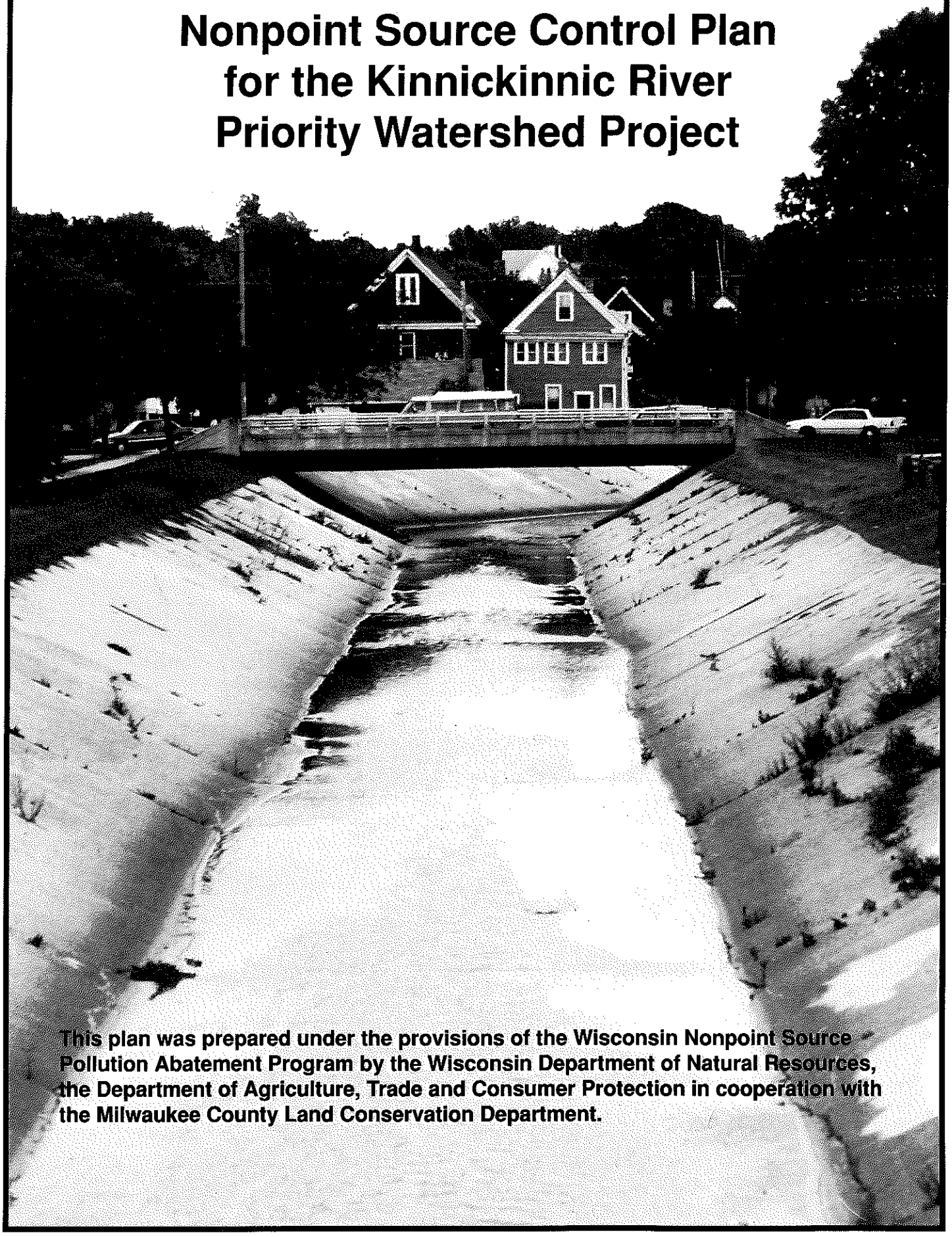
Nonpoint Source Control Plan for the Kinnickinnic River Priority Watershed Project



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

Watershed Plan Organization Information

Natural Resources Board
1995

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Nonpoint Source Control Plan for the Kinnickinnic River Priority Watershed Project

The Wisconsin Nonpoint Source Water Pollution Abatement Program

Plan Approval:

October, 1994

This Plan Was Cooperatively Prepared By:

The Wisconsin Department of Natural Resources
The Kinnickinnic River Priority Watershed Citizens Advisory Committee

Publication WR-378-94

For copies of this document please contact:

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The 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.

Watershed Plan Credits

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Penny Podell, County Board Supervisor
Milwaukee County Courthouse
901 N. 9th Street
Milwaukee, WI 53233

Dear Penny Ms Podell:

I am pleased to approve the Kinnickinnic River 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. The plan has been approved by the Land and Water Conservation Board. I am also approving the plan as an amendment to the Milwaukee River Areawide Water Quality Management Plan.

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

Sincerely,

George

George E. Meyer
Secretary

Good luck on this important project!

cc: RoseMary Oliveira - Milwaukee Co.
Sharon Gayan - SED
Jim D'Antuono - SED
Becky Wallace - WR/2
Chuck Ledin - WR/2
Cindy Hoffland - CA/8

File No. 94-769

By the Committee on Energy, Environment and Extension Education:

(ITEM 1) WHEREAS, the Kinnickinnic River watershed was designated a "priority watershed" in 1990 under the authority of the Wisconsin Nonpoint Source Pollution Abatement Program described in Section 144.25 of the Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code, and

WHEREAS, the purpose of this priority watershed plan is to:

a) Improve water quality by controlling erosion, reducing storm water pollution and stabilizing eroding stream banks; and

b) Control polluted runoff by encouraging watershed stewardship, local involvement, partnerships, education, and financial assistance; and

WHEREAS, this plan was prepared by the Department of Natural Resources (DNR) and the twenty-five (25) member Kinnickinnic River Priority Watershed Citizens Advisory Committee, including five (5) staff members from the following County departments:

Parks, Recreation and Culture

Public Works

- Environmental Services
- Architecture and Engineering
- General Mitchell International Airport (GMIA)

County Board of Supervisors

; and

WHEREAS, County Board approval of this plan and subsequent approval of the plan by the State of Wisconsin Land and Water Conservation Board will allow the distribution of $12,493,000 in state funding to local units of government in the Kinnickinnic River watershed over the next eight (8) years for voluntary water quality improvements; and

WHEREAS, the Milwaukee County Land Conservation Committee, on September 20, 1994 voted 7-0 to recommend approval of the final draft of the Nonpoint Source Plan for the Kinnickinnic River Priority Watershed Project and the Energy, Environment and Extension Education Committee voted 7-0, also on September 20, 1994, to concur in that recommendation; now, therefore,

BE IT RESOLVED, That the Milwaukee County Board of Supervisors hereby approves the final draft of the Nonpoint Source Plan for the Kinnickinnic River Priority Watershed Project.

FISCAL NOTE: Adoption of this resolution will result in the following funds being made available to Milwaukee County from the DNR over the next 8 years for voluntary water quality improvements:

Grant Funding	$2,415,000
Milwaukee County Cost Share	886,000
Total Cost of Plan Recommended Water Quality Improvements	$3,301,000

The above cost share portion will be required only if the County chooses to apply for grant funding.

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SUMMARY

Introduction

The Kinnickinnic River Watershed Project Area is a 31.8 square-mile drainage area located in Milwaukee County, Wisconsin. About 200,000 people live in this watershed which includes parts of seven governmental jurisdictions. Land uses are mostly urban. The watershed is one of six watersheds that make up the Milwaukee River Basin.

The Kinnickinnic River Watershed Project Area was designated a "priority watershed" in 1990 under the Wisconsin Nonpoint Source Water Pollution Abatement Program. It is one of 67 priority watersheds statewide, encompassing more than 4 million acres, in which the clean-up and protection of water resources through control of nonpoint sources of pollution is a priority for the Department of Natural Resources (DNR).

Nonpoint source pollution is carried in storm water runoff from streets, parking lots, construction sites and other sources that cannot be easily traced to a single point such as a municipal or industrial wastewater discharge. Nonpoint source pollution in the Kinnickinnic River Watershed Project Area has degraded surface waters and reduced opportunities for aesthetic, recreational, and biological uses of the principal waterbodies in the watershed, including Lake Michigan, the Kinnickinnic River, Wilson Park Creek, Holmes Avenue Creek, Villa Mann Creek, Zablocki Park Creek, Lyons Park Creek, and West Milwaukee Ditch.

Nonpoint sources in the Kinnickinnic River Watershed Project Area include eroding streambanks, runoff from paved surfaces and rooftops, and erosion from developing and redeveloping urban areas. Pollutants from nonpoint sources are carried to the surface water or groundwater through the action of rainfall runoff, snow melt, and seepage. Principal pollutants of concern include toxic materials such as heavy metals, contaminated sediment, nutrients, bacteria, cancer-causing organic compounds, oils, grease, and other contaminants from paved surfaces.

Water Quality

The Kinnickinnic River watershed contains about 16.8 miles of tributary streams feeding to the Milwaukee River Harbor and Lake Michigan. Perennial streams are the predominant surface water features of the watershed. To a lesser extent, intermittent streams and portions of Lake Michigan drain water from the headwaters and direct drainages respectively.

The Kinnickinnic River below 6th Street has the potential to support a balanced warm water sport fish community and partial body contact recreation. The Kinnickinnic River above 6th Street and its six principal tributaries have limited biological and recreational uses because of depths too shallow to support sport fish, but having characteristics necessary to support forage fish communities. All of these waterbodies are only partially meeting, or not meeting, their full potential due to cultural impacts.

Recurring problems in all areas of the watershed include loss of aquatic habitat, low dissolved oxygen, high bacteria levels, and chronic toxicity from heavy metals, oil and grease, hydrocarbons, volatile organic compounds, excessive algal growth, and destabilization of stream hydrology caused by increased storm water runoff and loss of stream base flows.

Loss of habitat caused by channelizing of natural streams is prevalent in all areas of the watershed. More than 70 percent of the streams have been channelized or straightened, and in most cases they have been lined with concrete.

Nonpoint Pollution Sources

Nonpoint Sources

Principal nonpoint sources are derived from streambank erosion, redeveloping areas, and runoff from established urban areas such as commercial, residential, and industrial lands.

Pollutants found primarily in runoff from established urban areas include heavy metals (lead, copper, zinc, cadmium, chromium, etc.) and a large number of toxic organic chemicals (PCBs, aromatic hydrocarbons, esters and many others). Other substances contained in runoff include sediment, nutrients, bacteria, protozoans (e.g. Cryptosporidium), and pesticides.

Runoff from intensely developed areas causes drastic changes in stream hydrology. This occurs as runoff from paved and roofed surfaces accelerates, creating large increases in stream peak flows and flow volumes. When compared to undeveloped stream basins, these flows dramatically increase during rain storms and decrease below normal levels between rain storms. This produces "flashy" streams with temperatures and chemical characteristics which limit aquatic life and recreational uses.

Streambanks along most of the streams in the watershed were surveyed. The most extensive areas of erosion caused by urban runoff exist in the Kinnickinnic River along the Kinnickinnic River Parkway, in Jackson Park, and at isolated locations below 6th Street; and in Zablocki Park Creek between Howard Avenue and Loomis Road.

Runoff from urban development and redevelopment is a significant source of pollution in the watershed. Construction of new buildings, roads, and utilities disturbs otherwise stable

areas, exposing large amounts of soil to erosion. Without adequate controls, construction site erosion can wash soil and debris onto road surfaces and sidewalks, clog storm sewers, and have catastrophic impacts on urban streams.

Pollution Reduction Goals

Water quality and aquatic habitat investigations were conducted as part of the planning effort for the Kinnickinnic River Watershed Project. The results indicate that significant reductions are needed for several key pollutants to achieve the watershed project's water quality objectives.

Overall, a 25 percent reduction in total pollutant loading is needed to improve water quality and aquatic habitat in the watershed. This goal should be revised, however, if and when other water quality data from within the watershed or from nearby streams (e.g. Lincoln Creek) show that significant improvements toward enhancement of streams to support healthier and more diverse aquatic communities cannot be achieved at the 25 percent reduction level.

An important means for improving water quality in the Kinnickinnic River, its tributaries, and nearshore lake areas is to reduce the concentrations of heavy metals and other toxic materials in urban runoff. Watershed-wide an estimated 25 percent reduction in metals concentrations in storm water discharges is needed to achieve chronic toxicity standards set forth in Chapter NR 105 of the Wisconsin Administrative Code. In addition, a moderate reduction in phosphorous and sediment loading is needed to reduce the prevalence of noxious algae growth and the accumulation of contaminated sediments.

Management Actions

This plan prescribes best management practices (BMPs). BMPs are actions or structures that are needed to control nonpoint pollution sources to the levels described above. State funding is available to help offset the expense of installing these practices and managing the local nonpoint source control program recommended in this plan.

Financial assistance is available from the nonpoint source program for a variety of activities. Landowners, land renters, counties, cities, towns, sewerage districts and other units of government are eligible for the financial assistance available to this project. State funds help support:

- Construction of BMPs such as those described in Chapters 4 and 5.

- Staff or contracts with consultants to develop storm water management plans and to design storm water BMPs.

- Staff and activities related to developing and/or amending water quality provisions in storm water management ordinances and construction erosion control ordinances.

- Staff for the implementation of supplementary catch basin cleaning programs.

- Information and education programs.

Participation in watershed projects is voluntary. Projects are implemented by local units of government, such as cities, villages, and counties. The DNR reviews the progress of local units of government and provides them with assistance throughout the life of the project. The DNR also monitors changes in water quality resulting from the control of nonpoint sources.

The following is an overview of the management actions needed to meet water quality goals in the Kinnickinnic River Watershed Project Area.

Management Program

The nonpoint source management program has three elements. These include urban storm water quality control, streambank erosion control, and construction erosion control.

Storm Water Pollution: The control program for urban storm water is based on a pollutant reduction goal of 25 percent of toxic materials, as indicated by lead and other heavy metals.

Approximately 4,600 acres of urban lands are designated source areas targeted for nonpoint source control. Urban nonpoint source controls include wet detention ponds, infiltration devices, catch basin cleaning, and urban pollution prevention practices. If wet detention and catch basin cleaning are used, nearly 23 acres of wet detention ponds need to be constructed, and about 1,300 catch basin cleanings per year are recommended.

Shoreline and Streambank Erosion Control: Approximately 4,200 feet of streambank erosion at 16 sites are eligible for cost sharing. Of these, five sites are deemed highest priority. These priority sites are located along the Kinnickinnic River in Jackson Park and along Zablocki Park Creek in Milwaukee.

Construction Site Erosion: About 400 acres of urban development and redevelopment and construction is expected in the watershed over the next two decades. Improved construction erosion control measures are needed in each of the six municipalities in the watershed.

Core Elements of the Management Program: The core elements of the nonpoint source control program applicable to local units of government include basic measures that can be implemented without further study. Adopting a community specific core program is the first

step in the implementation process. As such, communities 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.

The basic elements of the core program are:

- Strengthen and enforce existing construction erosion control ordinances to be consistent with the model ordinance 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."

- Develop and implement a community specific program of urban pollution prevention practices. This may include a combination of activities such as 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 information and education strategy.

Segmented Elements of the Urban Management Program: The segmented elements of the nonpoint source program include those requiring site specific investigations prior to implementation. Best management practices implemented under this portion of the program likely will include wet detention ponds, infiltration devices, streambank erosion controls and other structural means for reducing urban nonpoint source pollution.

Detailed studies will include engineering feasibility and other site specific investigations. 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 basic elements of the segmented program are:

- Adopt and enforce a comprehensive storm water management ordinance consistent with the state's model storm water ordinance currently under preparation.

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

- Conduct detailed engineering studies to determine the best means to implement community specific nonpoint source control measures for existing urban areas. This component will consider structural urban practices such as detention and supplementary catch basin cleaning and street sweeping.

- Design and install structural urban best management practices as described in the state's storm water manual (in preparation) for existing urban areas with detailed engineering studies.

Costs

The total estimated cost of carrying out the recommendations presented in this plan is estimated to be about $16 million. This cost will be shared by the State of Wisconsin through its Nonpoint Source Water Pollution Abatement Program, the Department of Transportation, local units of government and individual landowners. Table 5-3 summarizes the estimated costs for project components and shows how these costs would be incurred by the major project participants.

Core Program Costs

Carrying out core activities will cost about $2.2 million over eight years. Principal cost components include measures needed to control construction site erosion over the eight-year project period. Costs incurred would be primarily for the installation of best management practices to control construction site erosion, and local staffing to support project administration and information and education activities.

The nonpoint source program would cover about 95 percent of the total cost for this component. The remaining portion (5 percent) of the cost for this component would be borne by individual landowners and developers, who would cover 100 percent of the engineering and capital costs for designing and installing construction erosion control practices.

Segmented Program Costs

It will require an estimated $14.1 million to carry out segmented activities over the eight-year project period. Costs would be incurred primarily for preparation of storm water management plans and for the engineering and capital costs required to install urban structural practices.

The cost estimates for these components largely reflect the expense of placing structural practices in existing urban areas. Expenditures for the purchase of land, including home relocation where necessary and re-routing storm sewer pipes where needed can increase the costs dramatically.

About 25 percent of these costs would be borne by units of government or individual landowners and developers to cover the capital cost of practice installation. In addition, these parties would be responsible for supporting the cost of maintenance. About 75 percent of the segmented program costs would be covered by the nonpoint source program, primarily for preparing storm water management plans, purchasing easements, and state sharing capital costs for structural BMPs. The state share would cover the following items.

- Assistance for preparing detailed engineering site feasibility studies to locate and select urban structural practices, including 100 percent of the costs incurred by additional staff who are required in order to prepare these studies.

- Assistance for installing urban structural practices such as wet detention ponds, including 100 percent of the practice design costs, 70 percent of the capital cost for practice installation, and 50 percent of land purchase costs.

- Assistance for a supplementary catch basin cleaning and street sweeping schedule where needed, including 50 percent of the costs for a five-year period.

It is intended that local units of government would cover the remaining costs associated with installing urban structural practices, including maintenance, and continuing the supplementary catch basin cleaning and street sweeping schedule past the five-year seed period, as needed. However, a part of the local government share could be paid for by landowners who install practices on private property.

Information and Education Costs

This component will cost about $210,000 for non-staff related expenses over the life of the project. The state's nonpoint source program supports 100 percent of these costs.

Project Implementation

Project implementation is scheduled to begin in summer, 1994 and continue for eight years. Cost share agreements may be signed throughout the eight-year project period, provided that the municipality conducts its core activities.

Information and Education

An information and education program will be conducted throughout the project period. Milwaukee County, local units of government, and the UW-Extension staff have overall responsibility for the program. The program includes:

- A media campaign to inform the public about runoff pollution and what can be done to reduce it.

- More intensive educational activities, such as meetings, workshops, and demonstration projects for landowners and local government officials who must adopt new pollution control techniques.

- Water quality informational materials for homeowners, local government officials, community groups, and concerned citizens to inform them about watershed activities, implementation processes, and pollution control methods.

- Educational activities and service projects for youth to inform them about water resource issues and help them develop a conservation ethic.

Further Information

If you want more information about the Kinnickinnic River Priority Watershed Project or a copy of the watershed plan contact one of the following:

Nonpoint Source Program Coordinator
DNR
Southeast District
2300 North Third St.
Milwaukee, WI 53212
(414) 263-8500

Urban Water Quality Education Specialist
University of Wisconsin-Extension
1304 S. 70th St. 2nd Floor
West Allis, WI 53214
(414) 475-2881

CHAPTER ONE
Plan Purpose and Legal Status

The Kinnickinnic River Watershed Project Area was designated as a "priority watershed" in 1990 under the Wisconsin Nonpoint Source Water Pollution Abatement Program. Map 1 shows the location of the Kinnickinnic River Watershed Project Area. It is one of 60 watersheds statewide where clean-up and protection of water resources through control of nonpoint sources of pollution is a priority for the Department of Natural Resources (DNR).

This priority watershed project is guided by a plan prepared cooperatively by the DNR, the University of Wisconsin Extension (UWEX), local units of government, with input from the Department of Agriculture, Trade and Consumer Protection (DATCP). The priority watershed plan assesses nonpoint and other sources of water pollution and identifies best management practices needed to meet specific water resource objectives. The plan guides implementation of these practices to improve water quality.

Nonpoint Source Water Pollution Abatement Program

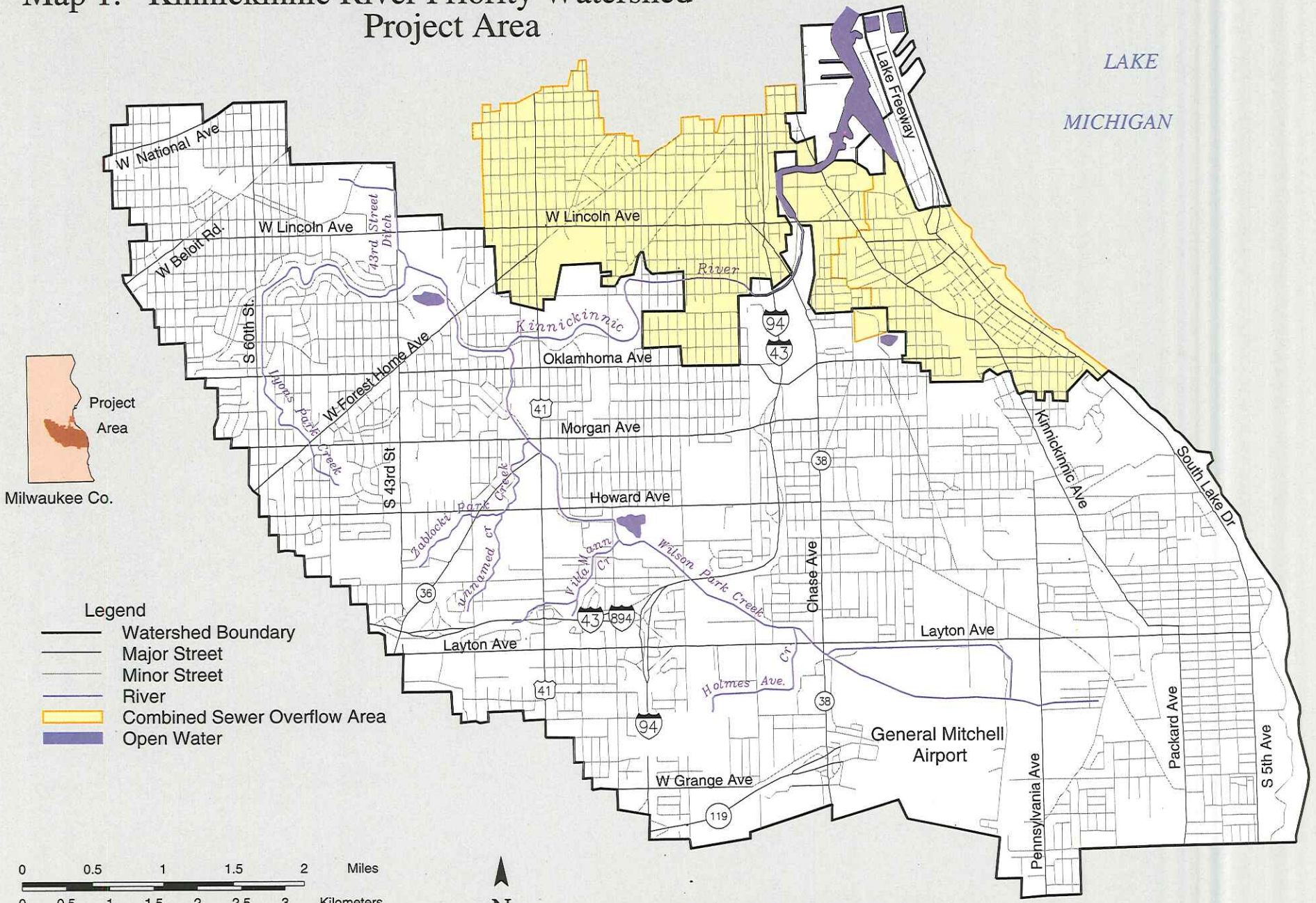
The Nonpoint Source Water Pollution Abatement Program (NPS Program) was created in 1978 by the State Legislature. Its goal is to improve and protect the water quality of streams, lakes, wetlands, and groundwater by reducing pollutants from urban and rural nonpoint sources. Nonpoint sources include: eroding agricultural lands, eroding streambanks and roadsides, runoff from livestock wastes, erosion from developing urban areas, and runoff from established urban areas. Pollutants from nonpoint sources are carried to the surface water or groundwater through the action of rainfall runoff, seepage, and snowmelt.

The following is an overview of the NPS Program:

- The NPS Program is administered by the DNR. It focuses on critical hydrologic units called priority watersheds. The program is implemented through priority watershed projects for which detailed plans are prepared.

- Local units of government implement the plans. Water quality improvement is achieved through implementation of nonpoint source best management practices (BMPs) and adoption of ordinances. Landowners, land renters, counties, cities,

Map 1. Kinnickinnic River Priority Watershed Project Area



Wisconsin Department of Natural Resources
BIM - GEO Services Section
November 1994

villages, towns, sanitation districts, metropolitan Sewerage Districts, and regional planning commissions are eligible to participate.

- Technical assistance is provided to aid the design of best management practices. State cost-share assistance is available for installing these practices.

- Informational and educational activities are employed to encourage participation.

Project Planning and Implementation Phases

Planning Phase

The planning phase of the project began in 1992. Planning included the following activities:

- Appraisals of the conditions and uses of streams in the project area

- Inventories of the types of land uses and severity of nonpoint sources affecting the streams and Lake Michigan

- Evaluations of the types and severity of other factors affecting water quality (examples include discharges from treatment plants and natural or endemic stream conditions)

- Determinations of levels of nonpoint source controls needed and actions needed to improve and/or protect water quality

- Public reviews and comments received during plan development through public meetings and the Kinnickinnic River Priority Watershed Advisory Committee

- Approvals of the priority watershed plan documenting the above activities, plan implementation procedures, and project costs.

Implementation Phase

The implementation phase will begin following review of the draft priority watershed plan, a public hearing, and approval by the DNR, and local units of government.
During the implementation phase:

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

- Local units of government are contacted by the DNR or its designee to discuss the actions required to implement plan recommendations.

- Cost-share agreements for some practices are signed by the landowner and a local unit of government that provides oversight of best management practices, costs, cost-share amounts, and a schedule for installation of management practices. All practices are scheduled for installation within five years from the date an agreement is signed.

- Educational programs are implemented to raise awareness of nonpoint source pollution control and encourage participation in the priority watershed project.

Legal Status of the Nonpoint Source Control Plan

The Kinnickinnic River Priority Watershed Plan was prepared under the authority of the Wisconsin Nonpoint Source Water Pollution Abatement Program described in Section 144.25 of the Wisconsin Statutes and Chapter NR 120 of the Wisconsin Administrative Code. Similarly, this plan is subject to the amendment process under NR 120.08 (e) for substantive changes. The DNR will make determination if a proposed change will require a plan amendment. This watershed plan is the basis for the DNR to enter into cost-share and local assistance grants with agencies responsible for implementation and will be 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 statutes and rules will supersede the plan.

Other Planning Activities in the Project Area

This plan is one of several plans that address water resource protection throughout the Milwaukee River Basin. For example:

- Nonpoint source control plans similar to this one have been completed for each of the five other watershed project areas in the Milwaukee River Basin.

- SEWRPC has completed an Areawide Water Quality Management Plan, including sewer service areas for the Milwaukee River Basin and other basins in the region.

- A Remedial Action Plan for the Milwaukee River Estuary has been cooperatively prepared by the DNR and other local units of government under the direction of the U.S. Environmental Protection Agency and the International Joint Commission.

