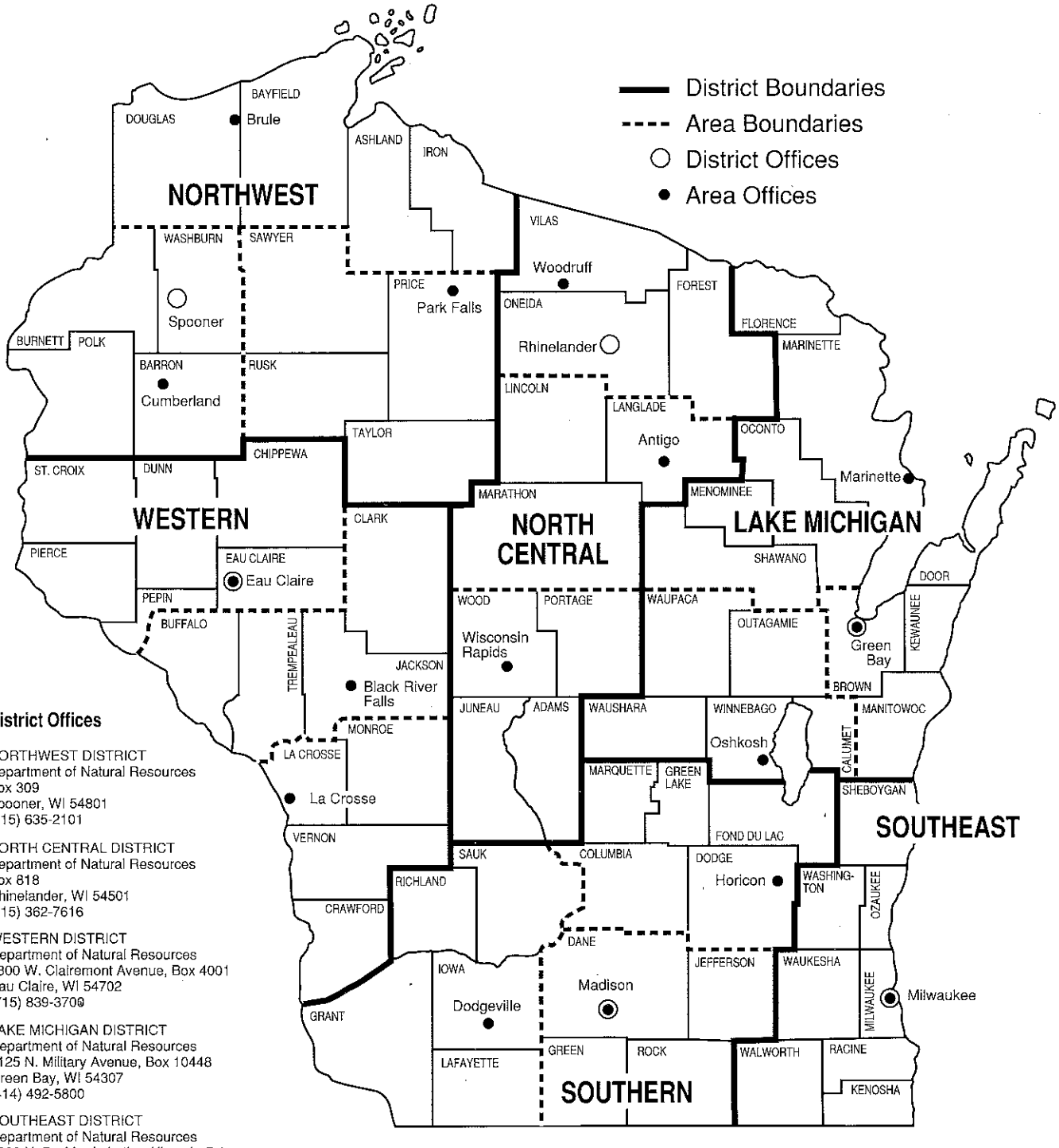
Year Selected-Map Number	Priority Lake Project	County(ies)
PL-90-1	Minocqua Lake	Oneida
PL-90-2	Lake Tomah	Monroe
PL-91-1	Little Muskego, Big Muskego, Wind Lakes	Waukesha, Racine, Milwaukee
PL-92-1	Lake Noquebay	Marinette
PL-92-2	Lake Ripley	Jefferson
PL-93-1	Camp/Center Lakes	Kenosha
PL-93-2	Lake Mendota	Dane, Columbia
PL-93-3	Hillsboro Lake	Vernon

* *Project completed*

Priority Watershed Projects in Wisconsin
1993



DNR Field Districts and Areas



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REV 8/91

Our Mission:

To protect and enhance our Natural Resources—
our air, land and water;
our wildlife, fish and forests.

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

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

And in cooperation with all our citizens
to consider the future
and those who will follow us.

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DEPT. OF NATURAL RESOURCES

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