LONER GREEN BAY REMEDIAL ACTION PLAN

for the Lower Fox River and lower Green Bay

Area of Concern

Published by

Wisconsin Department of Natural Resources
P.O. Box 7921
Madison, Wisconsin 53707

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*With help from members of the Lower Green Bay Remedial Action Plan, Citizens Advisory, and Technical Advisory Committees

February 1988

PUBL-WR-175-87 REV 88

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

February 23, 1988

File Ref: 8250

I am pleased to approve the Lower Green Bay Remedial Action Plan as part of Wisconsin's Water Quality Management Plan. The plan is an important contribution to Great Lakes cleanup. It is also an important step in the long-term effort of Fox River and Green Bay communities, industries, and citizens to restore and protect this valuable state resource.

The lower Green Bay and Fox River area is one of 42 Great Lakes "Areas of Concern" identified by the International Joint Commission because of ongoing water quality problems. This area represents an important resource for the people of the State of Wisconsin.

During the past two years, the Wisconsin Department of Natural Resources worked cooperatively with other agencies, researchers, and the citizens of northeast Wisconsin to develop a remedial action plan for the Lower Green Bay and the Fox River. A Citizen's Advisory Committee and four technical advisory committees advised the Department in the preparation of the plan. All groups worked together to identify management goals for the bay and river for the year 2000. They also developed 16 Key Actions and many specific recommendations necessary to achieve their "Desired Future State."

The plan's goals call for restoring swimming in the Bay and River and providing a fishery and ecosystem that is free from the effects of toxic contamination. These and other goals described in the Citizen Advisory Committee "Desired Future State" are very worthwhile goals.

Judging by the response at the public hearing and the commitment of those that contributed to the preparation of the plan, there is great opportunity to achieve the water quality goals laid out in the plan.
The plan incorporates the updating requirements of Public Law 92-500 as amended by Public Law 95-217 and as outlined in Federal Regulations 40 CFR, Part 35. This planning document is governed by the process for adoption of areawide water quality management plans as set forth in NR 121.08(1)(a) and (b).

Sincerely,

C. tTSesadny
Secretary

P0912-15

EXECUTIVE OFFICE

THOMAS D. CUENE
COUNTY EXECUTIVE

Timm(' County

305 EAST WALNUT, P. O. BOX 1600 • GREEN BAY, WISCONSIN 54305-5600
PHONE (414) 436-3355

March 1, 1988

C.D. Besadny, Secretary
Wisconsin Department of Natural Resources
Box 7921
Madison, WI 53707

Dear Secretary Besadny:

The Lower Green Bay Remedial Action Plan is the culmination of nearly two years of effort by local citizens, elected officials, DNR personnel and our scientific community. As County Executive, I am pleased to support this plan which builds upon the tremendous success we have experienced in water quality improvement over the past 15 years.

For the citizens of Brown County, this plan presents an incredible opportunity to improve the environment in which they choose to live. Many challenges remain and we must all work hard to solve the difficult problems facing us. It is imperative that all concentrate their efforts toward implementation of the plan's recommendations.

I can assure you that Brown County is prepared to do its share.

Sincerely,

Thomas D. Cuene

Thomas D. Cuene
Brown County Executive

TDC:cld

City of Green Bay

OFFICE OF THE MAYOR
ROOM 200 - CITY HALL - 436-3621

WISCONSIN
543 01

SAMUEL J. HALLOIN
Mayor

February 23, 1988

C. D. Besadny, Secretary
Wisconsin Dept. of Natural Resources
Box 7921
Madison, WI 53707

Dear Secretary Besadny:

As Mayor of the City of Green Bay, I want to express my support for the Lower Green Bay Remedial Action Plan. The Citizens Advisory Committee and Technical Advisory Committees have worked hard for nearly two years preparing this plan. The individuals who served on those committees deserve our wholehearted congratulations and gratitude on the plan's completion.

The technical analysis and implementation strategy in this plan will serve as a basis for the future management of our water resources. As Mayor of Green Bay, I look forward to participating in the implementation process.

Sincerely,

Samuel J. Halloin

Samuel J. Halloin
Mayor

Members of the Citizens Advisory Committee and DNR staff worked together to develop the Lower Green Bay Remedial Action Plan. (Photo by Dave Crehore)

Introduction to the Remedial Action Plan from the Citizen Advisory Committee

"We live here. This is our home. For some of us it is our ancestral home. Our families arrived here centuries ago. Others of us have only recently arrived but we all have a common commitment to the land and water which surrounds us.

We are very aware of the many decades that have passed in which human activities created environmental problems here in the Green Bay area. We are also aware that in the past decade or so many investments of both private and public funds occurred so the River and the Bay could be cleaned up.

Now we are learning more about how difficult it will be to continue this improvement process. We are committed to this progress. We are willing to work together, seeking the proper changes and improvements.

We are not afraid to lobby for new laws, for both private and public funds. We are afraid that some of the current institutional structures and the present division management activities to solve these problems will not be enough for cost-effective results. We are not limited by the past. We are committed to the future. Our general goal is to lay the foundation for a quality life experience here in the Green Bay **area** for our children and our grandchildren.

This report is the result of many people working together to provide ideas to achieve that goal. It is called a remedial action plan. For us it is much more. It is a significant gift to future generations. Many of us will not be alive early in the 21st Century when some of these ideas will begin to bear fruit. Our involvement in this activity, therefore, is similar to planting a seed."

This statement was read by Chairman John Rose at the January 22, 1987 public hearing and was reported in full in the January 23, 1987 Green Bay Press Gazette.

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RCKNOWLEDGEMENTS

This plan was prepared as a cooperative effort of many individuals who spent a great deal of time attending workshops and meetings, sharing ideas, and reviewing various drafts of this Plan and its technical reports. Members of the Citizens Advisory Committee (CAC) are listed on the inside cover of this plan. Members of the four technical advisory committees (TACs) are listed below. We thank them and the many citizens who helped by answering questionnaires, commenting on the plan and showing a strong commitment to restoration of the River and Bay.

CITIZENS ADVISORY COMMITTEE

The thoughts and suggestions of the Citizens Advisory Committee were an important factor in this Plan's development. The Plan's "Key Actions" and "Desired Future State" resulted from their suggestions. Effective leadership was provided by the Chairman, John M. Rose and Vice-Chair Carol Holden. The CAC formed subcommittees that paralleled the TACs. The chairs, co-chairs and members of these subcommittees contributed greatly to the TACs work. An additional subcommittee, the Information & Education subcommittee, sponsored a workshop to develop the Plan's information and education recommendations and contributed to many other efforts to improve public awareness and understanding of the Plan. The Citizens Advisory Committee sponsored an integration workshop which developed the Plan's "Key Actions." H. J. "Bud" Harris coordinated this workshop and prepared a report which contributes substantially to Chapter IV of this plan. Bill Elman of Fox Valley Water Quality Planning Agency provided staff support to the CAC and prepared the plan newsletter, NEWSRAP. The City of Green Bay's Bay Beach Wildlife Sanctuary provided an excellent facility and setting for many committee meetings.

TECHNICAL ADVISORY COMMITTEES

The Technical Advisory Committee chairs, Victoria Harris, Lee Meyers, John Sullivan, and Lynn Persson deserve special recognition for their effort in preparing for meetings and preparing their committee reports. Jeanne Christie Melanson served as an assistant plan coordinator, and staffed the Nutrient and Eutrophication TAC and Biota and Habitat TAC. Paula Allen staffed the Toxic Substances TAC. Ron Baba, as Chair of the Implementation Subcommittee, Institutional TAC prepared the analysis of institutional structures.

Biota and Habitat Management

Lee Meyers, Chair - WDNR, Lake Michigan District
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Ty Baumann - Bay Beach Wildlife Sanctuary
Brian Belonger - WDNR, Lake Michigan District, Fisheries Biologist
Jeanne Christie Melanson - WDNR, Bureau of Water Resources Management
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H. J. Harris - University of Wisconsin-Green Bay, Sea Grant Institute
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Terry Lychwick - WDNR, Lake Michigan District, Fisheries Biologist

Biota and Habitat Management (continued)

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David DeVault - Environmental Protection Agency, Great Lakes National Program Office
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Garet Lahvis - U.S. Environmental Protection Agency, Great Lakes Program Office
John Olson - Wisconsin Department of Health and Social Services, Division of Health
Lynn Persson - WDNR, Bureau of Water Resources Management
David Rades - Institute of Paper Chemistry
Donald Schneider - Fort Howard Paper Company
Ken Stromburg - U.S. Fish and Wildlife Service, Green Bay Field Office
Michael Witt - WDNR, Bureau of Wastewater Management
Paula E. Allen - WDNR, Bureau of Water Resources Management

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Larry Decker - U.S. Soil Conservation Service
Alice Goldsby - University of Wisconsin-Green Bay
Bill Hafs - Brown County Land Conservation Department
Val Klump - University of Wisconsin-Milwaukee
Peter LeMere - Green Bay Health Department
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Tim Rasman - WDNR, Lake Michigan District
Sumner Richman - Lawrence University
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Lynn Persson, Chair _ WDNR, Bureau of Water Resources Management
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Bob Deer - WDNR, Green Bay Area
William Elman - Fox Valley Water Quality Planning Agency
Bob Fisher - Bay Lake Regional Planning Commission
David Hildreth - WDNR, Lake Michigan District
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Cliff Kraft - University of Wisconsin Sea Grant Institute
Chet Miller - City of Green Bay, Parks and Recreation Department
Jim Murray, Co-chair, Socioeconomic Subcommittee - University of Wisconsin-Green Bay
Jeff Pagels - WDNR, Lake Michigan District
Bud Paruleski - Brown County Regional Planning Commission
David Smith - Brown County Agricultural and Extension Service

OTHER CONTRIBUTORS

Lynn Persson coordinated the overall planning effort. Vicky Harris provided coordination for DNR's Lake Michigan District's substantial contribution to the Plan.

Special thanks to David Hildreth, Assistant District Director, Lake Michigan District; and Steve Skavroneck, Planning and Policy Unit Leader for their help and support in the development of this plan. Also to Cynthia Lukas who helped prepare and edit the public review draft of the plan. Many DNR staff contributed to the Plan by providing information about their programs, reviewing drafts **and in many** other ways. Among those that contributed are Ron Bruch, Dennis Weisensel, **Dave** Crehore, Carrie Morgan, Jim Moore, Jim Raber, Bob Behrens, Mike Llewelyn, Duane Schuettpelz, Joe Ball, Terry Lohr, Al Shea, Julian Chazin, Lee Kernen, John Hagman, Patty Hanz, Roger Fritz, Bob Grefe, Ken Johnson, Doug Knauer, John Cain, Tom Pellet, Steve Miller, Dan Schramm, and many others. Tammy Litzer and Kathy Lyster provided early editorial assistance in the development of the Plan.

Figures and Illustrations: Jim McEvoy prepared the Area of Concern map, the illustrations of the current and desired future state, and several other illustrations in the plan. Other illustrations were drawn by the winners of the children's poster contest, "What the Bay Means to Me", sponsored by Lake Michigan Federation, Green Bay and De Pere Area Masonic Lodges, and the Citizens Advisory Committee. Brown County Planning Agency provided information for several of the Plan's maps. The "Clean Bay Backer" emblem was drawn by Jan Smith.

Typing: Also thanks to Susan Shea, Diane Barman and other members of WDNR staff for typing the "big document," and to Beth Miller for preparing the Implementation Tables.

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LOWER GREEN BAY
REMEDIAL ACTION PLAN

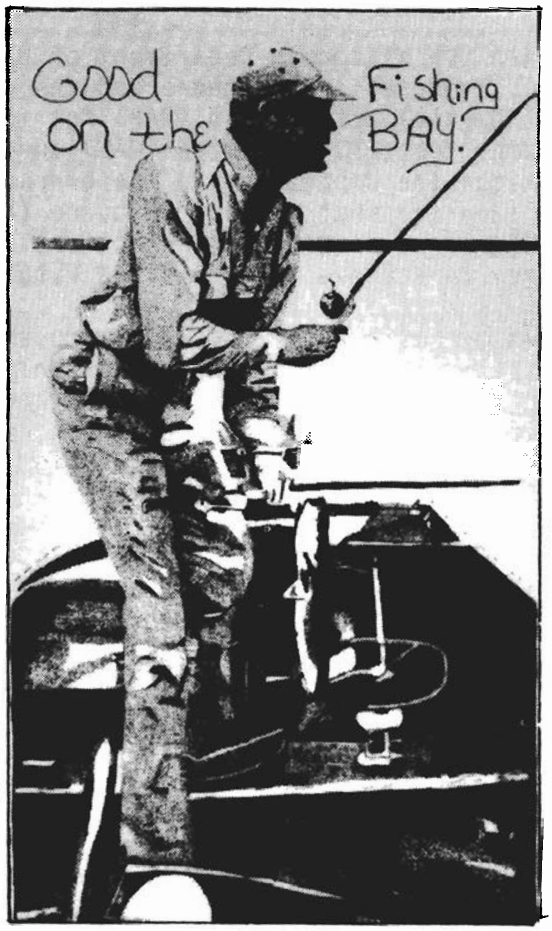

Figure i. Good Fishing on the Bay (Artist: Liane Lentz, Grade 11)

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EXECUTIVE SUMMARY

LOWER GREEN BAY. AND FOX RIVER REMEDIAL ACTION PLAN

Lower Green Bay and the Fox River is one of 42 Great Lakes "Areas of Concern" identified by the International Joint Commission because of ongoing water quality problems (Figure i). It is also an important resource for the state and the people that live in the area. Wisconsin, other states and provinces agreed (as part of the Great Lakes Water Quality Agreement) to prepare remedial action plans that will guide future cleanup and protection efforts in these areas. The purpose of these plans is to restore beneficial uses such as swimming and an edible fishery to the areas.

During the past two years the Wisconsin Department of Natural Resources worked cooperatively with other agencies, researchers and the citizens of northeast Wisconsin to develop a remedial action plan (RAP) for the Lower Green Bay and the Fox River. A Citizens Advisory Committee (CAC) and four technical advisory committees advised the Department in the preparation of the plan. All worked together to identify what kind of resource they wanted the Bay and River to be in year 2000 and to develop 16 Key Actions and many specific recommendations necessary to achieve this "Desired Future State"

Although there have **been** dramatic water quality improvements over the past ten years, serious problems still exist that affect not only the water quality itself, but also the area's fish, wildlife, wetlands and public uses. These problems are being caused by toxics, excess nutrients and sediments entering the system. The result has been the need to issue fish consumption advisories, curtailment of bay swimming, and increased stress for endangered species in the Bay. To complicate matters, the planning and management of the system has been spread among many agencies and levels of government.

Building upon a broad information base and past planning and management efforts, the RAP has used an "ecosystem approach" to analyze the pollution sources that affect the River and the Bay system and develop a cooperative approach to restore and maintain the system for all its beneficial uses.

CITIZENS' DESIRED FUTURE STATE AND PLAN GOALS

The CAC defined a "Desired Future State" for the lower River and Bay (Table i). The Desired Future State includes a healthy bay environment, a balanced edible sport/commercial fishery, water-based recreational opportunities, good water quality which protects public health and wildlife, balanced shoreline use, productive wildlife and plant communities, and an economical transportation network which minimizes adverse environmental effects. This Desired Future State provided a guidepost for the CAC to gauge plan recommendations.

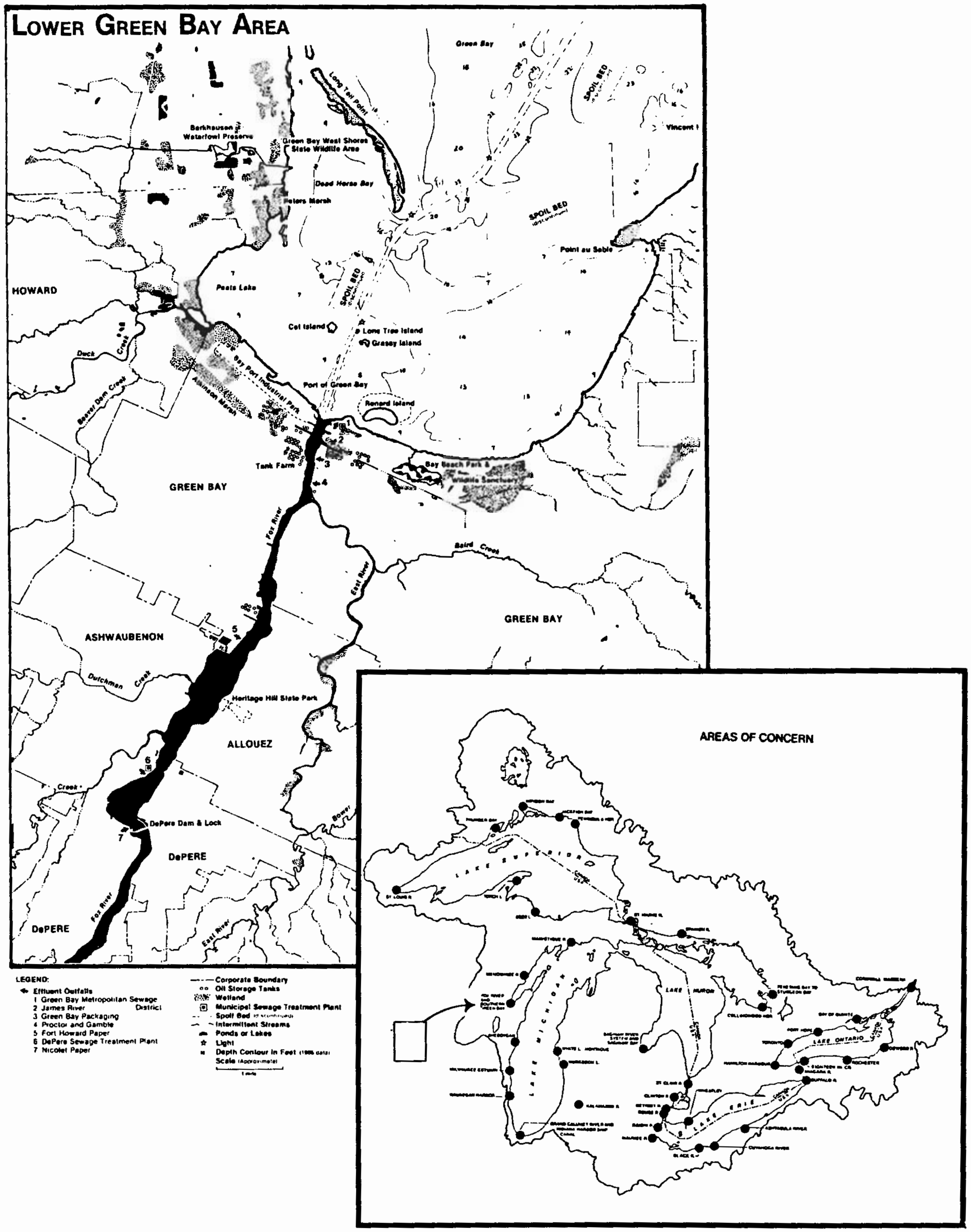

Figure ii. The Lower Green Bay and Fox River Area of Concern.

TABLE i. The Desired Future State of the Bay and River*

The Desired Future State of the Fox River/Lower Green Bay system includes the attainment, maintenance, and continued evaluation of the following:

1. A healthy bay environment providing for balanced and productive wildlife and plant communities including a well-balanced, sustainable, and edible sport and commercial fishery.

2. Water-based recreation opportunities including:

   a. Accessible local swimming beaches on the Bay; and

   b. Adequate boating areas and facilities.

3. Local Fox River/Lower Green Bay water quality that protects human health and wildlife from effects of contaminants and provides for drinkable water after standard treatment.

4. Balanced public and private shoreline usage including park, agricultural, commercial, residential, and industrial lands.

5. An economical transportation network including both water and land-based systems which minimizes adverse environmental effects.

6. Point and nonpoint discharges and runoff consistent with the maintenance of the desired water quality future state.

*Identified by the Citizens Advisory Committee, Lower Green Bay Remedial Action Plan

The plan identifies 7 primary goals for restoring the Bay and River by the year 2000:

1. Enhance and. protect multiple uses of the Bay and River including restoring swimming and an edible fishery.

2. Develop a blend of public and private shoreline uses that includes adequate public access.

3. Provide suitable and sufficient habitat to enhance and sustain wildlife of the Bay and River.

4. Establish a self-sustaining, balanced, edible fish community.

5. Improve the water quality and trophic state of the area of concern to relieve ecological stresses and support a full range of public uses.

6. Achieve and maintain water quality that provides an edible fishery, protects the ecosystem from the adverse effects of toxic substances on fish, aquatic life and wildlife utilizing the aquatic resources, and protects human health.

7. Develop a management strategy and organizational structure that will coordinate public and private efforts to improve and protect the natural resources.

THE KEY ACTIONS FOR A CLEAN BAY AND RIVER

The plan focuses on 16 Key Actions (Table ii.) and 120 associated recommendations necessary to restore the beneficial uses of the Bay and River. High priority actions include: reducing phosphorus and sediment loads to the Bay, eliminating the toxicity of industrial and municipal discharges and the impacts of contaminated sediments, and continuing efforts to restore the river's oxygen and fish. Habitat protection and continued improvements in the fishery including control of carp and lamprey are also important.

Other Key Actions focus on the people and their use of the Bay and River. Enhanced urban waterfronts that pull people to the water and downtown, reopened public swimming beaches, and better boating and fishing facilities are part of a key action to improve shoreline uses which recognizes the economic and recreational value of a healthy environment. Educational efforts and continued citizen participation in decisions that affect the Bay and River are encouraged.

PLAN IMPLEMENTATION

Since actions by one group can serve either to reinforce or hamper actions by another, a coordinated management approach will be needed to successfully implement the Remedial Action Plan. As part of the Plan, a Coordinating Council is proposed to guide plan implementation. Some recommendations can be implemented by existing state and local programs or by citizen initiatives. Others may require law or administrative rule changes, permit changes and other actions which are subject to due process and provide additional opportunity for public review and comment.

TABLE ii. KEY ACTIONS FOR A CLEAN BAY AND RIVER

To Restore, Protect and Enhance the Ecosystem

High Priority

1. Reduce Phosphorus Inputs to the River and Bay from Nonpoint and Point Sources.
2. Reduce Sediment and Suspended Solids Inputs.
3. Eliminate Toxicity of Industrial, Municipal and other Point Source Discharges.
4. Reduce Availability of Toxic Chemicals from Contaminated Sediments.
5. Continue Control of Oxygen-Demanding Wastes from Industrial and Municipal Discharges.

Moderate Priority

6. Protect Wetlands, and Manage Habitat and Wildlife.
7. Reduce/Control Populations of Problem Fish.
8. Increase Populations of Predator Fish.

Lower Priority

9. Reduce Sediment Resuspension.
10. Reduce Bacteria Inputs from Point and Nonpoint Sources.
11. Virtually Eliminate Toxicity Caused by Nonpoint and Atmospheric Sources

To Improve People's Use of the Ecosystem

High Priority

12. Create a Coordinating Council and Institutional Structure for Plan Implementation.
13. Increase Public Awareness of, Participation in, and Support for River and Bay Restoration Efforts.

Moderate Priority

14. Enhance Public and Private Shoreline Uses.

Monitoring and Research

15. Monitor to Evaluate the Effectiveness of Remedial Actions, Track Trends, and Identify New Problems.
16. Conduct Research to Better Understand the Ecosystem, Its Problems and How to Remedy Them.

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Plan implementation costs over the next 15 to 20 years are potentially high. Initial gross estimates range from $68 to $640 million, dependent on the findings of initial studies. Most of these costs are associated with the cleanup of contaminated sediments and providing for nonpoint source watershed projects in the entire Fox River Basin. The plan recommends that a mix of public and private, state, local and federal funds be used to pay for the recommended actions.

WHAT WILL THE PLAN ACCOMPLISH

The Lower Green Bay and Lower Fox River Remedial Action Plan provides a vision of what the system can be in the future. When fully implemented, the Remedial Action Plan will lead to a healthy river and bay system that people can enjoy and that will provide suitable habitat for fish and wildlife. Swimming, boating, and fishing, along with industrial and commercial uses will all be accommodated. Thick mats of algae, cloudy water, and toxic contaminants in fish will be lessened. Naturally reproducing varieties of game fish will increase, along with native birds and wildlife, as their natural habitats are restored. The natural beauty of the area will also be enhanced for the pursuit of recreation and to restore the quality of life that attracts business and tourism to the area.

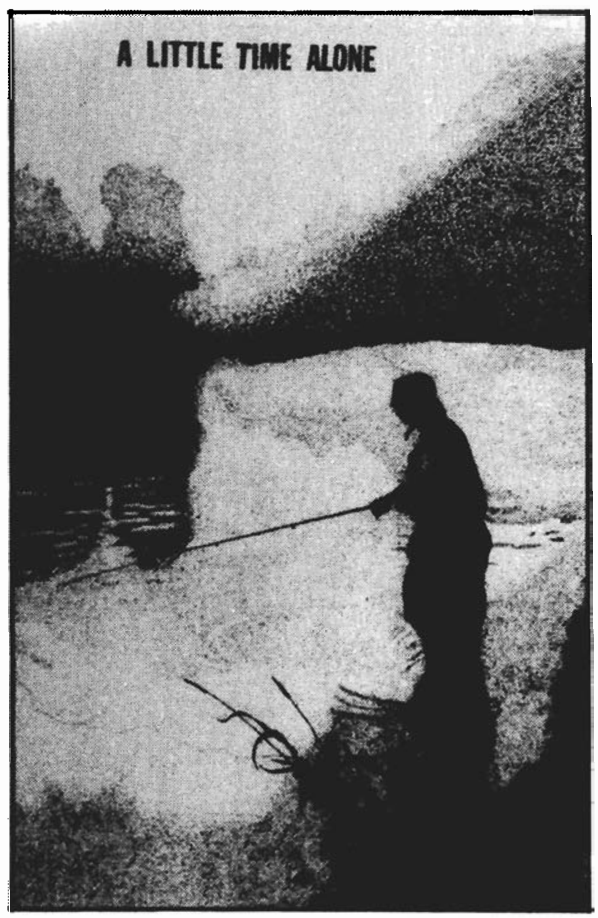

Figure iii. A Little Time Alone (Artist: Todd Kulow, Grade 10, Oconto Falls High School)

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<u>LOWER GREEN BAY REMEDIAL ACTION PLAN:</u>

for the lower Fox River and lower Green Bay

Area of Concern

I. INTRODUCTION

INTRODUCTION

This document, the Lower Green Bay Remedial Action Plan (RAP) examines problems in the Lower Green Bay and Lower Fox River from an ecosystem perspective. The Plan builds on clean-up efforts over the past 15 years which brought dissolved oxygen and **a** good fishery back to the area. Despite these past efforts however, toxic contaminants still are found in fish and wildlife populations, excess nutrients continue to cause algae blooms, and swimming is limited. The Plan's goals look to year 2000 for restoring the desirable uses of the Bay and River. The Plan identifies 16 Key Actions and 120 recommendations to guide management activities necessary to achieve these goals.

RAP Background

GREEN BAY -- ONE AREA OF CONCERN IN THE GREAT LAKES REGION

The Lower Green Bay ecosystem is a complex community made up of people, fish, birds, mammals, and plants. The area includes lower Green Bay and the adjacent Lower Fox River. It is also one Great Lakes "Areas of Concern" which Canada and the United States identified as having water quality problems which limit recreation, fishing, and other beneficial uses.

It is one of four AOCs in Wisconsin. Remedial action plans will be written to rehabilitate the water resources in the harbors at Milwaukee, Sheboygan, and Marinette. Similar efforts are underway in other Great Lakes states and provinces to address the problems of all other AOCs.

This Remedial Action Plan provides information necessary for restoring beneficial uses to the Bay and River by the year 2000 and beyond. The Plan:

1. Defines the environmental problems in the **area** and their geographic extent;
2. Identifies beneficial uses that are impaired;
3. Describes the causes and sources of the environmental problems;
4. Recommends remedial measures to resolve these problems;
5. Provides a schedule for implementation and completion of these remedial activities;
6. Identifies the jurisdictions and agencies responsible for these activities;
7. Explains the process by which the success of the Plan is to be evaluated;
8. Describes the surveillance and monitoring needed to track the program's effectiveness.

The following pages of the Lower Green Bay Remedial Action Plan will guide water resource managers, local officials and area citizens in their restoration actions for the Bay and River through the year 2000. The Plan is the first of its kind in Wisconsin and will be used as one model for other Great Lakes remedial action plans.

Plan Preparation and Citizen Input

PROCESS FOR PLAN PREPARATION

Many people helped prepare this plan. A Citizen's Advisory Committee (CAC) advised the Department on the Plan and included representatives from a wide range of interests including business, environmental groups, boating clubs, agriculture, industry and local government. Four technical advisory committees (TACs) comprised of resource managers, researchers and local experts helped assess the problems and management objectives and alternatives for the Bay and River. Over 75 people directly participated on the CAC and four TACs (Biota and Habitat Management, Toxic Substances Management, Nutrients and Eutrophication Management, and Institutional). Many other people contributed by filling out questionnaires, attending public meetings and hearings, and commenting on the draft plan. The plan's preparation process is described in more detail in Appendix A. Reports prepared as part of this planning effort are listed in the Plan's bibliography.

During the preparation of the Plan, citizens were asked a number of questions: What they would like the Remedial Action Plan to accomplish? How do they use the Bay and what limits their use of the Bay and River? What changes and type of resource would they like to have in the year 2000 and beyond? Their responses were an important consideration in the development of the Plan's goals and objectives.

The Citizens Advisory Committee (CAC) initially identified their "Desired Future State" for the Bay and River (reference Chapter III). Students in the Green Bay area drew over 400 posters for a contest sponsored by the CAC, Lake Michigan Federation, and Green Bay and De Pere Area Masonic Lodges, indicating "What the Bay Means to Me." Some of these posters illustrate this text.

Other citizens responded to two questionnaires which were handed out at public meetings and sent out with the Plan's newsletter NEWSRAP (FVWQPA, 1986; Persson, 1987). The people who responded to these non-random surveys indicated their primary uses of the Bay and River were fishing (54%), boating (54%), shoreline uses and nature enjoyment (47%), swimming (14%), and hunting (14%). They indicated their uses were limited by toxic pollution (51%), inadequate facilities and water quality for swimming and other recreation (27%), disturbance of fish, wildlife and their habitat (12%), and excess algae and nutrients (9%). Toxic substances in the system and the resulting fish consumption advisory was an important concern to most of the respondents and had restricted their use of the Bay and River.

Some of the major changes that they hoped could occur in the next 15 years and as a result of this Plan were:

* Reduce toxic contaminants;
* Enhanced shoreline use and habitat protection and management;
* Improved water and ecosystem quality;
* Edible and more game fish;
* Swimming returns to Bay Beach and the Lower Bay;
* Reduce pollution loads while maintaining a viable economy; and
* Efforts to clean up the River and **Bay** continue so that everybody can enjoy its use.

COMMENTS ON THE DRAFT PLAN

Approximately 250 attended the October public hearing and 25 people spoke at the hearing. We received an additional 48 comments from individuals and groups in the 30 day review period. A total of 48 individuals and 20 groups or companies provided comments. Some people both testified and submitted written comments.

In general, all comments (with 2 possible exceptions) were positive in regards to the Plan and its goals. However a number of groups and individuals believed the Plan recommendations should be strengthened or changed in one or more ways. A number of people commented that recommendations for toxic substances control, especially for point source discharges and atmospheric emissions, should be strengthened, and better reflect the Great Lakes Water Quality Agreement. The CAC and several others noted that nonpoint sources should be given equal weight to point sources and that possibly innovative farmer-based initiatives or regulation should be considered. A few people noted the high cost of implementing the Plan and suggested that cost-effective solutions must be sought and that socioeconomic factors should be considered before high-cost plan recommendations are implemented. Others indicated that the Plan and these typesof analyses don't adequately reflect the existing costs of pollution. A clean and healthy environment is worth the cost of cleanup. Other people said that pollution laws should be more strongly enforced and that the polluters should be responsible for cleanup. There were also many other useful comments and suggestions.

Many people thanked the Citizens Advisory Committee, WDNR and others that had helped prepare the Plan. Others volunteered their time to help with a Bay and River cleanup day, or habitat protection work or education efforts. Still others indicated that they hope the Plan will be speedily implemented.

Citizens comments on specific Key Actions and recommendations are discussed in the explanations of these items found in Chapter IV of the Plan. A more detailed summary of citizen comments is **available** in a separate report (Persson, 1988).

This plan recognized and responded to these citizen comments and suggestions in several ways. Some of the Plan's recommendations were changed or a process was identified to resolve issues that were identified during the review process. Many of the explanations of the Plan's recommendations were expanded to note citizen concerns so that they can be considered by those implementing the Plan. Other changes were made to respond to suggestions on how to make the Plan easier to read. The Key Actions and Recommendation chapters were combined. A glossary was added to the Plan. Wisconsin DNR and the Citizens Advisory Committee are developing a brochure to summarize the Remedial Action Plan.

Relationship to Other Planning and Management Activities

This Remedial Action Plan builds on many past and ongoing efforts. Among these are the Fox Valley Water Quality Management Plan, the Great Lakes Fishery Commission's Great Lakes ecosystem rehabilitation studies, Bay-Lake Regional Planning Commissions's Future of the Bay activities, various WDNR plans and programs, and the University of Wisconsin's Sea Grant Institute's and other agencies' research. The plan also builds on the comprehensive plans of Brown County, the City of Green Bay and other municipalities in the Area of Concern. Refer to the bibliographies of the four technical advisory committee for specific references.

A comprehensive management plan is also being prepared by WDNR for Lake Winnebago (Bruch, 1987) using a planning process similar to that used to prepare the Remedial Action Plan. These efforts have been coordinated and many of the Remedial Action Plan's recommendations that affect the Upper Fox and Wolf River Basins will be pursued as part of the implementation of the Lake Winnebago Comprehensive Management Plana

The selection of the East River Watershed as a priority watershed for nonpoint source management will initiate an intensive effort to inventory sources, identify critical areas and prepare a nonpoint source management plan for the watershed. This plan will be the basis for the cost-sharing of best management practices for nonpoint source control in the watershed. It is hoped that similar efforts can be undertaken in other of the basin's watersheds.

It is anticipated that the Remedial Action Plan will be a dynamic strategic plan that will provide a framework for future planning and management efforts in the Bay and River. The Plan may be refined based on the findings of these efforts.

The challenge of the next 15 years may be compared to that of the last 15 in which a major cleanup effort restored the dissolved oxygen and the fishery to the Lower Fox River.

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Citizen Actions for a Clean Bay and River

This Plan contains many recommendations that must be undertaken by local, state, and federal governments, industry, and others to restore the Bay and River. There are activities that IOU as an individual can do to help contribute to the overall effort:

* <u>Keep Informed and Share Ideas.</u> Get on the mailing list for the NEWSRAP newsletter. Share your ideas and concerns with elected officials and the people working to implement the Remedial Action Plan.

* <u>Start Restoration Efforts and Cleanup Days</u> with your neighbors and local groups to improve wildlife habitat and recreation areas, to cleanup trash, and to make others aware of the benefits these efforts have for a cleaner Bay and River.

* <u>Recycle Wastes</u> such as aluminum cans, paper, and oil.

* <u>Reduce Use of Toxic Chemicals</u> including pesticides, herbicides, and household products that contain toxic substances.

* <u>Reduce Use of Fertilizers</u> so you don't add to the nutrient problems of the Bay and River.

* Don't Litter. Make sure trash goes where it belongs.

Figure 1. Clean Bay Backers Emblem

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Back

LOWER GREEN BAY REMEDIAL ACTION PLAN:

for the lower Fox River and lower Green Bay

Area of Concern

II, THE SETTING, ENVIRONMENTAL PROBLEMS

AND THEIR SOURCES

THE SETTING

The following section explains the environmental and historical settings which have directed the development of the Lower Fox River/Lower Green Bay's resources. The environmental setting describes the physical characteristics of the area, the history of the area's uses and the resulting impacts on its natural resources. The historical setting explains the area's management history.

Much of the information given in this section was taken from the H. J. Harris' articles "Evolution of Water Resource Management: A Laurentian Great Lakes Case Study" (Harris et al., 1982) and the "Green Bay in the Future - A Rehabilitative Prospectus" report (Harris et al., 1982), and from the Technical Advisory Committee (TAC) reports: Toxic Substances Management (Allen etal., 1987), Institutional (Persson et al., 1988), Biota and Habitat Management (Christie and Meyers, 1987), and Nutrient and Eutrophication Management (Harris and Christie, 1987). For more detailed information refer to these reports and the Harris articles.

The Environmental Setting

THE AREA OF CONCERN

The Area of Concern (AOC) is located where the Lower Fox River empties into the southern end of Green Bay. It includes the lower seven miles of the Fox River from the De Pere Dam to its mouth and extends northeasterly up to an imaginary line crossing the Bay from Long Tail Point to Point au Sable (See Figure 2).

The Area of Concern is the part of the Bay and River where water quality has been most severely impacted by man. High turbidity, sedimentation, frequent algal blooms, broad fluctuations in dissolved oxygen, degraded or destroyed wildlife, fish, and plant populations, and adverse toxicant impacts have all been documented in the Area of Concern with greater frequency than in any other part of the watershed and Bay. This is due in part to the land and water uses upstream in the Area of Concern and also to the physical characteristics of the Area of Concern, itself a shallow, rapidly recycling environment.

The Area of Concern contains mostly Fox River water emptying into a shallow basin partially separated from the rest of the Bay by Long Tail Point and Point au Sable. The Bay portion of the Area of Concern is generally 10 to 15 feet deep. In 1986 it contained two small islands, several other islands covered by high water, and a confined disposal facility for dredge spoils (Renard Isle, formerly known as Kidney Island). The Area of Concern has been used in past years for open water disposal of dredge spoil.

The River from De Pere Dam to the mouth is level and channelized. It is flanked by intense urban and industrial development on both sides. The west shore of the lower Bay contains low lying areas of wetlands. The east shore is generally characterized by residential development along the shoreline.

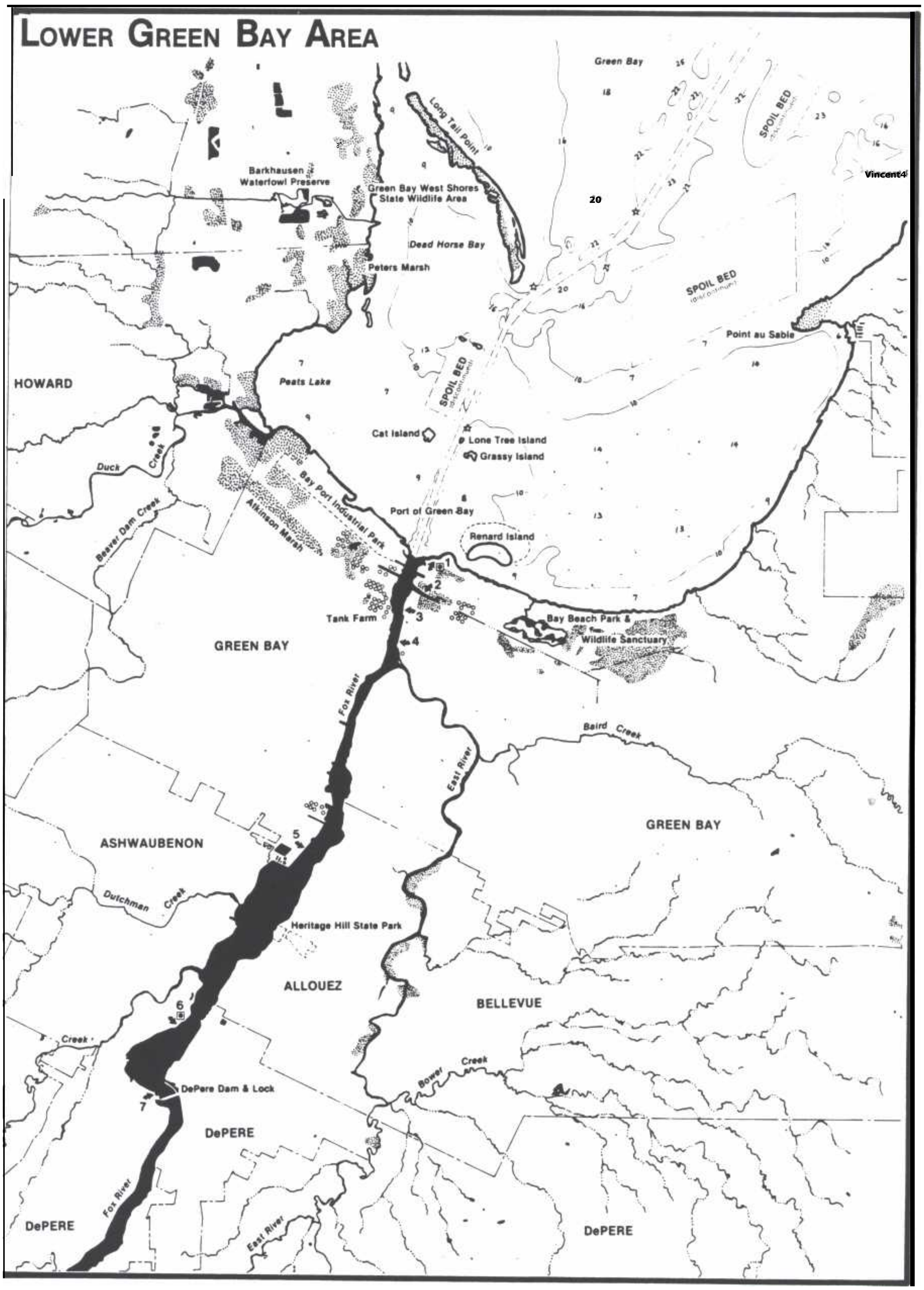

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Figure 2. Lower Green Bay/Lower Fox River Area

In order to understand why degraded water quality exists in the Area of Concern, it is necessary to look at the area as well as up river and into the Bay at both the current and historical activities that have impacted the area. Conditions found in the Area of Concern also impact the rest of the Bay and potentially Lake Michigan.

THE FOX RIVER BASIN AND GREEN BAY

The Lower Fox River empties a drainage basin that includes 6,641 square miles of land surface. Waters from the Upper Fox River, Wolf River, and Lake Winnebago empty into the Lower Fox River at the outlet of Lake Winnebago and travel northeast 39 miles to Green Bay. The Lower Fox is impounded by 12 dams and is navigable through 17 locks. It contributes most of the water and most of the pollution to Green Bay. Its basin contains a highly industrialized area as well as rich farmlands. The greatest concentration of pulp and paper mills in the world is located along this stretch of river. The River has the appearance and characteristics of a large flowing stream rather than a series of impoundments.

Green Bay is an elongated arm of Lake Michigan partially separated from the Lake by the Door County peninsula. The Bay runs northeast from the Fox River's mouth, is 119 miles long, and has a maximum width of 23 miles. The Bay is relatively shallow, ranging from an average of 10 to 15 feet at the southwestern end to 120 feet at its deepest point. The Area of Concern includes only the southern-most portion of the Bay.

Currents tend to flow counterclockwise in Green Bay as a whole. In lower Green Bay the water coming out of the Lower Fox River flows northward up the east side of the lower Bay. In northern Green Bay currents move from the north southward along the west shore of the Bay.

The water quality and productivity - as shown by water clarity and the amount and type of algae present - of the Bay changes dramatically from south to north. In the lower Bay the water quality is poor and characterized by overproduction of green and blue-green algae during the summer months. Its level of productivity or trophic status is classified as hypereutrophic (extremely productive). Moving northward water quality improves from eutrophic (very productive) to mesotrophic (moderately productive), and finally oligotrophic (low productivity) as the water becomes clearer and production of green and blue-green algae decreases.

Since 1860 water levels in Green Bay and the Great Lakes basin as a whole have varied seven feet due to climatic variations, primarily because of precipitation and cooler temperatures. In 1986 water levels were at record high levels. Both high and low water levels have significantly impacted fish, wildlife, and man in the Great Lakes. Changing water levels alternately create and destroy wetlands, cause severe shoreline erosion problems and flooding, and can impact navigational channels.

Additional adverse impacts are caused by seiches at these high water levels. Seiches are natural, very short term changes in water levels along shorelines due to wind, barometric changes, and other localized physical factors. These factors cause water levels in elongated basins to tilt, raising the water levels at one end of the Lake or Bay and lowering them at the other.

The Historical Setting

HISTORY OF THE AREA'S USES -- PAST AND PRESENT

Since the 1600s the Lower Fox River/Green Bay area has provided important resources for the development of industry, business, agriculture, and communities. The resulting land uses affecting the water resources include both the shoreline immediately adjacent to the River and the lower Bay, and the entire Fox River Basin's watershed.

Beginning in the 1600s beaver, otter, and mink were harvested until the fur trading business peaked as the area's primary industry in 1834. This exploitation did not significantly impact the ecosystem at the time but was an indicator of the trends to come.

By 1836 land sales began in the region. With this came the development of settlements, population increases, and the expanded utilization of the land and water. When European immigrants settled in the area around 1848 the Fox River Valley's agricultural business was established. Early settlers concentrated their farming efforts on grain, hay, and subsistence crops until dairying became popular. Today, agriculture is still an important economic business in the area.

The Lower Fox River's topography and water supply were utilized since 1850 to develop industry along the River. Between 1850 and 1900 paper mill industries became numerous. During the early 1900's the timber industry flourished with the demand for lumber in southern Wisconsin and Illinois. Waterways were used for shipment and processing of timber. As forested acreages were soon depleted, residents looked to the area's resources for other industrial opportunities. Today, industries and municipalities still use the River and Bay for waste assimilation and transportation. Some industries also use the River for a water supply and power source.

A re-established industry, fishing, remains an important economic resource in the area. This industry was jeopardized in 1950 when fish populations declined from overfishing and water pollution. But through cleanup efforts which restored some fish populations, sport and commercial fishing again contribute economically to the AOC.

Other current water uses are: water recreational sports; swimming; boating; hunting; wildlife, fish, and endangered species habitat; and commercial navigation. To enhance these uses more boat landings, public accesses to the water, swimming beaches, marina and mooring facilities, outdoor recreation opportunities, and wetland protection are needed. Improved water quality is also essential since restrictions remain on swimming and eating fish in the area. Downtown waterfronts and commercial areas can also benefit from improved water quality, as people are drawn to enjoy the River and Bay's shoreline.

HISTORY OF ENVIRONMENTAL IMPACTS

Over the years, two major human activities changed the Lower Fox River and Lower Green Bay--the intensive use of the natural resources in the region and the use of surface waters as a pollution sink.

As logging, agriculture and industry spread into Wisconsin, the Lower Fox River developed into an urbanized, industrialized area. The forests were harvested and land was cleared for agriculture causing severe soil erosion, and increased sediment and nutrient loadings and higher water temperatures in the River and the Bay. Over the past century hundreds of acres of wetlands that provided important habitat for fish and wildlife were filled and/or destroyed along the River and in the Bay.

All of this and industrialization contributed to major pollution problems. From the 1920s through the 1970s pollution reports recorded fish kills, periodic lack of oxygen in the water, and the increasing predominance of only those organisms able to tolerate highly polluted conditions. All totaled in the 1970s, the Fox River received the discharges from over 100 industries and municipalities. Many of these discharges were primarily cooling water and had little effect on the River. However, it was recognized that 9 municipal and 15 industrial discharges had a profound negative impact resulting in dramatic drops in dissolved oxygen levels that occurred regularly in the River and lower Bay in the early 1970s.

More than anything else these low dissolved oxygen levels severely limited the number and diversity of aquatic organisms in the River and Bay restricting aquatic life to the few organisms adapted to live in heavily polluted water. Other aquatic life was unable to survive and widespread fish kills resulted.

From the 1930s to 1970s dissolved oxygen conditions grew worse and the biochemical oxygen demand discharged to the River steadily increased due to paper industry growth and to a lesser extent population growth. Dramatic improvements in dissolved oxygen and the fishery over the period from 1972 to 1985 corresponded to a large reduction in the amount of biochemical oxygen demand (BOD) reaching the River. The passage of the Clean Water Act brought these and other changes to the management of the River and Bay system.

HISTORY OF MANAGEMENT

Wisconsin's initial water pollution laws date to the 1870s. State pollution control programs were developed in the 1920s and were subsequently strengthened in the late 1940s and mid-1960s. However Congress' passage of the 1972 Clean Water Act (amendments to the Federal Water Pollution Control Act) gave great impetus to state and national pollution control efforts.

The Clean Water Act's goals focused on: restoring fish and aquatic life by 1983; stopping the discharge of pollutants into navigable waters by 1985; protecting water quality to provide a healthy environment for fish and wildlife; and providing recreational opportunities such as swimming for people. A federal permit system was established to regulate all direct discharges into navigable waters. The federal system allows individual states to regulate discharges through permits and to assist municipalities with federal grant applications to repair or build wastewater treatment facilities. Wisconsin adopted its own version of the federal permit system known as the Wisconsin Pollution Discharge Elimination System (WPDES) in 1974. The Wisconsin Fund was also established to help communities pay the cost of pollution control.

For the Fox River and Green Bay Area of Concern (AOC) the creation of the WPDES permit system meant that industries and municipalities needed to reduce the organic pollutants (measured as BOD-biochemical oxygen demand) being discharged into the River. Point sources discharging the greatest pollution loads were mainly pulp and paper mills, and secondarily, municipal treatment plants. Pollution control was targeted primarily at these point sources in the early 1970s.

With the Clean Water Act's stricter pollution control requirements, industries and municipalities invested over $300 million in pollution controls to reduce biological oxygen demand discharges to the Fox River. As a result low dissolved oxygen levels (below 5 parts per million) disappeared along the River and became less frequent in the lower Bay which revived the diversity of aquatic life in the River and the Bay.

This improvement encouraged WDNR fish managers to establish a walleye fish stocking program below the De Pere Dam during 1977 through 1984. The program was successful in attracting many people to fish in the area. Today the last seven miles of the Lower Fox River is an established, regionally famous, walleye fishing area. However, PCBs and other toxic substances are found in the fish. A recent state fish consumption advisory recommends that no one eat walleye or other fish caught below the De Pere Dam. Also while much improved, the fishery still remains imbalanced with an overabundance of carp and too few predator species.

Today, the alleviation of toxic chemical contamination in the River and Bay from past and present point source discharges remains a major management goal. In 1978 researchers began studying this problem to understand its extent and nature because toxic chemicals move through the food chain to higher levels affecting fish, wildlife, and humans.

Many agencies at the federal, state and local levels have specific roles and responsibilities for the management of the River and Bay system. This management includes river flows, fish and wildlife habitat, dredging, wastewater treatment plants, and land use. Among these management agencies are: Fox Valley area counties and local municipalities, the Wisconsin Department of Natural Resources, the U.S. Environmental Protection Agency (U.S. EPA), U.S. Army Corps of Engineers (COE); and many others. In addition, nongovernmental groups including industry, business, recreation, and conservation organizations also play an important role in the overall management of the River and **Bay**.

THE ENVIRONMENTAL PROBLEMS

The Citizens Advisory Committee, other interested citizens, researchers, and resource managers helped identify the most pressing problems to be addressed in this Remedial Action Plan. Most of these problems were classified into four categories.

Biota and Habitat
Toxics Substances
Nutrients and Eutrophication
Institutional Concerns

In response, four technical advisory committees (TACs) were established and prepared reports to describe and assess these environmental problems. This section summarizes the committee's conclusions and impaired uses and problems which major pollutants cause in the Area of Concern (AOC). For more information regarding environmental problems and their sources refer to the Problem Assessment Sections of the individual TAC reports: Toxic Substances Management, Nutrient and Eutrophication Management, Biota and Habitat Management, and Institutional.

Biota and Habitat

BAY HABITAT

The future of the Bay's fish and wildlife is questionable if habitat degradation continues from industrial and urban development, high water levels, toxicants, and poor water quality. Disappearing wetlands, eroding shorelines and lack of underwater vegetation result in the decline of bird nesting and fish spawning habitat in the Bay. Loss of habitat jeopardizes the endangered species in the area as well as other fish and wildlife. Water quality problems also impair habitat for underwater organisms such as clams and insects that are an important food source for fish and wildlife. Another serious water quality problem is cloudy or turbid water, which is caused by suspended solids and overabundant algae populations. Underwater plant growth is reduced when sunlight cannot penetrate cloudy water. In addition, decaying algae and other material use oxygen which fish and wildlife need to live.

UNBALANCED FISHERY

Historically, the abundance and diversity of fish species that populated the Great Lakes, including the Lower Green Bay and Lower Fox River area, was very different from what it is today (Smith & Snell, 1891). Overfishing of the Great Lakes was evident before the beginning of the 20th Century, and it greatly reduced the native fish populations. Invasion of exotics such as alewife, sea lamprey, and rainbow smelt also reduced some native fish numbers. To rehabilitate the commercial fishing industry, man has attempted to rectify some of these problems and restore an ecological balance to the Great Lakes through sea lamprey control, fish stocking, and commercial harvesting of exotics. However, the system remains dramatically altered with less diversity in fish species composition than originally present.

Today, the unbalanced fish community of the inner Bay and the Lower Fox River is characterized by low abundance and low diversity of top predators (such as northern pike) and native forage species (the spottail shiner) combined with a presence of certain exotic species (carp, alewife, and sea lamprey). Excess carp populations may also present other problems. These fish are suspected of adversely affecting the Bay's ecosystem by uprooting underwater plants and stirring up sediments which increases turbidity. This combination of species has reduced the commercial and sport harvest of fish.

Toxic Substances

CHEMICAL GROUPS OF CONCERN

More than 100 chemicals have been identified in the Lower Fox River/Lower Green Bay area. More than twenty of these appear on the EPAs' priority pollutant list. In this list the federal government identifies chemical compounds and classes of compounds which may pose unacceptable risks to the environment or humans. The toxic chemicals known or suspected to exist in the AOC were organized by the Toxic Substances Management Technical Advisory Committee into three major categories.

Chemicals in Group A, polychlorinated organic compounds (e.g., PCBs, dioxins, furans), are toxicologically related and are suspected of causing most of the known reproductive problems documented in both fish and wildlife species in the area. Present fish consumption advisories are based on the risk associated with human ingestion of fish contaminated with PCBs.

Group B consists of substances known to be acutely toxic to aquatic life in the quantities presently being discharged into the system. At this time ammonia is the only chemical in this group.

Group C compounds include pesticides (e.g., DDT) polyaromatic hydrocarbons or PAHs (e.g., fluoranthene), volatile hydrocarbons (e.g., dichloromethane), PCB substitute compounds (e.g., isopropylbiphenyl), and those compounds detected but unidentified during laboratory analyses of samples from various portions of the ecosystem. The impacts of this group of chemicals, in the concentrations present, have not been adequately assessed.

IMPACTS OF TOXIC SUBSTANCES

Toxic substances are found in every physical and biological part of the Lower Fox River and Lower Green Bay. Levels of known toxic substances (specifically PCBs) in fish caught in the area have resulted in the issuance of fish consumption advisories since 1976. An advisory released in April 1987 recommends that no one eat walleye caught between the De Pere Dam and the mouth of the Fox River because of high PCB levels found in the fish.

The Wisconsin Department of Natural Resources bases their advisories on the Federal Food and Drug Administration's guidelines. The potential human health risk associated with repeated exposure to toxic substances was one of the primary motivating forces behind the development of this Remedial Action Plan (RAP).

The buildup of certain halogenated hydrocarbons (such as PCBs) may also affect fish and wildlife. Reproduction impairments in the Forster's tern, a state endangered species, have been symptomatically linked to toxic substances. While studies show some natural reproduction of walleye below the De Pere Dam, other studies indicate there may be a reduction in reproductive success associated with high body burdens of toxic substances. Preliminary bioassay tests of pulp and paper mills which discharge to the entire Lower Fox River indicated that 4 of 13 discharges were acutely toxic to fish and aquatic life. More testing is necessary to substantiate these results. Acutely toxic ammonia concentrations are found near the mouth of the Fox River and chronically toxic levels of ammonia are found extending several miles into the Bay

Another serious problem is that the River's sediments contain large amounts of persistent chemicals such as PCB. This contamination persists even though reductions of the biological oxygen demand and suspended solids in industrial and municipal wastewater and a ban on PCBs led to a decrease of toxic compounds entering the ecosystem since the 1970s. Re-introduction of toxic substances into the system from these contaminated sediments continues to be a major problem. Based on preliminary data, an estimated 80% of the PCB loading from the Fox River to the AOC is from in-place contaminated sediment sources.

Low levels of contaminants are found throughout the River system. These areas with low levels of toxic substances may create serious problems. Bioassay tests on Fox River sediments indicate that sediments with low levels of contaminants have a high degree of bioavailability. This means that organisms are constantly exposed to these contaminants throughout their life spans. After accumulating toxicants, these organisms, if eaten, are the starting point for toxicants to move up the food chain to fish, then onto fish-eating birds and/or humans where they can accumulate.

Nutrients and Eutrophication

NUTRIENTS AND SEDIMENTS

Each year municipalities and some industries discharge many pounds of phosphorus into the Lower Fox River and Green Bay and much more washes in from croplands, barnyards, construction sites, parking lots, streets, and other sources. The Fox River delivers an average of one million pounds of phosphorus to the lower Bay each year. All living things need food and nutrients to survive. However just as too much food is bad for humans, an over-abundance of nutrients especially phosphorus is harmful to the ecosystem and will cause eutrophication (high algae production).

Lower Green Bay is extremely eutrophic, in fact it is classified as hypereutrophic and experiences periodic heavy blooms of algae - making the Bay green during part of the summer. Too much phosphorus over-fertilizes the Bay and stimulates algae growth, particularly undesirable blue-green algae. Blue-green algae are a low quality food source for small aquatic animals called zooplankton which fish eat. Zooplankton usually prefer to feed on green algae, which are smaller and more palatable than the blue-green species. Therefore large amounts of blue-green algae are not being used through the food chain to produce fish. Blue-green algae that haven't been eaten die and are decomposed by bacteria.

Bacteria need a great deal of oxygen to decompose algae once it has died and settled on the Bay's bottom. This depletes oxygen in the Bay's waters. A lack of oxygen in the bottom waters due to decaying algae and other oxygen-demanding wastes will prohibit fish and other aquatic life from living there. In addition, decaying algae and low oxygen levels release phosphorus back into the water to stimulate additional algae growth.

Eutrophication causes problems in the Bay's food chain and in its fish populations. There are too few predatory fish due to poor habitat and lower production. Predatory fish like walleye, bass and northern pike help keep the numbers of small forage fish in check. Large numbers of forage fish eat most of the larger zooplankton which feed on algae. Too many forage fish and too few zooplankton result in more algae remaining in the Bay to cause water quality problems.