These and other reports recognize the importance of reducing nonpoint sources to achieve improved water quality in the Milwaukee River Estuary, Lake Michigan and streams of the Kinnickinnic River watershed.

Relationship of the Nonpoint Source Control Plan to the Integrated Resource Management Strategy

The DNR has adopted an approach to natural resource management called "integrated resource management." It uses the nonpoint source control program as the foundation for coordinating other DNR environmental quality (solid waste, wastewater, water regulation and zoning, water resources management, water supply) and resource management (fisheries, forest management, parks and recreation, and wildlife and endangered resources management) efforts.

This Priority Watershed Plan meets the requirements of Section 144.25 of the Wisconsin Statutes. This statute requires the DNR to develop "an integrated resource management strategy to protect or enhance fish and wildlife habitat, aesthetics, and other natural resources" for priority watersheds.

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 Kinnickinnic River Watershed Project Area. Amendments to the Act, approved in 1987, required large cities, major industries, construction activities of five acres or more and potentially other municipalities to apply for a National Pollutant Discharge Elimination System (NPDES) permit for the discharge of pollutants from separate storm water sewer systems. These permits (in Wisconsin called WPDES permits) are similar to those issued by the DNR for public and private wastewater treatment plants and industrial dischargers of wastewater.

The DNR, in accordance with regulations issued by the U.S. Environmental Protection Agency (EPA), has responsibility for implementing this permit program. The amendments to the 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 specified in this plan for improving water quality in the project area. For example, adoption and enforcement of construction site erosion control ordinances are specifically mentioned in the regulations and are identified in this nonpoint source control plan as a critical component of the sediment control strategy. Implementation of the priority watershed plan will likely meet this and many other permit requirements.

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

The coordinated implementation of the storm water permit program and this nonpoint source control plan will help ensure that the water quality goals and objectives for the Kinnickinnic River Watershed Project Area will be achieved. Specific information on the relationship between these two programs is further explained in Chapter 7. For updates, contact the DNR Nonpoint Source Section of the Bureau of Water Resources Management in Madison.

Plan Organization

The remainder of this plan is divided into eight chapters described below:

Chapter 2: "General Project Area Characteristics," is an overview of the cultural and natural resource features with respect to planning and implementation efforts for the priority watershed project.

Chapter 3: "Water Resources Conditions, Nonpoint Sources, and Water Resource Objectives," characterizes the existing and potential biological and recreational uses of surface waters. The results of the nonpoint source inventories are discussed and the water resources goals and objectives are set.

Chapter 4: "Nonpoint Source Control Needs," identifies the level of nonpoint source controls needed to meet the water resource objectives and identifies the management decision criteria and the nonpoint sources eligible for funding under the priority watershed project.

Chapter 5: "Implementation Program," describes the means by which the local units of government administer the project, estimates a local assistance and management practice cost-share budget, identifies technical and financial assistance available to local units of government in the project area.

Chapter 6: "Information and Education Strategy," presents the methods used to publicize and promote the priority watershed project in order to obtain the highest level of participation among landowners and units of government in the watershed. It describes the elements, costs, and responsible parties needed to carry out the information and education components.

Chapter 7: "Integrated Resources Management Program," presents guidelines for integrating other resource management programs, organizations and activities into the watershed project.

Chapter 8: "Project Evaluation," discusses the means for assessing the amount of nonpoint source pollution control gained through installation of best management practices.

Chapter 9: "Water Quality Monitoring and Evaluation" presents and strategy and a schedule for monitoring streams and lakes to determine the water quality impacts of implementing nonpoint source pollution controls.

CHAPTER TWO
General Project Area Characteristics

The Kinnickinnic River Watershed Project Area is a 31.8 square mile drainage area located in metropolitan Milwaukee County, Wisconsin. Of the total project area, 21.3 square miles drains to the Milwaukee River Estuary which flows into Lake Michigan. 5.0 square miles of the project area is drained by combined sewers to the Deep Tunnel, an underground reservoir that holds sanitary sewage and storm water until it can be treated by a sewage treatment plant. The remaining 5.5 square mile area drains directly to Lake Michigan through a system of ravines and storm drains and is not directly connected to the Kinnickinnic River.

Land use in the project area consists of areas of single-family and multi-family homes interspersed with commercial areas and small to medium sized industrial parks. A portion of General Mitchell International Airport, a medium-sized airport that serves most commercial air traffic in the region, is located in the project area. Virtually all of the project area is developed. Several parkland areas exist along stream corridors, along the Lake Michigan shoreline, surrounding some of the local schools, and in the six major cemeteries in the project area.

Topography is mostly gentle slopes with steeper slopes in the bluff areas along Lake Michigan and along some segments of the Kinnickinnic River below 6th Street. Much of the watershed project area drains runoff to a system of six tributary streams before it enters the Kinnickinnic River. These streams and their subwatersheds are shown in map 2.

The following is a brief overview of the project area's cultural and natural resource features important in planning a nonpoint source pollution control effort.

Cultural Features

Civil Divisions

The entire project area is within Milwaukee County and includes parts of the following municipalities: Milwaukee, West Allis, Greenfield, West Milwaukee, St. Francis, and Cudahy. Table 2-1 and map 2 show the areal extent of each municipality within the Kinnickinnic River Watershed Project Area.

Table 2-1. Municipal Areas in the Kinnickinnic River Watershed Project Area.

Municipality[1]	Acres	Percent of Project Area
city of Milwaukee[2]	13,520	58
village of West Milwaukee	195	1
city of West Allis	1,078	5
city of Greenfield	1,430	6
city of St. Francis	1,612	7
city of Cudahy	2,460	12
TOTAL	20,295	89

[1] Milwaukee County owns and operates many parcels within municipalities in the project area, including General Mitchell International Airport (1,062 acres) and 970 acres of park lands.

[2] includes 3,173 acres of combined sewered areas

Source: DNR

Population

The population in the Kinnickinnic River Watershed Project Area is estimated to be about 200,000 persons. It has declined at a slow rate since 1960 and is expected to stabilize with a smaller decline over the next 20 years.

Land Uses

Table 2-2 summarizes existing land uses in the project area. The area is almost entirely developed with residential areas occupying about 45 percent, industrial areas 12 percent, transportation 11 percent, and commercial areas 5 percent.

Map 2. Civil Divisions, Streams and Subwatersheds of the Kinnickinnic River Watershed Project Area

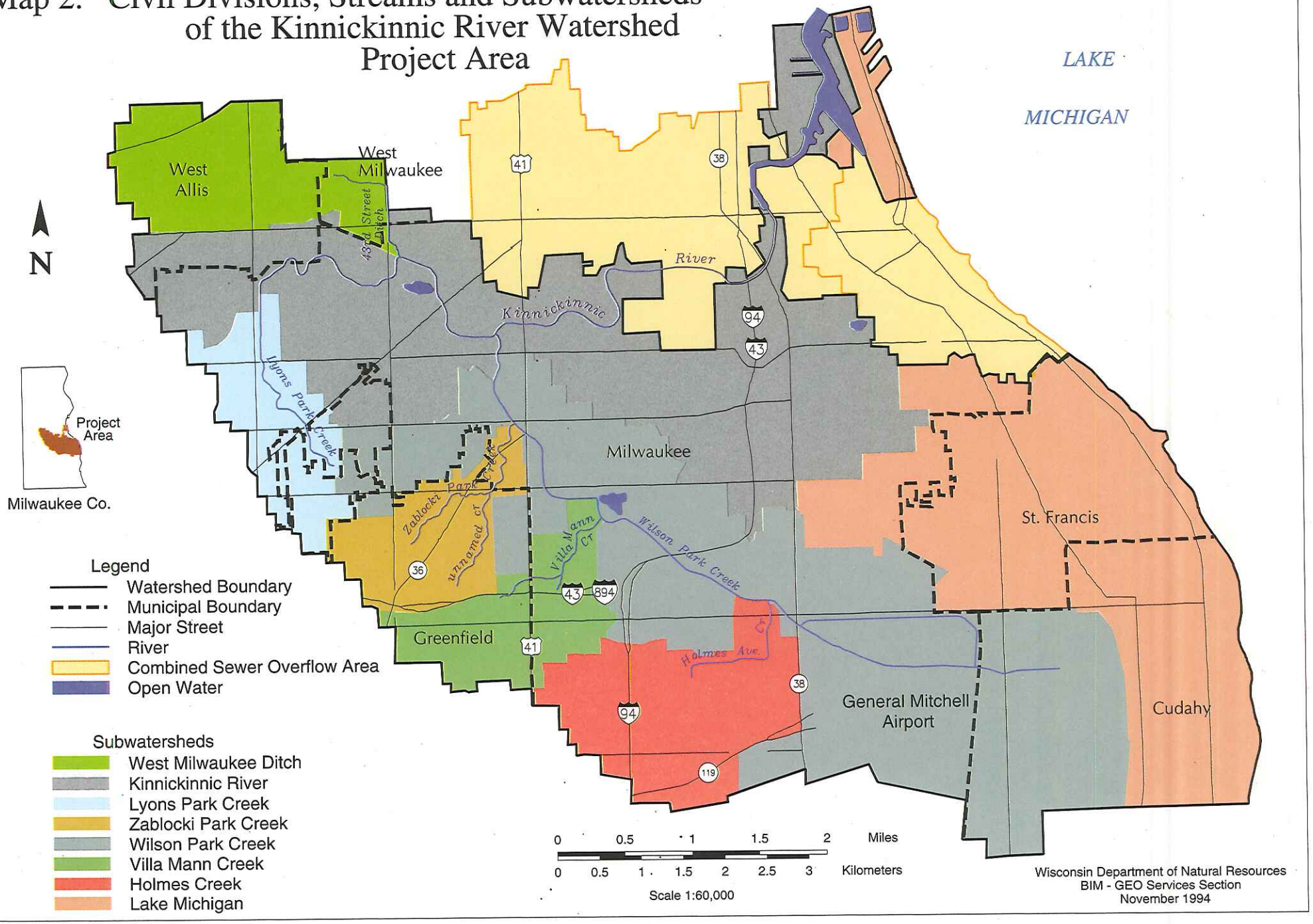


Table 2-2. Land Uses Within the Kinnickinnic River Watershed Project Area.

Land Use	Acres	Percent of Total
Single Family Residential	6,873	34
Multiple Family Residential	848	4
Commercial	970	5
Industrial	2,018	10
Highways	470	2
Railroads	401	2
Airport	1,062	5
Governmental/Institutional	800	4
Parks	726	3
Cemeteries	457	2
Surface Water	29	1
Combined Sewer Areas**	3,173	16
Other Open Lands	2,468	12
TOTAL	20,295	100

**combined sewer areas were not inventoried for detailed land uses.

Source: SEWRPC

Municipal and Industrial Point Sources of Water Pollution

There are many point source discharges of wastewater from municipal and industrial sources in the Kinnickinnic River Watershed Project Area. These sources include: 47 industrial discharges permitted under the WPDES wastewater control program, 23 combined sewer overflow devices designed to discharge storm water mixed with raw sewage when rainfall exceeds levels that can be accommodated by the MMSD sewage treatment system, 29 sanitary flow relief devices, and other unknown, illicit connections to the storm sewer system. Combined sewer (CSO) areas were not inventoried for detailed land uses and nonpoint source loadings because the MMSD Deep Tunnel is designed to store and treat virtually all storm water discharges in those areas.

Sanitary Sewer Service

Most of the project area is served by local public sanitary sewer systems tributary to the MMSD. There are a small number of on-site sewage disposal systems located in the city of Cudahy in the area west of South Pennsylvania Avenue from East Holmes Avenue extended to East Dale Avenue and in an area adjacent to Whitnal Avenue in the vicinity of the Edgerton Channel.

Water Supply Service

Water supplies used in the Kinnickinnic River Watershed Project Area are obtained from municipal sources originating in Lake Michigan. In addition, there are three principal aquifers lying beneath the project area from which groundwater can be obtained and which serve communities in areas outside the project area. Water obtained from these aquifers is either pumped from privately owned wells, or is obtained by municipal pumping facilities.

Natural Resource Features

Climate

The frequency, duration and amount of precipitation influences surface and groundwater quality and quantity, soil moisture content, runoff characteristics, and the physical condition of surface waters. Precipitation events throughout the project area are most frequently moderate in duration and quantity. An event is defined as a distinct period when precipitation is equal to or greater than 0.1 inch. Approximately 50 events per year occur in the project area.

The project area's annual precipitation is an average of 32 inches. The driest months are December, January, and February, with an average of 2.1 inches, 1.6 inches, and 1.4 inches of precipitation, respectively. These are also the months of greatest snow accumulation, when more than 30 inches or 68 percent of the average annual snowfall occurs. The wettest months are June, July, August, and September when more than 15 inches, or 47 percent of the average annual rainfall takes place. Most runoff occurs in March, April, and May when soil is either frozen or saturated.

Topography

Topographic relief in the project area ranges from 780 feet above sea level in the western portions of the project area to about 580 feet above sea level at the mean elevation of Lake Michigan. The physiographical terrain is characterized by gently rolling moraines and

ancient lakebed deposits. In nearshore areas of Lake Michigan, steep bluffs have formed with a narrow sand beach at the foot. Artificial drainage networks are prevalent in the project area.

Soils

The predominant soil association occurring in the project area is the Ozaukee-Morley-Mequon association. It extends westward from Lake Michigan with narrow sand beaches and intermittent "clay" bluffs and gently sloping to rolling morainic ridges that roughly parallel the shoreline. The erosion potential of these soils is based on their texture, structure, organic matter content, permeability, slope, and position on the landscape. All are susceptible to erosion and require soil erosion controls when disturbed, especially in sloped areas.

The Ozaukee-Morley-Mequon soils are well-drained to somewhat poorly drained and have silty clay or silty clay loam subsoils. They are formed on thin loess and silty clay loam glacial tills, on moraines and on old lake basins.

Surface Water Resources

Streams

Streams, which have a combined length of 16.8 miles, experience heavy pulses of flow during rain and snowfall events. Wilson Park Creek and the Kinnickinnic River form the principal perennial streams in the project area. Five smaller tributary streams flow most of the year. Intermittent waterways and storm drainages form the headwaters of these streams.

All but a few segments of the perennial and intermittent streams have been modified by channelization and impoundment. Most have been concrete lined for flood control purposes. Where channelization has occurred, habitat for fish and aquatic life has been severely degraded. Where concrete channelization has occurred, habitat has been largely destroyed. Streams in the watershed project area are listed in table 2-3.

Table 2-3. Streams of the Kinnickinnic River Watershed Project Area

Stream	Municipality	Length (mi)	Drainage Area (mi^2)
Kinnickinnic River	Milwaukee West Allis	6.0	6.9
Lyons Park Creek	Milwaukee	0.8	1.3
Zablocki Park Creek	Milwaukee Greenfield	1.2	1.1
Wilson Park Creek	Milwaukee Cudahy	5.3	7.4
Villa Mann Creek	Greenfield Milwaukee	1.2	1.2
Holmes Avenue Creek	Milwaukee	1.2	1.9
West 43rd Street Ditch	West Milwaukee	1.1	1.5
Lake Michigan	Cudahy St. Francis	-	5.5
Combined Sewer Area	Milwaukee	-	5.0
TOTAL		16.8	31.8

Source: DNR

Lakes: There are no inland lakes in the project area. Several small impoundments are located in the parks and cemeteries adjacent to the streams. Lake Michigan and the inner harbor area receive all the runoff from the project area.

Wetlands

Wetlands in the project area are small and isolated. Their value for wildlife habitat, fish spawning, recreation, attenuation of runoff and flood damages and removal of pollutants is very limited.

Groundwater Resources

Groundwater is contained in one of four aquifers underlying the project area--sand and gravel, eastern dolomite (limestone), sandstone and dolomite, and crystalline bedrock. An aquifer is an underground rock or soil formation that stores and transmits water to lakes,

streams, and wells. Aquifers in the Kinnickinnic River Watershed Project Area are listed here in sequence as they occur in the subsurface profile:

Sand and Gravel Aquifer

The sand and gravel aquifer is comprised of surface material deposited from glacial ice that covered the project area approximately 10,000 years ago. These deposits, which are generally 100 to 200 feet deep, are unconsolidated soil material with physical and chemical characteristics different from agricultural soils.

Groundwater in these deposits occurs and moves in the void spaces among the grains of sand and gravel. The potential for contamination is high because of the shallow depth to groundwater and permeability of the bedrock.

Eastern Dolomite Aquifer

The eastern dolomite aquifer occurs beneath the sand and gravel formation. It was deposited approximately 400 million years ago and is 300 to 400 feet thick. It consists of both the Niagara dolomite formation and an underlying shale layer (Maquoketa shale). Dolomite is a brittle rock similar to limestone which contains groundwater in interconnected cracks. The Maquoketa shale formed from impermeable clays and prevents water from moving between the Niagara dolomite and the deeper aquifers. The potential for contamination is moderate.

Sandstone and Dolomite Aquifer

The sandstone and dolomite aquifer occurs beneath the eastern dolomite formation in deposits between 425 and 600 million years old. It consists of sandstone and dolomite bedrock between 400 and 600 feet thick characterized by materials with variable water yielding properties. In southeastern Wisconsin, most users of substantial quantities of groundwater tap this deep aquifer to ensure adequate supplies are available. In areas where the Maquoketa shale underlies the dolomite aquifer, the potential for contamination is low.

Crystalline Bedrock Aquifer

The crystalline bedrock aquifer is located beneath the sandstone and dolomite aquifer in formations more than 600 million years old. Most of the deposits are very dense crystalline rock which normally yield small amounts of water. Fractures in the crystalline structured rocks store water but the quality and reliability of this water source and the extreme depth restrict its use.

Environmental Corridors

Areas within southeastern Wisconsin having the highest concentrations of natural, recreational, historic, aesthetic and scenic resources are called environmental corridors. These areas normally include selected elements of the natural resource base (lakes, rivers,

streams, wetlands, woodlands, prairies, wildlife habitat areas, wet and poorly drained soils, rugged terrain and areas of high-relief) as well as existing outdoor recreation sites, historic and archaeological sites, and natural and scientific areas.

Environmental corridors have been identified by the DNR and the SEWRPC. These areas contain primarily wetlands, woodlands and surface water and comprise only a minor portion of the project area. Preservation of these areas is important for protecting and improving water quality in the Lake Michigan basin.

Natural Area Sites

Natural areas were identified statewide by the Wisconsin Scientific Areas Preservation Council and the DNR's Bureau of Endangered Resources. They are tracts of land or water which exhibit pristine pre-settlement conditions and/or contain unique plant and animal communities.

Natural areas are classified in one of three categories: statewide or greater significance, county-wide or greater significance, and local significance. In the Kinnickinnic River Watershed Project Area, the St. Francis Seminary Woods is classified as having statewide significance.

Endangered Species

The DNR has documented the occurrence of five fish species in the project area (all below 6th Street) that are classified as endangered, threatened or rare in Wisconsin: the greater redhorse (Moxostoma valenciencienesi), the american eel (Anguilla rostrata), and the redfin shiner (Notropis umbratilis) are on the state watch list. The Longear Sunfish (Lepomis megalotis) is a threatened species, and the striped shiner (Luxilis chrysocephalus) is classified as endangered.

CHAPTER THREE
Water Resources Conditions, Nonpoint Sources and Water Resources Objectives

This chapter discusses the type and extent of pollution sources in the Kinnickinnic River Watershed Project Area and identifies their observed impacts on streams and lakeshore areas of the project area. It also sets forth water quality improvement objectives for the principal water resources. These objectives determine the level of nonpoint source pollution control recommended by the plan and become the basis for the pollution control strategy presented in Chapter 4, "Nonpoint Source Control Needs."

The chapter is divided into three sections. The first is a project area overview, presenting results of the water resources appraisal and the land resources inventory. The second section compares the impacts of each pollutant source for each subwatershed and civil division. Finally, the third section presents the water resources objectives and pollution reduction goals to be achieved through the nonpoint source program.

Project Area Overview

Surface Water Conditions

The perennial and intermittent tributary streams in the project area were classified by the DNR according to their potential to support recreational, fish, and aquatic life uses. The streams were classified using the State's stream classification system and supporting water quality criteria contained in Chapters NR 102, 104, and 106 of the Wisconsin Administrative Code.

As shown in tables 2-3 and 3-1, there are approximately 16.8 miles of perennial and intermittent streams in the project area. Only the portion below 6th Street has the potential to support warm water sport fish such as northern pike, black crappie, largemouth bass and bluegill. Currently, as a result of the influence of urban development, stream channelization and persistent pollution, all of these streams are not meeting their full biological or recreational potential.

Table 3-1. Stream Classifications of the Kinnickinnic River Watershed Project Area

Stream Segment	Length (miles)	Stream Use Classification	Municipality
Kinnickinnic River below 6th Street	2.5	WWSF	Milwaukee
Kinnickinnic River above 6th Street	3.5	LAL	Milwaukee West Allis
Lyons Park Creek	0.8	LAL	Milwaukee
Zablocki Park Creek	1.2	LAL	Greenfield Milwaukee
Wilson Park Creek (earthen channels)	0.5	LFF	Milwaukee
Wilson Park Creek (concrete channels)	4.8	LAL	Milwaukee Cudahy
Villa Mann Creek	1.2	LAL	Greenfield Milwaukee
Holmes Avenue Creek	1.2	LAL	Milwaukee
South 43rd Street Ditch	1.1	LAL	West Milwaukee
Lake Michigan	-	**	Cudahy St. Francis Milwaukee
TOTAL	16.8	-	-

WWSF = Warm water sport fish and aquatic life communities
LFF = Limited forage fish communities
LAL = Limited aquatic life

**Although high bacteria counts sometimes result in beach closings, lake usage support is more difficult to define because of the variety of recreational uses and public perceptions. Therefore, it is difficult or impossible to classify the lake with respect to use impairment as is done with streams.

Source: DNR

Water quality problems attributable to nonpoint sources are shown in table 3-2 and summarized below. Runoff from rooftops, streets, parking lots and other urban areas carries heavy metals, volatile organic compounds, sediment, nutrients, pesticides, pathogenic bacteria and other disease-causing organisms, grease, oil, and assorted debris. Consequently, streams become turbid, dissolved oxygen levels fall, aquatic habitat deteriorates, recreational uses are impaired, and Lake Michigan drinking water treatment is hindered.

Table 3-2. Nonpoint Source Impacts on Water Resources in the Kinnickinnic River Watershed Project Area.

Stream Name (Code)	Water Quality Problem	Nonpoint Source Pollutants	Observed and Potential Sources
Kinnickinnic River (KK)	Loss of habitat** Fish consumption advisory Contaminated sediment Limited recreation and aesthetics Toxicity	Metals PCBs Suspended solids Nutrients Pesticides Pathogenic organisms Oil and grease PAHs	Urban lands Channelization Sanitary sewer overflows Combined sewer overflows Spills Stream erosion Construction Sediment Resuspension
Lyons Park Creek (LP)	Loss of habitat Limited recreation and aesthetics Toxicity	Metals Suspended solids Nutrients Pathogenic organisms Oil and grease Low/high flow	Urban lands Channelization Sanitary sewer overflows Spills Stream Erosion Construction
Zablocki Park Creek (CP)	Loss of habitat Limited recreation and aesthetics Toxicity	Metals Suspended solids Nutrients Pathogenic organisms Oil and grease BOD Low/high flow	Urban lands Channelization Construction Stream erosion Unpermitted discharges
Wilson Park Creek (WP)	Loss of habitat Limited recreation and aesthetics Toxicity Contaminated sediment	Oil and grease Metals Suspended solids Nutrients Pathogenic organisms BOD PCBs Low/high flow	Airport runoff Spills Urban lands Channelization Construction
Villa Mann Creek (VM)	Loss of habitat Limited recreation and aesthetics Toxicity	Metals Suspended solids Nutrients Pathogenic organisms Oil and grease BOD Low/high flow	Urban lands Channelization Construction Unpermitted discharges
Holmes Avenue Creek (HC)	Loss of habitat Limited recreation and aesthetics Toxicity	Metals Suspended solids Nutrients Pathogenic organisms Oil and grease BOD Low/high flow	Urban lands Channelization Spills Sanitary sewer bypasses Construction Cooling water discharges
South 43rd Street Ditch (WM)	Loss of habitat Limited recreation and aesthetics Toxicity Contaminated sediment	Metals Suspended solids Nutrients Pathogenic organisms Oil and grease PCBs BOD Low/high flow	Urban lands Channelization Spills Sanitary sewer bypasses Construction
Lake Michigan (LM)	Drinking Water Contamination Beach closings Limited recreation and aesthetics	Pathogenic organisms Suspended solids Nutrients Oil and grease	Urban lands Spills Sanitary sewer bypasses Construction

**Loss of habitat means loss of fish and invertebrate habitat.

Source: DNR

Drainage modifications such as ditching and channelizing of streams and wetlands has immediate and long-term detrimental effects on water chemistry, stream base flows, temperature, and fish and wildlife habitat. Channelized streams tend to have velocities and substrates that are unsuitable for many forms of aquatic life, particularly during dry seasons and low flows when insufficient water depths limit aquatic habitat. Drainage of wetland areas has the effect of lowering water tables, reducing base flows in the stream and sometimes creating flooding problems downstream.

The Kinnickinnic River Estuary below 6th Street to the confluence of the Milwaukee River has excessive algae growth, carp (which intensify turbidity) and other pollution-tolerant fish. Warming of stream temperatures, periodic low dissolved oxygen levels and discharge of organic matter are other conditions impairing fish habitat.

Unpermitted wastewater discharges and combined sewer overflows have contributed biochemical oxygen demanding materials (BOD), pathogenic bacteria and protozoa, heavy metals and nutrient loads to streams and the estuary. Consequently, low dissolved oxygen levels and excessive algae growth are common. Currently, wastewater from the combined sewer area is being diverted to the Deep Tunnel system, but residual pollutants in bottom sediments of the estuary are continually resuspended.

There are 47 known industrial wastewater dischargers governed by DNR Wisconsin Pollutant Discharge Elimination System (WPDES) permits in the project area. Unintentional spills of toxic materials and inappropriate disposal of waste oil and other pollutants probably contribute to water quality problems. Storm drainage discharges and soil erosion are also of concern. Street and parking lot runoff regularly exceed acute toxicity standards for lead, zinc, copper and cadmium based on studies done in Milwaukee and Madison (DNR, 1992).

Streambank Erosion

Streambanks along all of the perennial and intermittent streams in the project area were surveyed. As shown in tables 3-3 and 3-8, the extent and severity of streambank erosion is significant (about 1,100 tons per year or 18 percent of the total sediment delivery to the Kinnickinnic River). Excessive erosion was recorded for approximately 6,600 feet or 4 percent of all streambanks in the project area. Most of the erosion was located in the earthen channels of the Kinnickinnic River, Zablocki Park Creek and Lyons Park Creek. Channelization and upstream modifications are the major causes of this accelerated erosion.

Table 3-3. Streambank Erosion in the Kinnickinnic River Watershed Project Area

Subwatershed	Segment	Sites	Feet	Tons/Year	Percent
Lyons Park Creek	1	2	88	4	0
	2	4	208	33	3
	3	0	0	0	0
Kinnickinnic River	4	25	3,973	697	65
	5	5	425	56	5
	6	0	0	0	0
	7	2	210	60	6
Zablocki Park Creek	8	12	1,665	223	21
Villa Mann Creek	9	0	0	0	0
Holmes Avenue Creek	10	0	0	0	0
Wilson Park Creek	11	0	0	0	0
43rd Street Ditch	12	0	0	0	0
TOTAL	-	50	6,569	1,073	100
Civil Division					
Milwaukee County	-	34	4,606	786	73
Milwaukee	-	14	1,875	283	26
Greenfield	-	2	88	4	1
TOTAL	-	50	6,569	1,073	100

NOTE: See table 3-8 for other sediment sources and delivery totals.
Source: DNR

Urban Runoff

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

Runoff from urban areas also affects stream characteristics. For example, as pavement and rooftops prevent rainwater and snowmelt from soaking into the ground, water runs off the surface at a much higher rate. Streams crest at much higher levels than prior to urban development. Consequently, in some areas groundwater recharge is reduced and dry-weather stream flows decrease to below minimum levels needed to sustain fish and aquatic life.