Excess algae can indirectly inhibit desirable underwater plant populations, too. The algae clouds the water so that sunlight does not penetrate through to support bottom-rooted plant growth. Bottom-rooted plants called macrophytes provide food for waterfowl and habitat for fish and other aquatic life

Excess sediment also clouds lower Green Bay waters, covers and destroys fish spawning areas and fills in the shipping channel. An **average** of 200 million pounds of suspended solids are delivered from the Fox River to the Bay each year. Soil erosion in the Fox River watersheds is the major source of sediments to the Bay. The cloudiness or turbidity of Green Bay water is also a reason why Bay Beach, the historical swimming beach, remains unsafe for swimming.

BACTERIA AND VIRUSES

Over the years, the number of bacteria and viruses in the Bay has decreased. However, bacteria that may increase the risk of ear, skin and intestinal infections still exist there. Wastewater treatment plants and animal waste and street runoff are the major sources of bacteria and viruses. Usually bacteria and viruses can't survive long in the water; but they can live in the sediment. Waves, swimmers and other disturbances can stir these sediments and resuspend bacteria in the water.

Institutional and Socioeconomic Concerns

SOCIAL AND ECONOMIC FACTORS

Social and economic factors are important in the management of the Bay and River. However the existing management process does not adequately consider social and economic factors in its decisions. Detailed technical information about the resource is often available for management decisions but parallel information about social and economic impacts is unavailable or inadequate. As a result the population estimates and other forecasts needed to plan and evaluate projects are inaccurate or inadequate. Also, there is no ongoing sound basis for economic analysis of projects affecting the area.

The quality of the water resource in Green Bay has historically been responsible for the location, size, and character of the City of Green Bay. The area's water quality remains critical to the type of water uses and to the local economy as a resource. But the water's role as a disposal site, for example, is being challenged because of the threat this poses to the Bay and the area's quality of life.

SHORE USE

Industrial uses predominate along the shore of the Fox River and to a lesser degree the lower Bay and limit public access to the water in several areas. These conditions. do not encourage people to use the River, Bay or downtown waterfront for recreational activities. For instance, downtown businesses have not or are not able to take full advantage of the commercial value of an attractive downtown waterfront. Also, there is no publicly sanctioned swimming beach in the Area of Concern. The historical beach in the area, Bay Beach, has been closed since the late 1930's. Communities have turned to swimming pools to meet their swimming recreational needs. There is also inadequate access for shore users such as anglers, sunbathers, picnickers and people who wish to hike or bike along the shore.

For the most part in the lower Bay, there is an adequate number of boat accesses. However, several of the access sites need expanded capacity and improved facilities. Also, boat access along the east shore is limited. There is a potential demand for more marina facilities.

People and wildlife are often competing for the limited natural shoreland that remains. Much of the critical wetlands and other shore habitat for fish and wildlife have been destroyed. Also, as the water quality improves there is increased pressure for residential and recreational development along the shore.

WATER USE

Because the Bay and River contain limited resources which many people wish to use, conflicts exist. Uses of the water resource in the lower Bay include process water for industry and commercial navigation, which requires dredging. These uses can be in conflict with other uses such as fishing (both sport and commercial), swimming, and boating.

PUBLIC AWARENESS, PARTICIPATION AND SUPPORT

The public's perceptions and attitudes about water quality and water-related activities form the basis for individual decisions. People need to have good information on which to make decisions and **a** vision of what type of resource the **Bay** and River can potentially be. The public also needs to have input on the major decisions that affect the Bay and River. Ultimately their support is critical to the success of Bay and River cleanup efforts.

MANAGEMENT AGENCY RESPONSIBILITIES

Many agencies and entities make decisions that affect the Lower Fox River and Green Bay. A major concern is insufficient coordination, communication and cooperation among those that manage the Bay and River. Some major problems, such as in-place contaminated sediment and nonpoint source pollution may not be adequately addressed by existing agencies and programs. This Plan contains recommendations which will improve cooperative management efforts between agencies. The recommendations indicate which agencies are responsible or have authority for undertaking certain tasks, offer time schedules, and describe tasks to evaluate the progress of these recommendations.

POLLUTION SOURCES AND OTHER FACTORS AFFECTING THE BAY AND RIVER

The Lower Green Bay and Lower Fox River Area of Concern is influenced by the 6,641 square mile drainage area of the Lower and Upper Fox River and Wolf River Basin. Within the basin there are many possible pollution sources that may contribute to conditions found in the Area of Concern (AOC). Because of the size of the basin and the availability of information in other plans and documents much of this Remedial Action Plan focuses on the major sources within the AOC and affecting the Lower Fox River directly. The Lower Fox River includes the river downstream of Lake Winnebago. Comprehensive inventories of many of the sources in the entire basin can be found in the Fox River Valley Water Quality Management Plan (FVWQPA, 1978 and subsequently revised by study elements), The Upper Fox River Water Quality Management Plan (WDNR, 1979) and the Wolf River Water Quality Management Plan (WDNR, 1980). This information is likely to be updated with the development of a comprehensive management plan for Lake Winnebago (WDNR, in progress) and the 1988 update of the Upper Fox River Water Quality Management Plan. The analysis of phosphorus loads in the Remedial Action Plan includes the entire Fox River Basin.

Sources in the AOC and Lower Fox River Basin are summarized below. They include municipal and industrial wastewater discharges (point sources), runoff from urban and agricultural areas (nonpoint sources), potential pollution from land disposal areas (landfills etc.), atmospheric deposition (air pollution), and contaminated sediment from past discharges (in-place pollution). Other factors affecting the AOC are wetland and habitat loss from land development and high water levels, and the disturbances of ships and navigational dredging.

Municipal and Industrial Wastewater Discharges (Point Sources)

The Lower Fox River is a heavily industrialized river containing the highest concentration of paper mills in the world. Today, along the 39 miles of the Lower Fox River there are 14 mills and 6 major municipal wastewater treatment facilities discharging directly to the River (Figure 3). Within the Area of Concern there are five mills and two municipal treatment plants that discharge directly to the River or **Bay**.

In the entire Lower Fox River Basin approximately 120 industries and 66 municipal treatment plants hold WPDES permits to discharge to surface water. They discharge to the Lower Fox River and its tributaries.

There are no combined sewer overflows in the AOC or that are known to discharge to the Lower Fox River.

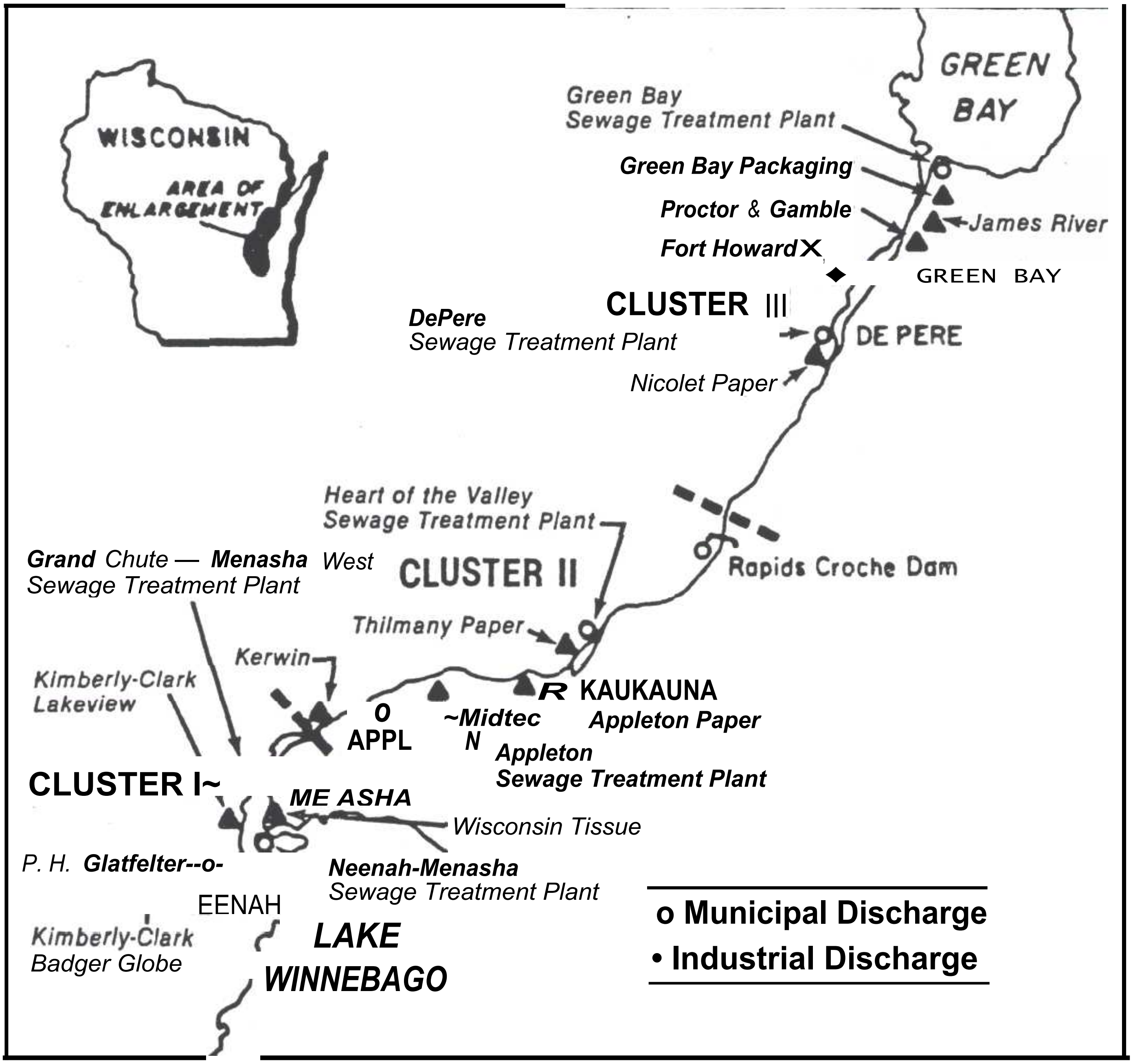

Figure 3. Major Municipal and Industrial Dischargers to the Lower Fox River.

Nonpoint Sources

There are 41 watersheds in the entire Fox and Wolf River Basin. Six are in the Lower Fox River Basin. Six are in the Lower Fox River Basin (below Little Lake Butte des Morte) and Duck Creek flows directly into the lower Bay. Those believed to have the greatest potential to contribute to phosphorus and sediment loads to the Bay are indicated with shading in Figure 4.

Land use in the Lower Fox River Basin is approximately 69% agricultural, 13% urban, and 18% wooded or natural. A detailed inventory of critical areas and nonpoint sources within watersheds in the basin is not available. Sediment runoff is a problem in some watersheds and localized areas where it contributes to water quality problems. Dairy agriculture predominates so that animal waste contributions are likely important. Pesticide impacts have not been investigated but are not believed to be significant compared to other sources. The Fox River Valley is one of Wisconsin's most urbanized and industrialized areas. Most of these urban areas in the basin were developed in close proximity to the River. Localized urban and industrial runoff is likely to be a source of pollutants, but sources have yet to be monitored or inventoried.

The area directly draining to the Area of Concern is generally heavily urbanized, especially along the Fox River. Uncovered coal and chemical piles, oil tank farms, and many industrial lots are located next to the River. Since the metropolitan area is also growing fairly rapidly, construction erosion and design of stormwater runoff systems are a concern.

land Disposal Areas

There are 16 abandoned landfills located within a quarter mile of the Lower Fox River and Lower Green Bay (Table 1). In general these have not been monitored. Studies are underway at two sites: the Schmaltz landfill which is a Superfund site; and the Bergstrom landfill. Four additional land disposal sites are of possible concern: Bayport Industrial Park's dredge spoil disposal areas, Wisconsin Public Service Corporation's ash disposal areas and two former coal-gas plants that may have tar deposits. Contamination of groundwater, surface runoff, and direct exposure to wildlife through the food chain are of potential concern.

The Wisconsin Environmental Repair Fund (Baken and Giesfeld, 1985) inventoried abandoned waste sites in each county. In the counties of the Lower Fox River Basin 333 sites have been identified including 95 in Brown, 46 in Calumet, 66 in Outagamie and 126 in Winnebago counties. Some of these may be located outside the Basin.

Atmospheric Deposition

Atmospheric deposition of PCBs and other toxic contaminants is difficult to quantify. Based on limited data from the early 1980s it is estimated that

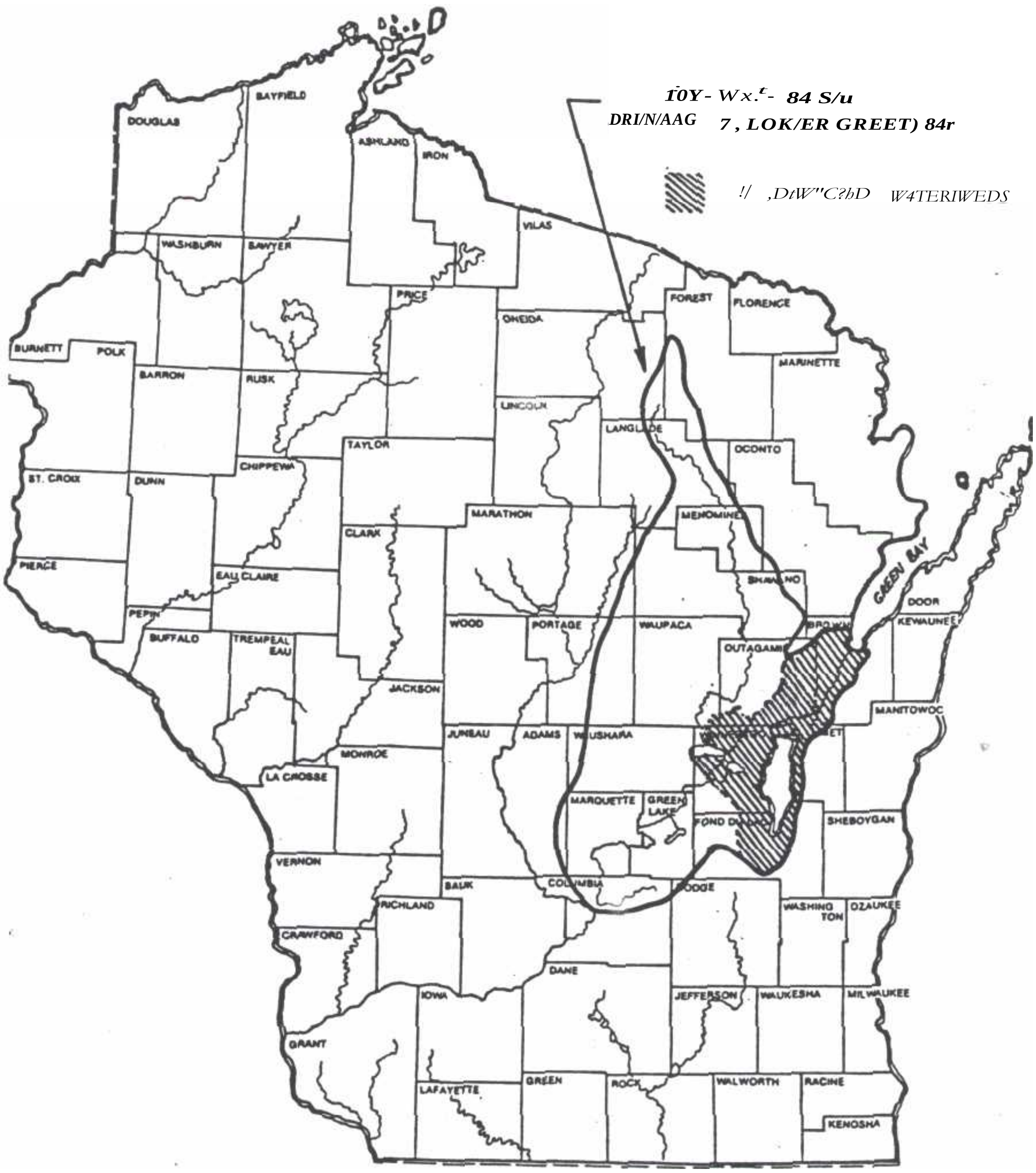

Figure 4. Fox and Wolf **River Basin Watersheds**

Table 1 Landfill sites located within 1200 feet of the Fox River and Green Bay

County/Site	Location*
Brown County	
City of Green Bay, Military Avenue	1601 N. Military Ave.
City of Green Bay, Danz Avenue	2130 Danz Rd.
Green Bay Wildlife Sanctuary	City of Green Bay, Danz Ave.
City of De Pere	North end 5th Street
Town of Allouez Dump	East end Green Ave.
Calumet County	
Schmaltz Landfill	SE NW S18 20N 18E
Winnebago County	
Bergstrom Landfill	City Neenah, SE S21 20N 17E
City of Menasha	SW S13 20N 17E
Allied Chemical	City of Menasha, 388 Ahnalp St.
City of Neenah	SW NW S22 20N 17E
City of Neenah	NE SE S27 20N 17E
City of Neenah	SW S21 20N 17E
Refuse Service, Inc.	Tn of Menasha, SE NW S21 20N 17E
Winnebago State Hospital	Tn of Oshkosh, NE NW S06 18N 17E
City of Oshkosh	SW NE S10 18N 16E
Town of Algoma	City of Oshkosh, SW NW S22 18N 16E

Figure 5. Sunset Over Smokestacks (Artist: Ben Piaskowski, Grade 12, Green Bay West High School)

atmospheric deposition contributed approximately 1,430 to 2,200 pounds per year total PCB to all of Lake Michigan (Andren, 1986). Only a small portion of this load is likely to have fallen in the AOC because of its relatively small surface area. Monitoring has yet to confirm this or determine what contribution atmospheric deposition on land in the Fox River Basin and subsequent runoff may have. It is also unknown to what degree air emission sources in the AOC contribute to atmospheric deposition of contaminants in the AOC, Lake Michigan or the Great Lakes in general. The potential contribution of proposed new sources such as waste incinerators is also unknown.

Contaminated Sediments (In-Place Pollution)

Contaminated sediments derived from past wastewater discharges are believed to be the major source contributing more than 80% of PCB loads from the Fox River to Green Bay. Most of the contaminates are potentially associated with organic sediments in depositional areas behind the 12 dams and in the backwaters of the Lower Fox River. Major hot spots include Little Lake Butte des Morts, located just downstream of Lake Winnebago, and in the South Turning basin in the AOC. Other areas with recorded high sediment PCB levels are found at the Chicago and Northwestern railroad bridge in the City of Green Bay, at the mouth of the East River, and below the Green Bay Metropolitan Sewerage District's outfall (Lohr, 1987).

Shipping and Navigational Dredging

The Port of Green Bay is a Great Lakes Port with 209 ships using the harbor in 1985. Navigational dredging is required to maintain the harbor's depth of 24 feet. An average of 350,000 cubic yards of sediment is dredged from the harbor and channel each year. The U.S. Army Corps of Engineers (COE) and Brown County are proposing to expand the existing confined disposal facility (CDF), Kidney Island, recently renamed Renard Isle, to meet spoil disposal needs for the next four years and possibly longer. As proposed, the COE will pay for dredging and the construction of the CDF and the county will be responsible for operation and maintenance costs of the facility. All state permits and requirements have been applied for. As proposed, the Department has given conditional approval to the facility. However, the project is currently in litigation. A private upland spoil disposal site has also been proposed for development. In the future maintenance of the navigational channel may become increasingly a local responsibility.

Wetland and Habitat loss

Most of the original wetlands in the AOC have been destroyed by filling and development. Those that remain are threatened by high water and further development. Important wetlands are also found in streams tributary to the AOC (the East River, Duck Creek, and Suamico River).

POLLUTION LOADINGS

Biochemical Oxygen Demand (BOD)

Since the Clean Water Act was passed there have been major reductions in loads of biochemical oxygen demand (BOD) to the Fox River. Pollution controls in the 1970s decreased BOD loads from approximately 375,000 pounds per day in 1971 to 35,000 in 1978 (Ball et al., 1985). In 1983-84 average loads were 17,400 pounds per day. Extensive monitoring and modeling of the river system (Patterson, 1986) formed the basis for a flow-temperature based wasteload allocation for BOD waste discharged to the River (WDNR, 1987). Minimum and maximum BOD loads under the wasteload allocation are summarized in Table 2. The allocations are designed to meet a dissolved oxygen standard of five parts per million in the River at all times. A two part per million dissolved oxygen water quality standard variance remains in effect in part of the lower Bay (in the AOC) during the winter months. This variance is under review.

Phosphorus and Sediment

Annual pollutant loads from the Fox River to Green Bay of total phosphorus, and suspended solids were estimated in the early 1980s based on monitoring of river flows and concentrations (Bannerman, et al., 1984). The total phosphorus load was estimated to be approximately 1.2 million pounds in 1982. Suspended solids loads averaged 200 million pounds per year in the early 1980s. Some indication of the importance of various phosphorus sources is indicated in Figure 6. These should be considered gross estimates of source loads. The estimates are based on the assumptions that all wastes reaching the River are eventually transported to the Bay and that industries report net loads of pollutants discharged rather than total loads.

PCBs

Based on a study conducted in the early 1980s (Marti, 1984), the Fox River contributes an estimated 60% of the total tributary loading of PCB to Lake Michigan. Tributary loading estimates include PCB loads from contaminated sediments and any existing discharges to the River but do not include atmospheric deposition or recycling of contaminants already in the Bay. Based on 1981 measurements, Fox River PCB loads to Green Bay were estimated to range from 367 to 1360 pounds per year with the average believed to be in the 1100 to 1320 pounds per year range. Extrapolating measured data (Marti, 1984) suggested a maximum load of 2640 pounds per year from the River.

TABLE 2. Dischargers in the Area of Concern: Loads and Limitations

Permittee Name	Current Categorical Effluent Limitations for BOD Monthly Avg. (lbs/day)	Current Categorical Effluent Limitations for BOD Daily Max. (lbs/day)	Wastewater Discharge Data for BOO (1) Average (lbs/day)	Wastewater Discharge Data for BOO (1) Maximum (lbs/day)	Proposed WLA Limitations (2) Baseload (lbs/day)	Proposed WLA Limitations (2) Most Stringent (lbs/day)	Current Wastewater Treatment Provided
Nicolet Paper Co.	1,980	3,612	1,566	7,334	3449	1,086	pH Control Primary Clarification
De Pere Wastewater Treatment Plant	1,184	2,368 (4)	125	875	3383	1,066	Primary Clarification Secondary Treatment (Contact-stabilization) Phosphorus Removal Secondary Clarification Filtration
Fort Howard Paper Co.	15,537	29,854	4,792	15,990	28,505	8,979	Paper Mills Primary Clarification Pulp Mills Primary Clarification Secondary Treatment (Activated Sludge) Secondary Clarification
Procter & Gamble Paper Products Co.	18,628	35,491 (5)	1,432	5,318	27,748 (7)	8,741	Paper Mills Primary Clarification Dissolved Air Flotation Pulp Mills Green Bay Met.
Green Bay Packaging, Inc.	2,585	5,170	1,113	6,874	4,937	1,555	Wastewaters are recycled; reverse osmosis permeate discharged.
James River Corp.	7,230	13,593 (5)	1,503	7,719 (6)	8,487 (7)	2,673	Paper Mills Primary Clarification Pulp Mills Green Bay Met.
Green Bay Metro. Sew. Dist.	13,135	19,703 (4)	6,883	31,842	23,614 (7)	7,348	Primary Clarification Secondary Treatment (Contact-stabilization) Phosphorus Removal Secondary Clarification
Total	60,279	109,791	17,414		100,123	31,539	

(1) This information was taken from the Discharge Monitoring Reports (DMRs) submitted by the permittee for the months of Aug. through Oct. 1983 and May through July 1984.
(2) WLAs were calculated from historical stream flow and temperature information taken from the years of 1934 through 1984. The risk level is the most stringent WLA value the permittee will have to meet.
(3) These judgments are highly generalized evaluations by Bureau of Wastewater staff and do not preclude different judgments should additional data become available.
(4) Weekly average effluent limitation.
(5) 10% of the amount of BOD contained in the industry's process wastewater which is discharged to the Green Bay Met. must be deducted from the categorical effluent limitation. During the summer of 1984, 107 of James River Corporation's BOD discharge to the Green Bay Met. averaged 4,509 lbs/day while 10% of Proctor & Gamble's BOD discharge to the Green Bay Met. averaged 4,399 lbs/day.
(6) This value represents an unusual discharge event. The next highest discharge value is 4,479 lbs/day BOD.
(7) Includes adjustment for mini-cluster between GBMSD, Proctor & Gamble and James River.
(8) Estimated using 1934-1984 WLA's vs 1976-1984 discharge performance. The discharge data for each discharger was evaluated graphically to determine the best period of record to use. Only the most recent data that was representative was included.

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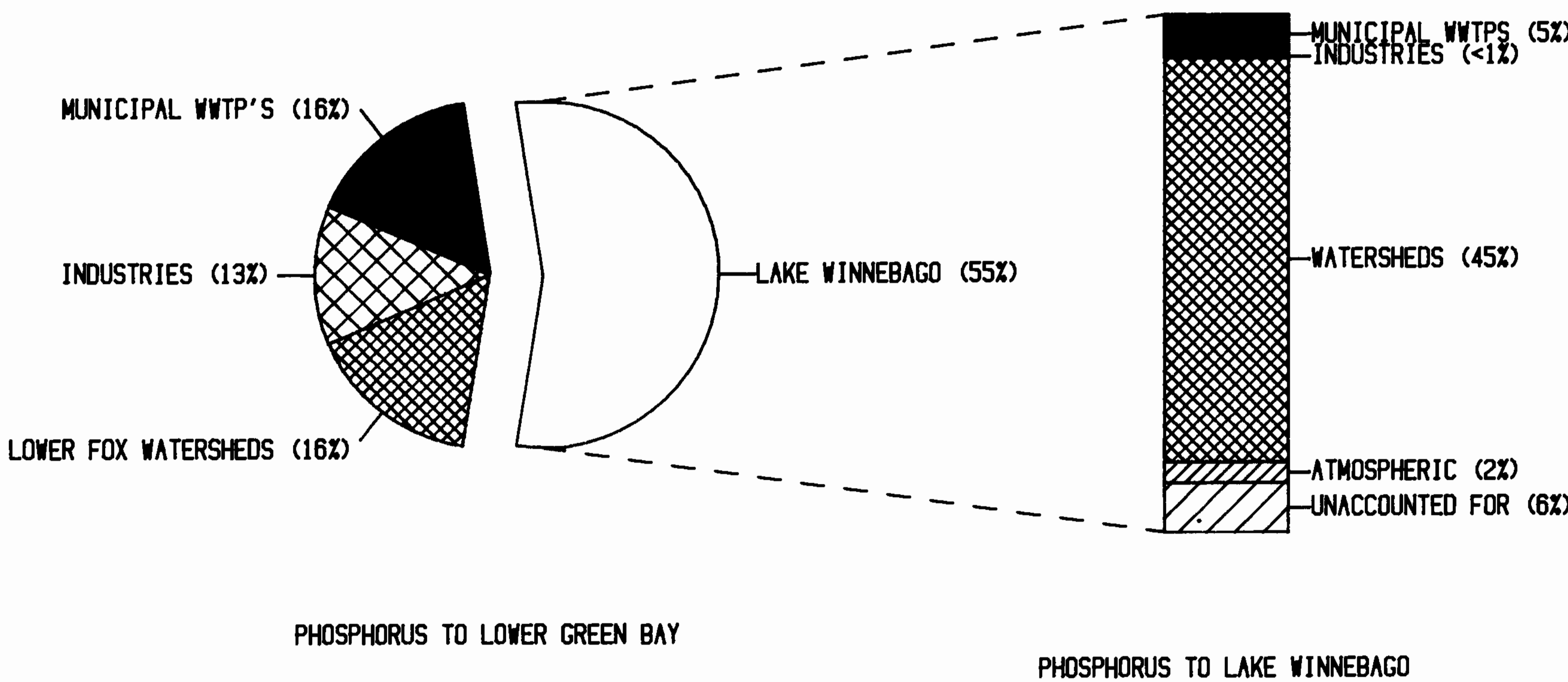
Figure 6. ANNUAL TOTAL PHOSPHORUS LOAD TO LOWER GREEN BAY

BASED ON EARLY 1980'S CONDITIONS



LOWER FOX WATERSHEDS INCLUDES DUCK CREEK
ALL %'S ARE %'S TO LOWER GREEN BAY

Back

LOWER GREEN BAY REMEDIAL ACTION PLAN:

for the lower fox River and lower Green Bay

Area of Concern

III. PLAN GOALS AND OBJECTIVES

PLAN GOALS AND OBJECTIVES

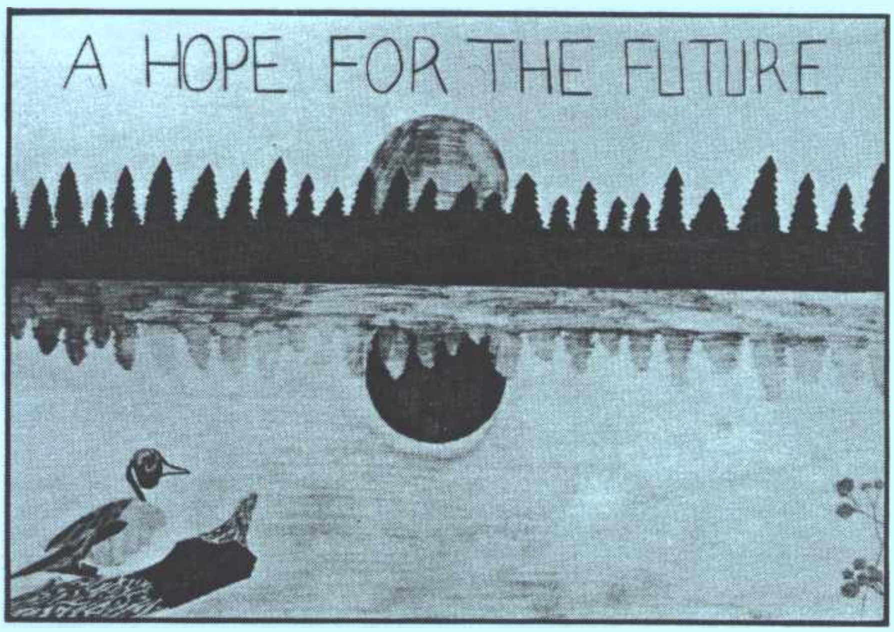
This section provides specific goals and objectives for "restoring the beneficial uses" of the Bay and River. The legal mandates for environmental protection and resource management established by state statutes, the Clean Water Act, and the Great Lakes Water Quality Agreement provided the framework for developing the Plan's goals and objectives. The goals and objectives are specific to the Bay and River and result from the combined input of the four technical advisory committees, the Citizens Advisory Committee, and public and **agency** reviews.

These goals and objectives provide the basis for evaluating and directing long-term management decisions which affect the Bay and River. The goals and objectives are not in and of themselves legally binding, until they are incorporated into local, state and federal law. Some grants and management actions may be required to be consistent with the Remedial Action Plan as part of the State's water quality management plan.

Achievement of these goals and objectives is dependent on accomplishing the Key Actions and the specific recommendations discussed in Chapter IV of this plan.

The Citizens Advisory Committee's Desired Future State

The CAC defined a "Desired Future State" for the lower River and Bay (Table 3). The Desired Future State includes a healthy bay environment, a balanced edible sport/commercial fishery, water-based recreational opportunities, good water quality which protects public health and wildlife, balanced shoreline use, productive wildlife and plant communities, and an economical transportation network which minimizes adverse environmental effects. This Desired Future State provided a guidepost for the CAC to gauge plan recommendations. Figures 8 and 9 illustrate the difference between the current state and Desire Future State.



(Artist: Betsy Niec, Grade 10, Oconto Falls High School)

Figure 8. Lower Green Bay: Present State

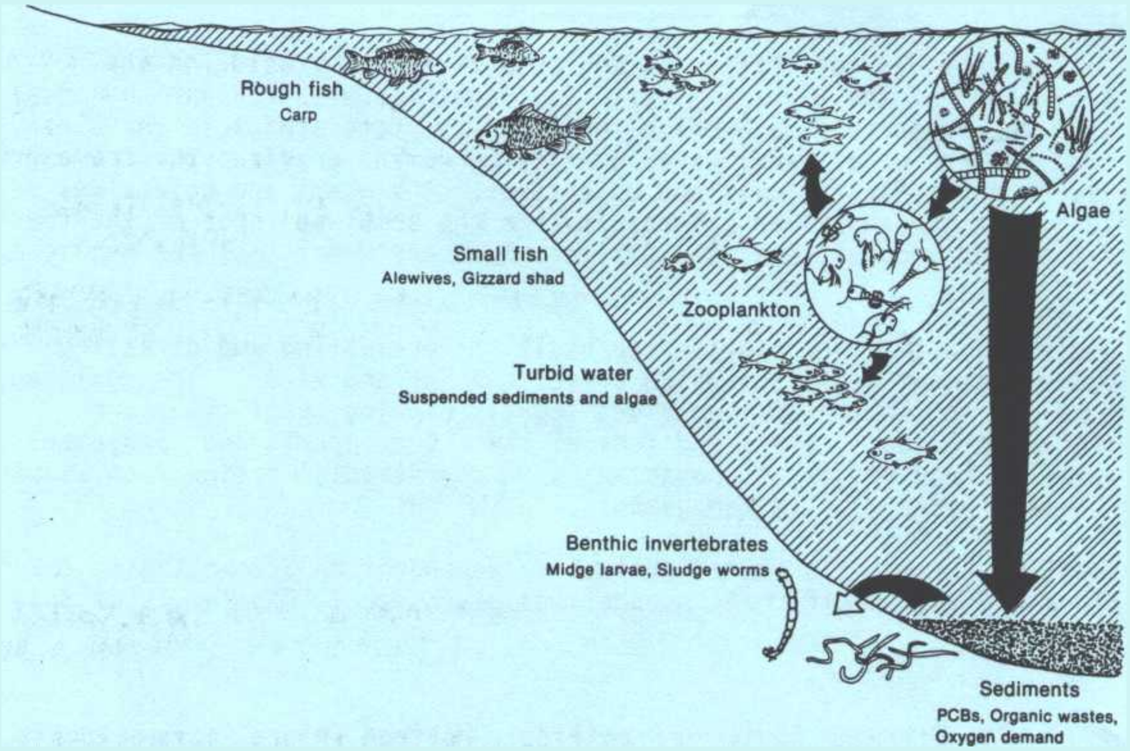
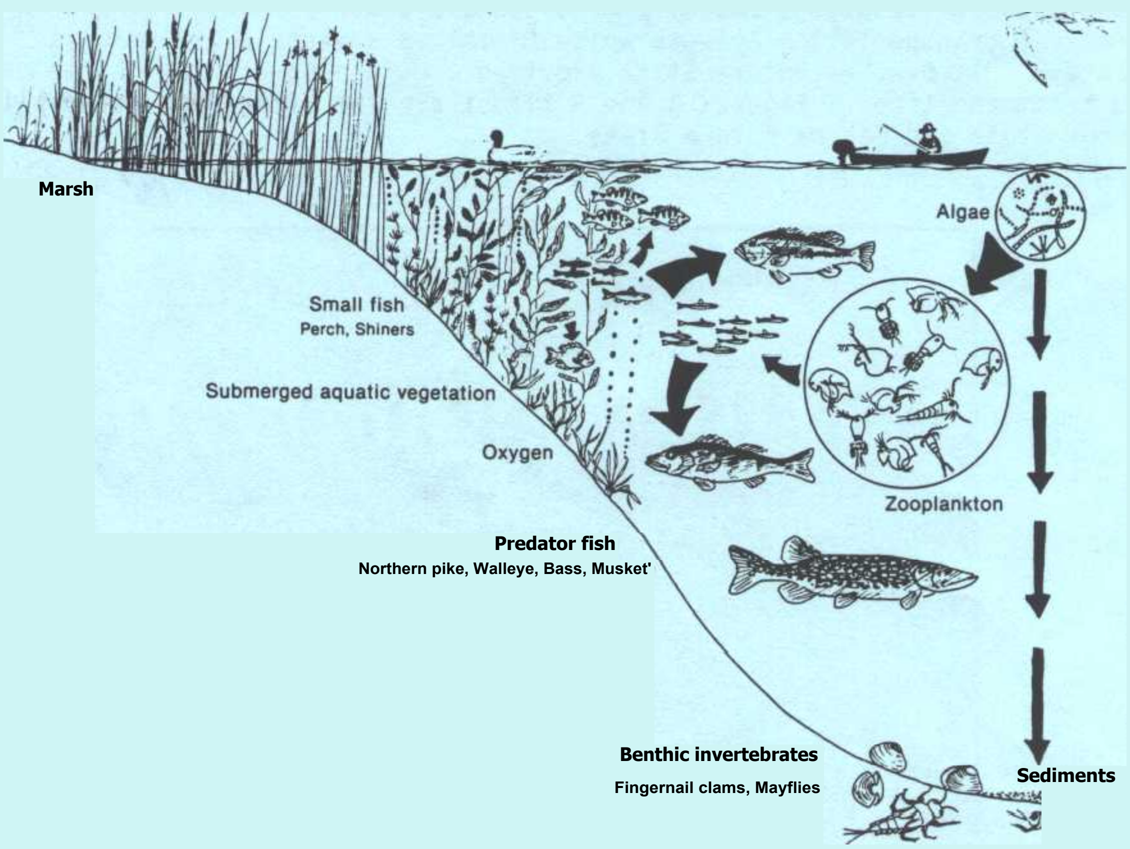


Figure 9. Lower Green Bay: Desired Future State



Citizens' Desired Future State

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TABLE 3. The Desired Future State of the Bay and River

The "Desired Future State" of the Fox River/Lower Green Bay system includes the attainment, maintenance, and continued evaluation of the following:

1. A healthy bay environment providing for balanced and productive wildlife and plant communities including a well-balanced, sustainable, and edible sport and commercial fishery.

2. Water-based recreation opportunities including:

    a. Accessible local swimming beaches on the Bay; and

    b. Adequate boating areas and facilities.

3. **Local** Fox River/Lower Green **Bay** water **quality that** protects human health and wildlife from effects of contaminants and provides for drinkable water after standard treatment.

4. Balanced public and private shoreline usage including park, agricultural, commercial, residential, and industrial lands.

5. An economical transportation network including both water and land-based systems which minimizes adverse environmental effects.

6. Point and nonpoint discharges and runoff consistent with the maintenance of the desired water quality future state.

*Identified by the Citizens' Advisory Committee Lower Green Bay Remedial Action Plan

Plan Goals

1. <u>ENHANCE AND PROTECT MULTIPLE USES OF THE BAY AND RIVER INCLUDING RESTORED SWIMMING AND AN EDIBLE FISHERY.</u>

   Existing uses to enhance and protect include fish and aquatic life, wildlife, endangered species, boating, swimming and other water sports, sport and commercial fishing, hunting, agriculture, commercial navigation, industry, and aesthetic and scenic enjoyment.

2. <u>DEVELOP A BLEND OF PUBLIC AND PRIVATE SHORELINE USES THAT INCLUDES ADEQUATE PUBLIC ACCESS.</u>

   These include parks for people to use and enjoy, accessible local swimming beaches on the Bay, and adequate boating areas and facilities. They also include natural areas and environmental corridors to protect important wildlife and fishery habitat, and commercial developments that build upon and enhance the value of downtown waterfronts. Other shoreline uses include residential, agricultural, industrial, and aesthetic and scenic values.

3. <u>PROVIDE SUITABLE AND SUFFICIENT HABITAT TO ENHANCE AND SUSTAIN WILDLIFE OF THE BAY AND RIVER.</u>

   Wildlife includes spring and fall migrant diving and dabbling ducks, nesting common and Forster's terns and other colonial water birds, marsh nesting species, seasonally occurring raptors, resident dabbling ducks, resident aquatic fur bearers, resident and migrant shore birds, and amphibians and reptiles.

4. <u>ESTABLISH A SELF-SUSTAINING, BALANCED, EDIBLE FISH COMMUNITY.</u>

   This includes increasing and/or maintaining sport or commercial species, in particular walleye, yellow perch, northern pike, and muskellunge populations as a dominant part of the biomass, plus other valued fish, such as channel catfish, white bass, lake sturgeon, smallmouth bass, and black crappie. This also includes encouraging forage species such as emerald shiner, spottail shiner, trout-perch, and darters which are an integral part of the fish community. There are a variety of other fish species present which should also be included in a balanced fish community. These species are listed in Appendix A of the Biota and Habitat TAC Report.

5. <u>IMPROVE THE WATER QUALITY AND TROPHIC STATE OF THE AREA OF CONCERN TO RELIEVE ECOLOGICAL STRESSES AND SUPPORT A FULL RANGE OF PUBLIC USES BY THE YEAR 2000.</u>

   Specific improvements to achieve include: increased water clarity; increased submerged aquatic vegetation in photic zone; increased populations of desirable aquatic invertebrates, fish and waterfowl; decreased frequency and biomass of algae blooms; reduced sedimentation to decrease the need for maintenance dredging and improve spawning habitat;

increased fish production relative to algae production; reduced frequency and distribution of low dissolved oxygen; reduced magnitude of system fluctuations (i.e., dissolved oxygen, algae blooms, and perch populations); and provide water quality suitable for swimming.

6 <u>ACHIEVE AND MAINTAIN WATER QUALITY THAT PROVIDES AN EDIBLE FISHERY, PROTECTS THE ECOSYSTEM FROM THE ADVERSE EFFECTS OF TOXIC SUBSTANCES ON FISH, AQUATIC LIFE AND WILDLIFE UTILIZING THE AQUATIC RESOURCES, AND PROTECTS HUMAN HEALTH.</u>

Reduce the loading of toxic substances from all sources to the Lower Fox River and to Green Bay. To the maximum degree possible concentrations of toxic substances in the water column and bottom sediments are reduced to levels where:

a. The most stringent state and/or federal fish and game consumption advisory levels are met;

b. Human health is protected from all water associated exposure routes;

c. Adverse effects on aquatic and terrestrial biota are virtually eliminated; and

d. Other beneficial uses of the water are not impaired.

7. <u>DEVELOP A MANAGEMENT STRATEGY AND ORGANIZATIONAL STRUCTURE THAT WILL COORDINATE PUBLIC AND PRIVATE EFFORTS TO IMPROVE AND PROTECT THE NATURAL RESOURCES.</u>

This should be done while protecting the public trust, providing for multiple uses, minimizing conflicts, recognizing the needs of the greater populace while protecting the viability of minority views, and improving the overall quality of life of citizens of the Green Bay area and northeastern Wisconsin.

RATIONALE

The Plan's goals described a rehabilitated ecosystem that is a compromise between the extremes of full restoration and continuing degeneration. While it is recognized that some changes in the environment are irreversible and that man will continue to affect the ecosystem, the goal of rehabilitation is to halt any further degradation and actually reverse the process to regain a more desirable environment. Figures 8 and 9 illustrate the difference between the Bay's "Current State" and "Desired Future State."

The Plan's goals indicate the need to enhance existing uses of the Bay, especially those related to recreational, natural and other public uses of the River and Bay. The Plan's goals include restoring swimming as a public use of the lower Bay and providing an edible fishery.

One use included in the Citizens Advisory Committee's "Desired Future State" is not included in the Plan's Goals. The use of the Area of Concern for potable water supplies is not recommended at this time. Even with the proposed improvements, water quality suitable for drinking supplies will probably not be obtained within the AOC by the year 2000. In addition, subtle, long-term chronic effects of toxics are too poorly defined to risk additional exposure for the general public. This public use should be re-examined in the future as water quality improves in the AOC.

Commercial navigation is an existing use of the Bay and River which received a great deal of comment, both pro and con, during the development of the Remedial Action Plan. Because commercial navigation is an existing use, it is included with other uses to be enhanced and protected. However, the Plan's recommendations suggest that in light of this controversy, long-range options for improving the cost-effectiveness and reducing environmental impacts of this use be evaluated by local government and other responsible agencies (reference plan recommendation 4.9). Maintenance of this use in a manner that meets current state and federal environmental protection regulations is primarily the responsibility of local units of government. Local government is also responsible for determination of shoreline use goals within similar constraints.

The fish and wildlife goals (#3 and #4) list some of the desired species for the Area of Concern. It is anticipated that the fish and wildlife described in the goal statements will return in greater numbers and reproduce to reach desired populations following rehabilitation of the River and Bay. Note that protection of the remaining habitat is also critical. The fish and wildlife on the list are mostly at or near the top of the food chain. They were chosen in recognition of the fact that water quality must improve and many other desirable biota must also thrive to support these species. The Plan's objectives list specific, measurable numbers of species and measurable improvements in the environment that must occur to achieve the fish and wildlife goals.

The trophic status goal (#5) is based on measurements of water quality and trophic state in lower Green Bay. The intent is to improve the trophic gradient in Green Bay, alleviate stresses due to hypereutrophic (extremely fertile) conditions, and establish a less eutrophic state in the Area of Concern. Although water quality in the Area of Concern would remain eutrophic (fertile), water quality would be better than the present hypereutrophic conditions and would provide improved aquatic habitat and recreational use. This change from hypereutrophic to eutrophic status in the Area of Concern is considered a reasonable, if not ambitious goal.

The toxic substances goal (#6) focuses on protecting fish, wildlife and human health from the adverse effects of toxic substances. While the Plan targets removing the fish and game consumption advisories, it refers to the "most stringent" rather than current consumption advisory levels. This language was used because what is considered safe may change over time. The current FDA guidelines were developed with consideration for both health and economic impacts. New information may alter what is considered a safe level of contaminants to consume in the future. The goal also provides for protecting health from other waterborne exposure routes - for example, so that the water is safe to swim in and that existing drinking water supplies (located outside the AOC in the northern portion of Green Bay) are not impaired. Protection of fish and aquatic life, as well as other animals that come in contact with contaminants through the food chain or direct exposure, is another important part of the goal. A concern is limiting the exposure of endangered species, Forester's and common terns to contaminants through the food chain. Another concern is eliminating conditions that are acutely toxic to fish and aquatic life such as high levels of ammonia or discharges that bioassays show to be acutely toxic. The goal also provides for the protection of fish and aquatic life from the long-term impacts of chronic toxicity especially in critical habitat such as spawning areas.

Achieving the Plan's toxic substances goal is consistent with the Great Lakes Water Quality Agreement's objective that "The discharge of toxic substances in toxic amounts be prohibited and the discharge of any or all persistent toxic substances be virtually eliminated." The Plan's Key Actions #3 and #11 are to "Eliminate Toxicity of Industrial and Municipal and other Point Source Discharges" and "Virtually Eliminate Toxicity Caused by Nonpoint and Atmospheric Sources."

The final goal (#7) recognizes that people will need to work together to achieve the other plan goals and that many people can benefit from their achievement.

Achievement of the goals of the Remedial Action Plan will also have beneficial effects far beyond the boundaries of the Area of Concern. For example, the Area of Concern is the most heavily stressed region of the Green Bay ecosystem. It is anticipated that its hypereutrophic status and high phosphorus loads will make the area insensitive to initial phosphorus reductions. As phosphorus concentrations are reduced, improvements in the Area of Concern will begin slowly at first and then more quickly with time and additional phosphorus reductions. Middle Green Bay, the area north of the Area of Concern, will be much more sensitive to initial phosphorus reductions and thus improvements in this part of the Bay will be noticeable much earlier in the implementation process. In addition, implementation of management recommendations for watersheds in the drainage basin will improve water quality, fish and wildlife habitats, and recreation uses in many tributary streams as well as the Lake Winnebago pool lakes.

Plan Objectives

Plan objectives provide specific guidance for what conditions should be met if the Plan's goals are to be achieved. Tables 4 and 5 at the end of this chapter contain the specific objectives for fish and wildlife popula- tions, **habitat**, water **quality**, and toxic **substances**, respectively, in the Area of Concern. A summary list of these objectives is provided below along with a listing of the Plan's objectives relating to institutional and socio-economic considerations. Shoreline use objectives have been established by local land use plans (Figure 11). Specific water use and recreational use objectives were not detailed during the development of the Remedial Action Plan. They could be developed as part of its implementation. Refer to the technical advisory committee reports and the comments column of Tables 4 and 5 for an explanation of and the rationale for the specific objectives.

BIRDS

* Maintain Forster's and common tern populations.

* Track cormorant population levels.

* Support more dabbling and diving ducks.

* Protect shorebirds **and marsh nesting birds**.

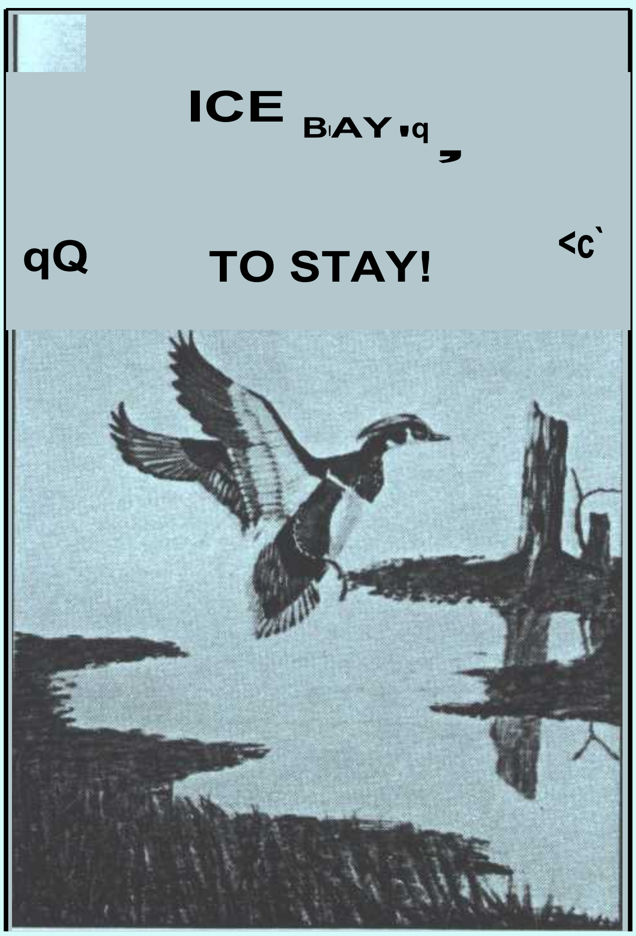

Figure 10.

(Artist: Eric Hanso
Grade 9, Oconto Falls
High School)

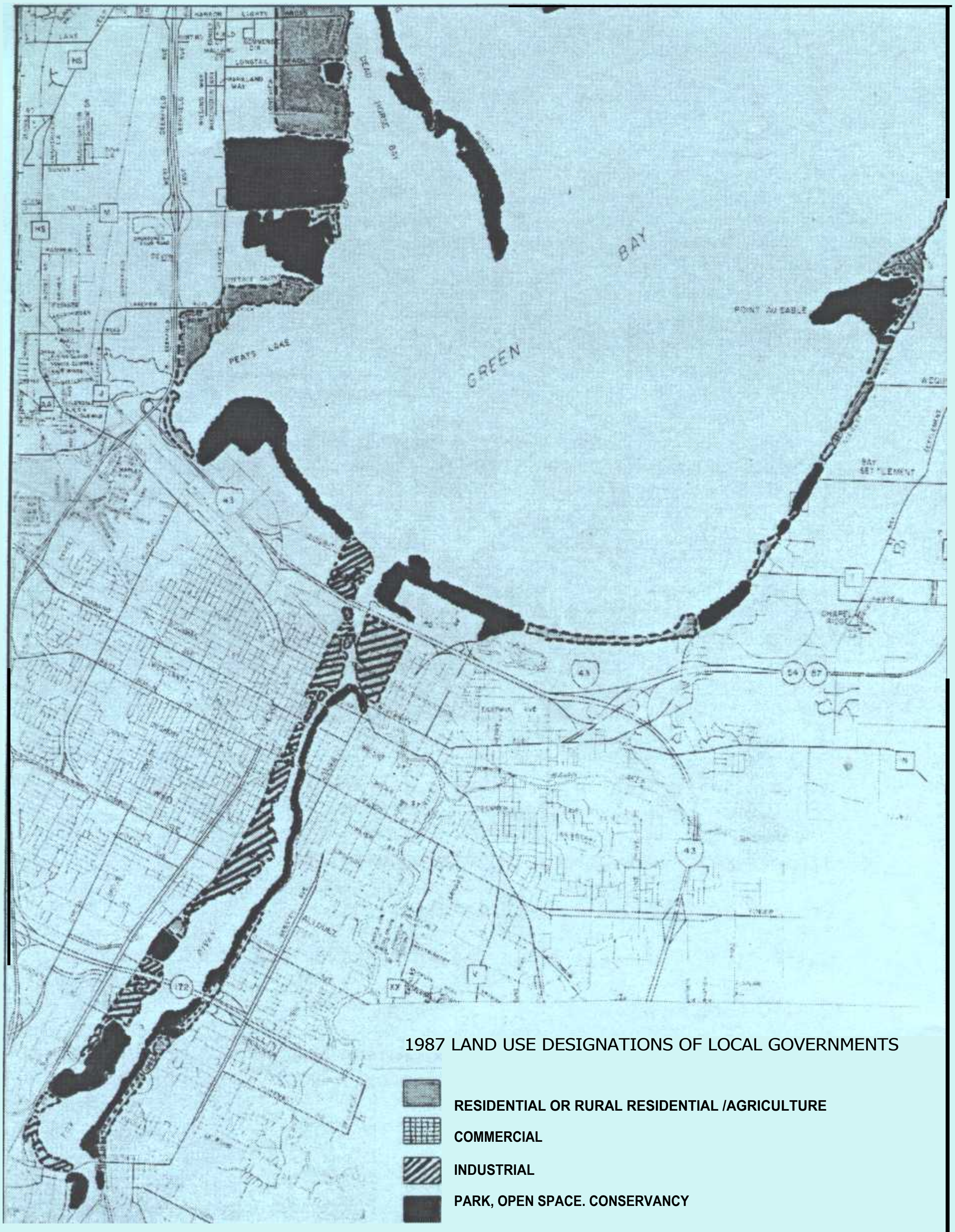

Figure 11. Shoreland Use Objectives Defined in Local Government Land Use Plans (information provided by Brown County)

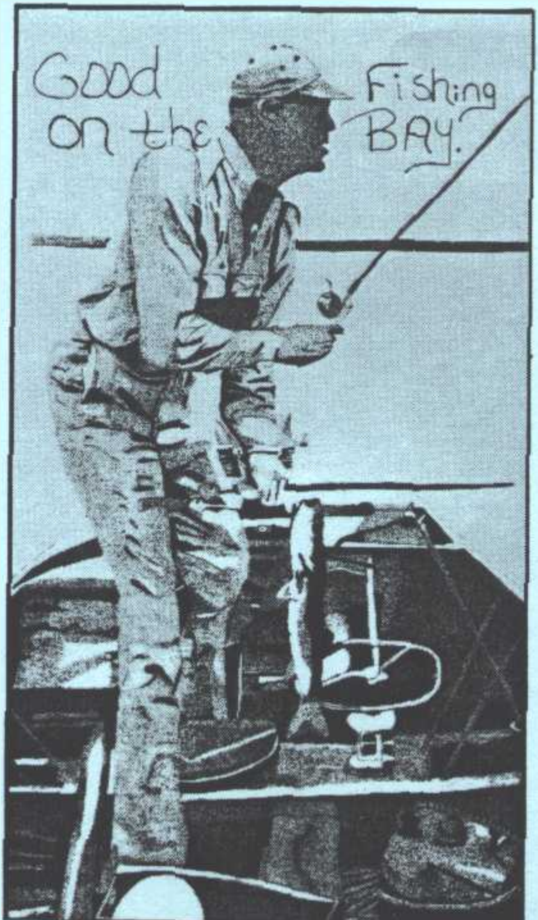

Figure 12.

(Artist: Liane Lentz, Grade 11, Oconto Falls High School)

FISH

* Achieve desired walleye, yellow perch, northern pike, and muskellunge populations and age classes.

* Achieve major reductions in carp populations.

* Protect against sea lamprey infestations.

* Shift fishery biomass to increased predator and sport species.

OTHER AQUATIC LIFE

* Develop **a** diverse community of pollution intolerant benthic organisms including borrowing mayflies, fingernail clams, snails, and other mayflies and caddisflies.

* **Improve** trophic **dynamics**.

WILDLIFE

* Maintain muskrat and mink populations.

* Identify objectives for other wildlife.

HABITAT

* Maintain emergent wetlands and increase submergent vegetation.

* Protect marsh nesting bird and shorebird habitat.

* Protect other important habitat for fish, aquatic life and other wildlife.

* Establish sanctuaries for endangered species.

WATER QUALITY

* Maintain adequate dissolved oxygen to support fish and aquatic life.

* Increase water clarity to provide for safe swimming and increased rooted aquatic vegetation.

* Reduce algae to improve water clarity and reduce nuisance conditions.

* Reduce total phosphorus concentrations and loads to reduce algae.

* Reduce suspended solids loads, to increase water clarity, improve **aquatic habitat**, and reduce the need for **navigational** dredging.

* Reduce bacteria levels to meet state health standards for swimming and recreation uses.

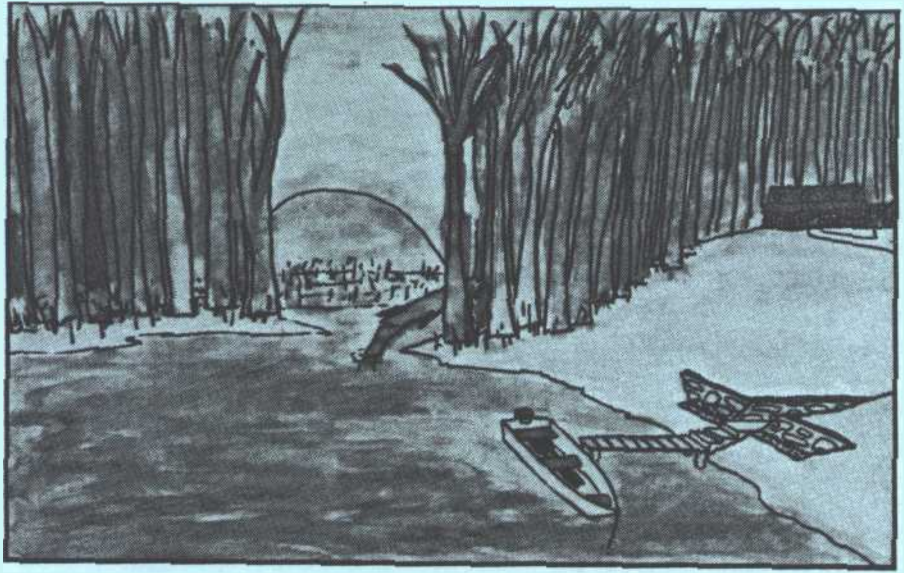

Figure 13. "Shouldn't Everything Be This Way" (Artist: Matt Hendricks, Bay View Middle School)

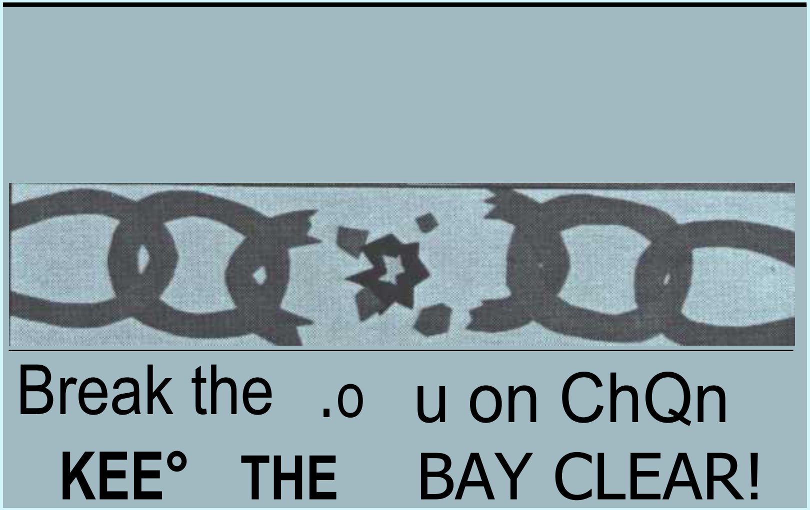

Figure 14. Break the Pollution Chain -- Keep the Bay Clean
(Artist: Joe Delwiche, Grade 5, Holy Family School)

TOXIC SUBSTANCES

* Reduce toxic contaminants in fish and wildlife to meet the most stringent state and/or federal consumption advisory levels (i.e., edible fish, etc.).