In effect, urban runoff produces "flashy" streams with temperatures and chemical characteristics which limit animal life and recreational uses. Streambank erosion may increase as flow extremes occur. Flooding of adjacent property may also occur, often requiring channelization and/or lining with concrete to accommodate flood flows or relocation of buildings to prevent flood damages. This destroys the natural stream system and speeds the transport of pollutants downstream.

In addition to these typical urban nonpoint sources, there are numerous other sources, including in-place sediment contamination, runoff from illegal or careless waste disposal, construction erosion, etc. Each of these represent potential causes of stream and lake use impairment.

All of these factors, many of which are or will be addressed by DNR Wisconsin Pollutant Discharge Elimination System (WPDES) storm water permit requirements, contribute in varying degrees to stream and lake use impairment. The purpose of the urban nonpoint source inventory and analysis was to identify which causes and related nonpoint sources are critical constraints to achieving water quality goals and which are only minor contributors.

Urban nonpoint sources described below include runoff from existing urban areas, construction sites, and planned (post-construction) urban areas.

Existing Urban Areas: The delivery of pollutants to streams from existing urban areas depends on the types of urban land uses, the types of storm water conveyance systems, and urban pollution prevention practices, including but not limited to street sweeping, yard waste collection, and waste oil recycling programs. Each factor is discussed below.

1. Urban Land Uses: Table 3-4 summarizes the type and extent of urban land uses for communities. Urban land uses and their estimated pollutant generation rates are shown in table 3-5. Highways, commercial areas, and high density residential areas (greater than six housing units per acre) are the largest sources of sediment, lead, and zinc

Table 3-4. Urban Land Uses of the Kinnickinnic River Watershed Project Area[1]: 1990.

[redacted]	Land Use In Acres								
	Residential Density[2]								
	Low	Med	High	Com	Ind	Transp	Inst	Open Space	Total
Milwaukee County	0	0	0	0	0	1,061.84	0	725.60	1,787.44
Milwaukee	4.79	3,849.25	663.85	516.77	1,265.77	667.29	429.13	1,161.76	8,558.61
West Milwaukee	0	1.70	0	6.16	165.64	8.52	0	12.67	194.69
West Allis	0	410.04	291.58	111.41	120.46	20.69	66.34	58.63	1,078.15
Greenfield	86.44	687.02	69.15	91.35	8.53	79.60	47.46	360.28	1,429.83
Cudahy	0	936.85	76.69	127.53	332.11	51.77	109.90	824.98	2,459.83
St. Francis	0.99	567.60	74.25	75.74	125.17	43.11	189.12	536.21	1,612.19
TOTAL	92.22	6,452.46	1,175.52	928.96	2,017.68	1,932.82	840.95	3,680.13	17,120.74

[1] Combined sewered areas were not inventoried for detailed land uses.
[2] Residential densities: Low (less than 2 units per acre), Med (2-6 units per acre), High (more than 6 units per acre).

Source: DNR and SEWRPC

Table 3-5. Estimated Pollutant Generation Rates From Urban Land Uses.

Land Use	Unit Area Load (pounds/acre/year)				
	Sediment	Phosphorus	Lead	Zinc	Other Concerns
Highways	880	0.9	5.5	2.1	volatile organics
Industrial	1,000	1.5	2.4	2.1	volatile organics
Commercial	1,000	1.5	2.7	2.1	volatile organics
Shopping Centers	440	0.5	1.1	0.6	volatile organics
High Density Residential	420	1.0	0.8	0.7	pesticides
Medium Density Residential	190	0.5	0.2	0.2	pesticides
Low Density Residential	10	0.04	0.01	0.04	pesticides
Parks	3	0.03	0.005	**	pesticides
Construction Sites	60,000	**	**	**	none

** = pollutant loads were not estimated.
Source: DNR Source Loading and Management Model (SLAMM).

on a per acre basis. Medium density residential areas (two to six housing units per acre) are less important sources of sediment and lead, but are significant sources of pesticides, bacteria, and household or automotive maintenance products which are sometimes dumped into ditches and storm sewers. Low density residential areas (less than two housing units per acre) are important where the improper use and disposal of pesticides, fertilizers, and automotive maintenance products may occur (DNR, 1992).

The pollutants in urban runoff depend on the configuration of "source areas." Source areas—characterized by streets, parking lots, rooftops and lawn areas—are present in different proportions depending on the land use pattern. For example, residential areas contain more lawn area than commercial areas, while commercial areas have more rooftop, street, and parking lot surfaces. Lawns can be important sources of fertilizers and pesticides. Rooftop areas are important sources of zinc and deposited atmospheric pollutants. Their connection to the storm drainage system may be direct or indirect, depending on the use of downspouts, grassed areas, drain tiles, etc. Streets are sources of significant amounts of lead, cadmium, sediment, and other pollutants, depending on their condition and the amount of traffic.

2. Storm Water Conveyance: Storm water is most commonly conveyed to streams through a combination of storm sewers, roadside ditches, grassed swales, and ponds. Storm sewers transport runoff rapidly with no pretreatment or filtering of the runoff before it enters streams. Properly designed grassed swales generally reduce runoff volume because of infiltration, and sod vegetation serves to remove some pollutants from runoff before it flows into streams and storm sewer systems.

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

3. Urban Pollution Prevention Practices: Table 3-6 lists basic information concerning storm water conveyance systems and street sweeping practices for communities in the project area. These factors affect the amount of pollutants from urban surfaces carried to lakes and streams by runoff. Street sweeping removes some of the particulate pollutants from street and parking lot surfaces before they can be transported to surface waters. Repeated street sweeping of commercial and industrial areas in the early spring provides some benefit. Other sweeping is primarily cosmetic, and serves little to reduce urban pollutant loads.

   The potential for lawn care chemicals to be carried by runoff to nearby streams and drainageways is a minor concern. Fertilizer residues can enrich surface waters with nutrients and promote algae growth.

Table 3-6. Grass Swale Drainage, Street Sweeping and Wet Ponds By Land Use For Municipalities in the Kinnickinnic River Watershed Project Area.

Municipality	Land Use	Acres	Percent Drained by Grass Swales	Infiltration Rate (in/hr)	Street Sweeping	Wet Ponds/ Catch Basins
Milwaukee	Residential	4,518	0	N/A	every 2 weeks	No water quality detention basins in the project area and no catch basins
	Commercial	517	0	N/A	once/week for arterial streets and once/month for alleys	
	Industrial	1,266	0	N/A		
	Institutional	429	0	N/A		
	Open Space	1,162	0	N/A		
West Milwaukee	Residential	2	20	0.14	every 4 weeks	Catch basins serve 100%
	Commercial	6	5	0.14	twice/year	
	Industrial	166	5	0.14	twice/year	
	Institutional	0	15	0.14	every 4 weeks	
	Open Space	13	80	0.18	twice/year	Grassed areas
West Allis	Residential	702	0	N/A	once/week	Catch Basins serve 100% of all land uses
	Commercial	111	0	N/A	once/week	
	Industrial	120	0	N/A	once/week	
	Institutional	65	0	N/A	once/week	
	Open Space	59	0	N/A	once/week	
Greenfield	Residential	843	60	<1	twice/year	Catch basins serve 50% of all land uses
	Commercial	91	10	<1	twice/year	
	Industrial	9	20	<1	twice/year	
	Institutional	47	0	<1	twice/year	
	Open Space	360	80	<1	twice/year	
Cudahy	Residential	1,014	0	N/A	every 4 weeks	Catch basins serve 95% of all land uses
	Commercial	128	0	N/A	every 4 weeks	
	Industrial	332	0	N/A	every 4 weeks	
	Institutional	110	0	N/A	every 4 weeks	
	Open Space	825	0	N/A	every 4 weeks	
St. Francis	Residential	643	0	N/A	twice/year	Catch basins serve most all land uses
	Commercial	76	0	N/A	twice/year	
	Industrial	125	0	N/A	twice/year	
	Institutional	189	0	N/A	twice/year	
	Open Space	536	0	N/A	as needed	

N/A = Data currently not available

Source: DNR

4. Nonpoint Source Loadings: Existing urban land uses and their respective amounts and types of pollutant loads are shown in table 3-7. Six pollutants (suspended sediment, phosphorus, zinc, lead, copper and cadmium) were chosen to characterize the type and severity of urban nonpoint pollution.

   Commercial and industrial areas have the highest unit/area/year pollutant loads, producing the most significant amounts of suspended solids, metals and other urban toxic pollutants. This occurs primarily because of the large impervious area these land uses occupy. Medium density (two to six housing units per acre) and multi-family residential areas also generate significant quantities of toxic pollutants, sediment and phosphorus.

Construction Site Erosion and Sedimentation. Construction site erosion and sedimentation is a water quality concern in most urban watersheds. It can destroy aquatic communities in streams and lakes and reduce the capacity of storm water conveyance systems resulting in localized flooding. Moreover, any water quality improvements occurring through implementation of nonpoint source control practices in downstream areas can be negated by construction erosion upstream.

In the Kinnickinnic River Watershed Project Area, most construction erosion occurs on sites that were previously developed. However, the impact of eroded sediments from these sites is no less severe than that of sites where development occurs for the fist time. Renovation of buildings and utilities can cause erosion and sedimentation. Although urban development and redevelopment projects will not necessarily increase the amount of urban surface area, they provide opportunities to install storm water management practices to treat runoff from both the redeveloped property and adjacent established areas. Table 3-8 and fig. 3-1 shows the estimated sediment sources in the Kinnickinnic River watershed area.

Predicting rates of construction site erosion is difficult. On some sites, erosion rates exceeding 75 tons/acre/year can occur. This rate of erosion is much greater than occurs on the most severely eroding croplands and more than 60 times the sediment loading rate from post-construction commercial and industrial areas. Often the close proximity of construction sites to storm sewers or other drainageways serving urban areas results in nearly all of the sediment being delivered to streams.

An analysis of construction site erosion in the Kinnickinnic River was conducted using land use inventory data provided by each municipality and SEWRPC. The average annual amount of land under construction for the period 1990 to the year 2010 was estimated by quantifying historical changes in urban land use. Development, totaling 980 acres, is estimated to occur at an average rate of about 49 acres annually (SEWRPC, 1987).

Average annual sediment loading to streams from construction erosion for 1990 to 2010 conditions was determined by multiplying the amount of land planned for construction by an average of 30 tons per acre per year. This rate of erosion and sediment control and is based on observed land development patterns and generalized climatic conditions. It is estimated that in the years between 1990 and 2010, construction erosion will contribute about 1,470

tons per year of sediment (about 27 percent of total sediment load from nonpoint sources) to streams in the project area.

Table 3-7. Subwatershed Areas, Civil Divisions and Nonpoint Source Loadings in the Kinnickinnic River Watershed Project Area: 1990.**

Subwatershed	Area		Lead		Phosphorus		Sediment	
	Acres	%	Pounds/Yr	%	Pounds/Yr	%	Pounds/Yr	%
KK River	4,318	25	722	25	3,261	26	1,638,336	25
Wilson Pk Cr.	4,726	28	740	25	2,821	23	1,660,602	25
43rd St Ditch	973	6	321	11	1,208	9	597,063	9
Lyons Pk Cr.	700	4	68	2	437	4	206,178	3
Zablocki Pk Cr.	704	4	83	3	311	3	181,443	3
Holmes Ave Cr.	1,187	7	308	10	1,045	9	654,904	10
Villa Mann Cr.	760	4	119	4	504	4	279,880	5
Lake Michigan	3,753	22	575	20	2,651	22	1,327,799	20
TOTAL	17,121	100	2,936	100	12,238	100	6,546,205	100
Civil Division	-	-	-	-	-	-	-	-
Milwaukee County	1,787	10	367	12	667	5	592,000	9
Milwaukee	8,559	50	1,455	50	6,662	54	3,704,396	57
West Milwaukee	195	2	113	4	381	3	170,985	3
West Allis	1,078	6	252	9	1,070	9	492,407	8
Cudahy	2,460	15	405	14	1,782	15	800,743	12
Greenfield	1,430	8	142	5	681	6	337,446	5
St. Francis	1,612	9	202	6	995	8	448,228	7
TOTAL	17,121	100	2,936	100	12,238	100	6,546,205	101

** Combined sewered areas were not included in the inventory of land uses and pollutant loadings.
Source: DNR

Table 3-8. Estimated Sediment Sources in the Kinnickinnic River Watershed Project Area: 1990.**

Subwatershed	Total Tons/Yr.	Urban Runoff	Construction Erosion	Streambank Erosion
Kinnickinnic River	2,003	819	371	813
Lyons Park Creek	200	103	60	37
Zablocki Park Creek	375	91	61	223
Wilson Park Creek	1,237	830	407	0
Villa Mann Creek	205	140	65	0
Holmes Avenue Creek	427	327	100	0
43rd Street Ditch	382	299	83	0
Lake Michigan	986	663	323	0
TOTAL	5,815	3,272	1,470	1,073
Civil Division	-	-	-	-
Milwaukee County	1,142	296	60	786
Milwaukee	3,301	2,148	870	283
West Milwaukee	175	85	90	0
West Allis	396	246	150	0
Greenfield	494	400	90	4
Cudahy	259	169	90	0
St. Francis	344	224	120	0
TOTAL	5,815	3,272	1,470	1,073

** Combined sewered areas were not included in the inventory of land uses and pollutant loadings.

Source: University of Wisconsin - Madison and DNR

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

Each of the six municipalities in the project area has ordinance requirements for controlling construction site erosion and sedimentation. In addition, developers are governed by state regulations (Ch. 144 Wis. Stats.) set forth by the Department of Industry, Labor and Human Relations (DILHR) for erosion control on sites with one and two family dwellings; and the DNR Wisconsin Pollutant Discharge Elimination System (WPDES) permit regulations for sites greater than five acres.

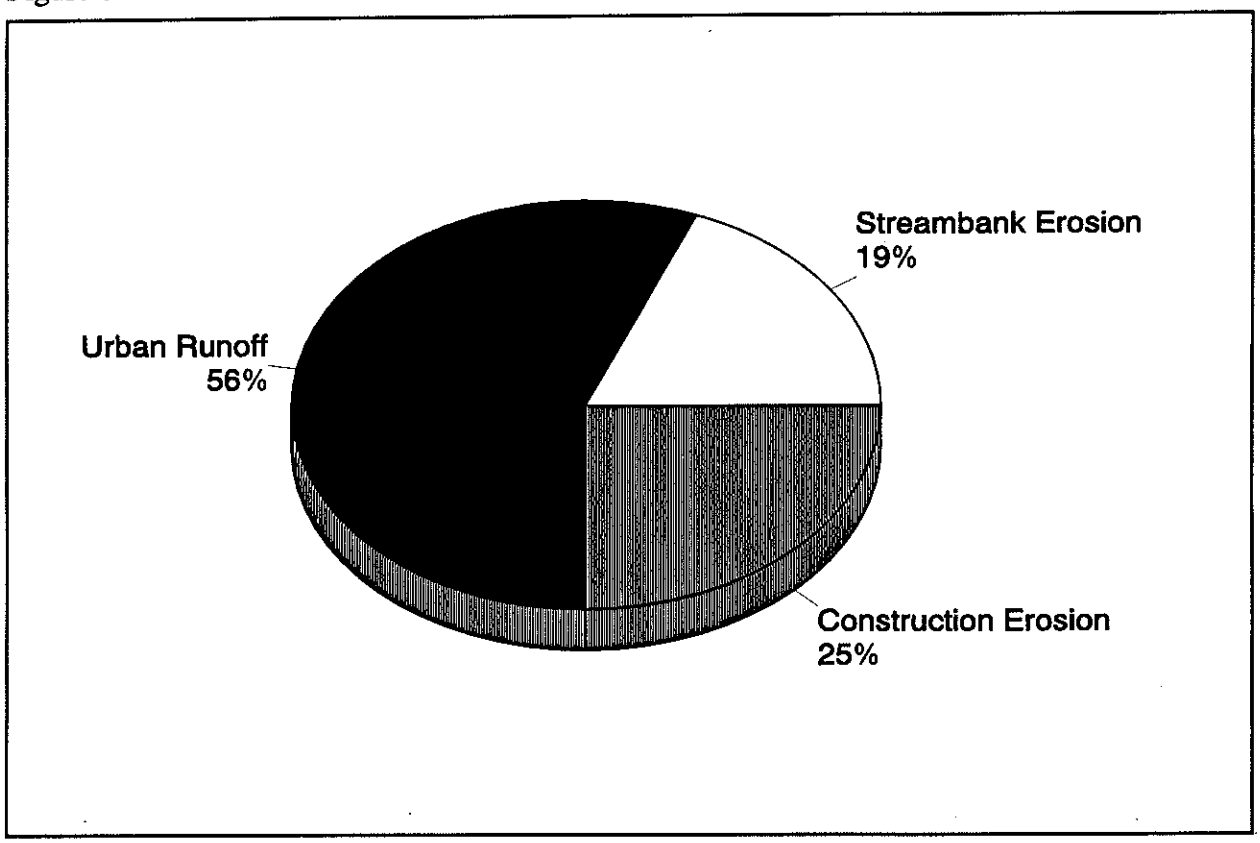
Despite these regulations, several potential impediments to effective erosion control exist. For example, developers sometimes perceive erosion control as an add-on cost and not a built-in cost of construction, enforcement is often done only in response to complaints, maintenance of erosion control is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

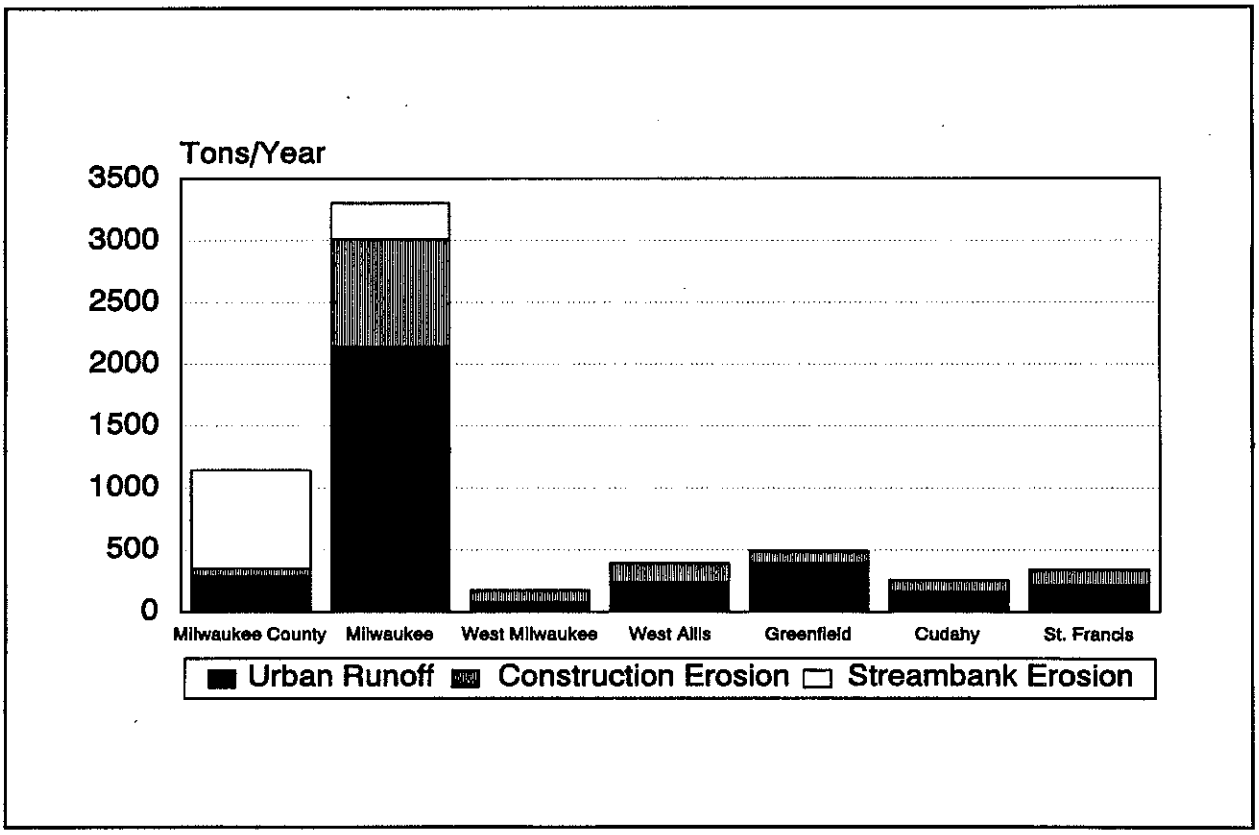
A construction site erosion and sedimentation control strategy is described in Chapter 4. In addition, workshops are held regularly to provide opportunities for learning and problem-solving among developers, builders, excavators, concerned citizens, municipalities, and other units of government. High priority items to improve compliance include more consistent issuance of citations, hiring of additional inspection staff where needed, new fee structures to cover the cost of improved staffing, and more effective court action when ordinance violations occur.

Storm Water Management: Each municipality in the Kinnickinnic River Watershed Project Area was surveyed regarding their current storm water management practices and policies as shown in table 3-6. In most cases, local authorities do not require installation of storm water management practices through ordinance or policy. An exception is the city of Milwaukee which has a storm water management ordinance.

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

Figure 3-1. Sediment Sources in the Kinnickinnic River Watershed Project Area





Water Resources Goals and Objectives

The goals and objectives of this plan focus on achieving optimum biological and recreational uses in Lake Michigan, the Milwaukee River Estuary, the Kinnickinnic River and its tributary streams while maintaining the channels for flood control. The goals and objectives provide the basis for prescribing nonpoint source pollution control best management practices (BMPs), information and education activities, and integration of other actions that would provide water quality benefits.

The following goals and objectives statements seek to "protect," "enhance," or "improve" the existing biological, recreational, aesthetic, and safety conditions of surface waterbodies.

"Protect" is used for streams fully supporting their potential biological and recreational uses. Controlling nonpoint sources is necessary to assure that the resource quality is maintained. For example, if a stream is supporting a healthy warm water sport fish population, this objective seeks to protect that use.

"Enhance" is used for streams that are moderately degraded and only partially meeting their potential biological and recreational uses. Controlling nonpoint sources is necessary to enhance water quality to support a healthier aquatic community. For example, nonpoint source controls may result in a more widely diverse and vigorous forage fish community by restoring lost habitat, even though natural conditions preclude the stream from ever supporting a warm water sport fish population.

"Improve" is used for streams that are severely degraded and not meeting their potential biological and recreational uses. In this case, nonpoint source controls can help achieve potential uses for the stream that cannot otherwise be attained. For example, nonpoint source controls may result in a stream changing from supporting a limited forage fish community to a healthy warm water sport fishery.

The water resource goals and objectives for the Kinnickinnic River and its tributaries focus on providing environmental conditions which allow the watershed's streams to achieve their potential biological uses. In many cases, other factors that limit these water resources, such as point sources, channelization, dams, or limited public access, will also need to be addressed to see the full benefits of nonpoint source controls.

Water resources goals and objectives are presented below. Each objective will be addressed in a manner consistent with all other objectives (i.e. flood control and safety objectives will not exclude fish and wildlife objectives and vice versa) to the extent possible. In addition, opportunities will be sought to achieve nonpoint source pollution reduction in ways that enhance degraded fish and wildlife habitat.

Watershed Project Goals and Objectives

Improve water quality throughout the watershed project area by reducing nonpoint source pollutants, including:

- suspended solids and sediment
- heavy metals
- polycyclic aromatic hydrocarbons (PAHs)
- disease-causing bacteria, viruses, protozoans and other organisms
- nutrients such as phosphorus and nitrogen
- nuisance and toxic wastes from illegal connections, spills and careless disposal in storm sewers
- other pollutants of concern

Protect public health and safety by:

- reducing or eliminating water-borne diseases and contaminated sediments
- reducing the number of beach closings
- reducing drowning hazards and personal injuries from peak flows in some of the concrete channels
- providing greenways where people feel safe

Improve fish, wildlife and other biological habitat throughout the watershed project area by:

- restoring fish habitat throughout the watershed project area wherever deemed practicable
- incorporating wetland and riparian vegetation in flood control measures and emphasizing low maintenance, natural-looking techniques
- prioritizing key stream reaches for habitat restoration
- achieving a stable streambank, using vegetation wherever possible
- recreating habitat for wildlife and waterfowl

Enhance recreational and aesthetic values of streams, riparian areas and lakeshores by:

- providing opportunities for canoeing, boating, hiking, biking, wading and swimming
- removing some of the physical impediments to boating in the Kinnickinnic River
- considering the rights and interests of riparian property owners
- sufficiently funding the existing park system and needed improvements

Prevent flooding and property damage by:

- maintaining the capacity of stream channels to carry flood flows while restoring vegetation and habitat along the river and the channels

- decreasing the need for more channel capacity by providing upstream detention
- incorporating water quantity concerns in water quality issues

Enhance public support for and participation in watershed project area cleanup by:

- building pride in and stewardship for the water resources
- educating watershed project area residents on the impacts of their activities on water resources and informing them about alternative behaviors, targeting specific audiences (considering how age, income and culture affect how they will accept messages)
- raising awareness of the relationship between cleaning up the streams and economic benefits such as higher neighborhood property values, more attractive opportunities for development, and increased tax base

Enhance funding and legal mechanisms to meet the above objectives by:

- showing cost comparisons of pollutant control scenarios (including property values, jobs and out-of-pocket costs)
- encouraging participation by municipalities, businesses and others in the watershed project development, coordination and funding
- identifying existing and potential funding mechanisms, including storm water utilities.
- coordinating with and taking advantage of other programs including Wisconsin DOT, Army Corps of Engineers wetland mitigation projects, Milwaukee Harbor Remedial Action Plan, Milwaukee River Revitalization Council, DNR Storm Water Permit Program, DILHR-local government erosion control programs, etc.

Pollution Reduction Goals

The following discussion establishes pollution reduction goals which target the control of toxic materials, sediment, nutrients and stream flow changes. The goals are based on the consensus of an interagency working committee led by the DNR, including SEWRPC, Milwaukee County, MMSD, and participating municipal representatives.

As previously discussed, extensive water quality and aquatic habitat investigations were conducted as part of the planning phase of the Kinnickinnic River Watershed Project and other related programs (DNR Water Quality Appraisal Report, 1993; SEWRPC, 1987). The results indicated that significant reductions are needed in the amount of suspended sediment, nutrients, and heavy metals loadings to achieve water quality goals and objectives.

However, there is currently insufficient water quality data and scientific basis to narrowly define nonpoint source pollutiont reduction goals. Therefore, the committee agreed to set the goals described below (based largely on the Water Resource Management Plan for the

Milwaukee Harbor Estuary, SEWRPC, 1987), review any additional data after five years, and revise the goals as needed.

Priority Pollutants

An important water quality objective in the Kinnickinnic River Project Area is to reduce the concentrations of toxic materials in urban runoff. Lead, zinc, copper and cadmium are often used as indicators of inorganic pollution for evaluating the impact of urban runoff on water quality. Monitoring of urban runoff in Milwaukee and Madison has shown that concentrations of heavy metals often exceed surface water quality standards for acute toxicity (Bannerman et al, 1992).

Figure 3-2 plots measured water quality data collected by MMSD in the Kinnickinnic River at 27th Street against the chronic toxicity standard used to establish effluent limits for point source discharges for lead. As figure 3-2 and table 3-9 show, 29 percent of the samples over a ten year monitoring period exceeded the NR 105 chronic toxicity standard for lead. Some of these concentrations occurred during storm events, usually indicated by low hardness, while others occurred during base flow conditions. This evidence suggests that reductions of heavy metals are needed to reduce chronic toxicity in the Kinnickinnic River.

A 25 percent reduction in loadings of heavy metals is needed to improve water quality in the project area. A corresponding 35 percent reduction in sediment loading and a 20 percent reduction in phosphorus loading are needed to improve water quality in the streams, the estuary and nearshore lake areas of the watershed project area, resulting in an overall 25 percent reduction in total pollutant loadings.

In addition, a high level of sediment and toxic pollutant reduction is needed in areas deemed "critical," including but not limited to older industrial, commercial and airport lands where heavy traffic and aircraft deicing occurs. Moderate levels of sediment reduction are needed from streambank erosion control and construction site erosion control practices.

These levels will reduce the amount of contaminated sediment deposited in the streams, the estuary and lake areas, enhancing their ability to support healthier and more diverse aquatic communities. Table 3-9 summarizes measured water quality data, other water quality planning recommendations, and pollution reduction goals for this project.

Table 3-9. Measured Water Quality Data and Pollution Reduction Goals for the Kinnickinnic River at 27th Street.

Pollutant		Percent of samples exceeding NR 105 criterion[1]			SEWRPC Harbor Estuary Study Recommendations (% reduction: maximum achievable/ expected)	Priority Watershed Pollutant Reduction Goals (% reduction)[2]
		Acute	Chronic	Human Cancer		
Metals	Zinc	1	4	NS	-	-
	Copper	0	6	NS	-	-
	Cadmium	0	52	NS	-	-
	Lead	1	29	NS	30 / 15	25
Total PAHs (µg/l)		NS	NS	**	-	-
Total PCBs (µg/l)		NS	NS	0	-	-
Suspended Solids (mg/l)		NS	NS	NS	25 / 15	35
Total Phosphorus (mg/l)		NS	NS	NS	20 / 10	20
Pesticides (µg/l)	Heptachlor	ND	NS	ND	-	-
	4,4' - DDT	ND	NS	ND	-	-

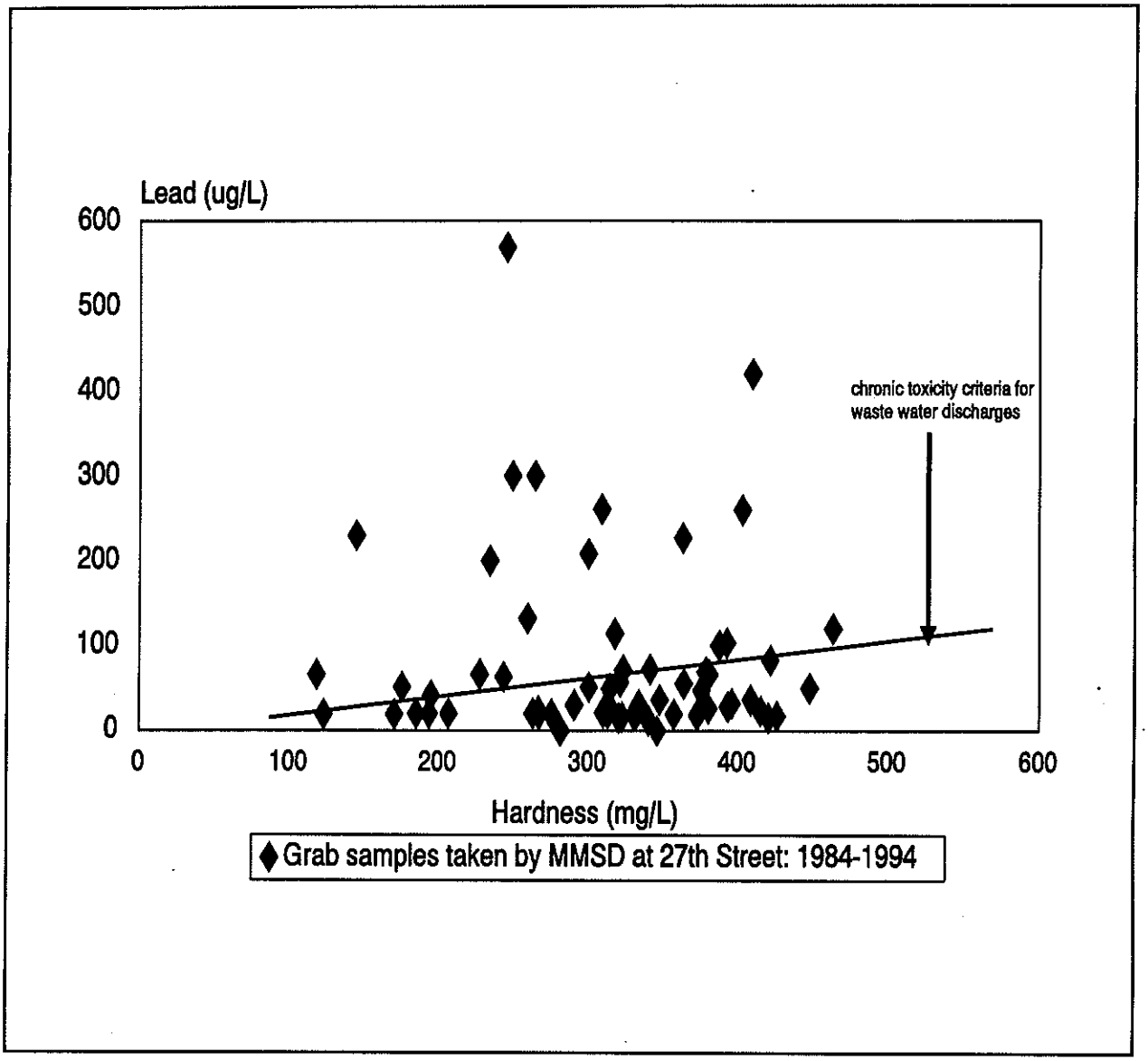
[1]Acute toxicity criteria should never be exceeded. Chronic toxicity criteria should not be exceeded on a 30-day mean basis and not be exceeded for more than 96 hours during any 30-day period. Metals, suspended solids, nutrients, and hardness data were collected by Milwaukee Metropolitan Sewerage District. PAH and pesticide data was collected by DNR.

[2] Pollutant reduction goals may be revised after five years, as needed.

ND = no detection; NS = no standard criterion; - = no reduction goal or recommendation.

**Lipid bag tests done in the summer, 1993 indicated the presence of PAHs in the stream.

Figure 3-2. Measured Lead Concentrations, Hardness and Chronic Toxicity in the Kinnickinnic River at 27th Street



Stream Flow

Specific goals are not established for stream flow. However, maintenance of base flow and reduction of peak flow conditions are important for improving aquatic habitat in most of the smaller streams. Wetland drainage and channelization has contributed to erratic stream flow and reduced capacities to support healthy aquatic communities. Conversion to urban land use results in greater amounts of runoff reaching streams. The "flashy" conditions often result in accelerated streambanks erosion, bottom scour, and in some cases flooding. Wherever possible, structural and non-structural best management practices for controlling nonpoint sources should be designed to reduce the fluctuating nature of stream flow in many of the project area's streams.

Organics

Specific reduction goals for pesticides, polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs) are not established because of the difficulty of detecting these pollutants and their movement in the environment. However, structural and nonstructural source controls will be implemented to prevent residues of organic compounds from reaching streams in the project area.

CHAPTER FOUR
Nonpoint Source Control Needs

Introduction

This chapter identifies the nonpoint source controls to be implemented under the Kinnickinnic River Priority Watershed Project. These controls are based on water quality data, results of the nonpoint source inventories, and the levels of reduction for toxic pollutants, sediment, and phosphorus needed to achieve pollution reduction goals of the plan as described in the previous chapter.

The first section prescribes best management practices (BMPs) for built-up areas, eroding streambanks, and areas where construction occurs. Management actions for each local unit of government in the watershed project area are presented. Finally, this chapter describes some of the design considerations for implementing BMPs.

Some sources of pollution derived from conditions outside the scope of the priority watershed program may affect water resources in the watershed project area. Therefore, management actions related to point source pollution control, fisheries, wildlife and recreation are discussed in the integrated resources management program in Chapter 7.

Nonpoint Source Control Needs

Nonpoint Pollution Sources

As discussed in Chapter 3, the principal water quality and quantity problems derived from urban runoff result from many factors including:

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

Three principal types of urban nonpoint pollution sources must be addressed in the Kinnickinnic River Priority Watershed project area. These sources are eroding streambanks, established urban areas, and construction sites.

Eroding Streambanks

Eroding streambanks in the project area occur almost entirely in park lands with some occurring in residential areas with single-family homes and multi-family apartment buildings. Of the total 656 tons of sediment per year released to streams by eroding streambanks (see Chapter 3, table 3-3), 629 tons or 96 percent comes from lands owned and operated by Milwaukee County. Management recommendations for eroding streambanks are discussed below.

Established Urban Areas

Runoff from established urban lands is a source of pollutants, particularly organic and inorganic toxic materials and sediment. Built-up urban lands may be treated with traditional management practices such as catch basin cleaning and street cleaning to achieve small levels of pollution reduction or retrofitted with storm water control practices for larger reductions of pollutants. An aggressive program may require purchasing land, modifying in-place storm sewers and utilities, and construction of best management practices, for example, storm water detention ponds. Established urban area pollutant loadings are a relatively large portion of the total in the Kinnickinnic River watershed project area (see Chapter 3, figure 3-1).

Redeveloped urban areas should have storm water quality and flow control practices included as part of the development. Practices installed as part of any development or redevelopment project are much less expensive than those retrofitted to existing urban areas.

Runoff from established urban lands is also an important cause of irregular and "flashy" stream flows. In turn, these flows cause streambank erosion and flooding problems. Such problems have traditionally been treated with extensive modifications to stream channels. These modifications often destroy fish habitat, increase hydraulic scour and cause safety problems, especially for children.

Construction Sites

Construction sites are those areas in any phase of construction that involves disturbing the soil through grading or excavation. Construction sites in the project area usually entail renovation or redevelopment. These activities include utility replacement, street replacement, bridge reconstruction, or rehabilitation of commercial, industrial, or residential areas. Construction also occurs where land is being converted for the first time, as occurs during building of a new residential subdivision or industrial park in an area previously undeveloped. Construction sites are important sources of sediment and other sediment borne pollutants.

Pollution Reduction Goals

Pollution reduction goals, described in Chapter 3, were used as the principal criteria for evaluating the effectiveness of nonpoint source management alternatives described in the next section. A summary of the reduction goals is as follows:

- Reduce overall pollutant loading to the Kinnickinnic River Watershed Project Area (including the river's principal tributary streams and Lake Michigan drainage) by 25 percent.

- Achieve a high level of sediment and toxic pollutant reduction for specialized land uses with potential for high impacts on water quality, including but not limited to high traffic areas, older industrial, commercial and airport lands.

- Achieve moderate levels of sediment reduction from streambank erosion control and construction site erosion control practices.

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

Management Alternatives

Alternative Actions for Established Urban Lands

Established urban land uses produce differing amounts of storm water pollutants and flow. Those urban land uses considered "critical" to control nonpoint source pollution were identified for each municipality. Two factors were used to identify critical urban land uses: the unit per area rate (pounds/acre/year) that each land use produces pollutants, and the portion of the total urban pollutant load (pounds/year) produced by each land use.

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

1. Do nothing.

2. Increase catch basin cleaning to at least two times each year on critical urban land uses.

3. Detain runoff from 50 percent of critical land uses.

4. Detain runoff from 70 percent of critical land uses.

5. Detain runoff from 100 percent of critical land uses.

The analysis of management alternatives assumes that wet ponds will trap all sediment particles of 20 microns or larger. This will result in about a 50 percent control of suspended sediment and about 30 percent control of phosphorus and heavy metals in urban runoff. The analysis assumes an infiltration rate of 0.5 inches per hour for infiltration basins and grassed swales. This is a moderate rate of infiltration that will provide less control of pollutants than wet detention ponds. Higher infiltration rates of about 2.5 inches per hour would provide excellent control of pollutants. Existing levels of street sweeping and grassed swale drainage are accounted for in evaluating these alternatives. The alternatives analysis determines the management program for reducing the mass loading of sediment, phosphorus and heavy metals to achieve water quality goals for the Kinnickinnic River, its tributaries and Lake Michigan.

Alternative Actions for Construction Sites

Two levels of management were evaluated for construction sites:

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

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

Streambank Erosion Control Alternatives

Alternatives for achieving the desired level of sediment control have not been evaluated but will be required as part of any feasibility study for streambank erosion control prepared prior to installing practices. For watershed planning purposes, it is assumed that streambank stabilization techniques will control all or nearly all of the potentially eroding sediment at sites where BMPs are installed. In addition, peak flow reduction through application of upstream detention or other BMPs is needed to reduce streambank erosion.

Management Needs

Management needs for established urban area runoff, construction site and streambank erosion controls are presented below.

Sediment Control for Construction Sites

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

Sediment Control For Eroding Streambanks

Streambank erosion occurs along a significant portion of the Kinnickinnic River in Milwaukee County's Jackson Park and in other areas within Milwaukee and Greenfield (see Chapter 3, table 3-3 and map 3). This erosion is caused primarily by the changing stream hydrology, which is characterized as "flashy" and having increasing volumes and peak flows. This exposes and erodes the banks, destroying the natural conditions needed for healthy aquatic communities. Also, the channel is scoured during heavy rainfall events, displacing in-stream cover such as rocks and logs and flushing away aquatic life as well.

Management criteria were applied to 50 sites encompassing approximately 6,600 feet of streambank erosion along the Kinnickinnic River and several tributaries. Approximately 2,400 feet of streambank erosion at 5 sites were targeted as priority sites. These sites comprise 37 percent of the length and 42 percent of the mass load coming from all eroding streambank sites.

Map 4 shows the various land uses in the watershed. Sites located in residential areas and woodlands may be impractical to control for several reasons. Access may be a limiting factor in some of these areas. In woodland areas, site preparation for structural controls may require disturbing extensive areas. As a result, sites located in these areas may need further evaluation. Options include structural controls such as riprap, shaping and seeding, fiber rolls and other bioengineering techniques. Less intrusive measures such as brush cutting to increase light penetration and vegetation establishment may also be effective. Foregoing control all together may be necessary if the degree of site disturbance needed to install practices offsets the benefits to the stream.

Reducing Acute and Chronic Toxicity in Storm Water Discharged to Surface Waters

The need for reducing the potential for toxicity problems was presented in Chapter 3, where it was shown that heavy metals concentrations in urban storm water are a concern. The approach used to identify management actions that reduce the toxicity of storm water runoff was based on evaluating individual subwatersheds and municipalities. Table 4-1 shows how nonpoint source control in established urban areas can be expected to affect total lead (an indicator of heavy metals) loads to streams and nearshore lake areas in the watershed project area.

The management alternatives analysis indicates that structural BMPs for nonpoint source control in established areas are needed in several areas of the watershed project to achieve the previously described pollutant reduction goals. In addition, each community will be expected to conduct the "core" activities of the plan described in Chapter 5, including urban pollution prevention and educational activities.

Sediment Controls For Established Areas

BMPs that control toxic materials in runoff also provide a corresponding higher level of sediment pollution control (see table 4-3). Consequently, additional structural BMPs above the level needed to reduce toxic materials are not justified in order to meet sediment

Table 4-1. Lead Delivery, Reduction Recommendations and Total Reduction*.

Civil Division	Sources	Lbs/yr Delivered	Lbs/yr Reduction	Lbs/yr Future	% of Total	% Reduction
Milwaukee County	Airport Land	133	33	100	4	25
Milwaukee	Urban Land Uses	1,689	422	1,267	57	25
West Milwaukee	Urban Land Uses	113	28	85	4	25
West Allis	Urban Land Uses	252	63	189	9	25
Cudahy	Urban Land Uses	405	101	304	14	25
Greenfield	Urban Land Uses	142	36	106	5	25
St. Francis	Urban Land Uses	202	51	151	7	25
TOTAL		2,936	734	2,202	100	25

* Lead is used as an indicator of heavy metals and other toxic constituents.

Sources: DNR Source Loading and Management Model (SLAMM)
DNR General Mitchell Field Nonpoint Source Study
SEWRPC Harbor Estuary Water Quality Management Plan

reduction goals. Note however, that controlling only streambank erosion and construction erosion at the levels described above are not sufficient to meet sediment reduction goals for the Kinnickinnic River Watershed Project Area.

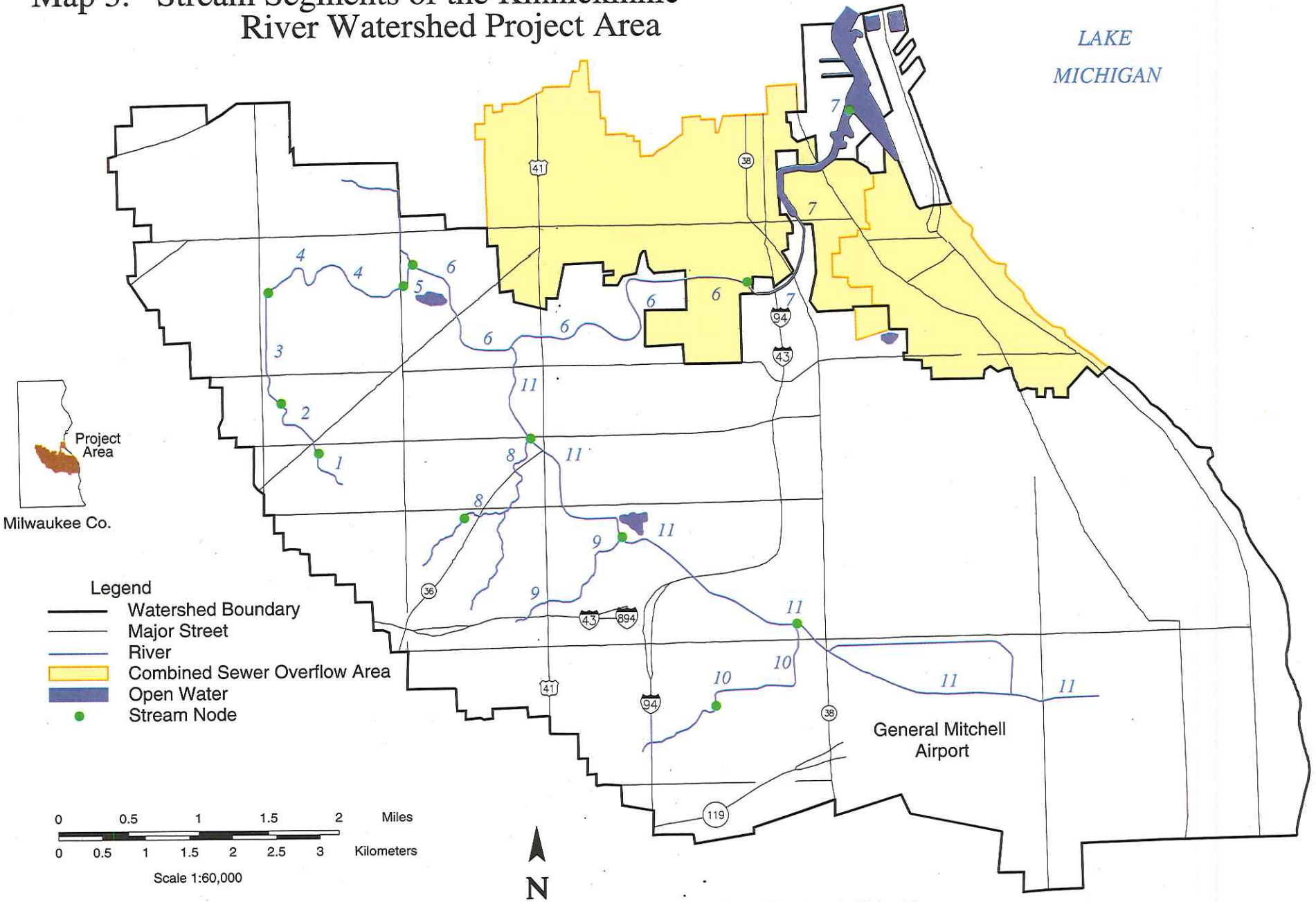
Reducing Excessive Stream Flows and Maintaining Base Flows

Hydrologic analyses have not been conducted to investigate the effect of management alternatives on reducing and preventing streambank erosion and bed scour, or on maintaining stream base flows. These studies will need to be conducted as part of future feasibility studies for nonpoint source control in established urban areas (see Chapter 5 for cost share eligibility).

Management Recommendations

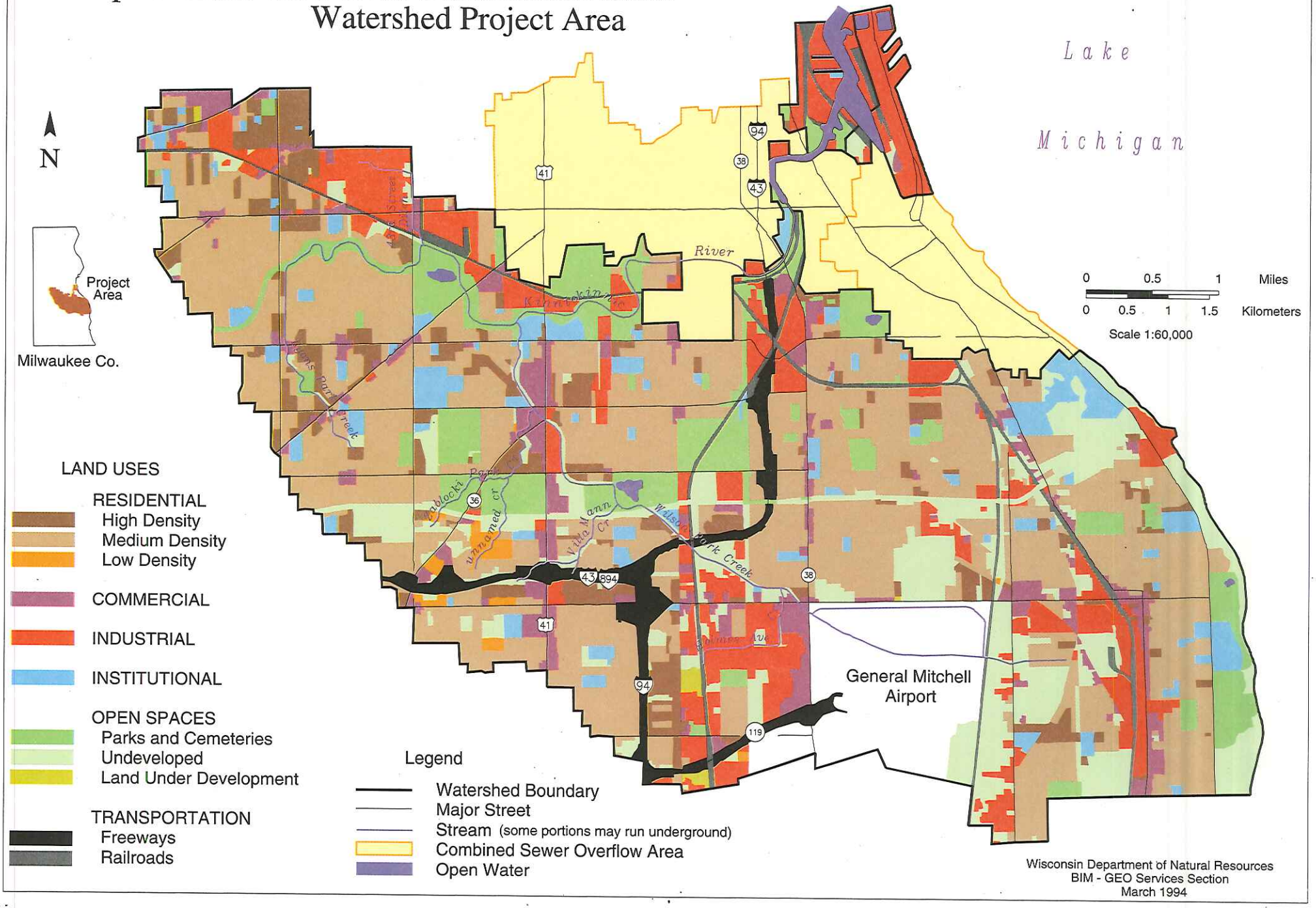
The recommended nonpoint source control program for this watershed project consists of three principal components as discussed below. Each component contains general recommendations and specifies the local units of government to which they apply. Where necessary, additional recommendations follow for specific units of government.

Map 3. Stream Segments of the Kinnickinnic River Watershed Project Area



Wisconsin Department of Natural Resources
BIM - GEO Services Section
November 1994

Map 4. Land Uses of the Kinnickinnic River Watershed Project Area



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March 1994

Construction Site Erosion Control

This part of the plan identifies the actions recommended for effective construction erosion control programs throughout the watershed project area. These actions are needed to control erosion from newly developing areas, urban development and redevelopment projects in established urban areas, and installation and/or maintenance of roadways, bridges and buried utilities.

State and Federal Requirements

Wisconsin State Statutes 101.65, 101.651, and 101.653 establish a statewide construction site erosion control ordinance. Currently, inspection and enforcement measures for erosion control on construction sites for one and two family dwellings are administered by the Wisconsin Department of Industry, Labor, and Human Relations (DILHR). Other provisions to be included on a statewide erosion control ordinance are being developed under a DNR - DILHR Memorandum of Understanding (MOU). One of the major provisions that is being discussed in the MOU is agency responsibility for residential, commercial, and industrial developments with ground disturbances of 5 acres or greater as required by U.S. Environmental Protection Agency (EPA) storm water regulations.

DILHR has been authorized to enforce erosion control measures for one and two family dwellings as well as other types of building activities in the Kinnickinnic River Watershed Project Area. Currently, however, DILHR does not regulate any developments that do not have building permits.

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

General Requirements

Local ordinances must meet the applicability and content requirements of NR 120.16 dealing with erosion control. The "Model Construction Site Erosion Control Ordinance," developed cooperatively by the DNR and the League of Wisconsin Municipalities (DNR, 1987), and suggested changes to the model ordinance (set forth by Mr. James H. Schneider, League Legal Counsel, in the March 1989 issue of "The Municipality") will be used as guides to determine adequacy of ordinances. Erosion control practice standards and applicability criteria should be consistent with those set forth in the Wisconsin Construction Site Best Management Practice Handbook (DNR, 1989). Education and training activities needed to control construction site erosion are described in Chapter 6.

Specific Recommendations for Local Governments and Developers

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

- Municipalities should review (and modify where needed) their existing ordinances to assure effective penalties for non-compliance and responses to concerns of citizens, inspection staff and developers.

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

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

- Developers and contractors need to know what is expected of them, and they need better access to technical information through seminars and other educational activities and materials.

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

More information about the implementation of these actions is described in Chapter 5 under the Core Program Roles and Responsibilities section. An erosion control information and education strategy is described in Chapter 6.

Streambank Erosion Control

Management criteria developed for eroding streambanks are based primarily on the rate at which sediment is being released into streams by the cutting action of stream flows. Secondary considerations include stream channel obstructions and riparian habitat degradation. Table 4-2 presents management criteria for eroding streambanks in the watershed project area (also see table 3-3 and map 3).

Five sites containing 2,440 feet of eroding streambanks are recommended for BMPs and identified as priority sites, meaning they are eligible for cost sharing of stabilization measures critical to meeting project goals. An additional eleven sites containing 1,760 feet were designated general eligibility sites, meaning they are eligible for cost sharing but are not critical to meeting project goals.