* Adequately protect swimming and other recreational uses from possible impacts of toxic substances.

* Reduce toxic contaminants in endangered species to levels that don't impair reproductive success.

* Reduce contaminants in the fish to levels that protect birds and animals which consume fish.

* Reduce contaminants in the sediments to levels which indicate clean sediments and protects birds and animals which consume fish.

* Reduce toxic contaminants in the water and sediment to levels that are not acutely toxic to fish and aquatic life.

* Reduce toxic contaminants in the water column to levels that are not chronically toxic to fish and aquatic life outside mixing zones, and within mixing zones, as needed, to meet fish and wildlife•population objectives.

* Eliminate the discharge of toxic substances in toxic amounts from all sources.

INSTITUTIONAL AND SOCIO-ECONOMIC OBJECTIVES

* Include social and economic factors as a consideration in management decisions in the Green Bay ecosystem. Long range as well as immediate impacts should be included. Some of these social and economic factors are: public values (likes and dislikes); existing and potential users of the Bay; how people want to use the Bay and spend their time; population growth and patterns; economic impacts and trade-offs; and future trends.

* Seek innovative solutions to environmental problems that benefit both the environment and economy.

* Replace the adversarial approach to alternative uses of the Bay and River with an exchange approach in which all parties end up better off rather than one necessarily losing and another gaining.

* Ensure that benefits to the larger population of alternative uses of the lower Bay are properly considered in land and water use decisions.

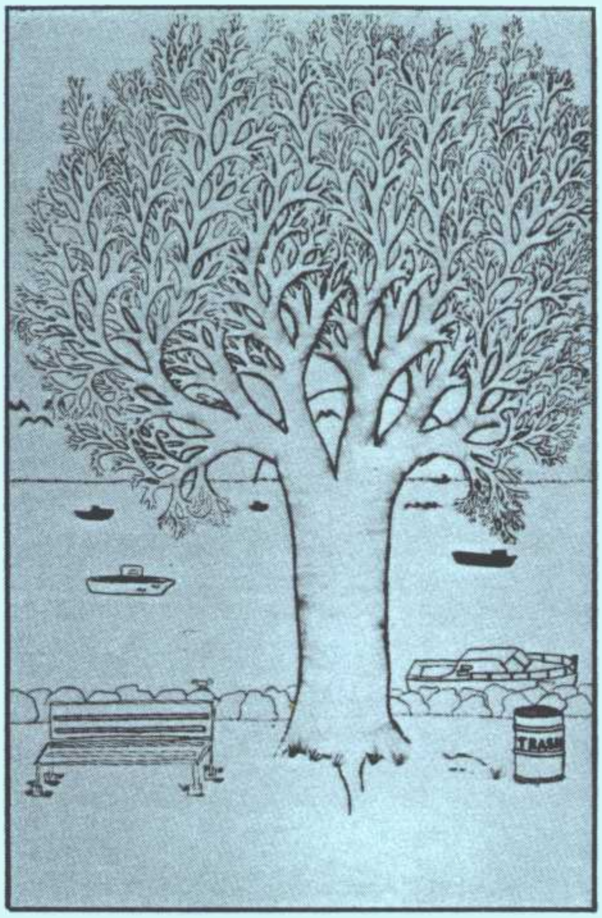

Figure 15. "Keep it Clean and Beautiful" (Artist: Stacy Tostrop, Grade 8, Bay View Middle School)

* Ensure that the public's and manager's perceptions of the lower Bay and River quality match actual conditions and recognize the River's and Bay's potential and value as a resource.

* Make restoration of the Bay and River a priority concern of all citizens and community leaders.

* Ensure that management efforts address major public concerns.

* Include public participation as an integral ingredient in the development and implementation of management programs that affect the Bay and River.

* Develop an institutional structure that will ensure implementation of the Remedial Action Plan and provide for an ongoing cooperative effort to protect and enhance Lower Green Bay and the Fox River Ecosystem.

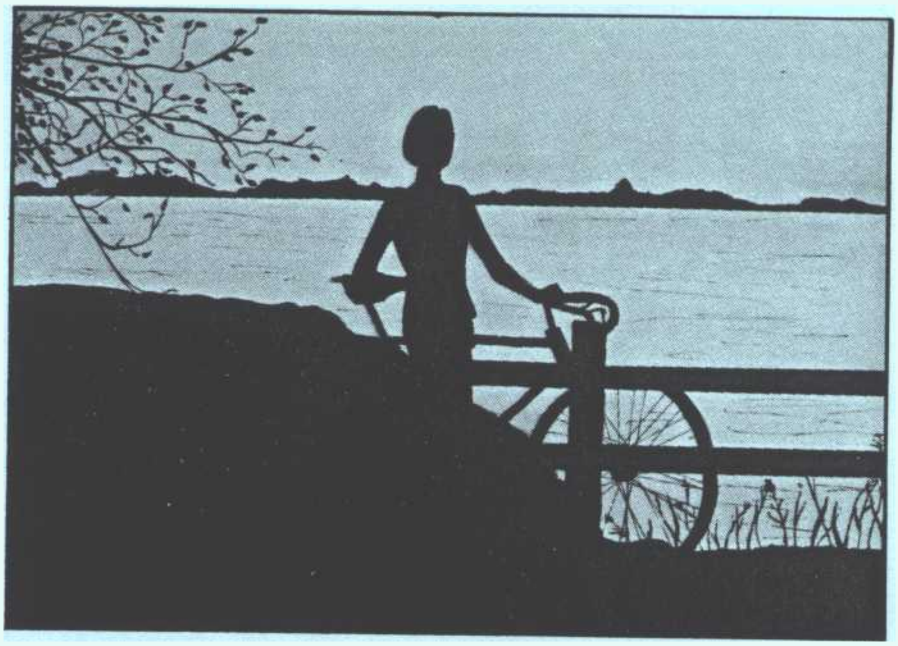

Figure 16. Untitled (Artist: Chris Collins, Grade 12,
Oconto Falls High School)

TABLE 4.

Fish and Wildlife Population Objectives Lower Green Bay and Fox River Area of Concern

Objective	Desired Annual Population		Desired Population Density		Comments
BIRDS					
Maintain Forster's tern populations.	Average: Minimum:	400–600 nesting pairs 50 nesting pairs			Endangered species. Minimum numbers during high water periods when less nesting habitat is available.
Maintain common tern populations.	Average: Minimum:	500 nesting pairs 100 nesting pairs			Endangered species. Minimum would be during high water periods when less nesting habitat is available.
Track cormorant population levels.	Average: Minimum:	400–700 nesting pairs To be determined			Formerly on state threatened species list. Population now re-established and no management is needed.
Support more dabbling ducks.	Average: Minimum:	5,000 peak concentration			Similar numbers were observed in 1978.
	Average: Minimum:	To be determined To be determined	Average:	Produce 1 duck per acre brood water	Brood water is marsh area with less than 24 inches water and 50% emergent vegetation and 50% open water.
Support more diving ducks.	Average:	2 million duck use days on west shore north to Peshtigo Point			This is twice the numbers observed in 1978. Includes larger area than AOC because population information is not available for the AOC alone.
Protect marsh nesting birds.	Average: Minimum:	To be determined To be determined	Minimum:	15 nesting pairs per acre habitat	Habitat is persistent emergent vegetation.
Protect shorebirds.	Average: Minimum:	To be determined To be determined			Habitat is unconsolidated shoreline (sand and mud) with periodic inundation.
WILDLIFE					
Maintain muskrat populations.	Average: Minimum:	To be determined To be determined	Average:	15 muskrats per acre habitat	Habitat is emergent vegetation where there is sufficient water depths to prevent complete freezing.
Maintain mink population.	Average: Minimum:	To be determined To be determined	Average:	1 mink per 60 acres habitat	Habitat is wooded areas adjacent to lakes and marshes.
Other wildlife	Average: Minimum:	To be determined To be determined.	To be determined		Studies needed to determine goals for other wildlife and nongame species.

TABLE 4.

Fish and Wildlife Population Objectives Lower Green Bay and Fox River Area of Concern (continued)

Objective	Desired Annual Population	Desired Population Density	Comments
FISH			
Achieve desired walleye population.	Average: 70,000 adults (approx.)	7 adults per acre	Harvest is close to 30,000/year now. May need to reduce harvest to maintain population and sustain yield.
Achieve desired yellow perch populations and age classes.		2,600 yearlings and older perch (at least 5 age classes) per trawl hour (August average) at index sites	
Achieve desired northern pike populations.	Average: 20,000 adults (approx.)	2 adults per acre	Population numbers may currently be low.
Achieve desired muskellunge populations.	Average: 3,300 adults (approx.)	1 adult per 3 acres	Species not currently found in AOC.
Achieve major reduction in carp populations.		At least 50% reduction as measured by similar decline in relative abundance at index trawl stations	Good population estimate for carp in AOC are not available. They may form a major portion of the fish biomass in AOC. The significance of their impact is uncertain.
Protect against infestations of sea lamprey	To be determined	To be determined	
Shift fishery biomass to increased predator and sport species.		Biomass Range: 200 to 300 pounds per acre Predator/Prey ratio range: 1/10 to 1/20	This objective describes and quantifies a positive change in biomass that reflects increasing food chain efficiency and a shift to a balanced and more desirable fishery.
OTHER AQUATIC LIFE			
Develop a diverse community of pollution intollerent benthic organisms including:		Average: 3,000-4,000 organisms per sq. meter	These are based on numbers observed historically in 1939. Number is for pollution intollerent organisms. R - river, B - Bay
Hexagenia (burrowing mayfly),		Average: 400-500 per m^3 (R)	
Fingernail clams,		Average: 500-1,000 per m^3 (B)	
Snails, and		Average: 250-500 per m^3 (B)	
Mayflies and Caddisflies.		Average: 250-500 per m^3 (R)	
Improve trophic dynamics.	To be determined	To be determined	Increased use of algae by the pelagic food chain to produce more fish and decrease the amount of algae in the detrital food chain to reduce biochemical oxygen demand.

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TABLE 5. Habitat, Water Quality, and Toxic Substances Objectives, Lower Green Bay and Fox River Area of Concern

Objective	Parameter to Measure	Desired Concentration or Level	Where and When	Comments
HABITAT				
Maintain emergent wetlands.		Minimum: 2272 acres	During low water levels, along West Shore in Area of Concern	May be refined based on further analysis. See recommendation 6.2. Areas are based on amounts observed in 1964 and 1974.
		Minimum: 384 acres	During high water levels, along West Shore in Area of Concern	
		To be determined	East River and Duck Creek	
Increase submergent vegetation.		To be determined	Along West Shore in Area of Concern	See Recommendation 6.2.
			East River and Duck Creek	
Protect shorebird habitat.		To be determined.		See Recommendations 6.2 and 6.19.
Protect habitat for marsh-nesting birds.	To be determined.	To be determined.	To be determined	
Protect other important habitat for fish, aquatic life, wildlife, and endangered species.		To be determined.	Fox River	See Recommendations 6.2, 6.16, 6.18, 6.19 and 16.2.
WATER QUALITY				
Maintain adequate oxygen to support fish and aquatic life.	Dissolved oxygen	Minimum: 5 mg/L (ppm)	Everywhere, all times	Need at least 5 mg/L at all times. May need higher during spring when fish spawn. Generally being met, however there is a 2 mg/L (ppm) winter water quality standard variance in the lower bay.
Increase water clarity to provide for safe swimming and increased rooted aquatic vegetation.	Secchi disk depth	Average: 2.3 - 4.3 feet (0.7 - 1.3 m)	Everywhere, summer	Current average is 1.6 feet (0.5 m) State guidelines suggest 4 feet (1.3 m) needed for safe swimming. Achieved by reducing suspended sediment and algae (see below).
Reduce algae to improve water clarity and reduce nuisance conditions.	Chorophyll-a	Average: 35-45 ug/L (ppb)	Everywhere, summer	Current level is 67 ug/L. Although still highly eutrophic conditions, the frequency and biomass of blue-green algae booms should be reduced. Achieved by reducing phosphorus concentrations (see below).

TABLE 5. Habitat, Water Quality, and Toxic Substances Objectives, Lower Green Bay and Fox River Area of Concern

Objective	Parameter to Measure	Desired Concentration or Level	Where and When	Comments
Reduce total phosphorus concentrations and loads to reduce algae.	Total phosphorus	Average: 100–125 ug/L (ppb)	Everywhere, summer	The current level is 190 ug/L. Corresponds to a normalized annual total phosphorus load of 53–90 mg/m'/yr, current normalized loads are 170 mg/m'/yr. Therefore a 40% to 50% reduction in total phosphorus annual loads would be needed.
Reduce suspended solids loads to reduce sedimentlation, increase water clarity and improve aquatic habitat.	Suspended Solids	To be determined		Current load is approximately 200 million pounds per year. Note: this objective should be set also with consideration for toxic reduction objectives.
Reduce bacteria levels to meet state health standards for swimming and recreational use.	Fecal coliform	Should not exceed a log mean of 200 per 100 ml in 5 samples or exceed 400 per 100 ml in 10% of samples taken in 30 day period.	Everywhere, summer	Current state standard to provide for safe swimming. Desired levels may change with new information and development of new statewide guidelines.
TOXIC SUBSTANCES				
Reduce toxic contaminants in fish and wildlife to meet the most stringent state and/or federal consumption advisory levels (i.e., edible fishery, etc.).	Total PCBs	Less than 2 mg/g (ppm)*	Everywhere, all times, for fillets of all fish commonly eaten	*Indicated parameter levels based on current FDA guidelines. Desired levels may change with new information and development of new guidelines.
	Total PCBs	Less than 3 mg/g reported on a lipid basis.*	Everywhere, all times for all ducks commonly eaten	*Indicated parameter levels based on current FDA guidelines. Desired levels may change with new information and development of new guidelines.
Adequately protect swimming and other recreational uses from possible impacts of toxic substances.	To be determined.	To be determined.	To be determined.	
Reduce toxic contaminants in endangered species to levels that don't impair reproductive success.	DDE	Less than 4 ug/g (ppm)	In common tern eggs, all times	
	Total PCBs	Less than 3 ug/g (ppm)	In Forster's tern eggs, all times	Successful reproduction is defined as 1.0 fledged young/pair on natural nesting sites and 1.5 fledged young/pair on artificial nest sites.

TABLE 5. Habitat, Water Quality, and Toxic Substances Objectives, Lower Green Bay and Fox River Area of Concern

Objective	Parameter to Measure	Desired Concentration or Level	Where and When	Comments
Reduce toxic contaminants in fish tissue to levels that protect birds and animals which consume fish.	Total PCBs	Less than 0.1 ug/g (ppm)	Everywhere, all times, for whole fish	This is IJC objective for PCBs.
Reduce toxic contaminants in sediments to levels which indicate clean sediments and protect birds and animals which consume fish.	Total PCBs	Less than 0.05 ug/kg (ppb)	Everywhere, all times	Proposed objective for clean sediments in Wisconsin. Current criteria used in Ontario.
Reduce toxic contaminants in the water and sediment to levels that are not acutely toxic to fish and aquatic life.	To be determined.	To be determined.	Everywhere, all times	Measurements should be based on bioassay and toxicity criteria established as part of state's development of water quality standards for toxic substances.
Reduce toxic contaminants in the water to levels that are not chronically toxic to fish and aquatic life.	To be determined.	To be determined.	Outside the mixing zone, all times Inside the mixing zone as determined to be necessary to meet fish and wildlife population objectives.	Measurements should be based on bioassay and toxicity criteria established as part of State's development of water quality standards rule for toxic substances. 1
HABITAT				
Virtually eliminate the discharge of toxic substances in toxic amounts from all sources.	To be determined.	To be determined.	To be determined.	Criteria will be established as part of State's development of water quality standards and effluent limit rules for toxic substances.

LOWER GREEN BAY REMEDIAL ACTION PLAN:

for the Lower Fox River and Lower Green Bay

Area of Concern

IV. THE STRATEGY: KEY ACTIONS AND RECOMMENDATIONS FOR A RESTORED BAY AND RIVER

INTRODUCTION

This chapter outlines the Plan's overall strategy to restore the Lower Green Bay and Fox River. This strategy is comprised of a series of key management actions. These Key Actions listed in Table 6 will direct resource managers, local municipal officials and others in restoring beneficial uses to Lower Green Bay and the adjacent Fox River. These actions are necessary in achieving a clean bay and river which we can all enjoy by year 2000.

Initially the Plan's Technical Advisory Committees identified over 40 objectives for the Lower Green Bay Remedial Action Plan. The Plan however consolidates these objectives and recommendations into 16 items designated as Key Actions. These Key Actions were identified during a workshop coordinated by Dr. H. J. Harris (1987). To affect a complete restorative strategy, the Plan divides these Key Actions into those that either (1) restore, protect and enhance the ecosystem; (2) improve people's use of the ecosystem; or (3) are directed toward monitoring and research.

The reader will also note the Key Actions are placed in one of three categories - high, medium, and low -- with regard to perceived priority. The priority rankings are based on the following criteria: extent of remedial effects on the ecosystem; importance with regard to timing; goodness of fit with the Citizens Advisory Committee's Desired Future State; and technical probability of implementing.

Associated with each Key Action are a series of recommendations. These specific recommendations act as a roadmap to guide agencies, organizations, federal, state and local governments, citizens, and private entities on what needs to be done to accomplish each Key Action. The Plan contains 120 management recommendations.

You may note differences between the final Remedial Action Plan recommendations and those within the TAC reports and draft plan. These changes were in response to comments of the Citizens Advisory Committee, WDNR staff, other TACs, and the public during review. There was also a need to consolidate and clarify recommendations in the TAC reports and present them in a similar format.

In addition, refer to the "Guide to Plan Key Actions" and "Guide to Plan Recommendations" for information that may help as you read the Plan's recommendations.

Implementation guidelines are found in Chapter V of this plan "Where to go from here? -- Implementation of the Remedial Action Plan."

Guide to the Plan's Key Actions

The discussion of each Key Action begins with a chart listing the title or heading of each recommendation included under the Key Action. The chart indicates the overall priority of the Key Action. The chart also indicates the overall priority of each recommendation both in relation to the Key Action and in relation to all other recommendations in the Plan. The page where the recommendation can be found is also listed.

The chart is followed by a brief narrative describing the basis for the Key Action and its recommendations. The narrative includes highlights of the environmental effects and use improvements that might be anticipated when Key Action recommendations have been accomplished. You will note however many of the Key Actions are interdependent and can not be achieved without substantial progress being made in other Key Actions. A table that summarizes this information follows the narrative.

The narrative also includes a brief summary of citizen comments and suggestions received on the draft plan. Refer to Appendix C for a more detailed summary of citizen comments. Some of the Plan's recommendations were changed to identify a process for resolving issues that were identified during the review process. Many of the explanations of the recommendations were expanded to note concerns that were identified in the review of the Plan so that they can be considered by those implementing the Plan. Also please note that accomplishing many of the recommendations will require administrative rule changes, permit changes and other actions which are subject to due process and provide additional opportunity for public review and comment.

TABLE 6. Key Actions For A Restored Bay and River

TO RESTORE, PROTECT AND ENHANCE THE ECOSYSTEM

High Priority

1. Reduce Phosphorus Inputs to the River and Bay from Nonpoint and Point Sources.

2. Reduce Sediment and Suspended Solids Inputs.

3. Eliminate Toxicity of Industrial, Municipal and other Point Source Discharges.

4. Reduce Availability of Toxic Chemicals from Contaminated Sediments.

5. Continue Control of Oxygen-Demanding Wastes from Industrial and Municipal Discharges.

Moderate Priority

6. Protect Wetlands, and Manage Habitat and Wildlife.

7. Reduce/Control Populations of Problem Fish.

8. Increase Populations of Predator Fish.

Lower Priority

9. Reduce Sediment Resuspension.

10. Reduce Bacteria Inputs from Point and Nonpoint Sources.

11. Virtually Eliminate Toxicity Caused by Nonpoint and Atmospheric Sources

TABLE 6. Key Actions For Restored Bay and River (Continued)

TO IMPROVE PEOPLE'S USE OF THE ECOSYSTEM

High Priority

12. Create a Coordinating Council and Institutional Structure for Plan Implementation.

13. Increase Public Awareness of, Participation in, and Support for River and Bay Restoration Efforts.

Moderate Priority

14. Enhance Public and Private Shoreline Uses.

MONITORING AND RESEARCH

15. Monitor to Evaluate the Effectiveness of Remedial Actions, Track Trends, and Identify New Problems.

16. Conduct Research to Better Understand the Ecosystem, Its Problems and How to Remedy Them.

Guide to Plan Recommendations

The following section is a guide to the format and interpretation of the recommendations contained in this Plan. The write-up follows the same format as the individual recommendations.

#1. THE TITLE PROVIDES AN ABBREVIATED SUMMARY OF THE RECOMMENDATION. The recommendation is usually stated in one or two sentences or a short paragraph. Different steps that should be done sequentially or simultaneously as part of the recommendation are also listed and indicated by a letter "a.", "b.", etc. Target dates for completion of the step are indicated in parentheses. Projected dates for completion indicate that an activity has been initiated. Ongoing activities are also noted.

a. The first step you should take to accomplish the recommendation. (Target date: 1989)

b. The second step you should take to accomplish the recommendation. (Target date: 1992)

c. Another step to be done simultaneously with "b". (Ongoing)

d. The last step to take in accomplishing the recommendation. (Target date: 1996)

Recommendations are listed and discussed under the highest priority key action to which they substantially contribute. Many recommendations contribute to more than one key action. This is noted and cross referenced.

All recommendations are numbered sequentially within the key action that they are discussed. Note that the numbering system used for the key actions and recommendations does not indicate priorities. Numbers are used for the easy reference of the reader.

EXPLANATION: A brief rationale and explanation of why the recommendation is important and how it might be accomplished follows the recommendation. Some of the discussion and comments that were received on the Technical Advisory Committee (TAC) recommendations may also be noted.

At the end of each explanation you are referred to related recommendations in the TAC Reports and elsewhere in the Plan. The TAC reports often provide a more detailed explanation as well as discussion of the problem the recommendation addresses.

The TACs and the abbreviations used to reference their reports are:

Biota and Habitat Management TAC	B&H
Nutrient and Eutrophication Management TAC	N&E
Toxic Substances Management TAC	TOXICS
Institutional TAC	INST

Citizen Comments: A summary of citizen comments on the draft plan's recommendation follows the explanation.

Following the explanation the recommendation's priority both for the Key Action and the entire plan is indicated. Who should contribute to the implementation of the recommendation is also indicated followed by an estimated cost and potential funding sources.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: This list indicates people and organizations from both the public and private sector who should help implement this recommendation. Table 7 provides a guide to agency abbreviations used to list public sector participants. Table 8 provides similar information for the private sector.

ESTIMATED COST AND POTENTIAL FUNDING SOURCES: Total project costs or annual maintenance or program costs for most of the recommendations are in the Plan. Costs are indicated as very low to extremely high based on general cost estimates provided by the technical advisory committees. Reference Table 9 for cost categories. Where available more specific cost figures are indicated. However, often a feasibility study is required to determine specific implementation costs. The costs are discussed as a range of values to indicate the order of magnitude of the cost, and provide a basis for evaluating the relative cost of different recommendations. Costs of all recommendations are summarized in Chapter V. Costs of ongoing programs, legally mandated actions, or projects with existing funding may be noted. However, only new initiatives that would require new funding sources or require an agency or organization to shift existing program priorities to new activities are included in the Remedial Action Plan's cost analysis. Potential funding sources are briefly listed for high priority recommendations.

TABLE 7. Who is Responsible for Contributing to a Clean Bay and River: Public Sector

Abbreviation	Name
ASCS	Agricultural Stabilization and Conservation Service, United States Department of Agriculture
Cities	City governments
COE	United States Army Corps of Engineers
Council	Coordinating Council for Implementation of the Remedial Action Plan
Congress	United States Congress
Counties	County government and agencies
FVWQPA	Fox Valley Water Quality Planning Agency
GLFC	Great Lakes Fishery Commission
GBMSD	Green Bay Metropolitan Sewerage District
LCCs	Land Conservation Committees (of county boards)
Legislature	Wisconsin Legislature
Laboratories	Public (and private) laboratories
NOAA	National Oceanic and Atmospheric Administration (?)
POTWs	Publicly owned treatment works (also municipal treatment plants)
Researchers	University and other researchers
RPCs	Regional Planning Commissions
SCS	Soil Conservation Services, United States Department of Agriculture
Sea Grant	University of Wisconsin Sea Grant Institute
Towns	Town governments
USGS	United States Geological Survey
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USDA	United States Department of Agriculture
UWGB	University of Wisconsin—Green Bay
UWEX	University of Wisconsin—Extension
Villages	Village governments
WDATCP	Wisconsin Department of Agriculture, Trade and Consumer Protection
WDHSS	Wisconsin Department of Health and Social Services
WDILHR	Wisconsin Department of Industry, Labor and Human Relations
WDNR	Wisconsin Department of Natural Resources
WDOA	Wisconsin Department of Administration
WDOD	Wisconsin Department of Development
WDOT	Wisconsin Department of Transportation
WGNHS	Wisconsin Geologic and Natural History Survey
WSLH	Wisconsin State Laboratory of Hygiene

TABLE 8. Who is Responsible for Contributing to a Clean Bay and River: Private Sector

Name of Group	Explanation or Examples
Boating Clubs	Green Bay Yacht Club, etc.
Chamber of Commerce	
Citizens	
Citizen Groups	League of Women Voters
Commercial Fishermen	
Commercial Operators	Gas stations, parking lot owner, etc.
Conservation Groups	Brown County Conservation Alliance, Ducks Unlimited, Trout Unlimited, etc.
Developers	Builders, land developers and contractors
Environmental Groups	Izaak Walton League, Lake Michigan Federation, Clean Water Coalition, Citizens for a Better Environment
Farmers	
Fishing Clubs	Green Bay Fishing Club, Green Bay/Lake Michigan Sport Fishermen
Industry	Industry, in general
Industrial dischargers	Industries with wastewater discharges to the river and bay
Industrial dischargers to POTWs	Industries that discharge to Publicly owned treatment plants (POTWs)
Laboratories	Private and public laboratories
Shoreline owners	Shoreline property owners

TABLE 9. Cost Ranges Used to Discuss Cost of Implementing Plan Recommendations

Project or Capital Costs

Extremely High			'$10,000,000
Very High	$1,000,000	to	$10,000,000
High	$250,000	to	$1,000,000
Moderate	$50,000	to	$250,000
Low	<$50,000		
Very Low	<$10,000		

AnnualOperationand Maintenance, or Program Management Costs

Very High			>$1,000,000
High	$100,000	to	$1,000,000
Moderate	$10,000	to	$100,000
Low	<$10,000		

KEY ACTION #1: REDUCE PHOSPHORUS INPUTS TO THE RIVER AND BAY FROM NONPOINT AND POINT SOURCES

Key Action's Priority: High

	Action Recommendation	Priority for Key Action	Priority for Plan	Page
	Water Quality Standards and Point Source Control			
1.1	Further evaluate phosphorus point source loads and treatment plant capabilities, making reductions in phosphorus loads as soon as possible.	High	High	68
1.2	Establish phosphorus water quality standards.	High	High	70
1.3	Establish wasteload allocation for phosphorus if necessary to achieve desired reductions.	High	High	70
	Nonpoint Source Controls			
1.4	Implement comprehensive watershed management projects to reduce phosphorus and other pollutant loads from nonpoint sources.	High	High	73
1.5	Seek innovative and alternative ways to achieve nonpoint source management objectives.	High	High	75
1.6	Require and use construction erosion and storm-water runoff controls	Mod.	Mod.	76
1.7	Require the use of shoreland buffer and green strips.	High	Mod.	77
1.8	Adopt animal waste management ordinances and use best management practices.	Mod.	Mod.	78
	In-Water Management			
1.9	Consider in-river phosphorus removal.	High-Mod.	Mod.	78

Action Recommendation		Priority for Key Action	Priority for Plan	Page
	Other Recommendations to Help Reduce Phosphorus Inputs from All Sources			
11.1*	Evaluate and control runoff of toxic substances from all watershed sources.	Mod.	Mod.	175
11.2*	Evaluate and, as necessary, control urban stormwater discharges.	Mod.-Low	Mod.	175
11.4*	Initiate industrial lot and urban runoff control demonstration projects.	Low	Lowl	178

*Reference Key Action Recommendation for more details.

KEY ACTION #1: DECREASE PHOSPHORUS INPUTS TO THE RIVER AND BAY FROM NONPOINT AND POINT SOURCES

High levels of phosphorous stimulate excessive algae production and contribute significantly to problems of water turbidity in Lower Green Bay and the Fox River. Reducing the amount of phosphorous entering the ecosystem from point and nonpoint sources is an important step toward reducing algae production, lessening turbidity, and restoring many beneficial uses. However, the level of phosphorus reduction necessary to achieve desired water quality improvements is moderately uncertain.

Combining reductions in phosphorous inputs with other remedial actions may work additively to achieve desired changes to the ecosystem. Therefore, the strategy for implementing this action should be flexible in order to respond to changes that may occur as other actions are implemented during the next 10 years. The strategy should contain a combination of point and nonpoint source controls that will allow future adjustment, benefits outside the Area of Concern, and a reasonable certainty of reductions in phosphorous inputs.

Phosphorous load reductions can be achieved by effluent limits and watershed management projects such as erosion control and stormwater runoff, riparian buffer strips, animal management, urban nonpoint source controls and correction of failing septic systems.

Table 10 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Primary effects of limiting phosphorous inputs into the ecosystem are a reduction of algae densities which, in turn, should reduce dissolved oxygen fluctuations in the lower bay. Lower algae densities also will contribute to improved water clarity and increased growth of submerged vegetation.

Important secondary effects include improving the feeding efficiency of sight-feeding fishes and fish-eating birds, reducing the numbers of bacteria and viruses in the water column, increasing the use of the resource by waterfowl, improving fish spawning and nursery habitat and the habitat for some forms of benthic organisms. Combined together, these various effects may beneficially alter the existing food web.

USE IMPROVEMENTS

This action will prompt the effects described above to some degree. These effects will be determined more strongly by the additive effects of the various actions, including not only phosphorous reductions but other actions such as reduced sediment and suspended solids inputs, carp control and increased populations of predator fishes. Other use improvements would include an enhanced aesthetic environment and reduced recreational and industrial fouling.

CITIZEN COMMENTS AND SUGGESTIONS

A number of people commented on various aspects of this Key Action. Several people noted that control of nonpoint sources should be given equal weight to point sources. They noted that point source controls alone will not be enough to achieve the necessary phosphorus reductions. Several questioned whether the traditional voluntary cost-share program for nonpoint source control will be adequate to achieve the needed phosphorus and sediment reductions. One person suggested that nontraditional farmer-based approaches should be tried such as the Sustainable Agriculture Project and the Iowa County Stewardship Project. Several people noted that the university and federal and state agricultural programs should spend more time researching and teaching farming practices that minimize the need for fertilizers and pesticides and reduce agriculture's impact upon water quality. One farmer noted he was getting good yields with less use of fertilizers. Another farmer noted that practices currently recommended to reduce soil loss require more pesticides and fertilizers to get comparable yields. One person noted that current economic conditions make it difficult for farmers to participate in nonpoint source management programs. Several people supported the establishment of a nonpoint source priority watershed in the East River and one group offered the Duck Creek watershed as a demonstration project.

Several people suggested that stricter standards and enforcement need to be established for nonpoint sources and they questioned whether such standards can be achieved through a voluntary basis, as is now the case. They recommended that the Legislature study the issue. They believed a more cost-effective approach to nonpoint source control is necessary.

One person recommended that a de minimus phosphorus loading should be determined at which point no further phosphorus reductions would be necessary. The person also suggested that treatment plants should not be required to reduce their phosphorus below the concentration necessary to maintain adequate biological treatment. Another person recommended that phosphorus limits be required in WPDES permits by 1991. One group questioned the use of a consensus approach, for any activity based on their experience with the Solid Waste Siting Bill.

Several people noted the need for stronger enforcement of existing local animal waste management ordinances.

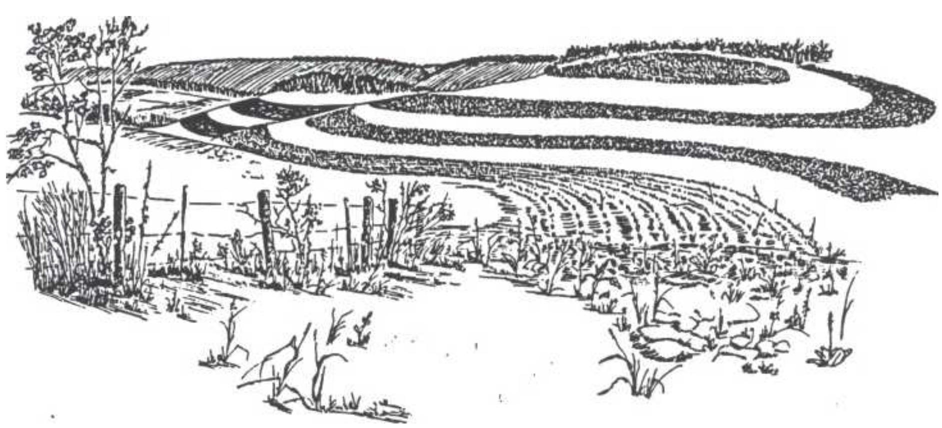

TABLE 10. Priority, Environmental Effects and Use Improvements Associated with Key Action #1.

KEY ACTION 1:	Reduce Phosphorous Inputs to the River and Bay from Nonpoint and Point Sources.
PRIORITY	High
ENVIRON. EFFECTS	Reduce algae. Improve water clarity. Increase growth of submerged vegetation. Increase numbers of diving and dabbling ducks. Reduce dissolved oxygen fluctuations. Alter existing food web. Improve fish spawning and nursery habitat. Improve habitat for benthic organisms. Improve feeding efficiency of sight-feeding fishes and fish-eating birds.
USE IMPROVE-MENTS	Meet legal water visibility requirements for swimming at public beaches. Increase recreational opportunities. Improve waterfowl hunting. Improve sport and commercial fishing. Improve aesthetics. Increase diversity of fishes. Reduce fouling of ships and recreational vessels.
COMMENTS	The level of phosphorous reduction will determine the extent of effects. Improvements won't occur without phosphorous reduction. Moderate uncertainty exists as to required level of reduction. Potential exists for conflict of submerged vegetation affects recreational boating and swimming.

Back

1.1 FURTHER EVALUATE PHOSPHORUS POINT SOURCE LOADS AND TREATMENT PLANT CAPABILITIES, MAKING REDUCTIONS IN PHOSPHORUS LOADS AS SOON AS POSSIBLE.

a. Routinely monitor and report the concentrations and loads of total phosphorus discharged to the Fox River, lower Green Bay and their tributaries. (Target date: 1988 ongoing)

b. Conduct feasibility studies to determine how to cost-effectively meet discharge limit requirements of 0.1 mg/L, 0.3 or 0.5 mg/L total phosphorus. (Target date: 1989)

c. Reduce as soon as possible phosphorus loads to that which can be achieved cost-effectively with existing treatment systems. A target of 0.3 mg/L total phosphorus is suggested. (Target date: 1990)

d. Use a consensus approach to establish the basis for point source and nonpoint source phosphorus load reductions and incorporate appropriate effluent limits into WPDES discharge permits as they are reissued. (Target date: 1989)

EXPLANATION: Better information is needed on source loads and treatment plant capabilities for phosphorus control. Better information is also needed on industrial discharges. Industries should evaluate their monitored and net discharge of phosphorus to the River and Bay. To assess total phosphorus loads from industry river intake and all discharges to the River and Bay including those via municipal wastewater treatment plants should be reported.

When a treatment plant can reduce phosphorus cost-effectively with their existing treatment system they should do so voluntarily as soon as possible to help improve river and bay water quality. A consensus approach could be used to implement needed reductions expediently. (Also see the explanation for the following recommendations in the TAC reports: N&E - 1, 3a, 3b, 15; and in this plan - 1.2, 1.3.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High.

WHO SHOULD ACT: Municipal treatment plants, Industrial discharges, WDNR, USEPA.

ESTIMATED COST AND POTENTIAL FUNDING SOURCES: Most municipal treatment plants which discharge to the Great Lakes tributaries are required to routinely monitor and report on the levels of phosphorus in their effluent. Industries less routinely report their phosphorus discharges. Twenty-six of the basin's larger industries are required to annually report how much phosphorus they discharge to streams and to municipal wastewater treatment plants by the State's Environmental Fees program (NR 101). Weekly monitoring of these 26 dischargers for total phosphorus in their influent and effluent would have a total annual cost of between $41,000 and $68,000. This estimate assumes monitoring costs of $15 to $25 per sample and that no industry currently monitors for phosphorus.

There are 40 discharges in the entire basin that contribute over 1000 pounds of total phosphorus per year to lower Green Bay. If a feasibility study for each of these discharges costs between $10,000 and $100,000 then total costs in the basin would be high to very high ($400,000 to $4,000,000).

Refer to recommendation 1.4 for costs of nonpoint source management. Costs of phosphorus control will be determined by the feasibility studies. It is not possible to estimate potential costs for industry for different levels of treatment with existing information.

Municipal treatment cost will be dependent on existing treatment plant design, **capacity** and concentration of phosphorus in the waste being treated. Generally 1.0 mg/L total phosphorus limits can be met with chemical treatment. Chemical treatment plus additional filtration units may be required for 0.5 mg/L and two stage chemical dosage and final effluent filtration may be required for 0.1 mg/L. Annual operation and maintenance costs depend both on sludge disposal costs and chemical addition costs. For each pound of phosphorus removed approximately 10 pounds of sludge are generated. At 90% removal levels approximately 19 pounds of alum (a chemical used to precipitate phosphorus) are needed for each pound of phosphorus removed. Other chemicals can also be used.

Costs of phosphorus treatment were evaluated at 5 municipal treatment plants in Wisconsin in 1982 and 1983. Phosphorus removal at the plants averaged 85% and ranged from 65% to 92%. The total annual removal cost (including annualized capital investment costs) divided by the total population served at the plants was $1.03/person/year and ranged from $0.51 to $4.65. The annual cost for each pound of phosphorus removed ranged from $0.27 to $1.34.

Some gross estimates of municipal treatment costs can be made assuming that all plants are currently at 1.0 mg/L discharge levels and that the phosphorus retention of Lake Winnebago is 60%. These estimates use a range of annualized costs per pound phosphorus removed -- $0.27, $1.34, and $5.00 -- which do not correspond to a specific percentage removal or type of treatment technology. An effluent limit of 0.5 mg/L at all municipal treatment plants in the entire Fox-Wolf drainage basin would reduce the annual load to the Bay by 116,000 pounds and could cost $43,000, $289,000 or $771,000 per year respectively. An effluent limit of 0.3 mg/L at all plants would reduce the annual load to the Bay by 162,316 pounds and could cost $61,000, $289,000 or $1,079,000 per year respectively. An effluent limit of 0.1 mg/L at all plants would reduce the annual load to the Bay by 162,316 pounds and could cost $77,000, $371,000 or $1,386,000 per year respectively. These cost estimates are all dependent on the treatment plants being able to meet the indicated effluent limits with annualized costs less than $5.00 per pound removed phosphorus. Capital costs of reducing phosphorus loads would probably be eligible for federal or state treatment plant construction grants or loans if phosphorus reduction requirements are included in WPDES permits. The specific availability of these fund is uncertain at this time.

1.2. ESTABLISH PHOSPHORUS WATER QUALITY STANDARDS. Establish water quality standards for phosphorus in the Area of Concern so that:

* Summer total phosphorus concentrations average between 0.1 mg/L and 0.125 mg/L;

* Summer average chlorophyll-a concentrations are between 35 to 45 ug/L;

* Target annual average phosphorus load reductions are established necessary to meet these concentrations (Estimated to be between 40% and 50% less than the average normalized loads monitored from 1981 to 1983).

a. Establish phosphorus water quality standards by administrative rule. (Target date: 1990)

b. Review and revise water quality standard as necessary (every 3 to 5 years after standard established).

EXPLANATION: Modeling indicates that this range of average summer total phosphorus concentrations will help improve water clarity and reduce the abundance of blue-green algae. Water quality standards provide the legal basis for requiring discharge controls. Water quality standards also establish objectives for nonpoint source control projects. (Also see the explanation for the following recommendations in the TAC reports: N&E - 1.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High.

WHO SHOULD ACT: WDNR, USEPA.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Statewide guidance (administrative rules) for the application of total phosphorus water quality standards and water quality standard based effluent limits are anticipated to be developed in 1989 and adopted in 1990. A standard for the Area of Concern could be established at the same time.

1.3. ESTABLISH WASTELOAD ALLOCATION FOR PHOSPHORUS IF NECESSARY TO ACHIEVE DESIRED REDUCTIONS. Establish, by administrative rule, an allocation between large and small municipal discharges, industrial discharges and nonpoint sources that provides for reductions which are necessary to meet the phosphorus water quality standard. Consider, among others, the following alternatives for allocation:

Alt.	Source Control Level		
	Municipal*	Industrial**	Nonpoint***
1.	0.1 mg/L	0.1 mg/L	11 Watershed projects
2.	0.3 mg/L	0.3 mg/L	21 Watershed projects
3.	0.5 mg/L	0.5 mg/L	41 Watershed projects

* Effluent limits indicated are for communities over 2,500 population. Cost-effective control of smaller community discharges should also be required.

** Reductions in discharge of phosphorus loads similar to that required of large municipal discharges.

*** Assumes a 40% reduction in phosphorus loads from each watershed. Supplemental programs and high levels of participation would be needed to achieve this level of reduction (see recommendations 1.5 through 1.9).

a. Accelerate nonpoint source control efforts in basin (see recommendations 1.4 through 1.8 and 11.2). (Target date: initiate 1988)

b. Initiate waste load allocation process. (Target date: **1989)**

c. Establish waste load allocation by administrative rule. (Target date: 1991)

d. Incorporate appropriate effluent limits and compliance schedules into WPDES permits. (Target date: 1991-1996)

e. Dischargers should reduce phosphorus loads as soon as possible and no later than required by WPDES permits. (Target date: 1996)

EXPLANATION: The total phosphorus load to the Bay from the Fox River was estimated to be slightly more than 1,000,000 pounds in 1982. Translating total phosphorus loads to in-bay phosphorus concentrations requires consideration of both total phosphorus loads and river flow (i.e., normalized loads). Available information indicates that an approximately 40% to 50% reduction in normalized average phosphorus loads will be required to meet the recommended water quality standard for phosphorus.

Phosphorus load reductions are needed from all sources including both nonpoint and point sources. A wasteload allocation provides a basis for determining how the load reductions should be distributed between sources. Cost-effectiveness and other factors must be considered. A disadvantage of wasteload allocation process is the extended period of time (sometimes up to 10 years) it can take to adopt the administrative rules and establish the legal basis for requiring additional phosphorus reductions. Phosphorus load reductions might be able to occur much quicker using a consensus approach (see recommendation 1.1).

Current approaches to phosphorus control are variable dependent on the type of source. Nonpoint source management is approached through a voluntary cost-share program, the Wisconsin Fund Nonpoint Source Abatement (Priority Watershed) Program (see recommendation 3.4). Municipal wastewater treatment plants serving communities with populations over 2,500 are required by administrative rule (NR 104) to meet 1 mg/L total phosphorus limits or provide 85% removal in order to meet Great Lakes phosphorus reduction goals. A commensurate removal requirement was also included in ch. NR 104 for industry, but was not implemented because of a court decision in 1978 (Niagara of Wisconsin Paper Corp. et al. vs. DNR). Future control of industrial discharges of phosphorus will be dependent on the adoption of statewide rules to guide establishment of phosphorus removal requirements and phosphorus water quality standards.

The Nutrient and Eutrophication Management TAC initially suggested either a 0.1 or 0.5 mg/L effluent limit for discharges be considered. During review a 0.3 mg/L was also suggested. Several of the municipal plants may be able to meet this level with only minor modification of their existing treatment systems. Several of the smaller communities which are not currently required to control phosphorus reported substantial loads in 1982. Thus, cost-effective controls for these communities must also be sought.

Industrial discharges of phosphorus currently are not regulated. The contribution of industry to phosphorus loads is uncertain since many major industries take in river water and then discharge it after use and treatment. In initial comments on the draft TAC reports, industry noted that reporting procedures are inconsistent. Some industries report net loads while others report amounts discharged with no consideration for the amount of phosphorus in intake water. Industrial dischargers may add phosphorus to the River (positive net loads) or may remove phosphorus through treatment (negative net loads). In determining industrial loads river intake and all discharges to the River and Bay including those via municipal treatment plants should be evaluated. Those industries that discharge positive loads of phosphorus should be required to treat to at levels similar to those required of municipal wastewater treatment plants. Those that discharge negative loads should be recognized for their contribution to improved water quality in the Bay and river and encouraged to contribute further if cost-effective.

Major reductions in nonpoint source phosphorus loads will be needed if water quality goals are to be met. Intensive watershed management projects are proposed (see recommendation 3.4). The Nutrient and Eutrophication Management TAC estimated total phosphorus loads from the 41 watersheds in the Fox and Wolf River Basins. They indicated that nonpoint source discharge effluent limits are needed in 11 targeted watersheds if point source discharge effluent limits are set at the 0.1 mg/L level. These watershed include the 4 in the Lower Fox River Basin (East River, Mud Creek, Plum Creek, and Ashwaubenon-Apple-Dutchman's Creeks), Duck Creek draining into the lower bay, and the 6 watersheds surrounding Lake Winnebago (see Figure III.2).

Intensive nonpoint source management is needed in 21 watersheds if point source discharge effluent limits are 0.3 mg/L and in the entire basin (41 watersheds) if the point source 0.5 mg/L. These estimates assume a 40 Y load reduction from nonpoint source management in each watershed. Most voluntary nonpoint source projects achieve less reduction (20 - 30%). Thus all critical nonpoint sources within a watershed will have to be controlled if a 40% reduction level is to be achieved. Additional management efforts such as indicated in recommendations 1.5 to 1.8 will also be needed throughout the basin to complement cost-sharing provided in these watershed projects. Since nonpoint source control will be needed in at least the 11 targeted watersheds, there is no reason to delay efforts in these watersheds until completion of the phosphorus wasteload allocation. These projects will also benefit the fisheries of the streams and lakes in the individual watersheds. In the case of watersheds adjacent to the Area of Concern these projects will protect and improve important spawning habitat for the area's fishery.

(Also see the explanation for the following recommendations in the TAC reports: N&E - 3, 4; and in this plan - 1.1, 1.2, 1.4 through 1.9, 11.1, 11.2, 11.3, 11.4, and 11.7.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High.

WHO SHOULD ACT: WDNR, FVWQPA, Municipal treatment plants, Industrial Dischargers, LCCs, Farmers and others affected by nonpoint source control projects.

ESTIMATED COSTS AND POTENTIAL FUNDING SOU :ES: Program costs for developing and establishing a wasteload allocation might run between $5,000 and $100,000 and would probably be met out of existing WDNR water resources program budgets. The range of treatment costs are indicated in recommendation 1.1.

Nonpoi nt Sources

1.4. <u>IMPLEMENT COMPREHENSIVE WATERSHED MANAGEMENT PROJECTS TO REDUCE PHOSPHORUS LOADS AND OTHER POLLUTANTS FROM NONPOINT SOURCES.</u> Implement nonpoint source controls in 11 targeted watersheds of the Lower Fox River and Winnebago Pool Lakes drainage area and other watersheds as needed to meet the phosphorus water quality standard and wasteload allocation, reduce sediment and toxic pollutant loads, and thus improve water quality.

a. Implement the East River Priority Watershed Project or similar project. Continue local effects to control nonpoint sources. (Target date: 1988)

b. Investigate alternative approaches to accomplishing nonpoint source control projects and programs in the basin. (Target date: 1990)

c. Implement priority watershed projects or a similar set of programs on Duck Creek, Plum Creek, Mud Creek, and Ashwaubenon-Apple-Dutchman's Creeks watersheds and the 6 watersheds surrounding Lake Winnebago. (Target date: If one per year is initiated, complete 11 watersheds by 2008)

d. As needed, further evaluate and implement projects in other watersheds in the Upper Fox and Wolf River drainage basins (possibly as part of Lake Winnebago Management Plan). (Target date: evaluation - 1990, implementation - to be determined by evaluation, WLA and Lake Winnebago Comprehensive Plan (see recommendation 1.3)

EXPLANATION: Phosphorus load reductions in all sources are needed to achieve the desired water quality in the Bay and River. Major nonpoint source control projects are needed in at least 11 targeted watersheds to obtain needed phosphorus and sediment load reductions. These 11 watersheds are believed to contribute the greatest loads of phosphorus and sediment to the Bay. Management may also be needed in other watersheds based on the results of the wasteload allocation. Phosphorus load reductions of 40% from each watershed are proposed. However, most voluntary nonpoint source control watershed projects only achieve 20-30% reductions. Supplemental programs (see recommendations 1.5 through 1.8 and 11.2) and participation by all sources in critical areas will have to be sought. See this Key Action; Citizen Comments and Suggestion Section for some comments relative to this recommendation.

Animal waste and urban area runoff are important nonpoint sources contributing to phosphorus loads in the basin. Soil loss is a problem in some watersheds and some localized areas, especially near waterways.

Watershed management projects also need to consider potential contribution of nonpoint sources to toxic water quality problems in the Bay and River. Urban runoff from industrial areas is an important potential source. Ammonia, pesticides and herbicides which run off from agricultural areas are toxic chemicals of possible concern. (Also see the explanation for the following recommendations in the TAC Reports: N&E - 4A, 4B, 14; B&M - 11, 12, 13; TOXICS - 41; and in this plan - 1.3.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High.

WHO SHOULD ACT: Legislature, WDNR, WDATCP, LCCs, Counties, Cities, Villages, Towns, Farmers, UWEX, SCS, ASCS, RPCs, FVWQPA, Industry, and Conservation groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Total costs of intensive nonpoint source watershed projects in the basin are estimated to range from $51.8 to $131.8 million depending on the number of projects undertaken.

Cost = $ 27 million for 4-5 watersheds on Lower Fox
= $ 24 million for 6 watersheds on Lake Winnebago
= $ 80 million for 30 additional watersheds in basin
Total = $131 million for 41 watersheds covering entire basin

Nonpoint source controls may be accomplished using the Wisconsin Fund Nonpoint Source Abatement (Priority Watershed) Program, Clean Water Act monies (if appropriated) and any other combination of federal, state, and county programs. Projects should be staged over a 10-15 year period. Since nonpoint source watershed management projects typically take 10 years from start to finish, we would have to initiate 3 projects a year for the next 4 years to complete 11 projects by year 2000 and 5 projects a year to complete 21 projects.

Limited state, federal and local monies are available for comprehensive nonpoint source projects. No monies for new priority watershed projects were included in Wisconsin's fiscal year 1988 budget. Funds for nonpoint source control projects allocated with the re-authorization of the Clean Water Act have yet to be appropriated. Thus, a major question is how nonpoint source management in the basin can be accomplished. Some possibilities might be seeking special funding for basin watersheds such as was done in the Milwaukee River Basin, seeking special state and federal programs to implement Remedial Action Plans, local funding, regulation of gross pollution sources, or coordination with other programs such as cross compliance, and the federal conservation reserve program. Another approach is to accept current funding levels and accept a later target year for achieving desired water quality in the Bay. For example, 21 watershed projects would be completed by 2018 if one watershed project is started each year beginning in 1987. It would take until 2039, if the rate is 1 project initiated every other year.

1.5 <u>SEEK INNOVATIVE AND ALTERNATIVE WAYS TO ACHIEVE NONPOINT SOURCE MANAGEMENT OBJECTIVES.</u> As a part of the ongoing evaluation of Wisconsin Nonpoint Source program and the implementation of this plan evaluate alternative approaches to achieve reductions in runoff of phosphorus, sediment, pesticides, herbicides, ammonia, and other pollutants from nonpoint sources in the basin.

a. Initiate a cooperative effort to evaluate options for increased participation and increased focus on toxicant controls in nonpoint source management programs. (Target date: 1988)

b. Complete report outlining these options. (Target date: 1990)

c. Initiate implementation of the report's recommendations. (Target date: 1990, ongoing)

EXPLANATION: To achieve phosphorus control goals a 40% reduction in NPS phosphorus load from each watershed management project will be needed (see recommendation 1.4). Often not enough people participate in voluntary cost-share programs to achieve this type of reduction. Increased levels of participation will be needed as well as the participation of all landowners in critical areas. New types of programs may also be needed (see recommendations 1.6 - 1.8 and 11.2). There also needs to be an increased emphasis on toxicant control in nonpoint source management programs. (Also see the explanation for the following recommendations in the TAC Reports: N&E - 9; TOXICS - 46, 45.)

Citizen Comments: A number of people questioned whether a traditional voluntary cost-share program will be adequate to achieve the Plan's objectives for nonpoint source management. One person suggested that non-traditional farmer-based initiatives should be tried. Examples are the Wisconsin Rural Development Center's work with the Sustainable Agriculture Project and the Iowa County Stewardship Project. Other people suggested that agriculture schools and researchers should focus on ways of reducing pesticide and fertilizer use and runoff. Several people suggested that a regulatory approach such as animal waste ordinances should be considered or that use of the conservation reserve program or cross compliance with agricultural support programs should be explored.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDATCP, LCCs, WDNR, UWEX, SCS, ASCS, RPCs, USEPA, Cities, Villages, Farmers, Developers, and Researchers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Estimated cost of this cooperative effort is low (<$50,000).

1.6. <u>REQUIRE AND USE CONSTRUCTION EROSION AND STORM WATER RUNOFF CONTROLS.</u> Adopt ordinances and use practices that will control erosion and storm water runoff from new construction and reduce runoff of nutrients, sediments and toxic substances. (Target date: 1989-1990)

EXPLANATION: Poor design and management can make construction sites a major source of sediment loads. Best management practices can reduce these loads. Requiring design and management practices that minimize the potential for pollutant runoff with storm water runoff reduces future problems. It is much cheaper to build-in best management practices initially than to retrofit existing development or to treat the runoff. A number of cities and villages throughout the state have enacted ordinances for construction erosion control and stormwater management. Model ordinances are available. (Also see explanation for the following recommendations in the TAC Reports: N&E - 5; TOXICS - 39, 43, 44, 47; and in this plan - 11.1, 11.2, 11.3, 11.4.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: Counties, Cities, Villages, Towns, WDOT, WDNR, LCCs, RPCs, WDATCP, SCS, UWEX, and Developers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Some management practices cost little or nothing. In general, construction erosion ordinance requirements are estimated to add to 3 % to the cost of construction. Construction erosion requirements can be linked with existing local building permit programs and administrative costs can be recovered by fees. On an average, 1 staff person may be needed to administer the program in a county. Thus overall administrative costs in the entire basin might range from $100,000 to $200,000 per year. Administrative costs and total costs of using best management practices would depend on the amount of building in an area.

1.7. REQUIRE THE USE OF SHORELAND BUFFER STRIPS AND GREEN STRIPS. Use shoreland zoning, easements or other land use controls to require appropriate setbacks, maintenance of natural areas and buffer strips uses along streams and rivers for land that have the'potential to impact water quality.

a. Continue to protect shoreland areas by use of wetland and shoreland zoning (ongoing).

b. Evaluate need for **additional** protection. (Target date: 1991)

c. Implement any needed programs. (Target date: 1996)

EXPLANATION: Buffer areas can reduce the impacts of adjacent land uses on streams and lakes. Natural areas have the added advantage of providing habitat for fish and wildlife. Properly designed grassed waterways can reduce erosion from water runoff. Wetland areas along streams and the Bay are protected by enforcement of Wisconsin's Shoreland and Wetland Zoning Program. They may also use their comprehensive zoning powers to protect some wetlands not covered by the states program. Local governments may enact shoreland and wetlanding zoning ordinances be more restrictive than the state requires. While wetland and shoreland zoning does protect these areas from complete destruction it does allow some uses that have substantial impact on water quality. Thus more protection may be needed. (Also see the explanation for the following recommendations in the TAC Reports: N&E - 6; B&H - 14; and in this plan - 2.1, 6.2, 6.3, 6.4 and 6.9.)

Citizen Comments: One group commented that a cost benefit analysis should be done before more protection is provided. Another person noted that more than 90% of the existing wetlands are gone - and thus the protection of the remaining wetlands deserve high priority.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: Counties, Cities, Villages, Towns, LCCs, SCS, WDNR, ASCS, RPCs, USEPA, Farmers, Developers, Industry, and other shoreline owners.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Many shoreland areas are adequately protected by enforcement of existing shoreland and wetland zoning ordinances. However some permitted uses, such as cropping or pasturing animals very close to a stream, can impact water quality. Green strips or natural area buffer strips along streams in a watershed could be required by local zoning ordinances. An alternative approach would be land or easement purchases. In a typical watershed, purchase of buffer areas would cost approximately $550,000. This assumes that there are 150 miles of streams in the watershed and 1/3 of the streams need to have buffer areas of 4 rods (66 feet) purchased to be adequately protected. New innovative programs would be needed to fund such programs. Purchase costs would range from $6,050,000 for 11 watersheds to $22,550,000 for 41 watersheds (the entire basin). Proposed changes in the conservation reserve program may provide for cropped land a long streams to be eligible for inclusion ion the program. This change might allow some cropped land to be put into shoreland buffer strips.