If concrete channels, dams and other in-stream structures deteriorate or are removed, newly exposed streambanks may begin to erode. When this occurs, the DNR and the appropriate unit of government will jointly evaluate the severity of the erosion and assign the site a management recommendation. Eligibility of these sites for technical and financial assistance will be consistent with the criteria in table 4-2.

Table 4-2. Eligibility Criteria for Management of Eroding Streambanks in the Kinnickinnic River Watershed Project Area.

Subwatershed	Priority Eligibility Criteria (tons/yr)	Sites	Feet	General Eligibility Criteria (tons/yr)	Sites	Feet	Estimated Sediment Controlled (tons/yr)
Kinnickinnic River	sites ≥ 40	4	1,800	sites ≥ 20 and <40	8	1,240	380
Zablocki Park Creek	sites ≥ 40	1	640	sites ≥ 20 and <40	3	520	67
Civil Division							
Milwaukee County	sites ≥ 40	3	1,660	sites ≥ 20 and <40	8	1,240	338
Milwaukee	sites ≥ 40	2	780	sites ≥ 20 and <40	3	520	109
TOTAL	-	5	2,440	-	11	1,760	447

Source: DNR

Nonpoint Source Control in Established Urban Areas

The control program for established urban areas is based on the pollution reduction goals for heavy metals, sediment, and phosphorus. The following is the rationale and description of the activities needed to meet those goals.

General Requirements

The long-term management goal for all subwatersheds is to achieve a 25 percent reduction of pollutants. This requires wet detention (or a corresponding level of infiltration based on an equivalent amount of pollutant removal) for 70 percent of all critical land use areas (see tables 4-3 and 4-4). Until detention can be phased in, a minimum of two catch basin cleanings per year is prescribed on all urban areas served by catch basins.

Wet detention and infiltration practices should be located where land availability and soil conditions are suitable for providing a high level of control as determined by detailed feasibility studies. Infiltration basins or trenches may be used in combination with wet detention ponds which would provide groundwater recharge and base flow enhancement.

Table 4-3. Management Alternatives and Pollution Reduction Potentials

Management Alternative	Estimated Percent Reduction		
	Sediment	Phosphorus	Lead
Wet Detention for 100% of Critical Land Areas	50	30	40
Wet Detention for 70% of Critical Land Areas	35	20	25
Wet Detention for 50% of Critical Land Areas	25	15	20
Catch Basin Cleaning (minimum two times per year)	20	10	15

Source: DNR

Table 4-4. Critical Land Uses and Recommended BMPs for Established Urban Areas in the Kinnickinnic River Watershed Project Area.

Civil Division	Subwatersheds	Critical Land Uses	Critical Land Use Acres	Estimated Wet Detention Acres[1]	Estimated Land Acres Required	Estimated Catch Basin Cleanings per Year[2]
Milwaukee County	Wilson Park Cr	Airport	1,061	4.5	9.0	350
Milwaukee	Kinnickinnic R Wilson Park Cr Lyons Park Cr Holmes Ave Cr Lake Michigan	Industrial	1,266	7.1	14.2	0
		Commercial	517	2.2	4.4	0
		Freeway[3]	390	2.7	5.4	0
West Milwaukee	43rd St. Ditch	Industrial	166	1.0	2.0	104
West Allis	43rd St. Ditch	Industrial	120	0.7	1.4	76
		Commercial	111	0.5	1.0	84
		Residential[4]	193	0.4	0.8	290
Cudahy	Lake Michigan Wilson Park Cr	Industrial	332	1.9	3.8	208
		Commercial	128	0.5	1.0	96
Greenfield	Zablocki Pk Cr Villa Mann Cr	Commercial	91	0.4	0.8	34
		Freeway[3]	80	0.6	1.2	44
St. Francis	Lake Michigan	Industrial	125	0.7	1.4	78
TOTAL	-	-	4,580	23.2	46.4	1,364

[1] Wet ponds or equivalent infiltration practices designed to control 50% (20 micron control) of suspended solids from critical land uses. NOTE: Detention may not be an appropriate BMP for airport runoff control.
[2] Each catch basin cleaned twice per year. State will share 50% of the cost of cleanings above 1993 levels for a limit of five years (see Appendix B for details).
[3] Freeways in the watershed project area (portions of interstate highways I-94, I-43 and I-894) are owned and operated by the Wisconsin Department of Transportation. Other units of government are not responsible for nonpoint source control on freeways.
[4] Residential land uses with densities greater than six units per acre are considered critical.
Source: DNR

Feasibility studies will be needed to select the site specific infiltration and wet detention practices consistent with this watershed plan. The cost and complexity of studies will vary, depending on the availability of land for locating practices and the compatibility of the existing storm sewer networks with locating structures. Assistance available to communities under the priority watershed project to develop nonpoint source controls in established urban areas is presented in Chapter 5.

Management of Established Urban Areas

Milwaukee County

Milwaukee County owns and operates about 1,800 acres in the watershed project area. The airport land (1,061 acres) is considered critical, needing storm water control practices in order to achieve project goals. To meet the pollutant reduction goals of this plan, the equivalent of an estimated 4.5 acres of wet detention ponds (on approximately 9 acres of land) are needed to adequately control airport runoff. Until these practices can be installed, an estimated 350 catch basin cleanings per year would provide a moderate, interim improvement in pollution control. These practices, along with previously described streambank stabilization measures and other core and segmented activities described in Chapter 5, are the plan recommendations for Milwaukee County.

Milwaukee

The city of Milwaukee has about 8,600 acres of established urban land in the separately sewered areas of the watershed project area. Approximately 2,200 acres are in land uses considered critical, i.e., those needing treatment in order to achieve project goals. To meet the pollutant reduction goals of this plan, the equivalent of 9.3 acres of wet detention ponds (on approximately 19 acres of land) are needed to control industrial and commercial runoff. An additional 2.7 acres of wet detention ponds would need to be constructed and maintained by the Department of Transportation to control runoff pollutants from freeways within the city of Milwaukee. These practices, along with previously described streambank stabilization measures and other core and segmented activities described in Chapter 5, are the plan recommendations for lands within the city of Milwaukee.

West Milwaukee

West Milwaukee has 195 acres of established urban land in the watershed project area. 166 acres are in land uses considered critical, i.e., those needing treatment in order to achieve project goals. In order to meet the pollutant reduction goals of this plan, the equivalent of a 1.0 acre wet detention pond (on approximately 2 acres of land) is needed to control runoff from industrial land. Until this practice can be installed, an estimated 104 catch basin cleanings per year would provide a moderate, interim improvement in pollution control. These practices, along with other core and segmented activities described in Chapter 5, are the plan recommendations for West Milwaukee.

West Allis

West Allis has about 1,100 acres of established urban land in the watershed project area. Approximately 420 acres are in land uses considered critical, i.e., those needing treatment in order to achieve project goals. To meet the pollutant reduction goals of this plan, the equivalent of 1.6 acres of wet detention ponds (on approximately 3 acres of land) are needed to control runoff from industrial, commercial, and high density residential lands. Until these practices can be installed, an estimated 450 catch basin cleanings per year would provide a moderate, interim improvement in pollution control. These practices, along with other core and segmented activities described in Chapter 5, are the plan recommendations for West Allis.

Cudahy

Cudahy has about 2,500 acres of established urban land in the watershed project area. Approximately 460 acres are in land uses considered critical, i.e., those needing treatment in order to achieve project goals. To meet the pollutant reduction goals of this plan, the equivalent of 2.4 acres of wet detention ponds (on approximately 5 acres of land) are needed to control runoff on industrial and commercial lands. Until these practices can be installed, an estimated 304 catch basin cleanings per year would provide a moderate, interim improvement in pollution control. These practices, along with other core and segmented activities described in Chapter 5, are the plan recommendations for Cudahy.

Greenfield

Greenfield has about 1,400 acres of established urban land in the watershed project area. Approximately 170 acres are in land uses considered critical, i.e., those needing treatment in order to achieve project goals. To meet the pollutant reduction goals of this plan, the equivalent of a 0.4 acre wet detention pond (on about 1 acre of land) is needed to control runoff from commercial land. An additional 0.6 acres of wet detention ponds would need to be constructed and maintained by the Department of Transportation to control runoff pollutants from freeways within Greenfield. Until these practices can be installed, an estimated 78 catch basin cleanings per year would provide a moderate, interim improvement in pollution control. These practices, along with other core and segmented activities described in Chapter 5, are the plan recommendations for Greenfield.

St. Francis

St. Francis has about 1,600 acres of established urban land in the watershed project area. Approximately 125 acres are in land uses considered critical, i.e., those needing treatment in order to achieve project goals. To meet the pollutant reduction goals of this plan, the equivalent of a 0.7 acre wet detention pond (on about 2 acres of land) is needed to control runoff from industrial land. Until this practice can be installed, an estimated 78 catch basin cleanings per year would provide a moderate, interim improvement in pollution control. These practices, along with other core and segmented activities described in Chapter 5, are the plan recommendations for St. Francis.

Best Management Practices

Four general classes of management practices are used to reduce the adverse impacts of runoff from urban areas. These classes include: source reduction practices, infiltration practices, wet detention practices, and streambank erosion control practices.

Source Reduction Practices

These practices are meant to reduce the generation of urban pollutants as close to the source as possible. At a minimum, pollutants are controlled prior to being washed from urban surfaces by rainfall and snowmelt.

Source controls are generally non-structural, relying instead on changes in lifestyle by urban residents. Reducing the amount of automobile traffic is an example of a source control, as automobiles are the source of many urban pollutants. Current policies requiring removal of lead from gasoline and asbestos from automobile brake linings are also examples of source controls. Other source controls that should be used as part of the Kinnickinnic River Priority Watershed Project include, but are not limited to:

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

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

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

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

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

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

- Control construction site erosion.

- Minimize use of street de-icing compounds.

- Reduce the amount of motorized traffic.

- Reduce the areal extent of parking lots.

Source controls that prevent the discharge of pollutants (example: substitution of non-phosphorus lawn fertilizers for use in watersheds with eutrophic lakes or ponds) are the most effective. Citizen action that leads to this type of control is an important component of any strategy to reduce nonpoint pollution.

Source controls that rely on better pollution prevention practices, such as pet waste control programs, oil recycling, and responsible use of pesticide products can also be initiated locally. These types of controls are inexpensive and important for any program to reduce urban nonpoint pollution. Information and education efforts presented in Chapter 6 are critical in supporting these "grass roots" approaches to solving urban water quality problems.

Infiltration Practices

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

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

Not all sites are appropriate for the use of infiltration practices. A minimum separation distance of three feet between the bottom of the infiltration device and the groundwater or bedrock is generally required. Poorly drained soils limit the effectiveness or practical use of infiltration devices. Slopes and high flow rates may limit the use of grassed swales in residential areas.

Runoff from residential rooftops and driveways, rooftops in institutional, commercial, and non-manufacturing industrial areas can generally be infiltrated with little risk of groundwater contamination. Runoff from parking lots in institutional areas, commercial areas and separate employee or visitor parking lots in non-manufacturing industrial areas can be routed through infiltration devices but requires some type of pretreatment. Infiltration devices in these areas should be monitored to assure that groundwater contamination is not occurring. Highly contaminated runoff, such as that from commercial and industrial storage and loading areas should not be routed through infiltration practices.

Wet Detention Practices

Wet detention ponds effectively control particulate pollutants and can be designed to control peak flow discharges. Consequently, wet ponds can be employed to serve many needs, including removal of pollutants, control of peak flooding and/or storm water flows that may cause streambank erosion and streambed scour. These ponds have limited effectiveness in controlling pollutants dissolved in storm water, and cannot effectively reduce the total storm water volume or enhance stream base flows. Wet ponds can be situated near a small source area such as a parking lot, but they are more commonly used to control runoff from larger areas with a combination of uses. Other pollution control practices, such as sand filters, may be used in lieu of wet detention where appropriate and eligible under Chapter NR 120.

Streambank Erosion Control Practices

Generally, these practices include seeding and shaping for areas with minor erosion problems. Rapidly eroding sites, extensive areas of erosion, or areas with steep or high streambanks may require more stable materials. These include bioengineering (use of fiber materials and vegetation), rock riprap, gabions, or other structural practices with the ability to withstand higher stream flows.

Easements

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

- Shoreline buffers.
- Critical area stabilization.
- Wetland restoration.

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

Easements may be contracts between a landowner and the DNR, or between a landowner and a local unit of government. The local unit of government will be responsible 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. Use of these practices as storm water runoff control measures, and the use of easements to support these practices, must be reviewed on a case-by-case basis by the DNR.
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 the 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 the DNR Bureau of Water Resources Management and the Bureau of Property Management for final approval.

Easements for Riparian Lands

These are the highest priority areas for obtaining easements to support critical area stabilization and shoreline buffer practices. These practices give added protection to streams and lake areas that are most sensitive to nonpoint source pollution and may require control measures above and beyond pollutant reduction levels identified in Chapter 3 to meet water resource goals. Also, these streams and lake areas will benefit from permanent vegetative cover, including enhancements to aquatic habitat and, if agreed to by the landowner, improved public access to surface waters.

Easements for Non-Riparian Lands

Easements may also be used in combination with critical area stabilization in non-riparian areas to reduce the delivery of pollutants to surface waters.

Easements for Shoreline Buffers

Easements may be used in combination with shoreline buffers designed to control the delivery of runoff pollutants to streams. The following conditions must be met to use easements for this purpose:

- The shoreline buffer must be located immediately adjacent to a perennial or intermittent stream, lake or wetland.

- Shoreline buffers designed to control targeted areas of streambank degradation may also be supported by easements.

Easements to Support Wetland Restoration

Easements may be used in combination with wetland restoration projects. The eligibility criteria for wetland restoration easements are similar to the criteria for easements for shoreline buffers and critical area stabilization in areas adjacent to streams and lakeshores.

Wetland Restoration

Wetland restoration is an eligible best management practice for the purpose of controlling nonpoint source pollution. Secondary benefits of wetland restoration include the enhancement of recreation, wildlife, and fish habitat. Wetland restoration includes the design of wetland basins, modification of existing drainage systems, or other methods of restoring the predevelopment conditions of an altered wetland.

Performance Standards and Design Criteria for Structural Practices in Established Urban Areas

The guidelines in this section are presented to facilitate the design, review, and approval phases required before controls can be installed and cost-shared through the nonpoint source program. The design standards contained in this section are preliminary, and may need to be supplemented by engineering references and design manuals. Also, the DNR Nonpoint Source and Land Management staff should be contacted prior to the start of practice design activities, in accordance with NR 120.

To meet water resources objectives for the Kinnickinnic River, its principal tributary streams, and nearshore lake areas, the combined effect of all practices must achieve at least a 25 percent reduction of pollutant loads from established urban areas and reduce to the maximum extent possible pollutant loads from development and redevelopment. In addition, existing urban storm water flows must be reduced sufficiently in all parts of the project area to help any stream restoration efforts. Conformance of individual practices to the following guidelines will assure that the total level of control is adequate, provided the recommended plan is fully implemented.

Standards

The following preliminary standards should be used to guide the design of individual practices. They will be superseded by standards developed as part of the model ordinance for storm water management, which is being prepared by the DNR.

1. Wet detention ponds in established urban areas should be designed to control at least 50 percent of the incoming suspended sediment load. This will be achieved by trapping the 20 micron or larger particle size. This will provide a moderate level of control of heavy metal loads from lands tributary to the pond. Where retrofitted, ponds should be located to control runoff coming primarily from the critical land uses. Where planned as part of new development, ponds should be located to control runoff from all land uses.

2. Wet detention ponds in existing urban areas should contribute to reducing stream velocities and minimizing erosion and streambed scour.

3. Wet detention ponds in planned urban areas should prevent increases in peak flows and duration of peak flows for the 2-year, 24-hour storm.

4. Infiltration devices in existing and planned urban areas should treat runoff from the one-inch storm where soils are suitable for infiltration. Where retrofitted, these devices should be located to control runoff coming primarily from critical land uses. Where planned as part of new development, infiltration devices should be located to control runoff from all land uses. In locating practices, infiltration rates should be carefully considered as they are a prime determinant of the pollution control effectiveness.

5. Infiltration devices in existing urban areas should contribute to reducing stream velocities to speeds that do not erode banks or scour habitat.

6. Infiltration devices in planned urban areas should prevent increases in peak flows and durations of peak flows for the 2-year, 24-hour storm at pre-development levels.

Design Criteria

NR 120.14(22) requires that the DNR participate in the BMP design review and approval process. Selected preliminary design criteria for wet detention ponds and infiltration devices are presented in table 4-5.

Pretreatment and groundwater monitoring for infiltration devices is generally required in the practice design. Providing pretreatment for these devices will greatly reduce required maintenance to reduce clogging and restore infiltration. Pretreatment could be a sediment trap, a wet detention pond or a grass filter strip. Practices should be equipped with groundwater monitoring wells to assure that groundwater contamination remains within acceptable limits.

Finally, all detention and infiltration practices should be equipped with signs that clearly identify that the site contains urban storm water pollutants. Such signs should also carry warnings, where appropriate, against using storm water treatment facilities for swimming, consumptive fishing, wading, dumping of wastes, or any other activity that could endanger public health.

Environmental and Public Health Concerns

Public concern has been expressed about the potential economic, environmental and public health impacts of storm water detention ponds. Concern has been expressed about the toxicity of sediments and water in wet detention ponds and the danger posed to humans and wildlife. Concern has also been expressed about the disposal of contaminated sediments and the costs which may be incurred in finding and utilizing suitable disposal technology.

Information was collected in 1990 about the water and sediment quality in a wet detention pond serving a mixed residential and commercial area in Madison, Wisconsin. This information is discussed below as it relates to these public concerns. It is important to recognize that sediment and water quality may vary between detention ponds serving the same general land uses, due to differences in the specific mix of tributary land uses and spills or illegal connections to the storm sewer system. Caution should also be used in applying these data to ponds serving more intensive land uses, such as older industrial areas and airport lands.

Table 4-5. Selected Preliminary Design Criteria for Wet Detention Basins and Infiltration Devices.

Practice	Design Criteria			
Wet Detention Basins	**Size: (% of total drainage area)**	**Land Use**	**90% control of suspended solids (% of total drainage area)**	**50% control of suspended solids (% of total drainage area)**
		Freeways	2.8	1.0
		Industrial	2.0	0.8
		Commercial	1.7	0.6
		Institutional	1.7	0.6
		Residential	0.8	0.3
	Pond Depth: ≥ 5 feet of permanent pond			
	Safety Shelf: ≥ 10 feet around pond perimeter			
	Sideslope: ≥ 5:1			
	Shape: ≥ 3:1 length to width ratio			
	Vegetated buffer width: ≥ 25 feet			
	Depth to groundwater: ≥ 3 feet (all soil types)			
Grass Swales	Gradient: ≥ 0.5% and ≤ 5%			
	Sideslopes: ≥ 3:1			
	Depth to groundwater: ≥ 3 feet (all soil types)			
	Velocity: ≤ 6 feet per second			
	Infiltration rates: ≥ 0.5 inch per hour			
	Vegetative cover: dense, water-tolerant, erosion-resistant grasses			
	Other: prevent compaction and clogging before and after construction			
Infiltration Devices	Depth to groundwater: ≥ 3 feet (all soil types)			
	Width: wider than deep			
	Distance to water supply wells: ≥ 100 feet or as needed			
	Infiltration rates: ≥ 0.5 inches per hour			
	Pretreatment: grass filter strip, detention basin, sediment trap, etc.			
	Other: prevent compaction and clogging before and after construction			

Source: DNR

Detention Pond Water Quality

Samples were collected on each of nine different days between early May and late June. The study evaluated three heavy metals (lead, zinc, copper), bacteria, polycyclic aromatic hydrocarbons (PAHs), pesticides, and phthalate esters. Metals concentrations measured in the pond were compared to the chronic toxicity standards for warm water fish and aquatic life; bacteria concentrations were compared to the standard for full body contact recreation; insecticide concentrations were compared to acute toxicity criteria for water fleas; PAH concentrations were compared to the human cancer criterion, and phthalate ester concentrations were compared to the human threshold criterion.

The study concluded that PAHs, pesticides, and phthalate ester concentrations in the pond water did not exceed the applicable criteria on any of the dates sampled. Bacteria concentrations were found to significantly exceed the recreational standard on several sampling dates, with the greatest concentrations soon after rainfall events. All heavy metals were found to occasionally exceed the applicable standard. Lead concentrations exceeded the chronic toxicity standard for all samples. Copper and zinc concentrations exceeded the chronic toxicity standard about 25 percent of the time. All metals concentrations were between one and 1.5 times the chronic toxicity standard, but well below the acute toxicity standards.

In addition to these tests, acute toxicity was evaluated through a 24-hour exposure bioassay test using water fleas as the test organisms. All samples tested completely negative, showing 0 percent mortality.

In summary, the water in ponds receiving runoff from commercial and residential areas is generally non-toxic. Occasionally, however, humans coming in contact with the water could develop bacterial infections. Therefore, storm water ponds should not be used for any type of body contact recreation. Although aquatic life will develop in these ponds, signs discouraging consumptive fishing and swimming should be posted.

Detention Pond Sediment Quality

Assuming a sediment accumulation rate of one to two inches per year and a pond storage depth of two feet, most wet detention ponds will require periodic dredging of contaminated sediments about once every 15-20 years. The quality of pond sediments is a concern, in part, because disposal options vary with the degree of contamination.

The concentrations of eight heavy metals (lead, cadmium, zinc, copper, nickel, arsenic, chromium, and cyanide) were measured in sediment taken from a detention pond serving a mixed residential and commercial area in Madison, Wisconsin. The concentrations were evaluated to determine whether the sediments could be landspread or placed in a conventional land fill, as opposed to requiring disposal in a special hazardous waste landfill at a significantly greater cost.

None of the eight metals tested from the commercial/residential area required disposal at a hazardous waste landfill under current Wisconsin state law. Only one metal, lead, showed

any potential of posing a hazardous waste problem. Upon further testing, using the EP Toxicity Test and the TCLP Test, concentrations of this metal were found to pose no hazard. In addition to heavy metals, organic pollutants were also measured. These included the pesticides diazinon, chlordane and DDT; PCBs; PAHs; and phthalate esters. The organics pollutants data produced no evidence of hazardous waste conditions.

The options for disposal would generally be either landspreading or burying in a conventional landfill. In order to evaluate the suitability of sediments for landspreading, metals criteria set forth in NR 204 Wis. Adm. Code (Municipal Sludge Management) were used. Concentrations of lead in detention pond sediments were well below the limit of 250 mg/kg (milligrams per kilogram) specified in NR 204. Concentrations of cadmium in sediments throughout the pond were also well below the 10 mg/kg threshold specified in NR 204.

Dredged pond sediments must be tested before landspreading (contact the DNR Bureau of Solid Waste Management for more information). Variability in concentrations of heavy metals and carcinogenic materials may make some sediments unacceptable for landspreading. Placement of dredge spoils in a landfill nearby the pond or in areas not used for growing food crops are usually the best options.

Pollutant Bioaccumulation

There is also public concern over the potential for accumulation of toxic constituents by fish and other organisms in wet detention ponds and their subsequent export into surrounding ecosystems. This is an area needing further investigation.

CHAPTER FIVE
Implementation Program

Introduction

This chapter describes the methods and procedures for implementing the management actions and pollution control strategies described in Chapter 4. The success of the priority watershed project depends on the practical implementation of these actions.

More specifically this chapter identifies:

- agencies and units of government responsible for carrying out the identified tasks;
- best management practices (BMPs) necessary to control pollutants on the critical sites identified in Chapter 4;
- cost-share budgets;
- cost containment policies;
- cost-share agreement reimbursement procedures including administrative procedures for carrying out the project;
- staffing needs;
- schedules for implementing the project;
- involvement of other programs;
- project budgets including the expenses for cost-sharing, staffing for technical assistance, administration, and the information and education program.

Sequence of Management Program Activities

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

Core Activities of the Management Program

The core activities of the nonpoint source control program applicable to local units of government include basic measures that can be implemented without further study. Adopting a community specific core program is the first step in the implementation process. Communities will need to commit to implementing the core program within the first three years of the project. This is a prerequisite to receive technical and financial assistance through the priority watershed project. This requirement applies only to the receipt of funds used directly by the municipality as a grantee, such as where the municipality installs, owns, and operates a BMP. It does not apply to those instances where the municipality acts as a grantor, passing cost-share funds through to private landowners. This means that individual landowners could receive cost-share funds from the DNR for the installation of BMPs prior to a municipality's agreement to conduct core activities of the urban program.

The basic activities of the core program are:

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

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

- Implement an information and education program consistent with the intents and purposes of Chapter 6 of this watershed plan.

- Following the completion and adoption of the DNR Storm Water Management Guidebook and Model Ordinance (in preparation), storm water management ordinances should be incorporated into the core program.

Segmented Activities of the Management Program

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

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

Furthermore, detailed studies are needed for these practices, including engineering feasibility and other site specific investigations for existing and new development. Study results will

determine the best means for reducing urban nonpoint sources in a specific community by more site specific application of the plan's recommendations.

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

The basic activities of the segmented program are:

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

- Design and install BMPs for existing urban areas, including detailed engineering studies.

- Develop, as needed, storm water management plans for existing and planned urban development. These plans will identify the type and locations of BMPs.

- Adopt and enforce a storm water management ordinance consistent with the state's model storm water ordinance (in preparation).

Program Participants--Roles and Responsibilities

The specific roles and responsibilities for program participants are summarized below. The primary participants include local units of government (examples: cities, villages, county, local public works departments), the DNR, other state agencies, landowners and land operators. Where applicable, roles and responsibilities are discussed with respect to the previously described core and segmented activities. As noted in Chapter 1, "Plan Purpose and Legal Status," implementation begins following approval of this priority watershed plan by Milwaukee County, and the DNR with input from representatives of the Watershed Project Advisory Committee.

Local Units of Government Core Program Roles and Responsibilities

The following is a schedule for implementing the core activities of the nonpoint source control strategy for this priority watershed project. Each participating unit of government should:

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

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

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

4. Implement the information and education strategy as described in Chapter 6.

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

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

7. Participate in the annual watershed project review meeting.

Local Units of Government Segmented Program Roles and Responsibilities

The following is a schedule for the segmented activities of the nonpoint source control strategy for this priority watershed project. Each municipality should:

1. Within 12 months of the start of implementation, identify the high priority subbasins the community wishes to address for nonpoint source management. This list can be amended throughout the 8 year project period.

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

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

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

   a. 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 BMP installation.
      - Request reimbursement from the DNR for practices installed by private landowners. Eligible BMPs must be listed in the cost-share agreement signed prior to construction.
      - Reimburse landowners for the eligible amount of cost sharing.
      - Monitor landowner compliance with provisions of the cost-share agreement.

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

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

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

      - The downstream community can act as grant recipient, which includes ultimate accountability for practice maintenance. The responsibility could then be delegated, all or in part, to the upstream community through an inter-governmental agreement.

      - The upstream community can act as the grant recipient, which includes ultimate accountability for practice maintenance. The downstream community could provide, through an inter-governmental agreement, all or part of the local share of the practice installation cost.

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

6. Submit information needed for project evaluation to DNR.

DNR

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

DNR Core Program Roles and Responsibilities

1. Assist local governments to enforce construction erosion control provisions developed in accordance with the DNR - DILHR Memorandum of Understanding.

2. Review community specific programs of urban pollution prevention practices for nonpoint source control.

3. Review and approve annual work plans for staff and activities necessary to implement the project.

4. Review and approve annual project implementation reports.

5. Participate in the annual watershed project review meeting.

6. Track changes in urban pollutant loads using information supplied by local units of government.

DNR Segmented Program Roles and Responsibilities

1. Develop a model storm water management ordinance. Assist communities with adoption and enforcement of storm water management ordinances.

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

3. 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.

4. Enter into cost-share agreements with local units of government for nonpoint source controls on eligible lands owned or operated by the local government.

5. Review designs of urban nonpoint source BMPs for which cost-share agreements are signed.

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

Wisconsin Department of Transportation (DOT)

The DOT is responsible for highway construction and right-of-way maintenance. The DOT has project roles and privileges that are similar to other units of government and may enter into agreements with the DNR for carrying out the core and segmented program activities, particularly those that involve storm water and stream protection within highway corridors.

Landowners and Land Operators

In many situations, private landowners will install BMPs on their property. Landowners are important participants in the urban implementation activities. Eligible landowners will participate in the project by signing cost-share agreements with local units of government. Maintenance responsibility can be assigned using agreements similar to those discussed above.

Milwaukee County Staff

To enhance intergovernmental coordination within the Kinnickinnic River Watershed Project, Milwaukee County staff will assist the DNR in implementing the core program by:

1. Providing assistance to municipalities in preparing and implementing the information and education activities described in Chapter 6.

2. Providing assistance in construction erosion control training programs for local government staff, consultants, developers, contractors and builders.

3. Entering 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.

4. For lands the county owns or operates, enter into grant agreements with DNR to correct identified nonpoint source problems and fulfill their obligations as a grant recipient.

5. Design best management practices and verify proper practice installation.

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

7. Prepare and submit to the DNR annual work plans for activities necessary to implement the project.

8. Prepare and submit to the DNR 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 which result from installing BMPs.

9. Participate in the annual watershed project review meeting.

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

Milwaukee Metropolitan Sewerage District (MMSD)

The Sewerage District has roles, responsibilities and privileges that are similar to cities, counties and villages in the watershed project area. The District may enter into grant agreements with the DNR for carrying out the core and segmented program activities, particularly those that involve storm water, wetland, and stream habitat restoration components.

USDA-Soil Conservation Service (SCS)

This agency works through the local land conservation committee to provide technical assistance for planning and installing conservation practices. The district conservationist or other SCS personnel may work with the landowners or units of government to provide assistance with technical work.

University of Wisconsin Extension (UWEX)

Area extension agents 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 in Chapter 6 in the information and education strategy.

Best Management Practices (BMPs)

BMPs Eligible For Cost-Sharing And Their Rates

Best management practices are those practices identified in NR 120 and determined in this watershed plan to be the most effective in reducing nonpoint sources of pollution. Design and installation of the best management practices must meet the conditions listed NR 120. Generally, these practices use standard specifications in the U.S. Soil Conservation Service Field Office Technical Guide and the Draft Wisconsin Storm Water Handbook. The Department may approve alternative best management practices and design criteria based on the provisions of NR 120.15 where necessary to meet the water resource objectives.

Specifications for the structural urban practices were described in Chapter 4. Application of these practices will be guided by technical assistance provided by the DNR. Eligible practices and state cost-share rates are listed in NR 120 and summarized below in table 5-1.

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

Best Management Practice	State Cost-share Rate
Critical Area Stabilization[1]	70%
Grade Stabilization Structures	70%
Streambank and Shoreline Stabilization	70%
Shoreline Buffers[1]	70%
Wetland Restoration[1]	70%
Wet Detention Ponds[2]	70%
Infiltration Trenches and Basins[2]	70%
Grass Swales and Waterways[2]	70%
Street Sweeping[3]	50%
Catch Basin Cleaning[3]	50%

1 Easements may be used in conjunction with these practices.
2 Applies only to structures for established urban areas--those in existence prior to the date the DNR approves this watershed plan.
3 This is an alternative best management practice not listed in NR 120 of the Wisconsin Administrative Code (See Appendix B).

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 for cost-sharing in urban areas:

1. Operation and maintenance of cost-shared best management practices (BMPs).
2. Construction erosion control practices.
3. Structural BMPs for new urban development--those whose construction activity commenced after DNR approval of this plan.
4. BMPs installed prior to signing cost-share agreement.
5. Some activities covered under the Wisconsin Pollution Discharge Elimination System (WPDES) Program (see Chapter 7).
6. On-site septic system controls or maintenance.

7. Dredging activities.

8. Activities and structures intended primarily for flood control.

9. Minimum levels of catch basin cleaning, street sweeping and leaf collection (see Appendix B).

10. Actions which have drainage of land or clearing of land as the primary objective.

11. Practices already installed,with the exception of repairs to the practices which were rendered ineffective due to circumstances beyond the control of the landowner.

12. Bulk storage of fertilizers and pesticides.

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

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 for installation of BMPs. In some cases the municipality will act only as a grantee. In this case, the municipality will use funds obtained under the grant agreement directly for practices it will install, own, and operate.

In other cases, 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 have responsibility for installing, operating, and maintaining the management 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 appear in NR 120, Wis. Adm. 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 BMPs to meet the project objectives. Practices included in cost-share agreements must be installed within the schedule agreed to in the cost-share agreement. Unless otherwise approved, the schedule of installing BMPs will be within 5 years of signing of the cost-share agreement. Practices must be maintained for a minimum of ten years from the date of installing the final practice included in the cost-share agreement.

Local, state, or federal permits may be needed prior to installation of some BMPs. The areas most likely to need permits are wetlands and 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 that enter into cost-share agreements with landowners are required to enforce compliance with the agreement. Where DNR enters into 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 a length of time stipulated in the agreement.

Identifying Wildlife and Fishery Needs

The local units of government will consult with DNR's Southeast 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 protection practices or 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. Competitive bids will be required for all structural BMPs with estimated total costs 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 nonpoint source grant recipient (a local unit of government) 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 governing unit will determine if the bid constitutes an appropriate cost for the project. If no bids are received or if the lone bid is not deemed appropriate, the governing unit will limit cost sharing based on average costs.

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 staffing and support costs of carrying out the implementation program. Each local unit of government will have its own agreement. Consistent with NR 120 these grant funds will be used for design, installation and inspection of best management practices on land owned by the local unit of government; additional staff to implement the project; development and enforcement of erosion control and storm water management ordinances; and information and education activities. Other items such as travel, training, and 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 activities of the implementation program are eligible for financial assistance. The type of eligible activities and the amount of state funds generally available are described below in table 5-2.

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

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 Kinnickinnic River Watershed Project. The records of all watershed project 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.

Table 5-2. Urban Implementation Activities Eligible for State Funding.

Activity	Cost-Share Rate
Construction site erosion control and storm water management ordinance revisions and amendments	100%
Development of storm water quality management plans[1]	100%
Engineering studies for existing urban areas and planned urban areas[1]	100%
Design and engineering for structural best management practices[1]	100%
Additional staff needed for project management, supplementary catch basin cleaning and street sweeping[2]	100%
Development of alternative financing and administration strategies[1]	100%

[1] Funding not available for components dealing exclusively with drainage and flood control nor for BMPs serving land uses not identified as "critical" Chapter IV.

[2] Funding is limited. Level of staffing based on a work plan submitted by local units of government and approved by the DNR (see Appendix B).

Source: DNR

Budget and Staffing Needs

Project budget and staffing requirements are described below and summarized in tables 5-3 and 5-4.

Storm Water Planning and Engineering Feasibility Studies

Storm water management plans and engineering feasibility studies will be needed for approximately 4,600 acres of established urban development in order to determine the type, size and location of BMPs. Most of these studies will probably be carried out by the private sector, with most of the cost borne by the DNR. Estimated costs of preparing feasibility studies for each community are presented in tables 5-3 and 5-4. In making these estimates, a planning cost of $100/acre was estimated.

Detailed Engineering Designs

Once BMP feasibility studies are completed, 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 sections and in tables 5-3 and 5-4. Cost estimates are based on the assumption that designs are prepared by the private sector and funded 100 percent by the DNR.

Alternative Funding Sources

A substantial portion of the estimated costs of implementing this plan's management recommendations is for the construction of storm water management practices in existing urban areas to control pollutants discharged by a variety of land uses and activities. Where urban structural practices are used to control storm water pollutants, state cost sharing is limited and the burden falls heavily on local funding sources.

Some municipalities have endorsed a concept of distributing the cost of pollution control by developing a mechanism to charge those responsible for discharging the pollutants. In addition, municipalities have indicated a desire to pursue additional state or federal funding sources.

One way to distribute costs is to assess the volume of storm water or the amount of pollutants from each source. This requires the identification of sources responsible for pollutant discharges. This plan endorses investigations that identify specific sources of urban storm water pollutants. If storm water pollutant dischargers cannot take actions to reduce runoff pollutants, they can be charged a portion of the local share of the cost of the BMP that would be installed by a downstream landowner or local unit of government.

State or federal programs could be developed to help distribute the cost of pollution control. This could be done by collecting storm water pollution discharge fees from individual polluters and redistributing these funds to local units of government. Such fees could be associated with the production or use of polluting materials such as the state's tire tax which is collected on every tire sale to finance long-term tire disposal. Alternatively, costs could be distributed by assessing local charges within the urban area based on the amount of polluted runoff discharged. Current examples include utility districts and basin authorities being used throughout the country to finance storm water management practices.

This plan endorses continuing investigation into pollution control alternatives as well as development of alternatives for distributing 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 further Legislative Council Study on Nonpoint Source Pollution Control. Other alternatives, such as the creation of local utility districts should be investigated by municipalities.

Cost of Installing Structural Practices in Established Urban Areas

Factors that affect the cost of constructing BMPs to control pollutants in urban runoff include:

- labor rates,
- land costs,

Table 5-3. Summary of Total Estimated Project Costs (in thousands of dollars over eight years).

Item	State Share	Landowner Share[1]	Milwaukee County	Milwaukee	West Milwaukee	West Allis	Greenfield	Cudahy	St. Francis	TOTAL
Local Assistance Staff Support	1,500	0	0	0	0	0	0	0	0	1,500
Information and Education Direct	210	0	0	0	0	0	0	0	0	210
Other Direct (travel, supplies, etc.)	375	0	0	0	0	0	0	0	0	375
Subtotal	2,085	0	0	0	0	0	0	0	0	2,085
Cost-Share Funds: Practices on Established Urban Areas[1,2,3]	8,622	0	680	1,385	152	247	61	365	106	11,618
Cost-Share Funds: Streambank Stabilization[1]	588	0	174	78	0	0	0	0	0	840
Construction Site Erosion Control Practices ($250/acre)	0	98	0	0	0	0	0	0	0	98
Storm Water Planning ($100/acre)[1]	1,148	0	32	257	6	32	43	74	48	1,640
Cost-Share Funds: Easements	50	0	0	0	0	0	0	0	0	50
Subtotal	10,408	98	886	1,720	158	279	104	439	154	14,246
TOTAL	12,493	98	886	1,720	158	279	104	439	154	16,331

[1]The local share of the cost of practices on established urban areas, streambanks and storm water planning may be paid by private landowners or other state agencies instead of local governments where applicable.

[2] BMPs for established urban areas estimated at $350,000 state share per acre of wet pond and $20 per catch basin cleaning. Pond costs include land purchases at 50% state cost-share rate and design work at 100% state share. Local governments bear the additional cost of operation and maintenance which is estimated at $2,000 per pond acre per year (not included in the table).

[3]State share includes $495,000 for BMP costs borne by Wisconsin Department of Transportation.

Source: DNR

Table 5-4. Summary of Estimated State Share Distributions (in thousands of dollars over 8 years)

Item	TOTAL	Milwaukee County	Milwaukee[1]	West Milwaukee	West Allis	Greenfield	Cudahy	St. Francis
Local Assistance Staff Support	1,500	250	0	250	250	250	250	250
Information and Education Direct	210	35	0	35	35	35	35	35
Other Direct (travel, supplies, etc.)	375	63	0	62	63	62	63	62
Subtotal	2,085	348	0	347	348	347	348	347
Cost-Share Funds: Practices on Established Urban Areas[2]	8,622	1,577	3,255	351	562	140	842	245
Cost-Share Funds: Streambank Stabilization	588	406	182	0	0	0	0	0
Storm Water Planning	1,148	74	599	14	76	100	172	113
Cost-Share Funds: Easements	50	10	20	0	0	0	20	0
Subtotal	10,408	2,067	4,056	365	638	240	1,034	358
TOTAL	12,493	2,415	4,056	712	986	587	1,382	705

[1] The city of Milwaukee has addressed staff and education needs of this project through implementation activities of the Milwaukee River and Menomonee River priority watershed projects and the WPDES storm water permit program.

[2] Total state share includes $1,155,000 DNR distributions to Wisconsin Department of Transportation (DOT) for best management practices serving portions of highways I-94, I-43 and I-894 plus DOT share of BMP expenditures totaling $495,000.

- cost of relocating residences,
- excavation costs, and
- cost of rerouting storm sewers.

These costs vary from case to case. Land and labor costs will vary by community. In rare cases, residences and businesses in densely urbanized areas may be removed or relocated to allow space for BMPs. Excavation costs for underground structures, such as detention below parking lots or buildings, are several times greater than for surface structures. Finally, rerouting storm sewers to retrofitted BMPs can be costly.

Table 5-3 presents cost estimates for installing wet detention ponds and supplementary cleaning of catch basins in established urban areas. It assumes detention and supplementary catch basin cleaning will be implemented for all areas identified as critical (see Chapter 4, table 4-3). The total cost for installing these ponds ranges from $200,000 to $800,000 per surface acre of pond, including land purchases. The lower cost assumes that open land is available for purchase, but that extensive rerouting of the storm sewer system is required. The upper end of the cost range assumes that land is completely developed and condemnation of existing businesses or homes would be required. Both figures assume that design, excavation, inlet/outlet construction, and landscaping costs about $100,000 per surface acre of pond.

In all cases, the state share is limited to 50 percent of the land purchase, 70 percent of the cost for pond construction and 100 percent of design costs. This equals an estimated average $350,000 of state assistance per surface acre of detention pond (based, in part, on true costs of similar projects in the metropolitan Milwaukee area). The remaining costs, including annual operation and maintenance are not eligible for cost sharing under the existing rules governing the state nonpoint source program. Operation and maintenance costs for detention ponds are about 5 percent of the capital construction cost per year.

Total Costs of BMPs in Established Urban Areas

Table 5-3 shows the estimated cost of recommended levels of wet detention for 70 percent of the critical urban land uses, including supplementary catch basin cleaning as part of a program that phases in detention. The costs presented in table 5-3 assume $20 per catch basin cleaning. The plan calls for two catch basin cleanings per year. The state would fund 50 percent of the cost of the second cleaning per year until detention practices are installed or the end of five years, whichever comes first. The total cost of treating established urban areas with BMPs recommended in this plan is about $11.6 million. The state share would be approximately $8.6 million and the local share about $2.9 million.

Cost of Streambank Erosion Control Practices

The average cost of streambank stabilization design and construction is estimated at $200 per foot, based on actual project costs for riprap and bioengineering installations in the Milwaukee metropolitan area. The total costs are estimated to be $840,000 over the eight year project period with a state share of $588,000.

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, state building codes and storm water permits.

Cost of Installing Construction Erosion Control Practices

It is assumed that construction site practices will average $250 per acre. This will require an estimated $98,000 over eight years to install construction site erosion control practices in the watershed project area. All of this cost will be borne locally by the private developers, contractors and landowners to meet requirements of local ordinances, state building codes, and state storm water permits.

Cost of Reviewing and Amending Construction Erosion Control Ordinances

Funding is available on a limited basis to initially support this activity. Within five years, it is expected that the local government will charge building permit fees adequate to support enforcement and periodic updating of erosion control ordinances.

Cost of Developing Storm Water Management Ordinances

Likewise, the cost of additional staff for developing storm water management ordinances will be funded 50 percent by the DNR for the first five years. Permit fees should be structured so that continued funding is available for enforcement of ordinances.

CHAPTER SIX
Information and Education Strategy

The Kinnickinnic River information and education strategy has been prepared as part of a basinwide information and education strategy. The strategy is based upon survey data from rural and urban residents, committee review, staff suggestions, and other participatory processes. The plan also draws on elements of the Urban Water Quality Information and Education Strategy for the Milwaukee River Program (Johnson, 1989) and other basinwide information and education materials. These basinwide materials contain support information and policy positions not included here. Appendix C of this plan contains a list of basinwide information and education goals and Appendix D contains more detailed descriptions of educational materials and events.

Purpose and Perspectives

The primary purpose of the information and education strategy for the Kinnickinnic River Watershed Project is to enhance implementation of watershed plan objectives. To achieve the most impact with available funds, educational program planning was viewed from several perspectives:

- Key audiences capable of having the greatest impact on the resource because they own, manage, or help govern critical lands.
- Key messages from the watershed project that need to be relayed.
- Potential uses of activities such as providing information, promoting participation, and instruction on specific practices.
- Opportunities for combining efforts of public and private agencies.
- Critical timelines associated with phases in the watershed project.
- Educational approaches that are most effective for the purpose.

The resulting educational plan for the Kinnickinnic River Watershed Project Area includes recommendations for both general and specifically targeted activities. It recognizes that certain targeted audiences hold the key to actions that will produce improvements in water resources. At the same time, the plan acknowledges that educational activities designed for general audiences are important. They can influence both short and long-term management

decisions. In part, this is a recognition that numerous encounters with information are often required to motivate positive action. The general activities also address public "right-to-know" and "momentum-building" objectives. Even so, targeting audiences and refining messages will be done to maximize cost efficiency and program impact.

Background

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

Watershed Characteristics

Compared to the other Milwaukee River watersheds, the Kinnickinnic Watershed is relatively small but densely populated. Because there is no agriculture remaining in the watershed, it poses distinctly urban problems. Key themes for this watershed include storm water pollution prevention, retrofitting storm water quality controls, restoring more natural stream channels, and addressing a culturally diverse population. The following paragraphs describe some of the key characteristics of this watershed and their implications for this information and education strategy.

High Degree of Urbanization

The Kinnickinnic River Watershed Project Area is the most urban of all the Milwaukee River watersheds.

Some development of new residential subdivisions is still occurring in headwaters areas but most of the watershed has already been developed. From a water quality standpoint, significant land uses in the watershed include the Milwaukee County international airport, General Mitchell Field, and large areas of old industrial and commercial development. These areas will be required to address storm water management as part of the new state/federal storm water permit program.

Because the Kinnickinnic River Watershed Project Area has no remaining agricultural land, all of the information and education programs must be geared for urban audiences. Local government staff and elected officials are especially important audiences because they must take action to incorporate pollution prevention in public works programs, require storm water management in redevelopment projects, and seek opportunities for retrofitting storm water

facilities in existing development. Pollution prevention is also an important subject for the public and owners/operators of commercial and industrial property. Coordinating information and education programs between the watershed and the storm water permit programs will be helpful because both address urban runoff issues for local governments, as well as industries and the airport.

Concrete Channels

Much of the Kinnickinnic River's main channel and major tributaries are open concrete channels and other tributaries have been confined to ditches or enclosed sewer pipes. While the concrete channels, pipes and ditches have improved drainage efficiency and prevented flooding, they have also made the Kinnickinnic River and its tributaries very "flashy", streams with water levels that rise and fall quickly. High flows scour the channels during storms washing out the few pollution-tolerant organisms that live in these streams. Rapid flows also make these streams very unsafe for children who play in them.

The Citizens Advisory Committee has identified concrete channels as one of the key issues for this watershed. If some of these channels can be restored to a more natural condition without creating flooding problems, neighbors will realize more immediate benefits from water quality improvements. Thus channel restoration is an important "integrated resource management" issue for this watershed that must be addressed in educational materials and programs.

Limited Use of River

Due to poor water quality and channel modifications, most of the streams in this watershed have little remaining habitat for fish and wildlife, little use for recreation and poor aesthetics. Because these streams look more like open sewers than natural resources, neighbors are not motivated to invest much in clean up or pollution prevention.

In the short term, educational programs must emphasize benefits of cleanup efforts to downstream water resources such as the harbor and Lake Michigan. Over the long run, they must also work on restoring a vision of the river and its tributaries as natural resources. School programs, stream cleanups, water quality monitoring and restoring some natural channels would help foster a more positive image of the Kinnickinnic River.

Park Land Along the River

One of the Kinnickinnic River's few assets is the extent of adjacent park land. This green space is important from several perspectives. Perhaps most importantly, it provides opportunities for restoring some natural channels. It also allows public access to the river and its major tributaries for cleanup and water quality monitoring projects. Furthermore, it provides some motivation for investing in water quality and habitat improvements. Cleaning up the waterways and, where possible, restoring more natural channels, will benefit the parks in terms of aesthetics, wildlife, recreation and safety.

Culturally Diverse Population

Residents of this watershed include many people who speak Spanish or Hmong as their first or only language. To reach these audiences we will need to translate printed materials into their languages, use Spanish newspapers and radio programs, and work with Spanish and Hmong community groups. In addition to translation, we must consider cultural differences when adapting educational materials and programs for residents of this watershed.

Audience Characteristics

Key audiences have been grouped into four categories for this educational plan:

1. Local governments
2. Urban residents
3. Business and industry
4. Youth

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

Local Governments

Elected and appointed officials of local governments are very important audiences because they must apply for grants, adopt ordinances and appropriate funds to address runoff pollution problems. There are eight local governments (five cities, one village, Milwaukee County, and the Milwaukee Metropolitan Sewerage District) in this watershed. All were invited to send representatives to the citizens advisory committee and technical work groups that reviewed the plan, but many elected and appointed officials remain relatively uninformed about urban runoff problems and solutions. Characteristics of local government audiences which have become apparent during the planning process include:

- Misconception that the Deep Tunnel Project will take care of all urban runoff problems
- Attitude that has written off the Kinnickinnic River as a resource
- Concern about federal mandates related to urban storm water runoff
- Reluctance to regulate or tax more than neighboring communities and resistance to raising local taxes
- Pressing social problems in the urban environment which compete with water quality problems for funding

- Historic belief that cleaning up point source pollution was all that urban areas would need to do to solve water quality problems

- Concern about economic issues such as job attraction and retention, maintaining property values, and expanding tax base

The educational approach selected for this audience includes:

1. Meetings (one-to-one or through the Intergovernmental Cooperation Council)
2. Demonstration projects and tours
3. Storm water pollution prevention assessments for public works and parks departments
4. Workshops for staff on new practices—with handbooks and fact sheets
5. Regional water quality conferences
6. Speakers Bureau for local government associations—with high quality audiovisual and printed materials

Considerable time and effort must be devoted to this audience due to the numbers of local governments and the importance of their action to control construction erosion, manage storm water runoff, and restore more natural stream channels.

Urban Residents

The Milwaukee River Basin is the largest urbanized area encountered by the Wisconsin Nonpoint Source Priority Watershed Program. To determine what educational methods might be most effective with urban residents, a survey was conducted during the summer of 1989. According to the survey, Milwaukee area residents find the following methods the most interesting ways to receive information about water quality:

- Community water quality newsletters
- Television news reports
- Educational materials received in the mail
- Newspaper stories

About 50 to 70 percent of the survey respondents report that they are "very likely" to learn about water quality through these means. On the other hand, less than 15 percent report that they are very likely to attend meetings or workshops, check out videotaped programs from local libraries, or visit demonstration sites. Workshops, videotaped programs and demonstration projects are more appropriately used for government staff and consultants rather than the general public.

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

- Perception of the Kinnickinnic River as an open sewer

- Misconception that the Deep Tunnel Project will take care of all urban runoff problems
- Pessimism about the degree of water quality improvement possible in the river and harbor
- Value placed on "quality of life" and clean neighborhoods
- Cultural and language diversity of residents in this watershed
- Perception that industry is the leading cause of water quality problems
- Reluctance to accept any degree of risk from toxic materials
- Preference for funding sources other than property tax

Educational methods selected for use with this audience include:

1. Promotional media campaign (initiated through the Milwaukee South Watershed Project)
2. Newspaper coverage including news, feature articles and limited advertising
3. Television coverage including news stories and interview shows
4. Radio coverage including news stories, talk shows and public service announcements
5. Watershed newsletters sent to interested citizens and groups
6. Articles in local organization newsletters
7. Speakers Bureau for local groups—with high quality audiovisual and printed materials
8. Workshops, volunteer leader training, demonstrations, audio-visual and printed materials about new practices for interested citizens
9. Exhibits at local events, especially water-related ones
10. Improved spill reporting and response system
11. Volunteer projects and leader training

The educational approach for the urban public relies heavily on the mass media. Newsletters, speakers, volunteer projects, and leader training are reserved for interested citizens and organizations.

Business and Industry

Another component of the urban audience are businesses and industries affected by watershed plan recommendations. Those most affected by the plan are the Milwaukee County Airport (General Mitchell Field), the Wisconsin Department of Transportation (freeways), and owners of property identified as needing retrofitting for storm water management devices or streambank stabilization.

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

- Concern about economic costs and benefits
- Sense of civic responsibility
- Concern about Wisconsin's competitiveness as a place to do business compared to other states
- Value placed on "quality of life" (including clean water for recreation) in decisions about corporate relocation
- Limited time availability

Educational methods selected for use with this audience include:

1. Articles in industry newspapers and magazines
2. Speakers for business and industry associations
3. Workshops on new practices for those affected by new regulations—with handbooks, audiovisual and printed materials
4. Demonstration projects and tours
5. Storm water pollution prevention assessments
6. Exhibits at appropriate industry shows and meetings

The watershed project will focus on businesses and industries that are not affected by the storm water permit program but are significant sources of polluted runoff.

Youth

Youth are addressed by this plan because in the future they will be the ones who must act and support action to reduce runoff pollution. The current statewide movement to infuse environmental education in school curricula makes the timing for water quality education initiatives especially appropriate.

Characteristics of the youth audience in this watershed include:

- Most frequent users of the river and some of the few who still envision it as a resource for recreation and other uses
- Limited access to high quality water resources
- Limited water resource education due scarcity of teachers with appropriate training and inadequate funding for field trips
- Appreciation of "hands-on" education and service projects

- Need for information about career opportunities related to water resources

The educational approach developed for this audience includes:

1. Teacher and youth leader workshops
2. Curriculum development
3. School programs including a water quality testing project for high school and middle school students
4. Volunteer projects including storm drain stenciling

Due to limited resources available to the Milwaukee River Program, staff from private and public nature/environmental education centers that currently work with schools in the watershed will play a leading role in these activities. Private as well as public funds will be sought for expensive projects.

Coordination With Other Programs

Information and education activities for this watershed will be coordinated with the Milwaukee Estuary Remedial Action Plan, Milwaukee River Revitalization Council and other related programs. Many of the educational materials and programs needed for this watershed have already been initiated through the Milwaukee River South and Menomonee River Watershed Projects. Printed and audiovisual materials have been developed in a way that allows their use in the Kinnickinnic River Watershed Project Area. What is needed now is an effort to distribute materials and expand programs to reach audiences in the Kinnickinnic River Watershed Project Area. In some cases, these materials or programs will need translation or other adaptations to reach Spanish-speaking and Hmong audiences.

Staff from UW-Extension, DNR, Milwaukee County and other interested groups will meet regularly to coordinate information and education efforts. Some overlap of citizen members and staff assignments for the various information and education work groups will also enhance coordination. More detailed descriptions of educational materials, events and responsible parties are included in Appendix D.

Budget

This budget includes watershed-specific costs for the Kinnickinnic River Watershed Project. It does not reflect costs of exhibits, newsletter publication and distribution, fact sheet printing, workshops and other activities covered through contracts between DNR and UW-Extension. In addition, it does not include the public relations and information strategy which is being funded through the Milwaukee River South Watershed, but will be used to benefit this watershed. Finally, costs listed in this budget are based on 1994 data and will require

adjustment in future years to reflect available funds, inflation, and changes in activities that are needed to achieve the goals of the program.