1.8. <u>ADOPT ANIMAL WASTE MANAGEMENT ORDINANCES AND USE BEST MANAGEMENT PRACTICES.</u> Counties should adopt animal waste management ordinances that will minimize runoff of wastes into streams and rivers and protect groundwater quality. (Target: 1988-1990)

EXPLANATION: Dairy agriculture predominates in the Lower Fox River Basin. One cow produces 44 pounds of phosphorus waste a year. Thus, it is important that this waste does not pollute the tributaries of the Fox River and contribute to nutrient loads in the Bay and River. Animal waste management ordinances have been adopted by some counties to ensure proper land spreading techniques and proper design and construction of manure storage and handling facilities. (Also see the explanation of the following recommendations in the TAC Reports: N&E - 7.)

Citizen Comments: Several people noted the need for stronger enforcement of existing local animal waste management ordinances. One person suggested they should apply to a wider range of manure sources. One farmer noted that manure storage facilities, if not properly designed and maintained may cause their own pollution problems. Another person recommended that small livestock operations be managed to minimize manure runoff. In particular, minimum set-backs should be recommended for keeping stockyards and pasture areas fences away from streambanks.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: Counties, WDATCP, UWEX, WDNR, Farmers, and LCCs.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Brown County and several other counties in the Fox River Basin already have passed animal waste management ordinances. Costs of administrating a county program are generally very low (<$10,000 a year), thus costs in the entire basin would be low to moderate (0 to $100,000 total). These ordinances generally only apply to installation of new facilities such as manure storage facilities.

In-Water Management

1.9. <u>CONSIDER IN-RIVER PHOSPHORUS REMOVAL.</u> Conduct a feasibility/engineering study for removing phosphorus and algae from Fox River water at the Lake Winnebago outlet or further downstream.

a. Complete preliminary feasibility study. (Target date: 1990)

b. Complete detailed study as appropriate based on "a." (Target date: 1992).

c. Implement recommendations of study as appropriate. (Target date: To be determined by "a")

EXPLANATION: About 95% of the phosphorus in the Fox River during the summer is in the form of algae. An in-river treatment system might be able to remove substantial phosphorus from the River. Innovative technology would be required and costs could be high. However, whole river treatment systems are used in Europe and should be investigated for their applicability in removing phosphorus from the Fox River and Green Bay system. Potential impacts on the wasteload allocation and ecosystem should be explored as part of the feasibility study. (Also see explanation for the following recommendations in the TAC Reports: N&E - 11.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High to Moderate/Moderate

WHO SHOULD ACT: Researchers, Sea Grant, GBMSD, USEPA, FVWQPA, and WDNR.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Fox Valley Water Quality Planning Agency did a preliminary analysis of the cost of algae removal using screening methods below Lake Winnebago. In 1978 costs for screening alone ranged from 3.7 to 6.6 million depending on the method. Annual operation and maintenance costs were not estimated but would be expected to be very high because of the large amount of wet solids to be handled and disposed of. A more detailed study is necessary to look at alternative technologies and total treatment costs. A review of existing engineering technology that is applicable would be a low cost (<$50,000). A more detailed feasibility study and possible pilot study would be more costly ($100,000 to $750,000).

KEY ACTION #2: REDUCE SEDIMENT AND SUSPENDED SOLIDS INPUTS

Key Action's Priority: High

Action Recommendation		Priority for Key Action	Priority for Plan	Page
2.1	Include additional land in conservation reserve	Mod.	Mod.	84
	Other Recommendations to Help Reduce Sediment and Suspended Solids Inputs			
1.1*	Further evaluate phosphorus point source loads and treatment plant capabilities, making reductions in phosphorus loads as soon as possible.	High	High	68
1.3*	Establish wasteload allocation for phosphorus if necessary to achieve desired reductions.	High	High	70
1.4*	Implement comprehensive watershed management projects to reduce phosphorus and other pollutant loads from nonpoint sources.	High	High	73
1.5*	Seek innovative and alternative ways to achieve nonpoint source management objectives.	High	High	75
1.6*	Require and use construction erosion and storm-water runoff controls	Mod.	Mod.	76
1.7*	Require the use of shoreland buffer and green strips.	High	Mod.	77
1.8*	Adopt animal waste management ordinances and use best management practices.	Low	Mod.	78
1.9*	Consider in-river phosphorus removal.	Mod.	Mod.	78

*Reference indicated Key Action Recommendation for more details.

KEY ACTION #2: REDUCE SEDIMENT AND SUSPENDED SOLIDS INPUTS

The Lower Green Bay-Fox River ecosystem receives high levels of sediment and suspended solids from point and nonpoint sources. Soil particles, particularly clays and silts, enter the ecosystem from agricultural and urban runoff. Organic and inorganic suspended solids enter the ecosystem from municipal and industrial waste discharges. The annual load of suspended solids in the Fox River has been estimated to average 200 million pounds, and tributaries to the River contribute significantly to this load.

Sediments and suspended solids, along with algae, contribute to the highly turbid water in the Bay and River. Efforts to reduce phosphorous inputs from point source effluents will also reduce some inputs of suspended solids. Therefore, other efforts to reduce inputs of sediment and suspended solids need to be directed toward nonpoint sources in agricultural and urban areas. These efforts will be similar or complementary to those directed at reducing phosphorus. Efforts to reduce sediment and suspended solid inputs, along with efforts to reduce phosphorous inputs, will have multiple effects in the Green Bay-Fox River ecosystem. Table 11 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Reducing inputs of sediment and suspended solids will contribute to increased water clarity and many of the effects associated with decreasing phosphorous inputs. This action also will reduce sedimentation in depositional areas, such as channels and harbors, and in tributary streams. Sediment reductions in river and streams will improve spawning habitat and the survival of fish eggs. Improvements in animal waste management should reduce bacteria inputs to the ecosystem's tributaries. Nonpoint source controls may reduce inputs of toxic compounds since many of these chemicals adhere to particles. Additional reduction of suspended solids from municipal and industrial sources also would reduce the discharge of toxic substances since toxic compounds are frequently associated with suspended solids.

USE IMPROVEMENTS

This action will improve fishing and waterfowl hunting opportunities and other recreational activities, particularly swimming. It also should decrease maintenance dredging and possibly reduce costs of water treatment for industrial uses.

CITIZEN COMMENTS AND SUGGESTIONS

There were no specific comments on this key action. Refer to Key Action #1 for general comments on nonpoint source management.

TABLE 11. Priority, Environmental Effects and Use Improvements Associated with Key Action #2.

KEY ACTION 2:	Reduce Sediment and Suspended Solids Inputs
PRIORITY	High
ENVIRON. EFFECTS	Improve water clarity. Reduce bacteria inputs. Increase growth of submerged vegetation. Reduce toxic inputs from point and nonpoint sources. Improve stream and lake spawning habitat. Improve fish egg survival. Improve habitat for benthic organisms. Increase numbers of diving and dabbling ducks. Improve feeding efficiency of sight-feeding fishes and fish-eating birds. Reduce sedimentation in depositional areas such as channels and harbors.
USE IMPROVE-MENTS	Meet legal water visibility requirements for swimming at public beaches. Increase recreational opportunities. Improve waterfowl hunting. Improve sport and commercial fishing. Improve aesthetics. Increase diversity of fishes. Decrease maintenance dredging. Decrease cost of water treatment.
COMMENTS	The precise amount of turbidity due to sediment particles is undetermined. However, recent modeling efforts suggest that reductions of sediment particles and algae particles will act synergistically to increase light penetration of the water.

Back

2.1. INCLUDE ADDITIONAL LAND IN CONSERVATION RESERVE PROGRAM. Change laws so all land likely to impact water quality is eligible for the Conservation Reserve Program. (Target date: 1990)

EXPLANATION: Erosion control to reduce the loss of sediment and phosphorus from farmland is part of the Farm Bill legislation. However, it includes only 3T soils (soils with 3 times the tolerable soil loss) and much of the land in the Lower Fox River watershed is not eligible. **A** special **area** cost-share program may be needed to enroll some soils a proposed change in the Conservation Reserve program may allow cropped land along streams to become eligible which are likely to impact water quality in critical areas. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 15; and in this plan - 2.1.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: USDA, SCS, LCCs, Local Governments, WDATCP, and Farmers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: A change in the Conservation Reserve Program would need to be implemented statewide or nationwide. For this reason it is not possible to estimate costs for the change specific to the Fox River Basin.

Other Recommendations that May Help Reduce

Sediment and Suspended Solids Inputs

Note that recommendations that will reduce phosphorus inputs (Key Action #1) and virtually eliminate toxicity by nonpoint and atmospheric sources (Key Action #11) will help reduce sediment and suspended solid inputs.

KEY ACTION #3: ELIMINATE TOXICITY OF MUNICIPAL, INDUSTRIAL AND OTHER POINT SUIRCE DISCHARGES

Key Action's Priority: High

	Action Recommendation	Priority for Key Action	Priority for Plan	Page
	Water Quality Standards			
3.1	Complete rule adoption for water quality standard and associated effluent setting procedures for toxic substances.	High	High	89
3.2	Adopt antidegradation and mixing zone rules to protect lower Green Bay.	Mod.	Mod.	90
	Control Discharges of PCB and Other Bioaccumulating Substances			
3.3	Adopt water quality standards for PCB and other bioaccumulating substances.	High	High	91
3.4	Identify all PCB sources.	High	Mod.	93
3.5	Use fish tissue monitoring to track and flag the need for point source control of furans and dioxins.	High	Mod.	94
3.6	Monitor and control discharges of PCB and other bioaccumulating substances.	High	High	94
	Control Acute and Chronic Toxicity of Discharges			
3.7	Establish water quality standard and effluent limit setting procedures that recognize additive effects.	High	High	96
3.8	Evaluate and control ammonia toxicity.	High	High	97
3.9	Monitor and control discharges of acute and chronic toxicity.	High	High	98

Action Recommendation	Priority for Key Action	Priority for Plan	Page
3.10 Identify areas where chronic toxicity in mixing zones may jeopardize fish and aquatic life uses, and identify steps to remedy, if necessary.	Mod.	Mod.	99
Increase Monitoring Capability for Toxic Substances			
3.11 Establish and use standard tests for toxicity monitoring.	Mod.-High	Mod.	101
3.12 Increase WDNR capabilities for monitoring toxicants.	High	Mod.	101
3.13 Include additional types of toxicity monitoring in laboratory certification and registration programs.	Mod.	Mod.	102

KEY ACTION #3: ELIMINATE TOXICITY OF MUNICIPAL, INDUSTRIAL, AND OTHER POINT SOURCE DISCHARGES

Toxic contaminants enter the aquatic ecosystem through both water and air. During the past decade, levels of some toxic compounds, notably PCBs, in industrial and municipal effluents have been markedly reduced. However, recent bioassays still show some effluents to be acutely toxic to fish and other aquatic life.

The Plan's recommendations call for additional monitoring of point sources combined with strict effluent limits on toxic substances. Effluents from industrial and municipal point sources can be monitored relatively easily for toxicity to aquatic life, and problems with toxic effluents can be addressed by a number of different approaches. Advanced wastewater treatment is one option. Another is modifying manufacturing processes to reduce use of a particular toxic chemical or using a substitute chemical. Table 12 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Eliminating toxicity of point source discharges will reduce the overall loading of toxic substances to the ecosystem and will protect fish and other **aquatic** life. This action also will lead to a long-term reduction of contaminants in the environment, particularly in sediments, and will help reduce the buildup of contaminants in organisms.

USE IMPROVEMENTS

This action alone may reduce the risk of health effects from eating Green Bay fish to an undetermined degree. However, it probably will not reduce PCB levels in all fish to standards set by the U.S. Food and Drug Administration.

CITIZEN COMMENTS AND SUGGESTIONS

Approximately 15 comments were received on this Key Action. Most of the people that commented indicated that they would like to have stronger point source toxic controls recommended by the Plan. Three people indicated that they believed the level of controls that were recommended in the Plan were unrealistic or potentially too strict.

Several people commented that standards and effluent limits should not be more restrictive than necessary because of the high cost of meeting them. One person noted that the Plan should have more specific standards to determine "How clean is Clean" and that they should not be more stringent than that needed to meet the "Desired Future State."

Ten people commented that the Plan's goals and recommendations should more closely reflect the Water Quality Agreement goal of "eliminating toxics" rather than "reducing toxics." Specifically one person noted "Consistent with the Water Quality Agreement, the Plan should be calling for the virtual elimination of toxicity and zero discharge of toxic chemicals that bioaccumulate and can contaminate our food supplies. These words should be used (throughout) the Plan "to eliminate" these problems, not just control or reduce them."

Three groups specifically advocated that the Plan contain the Toxic Substances Management Technical Advisory Committee's recommendations relating to "no chronic toxicity at end pipe by 1996", assumed additivity of toxic substances when setting effluent limits, and antidegradation for the Bay portion of the Area of Concern. Refer to the explanation of recommendations #3.2, 3.6, 3.7, 3.9, and 3.10 for a more detailed discussion of these comments.

Several people called for tertiary treatment to control toxic substances discharges to the Bay. One person commented that "Sewage treatment plants must add tertiary treatment to their present systems so that toxics will be removed before discharge. The cost for adding this third stage of treatment are worth the benefits of such treatment."

Eight people thought stronger enforcement was needed. They noted that the DNR compliance monitoring inspections should not be pre-announced. Specifically one person observed that "the entire WPDES program needs increased funds for monitoring and enforcement. The DNR needs to change its policy of prior notice for on-site inspections, to one of more frequent, unannounced spot checks of dischargers."

Other people commented that industries should take responsibility for their past and present discharges to the Bay and River. One person noted industry must be held responsible for their own actions, and compliance with existing and new strict standards must be made mandatory.

TABLE 12. Priority, Environmental Effects and Use Improvements Associated with Key Action #3.

KEY ACTION 3:	Eliminate Toxicity Of Industrial, Municipal and other Point Source Discharges
PRIORITY	High
ENVIRON. EFFECTS	Reduce toxic loadings. Protect fish and aquatic life from acute and chronic toxicity. Promote long-term reduction of toxic substances in the environment, especially in sediments. Decrease bioaccumulation of toxic substances in organisms.
USE IMPROVE-MENTS	Decrease potential human health risks from eating Green Bay fish and waterfowl. Protect furbearers, wildlife and endangered species from toxic effects. Protect aquatic life, particularly zooplankton, from conventional pollutants such as ammonia, which may improve the zooplankton community in portions of the area of concern.
COMMENTS	Overall effect of ammonia on zooplankton communities in the area of concern is not well documented. Available information indicates the potential effects of ammonia will be deleterious.

Water Quality Standards

3.1 COMPLETE RULE ADOPTION FOR WATER QUALITY STANDARDS AND ASSOCIATED EFFLUENT SETTING PROCEDURES FOR TOXIC SUBSTANCES. These rules should protect human health, fish and aquatic life, and wildlife from impacts due to chronic and acute toxicity, and toxicity due to bioaccumulates. Strengthen use of risk assessment and management in developing and applying these rules.

a. Complete development of administrative rules for water quality standards (NR 105) and effluent setting procedures (NR 106) for toxic substances. (Target date: 1988)

b. Promulgate and adopt NR 105 and NR 106. (Target date: 1988)

c. Incorporate appropriate effluent limits for toxic substances and compliance schedules into WPDES Permits. (Target date: 1988-1993)

d. Strengthen WDNR risk assessment and risk management capabilities so they can be used as soon as possible in applying water quality standards and effluent limits. (Target date: 1989)

e. Periodically review and revise NR 105 and NR 106 to incorporate new information on toxic substances. (Target date: every three years)

EXPLANATION: WDNR is currently developing administrative rules for water quality standards criteria for toxic substances (NR 105) and procedures for calculating associated water quality based effluent limits (NR 106). An advisory committee has been established to advise the Department in this effort. Public hearings on these rules are targeted for late 1987 and early 1988. Once these rules are adopted, they will be periodically reviewed and revised to incorporate new information on toxic substances and their impact on fish, other aquatic life, wildlife, and human health.

Risk assessment and risk management should be considered in the development and application of water quality standards. Risk assessment allows better evaluation of potential impacts of toxicants on human health, and fish and aquatic life. Risk management is used to develop strategies to meet a desired risk level. A major issue to be resolved is what is an acceptable level of risk for different water uses.

Please note that recommendations #3.2, 3.3, and 3.7 pertain to specific issues that should be considered in the development and future revisions of these rules. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 20, 21, 22, 23, and 24; and in this plan - 3.2, 3.3, and 3.7.)

Citizen Comments: One person commented that risk assessment was important. Another noted that risk asssessment should not be used as a substitute for "eliminating" toxic discharges and that current risk assessment techniques do not consider all types of risk associated with toxic chemicals.

Several comments indicated that standards should not be made any more restrictive than absolutely necessary because of the high cost of meeting them. One person said that the Plan should have more specific standards to identify "how clean is clean". This person was concerned that the standards and/or required control levels may be more stringent than the desired future state. Another person observed that because of the "backsliding" issue standards could only be revised to become more stringent. The person suggested that this should be stated and the recommendation revised or its implementation delayed until adequate information is available.

Other people were concerned that the recommendation and proposed standards would not be strict enough. They noted that, consistent with Great Lakes Water Quality Agreement, the Plan should be calling for the virtural elimination of toxicity and zero discharge of toxic chemicals that bioaccumulate and contaminate the fish we eat. Other people noted the Clean Water Act's goal of zero discharge.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High.

WHO SHOULD ACT: WDNR, Legislature (Code Approval), USEPA.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: WDNR is currently drafting water quality standard rules for toxic substances which should be submitted to the legislature for approval in 1988. The rules will be applicable statewide. Strengthening of WDNR risk assessment capability would be a moderate annual cost ($50,000 to $100,000). However these costs would relate to statewide programs. Costs to dischargers of meeting these standards and effluent limits are not possible to estimate at this time. However, they will be required by statewide law.

3.2. ADOPT ANTIDEGRADATION AND MIXING ZONE RULES TO PROTECT LOWER GREEN BAY. As part of the adoption of rules to clarify the State's antidegradation policy, establish rules that apply to and protect lower Green Bay. Seek a "no mixing zone" policy for new discharges that contain toxic substances or other policy that will avoid further degradation of the **Bay** and lake from the effects of toxic pollutants. (Target date: 1988, review every 3 years)

EXPLANATION: The Toxic Substances Management TAC recommended establishing a "no mixing zone" policy for toxic substances in the portion of the Bay in the Area of Concern. This policy could require any new discharge to the Bay to meet effluent limits that provide for no toxicity at end of pipe. Currently chronic toxicity is allowed within a mixing zone. The TAC noted that there are few if any discharges to the Bay within the Area of Concern. Most discharges are to the Fox River, or to the Bay at the River's mouth.

Many comments were received for and against the TAC's recommendation. Several people noted that we do not want to clean up the Area of Concern by transferring the problem to the larger lake - i.e. dilution should not be the solution. Others noted that such a recommendation may affect Green Bay Metropolitan Sewerage District's upgrading options, making it more costly for the plant to move its discharge downstream of the Bay Beach area.

The State is developing statewide antidegradation administrative rules. As part of this effort, an antidegradation policy for Green Bay and the Great Lakes should be established. The proposed antidegradation administrative rules (NR 207 and amendments to NR 102) propose a policy of no increase over background levels in the Great Lakes for the IJC critical eleven pollutants. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 25.)

Citizen Comments: Several people commented that the Plan should contain the Toxic TAC's recommendation, for establishing a "no-mixing-zone rule for toxic substances in that portion of the Bay in the Area of Concern." Other people suggested that the word "consider" should be dropped from the draft plan's recommendation. They noted that new toxic discharges (such as from moving GBMSD's outfall to mid-bay) would degrade water quality. One person commented that public water should not be used to mix our industrial pollutants to meet discharge limits. For chlorinated organics, there should be a zero discharge limit because they are persistent, bioaccumulative and dangerous to life in several different ways.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: WDNR, Legislature (Code Approval), USEPA.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: WDNR is currently drafting antidegradation rules that should be sent to the legislature for approval in 1988. If a no mixing zone rule is adopted for the Bay portion of the Area of Concern it would substantially add to the cost of any industry or municipality that wishes to discharge to the area in the future. Costs would be dependent of the type of discharge.

Control Discharges of PCB and Other Bioaccumulating Substances

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3.3. <u>ADOPT WATER QUALITY STANDARDS AND HUMAN HEALTH CRITERIA FOR PCBs AND OTHER BIOACCUMULATING SUBSTANCES.</u> As part of the adoption of NR 105 and NR 106, establish water quality standards, human health criteria and effluent limit procedures for PCBs and other bioaccumulating substances. A congener-specific approach should be used if possible to set water quality standards. However, if it is not possible to do so because of inadequate data, establish standards for total PCBs and other bioaccumulates, and periodically review and revise them to incorporate new information. (Target date: 1988, review every 3 years)

EXPLANATION: High levels of PCBs in fish is the primary reason for the fish consumption advisory in the Fox River and Green Bay (and Great Lakes). Thus, PCBs are one of the important chemicals that must be addressed in the establishment of water quality standard rules for toxicants.

Research shows that different PCB congeners have significantly different toxicity. Controlling PCBs by regulating congener specific PCBs rather than total PCBs may decrease the cost of control and increase environmental effectiveness. Thus both scientists and industry appear to favor this approach. However, it is unclear whether adequate information is available to develop and justify individual standards for specific congeners at this time. If adequate data is available, a congener specific approach should be used to develop water quality standards for PCBs. However if information is inadequate, water quality standards for total PCB should initially be developed. The standards could be revised when adequate information is available to justify a congener-specific approach.

Congener-specific monitoring by industries and municipalities will be necessary prior to setting standards and effluent limits using a congener specific approach. Additional human health criteria are needed to guide management decisions for the control of toxic contaminants that bioaccumulate and in the development of fish and wildlife consumption advisories. Establishment of Health criteria should include, when possible: a risk assessment/management approach to set criteria and establish consumption advisories; criteria for PCB, dioxin, furans, and pesticides; and provisions for periodic re-evaluation. (Also see the explanation for the following recommendations in the TAC Reports: TOXICS - 20, 21, 24; and in this plan - 3.1, 3.4, 3.5, 3.6.)

Citizen Comments: One person questioned the use of congener-specific PCB regulations and studies since adequate data to establish standards may not be **available** and taxpayers would be shouldering the additional costs of any required studies or testing. Setting standards should not be delayed.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High.

WHO SHOULD ACT: WDNR, Legislature (Code approval), USEPA.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Water quality standards criteria for total PCB are proposed for inclusion in an administrative rule (NR 105) currently being drafted by WDNR. It is uncertain whether there is an adequate research data base on which to establish water- quality standards criteria for each PCB congener and consider their additive effects. Additional research may be necessary. The impacts of using a congener specific approach is difficult to evaluate at this time. Presumably control would be more cost-effective, since it would require less control for congeners with low toxicity and more control for those that are more toxic. However in that congeners of PCB breakdown to other PCB congeners, and that treatment technology may be similar for all congeners, the real savings may be less substantial. A more detailed analysis is needed and could be a low to moderate cost ($20,000 to $200,000 total) assuming an adequate research data base is available.

3.4. IDENTIFY ALL PCB SOURCES. As part of the USEPA Mass Balance study (see recommendation 16.1) or in a separate effort identify and quantify loads of all potentially significant point sources of PCB by 1989. This includes municipal discharges, major industries, and smaller industries that are potential sources, and tributary streams to determine if there are sources on these streams. (Target date: 1990)

* Monitor sources at least 4 times per year for the next 2 years at detection levels of 0.2 - 0.5 ug/L (ppb) and possibly lower for high flow discharges. Monitor both inflow and discharge for sources that use riverwater in order to determine net loads.

* Tributary monitoring should achieve low, nanogram/L (ppt) levels of detection.

a Monitor all sources below the De Pere dam. (Projected date: 1988)

b. Monitor all sources above the dam. (Target date: 1990)

EXPLANATION: Information on potential PCB sources is limited. Only a couple of the major discharges to the Fox River routinely report monitoring for PCBs. Other major discharges monitor for PCBs once every 5 years when their WPDES permit is reissued. Thus only 1 or 2 tests have been run on these sources. No data is **available** for most small discharges. Fox River tributaries should be monitored to determine if they contain discharge sources and/or in-place pollutants. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 35, 32, 29, 12; and in this plan - 15.1 and 16.1.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, USEPA, Municipal treatment plants, Researchers, Sea Grant, USGS, Industrial discharges.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Quarterly monitoring of 8 major point sources below the De Pere Dam will be conducted as part of USEPA's Mass Balance Study of toxic substances in the Bay. Estimated cost is anticipated to be $70,000. Upstream sources and tributaries are not scheduled to be monitored. An upstream monitoring effort might evaluate 15 discharges and 10 tributary and river stations during a two-year period and might cost $100,000 to $400,000. Source monitoring costs could be born by dischargers, or additional funds sought to fund a special research project to cover both sources and river sites.

3.5. USE FISH TISSUE MONITORING TO TRACK AND TO FLAG THE NEED FOR POINT SOURCE CONTROL OF FURANS AND DIOXINS.

a. Biannually monitor dioxin and furans in addition to PCBs in fish tissue in the River and Bay. (Target date: Initiate 1989)

b. If whole fish samples are found to contain levels of 2,3,7,8-TCDD and TCDF that exceed 10 picograms/gram (ppt), initiate a point source evaluation and control program. (Ongoing after 1989)

EXPLANATION: Fish tissue monitoring is a very effective way of tracking toxic contaminants in the ecosystem. Decreases or increases in bioaccumulating substances are most likely to be seen in fish because they are at the top of the aquatic food chain. Two compounds, dioxin and furans, are found at low levels in Fox River and Green Bay fish. These chemicals are very difficult to monitor in water and wastewater. These substances will appear in fish tissue before they are monitored in discharges. This recommendation suggests using fish tissue monitoring to track their levels in the ecosystem. If levels rise above a trigger point of 10 picograms/gram (parts per trillion) an intensive investigation of sources should occur and a control program should be developed. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 16; B&H - 25; and in this plan - 15.1, 15.2.)

Citizen Comments: One person commented that the trigger point should be lower because Ontario currently sets health advisories at this level of contamination.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, USEPA, and Wisconsin State Lab of Hygiene.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Wisconsin has no funding or laboratory capabilities for monitoring dioxins and furans. Fish could be collected as part of WDNR's ongoing fish monitoring program. However each analysis of 15 furan and dioxin congeners costs approximately $1,500. A sampling program of 6 samples (3 walleye and 3 carp) would cost approximately $9,000 a year.

3.6. MONITOR AND CONTROL DISCHARGES OF PCB AND OTHER BIOACCUMULATING SUBSTANCES. Major industries and municipalities that are potential sources should monitor their discharges for persistent bioaccumulative toxic substances and when found, implement a program to reduce levels of these substances to those consistent with water quality standards.

a. Routinely (at least quarterly) monitor discharges to determine the concentrations and loads of PCB and other persistent, bioaccumulative toxic substances. (Target date: 1988 ongoing, Review 1991)

When these substances are present, implement a toxicity reduction program in accordance with a schedule contained in the WPDES permit to reduce these materials in effluent to at least levels dictated by water quality standards for toxic substances. (Target date: 1988 ongoing)

c. Evaluate the need to develop categorical limits for some substances which bioaccumulate so that the best technology that is cost-effectively available is used to treat them; or that changes in manufacturing processes are undertaken. This will minimize their discharge to and impact on the ecosystem. (Target date: 1989)

EXPLANATION: The accumulation of toxic substances such as PCB in the food chain is one of the major toxic problems in the Lower Fox River and Green Bay. Acute and chronic toxicity tests do not indicate the presence of bioaccumulants. Thus routine chemical tests are required to guide the control and reduction of bioaccumulating toxicants. Initially a chemical by chemical testing approach will be necessary. When bioassay or other chemical tests become available that address bioaccumulation they should be used (reference recommendation 3.11). Advances in technology that will greatly reduce or eliminate discharges of bioaccumulating toxic substances in effluents should be continually evaluated and applied as they become cost-effective. Reductions should be made based on the assessment of risk associated with both direct and indirect human and environmental exposure and consistent with water quality standards.

There are several different approaches to reduce/control PCBs and other bioaccumulants in wastewater discharges. Changes in manufacturing processes may often be used effectively to reduce or eliminate the discharge of bioaccumulating substances. These might include product substitution, recycling or other steps to reduce the amount of toxicant used. Biochemical or chemical treatment of the wastewater is also possible, but is often more expensive and difficult. A similar strategy applies to reducing discharges from municipal wastewater treatment plants. Requiring control at the source (usually met by pretreatment or manufacturing process change) is often preferable to whole plant treatment. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 29, 32, 35; and in this plan - 3.1, 3.3, 3.4, 3.5.)

Citizen Comments: Several people noted that control of PCBs should be aimed at the Great Lakes Water Quality Agreement's goal of virtually eliminating the discharge of all persistent bioaccumulating substances. Another person noted that there should be a zero discharge limit for chlorinated organics. Another person commented that any categorical limits that are established should not depend on cost effectiveness.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High.

WHO SHOULD ACT: WDNR, USEPA, Municipal Treatment Plants, Industrial Dischargers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Major sources are screened for priority pollutants when their WPDES permits are reissued. More extensive monitoring is proposed in recommendation 3.4. Dischargers are required by their WPDES permit to routinely monitor for these substances if a potential problem is found.

Costs of a toxicity reduction evaluation and any controls required to meet WPDES permit requirements would be very site specific and can not be estimated. They would be based on statewide requirements for toxic substance control.

Program costs of evaluating the need for categorical effluent limits for some bioaccumulating substances, and developing and promulgating appropriate administrative rules may be low to moderate ($20,000 to $100,000 total). Costs of meeting these requirements would be analyzed as part of the initial evaluation.

Control Acute and Chronic Toxicity of Discharges

3.7. <u>ESTABLISH WATER QUALITY STANDARDS AND EFFLUENT LIMITS FOR TOXICANTS THAT RECOGNIZE ADDITIVE EFFECTS.</u>

a. As part of the adoption and refinement of water quality standard rules (NR 105 and 106) establish standards and associated effluent limit procedures which recognize the additive effects of toxic substances. Include procedures such as bioassays and methods of application when regulating toxicants using a chemical-by-chemical approach for chemicals with known synergistic effects. (1988)

b. WDNR's and U.S. EPA's capability to evaluate and model the additive effects of toxic substances should be strengthened. (Target date: 1990)

c. Periodically review and revise water quality standards to incorporate new information on additivity of toxic substances. (Ongoing)

EXPLANATION: Many toxic chemicals such as heavy metals are known to have combined effects that are additive. Some additive effects are synergistic, that is combined effects of two pollutants produce an effect greater than the effects of the pollutants acting independently. Some times additive effects appear to be less than each pollutant acting independently.

The Toxic Substance TAC recommended that effluent limits be set "based on assumed additive impacts of toxic substances unless this assumption can be proven invalid." They noted that not all toxic substances when combined exhibit additivity of effect, however there is enough data to indicate that this frequently occurs. They suggested that water quality standards should assume additivity unless there is documented evidence to demonstrate otherwise.

The Plan's recommendation calls for consideration of additive effects of toxicants when setting water quality standards and effluent limits. The

Plan's recommenation calls for the use of bioassays to monitor the combined effects of chemicals and demonstrate that they are not acutely or chronically toxic. In setting chemical-by-chemical effluent limits for toxic substances additivity of toxic substances can not be assumed, but must be based on adequately reviewed scientific information or site specific evaluation. This information is not available in the national toxic substances data bases which WDNR uses to determine criteria for toxic substances and establish water quality standards and effluent limits. The Plan's recommendation has been modified to specifically identify this as a data need that should be addressed in the future. WDNR and USEPA also need improved capability and modeling procedures to evaluate the additivity of acute and chronic toxicants using a chemical-by-chemical approach when appropriate. When this information is available, the need for including additivity effects in chemical-by-chemical effluent limits for acute and chronic toxicity should be re-evaluated. In the interim, whole effluent bioassay requirements should provide adequate protection. Since bioassays do not monitor for carcinogins, a chemical-by-chemical approach is required for these substances.

WDNR is proposing in a new administrative rule (NR 106) that whole effluent bioassays using fish or other aquatic life be used to evaluate the additive effects of chemicals on the chronic and acute toxicity of discharges. The rule also include provisions for protecting against the additive effect of carcinogens when setting effluent limits. (Also see the explanation for the following recommendations in the TAC Reports: TOXICS - 22; and in this plan - 3.1, 3.8, 3.9.)

Citizen Comments: One group strongly advocated that the Toxic TACs recommendation be the Plan's recommendation. They noted that making no assumption about the toxic impacts of combinations of contaminants is equivalent to assuming that they do not act in an additive manner. They suggested that adequate information and models are available in the research literature to establish chemical-by-chemical standards and effluent limits that recognize the additive effect of toxic chemicals.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, USEPA, Industrial dischargers, and Municipal treatment plants.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: WDNR is currently drafting toxic water quality standard rules that should be sent to the legislature for approval in 1988. Increasing WDNR's capability to consider additive effects would be a moderate cost ($50,000 to $100,000 per year).

3.8. EVALUATE AND CONTROL AMMONIA TOXICITY. Control known sources of chronic and acute ammonia toxicity and other significant sources when they are discovered.

a. Determine all significant sources (point and nonpoint) of ammonia toxicity in the Area of Concern. (Target date: 1988-1993)

b. Establish ammonia toxicity effluent limits and compliance schedules for point source discharges in WPDES permits (Target date: 1988-1993).

c. Control other sources based on findings of (a). (Target date: To be determined by "a")

EXPLANATION: Ammonia toxicity to fish and aquatic life is a significant problem in the Area of Concern. Sources can include municipal and industrial discharges and runoff from agricultural areas. Green Bay Metropolitan Sewerage District (GBMSD) is a major contributor. An effluent limit has been established for its discharge and GBMSD is preparing a facility plan to determine how to best meet these limits. The importance of other sources, especially runoff from agriculture and urban areas is not known. Other point sources should also be evaluated for their contribution to ammonia toxicity as their WPDES permits are reissued. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 33; and in this plan - 11.1 and 1.4, 1.5.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, USEPA, LCCs, WDATCP, UWEX, Municipal treatment plants, GBMSD, Industrial dischargers, and Farmers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: An analysis of individual impacts of discharges can be done as WPDES permits are reissued in the basin. An analysis of the combined impacts of these and other sources and control options could cost $20,000 to $150,000 dependent on the scope of the analysis. Any point source control costs would be required to meet statewide laws. Cost of controlling other sources would be evaluated in the study.

3.9. <u>MONITOR AND CONTROL DISCHARGES OF ACUTE AND CHRONIC TOXICITY.</u> Use bioassays to monitor effluent limits and toxicity reduction evaluations to control wastewater discharge sources of acute and chronic toxicity as soon as possible and no later than 1991, or as otherwise indicated by administrative rule. (Target date: 1991)

EXPLANATION: Bioassay monitoring, while costly, is a good way to determine if discharges are acutely or chronically toxic to fish and aquatic life. It also indicates the additive effects of toxic chemicals. USEPA is proposing this approach for national use. The monitoring serves as the basis for both requiring and tracking the effectiveness of controls. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 27).

Citizen Comments: Several people commented that both acute and chronic toxicity should be controled at the end of pipe. Refer to the explanation of recommendation 3.10.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, USEPA, Municipal treatment plants, Industrial dischargers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Requirements for monitoring will be based on. administrative rules which are currently being developed to regulate toxic discharges in the state. Bioassay monitoring requirements are proposed for inclusion in WPDES permits of 14 major pulp and paper mill dischargers. These tests cost approximately $3,500 for each analysis. Annual cost of monitoring these discharges could range from $200,000 to $600,000 depending on whether quarterly or monthly monitoring is required. To monitor the 5 major municipal discharges could cost an additional $70,000 to $200,000.

Costs of a "toxicity reduction evaluation" (guidelines for which EPA is currently developing) and any control required to meet WPDES permit requirements would be very site specific and can not be estimated. The costs would be based on statewide requirements for toxic substance control.

3.10. <u>IDENTIFY AREAS WHERE CHRONIC TOXICITY IN DISCHARGE MIXING ZONES MAY JEOPARDIZE FISH AND AQUATIC LIFE USES, AND IDENTIFY STEPS TO REMEDY, IF NECESSARY.</u>

a. Identify spawning habitat and other areas in the Area of Concern where chronic toxicity may be a potential concern to fish and aquatic life. (Reference recommendation 8.1.) (Target date: 1989)

b. Evaluate impacts of chronic toxicity in mixing zones on fish and aquatic life in these areas and the legal basis for control of any toxicity that is found. (Target date: 1991)

c. If necessary, incorporate requirements in WPDES permits to insure the protection and attainment of fish and aquatic life in the Area of Concern. (Target date: 1991-1996)

EXPLANATION: The Toxic Substances TAC recommended eliminating "chronic toxicity at end of pipe from industrial and municipal wastewater discharges with a target date of 1996." Many comments for and against this recommendation were received. Those against said it was technically impossible to eliminate chronic toxicity at end of pipe, and even if possible, costs would be prohibitive. Those in favor indicated the recommendation followed the Water Quality Agreement's stated policy prohibiting "the discharge of toxic substances in toxic amounts." The Citizens Advisory Committee suggested requiring no chronic toxicity at end of pipe this policy only if it was necessary to meet their "Desired Future State."

The Plan's recommendation suggests evaluating the impacts of any chronic toxicity in the mixing zone and taking steps to remedy any problems that are identified. For example, walleye and other fish spawning areas need to be protected from chronic toxicity during critical periods. Proposed studies to identify walleye spawning areas (reference recommendation 8.1) and to determine why mayflies such as <u>Hexagenia</u> have not returned to the River (reference recommendation 16.4) could be used to assess the potential impacts of chronic toxicity within the mixing zone of discharges. This approach would require end of pipe control of chronic toxicity only when needed to bring environmental benefits. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 34; and in this plan - 8.1, 16.2, and 16.4.)

Citizen Comments: Three commenters strongly advocated the Plan adopting the Toxic Substance Management TAC recommendation. Another commenter questioned whether eliminating toxicity in the mixing zone was cost-effective.

One group commented that the Plan's recommendation doesn't make sense because the desired future state clearly states we want water quality that protects wildlife from the affects of contaminants. So by definition if a discharge has been found to be chronically toxic using a bioassay, its toxic to the wildlife and it violates the desired future state. Nine years should be plenty of time to reach this goal.

Another group noted that two of the most important steps in achieving the Agreement's goal of virtual elimination of toxic substances could have come from implementation of the Toxics TAC's recommendations on mixing zones and limiting acute and chronic toxicity. They urged that the final RAP reflect their recommendations. They noted that while there may not be the regulatory authority to implement these recommendations the Plan should contain them so it then becomes a blueprint for what is necessary to restore conditions in the River to support all of the desired uses.

Major reservations were identified by another commenter who noted that eliminating toxicity in mixing zones, even acute, may be possible but in many cases may not be cost-effective. The proposed dates of 1991 and 1996 for eliminating acute and chronic toxicity respectively are certainly premature compared to the dates which most of the other recommendation in the Plan will be accomplished. There are limited funds and resources available to accomplish the Plan. These funds and resources need to be balanced over all high priority areas rather than targeting that which is more easily measured. Also, based on the state of knowledge as to what is truly toxic the person questioned whether we will know even by the year 2000 what is actually necessary to meet the desired future state.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: WDNR, Municipal treatment plants, USFWS, Researchers, USEPA, Industrial dischargers, Conservation and Environmental groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Current studies should evaluate spawning habitat in the Lower Fox River (see recommendation 8.1). A more detailed evaluation of the impact of any chronic toxicity in mixing zones could have costs ranging from $50,000 to $500,000. Costs of any required control would be dependent on the finding of the study.

Increase Monitoring Capabilities for Toxic Substances

3.11. ESTABLISH AND USE STANDARD TESTS FOR TOXICITY MONITORING.

a. USEPA should develop and establish standards for bioassay and chemical tests that evaluate toxic end points including but not limited to bioaccumulation, carcinogenicity, and congener specific PCB tests. (Target date: 1988 and ongoing)

b. Dischargers and WDNR should use these tests as soon as possible to evaluate and control the toxicity of effluents discharged into the Fox River/Green Bay ecosystem. (Target date: ongoing)

EXPLANATION: Standardized tests are needed to regulate toxicants and insure comparable data. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 26, 30; and in this plan - 3.6, 3.9.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate-High/Moderate

WHO SHOULD ACT: USEPA, Researchers, WDNR.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: USEPA should be developing and establishing standard toxicity tests as part of their ongoing programs.

3.12. INCREASE WDNR CAPABILITIES FOR MONITORING TOXICANTS. Increase and strengthen WDNR's capability to monitor toxicants for problem identification, trends tracking, regulatory, and lab certification purposes.

a. Increase laboratory capability for testing specific chemical compounds and their congeners, particularly PCB. (Target date: 1988)

b. Establish a biological monitoring program that includes testing toxicological end points for fish, other aquatic life and human health. Included should be testing for PCBs, furans, dioxin and other substances of concern to the Fox River and lower Green Bay. (Target date: 1989)

c. Develop capability to conduct standard acute and chronic bioassays for evaluative and regulatory purposes. (Target date: 1989)

EXPLANATION: WDNR must have the capability to monitor toxicants and toxicity if it is going to adequately protect Wisconsin's waters from their effects. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 15, 28; and in this plan - 3.5, 15.1, and 15.2.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, Legislature, State Lab of Hygiene, and USEPA.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: WDNR requested $489,000 be included in the FY 1987-89 budget to establish state wastewater biomonitoring capability for toxic substances. It was not funded. The State Lab of Hygiene is developing the capability to monitor congener -specific PCBs. The project is partially funded by an USEPA grant.

3.13. INCLUDE ADDITIONAL TYPES OF TOXICITY MONITORING IN LABORATORY CERTIFICATION AND REGISTRATION PROGRAM. Amend laboratory certification rules (NR 149) to cover additional types of toxicity monitoring. Include: acute and chronic bioassays, assessment of lab capabilities to identify and qualitate congeners of PCB and other chlorinated hydrocarbons, biomonitoring tests, and demonstration of laboratory ability to produce accurate low level data for toxic substances. (Target date: 1989)

EXPLANATION: Toxicant and toxicity monitoring requires new techniques and technology and low levels of detection. Control decisions should be based on good data. Thus laboratory certification and registration is important. Assessment of lab capability to identify and quantitate PCB congeners can be done by: 1) reviewing methods of analyses; 2) requiring successful analysis of reference samples, consisting of a representative group of congeners; and 3) conducting on-site evaluations every third year. Demonstrations of laboratory ability to produce accurate low level data for phosphorus, PCBs, toxic metals, etc. is accomplished by: 1) requiring low level reference samples, blind and known standards; 2) conducting on-site evaluations every third year; and 3) requiring statistical determination of limits of detection and quantification. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 36.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: WDNR, Wisconsin State Lab of Hygiene, Municipal treatment plants, Researchers, USEPA, NOAA, Industrial dischargers, Public and private laboratories, and Certificastion Standards Review Council.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Program costs for amending lab certification rules and making the proposed program changes would be approximately $20,000. They probably can be absorbed by the existing WDNR lab certification program budget. Implementation costs would be absorbed by the laboratories.

KEY ACTION #4: REDUCE AVAILABILITY OF TOXIC SUBSTANCES FROM CONTAMINATED SEDIMENTS

Key Action's Priority: High

	Action Recommendation	Priority for Key Action	Priority for Plan	Page
4.1	Determine mass and availability of PCB and other contaminants in the River system.	High	High	107
4.2	Conduct a remedial investigation/ feasibility study of in-place pollution control options for the River.	High	High	108
4.3	Establish federal, state and local programs to effectively clean-up in-place contaminated sediments.	High	High	109
4.4	Clean-up contaminated sediments based on results of the feasibility study.	High	High	111
4.5	Avoid re-introduction of toxic pollutants to the River system.	High	High	112
4.6	Complete adoption of new administrative rules for disposal of dredged materials.	High	High	112
4.7	Adequately evaluate and contain, as necessary, existing dredged material disposal sites so that contaminants do not re-enter the ecosystem.	Mod.	Mod.	113
4.8	Coordinate navigational dredging projects and remedial measures.	Mod.	Mod.	114
4.9	Develop a 25 year dredge disposal plan and evaluate harbor and port alternatives.	High	Mod.	115
4.10	Minimize impacts of ultimate disposal of toxic contaminants.	High	Mod.	117

	Action Recommendation	Priority for Key Action	Priority for Plan	Page
	Other Key Actions and Recommendations to Help Reduce Availability of Toxic Substances from Contaminated Sediments			
#3*	Eliminate toxicity of municipal, industrial and other point source discharges.	High	High	85
#11*	Virtually eliminate toxicity caused by nonpoint and atmospheric sources.	Mod.	Low	171
9.1*	Consider pilot projects to control suspended sediments.	Low	Low	162

*Reference indicated Key Action recommendations for more details.

KEY ACTION #4: REDUCE AVAILABILITY OF TOXIC SUBSTANCES FROM CONTAMINATED SEDIMENTS

Of the many toxic substances known to be present in sediments of the Fox River and Lower Green Bay, PCBs comprise the group of chemicals that are of overriding concern. PCBs are known to exist at high concentrations in sediments of the Fox River. Their presence contributes to: PCB levels above FDA standards in some fish in the Area of Concern; a potential human health hazard from eating these fish; impaired reproduction of some fish and wildlife species; and complications in navigational dredging.

Compliance with the international Great Lakes Water Quality Agreement, the federal Clean Water Act, and the identified desired future state for Green Bay and the Fox River demands action to deal with in-place pollutants. The problem of in-place pollutants is of such magnitude that establishment of a multi-agency federal and state task force should be considered. This task force should initiate a remedial feasibility study to identify an acceptable course of action. Table 13 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Reducing the availability of in-place toxic substances, particularly by removing contaminated sediments, will cause a decline of PCB concentrations in fish, plankton, benthic organisms and fish-eating wildlife. It also should improve the reproductive potential or success of populations of the Forster's tern, walleye and other biota.

USE IMPROVEMENTS

This action will reduce human cancer risks from eating fish from Lower Green Bay and the Fox River. It also will lessen the problems associated with toxic contaminants for furbearers, wildlife and endangered species, and will improve opportunities for existing and future uses of the ecosystem such as fishing and hunting. However, this action probably will have adverse short-term effects on water turbidity and probably will produce a transitory increase in PCB concentrations in fish.

CITIZEN COMMENTS AND SUGGESTIONS

Approximately 9 people commented on this Key Action. All recognized in-place pollutants as a major problem. Several commented that the Plan should affix responsibility for cleanup and/or Superfund status should be sought. Those responsible for discharging toxics into the system should be responsible for cleaning it up.

One group noted that the question of what is the least harmful way of dealing with toxic sediments still has to be answered. They hoped to see it resolved in a manner which does not compromise water quality or cause further degradation of the environment.

A number of people commented both for and against the continuation of dredging and **a** commercial harbor. Both viewpoints appeared to generally believe that a 25 Y^r dredge disposal plan and evaluation of harbor and port alternatives was worthwhile. However one group questioned advisability of such an evaluation because a past effort was ignored. Two people said the Plan should have more adequately addressed Kidney Island.

Refer to the explanation of individual recommendations for addition discussion of these and other comments on this Key Action.

TABLE 13. Priority, Environmental Effects and Use Improvements Associated with Key Action #4.

KEY ACTION 4:	Reduce Availability of Toxic Chemicals From Contaminated Sediments
PRIORITY	High
ENVIRON. EFFECTS	Reduce PCB concentrations in fish, plankton, benthic organisms and fish-eating wildlife and humans. Increase reproductive success of Forster's tern, walleye and other biota.
USE IMPROVE-NEWTS	Decrease potential human health risks from eating Green Bay fish and waterfowl. Protect furbearers, wildlife and endangered species from toxic effects.
COMMENTS	The action may have short-term adverse effects on turbidity and PCB concentrations in fish.

B

4.1. <u>DETERMINE MASS AND AVAILABILITY OF PCB AND OTHER CONTAMINANTS IN THE RIVER SYSTEM.</u> Determine the total amount of PCB and heavy metals in the sediment deposition areas of each river reach and determine bedload/solution losses from these areas.

a. Compile and evaluate all existing data on toxic contaminants in the River and inner bay sediments to determine the mass, concentrations, and transport of PCB and identify data gaps and needs. (Target date: 1988)

b. Complete Little Lake Butte des Morts study of contaminated sediments to determine transport rates and mass of PCB to the Lower Fox River. (Target date: 1988)

c. Conduct study (possibly as part of the Mass Balance Study - Refer to recommendation 16.1) to determine the amounts of PCB being transported over the Rapids Croche Dam, the De Pere Dam, and at the confluence of the Lower Fox River with Green Bay. (Target date: complete in 1990)

d. Conduct study (possibly as part of the Mass Balance Study) to evaluate mass, storage, availability and movement of PCB in other river reaches. (Target date: complete **in** 1993)

EXPLANATION: Current information indicates contaminated sediment is the major source of PCB loads from the Fox River to the Bay. A critical first step in control of this source is to determine the amount and movement of contaminants in the River's 12 reaches. Some contaminants move with the sediment along the bottom of the River (i.e., bed load), and others move in solution. Ideally this study would be done as part of or at the same time as U.S. EPA's Green Bay Mass Balance Study so similar information is gathered about both the Bay and River. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 3; and in this plan - 4.2, 16.1).

Citizen Comments: One group commented that the single biggest problem causing fish advisories is with in-place, toxic pollutants. They supported the need to work with other communities and state and federal agencies and lawmakers for appropriate funding for such things as the Mass Balance Study.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, USEPA, USGS, Researchers, GBMSD, Sea Grant, Industry.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The Little Lake Butte de Morts study is currently underway and is funded by a combination of WDNR, U.S. EPA and U.S.G.S. funds. The additional assessment of PCB transport from major river segments (4.1c) is likely to cost $400,000 to $600,000 and is proposed to begin at the same time as is EPA's Mass Balance Study of toxics in the Bay. Approximately $400,000 of funding appears to have been committed from combined sources including a new 1988-89 state appropriation, contributions by industry, and USGS cost sharing. Additional monitoring of specific reaches may be needed based on the results of this study and to provide information required for the engineering analyses of alternatives done as part of the remedial investigation/feasibility study. Cost of this monitoring may range from $200,000 to $300,000 as indicated by similar monitoring done for the Sheboygan River Harbor and other Superfund projects.

4.2. CONDUCT A REMEDIAL INVESTIGATION/FEASIBILITY STUDY OF IN-PLACE POLLUTANT CONTROL OPTIONS FOR THE RIVER. Conduct a remedial investigation/feasibility study to determine how to best reduce availability of in-place contaminants. The study should:

* Identify the most environmentally sound and cost-effective approaches;

* The objective should be reducing contaminants in fish to acceptable levels based on criteria established in Annex 1 of the Great Lakes Water Quality Agreement (for example, a sediment objective of 0.05 ug/kg (ppb) PCB would probably be necessary to obtain IJCs objective of 0.1 ug/g (pcm) total PCB in whole fish tissue);

* Include a management plan for ultimate treatment, disposal or containment of contaminants;

* Evaluate approaches to coordinate remedial measures and navigational dredging;

* Include the opportunity for public review and participation. (Target date: complete by 1995)

EXPLANATION: The Toxic Substances Management TAC initially recommended a series of remedial steps to follow in dredging contaminated sediments. At this time, they knew of no viable alternative to dredging this system that will isolate in-place contaminants and make them unavailable to the ecosystem.

The TAC noted that assuming the River and Bay will be naturally cleansed of toxic contaminants if no remedial action is taken, the time period needed would be prohibitive. Capping is probably not a permanent solution particularly in the shallow depths of the Lower Fox, Little Lake Butte des Morts, and Lower Green Bay. The technology does not currently exist for in-place chemical decomposition (for example by microbial degradation). Other technologies, such as chemical stripping, are quite experimental. However, comments on the Toxics TACs Report noted that these and other alternative technologies need to be examined in more detail. Also new technologies need to be developed and evaluated nationwide (see recommendation 16.9).

A feasibility study was later suggested to examine all cleanup options and to determine the most cost-effective and environmentally sound means to reduce in-place contaminants. An engineering feasibility study is likely to take 2 to 5 years to complete depending on data availability and complexity of the system and disposal options. (Also see the explanation of the following recommendations in the TAC reports: TOXICS - 2; and in this plan - 4.1, 4.3, 4.4, 16.9.)

Citizen Comments,: One person said that the target completion date should be moved up to 1993.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, USEPA, County and local government, Brown County Harbor Commission, COE, Municipal Treatment Plants, Industry

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The remedial investigation/feasibility study is a detailed analyses of the engineering alternatives for cleanup. It is likely to cost $400,000 to 1 million based on similar studies done for Superfund and other clean-up projects.

Funding would likely need to be a mix of state, local and federal funding sources. There are no existing programs that specifically fund Remedial Investigations/Feasibility Studies for areas with contaminated sediments (see recommendation 4.3). Options include seeking a state budget initiative, funding of a study for a pilot project from USEPA's Great Lake's in-place demonstration program, seeking designation of the site as a Superfund site if it qualifies under new regulations, or some other new initiative.

4.3. <u>ESTABLISH FEDERAL, STATE, AND LOCAL PROGRAMS TO EFFECTIVELY CLEAN UP IN-PLACE CONTAMINATED SEDIMENTS.</u> Congress and the Wisconsin Legislature, in partnership with local governments shall establish complementary programs that effectively address the safe removal, containment and/or disposal of in-place pollutants. (Target date: 1989)

* The programs should include adequate funding mechanisms and recognize the joint public and private responsibility for cleanup.

* Eligibility requirements should include risks to humans and wildlife from eating contaminated fish and risks due to potential drinking water contamination.

EXPLANATION: In the 42 Areas of Concern in the Great Lakes, the most common problem identified is the presence of toxic contaminants in the sediment of rivers and harbors. Yet there are no Federal, state or local programs that adequately address these sources. Existing programs such as Superfund and Wisconsin's Environmental Repair Fund (ERF) have criteria that make it unlikely a site will be selected and/or grossly inadequate funding. The Clean Water Act's in-place pilot program is underfunded and the funding has yet to be appropriated.

The scope of the in-place contaminant problem mandates that cleanup efforts be a joint public and private effort involving all levels of government. The program(s) should be a combination of existing programs (e.g.. Superfund, Clean Water Act, Wisconsin Environmental Repair Fund, navigational dredging, and solid waste disposal) and new initiatives at all government levels. Development of these programs is critical if we are to get rid of the toxic contaminant problems that plague the Great Lake's sport fishery. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 1).

Citizen Comments: Several people suggested that Superfund designation for hot spots in the Fox River should be immediately pursued. They noted that no other funding sources have surfaced yet, and the new criteria include bioaccumulation in fish as an adequate reason for selection. Other people commented that the Plan should affix responsibility for cleanup. Those responsible for discharging toxics into system should be responsible for cleaning it up. Several other people noted that the proposed mix of public, private, local, state, and federal funding is critical if the in-place pollution problem is to be solved.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: Congress, Legislature, USEPA, Counties, Municipalities, WDNR, COE, Brown County Harbor Commission, and Others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Refer to recommendations 4.1, 4.2 and 4.3 for contaminated sediment clean up costs specific to the Lower Fox River.

There are no federal, state or local programs that adequately address the problems of contaminated in-place sediments and their cleanup. A several million-dollar, pilot cleanup demonstration program included as part of the Great Lakes allocation has yet to be appropriated. Even if the funding is appropriated, the level of funding is inadequate to tackle even one major cleanup effort. WDNR proposed an approximately $700,000 annual funding in the 1987-89 biennial budget to establish a management program for toxic substances in harbor and river sediments. It was to fund development of Remedial Investigation/ Feasibility Studies at several contaminated sites (cleanup costs would be sought later based on the studies). The program was not included in the state budget. Ongoing navigational dredging activities in the River below the De Pere dam might be coordinated with remedial action cleanup efforts and provide for cost savings in downstream cleanup costs. Traditionally the Army Corps of Engineers has funded dredging and dredged material disposal, however future funding is uncertain. Total or partial local funding of these activities in the future is likely. Superfund is another potential program that might deal with in-place contaminated sediments. Until the Superfund law was amended in 1986 health risks associated with eating contaminated fish were not considered in priority ranking of Superfund sites. New guidelines that include these considerations are likely to be established in late 1987 or early 1988. Under Superfund responsible parties are required to pay cleanup costs.

4.4. <u>CLEAN UP CONTAMINATED SEDIMENTS BASED ON THE RESULTS OF THE FEASIBILITY STUDY. Initiate pilot clean up projects on upstream river</u> reaches, evaluate results and continue cleanup efforts as indicated by the feasibility study and the results of the pilot projects. Guidelines are:

* Minimize to the fullest extent possible the resuspension and downstream transport of material during dredging or other cleanup operations.

* Clean up sediments until the active sediment zone is less than or equal to 0.05 ug/g dry weight total PCBs to attain the IJC target concentration of 0.1 ug/g for fish and aquatic life protection.

a. Initiate a pilot clean-up project at Little Lake Butte des Morts and evaluate results and downstream impacts. (Target date: 1995)

b. Continue clean-up projects working downstream as indicated by the feasibility study and results of pilot projects. (Target date: To be determined by feasibility study, "4.2")

c. Provide for the safe ultimate disposal of contaminants in dredged materials. (Target date: To be determined by feasibility study, "4.2")

EXPLANATION: The recommendations of the feasibility study (see recommendation 4.3) should guide clean up of the river system. Efforts should begin upstream to avoid recontamination of cleaned up areas. Little Lake Butte des Morts is the most upstream reach containing significant amounts of PCB in the sediment. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 4, and in this plan - 4.1, 4.2, 4.4).

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, USEPA, County and local government, Brown County Harbor Commission, COE, Industry.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: A pilot cleanup project could cost from $500,000 to 5 million depending on the scope of the effort. Little Lake Butte de Morts is a likely location for such a project. A cooperative effort is most likely to be successful in developing a pilot project. Potential funding sources could include the U.S. EPA's new demonstration project program for cleanup of in-place pollutant in the Great Lakes. However, the multi-million dollar program authorized by the Clean Water Act has yet to be appropriated. The Wisconsin legislature could establish a state in-place contamination cleanup demonstration program that could help fund a pilot cleanup project. Industries and local governments would also need to contribute to effort.

The remedial investigation feasibility study will determine the cost of different cleanup options. Costs are dependent on the type of treatment amount of material handled, level of contamination, and disposal costs. Present dredging projects with on-site disposal are running $4-5 for clean material. The additional cost of transporting contaminated sediment to a licensed solid waste site could be quite high, maybe $20 to $50 per yard for disposal. Total cost of cleanup could be quite low (for a do nothing alternative) to extremely expensive (several hundred million dollars) for removal and disposal of contaminated sediments in the entire river system. These costs are based on estimates of cleanup costs developed for other harbor and river systems. Dredging and disposal of very contaminated sediment in a pilot cleanup project proposed for a small portion of the Hudson River will cost $40,000,000. Building an expanded contained disposal facility (CDF) to hold 3.7 million cubic yards of contaminated materials from the navigational channel at Green Bay is anticipated to cost $10 million to $12 million. By comparison industries and municipalities invested over $300,000,000 in the last 10 years to remove biological oxygen (BOD) from their discharges and return oxygen and fish to the Fox River. Like the cost of wastewater cleanup it will take a combined effort of public and private, state, federal, and local funding if cleanup of contaminated sediments in the lower Fox River is to be accomplished (reference recommendation 4.3).

4.5. AVOID RE-INTRODUCTION OF TOXIC POLLUTANTS TO THE RIVER SYSTEM. Eliminate or control, to the greatest degree possible, the re-introduction of toxic pollutants into cleaned up areas in order to maintain a sediment objective of 0.05 ug/kg (ppb) and the IJC target goal of 0.1 ug/g (ppm) in fish. (Target date: ongoing)

EXPLANATION: Clean up of contaminated sediments will require a major effort and cost. Areas that are cleaned up should not be recontaminated by new discharges of toxicants or dredging practices that resuspend buried contaminants. Therefore upstream reaches and sources should be controlled before clean up is undertaken. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 5; and in this plan - 3.6, 4.4).

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, USEPA, Counties, Cities, Villages, Municipal treatment plants, Brown County Harbor Commission, COE, and Industrial dischargers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Costs will be part of the River clean-up effort (4.4) and the control of toxic contaminants in point and point sources (see Key Actions #3 and #11).

4.6. COMPLETE ADOPTION OF NEW ADMINISTRATIVE RULES FOR DISPOSAL OF DREDGED MATERIALS.

a. Complete adoption of NR 522 to formalize solid waste program procedures for review of dredged material disposal facilities and specific requirements for in water confined disposal facilities. (Projected date: 1988)

b. Complete adoption of NR 347 to establish sediment criteria for in water disposal and sampling and analysis requirements. (Projected date: 1988)

c. Increase WDNR capability to administer these rules. (Target date: 1988)

EXPLANATION: WDNR is drafting rules to guide responsible parties in dredging and disposal of dredged materials. The requirements will also generate data that will help in the evaluation of disposal effectiveness and improvements. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 7.)

Citizen Comments: One person commented that these rules (522 and 347) exempt the Green Bay Project (Kidney Isle expansion) and may allow open water disposal of some sediment.... The Plan shouldn't indicate blanket support for rules.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, Legislature, and Others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Development of rules is part of WDNR's ongoing program. Improvement in staff capability to administer these rules is needed and would be for a statewide program. It might cost approximately $50,000 to $100,000. However, the cost would not be specific to the Lower Green Bay and Fox River Area of Concern.

4.7. ADEQUATELY EVALUATE AND CONTAIN EXISTING DREDGED MATERIAL DISPOSAL SITES SO THAT CONTAMINANTS DO NOT RE-ENTER THE ECOSYSTEM.

a. The existing Renard Isle (Kidney Island) Confined Disposal Facility should be evaluated and contained, as necessary, following requirements defined in the Conditional Grant of Solid Waste Site Exemption, facility plan approval and WPDES Permit requirements, and other established guidelines for the expansion of the site. An additional consideration is to minimize exposure of endangered species and other wildlife to toxic contaminants (see recommendation 6.16) and minimize adverse impacts of alternative uses of the site (see recommendations 6.16 and 14.7). (Target date: 1990)

b. The Bay Port Industrial Park and other contaminated dredge material disposal sites should be evaluated to determine any existing impacts on the ecosystem, how to mitigate them, and to develop guidelines and plans for minimizing impacts of any future uses of the sites. (Target date: 1995)

EXPLANATION: Sites where contaminated dredged materials have been disposed of in the past need to be evaluated to make sure they are not now a source of contaminants to the Bay and River. Sites include the old dredge spoils piles deposited in the Bay (see recommendation 9.2), Bay Port Industrial Park and the existing "Kidney Island." These older sites were not designed to completely isolate dredged materials from the environment. While not believed to be a significant problem, the transportation of contaminants in dissolved form, with suspended solids or through the food chain in the disposal area is possible. This should be investigated to confirm that there is not a problem. If a problem exists or changes in use of the site are proposed that could create problems, solid waste guidelines for site closure should minimize the potential for contamination. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 9; and in this plan - 6.12, 6.12, 9.2, 11.6.)

Citizen Comments: One person commented in favor of the recommendation but suggested that the dates be moved up because we have issues at hand right now that need dealing with.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: COE, Brown County, City of Green Bay, Brown County Harbor Commission, WDNR, USEPA, USFWS, and Others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The cost of site evaluations could be moderate to high ($50,000 to $1 million total) based on comparable studies on abandoned landfills and Superfund sites. Clean-up and containment costs depend on the findings of the evaluations but could be very low (no action) to very high (several million dollars). Site evaluations are usually the responsibility of the site owner or party responsible for initial waste disposal (i.e., responsible party). Abandoned sites may be eligible to be evaluated under Wisconsin's Environmental Repair Fund or Superfund. Another option is seeking money for a special research project at one or more of the sites.

4.8. <u>COORDINATE NAVIGATIONAL DREDGING PROJECTS AND REMEDIAL MEASURES.</u> Insure that existing maintenance dredging and any new initiatives to deepen or enlarge the harbor are coordinated with remedial actions and do not jeopardize efforts to restore other beneficial uses of the Bay and River by increasing the availability of toxic substances to the system. (Target date: ongoing after 1989)

EXPLANATION: Depending on how and when maintenance dredging for navigation is done it has the potential to jeopardize or complement remedial actions. Coordination of efforts may reduce costs of both efforts and may lead to better protection of the environment. However upstream sources of contaminants must be controlled if downstream cleanup efforts are to be effective. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 6; and in this plan - 4.2, 4.3, 4.6, 4.7.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: COE, Brown County, Brown County Harbor Harbor Commission, WDNR, and Industry.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: This recommendation should be accomplished by better coordination of existing programs and agencies.

4.9. <u>DEVELOP A 25 YEAR DREDGE DISPOSAL PLAN AND EVALUATE HARBOR AND PORT ALTERNATIVES.</u>

a. Develop a 25-year dredge disposal plan for Green Bay to address disposal of sediments dredged to keep the commercial harbor open. This plan should be integrated with remedial dredging measures and updated regularly (every 5 years). (Target date: 1991)

b. Conduct a comprehensive study of long range environmental and economic impacts of alternate uses of the port. Some alternatives to include:

* Alternative modes of transportation and approaches to providing port facilities.

* Change in size the as well as the long-range economic viability of the port;

* Private versus public ownership of the port facility;

* Long range dredging and dredge disposal needs (25 years with interim reviews and revisions);

* Environmental impacts on water quality, the fishery and wildlife;

* Potential for new industry to be drawn with the port;

* Opportunities to coordinate navigational dredging with remedial measures designed to reduce the impact of toxic substances in sediment. (Target date: 1991)

EXPLANATION: The disposal of dredged materials from navigational dredging operations in Green Bay has been an ongoing problem and a source of considerable controversy in the Area of Concern. There is a clear need for a plan that could be used in long-term planning efforts (25 years) to provide safe dredge disposal options. As remedial dredging operations are initiated, planning for navigational dredged material disposal should be integrated with remedial planning so that state, federal, and local expertise and resources can be pooled. The Plan should be reviewed and revised as necessary every 5 years to respond to changes in technology and regulations.

Like other small Great Lakes ports, The Port of Green Bay, is an important part of the local economy. The port provides alternatives to land-based transportation, namely rail and highway shipping. At the same time there are major shifts in Great Lakes shipping, a decline in Seaway general cargo trade and a trend toward "load centers" at a few major ports that may impact Green Bay. The major industry that ships coal into the port recently built railroad loading facilities.

Contaminated sediments make harbor dredging costly, controversial, and an environmental concern. The U.S. Army Corps of Engineers (COE) has in the past provided dredging and dredge spoil disposal facilities for Great Lakes ports. However, the COE is increasingly requiring local municipalities to sponsor and be responsible for maintenance of dredge disposal sites. In the future it is likely that all aspects of harbor dredging and dredge spoil disposal will have to be funded by local monies. Such costs can be significant. For example COE costs for expanding the existing contained disposal site (Kidney Island - now called Renard Isle) are projected to be $10,000,000 to $12,000,000. Maintenance costs for the facility will be a local responsibility. Typically such costs are 0.5% to 2% of initial construction costs, in this case, $50,000 to $240,000 per year. The expanded structure is designed to provide four years of dredge disposal capacity. Thus by 1993 additional disposal facilities may be necessary.

The many factors affecting the port make it important that the Green Bay community carefully evaluate the environmental and economic impacts of alternative uses of the port. This effort should be coordinated with the assessment of long range (25 year) dredge disposal needs. Ideally this effort should begin now because the planning, design, approval and construction of a facility to contain dredged materials typically takes 5 to 8 years.

Different approaches to operating the port could require an increase or decrease in the amount of contaminated sediments that need to be dredged. Some alternatives that have been mentioned by various groups include: deepening the entire channel to 27 feet to make the port available for all boats able to pass through the St. Lawrence Seaway; maintaining the existing the port at its current depth; limiting the port to the mouth of the River and providing land-based transportation to transport bulk commodities up-river; using Kewaunee as a deep water port and transporting goods by rail or other means to Green Bay; and closing the port. Different dredge disposal options can also have significantly different costs and environmental impacts. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 11; INST. - 12.)

Citizen Comments: While people had very different opinions on dredging they generally supported the recommendation. One group noted they support dredging, but also concur with the Plan's call for development of long-term dredging plan looking aL costs and benefits. Another group said that the harbor is essential for economic vitality of this area. They want to participate in any study of harbor alternatives.

Other people commented against dredging or suggested other alternatives that should be considered. One person noted that the continuance of dredging may be a problem because it causes turbidity and resuspension of toxics. It is vital that a benefit cost analysis be done independently and be done honestly. There may be more than one way to get goods into this area. One group suggested another option should be studied such as leaving the spoils in place and perhaps using another harbor. One person suggested a dredge/no dredge option study should be made. It seems reasonable to ask the question if a deep water regional port is a possible option in balancing economic concerns of area jobs and economic health with long term environmental and economic cost of dredging and toxic sediment containment.

Finally, one group questioned the advisability of establishing a multi-agency task force to study in-place pollutants and what to do with them. A past effort to do so was ignored. If this occurs again, this key action would just be a costly exercise in futility.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: Brown County, Brown County Harbor Commission, City of Green Bay, City of De Pere, Industry, COE, RPCs, WDNR, WDOD, WDOT and Others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Costs of developing a 25-year dredge plan and evaluating harbor alternatives might each be moderate ($50,000 to $250,000) depending on the scope of the analysis. A cooperative effort of local governments, industry and interested agencies is suggested. Bay Lake Regional Planning Agency is currently developing an economic impact study of the port which could be used to develop an analysis of economic alternatives.

4.10. MINIMIZE IMPACTS OF ULTIMATE DISPOSAL OF TOXIC CONTAMINANTS. As part of the development of the state's in-place pollutant, and solid and hazardous waste programs, develop policy and guidelines for ultimate disposal of PCBs and other toxic contaminants. Both technical and institutional factors should be considered.

a. Develop approaches to reduce the amount of toxic wastes generated by reuse and recycling, product substitutions, etc. (Target date: 1992)

b. Develop guidelines for selecting ultimate disposal options for PCBs and other toxic chemicals so as to avoid recycling these wastes through the ecosystem via sludge, leachate, atmospheric emissions or other means. (Target date: 1991)

c. Continually evaluate new technologies for clean up of contaminated sediment including the feasibility of using processes to remove contaminated sediments, separating out and destroying toxicants, and reusing clean sediments. (Target date: ongoing after 1989)

d. Evaluate environmental and institutional desirability and feasibility of constructing facilities, such as a high temperature/efficiency incinerator for destruction or disposal of contaminants requiring toxic and hazardous waste disposal. (Target date: 1995)

EXPLANATION: Toxic wastes, once they are generated, are difficult to dispose. Past wastewater discharges have contaminated river and bay sediments. Clean up of these sediments will generate a waste which must be disposed of safely.

Ultimate disposal means discard material containing toxic substances in a way that makes toxicants permanently unavailable to the ecosystem. Many disposal methods involve redistributing and diluting toxic substances (partial incineration, land spreading) or storing them where they are only temporarily removed from the ecosystem. Making contaminants permanently unavailable should be the determining factor in selecting disposal options whether they include landfilling, chemical decomposition or use of confined disposal facilities (CDF).

As part of development of the in-place control program, and solid and hazardous waste solutions to ultimate disposal, recycling, destruction or elimination of toxic wastes must be sought when feasible. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 10; and in this plan - 4.3)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, USEPA, Counties, Cities, Villages, Municipal treatment plants, Brown County Harbor Commission, COE, Industrial dischargers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Developing approaches to reduce toxics (4.10a) and evaluating feasibility and desirability of constructing facilities for toxic and waste disposal (4.10d) could be done by a cooperative effort of industry, local government and interested agencies. Costs of such analyses are estimated to be low to moderate ($0 to $250,000). The other efforts (410.b and 410.c) ideally would be part of a state in-place contamination clean-up program and might cost $0 to $50,000 each.

KEY ACTION #5: CONTINUE CONTROL OF OXYGEN-DEMANDING WASTES (BOD) FROM MUNICIPAL AND INDUSTRIAL POINT SOURCE DISCHARGES

Key Action's Priority: High

	Action Recommendation	Priority for Key Action	Priority for Plan	Page
5.1	Remove the winter dissolved oxygen water quality standard variance from the Bay.	High	High	121
5.2	Continue to periodically review and revise the wasteload allocations on the Lower Fox River.	High	Mod.	121

Other Key Actions to Help Control Oxygen-Demanding Wastes

#1*	Reduce Phosphorus Inputs to the River and Bay from Nonpoint and Point Sources.	Mod.	High	63

*Reference Key Action recommendations for more details.

KEY ACTION #5: CONTINUE CONTROL OF OXYGEN-DEMANDING WASTES (BOD) FROM MUNICIPAL AND INDUSTRIAL POINT SOURCE DISCHARGES

Before 1970, heavy loading of organic materials from point sources created intolerable conditions for some fish and many forms of aquatic life in the Lower Green Bay-Fox River ecosystem. Improved effluent treatment processes have significantly reduced discharges of oxygen-demanding waste from municipal and industrial sources during the past decade, and these reductions have changed the ecosystem favorably. Control of oxygen-demanding waste should continue as an integrated part of other proposed actions rather than as an isolated action. Table 14 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Control of point source discharges of organic waste has, most importantly, reduced variations in dissolved oxygen. It also has decreased suspended solids and sediments, decreased sediment oxygen demand, improved habitat conditions for benthic organisms, improved habitat conditions for fish, altered food web structure, and reduced discharge of toxic substances.

USE IMPROVEMENTS

This action has and will continue to improve recreational and commercial fishing, expand nonconsumptive recreational uses and improve aesthetics.

CITIZEN COMMENTS AND SUGGESTIONS

Only two people commented on this Key Action. One indicated support for removing the current winter dissolved oxygen water quality standard variance in the Bay. The other indicated that "The notion of allocating water to each user company to the most that the River can handle is disgusting to me."

TABLE 14. Priority, Environmental Effects and Use Improvements Associated with Key Action #5.

KEY ACTION 5:	Continue Control of Oxygen-Demanding Waste From Industrial and Municipal Discharges.
PRIORITY	High
ENVIRON. EFFECTS	Decrease suspended solids and sediments. Decrease sediment oxygen demand. Reduce variation in dissolved oxygen. Improve habitat for benthic organisms and fish. Alter food chain structure. Reduce discharge of toxic substances.
USE IMPROVE-MENTS	Improve commercial and recreational fishing. Improve aesthetics. Increase recreational uses.
COMMENTS	Many changes and improved uses in the ecosystem have already occurred. This action must be continued.

Back

5.1. REMOVE THE THE BAY'S WINTER DISSOLVED OXYGEN WATER QUALITY STANDARD VARIANCE. Remove the 2 mg/L winter dissolved oxygen variance for lower Green Bay and reestablish a water quality standard of 5 mg/L dissolved oxygen at all times.

a. Complete standards review study to provide documentation needed to change the standard. (Projected: 1988)

b. Revise water quality standard administrative rule (NR 103.05(5)) to remove the variance if justified by (a). (Projected: 1989)

c. Evaluate the need for wasteload allocation and as needed, revise wasteload allocation and effluent limits to meet revised water quality standards (see recommendation 5.2). (Projected: 1991)

EXPLANATION: Fish and and other aquatic life need 5 mg/L dissolved oxygen to thrive. Currently the bay southeast of the shipping channel between the mouth of the Fox River and south of the Brown County line has a dissolved oxygen standard of 2 mg/L during the winter months. This variance was enacted years ago when water quality was much poorer and very low dissolved oxygen levels occurred during winter ice-cover. It appears that with the wastewater treatment improvements of the past ten years this variance is no longer appropriate. A standards review study was initiated in 1987 by WDNR. However, lack of ice cover caused the winter monitoring to be delayed a year. Removal of the variance will require dischargers to treat to levels necessary to maintain 5 mg/L dissolved oxygen in the River and Bay at all times of the year. While this action will provide for the long-range protection of the resource, it is not expected to have a major impact on current discharges or the present wasteload allocation. (Also see the explanation of the following recommendations in the TAC Reports: N&E - 2; B&H - 10).

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR and USEPA.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: These efforts are currently underway and are funded by WDNR program budgets. If a wasteload is required, control costs will be evaluated in the process off wasteload development.

5.2. CONTINUE TO PERIODICALLY REVIEW AND REVISE THE WASTELOAD ALLOCATIONS ON THE LOWER FOX RIVER TO MAINTAIN AT LEAST 5 mg/L DISSOLVED OXYGEN AT ALL TIMES.

a. Continue automatic monitoring stations for dissolved oxygen and other parameters at 2 stations in the Area of Concern and 3 other stations on the River. Consider adding 1 more station in the Area of Concern. (Ongoing)

b. Periodically run synoptic surveys to obtain data to evaluate the wasteload allocation model. (1989 and 1990 and every 5 years thereafter)

c. Review and as necessary refine the wasteload allocation model. (1990 and every 5 years thereafter)

d. As necessary revise the wasteload allocation and adopt any changes through administrative rule revision. (1991 and every 5 years thereafter)

e. Change WPDES permit effluent limits accordingly. (1991 and every 5 years thereafter)

EXPLANATION: For many years low dissolved oxygen was the major problem in the River and Bay. In the 1970s wasteload allocations were established for BOD in the Lower Fox River. Municipal and industrial dischargers spent over $300 million to control their discharges of BOD. The result was improved dissolved oxygen levels and of reestablishment of walleye fishing in the area.

The wasteload allocation is periodically reviewed and refined to insure dissolved oxygen levels are maintained and protected. This requires an intensive monitoring and modeling effort followed by an administrative rule change.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, FVWQPA, Industrial and Municipal Discharges, and USEPA.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The wasteload allocation program and its requirements are an ongoing program with legal requirements for review and as necessary, revision, every 5 years.

KEY ACTION #6: PROTECT WETLANDS, AND MANAGE HABITAT AND WILDLIFE

Key Action's Priority: Moderate

	Action Recommendation	Priority for Key Action	Priority for Plan	Page
	Preserve Habitat			
6.1	Continue West Shoreland acquisition.	High	High	128
6.2	Establish goals for wetland and other habitat protection and use existing authorities to achieve them.	High	High	128
6.3	Continue adoption and strict enforcement of local wetland zoning.	High	High	129
6.4	Consider additional wetland zoning.	High	Mod.	130
6.5	Encourage private wetland preservation.	High	Mod.	131
6.6	Change bulkhead lines as necessary to protect habitat.	High	Mod.	131
6.7	Continue to use shoreland modification permits to protect habitat and water quality.	Mod.	Mod.	132
6.8	Seasonally limit public entry to critical habitat.	Mod.	Low	132
	Create or Restore Existing Habitat			
6.9	Develop and use habitat enhancement methods.	High	Mod.	133
6.10	Consider stabilizing Cat Island	Mod.	Low	134
6.11	Dike wetlands if needed.	Mod.-High	Low	134
6.12	Improve Interstate-43 wetland mitigation areas.	Mod.	Low	135
6.13	Consider development of artificial reefs.	Low	Low	136

Action Recommendation		Priority for Key Action	Priority for Plan	Page
	Manage Wildlife and Endangered Species			
6.14	Provide upland bird nesting habitat.	Mod.	Low	136
6.15	Complete purple loosestrife control plan and manage accordingly in the Area of Concern.	Low	Low	137
6.16	Establish breeding sanctuaries and management program for endangered tern populations.	High	High	138
6.17	Protect against outbreaks of avian disease.	Mod.	Low	140
6.18	Evaluate mink and muskrat populations in the Area of Concern and manage as necessary.	Mod.-Low	Low	140
6.19	Inventory nongame species along the West Shore and develop management program if needed.	Mod.-	Low	141
	Other Key Actions to Help Protect Wetlands and Manage Habitat and Wildlife			
#1*	Reduce Phosphorus Inputs to the River and Bay from Nonpoint and Point Sources.	High	High	63
#2*	Reduce Sediment and Suspended Solids Inputs.	High	High	81
#3*	Eliminate Toxicity of Industrial, Municipal and Other Point Source Discharges.	High	High	85
#4*	Reduce Availability of Toxic Chemicals from Contaminated Sediments.	High	High	103
#5*	Continue Control of Oxygen-Demanding Wastes from Industrial and Municipal Discharges.	High	High	119
#9*	Reduce Sediment Resuspension.	Mod.	Low	159
#11*	Virtually Eliminate Toxicity Caused by Nonpoint and Atmospheric Sources.	Mod.	Low	171

*Reference appropriate Key Action Recommendations for more details.

KEY ACTION #6: PROTECT WETLANDS, AND MANAGE HABITAT AND WILDLIFE

The degradation or loss of habitat in the Lower Green Bay-Fox River ecosystem has adversely affected fish and wildlife populations. Poor water quality has degraded habitat for some fish and wildlife species, and habitat improvements require changes associated with water clarity improvements (see Key Actions 1 and 2). Wetland habitats are particularly important to many desirable species. However, about 90 percent of the original marshes in the Lower Green Bay-Fox River ecosystem were lost between 1834 and 1975.

Protection and improvement of remaining wetlands and development of aggressive management programs for other habitats are essential. Emphasis should be placed on "community management" rather than species management, although endangered or threatened species may require special consideration. Wetlands can be protected through land acquisition, zoning, incentive programs for private landowners and changes in bulkhead lines. Many programs or ordinances are already in place and may only need to be strengthened.

Other habitat management opportunities include improving wetland mitigation areas near Interstate Highway 43; creating or improving fish spawning or rearing areas in or on rocks, gravel and marshes; building experimental reefs and promoting tern colonization of suitable areas. Habitat management for both fish and wildlife should be an integral part of priority watershed projects. Wetland protection and habitat management are needed to rehabilitate the Lower Green Bay-Fox River Area of Concern. Table 15 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Wetland protection and habitat management should increase northern pike spawning habitat and improve nursery grounds for several other fish species. Improvements of emergent marshes will increase littoral zone benthic organisms production and increase habitat for marsh-nesting birds, including the Forster's tern. These developments also may increase dabbling duck production and migrant duck use. Protecting or increasing wetland or riparian habitats also will **maintain** or increase other wildlife populations. Protection and management strategies could be used to increase numbers of targeted species such as the common tern.

USE IMPROVEMENTS

This action -- coupled with Key Actions 1, 2, 4, 7 and 8 -- should support increased opportunities for commercial and sport northern pike fishing and improve waterfowl hunting. Enhancement of wetland and riparian habitats also could increase furbearer production for trapping and could increase the aesthetic and educational values of the ecosystem.

CITIZEN COMMENTS AND SUGGESTIONS

Four people commented on this Key Action. Two people recommended that this Key Action deserves high priority rather than moderate priority. One noted that "Habitat preservation is characterized by a peculiar problem: every victory against development is only temporary, but every defeat is final. Historically, wildlife habitat in the Green Bay Region has been "nickel-and-dimed" into near oblivion. We need uncompromising effort to save the few wetland and natural habitats remaining in the area."

One group suggested that changing the bulkhead lines in urban areas to protect wildlife habitat will probably result in more problems than benefits. The group also recommended that prior to introducing any legislation at protecting habitat not already regulated in the Area of Concern, a cost benefit analysis should be done to determine if such legislation will have a measurable effect. The group preferred statewide legislation to protect such habitat. Also the group did not favor designating Renard Isle as a sanctuary for birds. A passive recreation **area** with **designated areas** for bird nesting was preferable.

Another person suggested that the inventory and development of a management program for nongame species could be done more speedily if volunteer and university resources and funds are tapped.

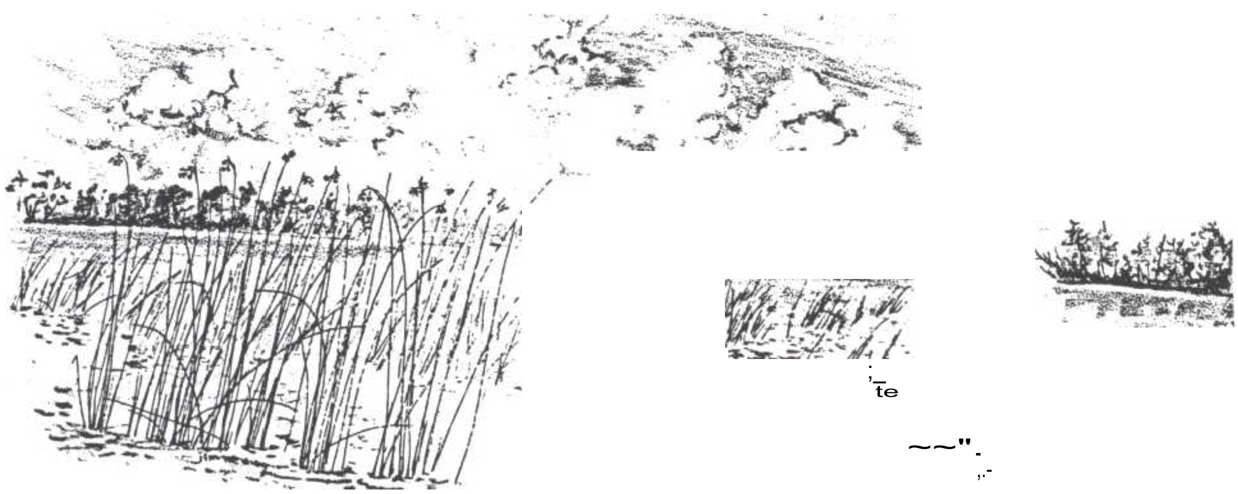


TABLE 15. Priority, Environmental Effects and Use Improvements Associated with Key Action #6.

KEY ACTION 6:	Protect Wetlands and Manage Habitat and Wildlife.
PRIORITY	Medium
ENVIRON. EFFECTS	Increase pike spawning habitat. Increase habitat for marsh-nesting birds, including Forster's tern. Increase certain benthic organisms. Increase numbers of migrant and resident ducks. Improve water clarity. Improve particulate food quality. Reduce sediment resuspension. Improve nursery ground for fish. Increase endangered species production. Increase or maintain other wildlife populations.
USE IMPROVE-MENTS	Improve duck hunting. Improve bird watching. Increase opportunities for commercial/sport northern pike fishing. Increase furbearer production for trapping. Improve aesthetics. Improve educational values.
COMMENTS	Marsh diking has both benefits and disadvantages. Some wildlife benefits may preclude some fishery benefits.

Preserve Habitat

6.1. <u>CONTINUE WEST SHORE LAND ACQUISITION.</u> For public ownership, protection, and management acquire (as land becomes available) a total of 1,201 acres of critical wetlands near Peat Lake and 1,799 acres near Long Tail Point. (Ongoing)

EXPLANATION: The West Shore contains most of the few remaining wetlands on Green Bay. These wetlands provide critical habitat for the fish and wildlife of the Bay. Populations of breeding ducks, endangered species and other wildlife will be reduced further without the wetlands. Northern pike also use wetlands for spawning as do many other smaller aquatic organisms that form the base of the Bay's food chain.

In 1979, the WDNR Board approved a land acquisition program for the West Shore. The West Shore Master Plan, as it is called, guides acquisition and management of those lands which are acquired. Acquisition occurs as parcels become available. Most lands designated for public ownership do not have commercial or residential development potential. In 1986, 501 acres (42% of the Goal) of the Peats Lake Land Unit and 641 acres (36% of the Goal) of the Long Tail Point Land Unit had been acquired. To complete the units, 1,783 acres remain to be acquired. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 1.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, Brown County, Conservation Groups, Legislature and Citizens.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Acquisition of approximately 1,800 additional acres of shoreland wetlands in the Peats Lake and Long Tail Point land units is likely to be very expensive ($1,000,000 to $10,000,000 total). Because state funding available for land purchase is often quite limited, acquisition by the county and other organizations such as duck clubs, the Nature Conservancy, and private donations could help.

6.2. <u>ESTABLISH GOALS FOR WETLANDS AND OTHER HABITAT PROTECTION AND USE EXISTING AUTHORITIES TO ACHIEVE THEM.</u>

a. Refine the identification of important wetlands and determine the acreage of wetlands and other habitat needed to sustain viable fish, endangered species and other wildlife populations. Establish common goals for wetland protection and management. (Also see recommendations 6.16, 8.1, 8.3, 8.4.) (Target date: 1992)

b. Use existing authorities such as shoreline modification permits, acquisition, wetland zoning, and others to achieve these goals. (Ongoing)

c. Evaluate capability and effectiveness of these authorities to protect wetlands and achieve the goals. Seek additional authorities as needed. (Target dates: 1992-1996)

EXPLANATION: As noted in recommendation 6.1 and elsewhere in this plan, wetlands play a vital role in the Fox River and Green Bay ecosystem. Different agencies manage a variety of programs which include requirements for wetland protection. Yet some important habitat, especially smaller wetlands, continue to be lost. Also the number of programs makes it difficult for land owners to know what regulations affect their land and how these regulations are applied.

Shoreline modification permits are required by the U.S. Army Corps of Engineers (COE), WDNR, and local units of government to provide protection of fish and wildlife habitat. It is often difficult to evaluate how destruction or modification of a small wetland will affect the Bay and River ecosystem. Individually the action may have little impact. However, when combined with many other similar actions the ultimate effect may be the loss of most of the wetlands in the area. The recently adopted wetland zoning maps (see recommendation 6.3) provide some guidance for larger wetlands (greater than 5 acres) adjacent to lakes and streams. However, this zoning does not cover some important wetlands and some permitted uses may adversely impact the wetlands.

A joint effort by all levels of government to establish goals for wetland and habitat protection in the Area of Concern would help coordinate efforts and protect important areas. There are many good inventories that could be used in this effort. Applicable authorities could also be identified. Such an effort would also help landowners understand the importance of their wetlands, good management practices, and the regulations that apply to the wetlands. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 3, 5, 7; and in this plan - 1.7, 6.1, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.15, 6.16, 6.19, 8.1, 8.3.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, COE, USFWS, Counties, Cities, Villages, Towns, Conservation groups, Researchers, and Coordinating Council.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Identification of important wetlands and habitat by a coordinated, cooperative effort of agencies and local government and establishment of protection goals could be low to moderate cost ($0 to $250,000). Evaluating existing authorities should be low (less than $50,000). New program costs would be determined by the evaluation. Annual costs could range from low to high ($0 to $1,000,000 per year).

6.3. <u>CONTINUE ADOPTION AND STRICT ENFORCEMENT OF LOCAL WETLAND ZONING.</u> (Ongoing)

EXPLANATION: State law requires that counties and municipalities adopt wetland zoning to protect wetlands near rivers and lakes. All municipalities within Brown County are on schedule for shoreland wetland zoning adoption. This zoning provides additional protection to wetlands of 5 acres which are within the shoreland area (within 1000 feet of a lake and 300 feet of a stream or the landward side of the floodplain, whichever is greater). Compliance with this zoning is important if wetlands are to be adequately protected. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 4 and in this plan - 6.1, 6.3 and 1.7.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: Counties, Cities, Villages, Towns and WDNR

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Local wetland and shoreland zoning is an existing program required by state law.

6.4. CONSIDER ADDITIONAL WETLAND ZONING. Consider increased local protection of critical wetlands by protecting smaller wetlands, comprehensive zoning, or additional use restrictions.

a. Evaluate need for additional protection of wetlands (see recommendation 6.2). (Target date: 1992)

b. Develop programs as needed. (Target date: 1996)

EXPLANATION: Many smaller wetlands (less than 5 acres) also provide valuable wildlife habitat. They are not protected under existing state and local law. Some permitted uses of larger wetlands may degrade them. Possible approaches to consider: including 2-acre wetlands in local shoreland wetland ordinances; using local comprehensive zoning powers to establish conservancy zoning outside of the currently regulated shoreland areas; and tightening permitted use requirements for wetlands greater than 5 acres. See Key Actions' Citizen Comments section for some comments on this recommendation (Also see the explanation of the following recommendations in the TAC Reports: B&H - 5; and in this plan - 6.2, 6.3. and 1.7.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: Brown County, Green Bay, De Pere, and other Counties, Cities, Villages and Towns in the Lower Fox River Basin.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The evaluation of the need for additional wetland protection should be low cost ($0 to $50,000), and additional protection could be built into existing local comprehensive and shoreland zoning programs. Initial costs to establish these programs are likely to be low ($0 - $50,000).

6.5. ENCOURAGE PRIVATE WETLAND PRESERVATION. Create private landowner programs which provide incentives and information on how to protect/improve critical wetland habitat (Point au Sable, Duck Creek, East River, etc.).

a. Develop private landowner programs. (Target date: 1996)

b. Landowners should protect and improve critical wetland habitat. (Ongoing effort)

EXPLANATION: Private owners of wetland areas can help protect and manage them in a way that benefits fish and wildlife. A number of mechanisms might be examined. Biota and Habitat TAC members suggested examining Minnesota's law that gives property tax credits to landowners who protect and create wetlands. It has been a successful mechanism in Minnesota. Another method might be to provide cost-sharing for measures which private landowners take to improve wetland habitat. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 6; and in this plan 6.9, 1.7.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, LCCs, UWEX, Legislature, Counties, Landowners, SCS, WDATCP, Conservation groups, and Coordinating Council.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The initial assessment of program needs would be low ($50,000 total). The annual cost of developing local, state and federal programs to encourage wetland protection could be low to moderate ($0 to $100,000 per year) if the effort is primarily an information and education effort, and to moderate to very high if a tax credit or cost sharing program ($10,000 to $1,000,000 per year). Legislative and local government initiatives would be necessary for a tax credit or cost-sharing programs.

6.6. CHANGE BULKHEAD LINES AS NECESSARY TO PROTECT HABITAT. Actively pursue changes in bulkhead lines to protect fish and wildlife habitat especially along the Fox River.

a. Evaluate existing bulkhead lines and identify those that might jeopardize important fish and wildlife habitat. (Target date: 1991)

b. Change bulkhead lines as necessary to minimize impacts on fish and wildlife habitat. (Target date: 2000)

EXPLANATION: Bulkhead lines establish how far out from a shore a landowner can fill and create additional land. Most bulkhead lines were established many years ago and would allow substantial additional filling especially along the Fox River. Some of these areas may be important habitat and spawning areas for fish. A survey of potential walleye spawning areas along the Fox River is currently being done by WDNR's fish management program (see recommendation 8.1).

Bulkhead lines are established and can be rescinded by municipal ordinances which are subject to WDNR approval based on section 30.11, Wisconsin Statutes. Thus if existing bulkhead lines jeopardize critical habitat, local municipalities and WDNR can work together to change the lines. It is anticipated this would be controversial and time consuming. However, many acres of aquatic habitat could be saved. It could be done after important habitat was identified and goals for wetland protection were established (see recommendation 6.2). See Key Action's Citizen Comment and Suggestion Section for pertinent comments. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 7; and in this plan - 6.2, 8.1.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: Local governments, Brown County Harbor Commission, RPCs, WDNR, COE, USFWS, Industry, Developers, Shoreline owners, and Conservation groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The initial evaluation of existing bulkhead lines should be low cost (<$50,000 total cost). Changing bulkhead lines could require substantial local and WDNR staff time and thus costs could be moderate ($50,000 to $250,000 total cost). Some shoreline owners could lose the opportunity to extend their land further into the River.

6.7 <u>CONTINUE TO USE SHORELAND MODIFICATION PERMITS TO PROTECT HABITAT AND WATER QUALITY.</u> (Ongoing)

EXPLANATION: Shoreline modification permits are required by U.S. Army Corps of Engineers, WDNR, and local units of government to provide protection of fish and wildlife habitat. Practices such as using suitable materials to create fish spawning habitat should continue to be required when appropriate.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate.

WHO SHOULD ACT: WDNR, COE, Counties and local government, shoreline owners, USFWS, DOT, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: These are ongoing programs.

6.8. <u>SEASONALLY LIMIT PUBLIC ENTRY TO CRITICAL HABITAT.</u> To reduce human disturbance, close important publicly owned wetland areas to public entry during times of the year which are critical to wildlife.

a. Identify areas needing protection and protection strategy. (Target date: 1989, review 1992)

b. Establish closed entry periods as appropriate (a). (Target date: 1989, review 1992)

EXPLANATION: This action would prevent human visitations from disrupting wildlife during reproduction and early raising of young in the spring. The presence of humans during this time can affect reproductive success.

A second part of this action might be to actively encourage use at other times to give people access to these unique habitats and encourage people to appreciate them. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 8.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: WDNR, Brown County, Green Bay, USFWS, Conservation groups and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Identification of areas needing seasonal protection is likely to be very low cost (<$10,000 total) and have low annual costs to implement (<$10,000 per year).

Create or Restore Existing Habitat

6.9. DEVELOP AND USE HABITAT ENHANCEMENT METHODS.

a. Identify methods to enhance fish and wildlife habitat in tributary streams such as Dutchman's, Duck, and Ashwaubenon Creeks and the East River. Provide guidelines for fish and wildlife habitat improvement that can be undertaken by landowners or can be included in watershed projects. (Target date: 1991)

b. Improve fish and wildlife habitat accordingly. (Target date: 1991, ongoing)

EXPLANATION: The Biota and Habitat committee identified the tributaries to the Lower Fox River and the Area of Concern as the areas most in need of habitat improvement. Improving water quality and the habitat available for fish and wildlife will also improve water quality and increase fish and wildlife populations in the Lower Fox River and lower bay.

One way to enhance habitat in the Area of Concern is by creating additional or increased authority to protect remaining habitat on Duck Creek and the East River and other tributaries to the Lower Fox River and lower Green Bay where protection does not already exist. It may be desirable to introduce special legislation for RAP areas of concern similar to the legislation introduced in the states surrounding Chesapeake Bay. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 13, 29, 35, 39, 41, 50; and in this plan - 1.4, 1.7, 6.2, 6.4, 6.5.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, LCCs, Counties and Local Government, WDATCP, SCS, ASCS, Researchers, Farmers, Conservation groups, Shoreland owners, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Developing methods and guidelines to enhance habitat in tributary creeks should be low cost (<$50,000 total). Until these guidelines are developed it is hard to estimate cost of habitat improvements. They could range from low (<$50,000 total) to high ($250,000 to $1,000,000 total) with moderate annual maintenance costs ($10,000 to $100,000 per year).

Possible funding sources include USFWs Dingle-Johnson grants funded by taxes on fishing tackle and boat motors, a state budget initiative, local government programs, and contributions by landowners and conservation groups. When possible such efforts could be coordinated with intensive nonpoint source management projects.

6.10. CONSIDER STABILIZING CAT ISLAND.

a. Evaluate feasibility of riprapping or otherwise stabilizing Cat Island to protect against its loss during high water. (Target date: 1990)

b. Stabilize, as appropriate (a). (Target date: 1995)

EXPLANATION: Cat Island provides important colonial nesting bird habitat. During high lake levels this habitat is unavailable. High water levels and wave action may jeopardize the continued existence of the island. Riprap includes placement of large boulders and rocks to help stabilize the island.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

WHO SHOULD ACT: Brown County, COE, Moderate, WDNR, Researchers, USFWS, and Others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The cost of the feasibility study is likely to be low (<$50,000 total). However, the cost of stabilizing the island is likely to be very high ($1,000,000 to $10,000,000 total) with low annual maintenance costs (<$10,000 per year). There are no obvious funding sources.

6.11. DIKE WETLANDS IF NEEDED. As determined to be appropriate, dike additional west shore wetlands to protect habitat during high water periods and improve water clarity.

a. Conduct feasibility and desirability study. (Target date: 1995)

b. Dike marshes, as appropriate (a). (Target date: 2000)

EXPLANATION: This action has advantages for wildlife and benthos and possible disadvantages for fish. The positive effects of diking are expected to be similar to those found at Sensiba Marsh located north of Long Tail Point. The dike prevents turbidity from waves wind, sediment, and algae from entering the marsh. Therefore, the water is quieter and clearer. This condition has resulted in improved habitat for nesting birds, invertebrates and emergent and submergent vegetation. However, dikes would prevent fish, such as northern pike, from using it as a spawning area. It would also prevent carp from spawning there (an advantage). Thus, the feasibility study should investigate the feasibility of designs which would allow passage of desirable fish (northern pike, etc.) but keep carp out. It should also evaluate long-term effects. Some other considerations are the effects of diking on the "sea scapes" of the area and the possibility that a lake bed grant would have to be obtained. (Also see the explanation of the following recommendations in the TAC Report: B&H - 17.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate-High/Low

WHO SHOULD ACT: Brown County, WDNR, COE, USFWS, Villages, Towns, Researchers, Conservation groups and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The cost of the feasibility study is likely to be low to moderate cost ($0 to $250,000 total). The cost of diking wetlands is very high ($1,000,000 to $10,000,000). Funding sources have yet to be determined.

6.12. <u>IMPROVE INTERSTATE 43 WETLAND MITIGATION AREAS.</u>

a. Study wetland mitigation areas, installed in Atkinson's Marsh when Interstate 43 was built, to determine best management practices to increase fish and wildlife productivity in the areas. (Target date: 1992)

b. Implement management practices on Atkinson's Marsh along I-43 (Tank farm ponds, ditches, etc.) as appropriate (a). (Target date: 1997)

EXPLANATION: The installation of Interstate 43 destroyed some natural wetlands. As a mitigation measure, when I-43 was built some artificial wetlands and ditches were created between the highway and the industrial park from the I-43 bridge to Duck Creek to provide habitat for fish and wildlife. These artificial wetlands might be better managed to improve both the spawning habitat for fish and the nesting habitat for birds. This study could also examine how water levels could be better managed. This study should be coordinated with studies of waste disposal sites in the area (see recommendation 4.7 and 11.6) since many of the channels are in direct contact with past dredged materials and fly ash disposal areas. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 18; and in this plan - 6.9, 11.6, 4.7, 11.6.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: WDOT, WDNR, USFWS, UWGB, City of Green Bay, Landowners, Conservation groups, and Researchers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The cost of the study is estimated to be moderate ($50,000 to $250,000 total). This evaluation could be funded through a combined effort. DOT was responsible for initially developing the mitigation areas. A study of the area would provide a good opportunity for DOT to reevaluate the effectiveness of mitigation and how to improve future mitigation efforts. Separate studies of toxic substance movement could complement this analysis. Cost of the improvements themselves could be high ($250,000 to $1,000,000 total) with low annual maintenance costs (<$10,000 per year).

6.13. CONSIDER DEVELOPMENT OF ARTIFICIAL REEFS. As appropriate, construct artificial reefs to provide fish and wildlife habitat and break wave action.

a. Study inner-bay water current patterns to determine the impacts of various reef island designs which would provide fish and wildlife habitat and break wave action to allow establishment of emergent and submergent plants. (Target date: 1995)

b. Construct experimental reefs as appropriate (a). (Target date: 2000)

EXPLANATION: Reefs may have both positive and negative effects on both water quality and hydrodynamics. These two areas would be studied to determine the probable effect of reefs on the site and how they might be constructed. Reefs could slow wave action, reduce turbidity, and promote the growth of submergent plants. They could also promote sedimentation in the inner bay or change the hydrodynamics in ways that would not be beneficial to the ecosystem. (Also see the explanation of the following recommendation in the TAC Reports: B&H - 21; N&E - 12, 16; and in this plan - 9.1, 9.2, 9.3.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

WHO SHOULD ACT: USFWS, Sea Grant, WDNR, COE, Conservation groups, and Researchers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The feasibility study is projected to be low cost (<$50,000 total) although a detailed evaluation could cost more. Building reefs is likely to be high cost ($100,000 to $1,000,000 total) and have low to moderate annual maintenance costs ($0 to $100,000 per year). There are no obvious funding sources for this type of project.

6.14. PROVIDE UPLAND BIRD NESTING HABITAT - Plant warm season grasses on uplands for bird nesting habitat. (Target date: 1990)

EXPLANATION: Some grasses can enhance habitat for bird nesting. (Also see the explanation contained in the following recommendation in the TAC reports: B&H - 19.)

PRIORITY FOR KEY. ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: WDNR, UWGB, Brown County, City of Green Bay, Conservation groups, Industry, Landowners, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The cost of grass planting is estimated to be moderate ($50,000 to $250,000 total) and the annual maintenance cost is estimated to be moderate ($10,000 to $50,000) in the Area of Concern. This is an alternative that could be initiated by private or public landowners. It could be encouraged through education and cost-sharing efforts.

6.15. <u>COMPLETE PURPLE LOOSESTRIFE CONTROL PLAN AND MANAGE ACCORDINGLY IN THE AREA OF CONCERN.</u>

a. Complete development of state purple loosestrife management strategy. (Projected: 1990)

b. Develop management strategy for the Area of Concern. (Target date: 1993)

c. As appropriate, control purple loosestrife. (Ongoing)

EXPLANATION: This plant is currently replacing very large amounts of native vegetation in North America including Wisconsin. It does not provide good habitat for native wetland wildlife. The Purple Loosestrife Task Force, a statewide committee, will be studying the impacts of the European plant, purple loosestrife, on native communities and wildlife habitat and suggesting management strategies.

Currently, there is no effective strategy for removing areas of heavy infestation of purple loosestrife. Prevention and containment appears to the best way to control the spread of these areas. Prevention is best accomplished by locating and removing by hand, or killing with careful use of herbicide, the first observed plants in an area. Small (less than 50 plants) colonies can be eradicated relatively easy. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 9.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

WHO SHOULD ACT: WDNR, Brown County, City of Green Bay, Villages, Towns, Researchers, Conservation groups and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Developing a control plan for the Area of Concern should be low cost (<$10,000 total) once the state plan is completed. Existing areas of infestation could be mapped by university students or volunteers. However, control is difficult and since it is labor intensive is likely to have a moderate ($10,000 to $100,000) annual cost. Hand-pulling might be a project for youth groups or others. However, it would take a very widespread effort to have any real effect.

Manage Wildlife and Endangered Species

6.16. <u>ESTABLISH BREEDING SANCTUARIES AND MANAGEMENT PROGRAMS FOR ENDANGERED TERN POPULATIONS.</u> Work cooperatively to formally establish breeding sanctuaries for endangered Forster's and common terns and the Caspian tern so that they can be adequately protected and managed.

a. Protect Renard Isle (formerly known as Kidney Island) for endangered tern breeding and nesting unless other major sanctuaries and populations of terns can be established in the lower bay. (Ongoing)

b. Identify additional nesting areas for common and Forster's terns in order to expand the populations and decrease reliance on a single breeding site. (Also see recommendation 6.2.) (Target date: 1990)

c. Establish breeding sanctuaries to protect endangered terns. As part of the establishment of these sanctuaries identify the adequacy of existing authorities to provide protection. If necessary seek additional authority. (Target date: 1995)

d. Promote tern population relocation and colonization of sanctuaries. (Target date: ongoing after 1995)

e. Develop programs to manage habitat and minimize disturbance of endangered species. (Ongoing: review and revise, 1995)

f. Conduct research to determine cause and extent of reproductive impairments that have been systematically linked to toxic contaminants. (Target date: 1993)

g. Continue to monitor tern populations and contaminant levels and revise management program in response to findings. (Ongoing: review and revise 1995)

EXPLANATION: Renard Isle (formerly called Kidney Island) is a critical nesting area for endangered terns. It is the only remaining location in the lower bay where common terns are nesting. These terns require island habitat for breeding where they can be protected from rodents, cats, dogs and other predators. Continued high water levels make the island critical not only to common terns but to Caspian and possibly Forster's tern, both of which nested on the island in 1985 and 1986, respectively.

Formal sanctuaries for endangered tern species must be established in the lower bay to allow for their adequate protection and management. The colonies found on Renard Isle include over 707 and 50% respectively of the breeding common and Forster's terns in the state in 1987. Wisconsin's only breeding colony of Caspian tern also was found on the island in 1987. The Biota and Habitat Management TAC recommended classifying Renard Isle as a wildlife preserve and state natural area. This is one option that should be considered since it is the only nesting site in the lower bay used by the birds at this time. However, it would be desirable to develop additional nesting sites so that the populations of endangered species would not be dependent on a single site.

Renard Isle has some draw backs as endangered species habitat, even though the birds do not appear to be aware of them. The island is a waste disposal site. The man-made island, a confined disposal facility (CDF), contains dredge spoils contaminated with PCBs and other toxic chemicals. Forster's terns nesting on the island were found to have reproductive impairments when compared to terns nesting at less contaminated sites. However, most of the terns exposure to toxic substances is probably through the food chain, rather than direct contact with contaminated sediments. Areas of ponded water on the island may increase the movement of contaminants through the food chain. The terns also share the island with over 10,000 ring-billed gulls. These gulls compete for nesting areas.

The island is also under multiple use pressures. Brown County and the U.S. Army Corps of Engineers plan to expand the CDF to three times its current size to accommodate more dredged materials. Brown County has a lake bed grant for the area and has proposed developing a recreational area on the island and connecting it to the mainland. Since common terns require true islands to be protected from predators and minimal human disturbance for nesting this proposal is incompatible with endangered species protection.

If other sanctuaries and populations of terns could be established in the lower bay it may not be as important to maintain Renard Isle as a single use sanctuary for common terns and other endangered terns. Thus all parties who have an interest in Renard Isle could benefit from a joint effort to find and establish alternative sanctuaries for endangered species in the lower bay. Development of management programs for endangered terns in the Area of Concern should also be coordinated with statewide efforts to protect these species.

If a sanctuary is established it would need to be managed for habitat and to minimize disturbance of endangered species. Some management practices include fencing of areas or other techniques to prevent encroachment of ring-billed gulls in common tern nesting areas, control of vegetation such as smartweed and maintenance of sparsely vegetated sand or gravel substrate for nesting common terns. Other measures are needed to minimize human disturbance and to minimize contact with toxicants. Wooden platforms should be installed only during period of high water levels when other habitat is not available for Forster's terns. (Also see explanation of the following recommendations in the TAC Reports: B&H - 53, 54, 55, 56, 57, 58, 59, 60, 61; INST. - 8)

Citizen Comments: One group questioned whether Brown County citizens will be willing to pay for a bird sanctuary on Renard Isle.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High.

WHO SHOULD ACT: Brown County, WDNR, USFWS, COE, City of Green Bay and other municipalities, RPCs, Researchers, and Conservation groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: It is difficult to estimate costs of establishing, maintaining and managing sanctuaries for endangered tern population until an analysis of alternative sites is completed. That analysis should be relatively low cost ($10,000 to $50,000 total). Costs of establishing breeding sanctuaries could be low (<$50,000) if existing sites were adequate, but could be substantial if land had to be purchased or new islands created ($250,000 to $1,000,000). New budget initiatives would be necessary to support any high cost alternatives. Initial startup costs of tern relocation and habitat management programs should be low (each <$50,000 total). Ongoing annual costs for relocating habitat management, and monitoring should also be low (each <$10,000 per year). Research on causes of reproductive impairment could be low (<$50,000 total) to moderate ($50,000 to $250,000 total) depending on the scope of the study. Research funding programs of NSF, USEPA and others could be sought because results should be of broad interest to Great Lakes and endangered species management programs.

6.17. PROTECT AGAINST OUTBREAKS OF AVIAN DISEASE. Complete wildlife disease contingency plan and continue to monitor urban wildlife to assess disease potential.

a. Complete plan to help avoid and deal with outbreaks of wildlife disease. (Target date: 1990)

b. Continue to monitor urban wildlife population levels especially giant Canada geese and gulls to assess the potential for disease problems. (Ongoing)

EXPLANATION: Avian disease can be a problem where wildlife congregate. Breakouts of avian botolism in giant Canada geese and ring-billed gulls population is of special concern. (Also see explanation of the following recommendations in the TAC Reports: B&H - 63, 64.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: USFWS, WDNR, Bay Beach Wildlife Sanctuary, and Brown County.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: No new program costs anticipated. Bay Beach Wildlife Sanctuary, USFWS and WDNR are currently cooperating in the development of a contingency plan and monitoring.

6.18. EVALUATE MINK AND MUSKRAT POPULATIONS IN THE AREA OF CONCERN AND MANAGE AS NECESSARY. Evaluate mink and muskrat populations to document present levels along with identifying factors which may be limiting desired population levels.

a. Increase monitoring of mink and muskrat for contaminants. (Ongoing)

b. Determine harvest amounts in the Area of Concern. (Target date: 1990)

c. Recommend and implement management programs as appropriate. (Target date: 1995)

EXPLANATION: Mink and otter are very sensitive to PCBs and similar toxic contaminants. The West Shore has good habitat for these animals. Limited information is available to assess population levels and evaluate if toxic substances are impacting mink and otter in the Area of Concern. (Also see explanation of the following recommendations in the TAC Reports: B&H - 67.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate-Low/Low

WHO SHOULD ACT: WDNR, USFWS, Researchers, and Conservation groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Current monitoring of wildlife is limited. Costs of a small increase in the program are projected to be low (<$10,000 per year). Estimated cost of harvest survey will likely be low (<$50,000 total). Ongoing annual cost of management would be low (<$10,000 per year).

6.19. INVENTORY NONGAME SPECIES ALONG THE WEST SHORE AND DEVELOP MANAGEMENT PROGRAM IF NEEDED.

a. Initiate proposed inventory of endangered species and nongame species on the West Shore to gather occurrence data on rare plants, animals, and natural communities. Identify management objectives and alternatives. (Target date: 1995)

b. Implement management program, as necessary (a). (Target date: 1997)

EXPLANATION: Little is known about endangered and nongame species in the Area of Concern. The Natural Heritage Inventory Program has identified the plan area as a high priority for future endangered resource inventory work. Data on mammals, birds, amphibians, reptiles, butterflies, and rare plants is needed. However funding is uncertain. (Also see explanation of the following recommendations in the TAC Reports: B&H - 66.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate-Low/Low

WHO SHOULD ACT: WDNR, USFWS, Researchers, Brown County, Bay Beach Wildlife Sanctuary, and Conservation groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Cost of an inventory of nongame species is likely to be moderate ($50,000 to $250,000) depending on the scope of the study. Annual costs of a management program are likely to be low (<$10,000 per year) once a management plan is developed. Endangered species checkoff monies might fund part of the study. Other research funding could be sought. Volunteer help might be useful in inventories of some species. One person suggested that university and conservation groups be called upon so that this work can be done earlier.

Other Recommendations that May Protect Wetlands

and Manage Habitat and Wildlife

Please note that good water quality is a critical part of providing good fish and wildlife habitat. Thus all recommendations that contribute substantially to Key Actions which reduce phosphorus and sediment inputs (Key Actions #1 and 2), eliminate toxicity (Key Action #3, 4, 11) and protect dissolved oxygen levels (Key Action #11) are important components of habitat protection.

FORSTER'S TERN

KEY ACTION #1: CONTROL POPULATIONS OF PROBLEM FISH

Key Action's Priority: Moderate

	Action Recommendation	Priority for Key Action	Priority for Plan	Page
7.1	Complete development of a program to prevent sea lamprey migration.	High	Mod.	146
7.2	Conduct pilot project to evaluate and manage carp populations.	Mod.-High	Mod.	146
7.3	Manage alewife as necessary.	Low	Low	148
7.4	Evaluate potential for white perch to impact the Green Bay fishery.	Low	Low	149
	Other Key Actions to Help Control Population of Problem Fish			
#1*	Reduce Phosphorus Inputs to the River and Bay from Nonpoint and Point Sources.	High	High	63
#2*	Reduce Sediment and Suspended Solids Inputs.	High	High	81
#3*	Eliminate Toxicity of Industrial, Municipal and Other Point Source Discharges.	High	High	85
#4*	Reduce Availability of Toxic Chemicals from Contaminated Sediments.	High	High	103
#5*	Continue Control of Oxygen-Demanding Wastes from Industrial and Municipal Discharges.	High	High	119
#6*	Protect Wetlands, and Manage Habitat and Wildlife.	High	Mod.	123
#9*	Reduce Sediment Resuspension.	Mod.	Low	159
#11*	Virtually Eliminate Toxicity Caused by Nonpoint and Atmospheric Sources.	Low	Low	171

*Reference appropriate Key Action Recommendations for more details.

KEY ACTION #]: CONTROL POPULATIONS OF PROBLEM FISH

Some fishes in Green Bay, especially carp and sea lamprey, have been singled out for reduction and/or control. Sea lamprey are well known for their devastating impact on large predatory fish populations. The potential for a lamprey invasion of the Fox-Wolf river system increases as water quality and habitat improve at the downstream end of this river system. Lamprey control methods are established and a contingency plan exists to deter or control an invasion of the Green Bay-Fox River Area of Concern. Monitoring at the De Pere Dam in the Lower Fox River during the past several years has not revealed any lamprey, but advance planning for lamprey control would be prudent.

The detrimental effect of carp on littoral zone vegetation has been extensively documented, and there is good reason to believe carp are degrading littoral areas and marshes in the Lower Green Bay-Fox River ecosystem. However, the reduction and control of existing carp populations is problematic, particularly in a large system such as Green Bay. The carp population in the ecosystem has not been reliably estimated and the reduction that would be needed to achieve desired affects is uncertain. Present conditions in the ecosystem favor carp propagation. The existing benthic community and abundant organic material provide ample food for these bottom feeders. In addition, carp populations face little pressure from natural predation or commercial harvesting. Low numbers of predators are present to feed on young carp and highly turbid water does not favor these sight-feeding fishes. High concentrations of PCBs in carp preclude harvesting them for commercial marketing. Carp could be reduced by intensive harvesting, particularly during periods when carp mass in certain locations in spawning and winter schools. However, the benefits of intensive harvesting would be short-lived unless it was accompanied by changes in water clarity, habitat conditions and numbers of predators. Consequently, this action would be most effective in combination with Key Actions 1, 2, 4 and 8. Reduction and control of carp populations could provide substantial beneficial effects but only if combined with these other actions and initiated when reductions in ambient phosphorous concentrations are apparent. In essence, strategies to reduce and control carp populations should combine actions in such a manner as to "tip the scales" in favor of self-correcting processes in the ecosystem, thereby reestablishing a more desirable level of ecosystem performance. Table 16 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Reducing and controlling problem fishes such as carp would help reestablish submerged aquatic vegetation in the littoral zone, which would stabilize the substrate and reduce resuspension of particulates. Reducing numbers of carp also would cut the release of nutrients from sediment. Harvesting carp also would remove some PCBs from the ecosystem. These effects will improve habitat for fish and waterfowl.