Local Governments	
Milwaukee County	
$4,375/year for 8 years	$35,000
Municipalities (see table 5-4)	
10% of local assistance grants	$175,000
Special Projects	
Public Relations and Information Strategy	
Covered under a grant through the Milwaukee River South Watershed	---
Video Series for Local Governments	
Statewide project to be funded as a separate proposal, possibly including grants from other sources	---
TOTAL	$210,000

CHAPTER SEVEN
Integrated Resources Management Program

Introduction

The Integrated Resource Management Program is a tool for public officials and land use planning agencies to use for guiding the overall management of water resources in consort with nonpoint source control activities already described in this plan. The purpose of this chapter is to summarize opportunities and directives for integrating other resource management activities into the watershed project. Some of these activities are described below.

Milwaukee Estuary Remedial Action Plan

The Milwaukee Estuary Remedial Action Plan (RAP) targets an area of concentrated contamination that is partially within the Kinnickinnic River Watershed Project Area near the mouth of the Kinnickinnic River where it enters the Milwaukee Harbor. The purpose of the RAP is to unify efforts to monitor water, fish and sediment quality; promote waste collection and pollution prevention programs and facilities; restore stream habitat; control runoff; and increase general pollution control awareness. Demonstration projects and educational activities are recommended in the RAP.

While existing pollution abatement and prevention programs have made progress individually, the RAP serves to integrate these programs in order to achieve common goals. Some of these programs include:

- The Greater Milwaukee Toxics Minimization Task Force
- Lake Michigan Federation/MMSD Household Hazardous Waste Education Project
- Milwaukee River Revitalization Council
- Clean Sweep Programs
- Testing the Waters Programs
- MMSD Water Pollution Abatement Program
- Wisconsin Nonpoint Source Water Pollution Abatement Program
- Superfund Program
- WPDES Permit Program (see description below)

For more information about these and other RAP activities and materials, contact Marsha Jones, DNR Southeast District RAP Coordinator (414) 263-8708.

Storm Water Permit Program (NR 216)

General Comparison with Nonpoint Source Program

The Nonpoint Source (NPS) Program is characterized by comprehensive watershed based planning, local implementation, and extensive state financial assistance. The NPS Program is mainly restricted to specific geographic areas (priority watersheds) of the state. Priority watershed plans are developed which address general storm water management needs for agricultural and urban areas. Urban storm water management recommendations address construction site erosion, municipal storm water runoff, and industrial storm water runoff. For most people, involvement in the program is voluntary. However, the program is currently developing regulatory components, including identification of "critical sites" and issuance of orders requiring best management practices (BMPs). The Program is administered by DNR's Bureau of Water Resources Management under Chapter 144 of the Wisconsin Statutes.

In contrast, the WPDES (Wisconsin Pollutant Discharge Elimination System) Program is regulatory. It has some proposed watershed based components to it, but it mostly applies statewide to certain classes of dischargers defined by proposed NR 216. Implementation by the permittee is required according to conditions specified in the permit. The WPDES Permit Program is administered by DNR's Bureau of Wastewater Management under Chapter 147 of the Wisconsin Statutes.

The reason there are two programs is rooted in the definition of storm water pollution sources. Until 1993, the types of pollution sources to be covered by proposed NR 216 were classified, with a few exceptions, as nonpoint pollution sources. As such, the DNR had no authority to issue permits for them, but included them in its voluntary Nonpoint Source Program. During 1990 the federal government designated many of these sources to be point sources, in conformance with 1987 changes to the Clean Water Act. During 1993, these sources were redefined by Chapter 147 of the state statutes to be point sources in conformance with the new federal law. These sources will now be required to obtain permits consistent with proposed NR 216.

Even with the implementation of the state's storm water permit program, there will continue to be a major storm water management effort conducted through the Nonpoint Source Program. This is because not all urban storm water sources will be required to obtain WPDES storm water permits, and also because there will continue to be a wide variety of pollution prevention activities that can be effectively administered on a statewide and watershed basis through the Nonpoint Source Program. DNR staff from both programs continue to work together to identify areas of overlap and to keep things as simple as possible for storm water sources making the transition between programs. In addition, staff

from both programs work together in developing technical guidance and requirements for various aspects of storm water management. However, there will continue to be unique aspects of each program.

The contact for the Priority Watershed Program will continue to be the staff person designated by the Bureau of Water Resources Management. Depending on the phase that the watershed project is in, this person will either be located in the Southeast District office or in the bureau office in Madison. The Bureau of Wastewater Management will designate someone to work on permitting issues. Each program makes its own policy decisions. In the case of construction sites with buildings, the Department of Industry, Labor, and Human Relations (DILHR) will also be involved. This is because DILHR has the authority to regulate construction site erosion for all one and two family dwellings and for all places of employment (commercial, industrial, institutional buildings).

Currently, the administrative rules for the Nonpoint Source Program (NR 120) are in the process of being revised. In part, these revisions will address how the DNR will implement a new statutory provision (s. 144.25(8c)) that allows DNR to use Nonpoint Source Program funds to help municipalities meet their WPDES permit requirements.

Nonpoint Source Program Funding and the Storm Water Permit Program

Nonpoint source grants, by statute, are to be restricted to those activities identified in the priority watershed plan. Revisions to NR 120 will clarify if eligibility will be the same, increased, or decreased as a result of receiving a WPDES permit.

Funding assistance is available to support a wide variety of activities in urban and urbanizing areas. Funding is available to municipalities for staff or contractual support to conduct I&E activities, develop construction site and storm water ordinances, and to perform storm water planning, engineering, and design activities as described in Chapters 4 and 5 of this plan. Funding is also available to municipalities and individuals to install structural urban best management practices in established urban areas.

Practices to control construction site erosion and storm water runoff from new development are not eligible for cost sharing. Generally speaking, industrial areas contaminated by industrial processes are not eligible for assistance either.

It is anticipated that funding for urban activities will become increasingly competitive as more and more demands are made on program funds. The Land and Water Conservation Board will play a major role in determining how Nonpoint Source Program funds will be allocated between urban and rural portions of the program in the event that funding levels fall short of expenditure needs. The Land and Water Conservation Board is also responsible for making biennial budget funding recommendations to the Governor and the DNR on the overall level of support for the Nonpoint Source Program.

At this time, the Nonpoint Source Program will continue to fund activities related to assessing watershed conditions (land use and water quality) and developing local storm water management implementation programs. Many of the Part I and Part II municipal WPDES storm water permit application requirements are designed to answer similar questions. Consequently, many permit application requirements can be at least partially funded through the Nonpoint Source Program provided that the municipality lies within a designated priority watershed area. The level of funding will be based on the amount of funding available to the Program, the comparative level of detail required for the permit application, and the extent to which the planning activities address nonpoint sources.

The nonpoint source control plan is considered a guidance document, along with other information sources, in developing the municipal WPDES Permit. As a general rule, both programs emphasize non-structural approaches to storm water management in the early years followed by more intensive structural work, where feasible, in later years. However, the recommendations that are included in priority watershed plans do not have to be reflected verbatim in the WPDES permits.

Each year, the DNR coordinates applications for funding provided under the federal Nonpoint Source Program (Section 319 of the Clean Water Act). Past and current policy is that federal Section 319 funds may not be used to implement requirements of the new federal storm water regulations. This restriction on funding applies to activities such as preparation of permit applications as well as funding to implement end-of-pipe treatment that is either currently required or is anticipated as a permit requirement.

At this time, NPS program administrative rules (NR 120) do not allow use of funds to control source areas contaminated by industrial operations. This policy will remain in effect for all non-municipally owned industries that are required to hold WPDES permits under NR 216. There is some question as to whether municipal ownership of an industrial operation will allow Nonpoint Source Program funds to be used under s. 144.25(8c) of the Wisconsin Statutes. This issue will be resolved as NR 120 is revised.

Nonpoint Source Program funding has never been available for the planning or installation of construction site erosion control practices. This policy will also likely continue. The financial support that the program has given to municipalities to develop and administer construction erosion control ordinances will also greatly change because more and more construction sites are being regulated by DILHR. The final level at which this type of support will be made available will be established as NR 120 is revised.

For more information, contact John Pfender, DNR, Bureau of Water Resources Management Nonpoint Source and Land Management Section, 608-266-9266.

Coastal Nonpoint Pollution Control Program

The 1990 Federal Coastal Zone Act Reauthorization Amendments require that certain states do more to control nonpoint source pollution in coastal areas. Under this law, Wisconsin is one of 29 states and territories required to create a Coastal Nonpoint Pollution Control Program (CNPCP). Congress enacted the CNPCP legislation so that states and local governments would increase efforts to protect and manage the quality of coastal waters (including those of Lake Michigan) by implementing BMPs, enforcing regulations, providing technical assistance, encouraging public participation, coordinating existing efforts and monitoring water quality.

The CNPCP objectives were designed to dovetail with the federal Storm Water Permit Program. Consequently, discharges subject to WPDES storm water permits will not have to meet additional CNPCP requirements. The DNR is responsible for coordinating preparation of the state's program plan, scheduled for completion in 1995. For more information, contact Percy Mather, DNR, (608) 266-9263.

Multi-Objective Stream Restoration

During the planning phase of the watershed project, citizens groups and agency staff raised concerns about the impaired safety and environmental degradation of constructed concrete channels in the watershed project area. These concerns gave rise to questions about the feasibility of stream restoration and its impacts on existing flood control. In response, this plan recommends a pilot restoration project for Wilson Park Creek that integrates flood control and stream habitat objectives and is consistent with MMSD's facilities plans for Wilson Park Creek.

The project design concept should address the riparian areas along upper reaches of Wilson Park Creek south of Howard Avenue (see map 3, stream segment 11) in three separate zones. Each zone should be designed differently because of constraints and opportunities that characterize each area (modeled after the Wildcat Creek Modified Flood Control Plan, Philip Williams & Associates, Ltd., and MMSD Lincoln Creek restoration plans).

The first zone, upstream of the airport, should emphasize habitat restoration efforts in accordance with MMSD and airport approved plans. Easements and land acquisition efforts should be focussed here. Existing trail systems could be improved, enabling public access and parking for low impact recreational use.

The second zone, the stream corridor within airport property and 1000 feet downstream, could provide a maintenance channel. Sediment transport and detention in this area could enable periodic sediment removal, minimizing sedimentation and runoff pollutant discharges to downstream reaches.

The third zone, extending to 1000 feet downstream of the I-94 overpass could be another habitat restoration zone. Braided channels and meanders should be constructed upstream of the overpass where streamside trees and public access trails could be incorporated.

The planning, design and implementation of the project should encourage community input and public participation. State programs that provide funds for land acquisition and easements should be utilized (see Urban Streams Grant Program described below and easement discussions in Chapter 4). The Milwaukee River Revitalization Council or other groups could assist in raising additional revenues needed to enhance park facilities and fully implement the modified flood control plan.

Urban Streams Grant Program

Towns, villages, cities, counties and Indian tribes may apply for grants under the Urban Rivers Grants Program (these may supplement Nonpoint Source Pollution Abatement Program grants for priority watershed projects). Grants may be made for land acquisition along urban streams, provided they:

- help restore, preserve or enhance the river's resource value;
- enhance outdoor recreational benefits for all segments of the population; and
- are supported by local land use planning.

About $900,000 per year in state bonding funds are currently available. Grants will match a 50% local share and range from $10,000 to $100,000 with no more than 20% of the total grant monies going to any single municipality. Beginning in 1996, grant funds will likely increase to $1.9 million per year. Deadlines for applications are May 1. DNR Southeast District contact is Dan Kaemmerer, (414) 263-8704.

Stewardship Program

Under this program, the DNR can purchase an easement on both sides of the stream (generally 66 feet wide on each side). Streams in the watershed should be nominated for eligibility when the nomination period is opened. Contact the DNR Southeast District office (608) 263-8500 for more information.

Endangered and Threatened Species Sites

Endangered, threatened, and special concern species and their natural area habitats are listed in Chapter 2 of this plan. To the extent possible, every effort should be made to protect these species and their habitats. If site-specific information is needed, contact Elizabeth Spencer, (608) 264-6057, of the DNR Bureau of Endangered Resources.

Cultural Resources

Procedures for coordination with state and federal historic preservation laws can be obtained from the DNR Nonpoint Source Section (608) 266-9273. If archaeological sites are found within the watershed project area, special consideration must be given to their protection when BMP installations are being considered. Detention basins and streambank or shoreline shaping and riprapping are the most common practices that may disturb archaeological sites.

Fisheries

BMPs, such as streambank protection, shoreline buffer strips, and easements, should be implemented in such a way that will enhance fishery habitat management goals. The DNR fisheries manager should be consulted during the design phase of each streambank protection project.

CHAPTER EIGHT
Project Evaluation

Introduction

This chapter briefly describes the plan for monitoring the progress and evaluating the effectiveness of the Kinnickinnic River Priority Watershed Project. The evaluation strategy includes two major components:

- Administrative review
- Pollution reduction evaluation

DNR and local units of government will jointly evaluate the project. Additional information on the numbers and types of practices on cost-share agreements, funds encumbered on cost-share agreements, and funds expended will be provided by the DNR's Bureau of Community Assistance.

Administrative Review

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

Accomplishment Reporting

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

- Information and education activities
- Construction site erosion control ordinance enforcement activities
- Number of permits monitored for ordinance compliance
- Implementation of urban pollution prevention program activities
- Acres of urban lands covered by engineering feasibility studies

- Acres of urban development, by land use, covered by storm water management plans for controlling water quality
- Storm water management ordinance provisions developed and adopted
- Number of catch basin cleanings
- Number of feet and tons of eroding streambanks addressed by detailed engineering feasibility studies

Financial Expenditures

Participating units of government will provide the following financial data to the DNR and the DATCP on a quarterly basis:

- Number of landowner cost-share agreements signed
- Amount of money encumbered in cost-share agreements
- Number of landowner reimbursement payments made for the installation of best management practices (BMPs), and the amount of money paid
- Staff travel expenditures
- Information and education expenditures
- Expenditures for equipment, materials, and supplies
- Expenditures for professional services and staff support costs
- Total project expenditures

Participating units of government will also provide the DNR with the following financial data on an annual basis:

- Staff training expenditures
- Interest money earned and expended
- Total budget and expenditures on the project

Time Spent On Project Activities

Participating governmental units with local assistance grants will provide time summaries to both departments for the following activities on a quarterly basis:

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

Nonpoint Source Pollutant Load Reduction

The purpose of the second evaluation component, pollutant load reduction, is to estimate reductions in nonpoint source pollutants as a result of installing BMPs. Key sources were identified for estimating changes in pollutant loads that reach surface waters in the Kinnickinnic River Watershed Project Area, including construction sediment erosion, streambank erosion, and urban nonpoint source pollutants. Chapter 3 of this plan describes target pollutant reductions for each of the lakes and subwatersheds.

Streambank Sediment Sources

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

Construction Sites

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

Urban Storm Water

Local units of government will report annually to the DNR on any activities that may result in changes in urban pollutant loadings. Such activities include acres of established urban land, by land use, served by new storm water BMPs; new urban lands, by land use, not served by storm water BMPs; and other information requested by the DNR concerning BMP characteristics.

Evaluation Monitoring

Evaluation monitoring activities in priority watersheds are planned and conducted according to monitoring program guidance in the Bureau of Water Resources, Surface Water Monitoring Strategy. However, evaluation monitoring is not conducted in every priority watershed. The MMSD will continue to conduct water quality monitoring at selected sites on the Kinnickinnic River while extensive water quality monitoring will be conducted on

nearby Lincoln Creek where similar priority watershed management practices are being planned and installed. Depending on the availability of state and local funding, additional monitoring activities may be prescribed for the project at a later time.

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APPENDIX A
Watershed Planning Methods

This chapter describes the steps and procedures used to prepare this plan. These are:

1) Evaluating water quality and aquatic habitat.

2) Assessing pollution sources.

3) Establishing water resources objectives.

4) Establishing pollution reduction goals.

5) Developing a nonpoint source control strategy.

6) 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 improvement measures required to sustain these designated uses, and indicating the methods to implement, achieve and maintain those conditions.

The DNR's Southeast District water resources management staff conducted investigations of the existing quality and natural resource conditions for lakes and streams in the Kinnickinnic River watershed. Their purpose was to evaluate water quality problems and establish a basis for setting water resource management objectives. Detailed assessment results are documented in water resources appraisal reports.

Data Collection

The following is a summary of the five elements comprising the water quality and aquatic habitat investigation.

Subwatershed Delineation and Stream Segmentation

Prior to collecting field data, the watershed was divided into eight subwatersheds. These delineations were used to divide the perennial and intermittent stream network into segments and each subwatershed into smaller hydrologic units. Stream segments were used to separate portions of waterways where there were pronounced differences in stream character and/or water quality.

Stream Habitat Evaluation

Information characterizing stream habitat—including flow rate and depth, substrate quality, channel configuration, streambank stability, and water temperature—were collected using techniques that the DNR developed. The data were evaluated using the Department's Stream Classification Guidelines (Ball, 1982 and Pajak, 1987).

Water Quality Assessment

Water quality was assessed through review of historical water chemistry data and an evaluation of bottom dwelling organisms (macroinvertebrates) using the Hilsenhoff Biotic Index (Hilsenhoff, 1982). Bacteria (fecal coliform) 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 and information collected during this investigation.

Navigability and Recreational Use Determinations

The extent and degree to which lakes and streams are navigable was determined based on evidence of boating, field data including evidence of stream alteration or use, and information that landowners or other local experts provided. Recreational uses were determined through field observations, file data and information from local users.

Data Interpretation

The information described above was used to determine the existing and potential biological and recreational uses for 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. 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 which a stream system supports. 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 was applied to surface waters in the Kinnickinnic River Watershed in accordance with NR 102(04)(3).

Warm Water Sport Fish Communities (WWSF)

Surface waters capable of supporting a community of warm water sport fish (bass, walleye, pike) or serve as spawning areas for warm water sport fish.

Warm Water Forage Fish Communities (WWFF)

Surface waters capable of supporting an abundant, diverse community of forage fish (shiners, minnows) and other aquatic life (insects, clams, crayfish).

Limited Forage Fish Communities (LFF)

Surface waters of limited capacity, naturally poor water quality or habitat, and capable of supporting small populations of forage fish that tolerate pollution, or fish and aquatic invertebrates that tolerate pollution. Small physical stream size and reduced stream flow usually limit the aquatic life.

Limited Aquatic Life (LAL)

Surface waters capable of supporting a very limited community of aquatic life. Water bodies are usually small, such as intermittent streams and ditches, or have been extensively modified through channel straightening or concrete lining.

Recreational Stream Use Classification

Recreational stream use classifications are determined by the level of human body contact deemed 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 as follows:

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 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 of the 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 streambeds and lakebeds are clogged with sediment.

Assessing Pollution 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 (Bannerman, 1983).

Pollutants carried in urban storm water runoff include some of the same pollutants usually 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 which destroy stable habitat for aquatic life and often necessitates the conversion of natural streams into storm water conveyance channels to reduce flood damages.

Principal nonpoint sources evaluated in preparing this plan include:

1) Established urban land uses.

2) Construction sites.

3) Eroding streambanks.

Storm water pollutant concentrations, runoff volumes, and pollutant yields vary according to the urban land use (e.g., residential, commercial, industrial) and development characteristics such as intensity of the development and the storm water conveyance system. The inventory was designed to quantify the urban land uses and development characteristics for established urban development. This information was used to estimate the existing and future urban pollutant loads.

The DNR used land use information provided by SEWRPC, digitized it into a ARC/INFO Geographic Information System (GIS), and integrated it with the Source Loading and Management Model (Pitt and Voorhees, 1989) to estimate urban nonpoint source loads for five pollutants—sediment, phosphorus, zinc, copper and lead (representing urban toxic materials). Information on existing pollutant loads was used to identify the magnitude and distribution of the current nonpoint source loadings and to identify high priority land uses responsible for most of these loads. The effectiveness of applying urban management practices to these areas was also evaluated to determine what level of management is needed to reduce pollutant loads to acceptable levels in the future.

The potential for construction site impacts was assessed based on the number of acres planned for redevelopment and the adequacy of existing local construction erosion control programs. Each municipality and SEWRPC provided the number of acres planned for development. The adequacy of existing local construction erosion control programs was evaluated through a survey, which the University of Wisconsin Cooperative Extension Service (UWEX) and the DNR jointly developed, and completed by an authorized representative from each local unit of government.

Streambank and shoreline erosion survey techniques were applied to portions of urban streams where streambank erosion was a problem. Sites were selected based on information from the DNR water resources staff and local government staff.

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 of overshadowing improvements in water quality that might otherwise occur as a result of the priority watershed program. Recommendations for alleviating the water quality impacts of these other pollution sources are documented in the integrated resources management plan for the Kinnickinnic River Watershed Project Area.

Establishing Water Resources Objectives

Biological and recreational water resources objectives were established for each of the streams and nearshore lake areas in the watershed project area. These objectives identify how the project is anticipated to change the quality of the aquatic environment for recreational and biological uses. Factors considered in establishing water resources objectives include: 1) existing water quality and aquatic habitat, 2) factors or pollutants that may be preventing the surface water from reaching its full potential of supporting biological and recreational uses, and 3) the practicability 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 established together since they are integrally related.

The nonpoint source pollution reduction goals in this plan specifically target the control of control of toxic materials, sediment, phosphorus, and stream flow changes in urban areas. Importantly, 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 resource objectives presented in this plan recognize that pollution control and resource management efforts beyond the scope of the nonpoint source control program are needed to achieve the identified objectives. These will include implementation of other recommended management actions which SEWRPC establishes in the amended areawide water quality management plan for southeastern Wisconsin.

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 the Nonpoint Source Water Pollution Abatement Program were determined by:

- Evaluating pollutant loading for each nonpoint source in each subwatershed.
- Weighing the relative importance of controlling each source (e.g., construction erosion, urban runoff, etc.) in achieving the water resource objectives.
- Developing criteria to determine which sources need to be controlled.
- Applying the criteria to determine eligibility for participation in the priority watershed project.

This evaluation was carried out on a subwatershed basis. The result is a municipality specific prescription of nonpoint source control measures and a determination of assistance to be made available through the nonpoint source program.

Involving The Public and Local Units of Government

The DNR convened a Citizens Advisory Committee and a Project Team, including three technical working groups to assist in preparing this watershed plan. The Citizens Advisory Committee is made up of representatives from the county, municipalities, the SEWRPC, the UWEX, the MMSD, environmental groups and interested citizens. This Committee primarily provided policy guidance during the planning process and reviewed plan chapters.

Three types of technical working groups were formed to help with developing technical guidance in the plan—a water resources appraisal work group, a technical advisory work group and an information and education 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 B
1. Catch Basin Cleaning
2. Street Sweeping

Catch Basin Cleaning

Description

This practice is used to remove leaf litter, accumulated dirt and debris from catch basins (small sedimentation basins or grit chambers that collect street runoff before its transported to a subsurface conveyance system) for improving quality of downstream surface waters. Catch basins can be cleaned either manually with a shovel or, by machine using a clamshell bucket, or specially designed equipment including bucket loaders, vacuum eductors or vacuum attachments to street sweepers.

Purpose

In the Kinnickinnic River Watershed Project Area, wet detention and infiltration practices are needed to meet the pollutant load reductions called for in this plan. However, supplementary catch basin cleaning can be useful on an interim basis to provide a moderate level of pollutant load reduction as wet detention and infiltration practices are being phased in. If maintained properly, detention and infiltration BMPs will provide a higher level of pollutant load reduction than catch basin cleaning. As BMPs are installed, supplementary catch basin cleaning may be reduced as long as storm water ponds are cleaned regularly. The purpose of supplementary catch basin cleaning is to provide interim protection in areas that will ultimately be served by other BMPs.

Conditions

Cost sharing is authorized for partial support of a supplementary catch basin cleaning program for existing critical land uses. Supplementary catch basin cleaning is defined as levels greater than one cleaning for each catch basin per year in critical land use areas. Critical land uses are those defined for each subwatershed in Chapter 4 of the watershed plan.

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

- direct and indirect staff costs to operate the cleaning equipment including wages, salaries, benefits, and overhead (Only cost of "additional staff", as defined in NR 120.02, is eligible),
- fuel, equipment maintenance, and equipment depreciation,
- disposal of collected materials.

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

Street Sweeping

Description

Use of brush or vacuum style sweepers to remove leaf litter and accumulated dirt from street surfaces on a schedule designed for improving quality of surface waters.

Purpose

Like catch basin cleaning, the purpose of supplementary street sweeping in the Kinnickinnic River watershed project is to provide interim pollutant removal in areas that will ultimately be served by detention and infiltration BMPs. Street sweeping is a cost sharable BMP with the following conditions.

Conditions

Cost sharing is authorized for partial support of a supplementary street sweeping program for existing critical land uses. Supplementary sweeping is defined as levels above the 1993 level of street sweeping but only on land uses deemed critical. Critical land uses are those defined for each subwatershed in Chapter 4 of the watershed plan.

Supplementary street sweeping is supported at a 50 percent cost share rate and effective for a maximum five year period, beginning when the community first accepts cost share funds for

street sweeping. Eligible cost components and cost sharing rates are the same as for catch basin cleaning (see above). The community may negotiate with the DNR a flat fee cost share amount per curb mile. Cost sharing will be on a reimbursement basis.

Following the five year period of cost share eligibility, the community is expected to maintain at its own expense a comparable street sweeping schedule in those areas for which it received cost sharing. This requirement will be waived when the area is retrofitted with BMPs consistent with the recommendations of this plan.

Specific recommendations on the frequency and intensity of street cleaning were not made in Chapter 4 of the plan for two principle reasons. First, each community in the watershed project area has an existing program that includes at least two street sweepings per year. The city of Milwaukee, where the highest percentage of storm water pollutants originates, sweeps its streets as often as once per week. Supplementary street cleaning would provide only a very small gain in pollutant reduction. Second, experience in the Milwaukee River watershed projects has shown that very few communities have an interest in applying for cost sharing for supplementary street sweeping.

In addition, the city of Milwaukee is currently conducting a study to determine the relative merits and cost effectiveness of vacuum sweepers versus brush sweepers. Results of the study are expected to drive future recommendations for street sweeping.

APPENDIX C
Milwaukee River Program Basinwide Education Goals

Basinwide Goal Pertaining to Education

Educate key audiences regarding nonpoint source pollution and related resource management problems and solutions, thereby facilitating public involvement, informed decisionmaking, and plan implementation.

Information and Education Subcommittee-adopted Goals

The best available techniques, including research and survey results, will be utilized in educational strategy development, implementation, and evaluation. The Milwaukee River Priority Watersheds Information and Education Program will strive to:

- Improve the awareness and understanding of the watershed as a system, water quality problems, and the benefits available through integrated resources management, particularly nonpoint source pollution control.

- Inform people about the potentials of and instill a sense of responsibility or ethic for the natural resources within the Milwaukee River Basin.

- Achieve widespread participation in and support for the priority watershed and integrated resources management programs through the involvement of broadly-based and diverse groups.

- Develop and maintain a clear understanding of the steps the program will be taking among rural and urban landowners and users, watershed communities, community leaders, and other groups.

- Optimize both the use of rural and urban nonpoint source pollution control measures through voluntary cooperation, and the integrated use of complementary resource management techniques.

- Coordinate and cooperate with other federal, state, and local programs and promote all appropriate implementation strategies (including mandatory controls, where warranted) as mechanisms to achieve water quality improvements.

APPENDIX D
Information and Education Materials and Events

This appendix is a supplement to the educational strategy described in Chapter 6 of this plan. Many of the educational activities and materials described in this appendix are basinwide and statewide activities that have been initiated through other Milwaukee River Watersheds and will be used in the Kinnickinnic River Watershed. Descriptions of other basinwide and statewide activities are included in the Urban Water Quality Information and Education Strategy for the Milwaukee River Program (Johnson, 1989).