USE IMPROVEMENTS

This action would improve waterfowl hunting and nearshore fishing.

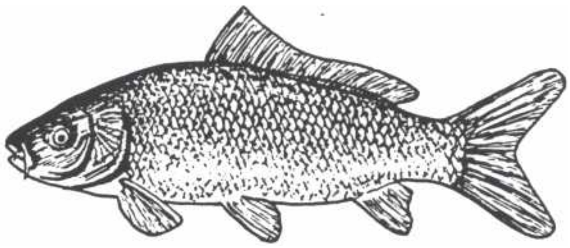
CITIZEN COMMENTS AND SUGGESTIONS

One person noted that they are in support of keeping our locks open (one lock is proposed to be closed to prevent sea lamprey migration): "To cease to operate them would destroy a very unique attractiveness of the Fox River Valley, a historical feature of the area as well as a recreational one." Another group noted that one of the present concerns in the Winnebago system, the possibility of lamprey eel infestation, is closely tied to the Lower Fox and Green Bay system. This problem needs timely attention. Fish habitats must not be threatened, but recreational interests of many Wisconsin residents should be considered.

One person suggested that a citizens action group is needed to further address the topic of problem fish species. The person volunteered to help organize a group called CARP (Citizens Against Roughfish Pollution) noting that many ideas, methods and steps are needed to reduce, eliminate and prevent populations of certain fish species.

TABLE 16. Priority, Environmental Effects and Use Improvements Associated with Key Action #7.

KEY ACTION 7:	Reduce/Control Populations of Problem Fish
PRIORITY	Medium
ENVIRON. EFFECTS	Reduce sediment resuspension and water turbidity. Increase growth of submerged vegetation. Decrease nutrient release from sediment. Improve nursery area for some fish species. May extract a small amount of contaminants from system. Improve the production of some benthic organisms. Increase utilization of wetlands by ducks and other birds.
USE IMPROVE-MENTS	Improve waterfowl hunting and nearshore fishing. Improve aesthetics. Increase recreational uses.
COMMENTS	The degree of reduction of problem fishes needed to achieve desired effects is not clear. A control program may be impractical, considering the size of the system.



7.1. COMPLETE DEVELOPMENT OF A PROGRAM TO PREVENT SEA LAMPREY MIGRATION. Develop and implement plan to prevent sea lamprey migration to potential spawning areas in the Fox and Wolf River Basin.

a. Complete a plan to prevent sea lamprey migration. (Projected: 1988)

b. Implement plan. (Target date: To be determined by plan "a")

c. Continue to annually monitor use of the Fox River by sea lamprey. (Ongoing)

EXPLANATION: Ongoing monitoring by U.S. Fish and Wildlife Service has not shown a sea lamprey problem. However, there is some concern that as water quality improves sea lamprey may move into the Fox River to spawn. The Winnebago pool lakes contain plenty of ideal sea lamprey spawning habitat. If the lamprey move up through the lock system on the Fox River, a serious sea lamprey problem could be introduced to the entire Fox and Wolf River and Lake Winnebago system. A sea lamprey infestation would adversely affect the fishery of the Bay as well as the upstream river and lake systems. In 1987 WDNR set up a task force of concerned citizens, including boating and fishing club members, to evaluate the potential lamprey problem. They have looked at several alternatives to protect the Fox River from lamprey infestations and have proposed closing one of the locks (WDNR, 1987). (Also see the explanation of the following recommendations in the TAC Reports: B&H - 44, 45.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, USFWS, COE, Counties and local government, Conservation groups, Boating groups, and GLFC.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: WDNR is sponsoring development of a sea lamprey control plan. A draft of the Plan was completed in 1987. Costs of lock closure would range from low to high ($10,000 to $1,000,000 total) and would be covered by the Army Corps of Engineers. Several groups have requested that the project also include a boat lift. Cost of such a project are uncertain but might be high to very high ($250,000 to $10,000,000). Annual operating and maintenance costs would be additional. There is no funding source for the lift. Lamprey monitoring is being done by USFWS.

7.2. CONDUCT PILOT PROJECT TO EVALUATE AND MANAGE CARP POPULATIONS. Initiate a three year pilot project to evaluate the importance of carp in the ecosystem and effectiveness of harvesting and other management options. Consider carps impact on the fishery, PCBs and water clarity, and ultimate disposal options.

a. Develop study design and find funding source. (Target date: 1990)

b. Complete project and recommend management program. (Target date: 1993)

c. Conduct additional carp removal or other management based on findings of pilot project. (To be determined by "b")

EXPLANATION: There are many carp in lower Green Bay. Their impact on the ecosystem is not well documented, however many people believe they adversely affect the fishery and habitat of the Bay. Carp also contain high levels of PCB. The commercial carp fishery was closed in 1984 because of these levels.

Harvesting carp has been suggested as one way of removing PCBs from the Bay and River and improving the overall fishery by removal of an undesirable species.

While potentially beneficial, carp harvest alone will not mitigate the contamination in the system. Each million pounds of carp harvested is estimated to remove 10 pounds of PCB from the Bay (assuming an average PCB concentration of 10 ppm in carp tissue). Harvesting 2 to 3 million pounds of fish, as was done in the past by the commercial carp harvest, will remove 20 to 30 pounds of PCB. By comparison, the estimated 1982 load of PCB from the Fox River to Green Bay was believed to be approximately 1,320 pounds (estimates ranged from 367 to 2,640 pounds).

Carp's effect on the rest of the Bay's fishery is uncertain. The walleye and perch fishery have improved greatly in the last 10 years even though carp numbers remain high. Also no one knows how many carp there are in the lower Bay and how many would have to be removed annually to significantly reduce the population. The past harvest of 2 to 3 million carp per year had little impact.

An additional consideration is the safe disposal or use of contaminated fish that are harvested. We don't want to recycle PCBs and other contaminants into the air or water through inadequately designed disposal methods.

A 3-year pilot project and evaluation study is recommended so that the overall impact of carp removal on the ecosystem can be better assessed. The study should evaluate the following impacts: role of carp in the ecosystem as indicated by biomass, age frequency, spawning areas, etc; the potential for removing toxicants from the River and Bay environment; habitat and fishery improvement including the economic impacts of a commercial harvest; the market potential for the sale of fish meal or other by-products after removal of toxicants; and, an evaluation of "ultimate" disposal options for carp and/or toxic substances extracted from them. Future carp management can then be based on the results of the pilot study and its evaluation.

Note: This is a major research project and state funding available for these types of projects is usually quite limited. The first step will be determining funding source(s). (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 14; B&H - 31B, 32B, 27.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate - High/Moderate

WHO SHOULD ACT: WDNR, USFWS, GBMSD, Commercial Fishermen, Industry, Brown County, City of Green Bay, Conservation Groups, Fishing clubs, Sea Grant, USEPA, Researchers, GLFC and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The 3-year pilot project is estimated to be a high cost project ($250,000 to $1,000,000 total). Cost would depend on the scope of the research project. Ongoing annual management costs will depend on the results of the pilot project, but might range from low (no management) to high ($100,000 to $1,000,000 per year). A $240,000 research project to estimate total carp numbers, biomass, and contaminant load in entire Green Bay was proposed to be part of USEPA's Mass Balance Study. However, it is unlikely to be funded unless the Mass Balance has higher than expected **appropriation.** Approximately $120,000 of this amount was to estimate carp numbers and biomass. Additional research would be needed to assess the carp's impact on the rest of the fishery, to determine what would be needed to reduce carp numbers and how to dispose of the carp safely. This project might be best accomplished through a cooperative effort of local, research and management interests.

7.3. MANAGE ALEWIFE AS NECESSARY. Utilize results of yellow perch-alewife research study to determine need for alewife management and, as appropriate, assess control options and implement them.

a. Complete Sea Grant alewife-perch interactions research study (Great Lakes Lab in Milwaukee) and use results to determine if alewife may significantly impact perch populations in Green Bay. Also evaluate potential importance of alewives to the Bay's and Lake Michigan's cold water fishery. (Research projected to be completed in 1988, target **evaluation** for applicability to Green Bay, 1990.)

b. If impacts on perch in the Area of Concern are significant and Lake Michigan's cold water fishery is not affected, evaluate methods of population control in order to promote native forage fish species. (Target date: 1994)

c. Implement alewife population controls, if needed. (Target date: To be determined by "b")

EXPLANATION: Alewives may be reducing native perch populations in the Area of Concern. A better understanding is needed of alewife-perch interactions. In particular, do alewife adversely affect yellow perch populations by eating perch larvae in the spring? A current Sea Grant study being conducted by Kitchell and Bitlkowski on perch and alewife interactions in Lake Michigan may help answer these questions (Sea Grant, 1987). While the alewives in the Area of Concern may be adversely impacting the perch fishery, they could or could not be an important source of forage fish for the rest of the Bay's coldwater sport fishery. Thus, any possible impacts on Green Bay's and Lake Michigan's cold water sport fishery should also be considered.

If results of the Sea Grant study indicates that alewife control may be desirable, evaluate methods of population control in order to promote native forage fish species. Limited techniques are available to control alewives. Harvesting could have detrimental effects unless done when fish aggregate in the spring. Stocking of top predators is another possibility. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 40; and in this plan - 8.2.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

WHO SHOULD ACT: Sea Grant, WDNR, Commercial Fishermen, GLFC, Researchers, and USFWS.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The perch and alewife study is currently funded by Sea Grant. Evaluation of the study's results to Lower Green Bay should be very low cost (<$10,000 total) and the evaluation of control methods should be low cost (<$50,000 total). Ongoing control costs would depend on the findings of the study but could range from low (no management) to moderate ($10,000 to $100,000).

7.4 <u>EVALUATE POTENTIAL FOR WHITE PERCH TO IMPACT THE GREEN BAY FISHERY.</u> Evaluate the potential impact white perch, an exotic invading species, may have on the lower Green Bay yellow perch fishery and possible management options and implications. (Target: to be determined)

EXPLANATION: The white perch is an exotic species which has been observed in other Great Lakes and may move into Lake Michigan. It does not appear to have a sport or commercial fishery value and may compete with the natural perch and forage species that are present. The significance of any potential impact and possible management options and implications may need to be evaluated for lower Green Bay as well as other portions of the Bay and Lake Michigan. However experience elsewhere indicates few control options.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

WHO SHOULD ACT: GLFC, Sea Grant, Commercial Fishermen, WDNR, Researchers, USFWS.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: If adequate research has been done elsewhere on the affects of white perch on the yellow perch fishery, the results could be extrapolated to Green Bay. The cost of such an evaluation would be very low (<$10,000 total). Initiation of a new research effort would be more costly ($250,000). The Great Lake Fishery Commission could work with cooperating agencies to evaluate options for a Great Lakes control program.

Other Recommendations that May Help Reduce Problem Fish

Note that some problem fish, such as carp, flourish because they can tolerate polluted water and poor habitat. Some more desirable species cannot thrive in these conditions. Thus key actions designed to improve water quality and habitat are important in the control of problem fish. These include recommendations designed to improve dissolved oxygen conditions (Key Action #5) and reduce chronic and acute toxicity to fish and other aquatic life (Key Actions #3, 4 and 11). Habitat protection and management is also important (Key Action #6), as are reductions in eutrophic conditions caused by excess nutrients and sediments (Key Actions #1 and 2).

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KEY ACTION #8: INCREASE NUMBERS OF PREDATOR FISH

Key Action's Priority: Moderate

Action Recommendation		Priority for Key Action	Priority for Plan	Page
8.1	Continue and expand walleye management program.	High	Mod.	154
8.2	Continue perch management program and complete research projects	High	Mod.	155
8.3	Initiate program to evaluate and manage northern pike populations	High-Mod.	Mod.	156
8.4	Initiate effort to re-introduce muskellunge (muskies) to lower Green Bay as water quality improves.	Mod.	Mod.	157
	Other Key Actions to Help Increase Number of Predator Fish			
#1*	Reduce Phosphorus Inputs to the River and Bay from Nonpoint and Point Sources.	High	High	63
#2*	Reduce Sediment and Suspended Solids Inputs.	High	High	81
#3*	Eliminate Toxicity of Industrial, Municipal and Other Point Source Discharges.	High	High	85
#4*	Reduce Availability of Toxic Chemicals from Contaminated Sediments.	High	High	103
#5*	Continue Control of Oxygen-Demanding Wastes from Industrial and Municipal Discharges.	High	High	119
#6*	Protect Wetlands, and Manage Habitat and Wildlife.	High	Mod.	123
#7*	Reduce/Control Populations of Problem Fish.	Mod.	Mod.	143
#9*	Reduce Sediment Resuspension.	Mod.	Low	159
#11*	Virtually Eliminate Toxicity Caused by Nonpoint and Atmospheric Sources.	Low	Low	171

*Reference appropriate Key Action recommendations for more details.

KEY ACTION #8: INCREASE NUMBERS OF PREDATOR FISH

The existing fish community in the Lower Green Bay-Fox River Area of Concern is unbalanced and characterized by low abundance and low diversity of both top predators and native forage species. A desirable fish community would be a coolwater fishery containing percid and pike species such as walleye, perch, northern pike, and muskellunge. This fish community also would include forage species such as spottail, emerald shiners, trout-perch and darter species. This action is aimed at establishing a predator-to-prey ratio ranging from 1:10 to 1:20 and altering the food web so large zooplankton (cladocerans and copepods) become more prevalent. Stocked walleye have survived and are growing well in the Area of Concern, although successful reproduction appears to be minimal. Stocking other predators, principally northern pike and muskellunge, should be preceded by efforts to assess and enhance available spawning habitat. Table 17 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Stocking top predators would have several advantages. It would enlarge the sport fishery, reduce forage fish populations, increase the abundance of zooplankton that feed on algae, improve the efficiency of the food chain and increase water clarity. Stocking northern pike and muskellunge also could increase predator pressure on carp populations. However, these predators also could feed on perch, which are desirable for both sport and commercial fishing.

USE IMPROVEMENTS

This action would increase fishing opportunities and could potentially improve aesthetics and opportunities for swimming and water sports.

CITIZEN COMMENTS AND SUGGESTIONS

One person commented that native, diverse genetic stock of fish are preferred over hybridized, nonnative and genetically inbred stocks. A healthy, native fishery should be the focus.

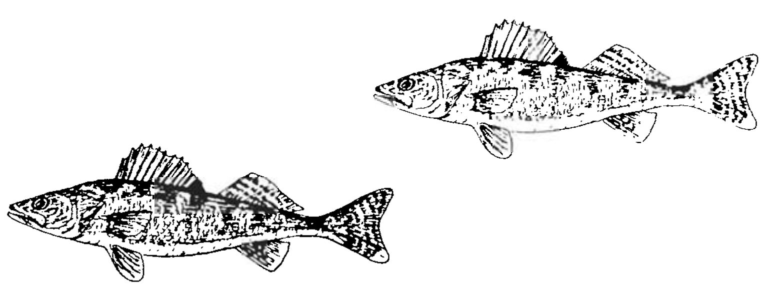
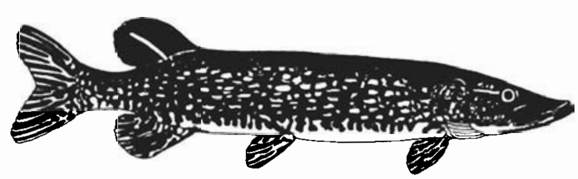


TABLE 17. Priority, Environmental Effects and Use Improvements Associated with Key Action #8.

KEY ACTION 8:	Increase Populations of Predator Fish
PRIORITY	Medium
ENVIRON.	Increase populations of northern pike. Decrease populations of all forage fish, including young carp, alewife, shad and perch. Increase large zooplankton populations. Reduce blue-green and green algae.
USE IMPROVE-	Increase sport fishery for predator fish. Potentially improve contact water sport use. Potentially improve waterfowl hunting.
COMMENTS	The effectiveness of "top down" ecosystem management is uncertain in a large, highly eutrophic system. This management strategy might have uncertain impacts on perch populations.



8.1. CONTINUE AND EXPAND WALLEYE MANAGEMENT PROGRAM. The WDNR walleye management program is evaluating natural reproductive success without stocking and will try to identify other spawning sites besides the De Pere Dam. Walleye are also monitored for contaminants.

a. Complete study of potential spawning areas (gravel substrate etc.) and identify improvement and protection needs. (Projected date: 1989)

b. Continue to monitor and evaluate walleye reproductive success and population numbers, making changes in the walleye stocking and management program as necessary. (Ongoing)

c. Continue to monitor walleye for contaminants and issue appropriate consumption advisories (see recommendation 15.2). (Ongoing)

d. Assess management options for reducing exposure of public to contaminants in fish. (Target date: 1990)

e. Conduct research study to determine possible cause and effect relationships for walleye reproductive impairments (see recommendation 16.2). (Target date: 1993)

f. Protect and improve walleye spawning areas as indicated by walleye habitat study (a), the evaluation of wetland protection needs (see recommendation 6.2) and the identification of habitat enhancement methods (see recommendation 6.9). (Target date: 1996)

EXPLANATION: WDNR initially stocked walleye in the late 1970s when water quality began to improve. An excellent walleye fishery has been re-established. The focus of future fish management efforts will be to develop a self-sustaining population. Several studies are currently underway to identify additional spawning habitat and to evaluate walleye food sources. Stocking has been discontinued and natural reproductive success is being monitored.

An additional concern is the high level of contaminants, primarily PCB, found in walleye in the area. The current fish consumption advisory recommends that no one eat walleyes caught between the De Pere dam and the mouth of the Fox River. These contaminants may also reduce walleye reproductive success. Reduction of these impacts is dependent on the elimination of toxicity from point source dischargers and the control of toxic substances found in contaminated sediments. Please refer to these key actions for more information. In the short term, management options for reducing exposure of the public to contaminants in fish should be explored. These might include better information and education programs, favoring walleye population age structures that have younger fish with less body burdens of contaminants, or catch and release regulations for trophy size fish. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 33, 34, 35, 25; and in this plan - 6.2, 6.9, 15.2.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, USFWS, Researchers, County and local governments, Sea Grant, UWEX, Conservation groups, Fishing clubs, health officials, and media.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Current WDNR fish management projects are evaluating walleye spawning areas and populations. Costs of assessing management options for reducing human exposure to contaminants is likely to be very low (<$10,000 total). A research study to determine cause and effect relations for reproductive impairments is likely to be a low to moderate cost (<$50,000 to $214,000 total). Cost of protecting and developing additional spawning areas will be dependent on results of spawning study ("a") but could range from low to moderate ($0 to $250,000 total) with low to moderate annual maintenance costs ($0 to $100,000).

8.2. <u>CONTINUE PERCH MANAGEMENT PROGRAM AND COMPLETE RESEARCH PROJECTS</u>.

a. The WDNR perch management program includes: Trawl annual index stations, summer shoreline seine hauls, and spring fyke netting. Target species is yellow perch, however, also monitoring levels of other fish species. Age structure management of the perch population will continue through regulation of commercial and sport harvests. (Ongoing)

b. Complete perch-alewife relationship research study (also see recommendation 7.3). (Projected date: 1988)

c. Complete perch sport fishery economic study. (Projected date: 1988)

d. Review and revise perch management program, as necessary. (Ongoing)

EXPLANATION: The WDNR has an ongoing perch management program. The current focus of the program is to establish more age groups in the population. Fishing pressure crops (removes) most perch once they reach a specific size (and age). Thus the fishery is limited to 1 or 2 age classes of younger, smaller fish. It would be preferable to have 4 to 5 age classes of fish in the Bay so the fishery would include older and larger fish. These additional age classes are needed to provide a cost-effective and stable fishery. Encouraging older age classes that feed on benthic organisms rather than zooplankton may also help improve water clarity. As part of the ongoing program, WDNR will be regulating drop net modifications and initiating food habit studies. Good water quality and habitat is important for the ongoing improvement of the perch fishery. Thus other key actions related to reducing toxicity, phosphorus and sediment loads, and maintaining dissolved oxygen must be pursued to improve and protect the fishery. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 36, 37, 38, 39; and in this plan - 7.3.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, Sea Grant, Researchers, Commercial Fishermen, Conservation groups, and Fishing clubs.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: No new program or research costs are anticipated. Sea Grant is funding the two research projects. WDNR's fish management program is funds the ongoing perch management program.

8.3. INITIATE PROGRAM TO EVALUATE AND MANAGE NORTHERN PIKE POPULATIONS. Evaluate northern pike populations and habitat to identify any problems and take any needed action to insure a good northern pike fishery.

a. Study northern pike populations (age frequency, recruitment, etc.) to identify factors which may be limiting the northern pike population. (Target date: completed by 1992)

b. Study potential spawning areas and identify improvement and protection needs. (Target date: completed by 1992)

c. Stock northern pike if necessary to establish a self-sustaining local pollution and evaluate success. (Target date: To be determined from study "a")

d. Protect and improve northern pike spawning areas as indicated by the northern pike habitat study (b), the evaluation of wetland protection needs (see recommendation 6.2) and the identification of habitat enhancement methods (see recommendation 6.9). (Target date: 1996)

EXPLANATION: Northern pike is an important top predator in the lower Green Bay ecosystem. They require good quality wetlands to spawn. Commercial catch records indicate a declining catch of northern pike. Further evaluation is needed to determine if populations are declining or if catch declines are simply due to a reduced market price for the fish. If the northern pike population is declining, habitat protection and stocking may be needed. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 29; and in this plan - 6.2, 6.9.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High-Moderate/Moderate

WHO SHOULD ACT: WDNR, USFWS, Researchers, County and local governments, Conservation groups, Fishing groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The studies of factors limiting northern pike populations and northern pike spawning areas are each anticipated to be a low cost (<$50,000 total). Annual stocking of northern pike and evaluating success could have a moderate cost ($10,000 to $50,000 a year). Costs of protection and improvement of spawning area will be determined by the results of the habitat study, "b" and would probably be a low initial cost (<$50,000 total) with low annual maintenance costs (<$10,000 per year).

8.4. <u>INITIATE EFFORT TO RE-INTRODUCE MUSKELLUNGE (MUSKIES) TO LOWER GREEN BAY AS WATER QUALITY IMPROVES</u>.

a. Evaluate habitat and determine the feasibility of stocking and establishing a self-sustaining population of the Great Lakes strain muskellunge. (Target date: 1990)

b. As appropriate, stock Great Lakes muskellunge and evaluate success. (Target date: 1990 ongoing)

EXPLANATION: The Great Lakes strain of muskellunge was present in Green Bay in the past. A first step will be to examine the presence of spawning habitat, food sources, etc. available to allow re-establishment of a self-sustaining muskellunge population. It may be possible to obtain eggs from muskellunge in Lake St. Clair which has a Great Lakes strain of muskellunge and an aquatic environment similar to lower Green Bay. A stocking program could then be used to re-introduce muskellunge to the Bay. The success of the program should then be monitored and evaluated. It will also be important to continue efforts to improve water quality and habitat, especially spawning areas. These include Key Actions relating to dissolved oxygen, toxicity from point sources and contaminated sediment, and reduced phosphorus and sediment inputs. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 41; and in this plan - 6.2.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: WDNR, Michigan DNR, Conservation groups, Fishing clubs, USFWS, and Researchers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Evaluation of the feasibility of stocking muskies should be low cost (<$25,000 total). Ongoing costs of stocking and evaluation should also be low (<$10,000 per year).

Other Recommendations to Increase Predator and Sport Fish

Note that many sport and predator fish require good water quality and habitat. Thus recommendations that contribute substantially to key actions aimed at improving water quality and habitat will help increase populations of these desirable fish. These include recommendations designed to improve dissolved oxygen conditions (Key Action #5) and reduce chronic and acute toxicity to fish and other aquatic life (Key Actions #3, 4 and 11). Habitat protection and management is also important (Key Action #6) as are reductions in eutrophic conditions caused by excess nutrients and sediments (Key Actions #1 and 2).

KEY ACTION #9: REDUCE SEDIMENT RESUSPENSION

Key Action's Priority: low

Action Recommendation		Priority for Key Action	Priority for Plan	Page
9.1	Consider pilot projects to control suspended sediments.	Mod.	Low	162
9.2	Consider spoil bed stabilization.	Mod.	Low	162
9.3	Determine causes of and manage turbidity.	Mod.	Low	163
	Other Recommendations to Help Reduce Sediment Resuspension			
6.13*	Consider development of artificial reefs.	Mod.	Low	136

*Reference indicated Key Action recommendation for more details.

KEY ACTION #9: REDUCE SEDIMENT RESUSPENSION

The extreme southern portion of Green Bay is periodically subject to considerable wind stress and wave action. This portion of the Bay is very shallow and, as a result, large quantities of sediment are resuspended in the water column. Islands that once acted as wind breaks in the inner bay have eroded, partly as a result of high water. Resuspension of solids can aggravate water clarity problems. Resuspension also can release materials, such as phosphorous and PCBs, that are attached to the sediments, thereby reintroducing them into the ecosystem and promoting algae production and bioaccumulation of toxic contaminants. The wind and wave actions that contribute to resuspension also deter establishment of submerged vegetation. Reduced sediment resuspension would have many beneficial effects and technology is **available** for pursuing this action. However, strategies to accomplish this action are largely impractical, so it is given low priority. Table 18 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Reducing sediment resuspension would improve water clarity, fish spawning and nursery habitats, and the efficiency of sight-feeding fishes and fish-eating birds. It also would increase the growth of submerged vegetation.

USE IMPROVEMENTS

The action would bring water closer to the legal water visibility requirements for swimming at public beaches. It also would increase fish diversity and improve waterfowl hunting, sport and commercial fishing, and aesthetics.

CITIZEN COMMENTS AND SUGGESTIONS

One person commented that two source of turbidity are neglected by this key action -- dredging and large ship traffic. Methods for limiting turbidity from both these sources already exist and should be applied immediately.

TABLE 18. Priority, Environmental Effects and Use Improvements Associated with Key Action #9.

KEY ACTION 9:	Reduce Sediment Resuspension
PRIORITY	Low
ENVIRON.	Improve water clarity. Reduce bacteria in water column. Increase growth of submerged vegetation. Reduce algae. Improve feeding efficiency of sight-feeding fishes and fish-eating birds. Improve fish spawning and nursery habitat. Reduce availability of toxic substances.
USE IMPROVE-	Meet legal water visibility requirements for swimming at public beaches. Improve waterfowl hunting. Improve sport and commercial fishing. Improve aesthetics. Increase diversity of fishes.
COMMENTS	Reduced sediment resuspension may have broad beneficial effects on the ecosystem, but the strategies to accomplish this are largely impractical.

9.1. CONSIDER PILOT PROJECTS TO CONTROL SUSPENDED SEDIMENTS. Consider in-bay management of sediment resuspension to promote reestablishment of submerged aquatic vegetation and increase water clarity, (i.e.: Use temporary or barrier reefs to reduce wave action where needed).

a. Evaluate desirability and feasibility. (Target date: 1992)

b. Initiate projects as appropriate (a). (To be determined by "a")

EXPLANATION: Wind events on lower Green Bay can cause significant resuspension of soft sediments that results in high turbidity and impairs reestablishment of submerged aquatic vegetation. In certain high energy zones of lower Green Bay it may be necessary to provide some protection against wave action if rooted aquatic plants are to become re-established. Temporary floating breakwaters or more permanent barrier reefs have been used in other parts of the Great Lakes with some success to reduce wave action and protect aquatic vegetation. Comments on the TAC recommendations noted that care must be taken in choosing reef materials. Some materials such as tires are unsightly and also contain toxic substances. Other means of controlling sediment suspension should be explored to fully achieve water clarity and habitat and biota objectives. (Also see the explanation of the following recommendations in the TAC Reports: N&E - 12; B&H - 21; and in this plan - 6.13.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: COE, USFWS, WDNR, Sea Grant, Researchers, and Conservation groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The cost of evaluating project feasibility is likely to be low (<$25,000 total), and as are annual maintenance costs (<$10,000 per year).

9.2. CONSIDER SPOIL BED STABILIZATION. Stabilize old spoil beds in inner bay to reduce turbidity if study shows this to be feasible and desirable.

a. Conduct feasibility study. (Target date: 1997)

b. Stabilize spoil beds as appropriate (a). (To be determined by "a")

EXPLANATION: Old spoil beds are a continuing source of suspended sediment to the Area of Concern. Sediment is transported through wind and wave action to other parts of the lower Bay. Stabilizing these areas by covering it or through some other method would reduce turbidity generated by wind and wave action in the Bay. An additional concern is the potential for higher levels of toxic substances (PCBs) to be found in these spoil beds (see recommendation 4.7). One stabilizing alternative that might be used is to cap the beds with rock and gravel to provide additional spawning habitat for desirable fish species or to create an island or shoal. The responsible party(s) for this source of degradation to the lake need to be identified. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 16; and in this plan - 4.7.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: COE, WDNR, USFWS, Researchers, UWGB, Local Governments, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The cost of a feasibility study to stabilize the old spoil beds is likely to be moderate ($50,000 to $250,000 total). The cost of stabilizing the beds is likely to be very high ($1,000,000 to $10,000,000 total) with low to moderate annual maintenance costs (0 to $100,000 per year).

9.3. DETERMINE CAUSES OF AND MANAGE TURBIDITY. Examine the causes of turbidity in the Bay and develop an appropriate management program.

a. Examine the relative contributions of algae, suspended sediments and dissolved substances to turbidity in the Bay. (Target date: 1992)

b. Minimize impacts of known source of turbidity (ongoing).

c. Determine other sources of suspended sediments. (Target date: 1992)

d. Develop an appropriate management program to improve turbidity based on findings. (Target date: ongoing after 1992)

EXPLANATION: We need to know about the causes of turbidity and how to manage them in order to meet water clarity objectives. One person commented that ships and navigational dredging are sources of turbidity that should be dealt with as soon as possible. (Also see the explanation of the following recommendations in the TAC Reports: N&E - 16, 12; and B&H - 21; and in this plan - 9.1, 9.2.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: Researchers, Sea Grant, USEPA, WDNR, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The cost of studies to determine the relative contribution of different types of particles to turbidity and the source of sediments are each likely to be low cost (<$25,000 total). Costs of developing a management program are dependent on the findings of these studies but could range from low (no management) to high ($1,000,000 total) with low to moderate annual maintenance costs ($0 to $100,000). Grants from Sea Grant, USEPA or other funding sources could be sought to fund the research projects.

KEY ACTION #10: REDUCE BACTERIA INPUTS FROM POINT AND NONPOINT SOURCES

Key Action's Priority: Low

	Action Recommendation	Priority for Key Action	Priority for Plan	Page
10.1	Recognize swimming as a desired use of the Ban and River when reviewing and revising applicable water quality standards.	High	Low	168
10.2	Disinfect municipal wastewater treatment plant discharges as needed to protect swimming and other recreational uses of the bay and river.	High	Mod.	168
10.3	Correct failing septic systems.	Mod.	Low	169
10.4	Control industrial discharges as needed to protect swimming and other recreational uses of the bay and river.	Low	Low	170

Other Recommendations to Help Reduce
Bacteria Inputs from Point and Nonpoint Sources

1.4*	Implement comprehensive watershed management projects to reduce phosphorus and other pollutant loads from nonpoint sources.	High	High	73
1.5*	Seek innovative and alternative ways to achieve nonpoint source management objectives.	High	High	75
1.6*	Require and use construction erosion and stormwater runoff controls	Mod.	Mod.	76
1.7*	Require the use of shoreland buffer and green strips.	High	Mod.	77
1.8*	Adopt animal waste management ordinances and use best management practices.	Mod.	Mod.	78
11.2*	Evaluate, and as necessary, control urban stormwater discharges and runoff	Mod.	Mod.	176

*Reference indicated Key Action recommendation for more details.

KEY ACTION #10: REDUCE BACTERIA INPUTS FROM POINT AND NONPOINT SOURCES

The Green Bay Health Department routinely takes bacteria counts in the Lower Green Bay and Fox River Area of Concern. The bacteria that are monitored are not themselves pathogenic, but they are indicators of the possible presence of infectious bacteria and viruses. At times, bacteria counts are within acceptable limits for swimming, but bacteria counts are periodically higher than limits set for "full body contact." Municipal waste and nonpoint animal waste are sometimes identified as the causes for these excessive levels.

Chlorination of effluents from sewage treatment plants and industries that process animal wastes is a standard practice for killing bacteria. However, routine chlorination is not without problems because the free chlorine radical can combine with organic compounds to form chlororganics that may have toxic properties. Other means of sanitizing waste effluent should be explored. Animal waste management programs, as well as programs to reduce urban and rural runoff, will help reduce bacterial numbers in the Area of Concern. This action was given low priority because it has relatively less effect on the ecosystem, the problem with high numbers of bacteria is not always apparent, and other actions will help correct or prevent this problem. Table 19 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Reducing bacteria from point and nonpoint sources will lower the incidence of infections and levels of bacteria, viruses and sediments in the water, which will in turn reduce the potential for human and animal diseases.

IMPROVED USES

The action would improve recreational opportunities, especially for swimming and other water-contact sports, and it would improve the safety of livestock watering upstream.

CITIZEN COMMENTS AND SUGGESTIONS

One person commented that the Key Action should also address viruses and bacterial spores. These can be present in the sediments for a number of years and be resuspended by wind and wave action.

TABLE 19. Priority, Environmental Effects and Use Improvements Associated with Key Action #10.

KEY ACTION 10:	Reduce Bacteria Inputs from Point and Nonpoint Sources
PRIORITY	Low
ENVIRON. EFFECTS	Reduce infectious bacteria and viruses in water column and sediments. Reduce potential for human and animal diseases.
USE IMPROVE-MENTS	Improve conditions for swimming, water contact sports and other recreation. Improve safety of upstream livestock.
COMMENTS	Heavy use of chlorine may prompt formulation of unwanted toxic compounds.

10.1. RECOGNIZE SWIMMING AS A DESIRED USE OF THE BAY AND RIVER WHEN REVIEWING AND REVISING APPLICABLE WATER QUALITY STANDARDS. (Ongoing)

EXPLANATION: State water quality standards may be revised in the future to provide for classifying and protecting different levels of recreational water uses. While there is no publicly sanctioned swimming beach in the Area of Concern some people waterski, and others swim off their boats or at "informal" swimming beaches. Monitoring by local health officials shows that the area often (but not always), meets current state health guidelines for fecal coliform (see recommendation 14.3). Any review of the recreational use classification for the Lower Fox River and lower Bay should reaffirm that swimming and other recreational uses involving full-body contact (such as waterskiing, sail boarding, etc.), are uses to be protected in the Area of Concern. The need to protect (and enforce) swimming and similar recreational uses of the Bay should guide determination of disinfection requirements for discharges (see recommendations 10.2 and 10.4) and other pollution abatement decisions.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Low

WHO SHOULD ACT: WDNR, Legislature, USEPA,

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: There are no new anticipated costs. This will be done as part of ongoing WDNR water resources programs.

10.2. DISINFECT MUNICIPAL WASTEWATER TREATMENT PLANT DISCHARGES AS NEEDED TO PROTECT SWIMMING AND OTHER RECREATIONAL USES OF THE BAY AND RIVER. (Ongoing: Review 1987-1992)

EXPLANATION: An administrative rule (NR 210) was recently revised that provides guidance for establishing disinfection requirements at treatment plants treating domestic wastes. Municipal treatment plants may be required to disinfect seasonally to protect recreational users, year round to protect public drinking water supplies, or during some other annual period to protect human and animal health. Some treatment plants may not be required to disinfect.

As a municipal treatment plant's WPDES discharge permit is reissued a determination will be made following the guidelines in NR 210, as to whether disinfection is necessary or not, and during what period disinfection is needed. Because the current use of the Bay and River includes swimming, wading, waterskiing, and sail boarding, this plan recommends that seasonal (May 1 to September 30) disinfection to protect these uses be required of discharges to the Area of Concern and to tributaries affecting the area.

Treatment plants that choose to use chlorine to disinfect will also be required to dechlorinate and meet a total maximum daily limit of 0.1 mg/L total residual chlorine. This dechlorination requirement is to protect fish and aquatic life from the impacts of acute and chronic toxicity that can be caused by chlorine.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, Municipal treatment plants.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Disinfection has been required year-round at all treatment plants in the past. The new requirements of NR 210 will require improved disinfection during the recreational season and dechlorination (for plants that use chlorine). Disinfection costs for municipal treatment plants should remain the constant. However plants will be required to dechlorinate. Capital costs for dechlorination are low averaging approximately $25,000. Municipalities may be eligible for some cost-sharing from 25% Small Project (ORAP) grant funding or amendments to their existing Wisconsin Fund grant applications. Since this treatment will be required by existing administrative rules, no additional costs will be the direct result of this plan recommendation.

10.3. CORRECT FAILING SEPTIC SYSTEMS.

a. Identify areas with failing septic systems. (Target date: 1993)

b. Homeowners should take measures to correct problems. (Ongoing)

EXPLANATION: Failing septic systems may be contributing to high bacteria levels in localized areas of the Lower Fox River Basin. Several citizens have noted that there are problems with failing septic systems in an area of the Bay just northeast of the Area of Concern that also need to be solved. (Also see the explanation of the following recommendations in the TAC Reports: N&E - 10.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: Counties, Municipal treatment plants, Sanitary Districts, DILHR, WDNR, and Homeowners.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: An assessment of failing septic systems potentially discharging to tributaries of the Lower Fox River and Green Bay should be a low cost (<$50,000 total). Costs to an individual homeowner of replacing a failed system can run $1,500 to $3,000 for traditional systems and $5,000 to $7,000 for mound systems. Homeowners may be eligible for partial grants up to $3,000 depending on the type of system from Wisconsin's Private Sewage System Rehabilitation and Replacement Grants. The 1988-89 budget for the program is $2,000,000. Homeowners can extend the functional life of their septic systems by being careful of how they use the system and regular cleaning and maintenance.

10.4. CONTROL INDUSTRIAL DISCHARGES AS NEEDED TO PROTECT SWIMMING AND OTHER RECREATIONAL USES OF THE BAY AND RIVER.

a. Assess need to revise administrative rules to control industrial sources of bacteria. (Target date: 1993)

b. As appropriate (a), revise rules to provide for disinfection of industrial wastes. (Target date: To be determined by "a")

c. As necessary, incorporate disinfection requirements into WPDES discharge permits. (Target date: To be determined by "a")

EXPLANATION: Currently, bacteria contributions from industry are not well understood although it is known that the opportunist pathogen *Klebsiella* is found in pulp and paper mill and food processing industrial effluent. Further assessment is needed to determine if control of bacteria in industrial effluent is necessary. Industries are not currently required to disinfect their discharges unless they contain domestic wastes. (Also see the explanation of the following recommendations in the TAC Reports: N&E - 13.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

WHO SHOULD ACT: Industrial discharges, WDNR, Researchers, WDHSS, USEPA.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The assessment of the need to treat could be a low-cost research or management study (<$50,000). The results of the study would indicate if disinfection is needed and estimate what the costs of disinfection (and dechlorination) might be.

KEY ACTION #11: VIRTUALLY ELIMINATE TOXICITY CAUSED BY NONPOINT AND ATMOSPHERIC SOURCES

Key Action's Priority: low

Action Recommendation		Priority for Key Action	Priority for Plan	Page
	Control Land Runoff			
11.1	Evaluate and control runoff of toxic substances from all watershed sources.	High	Mod.	175
11.2	Evaluate and, as necessary, control urban stormwater discharges and runoff.	High-Mod.	Mod.	175
11.3	Prevent chemical and coal stockpile runoff.	High-Mod.	Low*	177
11.4	Initiate industrial lot and urban runoff control demonstration projects.	Mod.	Low*	178
11.5	Assess possible impacts of pesticide and herbicide use and control as necessary.	Mod.	Low	178
	Control Waste Disposal and Spillage Areas			
11.6	Evaluate and control contributions of toxic substances from landfill and land disposal sites.	High	Mod.	179
11.7	Evaluate potential for groundwater contamination from other land uses to impact the Bay and River and control as necessary.	Mod.	Low*	181
11.8	Investigate sites of past coal gas manufacturing.	Mod.	Low*	182
11.9	Monitor fuel storage tanks for leaks and spills, and initiate measures to prevent and correct as necessary.	Low	Low	183
11.10	Evaluate and minimize impacts of spills on the River and Bay.	Low	Low	184

Action Recommendation		Priority for Key Action	Priority for Plan	Page
	Reduce Atmospheric Deposition			
11.11	Determine atmospheric deposition's contribution to toxic substances found in the Bay and River and establish load reduction goals.	High	Mod.	184
11.12	Identify emission sources that may be contributing to atmospheric depositions of toxic substances to the River, Bay and Great Lakes.	Mod.	Low*	186
11.13	Require emission controls that consider secondary impacts on water quality and human health.	Mod.	Mod*	187
11.14	Participate in development of regional, national, and international strategies to reduce toxic contaminants in the atmosphere.	Mod.	Low	188
	Other Recommendations to Virtually Eliminate Toxicity Caused by Nonpoint and Atmospheric Sources			
1.4**	Implement Comprehensive watershed management projects to reduce phosphorus and other pollutant loads from nonpoint sources.	High	High	73
1.5**	Seek innovative and alternative ways to achieve nonpoint source management objectives.	Mod.	High	75
1.6**	Require and use construction erosion and stormwater runoff controls.	Mod.	Mod.	76
1.7**	Require the use of shoreland buffers and green strips.	High	Mod.	77
1.8**	Adopt animal waste management ordinances and use best management practices.	Mod.	Mod.	78

* At this time very little is known about the impacts of nonpoint sources on the Bay's and River's toxicity problems. While these are not believed to have a major impact, and thus have a low priority, nonpoint sources need further assessment to determine what impact they may have.

** Reference indicated Key Action recommendation for more details.

KEY ACTION #11: VIRTUALLY ELIMINATE TOXICITY CAUSED BY NONPOINT AND ATMOSPHERIC SOURCES

At this time very little is known about the impacts of nonpoint sources and atmospheric deposition on the Area of Concern's toxicity problems. It is believed that their impacts are less than other sources (i.e., in-place pollutants and point sources). However, high priority should be given to studies that will further assess these sources. Their overall priority for management may change based on the results of these studies.

Immediate actions should be taken to control runoff of some sources, such as coal piles, which are likely sources of contaminants. Further evaluation is needed of many other sources. However, use of best management practices that reduce runoff from urban areas and reduce pesticide and ammonia runoff can minimize potential problems.

Potential impacts of abandoned landfill land disposal sites located near the River and Bay needs to be evaluated more thoroughly. Federal and state solid and hazardous waste management programs will guide this effort.

Monitoring and remedying air emissions of toxic contaminants is difficult because the concentration of a potentially toxic substance in one medium (air) must be translated into a concentration known to be toxic in another medium (water). The most immediate actions in regard to airborne emissions of toxic contaminants should include efforts to compile and evaluate existing information in order to identify potential air emissions sources; develop, evaluate, and run deposition models; estimate loading of toxics from air to water loads; and monitor coal-fired combustion sources for toxic compounds.

Currently Wisconsin is proposing administrative rules (NR 406 and 407) which will require increasing control of over 400 hazardous chemicals in air emissions. When established these regulations will provide part of the information needed to further evaluate the impact of these emissions on Bay water quality. Required reductions in emissions of toxic chemicals designed to protect human health from air-borne exposure to contaminants may also benefit Bay and Lake water quality. The Remedial Action Plan's recommendations build on these proposed rules, looking long-term to the difficult task of determining the relationships between air emissions, air deposition and water quality, and taking effective steps to control any problems that are found. In this evaluation consideration should be given to the effects of emissions from the area on water quality of Green Bay and Lake Michigan, as well as the Area of Concern.

The Department has established an interdisciplinary Task Force to review and evaluate the impact of municipal and other incinerator's emissions on health and the environment, and to develop policy and procedures for the control of such emissions. Table 17 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS AND USE IMPROVEMENTS: To be determined.

CITIZEN COMMENTS AND SUGGESTIONS

One person commented that the wording of the Key Action should be reworded to say, virtually eliminate "toxic contamination" rather than "toxicity."

Most of the comments on this Key Action focused on atmospheric emissions and deposition. Several people commented that the Plan doesn't deal with or lacks specific recommendations on air emissions. (Note recommendations 11.11 to 11.14 in draft Plan were directed at air emissions.) Others stated that air quality must be addressed by regulating toxic air emissions into the air. One person suggested that the Plan's target dates for toxic emissions recommendations should be earlier. Several people noted concern about existing and proposed waste incinerators. One person commented that "the incineration of garbage, sewage sludge, and paper mill wastes and resulting toxic air emissions must be dealt with to prevent fallout from affecting the Bay and River." One person was concerned about the effect this fallout has on dairy feeds and the dairy industry. One person noted that national legislation is needed.

Several people recommended that the Plan address the use of road salt. One person commented that strict regulations should be drawn up regarding sewage sludge which is spread on the land. It can be a source of nonpoint source pollution. Another person suggested earlier target dates for several of the recommendations directed at the control of urban runoff.

TABLE 20. Priority, Environmental Effects and Use Improvements Associated with Key Action #11.

KEY ACTION 11:	Virtually Eliminate Toxicity Caused By Nonpoint and Atmospheric Sources
PRIORITY	
ENVIRON. EFFECTS	Similar to effects of reducing point and in-place sources of toxic contaminants depending on proportion of nonpoint and atmospheric source load in total load to the Area of Concern Reductions in atmospheric emissions may help reduce amount of toxic contaminants reaching the entire Bay, Lake Michigan and Great Lakes in general.
USE IMPROVE-MENTS	Unknown at this time.
COMMENTS	There is little information at this time to assess how important nonpoint and atmospheric sources of pollution are in contributing to the Area of Concern's toxic problems. It is believed that their impacts on the Area of Concern are less that other sources (i.e. in-place pollution and point sources). However, high priority should be given to studies that will further assess these sources. Their overall priority may change based on new information generate by these studies. Localized sources that are problems such as coal pile runoff should be controlled. Overall reductions in the loads of toxic contaminants to the Great Lakes from atmospheric deposition should also be sought.

Control Land Runoff

11.1 EVALUATE AND CONTROL RUNOFF OF TOXIC SUBSTANCES FROM ALL WATERSHED SOURCES. Identify, evaluate, and remedy the contribution of watershed land use practices to toxicity problems in the Bay and River. Include urban and rural sources of ammonia, pesticides and other toxic chemicals. (Target date: To be determined)

EXPLANATION: There is a basic lack of information about the potential for nonpoint sources to contribute to toxic problems in the Bay and River. The first step is to evaluate the sources either as part of a nonpoint source priority watershed project, local planning effort, site evaluation, or research project. The evaluation should include: an evaluation of all urban runoff sources regardless of eligibility for cost sharing an evaluation of the contribution of nonpoint sources to high ammonia levels in the River and Bay (recommendation 3.8); and an inventory of the use of herbicides and pesticides and their potential impact (recommendation 11.5). Specific actions that should be undertaken based on existing information and programs are highlighted in recommendations 11.2 through 11.5. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS 41, 42, 45; and in this plan - 3.8, 1.3, 1.4, 1.5.)

Citizen Comments: Several people were concerned about the possible impacts of road salt.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: LCCs, Counties, Cities, Villages, SCS, WDNR, USEPA, Researchers, FVWQPA, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: This analysis could be done as part of intensive watershed projects (see recommendation 1.4) or during the evaluation of specific sources and implementation of specific source control programs (see recommendations 1.6 - 1.9, and 11.2 - 11.13).

11.2. EVALUATE AND, AS NECESSARY, CONTROL URBAN STORMWATER DISCHARGES.

a. Monitor selected stormwater outfalls during all flow periods to assess the potential impacts of these discharge types on the Lower Fox and the lower Bay. (Target date: 1988 to 1989)

b. Develop guidelines for the evaluation of areas contributing to stormwater discharge points. (Target date: 1988)

c. Develop stormwater quality management plans for areas contributing to stormwater discharges to determine sources and best management practices. (Target dates: 1989 to 1992)

d. Adopt stormwater ordinances and design practices that minimize future impacts of urban runoff in developing areas. (Target dates: 1988 to 1993).

e. When monitoring, modeling, or other evaluation indicates a stormwater outfall as an important source of toxicants or other pollutants use best management practices or best available engineering techniques to control the source. (Target dates: 1991 to 1993)

EXPLANATION: The significance of stormwater discharges on the River's and Bay's water quality is not known. The Clean Water Act makes industries and municipalities responsible for the quality of water discharged from stormwater pipes. Stormwater can pick up toxic chemicals from waste storage sites, and from areas where chemicals have been spilled or handled and inadvertently washed into floor drains. Municipalities, industries, and certain commercial operations are responsible for evaluating the potential for stormwater to become contaminated as a result of site operations and for taking steps to remedy such conditions that threaten water quality. These water quality management plans should: determine the size and extent of the drainage area which the facility occupies, characterize the type of activities carried out on the site including the use and fate of noncontact cooling waters; identify the potential for such activities as the sources of toxic substances and other pollutants; and identify best management practices to control runoff for the specific type of site or operation. (Also see the explanation of the following recommendation in the TAC Reports: N&E - 5; TOXICS - 39, 43, 44, 47; and in this plan - 11.3, 11.4, 11.5, 11.7.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High-Moderate/Moderate

WHO SHOULD ACT: Cities, Villages, WDNR, USEPA, Industries, some Commercial Operators.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Section 405 of the Water Quality Act of 1987 (Clean Water Act) addresses storm water discharges and provides compliance deadlines for industrial discharges and large municipal separate storm sewer systems owners. The Act requires U.S. EPA to establish application requirements for industrial sources and urban municipal systems serving populations over 250,000 by February 1989, and by February 1991 for systems serving populations between 100,000 and 250,000. These sources must submit discharge permit applications within one year and permitting agencies have one year to issue permits. Permits may allow the discharger up to 3 years to come into final compliance. These requirements may apply to other areas which contribute to violations of water quality standards or areas which are significant contributors of pollutants to waters of the United States. Stormwater dischargers to Great Lakes Areas of Concern may fall under this category.

Requirements for stormwater discharge control are being developed. The Clean Water Act (section 305) requires the reduction of pollutants "to the maximum extent practicable" and the effective prohibition of nonstormwater discharges into the separate storm sewer. Permits may require stormwater quality management plans for discharges within an urbanized area.

A monitoring study of representative urban stormwater discharges to scan for the types of pollutants present could be a low to moderate cost depending on the scope of the evaluation ($15,000 to $250,000 total). The more stormwater discharges and more toxic chemicals monitored the higher the cost. Load determinations could be even more costly. Any monitoring done should utilize and build on the work done by the National Urban Runoff Program (NURP) studies. There may be funding available for some research studies which are done as part of the implementation of Section 305 of the Clean Water Act.

Inventories, impact evaluations and development of water quality management plans for all the urban stormwater discharges in the Lower Fox River Basin could be a moderate to high cost ($100,000 to $500,000). By comparison, collecting the urban nonpoint source inventory for the Milwaukee Priority Watershed projects will cost about $160,000. Evaluation, modeling and development of stormwater management plans for urban areas in these watersheds will have equal to double the cost of initial data collection.

The stormwater quality management plans will estimate costs of different control options. Options for managing existing systems are rather limited. Best management practices such as street sweeping, diverting run-off away from areas likely to contain pollutants (coal piles, chemical storage areas, etc.) and finding sources discharging contaminants to storm sewers are examples of cost-effective control options. Major retrofitting of controls, such as stormwater detention basins on existing sewer systems can be quite costly and would probably not be worth while except for storm sewer sources that are major sources of pollutants.

Ordinances and design guidelines that minimize stormwater pollution from new developments are cost-effective options for avoiding future problems from urban stormwater runoff.

11.3. PREVENT CHEMICAL AND COAL STOCKPILE RUN-OFF. Require the use of best management practices to prevent run-off of toxic substances from coal, salt, and other stockpiles that are located near the River, Bay or their tributaries. (Target date: 1990)

EXPLANATION: Some types of bulk storage can potentially contribute toxic substances and other pollutants either by small spills, run-off or leaching of material. Management practices such as slow diversions, sealed pads, covering and wet detention ponds can reduce run-off and infiltration of these substances. Covers often are most important. Coal can also be treated to reduce leachate of toxicants. Because of documented problems with run-off, dust, and leachate, the province of Ontario requires the use of best management practices for coal piles and other chemical stockpiles. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 38; and in this plan - 11.2, 11.4.)

Citizen Comments: One person recommended that obvious stockpiles known to contribute contaminants to the River should be at least covered by 1988. Other control measures should be in place by 1989. Further delays are unwarrented.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High-Moderate/Low

WHO SHOULD ACT: Cities, Village, Industry, some commercial operators, WDOT, Brown County Harbor Commission and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Costs of covering other best management practices might run from $10,000 to $250,000 a site. If one assumes there are approximately 10 to 20 sites along the entire Lower Fox River that might need such practices, total cost in the basin might be moderate to very high ($100,000 to $5,000,000 total). Requirement for best management practices could be included in local ordinances or as part of WPDES discharge permit requirements. Costs would be borne by the site owners.

11.4 INITIATE INDUSTRIAL LOT AND URBAN RUN-OFF CONTROL DEMONSTRATION PROJECTS. Develop demonstration projects that show how industrial lot and urban runoff can be reduced. (Target date: begin 1989)

EXPLANATION: There are best management practices available to control contaminant from industrial lots, coal and chemical storage areas, and other urban areas. Demonstration of these practices encourages their use and provides an opportunity for individual industries and commercial operations to show their good citizenship. Projects should be monitored to evaluate effectiveness of practices which reduce contaminant loads to surface and groundwater. Projects should also stress site specific design, installation and maintenance procedures. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 37; and in this plan - 11.2, 11.3, 11.7)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: LCCs, Industry, Counties, Cities, Villages, WDNR, WDOT, USEPA, Brown County Harbor Commission, and UWEX.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The demonstration projects might be low to high cost ($35,000 to $1,000,000 total) depending on the scope of the projects. Practice costs might range from $25,000 to $500,000 and monitoring and evaluation costs would be similar. The project might be funded by a joint effort of industry, researchers, local government, UWEX and WDNR.

11.5. ASSESS POSSIBLE IMPACTS OF PESTICIDE AND HERBICIDE USE AND CONTROL AS NECESSARY.

a. Evaluate usage of pesticides and herbicides within each county and bulk distribution and sites having potential to impact the River and Bay. (Target date: 1989)

b. Monitor or otherwise evaluate ecosystem to determine if problems exist from pesticides and herbicides in current use. (Target date: 1991)

c. Complete analysis of overall potential impacts of pesticide use as it affects the Area of Concern, including recommendations to guide future management. (Target date: 1993)

d. As necessary, reduce impacts of pesticides and herbicide usage on the Area of Concern. (Target date: 1996)

EXPLANATION: WDNR has monitored Fox River water and fish tissue for pesticides since 1976. Most of the chemicals have subsequently been banned and monitoring does not indicate that these chemicals are a problem in the Area of Concern. However many new pesticides are on the market. While not believed to be a significant problem, these new chemicals need to be assessed for their potential impact on the River's and Bay's ecosystem. Important considerations in such an assessment would be the pesticide's toxicity, degradation rates and movement through the hydrologic cycle. Existing DATCP pesticide use inventories may provide some of the information needed for this evaluation. (Also see the explanation for the following recommendations in the TAC reports: TOXICS - 53.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: Counties, DATCP, Farmers, Pesticide distributors, UWEX, and Researchers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Cost of the evaluation could be fairly low (<$50,000 total) if adequate inventories are available and the results of other research is applicable to the area. They could be moderate to high cost ($50,000 to $500,000) if new data and research was necessary. Costs of any needed controls would be determined by the study.

Control Waste Disposal and Spillage Areas

11.6. <u>EVALUATE AND CONTROL CONTRIBUTIONS OF TOXIC SUBSTANCES FROM LANDFILL AND LAND DISPOSAL SITES</u>. Identify and evaluate landfills, dredge spoil, and other land disposal areas that may potentially impact the River and Bay, and their fish and wildlife. Owners should evaluate their sites, and develop and implement management plans for the sites.

a. All sites should be adequately closed and covered to minimize risk of contamination. (Ongoing)

b. Inventory and evaluate sites to identify those where more detailed investigations should be undertaken. All sites within a quarter mile of the River and Bay should be evaluated (Table III.1). Based on existing information sites that should be investigated first are:

* City of Green Bay, Military Avenue
* City of Green Bay, Danz Avenue
* City of Green Bay, Bay Port Industrial Park (Also see rec. 4.7)

* Bergstrom Landfill
* WPSC Fly Ash Site.

(Target date: 1988-1991)

c. Investigate surface, groundwater and/or wildlife food chain contamination at sites as appropriate to determine if they contribute to the River's and Bay's contamination problems. (Target date: 1991)

d. If monitoring or other studies show significant contamination from the site, the owner should take steps to hydraulically isolate the site from the River's and Bay's ecosystem and from the foodchain supporting the fish and wildlife in the ecosystem. (Target date: To be determined by "b" and "c")

e. If changes in use of a land disposal site are proposed, a site evaluation study should be conducted. Restrict development on sites unless the study can demonstrate that there are and will be no adverse impacts from toxic contamination. For sites where development is acceptable, require developers to prepare and follow a site development plan. This plan should specifically identify measures which minimize problems associated with toxic contamination during construction and subsequent use of the site. (Target date: 1988 establish legal basis)

EXPLANATION: There is little if any information about the contribution of toxic materials to the River's and Bay's ecosystem from landfills and land disposal sites. It is generally believed that these sites are not significant sources of PCBs. PCB is relatively insoluble in water and the clay liners and natural clay soils found at many sites have low permeability. It has been shown in lab studies that clay retains PCB and metals very well.

As part of the Wisconsin's Environmental Repair Fund an inventory of landfills and land disposal areas is being developed. Table III.1 lists sites within a quarter mile (1,200 feet) of the Fox River and lower Green Bay. Sites that are known to have significant amounts of PCB contamination should be investigated to confirm that they are not sources of PCBs. Sites also need to be evaluated for potential impacts from toxic chemicals that are more soluble in water (VOC's, base neutral compounds etc.). Sites without clay liners or where covers or liners have been breached are also of concern. Sites where there are uncovered contaminated wastes and substantial use by wildlife such as at the Bayport Industrial Park have potential for run-off and for contaminants to move through the food chain into fish and wildlife.

Landfills come under the state's solid waste rules for site closure. In general older sites are required to be covered by a clay cap of 2 feet and 6 inches of soil. Newer sites and sites with known problems may have more stringent requirements. Older land disposal sites and abandoned landfills also come under formal state solid waste rules and guidelines. However, they are not usually required to retrofit engineered controls unless problems are evident. The state's Environmental Repair Fund program may apply to these sites.