Promotional Media Campaign

Because this watershed is entirely urban, a major part of the information and education strategy is a promotional campaign. This campaign is being developed by the city of Milwaukee under funds allocated to the Milwaukee River South Watershed, but will also benefit the Kinnickinnic River Watershed. The purpose of the campaign is to simplify and popularize the urban runoff message thereby building widespread understanding of this kind of water pollution and acceptance of the practices needed to control it. The strategy focuses of the public audience and relies heavily on mass media and community groups to distribute the message.

The city of Milwaukee has the lead role in this project and has hired staff to implement a strategy developed under contract by a public relations consultant. UW-Extension and DNR staff will provide input and assistance in the development and implementation of the campaign as needed.

Media Contacts

News releases are distributed to local newspapers, television and radio stations to announce watershed events such as tours, workshops, public information meetings, demonstration project installations and grant awards. The lead responsible agency for the news releases will vary depending on which agency or private group is responsible for a particular event. Newspaper feature articles and appearances on radio talk shows and television interview programs will be sought to provide more in-depth coverage of the program. Special feature articles or interview shows may involve direct participation by State or District DNR or UW-Extension staff. In this watershed, local media that reach Spanish-speaking audiences

should be included (newspapers such as the Spanish Journal Newspaper Weekly and Spanish Time and radio programs such as Saturday Hispanic programs on WYMS-FM).

Programs for Local Groups

To provide a more organized approach for soliciting and meeting program requests from local groups, the Milwaukee River Program will develop a speakers bureau. Members of the speakers bureau will include state and local government staff and members of the advisory committees. Videotapes, slide programs and supportive educational materials for use by the speakers bureau are already available.

The primary responsibility for maintaining the speakers bureau database will belong to the Southeast District DNR. Area UW-Extension staff will play a role in developing or coordinating the development of needed materials. Area and County UW-Extension, LCD, DNR and DATCP staff will publicize and participate in the speakers bureau and the development of information and education materials according to their areas of interest and available time.

Newsletters

Many issues in the Milwaukee River Program transcend watershed boundaries and interest groups often have regional membership. Therefore, newsletters are most efficiently written and distributed at the basinwide, rather than watershed level. The Kinnickinnic River Watershed will be featured in upcoming issues of the Milwaukee River Watershed newsletter. These newsletters convey information to targeted groups such as local government officials, civic and environmental groups, fishing and boating groups, business and industry associations, interested citizens and other likely participants in the Milwaukee River Program.

The objectives of newsletters are to:

1. Supply basic information on the program
2. Provide updates on important elements of the program including dates of upcoming events
3. Improve understanding of runoff pollution problems and causes
4. Increase appreciation of lakes, streams and related natural resources in the watershed
5. Introduce landowners to recommended management practices
6. Provide information on available assistance including cost-sharing
7. Build a sense of momentum by providing information on participation and implemented practices

Newsletters are distributed to key audiences throughout the Milwaukee River Basin and used as handouts at public meetings, tours and exhibits.

The lead responsible party for watershed newsletters are the Area UW-Extension Water Quality staff with assistance from editorial staff in Madison. Other UW-Extension, DNR and local government staff are also involved in newsletter preparation and distribution.

Audiovisual and Printed Materials

A variety of fact sheets, brochures, slide and videotaped programs on rural and urban nonpoint source pollution have already been developed for use at public meetings, community group programs and volunteer training sessions. Some of these materials need to be translated into Spanish or Hmong for use in this watershed.

County LCD and UW-Extension staff use these printed and audiovisual programs for presentations to schools and community groups to explain the Priority Watershed Program, runoff pollution, and best management practices. Local governments also use the printed materials for exhibits and mailings to inform their residents about water quality and pollution prevention.

One remaining need is for a series of short (10-15 minute) video presentations and accompanying printed materials for local government staff to use in educating elected officials about urban best management practices. Some important topics for this series include storm water pollution control techniques, pollution prevention, and streambank stabilization.

Exhibits

Exhibits on the Milwaukee River Program, on urban and rural nonpoint source pollution problems, causes and solutions are available for use at county fairs, festivals, home and garden shows and other special events in the watershed. The subject of these exhibits can be changed to fit audience needs and interests.

Arrangements for use of exhibits in local areas are the responsibility of local government staff with assistance from Area UW-Extension and District DNR staff. Exhibit boards, pictures and signs are usually provided by Area UW-Extension staff.

Signs

Signs with the Milwaukee River Program logo will be used at selected locations to increase public awareness of the Program. Potential sites for signs will be selected and prioritized by the I&E Subcommittee. Signs will be produced via separate outside contracts. UW-Extension Water Quality staff have primary responsibility for coordinating this sign project.

Signs identifying demonstration projects will also be used. Wherever possible, more detailed signs explaining the watershed project and associated practices will be put up in prominent public locations such as parks, waysides, boat and fishing access sites, and river walkways.

Yard Care Programs

Yard care information and education activities are provided for urban residents. These activities include a training for volunteer leaders, fact sheets, InfoSource taped messages, and a State Fair exhibit.

Master gardeners and other volunteer leaders are trained by County UW-Extension Agents to provide programs for community groups on alternative yard care practices that reduce or prevent runoff pollution. These programs include topics such as reduced fertilizer use, alternative pest management techniques, yard waste reduction and reuse, selecting plants appropriate to the site, vegetative buffers for lakeshores and streambanks, and infiltration of storm water. Materials for the yard care program, including the "Yard Care and the Environment" fact sheet series, have been developed by County and Area UW-Extension staff with state specialist assistance.

School Programs

Several years ago, a consortium of nature/environmental education centers in the Milwaukee River Basin met with DNR and UW-Extension staff to evaluate water quality education opportunities for teachers and students. The conclusion of the group was that a variety of environmental awareness programs that include water quality are available for elementary and middle school teachers and students. However, programs for high school teachers and students were lacking. Therefore, the group formulated a proposal for a high school water quality monitoring program called "Testing the Waters." This proposal was modeled after the Rouge River Project in Michigan.

Each year about 1000 students from 32 public and private high schools test the water quality of streams throughout the Milwaukee River Basin and share their results through a computer network and student congress. Schools in the Kinnickinnic River Watershed are already involved in this project. During the next few years, the program will be expanded to include middle schools.

The lead responsible parties for this project are the private and public nature/environmental education centers, UW-Milwaukee, DNR and UW-Extension staff who work with school groups. These organizations submit special grant proposals to private foundations and public agencies for "Testing the Waters" and implement the program.

Youth and Community Group Volunteer Programs

School water quality programs are supplemented by youth and community group programs including educational events and service projects. More support for volunteer programs will soon be available through a state program called "Water Action Volunteers" or WAV. This program will have a full-time staff person to develop and distribute a packet of support materials and to organize training for volunteer leaders.

One of the available projects that is especially pertinent to the Kinnickinnic River Watershed is storm drain stenciling. The objectives of this project are to teach youth and adults that storm sewers carry materials directly to local lakes and streams and to discourage dumping of pollutants such as waste oil, antifreeze and paint into them. UW-Extension, DNR, LCD, and local government staff work with community groups to carry out this program. DNR purchases stencils on a statewide basis; UW-Extension develops and prints handout materials; local governments provide stenciling kits and paint; and volunteers provide the labor.

Local Government Meetings

Each year, local governments are invited to an urban grants workshop for the Priority Watersheds Program. The purposes of the workshop are to: (1) provide information on how to apply for nonpoint source grants; (2) update local governments on best management practice design, maintenance techniques, monitoring and research results; and (3) share what local governments have done with grant funds during previous years. Meetings may also be scheduled with individual local governments, especially those new to the watershed program.

DNR District staff have primary responsibility for scheduling individual meetings with local government staff and elected officials. Area Extension staff assist with these meetings as needed and work with DNR District staff to organize annual urban grants workshops.

Workshops on Urban Best Management Practices

Technical education and training are offered to local governments on urban best management practices such as construction site erosion control, storm water management, pollution prevention and streambank/lakeshore stabilization. Workshops provide information on design, installation, inspection, maintenance and financing for these practices to local government staff, developers, builders, contractors and consultants.

Area UW-Extension staff are responsible for organizing these workshops and for notifying local government staff and consultants of other training opportunities. Materials for use in the workshops are developed on a basinwide or state level. DNR and local government staff assist with the workshops by speaking, developing handouts, evaluating results and providing publicity.

Individual city and village Educational Programs

Each local government will have an information and education element included in any local assistance agreement. These will include activities such as:

- Publicity for new leaf collection and street sweeping programs
- Publicity for pet waste cleanup ordinances
- Publicity, coordination and supplies for storm drain stenciling
- Publicity for local waste oil recycling and hazardous waste collection programs
- Information for developers about new or changed local construction erosion control and storm water management ordinances
- Training of local government staff for urban best management practices

Local government staff are responsible for implementing their community's information and education program. Appropriate County or Area UW-Extension and DNR staff assist local governments in the development and implementation of information and education programs for their residents, businesses and industries. DNR and Extension staff also provide information on urban best management practices to city and village officials through telephone contacts, attending local government meetings, providing workshops, or other educational means. Area and County UW-Extension staff develop exhibits, printed and audiovisual materials and arrange workshops on urban best management practices for use by local governments.

Demonstration Site and Key Urban Practices Tours

Small group tours will be conducted for urban demonstration projects and other sites with urban best management practices. Local government staff, consultants and elected officials who need specific information and first-hand exposure to the demonstrated practices will be invited to the event(s). Southeast District DNR and UW-Extension staff have the major responsibility for organizing and conducting these tours.

Pollution Prevention for Business and Industry

To reduce polluted runoff from commercial and industrial property, Extension and DNR staff will work with business leaders to develop a program modeled after the city of Bellevue's Business Partners for Clean Water. This is a private-public partnership which relies on developing a cooperative working relationship with business and industry. The Business Partners Program provides:

- Advisory committees of business and industry representatives to participate in program development
- Workshops tailored to the needs of business and industry groups
- Presentations and displays for association and trade meetings
- Self-assessment tools for pollution prevention and storm water management
- Technical assistance through fact sheets, handbooks and on-site consultations
- Demonstrations of storm water controls and, where needed, research
- Articles for trade publications
- Public recognition of participants
- Public and peer recognition via achievement awards

This program will focus on businesses that have the potential to produce polluted runoff or illicit discharges to storm drains including: gasoline stations, painters, pressure washers, fleet maintenance, lawn care companies, golf courses, boat storage and cleaning, mobile cleaning operations, parking lot and grounds maintenance, and businesses with outdoor storage.

APPENDIX E
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 DNR and WDHSS that recommends people limit the fish they eat from some rivers and lakes based on the levels of toxic contaminants found in the fish.

CONTAMINANT:
Some material that has been added to water that is not normally present. This is different from a pollutant, which suggests there is too much of the material present.

CONVENTIONAL POLLUTANT:
Refers to suspended solids, fecal coliforms, biochemical oxygen demand, and pH, as opposed to toxic pollutants

COST-EFFECTIVE:
A level of treatment or management with the greatest incremental benefit for the money spent.

CRITERIA:
See water quality standard criteria.

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 DNR 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 DNR issues WPDES permits establishing the maximum amount of pollutant to be discharged to a receiving stream. Limits depend on the pollutant and the water quality standards that apply for the receiving waters.

EMISSION:

A direct (smokestack particles) or indirect (busy shopping center parking lot) release of any contaminant into the air.

ENVIRONMENTAL PROTECTION AGENCY (USEPA):

The federal agency responsible for enforcing federal environmental regulations. The Environmental Protection Agency delegates some of its responsibilities for water, air and solid waste pollution control to state agencies.

ENVIRONMENTAL REPAIR FUND:

A fund established by the Wisconsin Legislature to deal with abandoned landfills.

EPIDEMIOLOGY:

The study of diseases as they affect populations rather than individuals, including the distribution and incidence of a disease mortality and morbidity rated, and the relationship of climate, age, sex, race and other factors. EPA uses such data to establish national air quality standards.

EROSION:

The wearing away of the land surface by wind or water.

EUTROPHIC:

Refers to a nutrient-rich lake. Large amounts of algae and weeds characterize a eutrophic lake (see also "Oligotrophic" and "Mesotrophic").

EUTROPHICATION:

The process of nutrient enrichment of a lake loading to increased production of aquatic organisms. Eutrophication can be accelerated by human activity such as agriculture and improper waste disposal.

FACILITY PLAN:

A preliminary planning and engineering document that identifies alternative solutions to a community's wastewater treatment problems.

FECAL COLIFORM:

A group of bacteria used to indicate the presence of other bacteria that cause disease. The number of coliform is particularly important when water is used for drinking and swimming.

FISHABLE AND SWIMMABLE:

Refers to the water quality goal set for the nation's surface waters by Congress in the Clean Water Act. All waters were to meet this goal by 1984.

FLOURANTHENE:

A polyaromatic hydrocarbon (PHA) with toxic properties.

FLY ASH:

Particulates emitted from coal burning and other combustion, such as wood burning, and vented into the air from stacks, or more likely, collected by electrostatic precipitators.

FOOD CHAIN:

A sequence of organisms where each uses the next as a food source.

FURANS (2,3,7,8-tetra-chloro-dibenzpfurans):

A chlorinated organic compound which is highly toxic.

GREEN STRIPS:

See buffer strip.

GROUNDWATER:

Undergroundwater-bearing areas generally within the boundaries of a watershed, which fill internal passageways of porous geologic formations (aquifers) with water that flows in response to gravity and pressure. Often used as the source of water for communities and industries.

HABITAT:

The place or type of site where a plant or animal naturally lives and grows.

HEAVY METALS:

Metals present in municipal and industrial wastes that pose long-tern environmental hazards if not properly disposed. Heavy metals can contaminate ground and surface waters, fish and other food stuffs. The metals of most concern are: arsenic, barium, cadmium, chromium, copper, lead, mercury, selenium and zinc (see also separate listings of these metals for their health effects).

HERBICIDE:

A type of pesticide that is specifically designed to kill plants and can also be toxic to other organisms.

HYDROCARBONS:

Any chemical of a large family of chemicals containing carbon and hydrogen in various combinations.

INCINERATOR:

A furnace designed to burn wastes.

INFLUENT:

Influent for an industry would be the river water that the plant intakes for use in its processing. Influent to a municipal treatment plant is untreated wastewater.

IN-PLACE POLLUTION:

As used in the RAP, refers to pollution from contaminated sediments. These sediments are polluted from post discharges from municipal and industrial sources.

INTERNATIONAL JOINT COMMISSION (IJC):

An agency formed by the United States and Canada to guide management of the Great Lakes and resolve border issues.

ISOROPYLBIPHENYL:

A chemical compound used as a substitute for PCB.

LANDFILL:

A conventional sanitary landfill is "a land disposal site employing an engineered method of disposing of solid wastes on land in a manner that minimizes environmental hazards by spreading solid wastes in thin layers, materials at the end of each operating day". Hazardous wastes frequently require various types of pretreatment before they are disposed of, i.e., neutralization chemical fixation encapsulation. Neutralizing and disposing of wastes should be considered a last resort. Repurifying and reusing waste materials or recycling them for another use may be less costly.

LC-1:

The concentration that results in 1% mortality of the test animal populations exposed to the contaminant.

LC_{50}:

Lethal concentration for 50% of the test population exposed to a toxicant substance.

LD_{50}:
Lethal dose for 50 percent of the test population exposed to a toxicant substance.

LEACHATE:
The contaminated liquid which seeps from a pile or cell of solid materials and which contains water, dissolved and decomposing solids. Leachate may enter the groundwater and contaminate drinking water supplies.

LOAD:
The total amount of materials or pollutants reaching a given local.

MACROPHYTE:
A rooted aquatic plant.

MASS:
The amount of material a substance contains causing it to have weight in a gravitational field.

MASS BALANCE:
A study that examines all parts of the ecosystem to determine the amount of toxic or other pollutant present, its sources, and the processes by which the chemical moves through the ecosystem.

MESOTROPHIC:
Refers to a moderately fertile nutrient level of a lake between the oligotrophic and eutrophic levels. (See also "Eutrophic" and "Oligotrohpic.")

MILLIGRAMS PER LITER (mg/1):
A measure of the concentration of substance in water. For most pollution measurement this is the equivalent of "parts per million".

MITIGATION:
The effort to lessen the damages caused, by modifying a project, providing alternatives, compensating for losses or replacing lost values.

MIXING ZONE:
The portion of a stream or lake where effluent is allowed to mix with the receiving water. The size of the area depends on the volume and flow of the discharge and receiving water. For streams the mixing zone it is one-third of the lowest flow that occurs once every 10 years for a seven day period.

NONPOINT SOURCE POLLUTION (NSP):
Pollution whose sources cannot be traced to a single point such as a municipal or industrial wastewater treatment plant discharge pipe. Nonpoint sources include eroding farmland and construction sites, urban streets, and barnyards. Pollutants from these sources reach water bodies in runoff, which can best be controlled by proper land management.

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, snowmelt, or irrigation that flows over the ground surface and returns to streams. Runoff can collect pollutants from air or land and carry them to receiving waters.

SECONDARY IMPACTS:
The indirect effects that an action can have on the health of the ecosystem or the economy.

SECONDARY TREATMENT:
Two-stage wastewater treatment that allows the coarse particles to settle out, as in primary treatment, followed by biological breakdowns of the remaining impurities. Secondary treatment commonly removes 90% of the impurities. Sometimes "secondary treatment" refers simply to the biological part of the treatment process.

SEDIMENT:
Soil particles suspended in and carried by water as a result of erosion.

SEICHES:

Changes in water levels due to the tipping of water in an elongated lake basin whereby water is raised in one end of the basin and lowered in the other.

SEPTIC SYSTEM:

Sewage treatment and disposal for homes not connected to sewer lines. Usually the system includes a tank and drain field. Solids settle to the bottom of the tank. Liquid percolates through the drain field.

SLUDGE:

A byproduct of wastewater treatment; waste solids suspended in water.

SOLID WASTE:

Unwanted or discharged material with insufficient liquid to be free flowing.

STANDARDS:

See water quality standards.

STORM SEWERS:

A system of sewers that collect and transport rain and snow runoff. In areas that have separated sewers, such stormwater is not mixed with sanitary sewage.

SUPERFUND:

A federal program that provides for cleanup of major hazardous landfills and land disposal areas.

SUSPENDED SOLIDS (SS):

Small particles of solid pollutants suspended in water.

SYNERGISM:

The total effect is greater than the sum of the individual effects. For example, the characteristic property of a mixture of toxicants that exhibits a greater-than-additive cumulative toxic effect.

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, on-site sewer systems.

Nonpoint Source Water Pollution Abatement Grant Program - Funds to share the cost of reducing water pollution. Nonspecified sources are available in selected priority watersheds.

Solid Waste Grant Program - Communities planning for solid waste disposal sites are eligible for grant money. $500,000 will be available each year to help with planning costs.

WISCONSIN NONPOINT SOURCE WATER POLLUTION ABATEMENT GRANT PROGRAM:

A state cost-share program established by the State Legislature in 1978 to help pay the costs of controlling nonpoint source pollution. Also known as the nonpoint source element of the Wisconsin Fund or the Priority Watershed Program.

WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM (WPDES):

A permit system to monitor and control the point source dischargers of wastewater in Wisconsin. Dischargers are required to have a discharge permit and meet the conditions it specifies.

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

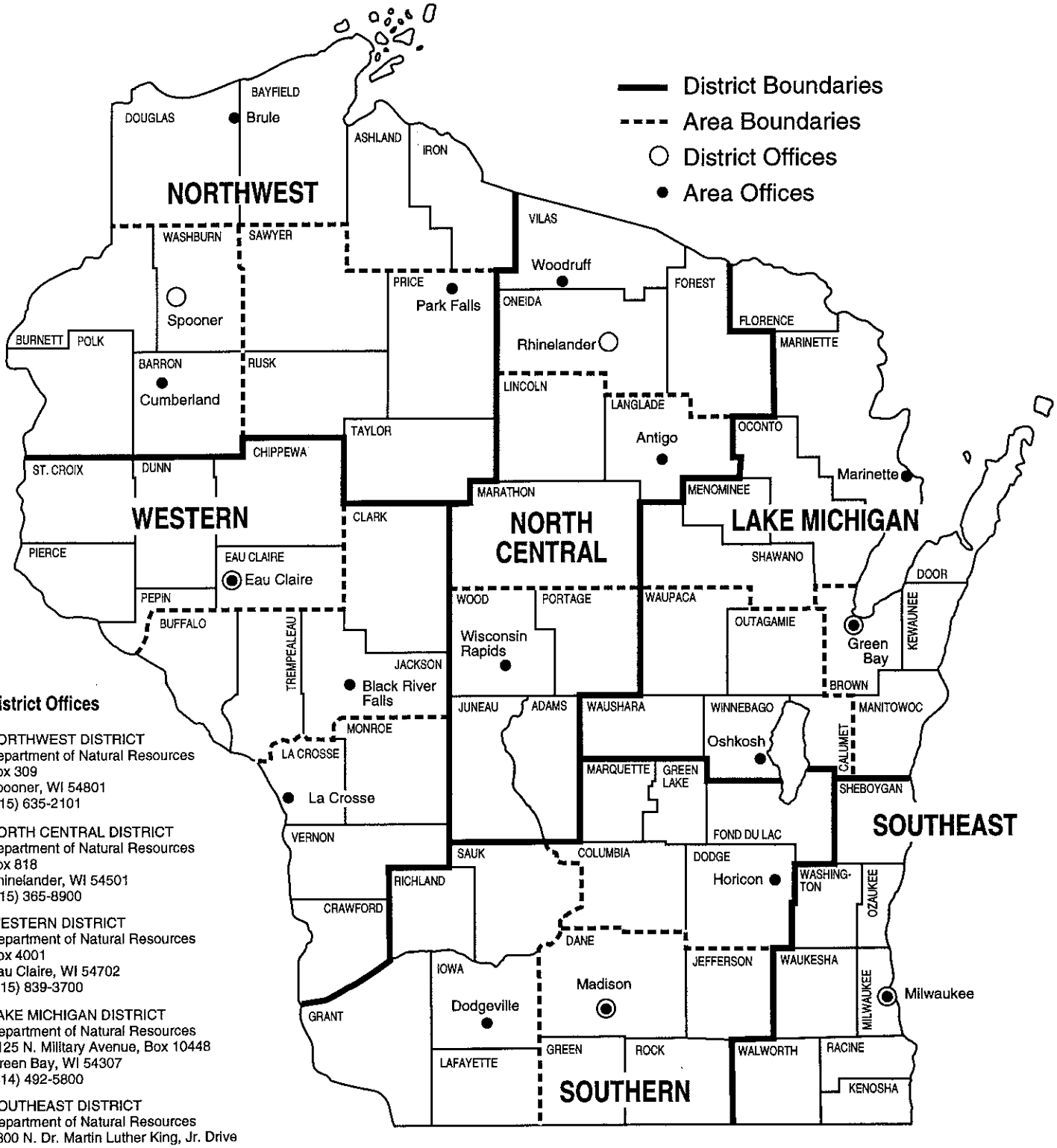
Year Selected-Map Number	Small-scale Priority Watershed Project	County(ies)
SS-1	Bass Lake*	Marinette
SS-90-1	Dunlap Creek	Dane
SS-90-2	Lowes Creek	Eau Claire
SS-90-3	Port Edwards - Groundwater Prototype	Wood
SS-91-1	Whittlesey Creek	Bayfield
SS-91-2	Spring Creek	Rock

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
PL-92-1	Lake Noquebay	Milwaukee
PL-92-2	Lake Ripley	Marinette
PL-93-1	Camp/Center Lakes	Jefferson
PL-93-2	Lake Mendota	Kenosha
PL-93-3	Hillsboro Lake	Dane, Columbia
		Vernon

* *Project completed*

Priority Watershed Projects in Wisconsin
1993

DNR Field Districts and Areas



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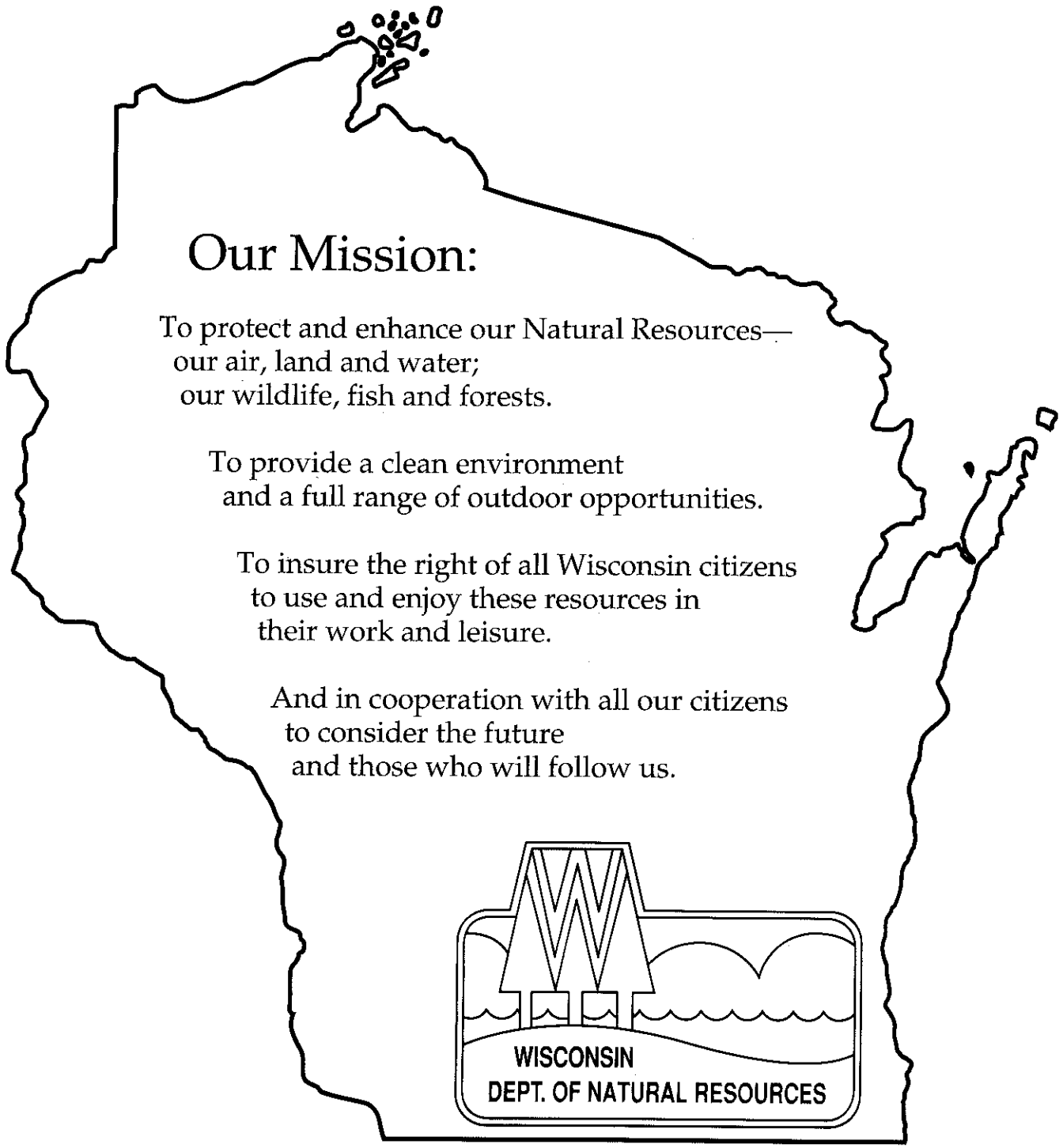

Our Mission:

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.

WISCONSIN
DEPT. OF NATURAL RESOURCES

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