Old land disposal sites are sometimes proposed as locations for building and development. Adequate cover along with adequate site evaluation and management prior to any building or development at all sites would avoid risk to human health and the River's and Bay's fish and wildlife. Any development should be done in a manner that does not jeopardize the integrity of the waste disposal site. (Also see the explanation of the following recommendations in the TAC reports: TOXICS - 48, 49.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: Counties, Cities, Villages, Towns, Owners of landfills and land disposal sites, WDNR, Developers.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Costs of evaluation and control of the 16 landfills near the River is difficult to estimate and will depend on what type of problems are found, if any. Total evaluation cost for the basin may range form high to very high ($640,000 to $4,000,000 total). Studies at individual sites typically might be $40,000 to $250,000 with a few problem sites having evaluation that cost $250,000 to $500,000. Cost of any needed cleanup would be depended on the findings of the evaluation. Extraction wells can run $250,000 to $500,000, air stripping $100,000, and capping with 2 to 10 feet of clay and top soil runs $2 to $4 a cubic yard of material. Costs could be borne by the responsible parties, or in the case of abandoned sites, may be eligible for funding under Superfund or the state's Environmental Repair Fund. Monitoring and control is the responsibility of site owners, although some abandoned sites may be assessed under the state's Environmental Repair Fund.

11.7. EVALUATE POTENTIAL FOR GROUNDWATER CONTAMINATION FROM OTHER LAND USES TO IMPACT THE BAY AND RIVER AND CONTROL AS NECESSARY. Use inventories, literature findings and pilot studies (possibly as part or at the same time as the mass balance study) to evaluate land uses that have the potential to contaminate groundwater and contribute toxicants to the River and Bay through groundwater/surface water interchanges. Possible land uses to evaluate include:

* Above ground storage tanks (also see recommendation 11.9);
* Below ground storage tanks (also see recommendation 11.9);
* Industrial lagoons;
* Sludge disposal and spreading areas;
* Snow disposal areas;
* Pesticide and herbicide storage areas (also see recommendation 11.5);
* Bulk chemical storage areas (also see recommendation 11.3);
* Spill sites (also see recommendation 11.10); and
* Road salt use.

a. Identify inventories of these sources and contaminants, and literature findings that may help evaluate the impact of these sources. Establish priorities for further investigation. (Target date: 1989)

b. Monitor sites of concern, as appropriate. (Target date: 1990-1993)

c. Initiate monitoring of the ecosystem (water, sediment, biota) for contaminants of concern from these sources. (Target date: 1990-1993)

d. Evaluate findings and develop management recommendations and guidelines. (Target date: 1994)

e. Require cleanup or other management as appropriate. (Target date: 1990-1996)

EXPLANATION: Leaks or spills from waste disposal or product spillage sites or fuel and chemical storage facilities have the potential to pollute groundwater and surface water. The extent of contamination from such areas and possible impacts on groundwater and surface water has not been fully assessed. Some sites have or are being inventoried and monitored. Representative sites known or suspected of having contamination problems and located close to the Fox River should be investigated. This is important particularly since the current high lake levels could be a contributing factor in the mobilization of contaminants from the groundwater to surface waters. Present and past cones of depression in area groundwater tables would also be a factor to consider in these evaluations. (Also see the explanation for the following recommendations in the TAC reports: TOXICS - 48, 51.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: Site owners, WDNR, USEPA, Researchers, and DATCP.

ESTIMATED COST AND POTENTIAL FUNDING SOURCES: Studies of different types of sites could range from $40,000 to $500,000 a piece depending on the scope of the study. Assuming 2 studies are conducted and other impacts could be assessed using literature values from other research, total costs of evaluation could be moderate to high ($80,000 to $1,000,000). Some funding for groundwater studies might be available from the state's groundwater research program.

11.8. <u>INVESTIGATE SITES OF PAST COAL GAS MANUFACTURING</u>. Study the sites of the two coal gas manufacturing plants that were formerly located along the Fox River to assess the existence and possible impacts of groundwater contamination.

a. Identify on and off site waste disposal areas and evaluate the potential for contamination, monitoring, and developing control strategy as necessary. (Target date: 1988)

b. Take remedial steps, if monitoring shows a problem exists. (Target date: To be determined by "a")

EXPLANATION: Two coal gas manufacturing plants were located along the Fox River. Studies of similar plants elsewhere have identified coal tars and purification waste areas with toxic contamination problems. PAHs, volatiles, and metals may have been in the wastes generated by the facilities. Consequently, the sites along the Fox River should be evaluated to determine if similar problems exist. Both on and off site disposal areas are of possible concern. (Also see the explanation for the following recommendations in the TAC reports: TOXICS - 50.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: WDNR, Site owners, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Evaluation of the 2 sites could be moderate to high cost ($80,000 to $1,000,000). Cost could be borne by site owners or other responsible parties or if abandoned, may be eligible for funding under Superfund or the state's Environmental Repair Fund.

11.9. MONITOR FUEL STORAGE TANKS FOR LEAKS AND SPILLS, AND INITIATE MEASURES TO PREVENT AND CORRECT AS NECESSARY.

a. Implement rules requiring owners of underground storage facilities to monitor them for leaks. (Projected: 1989-1990)

b. Owners of both above and below ground fuel storage facilities should monitor each facility for leaks and spills. They should continue measures to prevent spills and leaks. Each owner should develop a spill control plan so action is taken if a spill occurs. (Target date: ongoing)

c. Owners should be required to provide secondary containment for above ground storage tanks. (Target date: 1989)

d. Owners should report any leaks or spills to the Department, evaluate impacts, and restore the environment as required by state law. (Target date: ongoing)

EXPLANATION: There are many above and underground fuel storage tanks in the area. Leaks in underground tanks often go undetected. It is the owners responsibility to monitor for such leaks, report them, and undertake action to restore the site to its original condition. Many problems can be avoided by preventive action such as adequate maintenance, good inventory records and inspection of tanks and development of spill control plans to keep minor spills from becoming major problems. Also requiring secondary containments such as double-walled tanks, and periodic monitoring of @encapulated tanks should reduce problems. (Also see the explanation for the following recommendations in the TAC reports: TOXICS - 53.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

WHO SHOULD ACT: Storage tank owners, Counties, Cities, DILHR and WDNR.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Monitoring, reporting and environmental cleanup of spills and leaks is required by state law. Secondary confinement is not currently required for above ground petroleum product storage. Costs of new requirements have not been estimated.

11.10. EVALUATE AND MINIMIZE IMPACTS OF SPILLS ON THE RIVER AND BAY.

a. Rapidly report and clean up all spills. (Target date: 1989))

b. Evaluate potential impacts of past spills on bays and rivers. (Target date: identify sites 1989, monitoring 1990-1993)

EXPLANATION: Spills of fuel oil and gasoline are the most common in the area and can potentially contaminate groundwater and surface water. Other chemicals such as pesticides and herbicides can also be a concern when they reach surface water or groundwater through spillage. In order to insure that these spills do not adversely affect the Bay and River owners need to rapidly report and cleanup spills. Spill records could be used as a basis for determining where monitoring is needed within the Area of Concern to evaluate past spills. (Also see the explanation for the following recommendations in the TAC reports: TOXICS - 54; and in this plan - 11.7))

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

WHO SHOULD ACT: Owners, Counties, WDNR, DILHR, and DATCP

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Under Title III of the Superfund Amendments (Emergency planning and community right-to-know) counties and other levels of government are required to develop emergency response plans by October 1988. The primary focus of these plans is human health. However the same information could be used to develop an additional component of the Plan that would include response to emergencies that affect the River's and Bay's ecosystem. Such an effort could be a joint effort of local government, WDNR and other interested parties. Cost of additional planning are likely to be low (<$10,000 per county) for a total cost in the Lower Fox River Basin of under $50,000.

Atmospheric Deposition

11.11. DETERMINE THE CONTRIBUTION OF ATMOSPHERIC DEPOSITION TO TOXIC SUBSTANCES FOUND IN THE BAY AND RIVER AND ESTABLISH LOAD REDUCTION GOALS. Assess contribution of atmospheric deposition to surface water concentration of PCBs, other chlorinated hydrocarbons (dioxins, furans, etc.), ammonia, and other toxic substances of concern to the Bay and River.

a. Estimate gross atmospheric loadings of toxic chemicals to the Area of Concern based on literature values from existing research, emission source inventories and other records, and modeling (if feasible). (Target date: 1988)

b. Develop new initiatives for routine atmospheric monitoring for PCBs, dioxins, furans, VOCs, PAHs, and heavy metals. Include ambient monitoring for gases, vapors, semi-volatiles, particulates, as well as wet and dry deposition. If necessary develop new modeling capability. (Target date: 1989)

c. Refine atmospheric deposition load estimates based on monitoring, determination of deposition rates and rates of exchange, and modeling (b). This could be done potentially as part of U.S. EPA's Mass Balance Study. (Target date: 1991)

d. Establish load reduction goals. (Target date: 1995)

EXPLANATION: There is little information of the relative contribution of atmospheric deposition to the loading of PCBs and other toxic substances to the Bay and River. Some recent research indicates atmospheric loading to the Lake Michigan and the Great Lakes may be substantial. Because of the relatively small surface area of the Lower Green Bay and Fox River Area of Concern, the loading may be less significant. More information is needed to assess the relative loading of atmospheric deposition to the Area of Concern, Green Bay and Lake Michigan. Then it will be possible to determine if atmospheric reductions are crucial to reducing PCBs and other toxics in the system. The U.S. EPA Mass Balance Study may help assess PCB atmospheric loads. Atmospheric deposition of substances acutely or chemically toxic to fish and aquatic life should also be assessed. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 55 and 56.)

Citizen Comments: Several people noted the importance of atmospheric deposition as a source of toxics to Green Bay, Lake Michigan, and the Great Lakes in general.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: USEPA, Industry, NOAA, Sea Grant, and WDNR.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Initial determination of atmospheric deposition of PCB and other toxicants to the Fox River Basin and Area of Concern could cost approximately $400,000 to $600,000. They will be monitored as part of USEPA's Mass Balance Study for a two-year period. Preliminary cost estimates for data collection at one master station in the Bay was $150,000 station set-up costs and $40,000 annual monitoring costs thereafter. Additional stations will also be monitored at an estimated total cost of $190,000 to estimate loads to the basin and to help in model analyses. Data interpretation and modeling costs are additional. More refined cost estimates may be available when the Mass Balance study design is available. An ongoing monitoring and modeling effort to track trends could have similar annual costs if equipment used in the Mass Balance study was available for later use. No funding is available at this time for an ongoing effort. It might be possible through a combined effort of additional state revenues, USEPA, and local and industry funding.

11.12. <u>IDENTIFY EMISSION SOURCES THAT MAY BE CONTRIBUTING TO THE ATMOSPHERIC DEPOSITION OF TOXIC SUBSTANCES TO THE RIVER, BAY AND GREAT LAKES</u>

a. Inventory known and potential sources of air emissions which may contain toxic substances that are of concern to the Bay and River. (Target date: 1992)

b. Verify source emissions of these toxic substances using estimation techniques or through stack testing if possible. (Target date: 1992)

c. Analyze available data to estimate total loadings of these toxic substances to the atmosphere from all sources and identify major sources. (Target date: 1993)

EXPLANATION: The first step in the control of atmospheric deposition of PCBs and other toxicants is to identify emission sources which contribute to pollutants found in the air. Most of the point sources of air emissions have been identified and report their emissions of listed (traditional) pollutants such as SO_2 and NO_2. Proposed changes in air pollution rules (NR 406 and NR 407) would require these industries to also determine and report on their emissions of over 400 other toxic and hazardous air emissions. WDNR has begun to compile information on known sources of toxic and hazardous air emissions for 494 substances that are currently being estimated. It is likely to require 5 years to compile and calculate loads of all the toxic and hazardous substances once sources begin formal reporting. This type of information would need to be linked to models and depositional data, to determine appropriate source reductions (see recommendation 11.13). (Also see the following recommendations in the TAC Reports: TOXICS - 55 and 56.)

Citizen Comments: Several people noted that the air emissions in the Area of Concern and Fox River Valley should be evaluated for their impact on Green Bay and Lake Michigan, not just the Area of Concern. One person suggested that the target date for the inventory should be moved up to 1990. Other people noted that there is a potential for proposed waste incinerators to add to toxic air emissions. This impact should be considered when communities decide whether or not to build incinerators.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: Industry, WDNR, RPCs and US EPA.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Under proposed administrative rules emission sources will be required to determine their emissions of toxic substances and report them to WDNR. An inventory of sources and emissions will be developed by WDNR. The analysis of this information as it applies to the Fox River Basin and Area of Concern will probably cost $75,000 per year for a 5 year period ($375,000 total) and might be funded by WDNR's air management program.

Mobile sources are not being inventoried. Evaluation of these sources will probably cost an additional $25,000 a year for the same 5-year period ($125,000 total). Additional funding would have to be sought.

11.13. REQUIRE EMISSION CONTROLS THAT CONTROL TOXICS AND CONSIDER SECONDARY IMPACTS ON WATER QUALITY AND HUMAN HEALTH.

a. Complete adoption of toxic air emission rules (NR 406 and NR 407). (Target date: 1988)

b. Develop capability to evaluate secondary effects of air emissions on the River and Bay. (Target date: 1992)

c. Evaluate existing authority in statutes which allow for consideration of secondary impacts of air emissions on the Bay's and River's water quality when applying control technology.

d. Develop and propose additional legislation which could provide for such considerations in setting rules. (Target date: 1993)

e. Require through rules appropriate emission controls to protect biota of the River and Bay, and the health of people eating fish from the Bay. (Target date: 1995)

EXPLANATION: When applying control technology requirements to known sources of air emissions, consideration should be given to secondary impacts on water quality, fish and wildlife. This may require development of new evaluative techniques to determine secondary impacts. In addition, risk analysis may be required for at least some substances. Such analysis should consider secondary routes of exposure on human health resulting from impacts of air emissions. For example some substances such as PCB move through the food chain and are found in fish that people consume.

The new proposed rules for toxic and hazardous air emissions (NR 406 and NR 407) included 400 chemical compounds, proposed controls based on categorical limits and considers the risk to humans from exposure via inhalation and dermal contact. While these proposed rules do not consider secondary routes of exposure, they will be an important step in control and reduction of emissions of toxic and hazardous substances.

Methods and guidelines for evaluating secondary impacts are not readily available. It will take substantial resources to develop these capabilities and statutory changes which will allow for promulgation of rules that address these impacts. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 57.)

Citizen Comments: One person recommended that secondary and multiple exposure should be considered in the rules that are currently being adopted. Other people commented on the potential effect of proposed waste incineration on air and water quality.

Citizen Comments: One person commented that rule development is underway now. Why should adequate controls be delayed for 8 more years? Secondary and multiple routes of exposure should be considered immediately.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: WDNR, Legislature, USEPA, Industry, Researchers and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: This new initiative could require $500,000 of air management staff and program resources. Needed would be new program monitoring and modeling capabilities and seeking statutory and/or administrative rule changes necessary to require emission controls that consider secondary impact on water quality and human health. Additional cost of source control would have to be determined as part of program development.

11.14. PARTICIPATE IN DEVELOPMENT OF REGIONAL, NATIONAL, AND INTERNATIONAL STRATEGIES TO REDUCE TOXIC CONTAMINANTS IN THE ATMOSPHERE. (Ongoing)

EXPLANATION: While potentially having less impact on the lower Green Bay and the Fox River because of the River's load, atmospheric deposition is believed to be a major source of toxic contaminants such as PCB to Lake Michigan and the Great Lakes. Air pollution sources in the Area of Concern and Fox River Valley are potentially contributors to these problems. The scope of the problem of atmospheric deposition of these contaminants transcends local, regional, national and international boundaries. For example, an estimated 50% of Wisconsin's air contaminants contributing to acid deposition, come from outside the state. Therefore, the problem must be dealt with at all of these levels. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 58.)

Citizen Comments: Several people noted that control of air pollution to the Great Lakes is important.

PRIORITY FOR KEY ACTION/ENTIRE PLAN:

WHO SHOULD ACT: Canada, United States, Great Lakes Governors and Legislatures, IJC, USEPA, WDNR, Counties, Municipalities, Industry, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: This is an ongoing WDNR air management program activity. A major new initiative might require additional staff time and could have substantial travel costs.

KEY ACTION #12: CREATE A COORDINATING COUNCIL

AND INSTITUTIONAL STRUCTURE FOR PLAN IMPLEMENTATION

Key Action's Priority: High

Action Recommendation	Priority for Key Action	Priority for Plan	Page
12.1 Establish a coordinating council and institutional structure to facilitate plan implementation.	High	High	191

KEY ACTION #12: CREATE A COORDINATING COUNCIL AND INSTITUTIONAL STRUCTURE FOR PLAN IMPLEMENTATION

Many people need to work together to improve and protect the Bay and River. The Plan suggests an institutional structure for local, state, and federal agencies and citizens to cooperatively manage and protect the Bay and River. The Plan recommends that a Coordinating Council be formed to provide for cooperative and effective action in the implementation of the Plan. An interim implementation committee will be set up until such time that a coordinating council can be established. Refer to Chapter V for a more detailed description of this proposal.

CITIZEN COMMENTS AND SUGGESTIONS

Most of the people who commented on the Key Action agreed that there is a need for coordinated action. Sixteen out of 19 that commented were in favor of a coordinating council. One person noted that this is the Key Action to do everything else. One group noted that "...The complexity of the waterway and its relationship to other systems makes the concept of a coordinating council necessary to integrate and evaluate the effects of restoration procedures as they are implemented." Another group commented that "It is essential that you maintain and build upon the outstanding work you have done to inform and involve the community during the implementation stage. We also believe that a regular public report on progress in implementing the plan, including mid-course corrections, is essential to ensure accountability."

Other people while favoring a cooperative, coordinated approach had reservations about the proposed approach. One person noted that "I question the use of a coordinating council with no authority but would be willing to give it a fair trial." Others questioned whether the Governor should appoint the members. One person noted "Yes, I would support and encourage the formation of a coordinating committee chosen by methods which ensure diversity of opinion and background, both professional and nonprofessional, not merely appointed by governors committee."

Several people supported a more local community-based effort. One person noted we must "Think globally, act locally." There is a need to demonstrate commitment by those closest to the benefits of rehabilitation. A couple of people questioned whether a new group or level of government should be formed. They suggested the CAC, existing groups, agencies or units of government be the nucleus of the coordination effort. One group noted concern about the lack of enforcement authority of the proposed coordinating council. Another person asked how cooperation from upstream communities and property owners can be obtained.

All who commented appeared to agree that "Consensus is important in seeing the RAP become most effective in obtaining its objectives. A commitment to this process must be found by all involved."

TABLE 21. Priority, Environmental Effects and Use Improvements Associated with Key Action #12.

KEY ACTION 12:	Create a Coordinating Council and Institutional Structure for Plan Implementation.
PRIORITY	High
ENVIRON. EFFECTS	Will not lead to any specific environmental improvements. In general, will enhance overall success of Plan implementation
USE IMPROVE-MENTS	Establish mechanism to coordinate programs. Forum for resolving conflicts. Increase potential for funding. Maximize existing programs work. Provide means for inter-regional discussion of issues. Continuing focus on issues affecting the bay.
COMMENTS	Much of the success and timeliness of implementing this Plan will depend both on the amount of resources available and a continued focus on the issues by an institutional body formally charged with oversight of Plan implementation. Continued active participation over time of all key actors is critical. Funding to support council is important.

activities among agencies. A more detailed discussion of the need for coordination and the structure of the Coordinating Council is found in Chapter V of this Plan.

The Coordinating Council will have an important role working on Key Actions relating to nonpoint sources and inplace pollution that must be a joint effort of many agencies and all levels of government. The Council will also provide a forum for information exchange, conflict resolution, public participation, and effective and efficient management of the Bay and River resources.

The first step in accomplishing this goal is to set up an Interim Committee to start RAP implementation. The Interim Implementation Committee can immediately begin implementation activities and further evaluate and pursue establishment of a coordinating council. During this time all parties who are proposed for inclusion on the Coordinating Council can be asked to review and comment on the proposal. This will also provide time for other parties who have not been identified as participants to request inclusion in RAP implementation activities. Refinements and modifications can be made based on the review and experience of the Interim Implementation Committee.

PRIORITY FOR KEY ACTION/ ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, Counties, Cities, Villages, Legislature, Governor, RPCs, FVWQPA, WDATCP, USEPA, COE, USFWS, Sea Grant, Oneida Tribe, Industry, Recreational, Environmental and Conservation groups, and other interested citizens and groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Program functions of the Council are estimated to cost $200,000. They should come from a combination of local, state and federal funding sources. A new state appropriation would be needed as well as contributions or grants from county and other local interests and as well as federal agencies.

An estimate of support needed to operate the Implementation Committee includes approximately one-half time staff person (0.5 FTE) to set up meetings, prepare documents, take notes, and distribute information. Support services costs for typing, mailing, telephone and copying would total about $5000 a year. Each subcommittee will also need funding and staff support although the level of support will vary from one subcommittee to another. A subcommittee actively pursuing a high priority recommendation would require up to $5000 per year and one-half time staff person. Not all the subcommittees will necessarily need to be in operation at the same time. The Implementation Committee will be responsible for activating particular subcommittees on an as needed basis, commensurate with available support services.

At this time the DNR-Lake Michigan District has identified one-half of a staff position to support the implementation organization. Fox Valley Water Quality Planning Agency also has one half of a staff position available. Both agencies have some support monies but do not have exact figures at this time. Additional support will be needed to adequately staff the proposed interim implementation organization.

KEY ACTION #13: INCREASE PUBLIC AWARENESS OF, PARTICIPATION IN AND SUPPORT FOR RIVER AND BAY RESTORATION EFFORTS

Key Action's Priority: High

Action Recommendation		Priority for Key Action	Priority for Plan	Page
13.1	Include opportunities for public participation and input on major decisions that affect the Bay and River.	High	High	196
13.2	Develop public information programs.	High	High	196
13.3	Develop education programs.	High	High	198
13.4	Make water quality information easily accessible and understandable.	Mod.	Low	199
13.5	Encourage inclusion of both economic and environmental viewpoints on policy advisory boards.	Mod.	Mod.	199
13.6	Consider forming a bay and river interest group or coalition.	Mod.	Mod.	200

KEY ACTION #13: INCREASE PUBLIC AWARENESS OF, PARTICIPATION IN AND SUPPORT FOR RIVER AND BAY RESTORATION EFFORTS

This Remedial Action Plan only describes what needs to be done to clean the Bay and River, it does not ensure the actions will occur. Ultimately all citizens and local leaders must make restoration and protection of the Bay and River a priority concern if we are to have water that is safe to swim in, fish that are safe to eat, and a resource that all can enjoy.

The Plan recommends that information and education programs focus on the Bay and River so that people have a greater awareness of the Bay's potential and the problems that affect it. Surveys should be conducted to let decisionmakers know what public attitudes and values are. Water quality information has to be clearly presented. There also needs to be continued public participation in the management of the Bay and River so that all can have a say in and support these activities. Volunteer efforts can also contribute greatly to the Bay and River cleanup. Table 21 indicates the priority, environmental impacts and use improvements associated with this Key Action.

CITIZEN COMMENTS AND SUGGESTIONS

One person commented that any efforts at educating the public will have big payoffs: "I would like to see this area relentlessly pursued." A number of people specifically commended the Plan's public participation process and indicated they hoped it would continue during the Plan's implementation. Several people recommended that documents such as this plan contain glossaries so they are easier for the nontechnical person to read them. Others suggested that good summary brochures would be useful. Many people and groups offered to help in some information and education activities.

TABLE 22. Priority, Environmental Effects and Use Improvements Associated with Key Action #13.

KEY ACTION 13:	Increase Public Awareness of, Participation In, and Support for Restoration Efforts.
PRIORITY	High
ENVIRON. EFFECTS	Will not lead to any specific environmental improvements. In General, however, will enhance overall success of plan implementation.
USE IMPROVE-MENTS	Insure public knowledge and awareness. Better public and private decisions for managing and using the resource. Increased political mandate. Promote continue public support for remedial actions. Increased funding for restoration. Better understanding of interdependence and scope of issues and problems affecting the bay and river. Reduced intensity of conflicts. Improved management of resource Provide for on-going evaluation of Plan.
COMMENTS	Continued public support, especially over the long-term, can be determining factor in the level of effort and resources devoted to Plan implementation by the implementing agencies/parties. Adequate public input into decision-making through effective public participation is critical. Communication programs must be two-way. Good information and education programs are also important and require substantial funding.

13.1. <u>INCLUDE OPPORTUNITIES FOR PUBLIC PARTICIPATION AND INPUT ON MAJOR DECISIONS THAT AFFECT THE BAY AND RIVER.</u> (Ongoing)

EXPLANATION: Citizens should have the opportunity to express their concerns and ideas and have them considered in major decisions that affect the Bay. They have good ideas. People are also more likely to support decisions if they have had an opportunity to participate in their development. Public input can be provided by public forums, questionnaires, hearings, and advisory committees. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 11, 16.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High.

WHO SHOULD ACT: Everyone.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Estimated annual costs for public awareness of, participation in, and support for, River and Bay restoration efforts range from $17,000 to $45,000 and includes staffing and supply costs for advisory committees and public meetings. A one time, professionally done survey can be used to accurately gauge public opinion and awareness of a wide variety of River and Bay issues (usage, clean-up, priorities, awareness and understanding of community participation). This would cost between $18,000 and $50,000. The number of staff and amount of time devoted to public awareness and participation can be a very variable cost.

13.2. <u>DEVELOP PUBLIC INFORMATION PROGRAMS</u>. Provide all stakeholders (Table IV.5) with information on the problems, possible solutions and potential of the Bay and River so that they can assist in restoration and become involved in the decisionmaking process. (Ongoing)

a. Provide information to the public through the use of general media (TV, radio, newspaper), organization newsletters, Speakers' Bureau and slide show, displays, brochures and publications.

b. Publish periodic newsletter (NEWSRAP or equivalent) that provides information on watershed activities.

c. Promote clean-up and rehabilitation activities that individuals and groups can participate in. (Bay Day, annual bird surveys, Bay clean-up days, Citizen Guide to a Cleaner Green Bay--what you can do at home.)

d. Periodically brief opinion leaders on bay and river restoration efforts, progress, and actions needed -- including actions they can assist with. This can be accomplished by newsletters, personal contacts, and annual reports.

e. Provide information on environmental quality to economic development groups and encourage awareness of the interrelationship of business and the environment to quality of life.

f. Maintain information repositories where information on the River and Bay is made available to the general public.

g. Develop new and use existing nature trails to expose the public to the environment and help develop an awareness and appreciation of natural areas.

h. Improve exchange of information between all groups who are impacting or are impacted by the Bay and River through research symposiums and coordinating council meetings (reference Key Action #12).

EXPLANATION: Public support of cleanup efforts is critical to their success. An informed electorate who understands the complexity and interrelationships of the Green Bay and Fox River ecosystem, the problems and issues that affect it, and is aware of the system's potential is most likely to support wise use of the resource.

The NEWSRAP newsletter can serve many useful functions, such as: providing general updates on RAP progress; listing schedules of upcoming meetings and events; and providing a means of networking with interested stakeholders.

A strong public information effort is needed to keep citizens informed of the Plan's progress, encourage public involvement, and generate continued interest. Without public involvement and support, the Plan's goals will be difficult to achieve. (Also see explanation from the following recommendations in the TAC reports: B&H - 22; N&E - 22; INST. - 15.)

TABLE 23. Stakeholders, Opinion Leaders and Decisionmakers

Stakeholders:

Port Users	Chamber of Commerce	Anglers
Commercial Fishing	Hunters	Fish Eaters
Farmers	Outdoor Recreationists	Boaters
Birdwatchers	Riparian Owners	Developers
Marina Operators	Industry	Swimmers
Upstream, Coastal Bay Users		

Opinion Makers and Decision Makers:

Gov't officials (elected) - local	Educators
Industrial Leaders	Business and Commerce
Service Organization Leaders	Religious Leaders
State and Federal Legislators	Foundation Heads
Union Leaders	Public Interest Groups
Media Editors and Editorial Boards	Agency Heads

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: Council, Counties, Cities, Villages, WDNR, Press, UWEX, RPCs, FVWQPA, GBMSD, Sea Grant, Conservation and Environmental groups, Industry, and many others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Providing public information on problems, solutions and potential uses of the River and Bay is a high priority item with many overlapping components including supplies and staff time for developing and distributing information and educational materials, promoting clean-up and rehabilitation activities, developing nature trails, and maintaining and updating information repositories. Annual costs for these activities range from $50,000 to $100,000 and include the following: one-half to one full time employee, development of two to four newsletters and five issue papers or fliers, one to two clean-up days or similar activities. One time costs of $25,000 to $100,000 would include an educational display and development of one or two nature trails.

13.3. DEVELOP EDUCATION PROGRAMS. Develop resource and education materials on the Bay for teachers and students. Provide in-service training for educators including administrators, classroom teachers, 4-H and scout leaders, and anyone who works with youth.

a. Implement an aquatic supplement to Project WILD, a wildlife and natural resources education program for students in Kindergarten through 12th grade. This program is familiar to many educators and will assist in teaching students about the natural resources of the Bay. (Target date: 1989)

b. Develop resource directory/field trip list and inservice training program to assist educators in teaching about the Bay. Encourage use of local nature centers, parks, and wildlife areas as outdoor classrooms. (Target date: 1988, ongoing)

c. Work with area school administrators and curriculum coordinators to incorporate activities on Bay and River into school curriculum. (Target date: 1988, ongoing)

d. Make the Bay, River, and issues affecting them the focus of university courses. Consider developing a new course or seminar for teachers focusing on the Bay, River, and Great Lakes issues. Use the Bay and River as a case study in existing courses. (Target date: 1988, ongoing)

EXPLANATION: The RAP is a long-range plan, and as such it is important that we plan for the future by working to see that the students in the area develop an appreciation of the Bay, and are kept informed of the problems and issues affecting the Bay. (Also see explanation from the following recommendations in the TAC reports: B&H - 23; N&E - 22; INST. - 15.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: Teachers, School Administrators, Bay Beach Wildlife Sanctuary, WDNR, Conservation Groups, University, UWEX, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The estimated annual cost for developing educational programs is approximately $25,000. This cost would include funding for one-half of a full time DNR employee, supplies and part-time employee costs outside of the DNR that might be involved in working with teachers and administrators. Additional costs may be associated with development of a university course or program within specific school districts.

13.4. MAKE WATER QUALITY INFORMATION EASILY ACCESSIBLE AND UNDERSTANDABLE. Develop clear ways of describing and tracking water quality data and routinely provide this information to the public. (Target date: 1988, ongoing)

EXPLANATION: Improved presentation of water quality information would help people better understand and evaluate water quality needs and improvements. Water quality information is often presented in a technical manner that is difficult for experts as well as nonexperts to interpret. Water quality indexes and other simplified methods of data presentation could increase awareness and understanding of water quality. Local press could use this information in regular weather and fishing reports. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 18.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: WDNR, FVWQPA, GBMSD, UWEX, PRESS, UWGB, Schools, Green Bay, Brown County, RPCs.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The estimated annual cost for making water quality information easily accessible and understandable would range from $1,000 to $20,000. This money could be used to develop newspaper stories, citizen information handouts, billboard displays, etc.

13.5. ENCOURAGE INCLUSION OF BOTH ECONOMIC AND ENVIRONMENTAL VIEWPOINTS ON POLICY AND ADVISORY BOARDS -- Include people with both economic and environmental viewpoints on policy and advisory boards that make decisions affecting the Bay and River so that solutions to environmental and economic problems are sought that will benefit both interests. (Ongoing activity)

EXPLANATION: A diversity of viewpoints and perspectives can often lead to better decisionmaking. Many private, state and local agency boards tend to be somewhat single purpose and tend to have membership with similar priorities. Including membership with both economic and environmental viewpoints on policy boards is one means to create an environment in which the future of the Bay can be discussed in a cooperative rather than adversarial spirit. In so doing attempt to get parties to see the perspective of those who view the Bay in a different context. Ask people to seek solutions to their concerns which do not threaten others. This may at times require more complicated and lengthy effort, but the chances of success should improve greatly.

Possible approaches include asking that the Green Bay Economic Development Authority and other similar groups focusing on local economic development include in their memberships people representing the concern for the natural environment. Also ask that committees of the WDNR and other similar agencies include in their membership people from the business community. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 11.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: Everyone.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: This recommendation suggests an approach to be considered by existing agencies, and public and private groups whenever there is not a legal barrier to doing so. There are no additional costs.

13.6. CONSIDER FORMING A BAY AND RIVER INTEREST GROUP OR COALITION. Consider forming a bay and river citizen's interest group or an alliance of existing groups to provide volunteer support for cleanup, and information and education efforts. (Ongoing)

EXPLANATION: Many events are initiated and coordinated best by private citizens. A bay interest group could provide the means for sponsoring special bay events and raising funds for information and education and cleanup projects. Many people and groups commented that they would be glad to help with cleanup activities.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: Everyone

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The estimated annual cost for assisting the formation of one or more River and Bay interest groups is $2,000 for supplies. Staff time would be additional, but might be available from existing program resources.

KEY ACTION #14: ENHANCE PUBLIC AND PRIVATE SHORELINE USES

Key Action's Priority: Moderate

Action Recommendation		Priority for Key Action	Priority for Plan	Page
14.1	Evaluate and upgrade boat launch facilities as necessary.	High	Mod.	204
14.2	Encourage development of marina facilities if environmentally and fiscally sound.	Mod.	Mod.	205
14.3	Evaluate potential for developing a swimming beach in the area of concern.	High	Mod.	206
14.4	Develop shoreline fishing facilities.	Mod.	Low	207
14.5	Protect and develop recreational and environmental corridors.	High	Mod.	207
14.6	Accelerate efforts to revitalize the waterfronts and enhance the shoreline.	Mod.	Low	208
14.7	Through cooperative effort, develop management plan and program for Renard Isle (Kidney Island).	Mod.	Mod.	209
14.8	Improve air quality and associated aesthetics.	Mod.	Low	211

KEY ACTION #14: ENHANCE PUBLIC AND PRIVATE SHORELINE USES

The shoreline provides the link between people and the Bay and River. More parkways and walkways, boat launches, swimming beaches and fishing piers will give people more access to the River and Bay. Enhancements of the waterfront could make the downtown area more pleasant for residents and tourists alike.

The Plan recommends upgrading existing boat launches and adding additional accesses on the East shore. It suggests that marinas should be encouraged, when environmentally sound and cost-effective, to meet demands for increased facilities. Additional shoreline fishing piers and other facilities should also be developed.

Environmental corridors are one way of protecting habitat and providing buffer areas to help improve water quality. The Plan recommends that municipalities in cooperation with Brown County and State should protect and develop recreational and environmental corridors along the Fox River wherever possible.

There are many differing ideas on future use of the confined disposal facility, Renard Isle (Kidney Island). The Plan recommends that if endangered species are adequately protected, the island should be **evaluated** for the potential for mixed use development considering potential environmental concerns, recreational needs, mechanisms for interagency cooperation and public participation.

Along with improvements in shoreline use improvements in water and air quality, and better management of trash and litter will make use of the River and Bay more enjoyable. Table 24 indicates the priority, environmental impacts and use improvements associated with this Key Action.

ENVIRONMENTAL EFFECTS

Environmental corridors can provide habitat for birds and wildlife. Natural areas and green belts also provide buffer strips that help reduce runoff of pollutants. Carefully planned recreational areas can reduce human disturbance of wildlife and endangered species.

USE IMPROVEMENTS

As indicated above this Key Action will improve recreational use of the Bay. Swimming beaches will be re-established. There will be increased opportunities for shore and open-water fishing. People will have increased access to the water. People can enjoy a wide variety of recreational activities as they use environmental and recreational parkways located along the River and Bay. Improved shoreline use will also encourage economic growth of downtown business districts located along the River as communities take full advantage of the potential of their waterfronts.

CITIZEN COMMENTS AND SUGGESTIONS

One person urged attaching a high priority to the action since greater use of the River and Bay by the public will translate into greater political support for cleaning up the River and Bay. The person also noted that it is difficult for many members of the public to gain access to the shoreline, existing parks such as Bay Beach are not oriented to the water. Also communities should be encouraged to hold events which draw people to the water: canoe races, fishing festivals, regattas, milk box boat derbies, food and art festivals, etc. Another person recommended that this key action be one of the first addressed.

One group commented that boat launches on the west shore should also be considered. Another group asked "What would be the effect of increased/improved marina and boat launching facilities?" They felt the question has not been adequately answered. The group hoped the issue would be resolved in a manner which does not compromise water quality or cause further degradation of the environment.

One group commented that Renard Isle (Kidney Isle) should be used for passive recreation while setting aside designated areas for bird nesting. They questioned whether Brown County residents would pay for only a bird sanctuary.

TABLE 24. Priority, Environmental Effects and Use Improvements Associated with Key Action #14.

KEY ACTION 14:	Enhance Public and Private Shoreline Uses.
PRIORITY	Medium
ENVIRON. EFFECTS	Provide buffer areas for improve water quality. Protect habitat of near shore species. Increase fish and wildlife populations.
USE IMPROVE-MENTS	Improve the access of the public to the bay and river. Improve or maintain the value of private shoreline properties. Improve aesthetics and scenic values of area. Stimulate commerce in the downtown business districts. Stimulate economy from improved marinas, commercial waterfront, tourist, etc. Improve the quality of recreational facilities and activities. Reduce conflicts between users of the resource. Promote necessary planned shoreline development. Protect public and private investments in shoreline developments.
COMMENTS	The extent that future shoreline uses reflect overall Plan objectives will be an important measure of the success of implementation efforts. Improved access and shorelines will directly benefit the public and will increase overall public support for bay and river restoration efforts. With increased use comes the increased potential for use conflicts.

14.1. EVALUATE AND UPGRADE BOAT LAUNCH FACILITIES AS NECESSARY.

a. Municipalities should work together with funding agencies and the private sector to evaluate adequacy of existing boat landing facilities, parking and fee systems. Possible sites to evaluate include: Fox River mouth, Suamico, Fairgrounds, and Ashwaubenon. Considerations include: water level design, safe transient tie-up, environmental impacts, bridge openings and facilities. (Target date: 1989)

b. Further evaluate the need for and options for additional boat launch facilities along the East Bay Shore and Fox River between Allouz and De Pere and elsewhere as indicated by the evaluation of existing facilities (a). (Target date: 1990)

c. Upgrade existing sites and build new facilities as indicated by the evaluations. (Target date: 1990-1995)

d. Evaluate alternative mechanisms for financing improvement and maintenance including user fees, licensing fees, excise taxes, and general revenues. (Target date: 1990)

EXPLANATION: A coordinated effort to evaluate and manage sites could help reduce costs and provide better facilities. With the possible exception of the east shore there appears to be an adequate number of boat launch accesses on the Fox River and Green Bay in the Area of Concern. However, the capacity of facilities at many of these sites may be inadequate. Also there is greater demand for these facilities with the improved fishery. High water levels have damaged several of the sites and use is unevenly distributed between sites. While the Suamico River is outside of the Area of Concern, it does provide a major access site for the lower portion of Green Bay.

New boat launch facilities may be needed in two areas. There is an 11 mile stretch of the east shore of Green Bay in which there is no formal boat access. National standards are for a boat access every 5 miles in a metropolitan area. There is also limited access between Allouz and De Pere.

There are many factors that need to be considered in evaluation of existing and new boat launch facilities. These include: designing sites to meet both high and low water conditions and developing safe transient tie up facilities and a harbor of refuge where appropriate. Minimizing impacts on wildlife and environmentally sensitive areas, especially along the west shore and minimizing bridge opening requirements are both desirable. Also, adequate facilities (parking, rest room, trash, picnic, etc.) need to be developed as appropriate and their long-term upkeep and maintenance provided for. The west shore of the Bay contains critical wetlands that provide much of the remaining habitat for ducks and other wildlife in the Area of Concern. The WDNR West Shore Master Plan provides guidance for public acquisition of some of these wetlands and suggests a policy of minimizing human disturbance of critical habitat areas. Another factor is the drawbridges over the Fox River in the City of Green Bay. Some types of boat launch facilities could affect downtown traffic by increasing the demand for bridge openings.

Providing funds for long-term upkeep and maintenance is also important. Alternative approaches need to be evaluated to fund improvement and maintenance of boat launch sites. User fees can affect use distribution. Thus impacts on use and potentially sensitive environmental areas are also important considerations in determination of facility needs and user fees. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 3, 4; B&H - 70).

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: Brown County, Cities, Villages, Towns, Private camp owners.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Funding needed to evaluate and upgrade boat launch facilities is estimated to cost $560,000. The largest cost would be building and upgrading the launching facilities. Approximately $500,000 would be needed to upgrade and build at the four sites mentioned. Funding sources include user fees and general revenues.

14.2. <u>ENCOURAGE DEVELOPMENT OF MARINA FACILITIES IF ENVIRONMENTALLY AND FISCALLY SOUND</u>. In developing marina facilities consider facilities for visiting boats as well as permanent facilities. Adverse environmental impacts should be avoided. (Ongoing)

EXPLANATION: There appears to be a demand for more marina facilities in lower Green Bay. Concerns of boaters in the area include lack of permanent and transient boat tie ups and lack of places to pump out hold facilities. Also there is not a harbor of refuge in the area. In the past there have been efforts to develop public marina facilities. Private investment could provide facilities with minimal public expenditures. All marina sites that are developed would have to be done in a manner that would minimize environmental impacts. There is some concern about the possible impacts of a marina on water quality, especially at the mouth of the Fox River. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 5.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: Brown County, Green Bay, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Annual staff and supply costs associated with encouraging the development of marina facilities are approximately $7,000.

14.3. EVALUATE POTENTIAL FOR DEVELOPING A SWIMMING BEACH IN THE AREA OF CONCERN. -- Continue to concentrate on Bay Beach for development of a shoreline beach facility. Consider water quality, impact on environmentally sensitive areas, proximity to people likely to use the beach, public health and safety, and type of bottom and site adequacy in beach siting.

a. Continue to monitor bacteria levels and water clarity at Bay Beach, the University's shoreline park, and other possible beach locations. (Ongoing)

b. When water quality results indicate safe conditions, evaluate feasibility of reopening Bay Beach or another swimming beach in the Area of Concern. (Target date: To be determined)

c. Based on the results of the feasibility study, develop a swimming beach facility in Area of Concern. (Target date: To be determined)

EXPLANATION: Currently, there are no publicly sanctioned swimming beaches in the Area of Concern. Bay Beach, a major recreational park, is well know as the historical site of the City of Green Bay's primary swimming beach. It was closed to swimming in the late 1930s because of public health concerns. Since water quality has improved and fecal coliform levels more frequently (but not always) meet water quality standards. However water clarity is less than the 4 feet required for a public swimming beach. A riprap dike lies between the park and water.

Bay Beach should be the focus of future efforts to reestablish a swimming beach because it is a major recreation area, used by and located near the people most likely to use a swimming beach. Since it is already used as a recreational area its further development most likely will not disturb environmentally sensitive areas. Additional improvements in water quality as well development of appropriate recreational facilities would be necessary to open the beach. An alternative site to consider for a swimming beach is the University of Wisconsin, Green Bay's shoreline. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 16.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High (when conditions appropriate)/Moderate

WHO SHOULD ACT: Green Bay, Howard, Suamico, UWGB, Brown County, Shoreland owners, WDNR, USFWS, RPCs and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The estimated one-time cost of developing a swimming beach is $150,000. Maintenance of a swimming beach facility is estimated at $35,000 per year. Funding sources include the City of Green Bay and Brown County.

14.4. DEVELOP SHORELINE FISHING FACILITIES -- Develop shoreline (nonboating) fishing facilities in the Area of Concern at convenient locations likely to have good fishing. Site development should consider minimizing impacts on critical wildlife and fishery habitat. (Target date: 1990, ongoing)

EXPLANATION: There is a much improved fishery in the Lower Fox River and Green Bay and a large number of people could potentially use it. Some people do not have a boat and would benefit greatly from improved shoreline fishing access. Possible locations to be looked at are: bridge sites in Green Bay; De Pere Lock Canal; west shore at Harbor Lights; east shore at Joliet Park; Suamico Boat Landing located near the Area of Concern; and other potentially good sites identified by WDNR fish managers and others. As water quality improves other areas may become good sites for shoreline fishing facilities. (Also see the explanations of the following recommendations in the TAC Reports: B&H - 70; INST. - 17.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: Brown County, Green Bay, De Pere, Villages, DOA, WDNR, RPCs, Conservation Groups, Industry, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Design of shoreline fishing facilities can vary significantly. Estimated costs range from $10,000 to $250,000.

14.5. PROTECT AND DEVELOP RECREATIONAL AND ENVIRONMENTAL CORRIDORS. Protect and develop recreational and environmental corridors along the Fox River and its tributaries wherever possible, protecting public access where it now exists.

a. Develop strategy. (Target date: 1989)

b. Implement strategy. (Ongoing)

EXPLANATION: Recreational and environmental corridors insure public use of right-of-ways. Environmental corridors also provide important habitat and water quality protection to the River and Bay. If railroad right-of-ways such as the Soo Line become available state, county, and local governments should work together to preserve and develop a recreational and environmental corridor. Possible linkages with Heritage Hill State Park, and local parks should be investigated. Under no conditions should these important corridors be fragmented and unavailable to public use and access. Recreational and environmental corridors should also be protected and developed on the East River, Duck Creek and other tributaries. The state and local governments need contingency plans to protect beneficial public uses. Potential uses would include nonmotorized recreation, picnicking, bicycling, cross-country skiing, hiking, jogging trails and environmental greenways for buffer strips and natural areas. Protection and restoration of natural areas in the corridors is important for many wildlife species. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 9; B&H - 14; N&E - 6; and in this plan - 1.7.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: Brown and other counties, Cities, Villages, Towns, WDNR, WDOT, RPCs, WDOA, and Conservation Groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: It is not possible to estimate the cost for this recommendation at this time.

14.6. <u>ACCELERATE EFFORTS TO REVITALIZE WATERFRONTS AND ENHANCE THE SHORELINE</u>. Capitalize and focus on the assets of the Fox River and Bay by revitalizing and beautifying waterfronts and shoreline through joint public and private efforts. (Ongoing)

EXPLANATION: The City of Green Bay's Waterfront Plan (1984) provides a good guide for many of the activities needed to enhance the waterfront and improve shoreline uses in the Area of Concern. As noted in the Plan, restoring waterfront areas to more natural conditions can complement commercial and economic development efforts. "This can be done by creating a comfortable and inviting waterfront environment. The restoration of open space, greenery, and natural vegetation, coupled with broad public access, represents a different approach to historic waterfront land use. There are obvious environmental benefits that the people living in Green Bay would obtain from a riverfront park pathway and open space system. There is also the indirect, positive effect that such a restoration would have on the local economy, which is to keep our City a competitive, viable, and attractive place for people to work and live in." (Green Bay Park Committee and Plan Commission, 1984, page 2.)

Some of the things to consider in waterfront development include guiding future development to consider aesthetic values and public access, and improving landscaping and protect scenic beauty. Important natural areas and historic buildings should be protected and restored. Existing buildings could be remodeled and enhanced through innovative architectural design. Public use could be encouraged by providing areas and facilities along the River (ice cream stands, concert areas, etc.) and sponsoring public events such as farmers markets, band concerts, rowing races along the River. Waterfront development could complement efforts to improve the environment with economic development efforts. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 10.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: Brown County, Green Bay, De Pere, Howard, Suamico, Ashwaubenon, Industry, Chamber of Commerce, Redevelopment Board, Commercial establishments, Garden clubs, Conservation groups, WDOD, WDOA, UWEX, etc.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: It is not possible to estimate the cost for this recommendation at this time.

14.7. THROUGH COOPERATIVE EFFORT, DEVELOP A MANAGEMENT PLAN AND PROGRAM FOR RENARD ISLE (KIDNEY ISLAND).

a. Develop sanctuaries and programs to adequately protect endangered tern populations in Area of Concern (see recommendation 5.16). (Target date: 1995)

b. Evaluate the potential for mixed use development of Renard Isle. Consider:

* Insuring the integrity of the waste disposal site;

* Evaluation of potential environmental concerns, including impact on endangered species, water quality, and others;

* Mechanisms for interagency cooperation; and citizen input and participation;

* Consideration of the following uses: endangered species and wildlife habitat, passive recreation (picnic areas, shore fishing, nature trails, sunbathing, overlooks, etc.), boat shelter, and sail board launching; and

* Recreational needs and alternate sites for development.

(Target date: After "a" is accomplished)

EXPLANATION: There are many differing ideas on the future use of Renard Isle (formerly known as Kidney Island). The island is a confined disposal facility containing contaminated sediments dredged from the harbor. Brown County received a lakebed grant for the area in 1985. The county and U.S. Army Corps of Engineers are proposing to expand the island to 3 times its existing size. The city and county are interested in a possible causeway or isthmus between the shore and island and recreational use of the "island". They are developing a plan for the island's use (Brown County, 1987). A developer is proposing a private marina in the area. The Biota and Habitat TAC and U.S. Fish and Wildlife Service want to make the island a wildlife sanctuary to protect endangered species that require island nesting sites. In 1987 over 50% and 70% respectively of the states endangered Forster's and common terns nested on the island. The State's only Caspian tern colony was also found on the island. These birds require island nesting habitat to protect them from predators such as rodents and racoons and human disturbance.

Water quality specialists indicate that free flow of water is likely to be important to improving and protecting water quality. Preliminary analysis indicates that extending the mouth of the River, as is proposed by one marina developer, may potentially reduce the capacity of the River to assimilate waste and cause wasteload allocations to become more stringent. Water quality on the west shore of Green Bay may also be impacted.

An important factor for consideration is that the primary purpose of the site is for waste disposal, and this should affect all other decisions. Other uses have to be compatible with protecting the integrity of the disposal site. Some uses may have little impact, some uses will require expensive modifications to make them compatible, and other uses will not be compatible. The county is required to develop a plan of operation for the solid waste site by the solid waste site grant of exemption.

Also, sanctuaries for endangered species should be established in the Area of Concern prior to development. The island is the current primary habitat available to the birds. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 55, 56; INST. - 8; and in this plan - 6.16.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: Brown County, COE, Green Bay, WDNR, USFWS, RPCs, Conservation groups, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The program and plan development cost for Renard Isle is estimated at $20,000. The funding source would be Brown County.

14.8. <u>IMPROVE AIR QUALITY AND ASSOCIATED AESTHETICS</u>. Local industry and treatment plants should investigate ways of minimizing odors and other pollution from air emissions and water discharges.

a. Evaluate need and develop strategy. (Target date: 1990)

b. Implement strategy. (Target date: To be determined)

EXPLANATION: Air emissions that create odor, haze, and other pollution problems that detract from people's enjoyment of the River and Bay as a recreational resource. Wastewater discharges can also create odor problems in localized areas. When possible, local industries and wastewater facilities should design pollution control measures which reduce odors and meet other air and water quality standards. State and federal laws require control of pollutants such as particulates, sulfur dioxide, and nitrogen dioxide (NO_2). However, laws to control odors are quite limited and are dependent on local initiative and perceptions. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 13.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: Industry, some Commercial Operations, Municipal treatment plants, Green Bay, Brown County, WDNR, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: It is not possible to estimate the cost for this recommendation at this time.

MONITORING #15: MONITOR TO EVALUATE EFFECTIVENESS OF REMEDIAL ACTIONS, TRACK TRENDS, AND IDENTIFY NEW PROBLEMS

	Action Recommendation	Priority for Key Action	Priority for Plan	Page
15.1	Develop a remedial surveillance program for toxic substances and routinely report on findings.	High	Mod.	213
15.2	Increase fish and wildlife tissue monitoring to evaluate trends and develop consumption advisories.	High	High	214
15.3	Periodically monitor loads of PCB, phosphorus, sediment, and other substances of concern from the River to the Bay.	Mod.	Mod.	215
15.4	Monitor trophic status.	High	High	215
15.5	Increase bacteria monitoring in the Bay and River.	Low	Low	216
15.6	Monitor waterfowl population trends.	High	Low	216
15.7	Monitor endangered tern species population trends and reproductive success in the Area of Concern.	High	High	217
15.8	Continue monitoring fish population trends and harvests.	High	High	217
15.9	Continue to monitor benthic (bottom dwelling) organisms.	High	Mod.	218
15.10	Periodically map macrophytes (rooted aquatic plants) in the Bay.	Mod.	Low	218
15.11	Survey public attitudes on River and Bay Issues.	Mod.	Mod.	219
15.12	Periodically measure people's use of the Bay and River.	High	Mod.	219
15.13	Collect and update socioeconomic and demographic information that will help in assessment of management options for the Bay and River.	Mod.	Low	220

MONITORING #15: MONITOR TO EVALUATE EFFECTIVENESS OF REMEDIAL ACTIONS, TRACK TRENDS, AND IDENTIFY NEW PROBLEMS

Monitoring is the base of natural resources management programs because it identifies where management is needed and what needs to be managed. Monitoring also supports regulatory efforts and provides an evaluation of progress toward meeting management goals and objectives.

Good information about the ecosystem and its problems is critical to their management. Monitoring studies in the River and Bay help us track and evaluate water quality and the sources that affect them. These studies identify problems and provide information for establishing water quality standards, effluent limits, and guiding other management efforts. Information from the studies is also used to track trends and to assess the success of management efforts in achieving plan goals and objectives. Monitoring studies of other parts of the ecosystem (fish, wildlife, people, etc.) serve a similar function.

This Key Action identified a series of monitoring recommendations focused primarily at tracking trends and evaluating success of management efforts Many other of the Plans recommendations contain monitoring components (reference Appendix I).

Table 25 indicates the priority, environmental impacts and use improvements associated with this Key Action. Appendix I lists additional plan recommendations which have monitoring and research components.

CITIZEN COMMENTS AND SUGGESTIONS

One person commented that monitoring was very important and should not be short changed in the Plan.

TABLE 25. Priority, Environmental Effects and Use Improvements Associated with Key Action #15.

KEY ACTION 15:	Monitor to Evaluate the Effectiveness of Remedial Actions, Track Trends, and Identify New Problems.
PRIORITY	High
ENVIRON. EFFECTS	Improve the overall success of Plan implementation.
USE MPROVEMENTS	Will not lead to any specific use improvements. In general, however, will enhance overall success of Plan implementation.
COMMENTS	This action must not be de-emphasized during the process of Plan implementation. Monitoring and evaluation efforts should play a primary role in focusing the resources and efforts of implementing agencies.

RAP Evaluation and Trend Monitoring

15.1. <u>DEVELOP A REMEDIAL SURVEILLANCE PROGRAM FOR TOXIC SUBSTANCES AND ROUTINELY REPORT ON FINDINGS</u>. WDNR, USEPA, USFWS, counties, cities, villages and dischargers should work together to develop a surveillance program to evaluate Remedial Action Plan success in reducing levels to toxic substances in the environment. (Target date: 1989)

This should include:

* A thorough chemical specific trend monitoring program for both fish and wildlife. (Also see recommendations 15.2, 3.12.)

* A comprehensive biomonitoring program to assess the presence or absence of acute and chronic toxicity to fish, aquatic life, and wildlife that utilize the aquatic resources of the area (see recommendation 3.6, 3.12);

* Routine monitoring of atmospheric depositions and estimation of loads (see recommendation 11.11);

* Routine monitoring and reporting of specific chemical substances of concern in wastewater discharges and air emissions (see recommendations 3.6, 3.9, 11.12) and compilation of total point source loads;

* Periodic monitoring of loads of toxic substances from the River to the Bay (see recommendation 15.3).

* An annual or biennial report to the governor and local citizens in the Area of Concern documenting achievements toward the reduction of toxic contaminants in the environment.

EXPLANATION: The sources of toxic substances and ecosystem response should be monitored to evaluate effectiveness of remedial actions. Monitoring should include sources and all parts of the ecosystem (water, sediments, and biota). Successes can be documented and problems noted to allow midcourse correction if necessary. The report on toxic substances could be part of the coordinating council's annual report on plan progress. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 19; and in this plan - 3.6, 3.9, 3.12, 11.11, 11.2, 15.2, 15.3.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: USEPA, WDNR, Sea Grant, USGS, GBMSD, Researchers, NOAA, USFWS, Counties, Cities, Villages, WDHSS, Industrial dischargers, Municipal treatment plants, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Costs of the effort except for the report writing are included in other recommendations. The report should be a low annual cost (<$10,000 per year).

15.2. <u>INCREASE FISH AND WILDLIFE TISSUE MONITORING TO EVALUATE TRENDS AND DEVELOP CONSUMPTION ADVISORIES</u>. Expand the tissue monitoring program to track dioxin, furan, as well as PCB levels and other bioaccumulating toxicants in the Green Bay ecosystem. Use information to revise consumption advisories and initiate control efforts if high levels are found.

a. Modify the existing fish tissue program to: routinely monitor dioxin and furans in addition to PCBs; monitor more types of fish; establish a tissue bank for historical reference; increase sample size; and keep the size/age range of sampled fish consistent over time in order to increase the statistical validity of the results. (Target date: 1989)

b. Develop a wildlife tissue monitoring program that includes monitoring of PCB levels in fish-eating birds and predatory mammals (terns, otter, mink, raccoon, etc.) and increase monitoring of migratory and resident waterfowl populations. (Target date: 1989)

EXPLANATION: Tissue monitoring is a very effective way of tracking trends of toxic contaminants in the ecosystem. Decreases or increases in bioaccumulating substances are most likely to be seen in fish and fish-eating animals because they are at the top of the aquatic food chain. Fish fillet and wildlife monitoring is used to set consumption advisories.

Two compounds, dioxin and furans, are found at low levels in Fox River and Green Bay fish. These chemicals are very difficult to monitor in water and wastewater. If levels rise above a trigger point of 10 picograms/gram (parts per trillion) in fish tissue an intensive investigation of sources should occur (see recommendation 3.5). Preliminary monitoring has shown that some waterfowl and endangered species have accumulated high levels of PCBs and other chemicals in their tissues. Additional monitoring of these species and other wildlife (mink and otter) is needed to evaluate declines in populations and to develop appropriate consumption advisories.

Routinely review and refine the monitoring program to detect environmental trends in toxicant levels, evaluate new toxic chemicals of possible concern, provide good information for consumption advisories, and evaluate impacts on sensitive organisms. A good sampling program might include 50 to 60 samples per year, 3 trend monitoring sites including an intensive site a @DePere, limited dioxin and furan sampling, and periodic scans of chlorogramic chemicals to determine if any new chemicals are present. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 16, 18; B&H - 25, 59; and in this plan - 3.5, 15.1.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, USEPA, Wisconsin State Lab of Hygiene, USFWS, Researchers, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: WDNR spends approximately $2,500 a year monitoring carp and walleye in the Lower Fox River. It will be expanded slightly (an additional $1,000) in 1988 because of the increase pressure and interest in walleye and other species (W. sucker, bullheads, etc.). A good program for the Lower Fox River would cost approximately $15,000 per year.

15.3. <u>PERIODICALLY MONITOR ANNUAL LOADS OF PCB, PHOSPHORUS, SEDIMENT AND OTHER SUBSTANCES OF CONCERN FROM THE RIVER TO THE BAY</u>. (Target date: 1988, ongoing every 3 to 5 years)

EXPLANATION: As indicated by Key Actions #1, #2, #3, #4 and #11, major goals of this plan are to be achieved by reducing loads (inputs) of phosphorus, sediment, and toxic substances such as PCB from the River to the Bay. We need to periodically monitor these loads to determine if load reductions are occurring. Study methods should be similar to past studies so that calculated loads are comparable. Periodically monitoring phosphorus and sediment loads from Lake Winnebago would also be desirable. Loads should be monitored at least once every 5 years. (Also see the explanation of the following recommendation in the TAC Reports: TOXICS - 3, 31; and in this plan - 4.1, 15.4.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low

WHO SHOULD ACT: USGS, WDNR, USEPA, Researchers, Sea Grant, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The USEPA Mass Balance study will be monitoring flow, PCB and phosphorus loads to the Bay in 1988. Future costs are likely to be $5,000 to $100,000 each year that PCB, sediment and phosphorus loads from the River to the Bay are desired. Costs are dependent frequency of monitoring and number of parameters monitored. These costs assume that flow data will continue to be available from USGS at the De Pere Dam and that data is available on downstream sources contributions during the same period.

15.4. <u>MONITOR TROPHIC STATUS</u> -- Establish an ongoing monitoring program for phosphorus concentrations, dissolved oxygen, secchi disk depth, chlorophyll-a and other indicators of trophic status.

a. Include periodic synoptic surveys and two bay monthly ambient monitoring stations in the Area of Concern. (Target date: initiate 1989)

b. Periodically monitor and evaluate plankton particles, zooplankton and phytoplankton species. (Target date: 1989 and every 3 years)

EXPLANATION: Monitoring trophic status routinely in the Bay will provide information on whether we are meeting our water quality objectives. (Also see the explanation of the following recommendations in the TAC Reports: N&E - 18; and in this plan - 4.2, 5.2.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, UWGB, USEPA, Sea Grant, GBMSD, NOAA, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Cost of establishing two bay monthly ambient monitoring stations are likely to be low (<$10,000 year) for chemical sampling. This effort can probably be included in WDNR's existing ambient monitoring program. The phytoplankton and zooplankton analyses at these stations is likely to cost $9,000 to $12,000. These analyses are not routinely done by WDNR. They could be contracted with local universities. However there is no obvious funding source.

15.5. INCREASE BACTERIA MONITORING IN THE BAY AND RIVER. Monitor fecal coliform and possible other organisms to assess the safety of the Area of Concern for swimming. (Target date: ongoing, revise 1989)

EXPLANATION: State regulations require monitoring of the indicator organism, fecal coliform, to assess the safety of the public beaches for swimming. The local health department has been monitoring Bay Beach and other sites routinely in the past. This monitoring should be continued and possibly expanded to other sites and organisms to give a better indication of the safety of reopening Bay Beach or another beach in the Area of Concern. (Also see the explanation of the following recommendations in the TAC Reports: N&E - 17; and in this plan - 14.3.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

WHO SHOULD ACT: County and City Health Departments, WDNR, GBMSD, WDHSS, Researchers, Municipal Treatment Plants, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Costs of additional bacteria monitoring are likely to be low (<$2,000) for just fecal coliform monitoring and low to moderate ($10,000 to $25,000) if other bacteria and viruses are monitored. The analysis of other pathogens could be a research project tied to a epidemiological study.

15.6. MONITOR WATERFOWL POPULATION TRENDS. Conduct waterfowl surveys to monitor changes in waterfowl populations. (Target date: To be determined)

EXPLANATION: Citizens and managers have noted a general reduction in resident and migrant waterfowl in the Area of Concern. However, specific numbers are lacking. A good way to obtain counts is to make 6 or 7 over the flocks in the spring. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 68)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Low

WHO SHOULD ACT: USEPA, WDNR, Sea Grant, USFWS, Researchers, NOAA, Conservation Groups, Bay Beach Wildlife Sanctuary, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The annual cost of the counts is likely to be $2,000 to $5,000 per year. Counts require airplane over-flights and estimates by trained staff.

15.7. MONITOR ENDANGERED TERN SPECIES POPULATION TRENDS AND REPRODUCTIVE SUCCESS IN THE AREA OF CONCERN.

a. Expand annual monitoring of population trends. (Target date: ongoing, revise 1988)

b. Periodically monitor reproductive success. (Target date: every 3 to 5 years)

EXPLANATION: The Area of Concern has breeding populations of Forster's terns and common terns. These are state endangered species. The only breeding colony of Caspian Terns in Wisconsin was observed in 1986 on Renard Isle (Kidney Island). Population data is needed to guide management efforts to protect these species. This will be especially important during the period Renard Isle is enlarged. (Also see the explanation of the following recommendation in the TAC Reports: B&H - 52, 61; and in this plan - 6.16.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: USFWS, WDNR, Researchers and Conservation groups and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Costs of tern population trend surveys would be low (<$5,000). Bird watchers who would be willing to devote considerable time to this study could make a substantial contribution. Evaluations of bird reproductive success are more expensive (approximately $18,000 per year). The states endangered resource "checkoff" monies is one possible source of funding. Conservation and environmental groups or industry could also contribute. USFWS could also contribute staff resources.

15.8. CONTINUE MONITORING FISH POPULATION TRENDS AND HARVEST. (Ongoing)

EXPLANATION: The present WDNR fish management program includes creel censuses to determine sport harvest and monitoring of perch and other fish species in trawl index stations, summer shoreline seine hauls, and spring fyke nets. A special project (see recommendation 8.1) is monitoring walleye population trends and reproductive success in the Lower Fox River and conducting a comprehensive fish survey of the River. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 33, 36, 47, 48; and in this plan - 8.1, 16.6.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, Conservation Groups.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: These are ongoing programs funded by WDNR's fish management programs. Additional needs may be identified by current research studies.

15.9. CONTINUE TO MONITOR BENTHIC (BOTTOM DWELLING) ORGANISMS. Continue to routinely monitor benthic organisms in order to track and evaluate changes in water quality and habitat. (Target date: annually)

EXPLANATION: Benthic organisms provide an important food-source for fish and wildlife. For example in the past many dabbling ducks ate fingernail clams as a major food source and the mayfly, Hexegenia, was a major food source for fish in the Area of Concern. These organisms have not returned to the lower Bay in the numbers and diversity that would be desirable. Monitoring the numbers and types of benthic organisms will provide a good indicator of the health of the ecosystem. Ideally sampling of artificial substrate stations (approximately 16) could be done alternate years with natural substrate stations (approximately 50 sites). This would provide information that could be compared with long term trends. (Also see the explanation of the following recommendations in the TAC Reports: B&H - 42, 43; and in this plan - 16.4.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: Institute of Paper Chemistry, WDNR, USEPA, Sea Grant, GBMSD, Researchers, Industry, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Past monitoring has been done primarily by the Institute of Paper Chemistry and funded by a combination of sources including industry and local government. A survey of either natural substrate stations or artificial costs approximately $15,000 to $20,000.

15.10. PERIODICALLY MAP MACROPHYTES (ROOTED AQUATIC PLANTS) IN THE BAY.

a. Conduct initial study to get baseline data and setup transects. (Target date: 1992)

b. Periodically measure macrophytes. (Every 3 to 5 years)

EXPLANATION: A major goal of this Plan is to improve the habitat of fish and aquatic life and waterfowl. Rooted aquatic plants such as wild celery are important to waterfowl. As water clarity improves these and other plants should increase. We need to record the changes that occur.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: UWGB, WDNR, USFWS, Researchers, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: An initial study to establish transects and baseline data might cost $10,000 to $25,000. Each followup survey would cost $2,000 to $5,000.

15.11. SURVEY PUBLIC ATTITUDES ON RIVER AND BAY ISSUES. Decisions that affect the Bay and River should be made with consideration of public attitudes and values.

a. Conduct periodic surveys of the public's: perceptions of water quality; uses of water resources for recreation; desires and needs for future water-based recreation; and other issues. (1990, every 5 years)

b. Provide results to public and decisionmakers so that results can be used when making decisions that affect the Bay and River. (Ongoing)

EXPLANATION: Because decisionmakers and users of Green Bay experience the environmental conditions first hand, they hold certain options and perceptions. These viewpoints are used as the basis for usage decisions regarding fishing, swimming, boating, industrial activity, water commerce, and waste disposal. Research indicates: that concerns of users and public health officials often do not match; that conditions which are harmless are perceived to indicate contamination and danger; and that expectations about improvements often rely on scant information. Improved understanding of public concerns along with technical information can help management agencies make better policy decisions regarding management of the Bay and River. The results of surveys should be provided to the media for dissemination to the public. This must be presented clearly and accurately. Also the extent to which public leaders and agencies are making decisions that reflect both perceptions and actual conditions should be evaluated. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 16.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: RPCs, FVWQPA, Counties, Cities, Villages, WDNR, Researchers, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Periodic surveys of public attitudes and concerns could have low to moderate costs ($5,000 to $50,000 a year).

15.12 PERIODICALLY MEASURE PEOPLE'S USE OF THE BAY AND RIVER. (Target date: 1990, every 5 years)

EXPLANATION: Recording changes in people's use of the Bay and River is a good way to document and assess improvements in water quality and determine if beneficial uses are being restored. It also helps identify potential management problems and the need for additional recreational facilities.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/Moderate

WHO SHOULD ACT: RPCs, Counties, Cities, Villages, Researchers, WDNR, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Periodic surveys of public use could have low to moderate costs ($5,000 to $50,000 a year).

15.13 COLLECT AND UPDATE SOCIOECONOMIC AND DEMOGRAPHIC INFORMATION THAT WILL HELP IN ASSESSMENT OF MANAGEMENT OPTIONS FOR THE BAY AND RIVER. (ongoing)

EXPLANATION: Improved data collection and ability to predict population growth, other demographic and economic information can provided better information for resource management decisions. This data used with simulation models can help evaluate economic activity alternatives and resource management alternative for major actions that affect the Bay and River. Actions taken to improve the economy of the area are likely to impact the natural resource of the Bay and River. Actions taken to improve that natural resource of the Bay and River are also likely to impact the local economy. However it is often extremely difficult to assess whether these impacts will be positive or negative when both primary and secondary impacts are considered and to determine how significant the impacts will be. With better information it may be possible to find solutions to problems that benefit both the environment and the economy. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 1, 2.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low.

WHO SHOULD ACT: Counties and local government, RPCs, WDOA, Chamber of Commerce, Researchers, Sea Grant, UWGB, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Additional annual costs might be low to moderate ($10,000 to $100,000) depending on the scope of what is undertaken.

RESEARCH #16: CONDUCT RESEARCH TO BETTER UNDERSTAND THE ECOSYSTEM, ITS PROBLEMS AND HOW TO REMEDY THEM

Action Recommendation		Priority for Key Action	Priority for Plan	Page
16.1	Complete mass balance study of toxic substances.	High	High	224
16.2	Determine causes of walleye and bird reproductive impairments.	Mod.	Mod.	225
16.3	Conduct exposure and expanded epidemiological study.	Mod.	Mod.	225
16.4	Study benthic (bottom dwelling) organisms to determine why population numbers are low.	Mod.	Mod.	226
16.5	Periodically evaluate trophic dynamics.	Low	Low	226
16.6	Complete comprehensive studies of fish in the Area of Concern.	High	High	227
16.7	Conduct study to evaluate potential for "Top Down" management in the Area of Concern.	Low	Low	228
16.8	Improve capability to analyze water resource alternatives and seek solutions that will benefit both the environment and economy.	Mod.	Low	231
16.9	Develop and evaluate new technology to cleanup, contain or otherwise reduce the effects of in-place contaminated sediments.	High	High	231

RESEARCH #16: CONDUCT RESEARCH TO BETTER UNDERSTAND THE ECOSYSTEM, ITS PROBLEMS AND HOW TO REMEDY THEM

To a large degree, the successful development of this Remedical Action Plan was possible because of past and ongoing research in the Area of Concern. An adequate understanding of the ecosystem, the factors and stresses which affect it, and their causes are critical if we are to restore it and manage it wisely. The University of Wisconsin-Sea Grant Institute's and other university research, WDNR monitoring programs, work by the Institute of Paper Chemistry, Green Bay Metropolitan Sewerage District, Brown County Planning, and many others contributed to the extensive data and research base.

Ongoing research is critical if we are to be successful in implementing the Plan and evaluating the efficacy of our efforts. Future research needs to be directed at better understanding of the pollution sources and their effect on the Bay and River and the development of innovative, cost-effective, and environmentally sound control technology. A major challenge, both nationally and locally, is finding technical solutions for in-place contaminated sediments and other sources of toxic contamination.

Research is also needed to evaluate the system's response to management efforts. Are we successful in achieving the "Desired Future State"? If not, why not and what refinements can we make in our management program so that we are?

The ecosystem is dynamic, as is our understanding of it. The problems that this plan identifies is based on results of past research and monitoring. Future research will help is identify new problems that may need to be addressed to protect and restore the Bay and River.

Table 26 indicates the priority, environmental impacts and use improvements associated with this Key Action. Appendix I lists additional plan recommendations which have monitoring and research components.

CITIZEN COMMENTS AND SUGGESTIONS

One person noted that the draft plan had a "shortfall" as to the importance of long-term, publically supported research to anticipate future problems. Monitoring and research are relegated to a follow-up status which indicates that things will not change. This is simply not true.

TABLE 26. Priority, Environmental Effects and Use Improvements Associated with Key Action #16.

KEY ACTION 16:	Conduct Research to Better Understand the Ecosystem, Its Problems and How to Remedy Them.
PRIORITY	Medium
ENVIRON. EFFECTS	Improve the overall success of Plan implementation.
USE IMPROVE-MENTS	Will not lead to any specific use improvements. In general, however, will enhance overall success of Plan Implementation.
COMMENTS	This action is fundamental to insuring the information base upon which management decisions are made is as accurate and up-to-date as possible.

16.1. COMPLETE MASS BALANCE STUDY OF TOXIC SUBSTANCES. Use a mass balance approach to help define and delineate toxic problems in the Bay and River. (Target date: 1990)

Design the study so it answers existing management questions. Specifically:

* Results should be sensitive enough to help evaluate different sources and management options. For example, for PCB we must strive to determine effects of a 20 to 110 pound (10-50 kg) per year increase or decrease in load;

* Determine mass, movement, and availability of PCBs in Lower Fox River sediments (see recommendation 4.1).

* Assess sources of toxic substances (PCBs and others) both to the Bay and to the River and the mass or quantities of those sources (see recommendations 3.4 and 11.1, 11.6).

* Determine atmospheric loads of PCBs to the Area of Concern (see recommendation 11.11).

EXPLANATION: A major cooperative, 3 to 8 million dollar research project, the Green Bay Mass Balance Study, was initiated by the Great Lakes Program Office of USEPA in 1987. The study is designed to answer major questions about movement of toxic pollutants, in particular PCBs, in the Great Lakes. The intent is to use the results to develop toxic control policy for the Great Lakes, similar as to what was done for phosphorus in the 1970s. The preliminary scope of the Mass Balance Study focused on Green Bay, and proposed to consider the Fox River as a single point source discharging to the Bay. To help answer management questions specific to the Area of Concern this recommendation supports expanding the scope to include sources to the River as well as the Bay. The recommendation also suggests that the model that is developed be sensitive enough to help evaluate the only known discharge of PCBs to the system. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 3, 12, 31, 35, 48, 56; and in this plan - 3.4, 4.1, 11.6, 11.11.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: USEPA, WDNR, Sea Grant, USGS, GBMSD, Researchers, NOAA, Industry, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The Mass Balance study of toxic substances in Green Bay is projected to cost between 3 and 8 million dollars. Currently the EPA funding is allocated but not appropriated. Other agencies are also providing funding and staff resources to the project. The project is a Great Lakes research project with national significance.

The preliminary scope of the EPA project included the Fox River only to the first dam at De Pere. A coordinated effort of state, local industry and USGS is proposed to do work necessary to evaluate contaminated sediments above the dam. Costs of this project are included with recommendations 4.1 and 3.4.

16.2. <u>DETERMINE CAUSES OF WALLEYE AND BIRD REPRODUCTIVE IMPAIRMENTS</u>. Conduct studies to determine the causes of walleye and bird reproductive impairments found in recent research.

a. Conduct walleye study. (Target date: 1991)

b. Conduct bird study. (Target date: To be determined)

EXPLANATION: Recent studies have shown reproductive impairment of the endangered Forster's tern and possibly older walleye with high chemical body burdens. An understanding of reproductive problems associated with these organisms may help us understand the long term human responses to toxic chemicals as well as protect these organisms. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 17; B&H - 59; and in this plan - 6.16, 8.1.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: WDNR, USEPA, USFWS, Researchers, Sea Grant, and Others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: An intensive study to determine the causes of Forster's Tern reproduction impairments is likely to cost $150,000. This study would include comparisons with a control "clean" colony in Lake Poygen and egg viability studies. An intensive 2-year study of the cause and effect relationships of walleye reproductive impairments was included in WDNR's 1987-89 Biennial Budget Request. The $214,200 research project was not funded.

16.3. <u>CONDUCT EXPOSURE AND EXPANDED EPIDEMIOLOGICAL STUDY</u>. Assess area demography and resource use to determine potential toxic substance exposure and the human health risks from such exposure.

a. Complete the Sea Grant and WDHSS epidemiological study which researches the effects of PCBs and other chemicals on pregnant women and their babies. (Projected date: 1989)

b. Expand the existing study or initiate new studies that will include the number of people using the area, indicate the amount of time and type of use, delineate high-risk populations, and assess risks, associated diseases, cancers, deaths, etc., expected from the population-river-chemical interaction. (Target date: To be determined)

c. Use results to focus cleanup activities as well as information and education programs on eliminating and preventing major health risks. (Target date: 1990 ongoing)

EXPLANATION: Exposure studies help indicate to what degree people come in contact with toxic chemicals and epidemiological studies help project what the impacts of that exposure are likely to be. Knowing these risks we can make better cleanup decisions and better inform people on the risks they take and how to avoid them. (Also see the explanation of the following recommendations in the TAC Reports: TOXICS - 13.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, USEPA, USGS, Researchers, GBMSD, Sea Grant, Industry.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: An expanded study might run between $50,000 to $200,000 depending on the scope of the study. Using the information to let people know about health risks should be low cost (<$10,000 per year). The current study is funded by a combination of Sea Grant and DILHR funds.

16.4. STUDY BENTHIC (BOTTOM DWELLING) ORGANISMS TO DETERMINE WHY POPULATION NUMBERS ARE LOW. Use bioassays and other techniques to determine why populations of benthic organisms such as fingernail clams and the mayfly, Hexegenia, remain low. (Target date: 1989-1990)

EXPLANATION: The mayfly, fingernail clams and other benthic organisms are important parts of the food chain have either not returned to the Area of Concern or have not returned in expected numbers. A study is needed to determine the factors that may be hindering their population growth. (Also see explanation for the following recommendations in the TAC Reports: B&H - 28, 42, 43; TOXICS - 19; and in this plan - 15.9, 16.6.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Moderate

WHO SHOULD ACT: USEPA, WDNR, Sea Grant, Researchers, Industry, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The assessment of benthic organisms could be low to moderate cost ($5,000 to $100,000 total).

16.5. PERIODICALLY EVALUATE TROPHIC DYNAMICS. Assess planktivore populations (species composition and abundance), examine their interactions with zooplankton/phytoplankton, and evaluate the changes in these interactions and biomass as recommendations are implemented. (Target date: To be determined)

EXPLANATION: Past research on trophic dynamics in the Bay and River should be periodically repeated to evaluate changes due to improvements in water quality conditions. (Also see the explanation of the following recommendations in the TAC Reports: N&E - 19; and in this plan - 15.4.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

WHO SHOULD ACT: Researchers, Sea Grant, USEPA, USGS, WDNR, Industry, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: Past intensive research studies on trophic dynamics on the Bay have cost approximately $100,000. Future studies would have similar costs. Sea Grant has funded much of this work.

16.6. COMPLETE COMPREHENSIVE STUDIES OF FISH IN THE AREA OF CONCERN.

a. Complete 2-year WDNR project (1987-1989) to survey Fox River fish species, characterize reproductive success, and identify critical habitat. (Projected date: 1989)

b. Complete WDNR 2-year comprehensive study and mapping of fish habitat in the Fox River. (Projected date: 1989)

c. Complete Sea Grant fish biomass study for southern Green Bay to estimate energy flow through each trophic level and provide insight on the predator-prey ratio. (Projected date: 1989)

EXPLANATION: Several projects are currently underway to provide better information on the fishery of the lower Fox River and lower Bay. A 2-year WDNR project will look at both fish populations and critical habitat in the Lower Fox River. The fish population study will survey sport and forage species that are present and characterize walleye reproductive success. These studies will likely identify future monitoring needs.

The habitat study will identify important habitat for preservation and, when habitat is lacking, possible areas for improvement or even possible creation of additional habitat. Mapping the substrate will identify gravel and rubble spawning areas for walleye, smallmouth bass, and lake sturgeon. It will identify areas where benthic organisms are or should be present. As part of the study plankton, benthic organisms, water chemistry and macrophytes will be sampled and substrate mapped.

Sea Grant has a major research project underway to estimate fish biomass in Green Bay and estimate energy flow through the system. The study will use sonar technology to estimate fish population numbers. This technique provides good population estimates of fish that swim in open water. However it can not provide population estimates of bottom-dwelling fish such as carp. (Also see explanation for the following recommendations in the TAC Reports: B&H - 42, 42, 46, 47, 49, 51; and in this plan - 15.8, 8.1, 8.2, 8.3.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: WDNR, Sea Grant, USEPA, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The WDNR Fish Management program is funding the two-year intensive survey of fish on the Lower Fox River (approximately $85,000 total project cost) and an 8-year annual survey of fish on the Bay (approximately $19,000 annual cost). Sea Grant is funding the fish biomass research study. No additional funding is needed at this time. The conclusions of these studies could identify additional monitoring needs.

16.7. CONDUCT STUDY TO EVALUATE POTENTIAL FOR "TOP-DOWN" MANAGEMENT IN THE AREA OF CONCERN. Examine the potential for biomanipulation (Top-Down management) to further control algae once phosphorus load reductions have been achieved.

a. Use results of the Lake Mendota study and other research to assess desirability and feasibility of using a "Top-Down" management approach in lower Green Bay. (Projected date: 1995)

b. If appropriate, conduct additional studies to evaluate approaches that might be used in Green Bay. (Target date: 1996)

c. If appropriate (based on a. and b.), implement a "Top-Down" 3-year management project in lower Green Bay and evaluate success. (Target date: 2000)

EXPLANATION: Biological phenomena occurring within lakes have been demonstrated to affect nutrient levels and algae populations. If we can understand these phenomena, such as trophic interactions in Green Bay, we may be able to use them to assist in controlling eutrophication. However the feasibility of using biomanipulation on a large system such as Green Bay is uncertain. A major study being initiated on Lake Mendota may provide some answers. However the results probably won't be available for at least 5 years. Also phosphorus reductions should come first, so the recommendation has a relatively low priority at this time.

Any study of biomanipulation of lower Green Bay should also consider Lake Winnebago because algae populations in the lower Green Bay are believed to be strongly influenced by the upstream lake. (Also see explanation for the following recommendations in the TAC Reports: B&H - 51; N&E - 20.)

Citizen Comments: One person comments that "Top-Down" management is feasible in large areas such as the Bay. If it is not effective then why are we concerned about the forage base in Lake Michigan? Obviously "we" have again inadvertently turned the table on the alewife.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Low/Low

Who should act: UWGB, Sea Grant, USEPA, NOAA, WDNR, USFWS, Other Researchers, Others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The Lake Mendota 3-year research project cost approximately $300,000 annually for a total project cost of approximately $1,000,000. A similar project in lower Green Bay is likely to cost as much as and maybe more because of the size of the area. Substantial additional hatchery capability would be needed.

16.8. IMPROVE CAPABILITY TO ANALYZE WATER RESOURCE ALTERNATIVES AND SEEK SOLUTIONS THAT WILL BENEFIT BOTH THE ENVIRONMENT AND ECONOMY.. (Target date: To be determined.

EXPLANATION: Simulation models can help evaluate economic activity alternatives and resource management alternative for major actions that affect the Bay and River. Actions taken to improve the economy of the area are likely to impact the natural resource of the Bay and River. Actions taken to improve that natural resource of the Bay and River are also likely to impact the local economy. However it is often extremely difficult to assess whether these impacts will be positive or negative when both primary and secondary impacts are considered and to determine how significant the impacts will be. With better information it may be possible to find solutions to problems that benefit both the environment and the economy. (Also see the explanation of the following recommendations in the TAC Reports: INST. - 2, 11, 12.)

PRIORITY FOR KEY ACTION/ENTIRE PLAN: Moderate/Low.

WHO SHOULD ACT: Counties and local government, RPCs, WDOA, Chamber of Commerce, Industry, Researchers, Sea Grant, UWGB, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The cost of refining existing simulation models may be high ($100,000 to $1,000,000 total).

16.9. DEVELOP AND EVALUATE NEW TECHNOLOGY TO CLEANUP, CONTAIN OR OTHER WISE REDUCE THE EFFECTS OF IN-PLACE CONTAMINATED SEDIMENTS. (Target date: 1988 - 1993)

EXPLANATION: The lack of a federal program for in-place contaminated sediments means that little research and development money has been available to address the problem. The primary viable option at this time appears to be dredging. This option has high cost and also itself has environmental impacts. Alternative technology must be developed so that different and appropriate management can be applied to different situations. Some options that need further investigation are stripping of chlororganics from contaminated sediments so that toxicants are concentrated and a smaller amount of contaminated material must be disposed of. Other options to investigate include bio-degradation, capping and other alternatives. This type of technology needs to be developed nationally, because the problems of in-place contaminated sediments affects many of the nations harbors, rivers and estuaries both within and outside of the Great Lakes Basin.

PRIORITY FOR KEY ACTION/ENTIRE PLAN: High/High

WHO SHOULD ACT: USEPA, Congress, WDNR, Legislature, Researchers, COE, Industry, and others.

ESTIMATED COSTS AND POTENTIAL FUNDING SOURCES: The cost of developing new technology is quite high and should be part of a nationwide program.

Back

<u>LOWER GREEN BAY REMEDIAL ACTION PLAN:</u>

<u>for the lower Fox River and lower Green Bay</u>

<u>Area of Concern</u>

V. WHERE TO GO FROM HERE? -- IMPLEMENTATION OF THE REMEDIAL ACTION PLAN

INSTITUTIONAL STRUCTURE FOR PLAN IMPLEMENTATION

The Need for Coordinated Action

Successful implementation of the Remedial Action Plan will hinge upon the timely, coordinated action of a multiplicity of public and private institutions, agencies, interest groups and individual citizens. No one agency or group has the capability of implementing all the recommendations in the Remedial Action Plan.

The Institutional Technical Advisory Committee reviewed different institutional structures for implementing the Remedial Action Plan. These included:

* No structure - Agencies and groups individually implement their portion of the Plan and no formal structure for coordination is established.

* Agency and Local Government Coalition - Agencies and local governments that are interested in doing so, set up an Ad Hoc working group to informally coordinate activities. This group would have no formal authority and may or may not include all the key actors and citizen representation.

* Coordinating Council - This would be a council that is formally established by legislative or executive action and have formal responsibility for coordinating activities of the key public and private actors who have primary responsibility for plan implementation.

* River Basin Authority - This would be a new unit of government established by legislative action that would have clear authority and adequate powers (such as taxation) necessary to implement many of the recommendations in the Plan. Like the Coordinating Council it would also serve to coordinate the ongoing activities of other agencies and key actors.

Another option was suggested during the review period of the TACs report.

* A Statewide Remedial Action Plan Coordinating Council - This approach would be similar to the originally proposed coordinating council, but would provide a means of coordinating efforts in all the state's Great Lakes Area of Concern and possibly other areas where contaminated sediments require major cleanup efforts or ecosystem management. Regional implementation committees would coordinate efforts within a basin.

After review of these alternatives the Institutional TAC recommended that a coordinating council be established by legislative action. The council would include about 20 members, representing local governments, key agencies, and major stakeholders and interest groups in the Lower Fox River Basin and Green Bay area. The following section of this report summarizes the recommendations of the Institutional TAC that was reviewed and accepted by the Citizen's

Advisory Committee. It was suggested that the council be established for an initial period of at least 5 years, after which time the need for a different structure such as a modified river basin authority be reconsidered.

The Institutional TAC defined criteria to evaluate the various management options:

1. The management structure must include some mechanism to ensure continuing contact and discussion with the executive decision makers of the agencies, institutions, and units of government responsible for direct implementation activities.

2. The decision making body of the proposed organization must include representation of the major stakeholder and interest groups who will be affected by the implementation of the RAP.

3. The management structure must have the ability to establish relationships with jurisdictions responsible for water quality activities upstream of the lower Fox River.

4. The management structure must possess the expertise to deal with the technical aspects of all of the Key Actions proposed in the RAP.

5. The management structure selected must be the strongest possible configuration within the confines of existing political and economic realities.

An additional consideration is that either the organization itself or the agencies and key actors who are participants in the organization must have the capability and authority to carry out the Key Actions of the Plan. Major gaps exist in two areas:

1. Clean up of toxic chemicals from contaminated sediments -- in-place pollution, and

2. Management of nonpoint sources in the basin that is needed to achieve Key Actions #1, 2, 9 and 11.

The Institutional TAC recommended rejection of the coalition approach because such an organization structure lacks the authority and power to ensure the implementation of the RAP. The lack of authority will lead to a situation in which the achievement of the Key Actions of the Plan will depend on the voluntary participation and efforts of agencies and local governments. While the Council still is dependent on primarily the voluntary efforts of cooperating agencies it does assure the participation of all important parties and has a formal mandate and structure within which to work. The River basin authority, while providing a strong management structure for plan implementation, was not believed to be a politically viable option.

Several people suggested a statewide Remedial Action Plan coordinating council be formed to provide a stronger and more uniform approach to Remedial Action planning and implementation in the state. Regional implementation committees would coordinate efforts within a basin. In the interim period while the best approach for establishment of a Coordinating Council is being further evaluated, implementation efforts need to proceed.

Description of a Coordinating Council Concept

The Institutional Technical Advisory Committee provided the following description of a Coordinating Council.

Establishment of a Coordinating Council is an important step in plan implementation. A coordinating council may be defined as a body of local, state, and federal officials and significant individuals who represent a diversity of interests and points of view. A Council could be established with sufficient authority and funding to oversee the implementation strategies set forth in the Remedial Action Plan.

ESTABLISHMENT AND ORGANIZATION:

Establishment and Funding. The Council should be established by action of the State Legislature and appointments made by the Governor. This establishment should include a minimum annual budget of $200,000 for the Council's use. This should be funded by a mix of local, state and federal sources. The "Charge to the Council" should include a clear statement of its responsibilities to achieve the goals and objectives of the Remedial Action Plan (RAP) and as much authority and power as possible to enable the Council to ensure the accomplishment of the Key Actions of the RAP. To this end the charge should include instructions that will authorize the Council to review the annual work programs of agencies and units of local government and request modifications to these programs as required by the RAP.

Organization. The organization of the various components of the proposed Coordinating Council is presented in Figure 17. It would consist of the Council, program management functions, an implementation committee, and several advisory subcommittees.

The Council. The Council should consist of an approximately a 20 member board representing business, industry, environmental interests, and elected officials of the local, state, and federal levels of government. The council should include representatives of the entire Fox River Basin since some high priority Key Actions will not be achieved without cooperative efforts throughout the basin. The individuals appointed to the Council should represent the chief executive authority of the agencies and programmatic interests represented. Such individuals include:

* The County Executives or County Board Chairs of Brown, Calumet, Outagamie, Fond du Lac, and Winnebago counties
* The Mayors of Green Bay and De Pere
* The Chairperson of the Oneida Tribe
* Six at-large members representing industry, business, agriculture, and environmental interests.
* A U.S. Representative or Senator
* A State Assembly person or Senator
* The Director of the Great Lakes Program Office of the U.S. Environmental Protection Agency

Organizational Structure

Coordinating Council

THE COORDINATING COUNCIL
TWENTY ONE MEMBER BOARD

Program Management Staff
In-house or subcontracted

Implementation
Committee

To other Advisory Committees

Advisory Committee | Advisory Committee | Advisory Committee | Advisory Committee

Note: The Coordinating Council would be established by action of the State Legislature. Members of the Board would be appointed by the Governor. The Advisory Committees will mirror the Primary Actions enumerated in the Remedial Action Plan. In addition, one Advisory Committee will be organized to aid the Council in the development and management of a Public Information and Education Program.

Figure 17. Organizational Structure of the Coordinating Council

* The District Engineer of the U.S. Corps of Engineers
* The Regional Director of the U.S. Fish and Wildlife Service
* The Secretary of the Wisconsin Department of Natural Resources
* The Secretary of the Wisconsin Department of Agriculture, Trade, and Consumer Protection
* The Director of the Wisconsin Sea Grant Program

Program Management Functions. The Council will require professional staff support to accomplish the implementation of the RAP. Staff support will be critical to coordinate the activities of the Implementation Committee and the various Advisory Committees and the compilation and production of progress reports and annual reviews. These functions could be accomplished by an in-house staff of three -- a program manager, an assistant program manager, and a clerical specialist -- or subcontracted to an existing agency whose responsibilities and areas of professional expertise pertain to the goals and objectives of the RAP.

Implementation Committee. An Implementation Committee would provide administrative and management advice to the Council. This committee would include administrative personnel from the key agencies and units of government with responsibilities relating to the Fox River and lower Green Bay. This Implementation Committee will have the primary responsibility of analyzing the work programs of the many agencies and local governmental units participating in the RAP and developing proposals for modifications and additions to these work programs so as to facilitate plan implementation.

Advisory Committees. Advisory committees mirroring the Key Actions would provide more detailed, technical information to the Council and the Implementation Committee. The membership of these Advisory Committees will include program managers and technical specialists from the agencies involved in the implementation of the RAP as well as interested citizens. The inclusion of interested citizens on each of the Advisory Committees is intended to foster a strong element of citizen participation in the discussions pertaining to the achievement of the Primary Actions.

ROLES AND RESPONSIBILITIES:

The Council would be responsible for guidance and policy decisions related to:

1. The management and protection of the lower bay and the Fox River in accordance with the goals and objectives of the Remedial Action Plan;

2. The implementation of continuing public education and awareness programs;

3. The review of the annual work programs of agencies engaged in plan implementation activities and the provision of guidance for the modification of these work programs as necessary;

4. The review of progress toward plan implementation and continuing reformulation of the RAP; and,

5. The generation of funds through the development of grants and providing assistance to other agencies seeking grant funds.

Work Programs. The Council will have the authority to review the work programs of all agencies and local governments whose activities are significantly related to the achievement of the Primary Actions included in the RAP. In addition, the Council will serve as an advisor to these agencies and local governments and request modifications to work programs as necessary to foster continued implementation of the Plan. The Council will also have the responsibility for participating in all public hearings on matters relevant to the goals and objectives of the RAP. It would also be able to develop memorandum of understanding with state, federal and local agencies.

Progress Reports and Annual Reviews. The Council will responsible for the compilation and publication of periodic progress reports and annual reviews which provide information on the implementation of the Key Actions in the RAP.

Public Information and Awareness Programs. The Council will be responsible for the development and funding of a substantial effort to inform the public of the nature of the Remedial Action Plan, activities undertaken to achieve its implementation, and progress made toward its goals and objectives.

ADVANTAGES AND DISADVANTAGES:

Advantages:

* A Council can be created specifically for the implementation of the Remedial Action Plan.

* It could be created relatively quickly.

* It would be subject to local accountability.

* The Council strategy builds upon and strengthens the efforts of existing agencies and programs.

Disadvantages:

* Depending on the manner in which it is established, the Council may not have the necessary statutory power to carry out its charge.

* Again, depending on the manner of its establishment, the Council may not have the financial capability to maintain a staff qualified to oversee implementation of the Plan.

* A Council lacks the power to generate its own funding.

* It lacks the power to "force" total plan implementation.

Interim Implementation Structure

This is a critical time for the Lower Green Bay Remedial Action Plan (GBRAP). The transition period from plan development to plan implementation is a time when strong leadership is needed. Therefore, an interim Implementation Committee is necessary to provide leadership and advise the Department while options for the Coordinating Council are being further evaluated. At such a time when the Coordinating Council is established, the Implementation Committee would either be incorporated into the Coordinating Council or dissolved. Many of the Implementation Council members would likely become members of the council or its subcommittee and provide continuity between the interim and long-term implementation organizations.

ESTABLISHMENT AND ORGANIZATION

Establishment. The Implementation Committee should be established by the Secretary of the Department of Natural Resources, using an approach similar to that used to establish the Plan's Citizen Advisory Committee. The term of the committee will be for two years or until the Coordinating Council is formed, whichever occurs first. If the Coordinating Council is not formed within the two year period, a reevaluation of implementing organization options will be undertaken. The geographic area for this committee to represent should include the Lower Bay and Lower Fox River Basin. The committee will also need to coordinate with upstream organizations in the Fox and Wolf Watersheds.

Organization. The organization of the Interim Implementation Committee is presented in Figure 18. It would include the committee, a steering committee and several subcommittees.

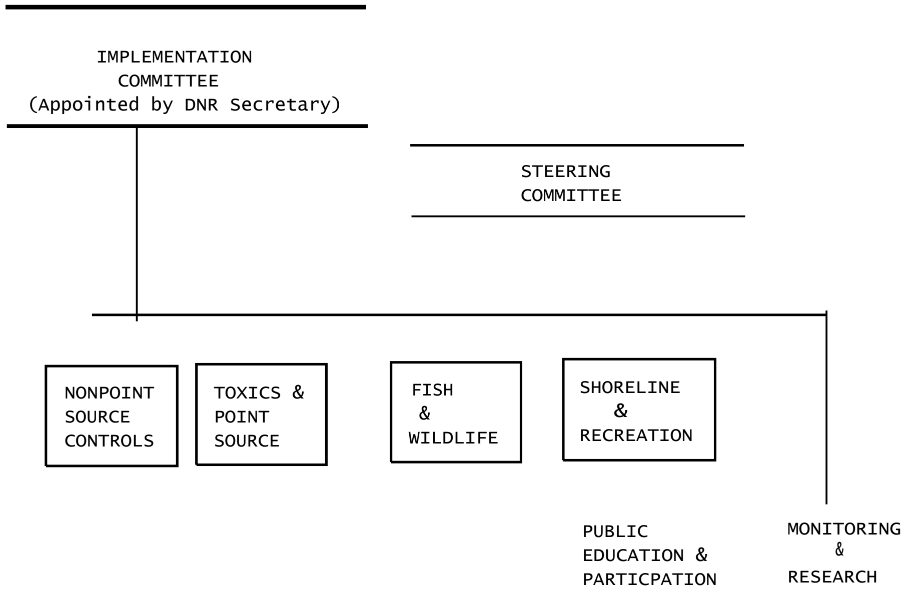
The Committee. The Implementation Committee will be made up of 20 to 25 members representing a cross section of stakeholders in the Lower Bay and Lower Fox River Basin. Emphasis will be placed on organizations and individuals with authority to implement the GBRAP recommendations. This group will provide oversight and coordination for various subcommittees. The Implementation Committee will elect their chair and steering committee.

The Implementation Committee and subcommittees should be made up of a cross-section of the organizations and individuals who's support will be needed for successful implementation of the GBRAP. The subcommittees membership should be a mix of experts and interested individuals. This will help ensure public participation and understanding of th process. Suggested members for the Implementation Committee are listed below:

1. Brown County
2. Outagamie County
3. Winnebago County
4. Calumet County
5. City of Green Bay
6. Oneida Tribe of Indians
7. Green Bay Metropolitan Sewage District (GBMSD)
8. U.S. Fish & Wildlife Service
9. Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP)

Organizational Structure

Interim Implementation Committee



The monitoring and Research Committee will be made up of members from the other committees (primarily).

The Steering Committee will be established and have members appointed by the Implementation Committee

Figure 18. Organizational Structure of the Interim Implementation Committee.

10. U.S. Army Corps of Engineers
11. Wisconsin Department of Natural Resources - Lake Michigan District (DNR-LMD)
12. Fox Valley Water Quality Planning Agency (FVWQPA)
13. Bay-Lake Regional Planning Commission
14. League of Women Voters
15. Green Bay Chamber of Commerce
16. Agricultural Community
17. Local Representative or Senator
18. (3) At large members (Citizens)
19. (2) Environmental Organizations
20. Pulp & Paper Industry
21. Lake Winnebago Comprehensive Plan Representative
22. Sportsmans Club

<u>The Subcommittees.</u> The subcommittees will be structured to address the Plan's key actions. The chair and some of the subcommittee members will be identified at the time the Implementation Committee is appointed. The rest of the membership will be determined by the Implementation Committee members. At least one member of the Implementation Committee should serve as a member of each subcommittee. This will enhance communication and understanding between the two levels of the implementation organization structure.

<u>Staff Support.</u> Staff support for the Interim Implementation Committee would need to be one-half position (0.5 FTE - full time equivalents) and approximately $5,000 in support services and supplies. Staff supported needed for a fully operational subcommittee might be similar. Thus a phased approach would be necessary to initiating subcommittee and implementation efforts.

ROLES AND RESPONSIBILITIES

The Implementation Committee will advise and work with the Department of Natural Resources in plan implementation activities. Specifically the committee will:

* Coordinate activities and information sharing to facilitate implementation of the Plan.

* Annually review implementation activities of organizations and individuals with implementation authority.

* Help organizations obtain technical assistance and funding for implementation projects.

* Coordinate public information and education activities.

* Provide opportunities for public participation in plan implementation activities.

* Identify and investigate conventional and <u>nonconventional</u> problem solving techniques for plan implementation.

* Report annually to the public and the WDNR Secretary on implementation accomplishments and needs.

Samples of activities that the committee should immediately become involved in include the following:

* Evaluate options for creation of a Coordinating Council and funding of major Key Actions;

* Green Bay Mass Balance Study;

* Fox River In-Place Pollutant Study;

* East River Priority Watershed Implementation;

* Development of information and education materials on the Plan;

* Coordination with Lake Winnebago Comprehensive Plan;

* Pursue Demonstration Projects; and

* Coordination with GBMSD Facilities Plan.

Each subcommittee will be responsible for identifying and ranking actions needed to implement the Plan. This information would be provided to the Implementation Committee and to organizations with implementation authority. The various organizations could then use this information to make the best use of their resources for GBRAP projects and highlight Key Actions that need additional support. The subcommittees will also review individual organization plans that relate to GBRAP projects and assess overall progress on plan implementation.

Who Needs To Be Involved and What Responsibilities Do They Have

Tables 7 and 8 in Chapter IV list many of the public and private sector actors who have a role in plan implementation. Local units of government that need to be involved include counties, cities, villages, and towns in the Lower Fox River Basin (Figure 19) and in the Upper Fox River and Wolf River Basins.

Table 27 lists many of the state's programs and regulations that can help in the implementation of the Remedial Action Plan. There are also many local and federal programs and laws that can also help in this effort.

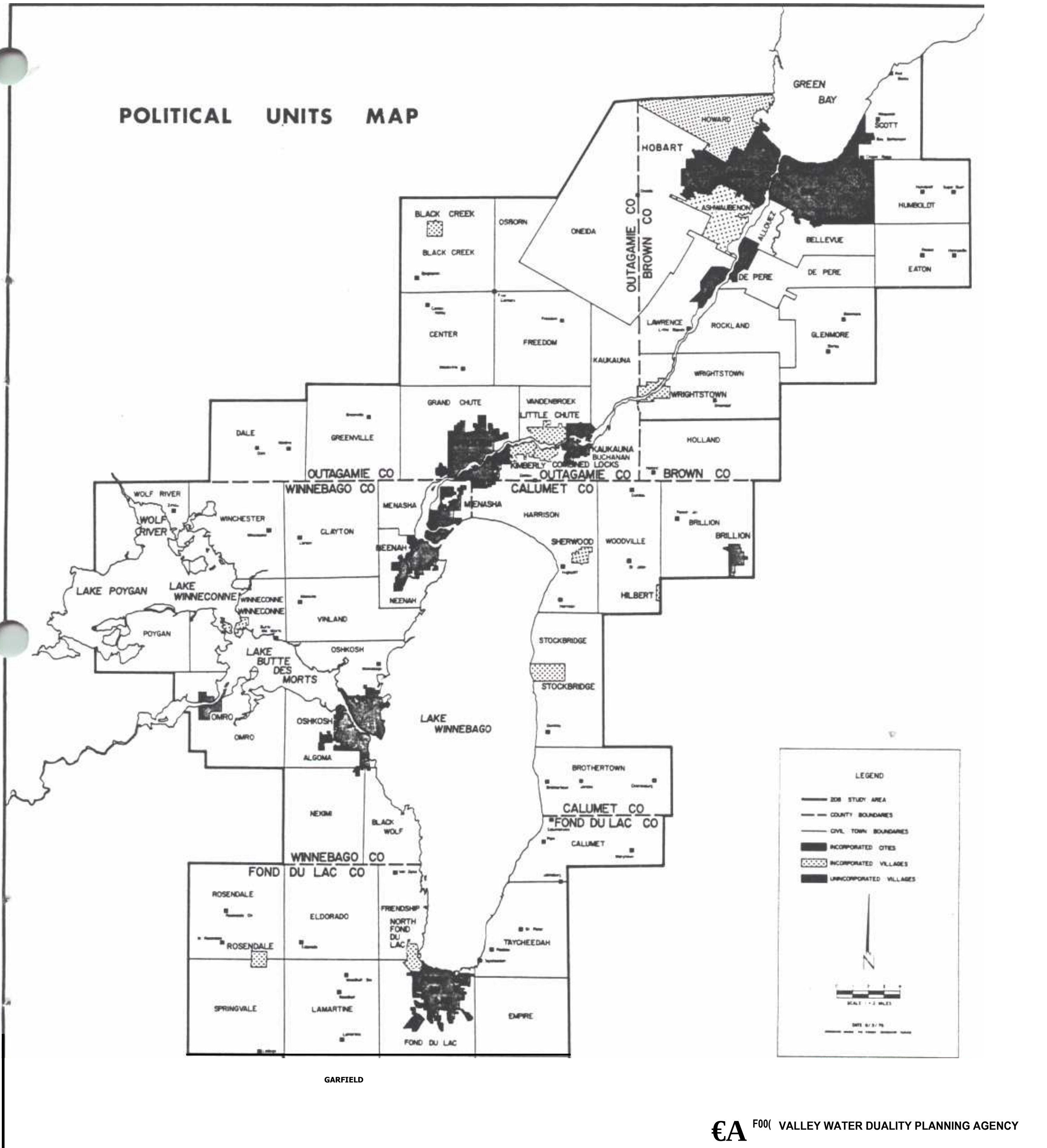


Figure 19. Political Units Map

TABLE 27. Partial Summary of State Programs and Regulations for Environmental Protection and Resource Management

Activity	Agency	Wisc. Statutes	Administrative Rules	Focus of Program or Regulation
WASTEWATER MANAGEMENT				
Treatment systems & sanitary sewers	WDNR	144, 147	NR 110, 114	Requires approval of plans for treatment facilities (POTW's) and sewerage systems (interceptors and collectors), certification of operators.
	WDILHR	145	ILHR 82	Regulates laterals to sewerage systems.
Wastewater discharges to surface water and land	WDNR	147 160	NR 200-299	Wisconsin Pollution Discharge Elimination System (WPDES) regulates wastewater discharges. Includes:
			NR 220-297	Categorical limits for industry;
			NR 104, 106* 212, 299	Water quality based effluent limits, WLA process, and water quality certification; and
			NR 206, 213, 215	Regulations for land disposal.
		144	NR 140	
Sludge disposal	WDNR	147 160	NR 110, 204 NR 140	Requires approval of land for sludge disposal and regulates spreading.
Industrial and commercial discharges to municipal treatment plants	WDNR	147 144	NR 202, 211 220-297	Requires pretreatment programs for large POTW's and some smaller POTW's effluent limits and monitoring required of some types of industry.
Private wastewater systems and waste disposal	WDILHR	145 236	ILHR 83, 85	Regulates siting, design, installation and inspection of on-site treatments systems.
	WDNR	146	NR 113, 206	Licenses people for holding tank maintenance and waste disposal, and regulates land disposal of domestic wastewater.
Wisconsin Fund	WDNR	144	NR 128 NR 160	Provides cost-sharing for planning and construction of POTW's. Also, cost-sharing for replacement of failing private sewer systems.
NONPOINT SOURCE MANAGEMENT				
Wisconsin Priority Watershed Program	WDNR County	144	NR 120*	Wisconsin's Nonpoint Source Water Pollution Abatement Program (Priority Watershed Program) provides cost-sharing and technical assistance for agricultural and urban NPS management in critical areas of priority watersheds.
Animal waste	WDNR	147	NR 243	Regulates large feedlots and those with demonstrated water quality impacts.
	WDATCP	92	Ag 165	Provides cost-sharing for animal waste management practices that have demonstrated water quality impact and have received notice of discharge. Limited applicability due to change in statutes.

TABLE 27. Partial Summary of State Programs and Regulations for Environmental Protection and Resource Management (continued)

Activity	Agency	Wisc. Statutes	Administrative Rules	Focus of Program or Regulation
NONPOINT SOURCE MANAGEMENT (continued)				
Soil and Water Resources Management	WDATCP	92		Provide funding for county technical assistance staff for water quality, soil erosion control, conservation compliance, and other resource management projects.
Fertilizer bulk storage	WDATCP	94 160	Ag 162	Regulates bulk storage by manufacturers and distributors.
Pesticide storage, transportation and use	WDATCP	94 161	Ag 29	Requires good handling practices, labeling, licensing of commercial applicators.
			Ag 163	Regulates bulk storage of pesticides.
	WDNR		NR 80	Can prohibit or limit use of a pesticide.
Urban stormwater and construction erosion	County	144	NR 122**	Statewide program limited to providing model ordinances and management procedure handbooks. As part of priority watershed programs urban NPS's are inventoried, cost sharing may be provided and construction erosion control ordinances required.
Soil erosion	WDATCP	92	Ag 160	Provides funding for county implementation of soil erosion projects. Limited applicability due to change in statutes.
Farmland Preservation	WDATCP County	91		Provides zoning for farmland preservation, tax reliefs for these zoned lands, and new requirements for cross compliance with soil erosion control objectives.
WATER RESOURCES MANAGEMENT				
Water Quality Standards	WDNR	144	NR 102, 103, 104, 105* NR 299	Provides use categories and criteria for Wisconsin water. New rules being developed for toxic criteria (NR 105). Water quality certification of actions.
Water Resources Planning	WDNR	144	NR 121	Provides for state water quality management plans including sewer service areas, basin plans, watershed plans, etc.
Water Quality Evaluation	WDNR	144		Ongoing water quality monitoring and evaluation program.
WATER REGULATION & ZONING				
Modifications to Navigable Waters	WDNR	30 31	NR 300–340	Regulates modification of navigable waters and shoreline modifications including dams, bridges, withdrawals, etc.
Dredging	WDNR	30 147	NR 346, 347* NR 522*	Regulates dredging activities. Codes being revised for discharge criteria and new codes to guide dredge materials.
Shoreline and Wetland Zoning	WDNR County	59, 61, 62	NR 115, 117	Requires local regulation of activities in shoreland and shoreland wetlands.

TABLE 27. Partial Summary of State Programs and Regulations for Environmental Protection and Resource Management (continued)

Activity	Agency	Wisc. Statutes	Administrative Rules	Focus of Program or Regulation
SOLID AND HAZARDOUS WASTE MANAGEMENT				
Floodplain Zoning	WDNR County	87	NR 116, 129	Requires local regulation of building in floodplain.
Landfills	WDNR	144, 160	NR 180, 140 (will be 500 to 520	Regulates siting, planning, construction, monitoring, and closure of solid waste landfills.
Hazardous Waste Management	WDNR	144, 160	NR 181	Regulates the generation, transportation, treatment, disposal, and storage of hazardous wastes.
Spills	WDNR	144, 160	NR 158, 140	Requires reporting and cleanup of hazardous substance waste spills.
Management of PCBs	WDNR	144, 160	NR 157, 140	Regulates management of PCBs in Wisconsin.
Petroleum Storage Tanks	WDILHR	101, 160	ILHR 10	Includes leak detection program, plan review, tank inspection, design, and construction standards, and recordkeeping.
Environmental Response and Repair	WDNR	144, 160	NR 550–51 NR 140	Inventories and ranks potential contaminated sites and provides for remedial action to be taken to clean-up pollutants at high priority sites. Also provides for the response to abandon containers of hazardous substances.
AIR MANAGEMENT			NR 400–494	
Ambient Air Quality Standards	WDNR	144	NR 404	Provides state standards for ambient air to wide development of regional implementation plans and control and enforcement programs.
Criteria Pollutant Emission Controls	WDNR	144	NR 400–440	Provides for controls of emission of criteria pollutants (NO2, SO_2, particulates, etc.) for existing and new sources.
Toxic and Hazardous Emission Controls	WDNR	144	NR 445–449	Provides for control of emission of pollutants. Currently regulates some pollutants and have proposed rule changes to include approximately 484 additional substances.
OTHER ENVIRONMENTAL PROGRAMS				
Industrial discharge fees	WDNR	144	NR 101	Requires industry discharging to water, land or POTW's to pay fee based on amount and type of discharge.
Wisconsin Environmental Policy Act	WDNR	23	NR 150	Requires environmental assessment to evaluate state funded projects.
Laboratory Certification	WDNR	144	NR 149	Requires laboratory certification and registration of laboratories doing testing required by state administrative rule.

TABLE 27. Partial Summary of State Programs and Regulations for Environmental Protection and Resource Management (continued)

Activity	Agency	Wisc. Statutes	Administrative Rules	Focus of Program or Regulation
NATURAL RESOURCES MANAGEMENT				
Fish	WDNR	29	NR 20–26	Provides for assessment and management of fishery by habitat protection, stocking, and regulation of sport and commercial fishery.
Wildlife	WDNR	29	NR 10–19	Provides for assessment and management of wildlife by habitat protection and regulation of hunting.
Endangered Species	WDNR	29	NR 27	Provides for assessment and management of endangered species.
Forest	WDNR	26, 28, 70, 77	NR 30–40, 46	Provides for management of state forests, technical assistance to landowners, tax credits for managed forest lands.
State Parks	WDNR	27	NR 41–45	Provides for management of state parks.
Community Assistance (being completed)				

* Existing rule which is being revised and is expected to be sent to legislature in 1987 or 1988.

** New rule which is being developed and is expected to be sent to legislature in 1987 or 1988.

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PLAN COSTS, IMPLEMENTATION PRIORITIES AND SCHEDULE

Plan Costs

An obvious question is what it will cost to restore a safe fishery, reopen local beaches, protect endangered species, and rehabilitate the ecosystem. The question is not easy to answer. Engineering and feasibility studies are needed for many projects to determine specific management needs and their costs.

General cost estimates were made for many of the recommendations (see Chapter IV). As indicated the cost estimates best indicate the order of magnitude rather than specific costs. The single expenditures for capital or project costs over the next 15-20 years are summarized in Table 28. Annual operation and maintenance or program management costs are summarized in Table 29. These cost estimates will need to be refined during the implementation of the Plan.

Estimated costs of implementing the Plan over the next 15 to 20 years is $68,258,000 to $640,459,000. The wide range of costs is due to the uncertainty of the cost of cleaning up in-place pollution and nonpoint sources in the Basin.

Estimated costs of implementing all the high priority recommendations in the Plan range from $54,148,000 to $554,100,000. Costs of implementing all moderate priority recommendations are estimated to range from $9,225,000 to $53,939,000. Estimated costs of low priority actions range from $4,885,000 to $32,420,000. Total annual costs will range from $646,000 to $10,340,000.

Note that these are very gross cost estimates which will be refined as feasibility studies are completed. The implementation committee of the Coordinating Council will also refine these cost estimates.

Table 30 provides estimated costs for individual recommendations and served as the basis to estimate total Plan costs. Total project costs or annual maintenance or program costs for most of the recommendations in the Plan are indicated as very low to extremely high based on general cost estimates provided by the technical advisory committees. Reference Table 9 for cost categories. Where available more specific cost figures are indicated. However, a feasibility study is often required to determine specific implementation costs. The costs are indicated as a range of values to indicate the order of magnitude and provide a basis for evaluating the relative cost for different recommendations. Recommendations costs are discussed in Chapter IV. Costs of ongoing programs, legally mandated actions, or projects with existing funding may be noted. Only new initiatives requiring funding sources or an agency/organization to shift existing program priorities to new activities are included in the Remedial Action Plan's cost analysis.

Table 28. Estimated Total Plan Costs for Annual Operation, Maintenance and Program Management*
(Thousand Dollars)

Key Action	High Priority Low	High Priority High	Moderate Priority Low	Moderate Priority High	Low Priority Low	Low Priority High	Total Low	Total High
1. Reduce Phosphorus Inputs.	$43	$1,386	$100	$1,800			$143	$3,186
2. Reduce Sediment...Inputs.								
3. Eliminate Toxicity of...Point Sources...			9	9			9	9
4. Reduce...Contaminated Sedments.	5	2,050	50	340			55	2,390
5. Continue Control of..800...								
6. Protect Wetlands 8 Habitat.	10	1,230	10	1,110			20	2,340
7. Reduce/Control Problem Fish.			0	1,010	$10	$100	10	1,110
8. Increase...Predator Fish.			10	170			10	170
9. Reduce Sediment Resuspension.					0	210	0	210
10. Reduce Bacteria Inputs...								
11. Eliminate Toxicity...Nonpoint Sources...			1	50	0	10	1	60
12. Create a Coordinating Council.	200	200					200	200
13. Increase Public Awareness...and Support.	92	170	2	2	1	20	95	192
14. Enhance Shoreline...Use.			42	42			42	42
15. Monitor...to Evaluate Effectiveness.	24	76	30	220	7	125	61	421
16. Conduct Research...			0	10			0	10
Total Annual Plan Cost	$374	$5,112	$254	$4,763	$18	$465	$646	$10,340

* It is not possible to estimate the costs of all recommendations.

Table 29. Estimated Total Plan Costs for Capital Improvement and Discrete Projects*
(Thousand Dollars)

Key Action	High Priority Low	High Priority High	Moderate Priority Low	Moderate Priority High	Low Priority Low	Low Priority High	Total Low	Total High
1. Reduce Phosphorus Inputs.	$51,405	$135,200	$6,050	$37,650			$57,455	$172,850
2. Reduce Sediment...Inputs.								
3. Eliminate Toxicity of...Point Sources...	40	250	220	970			260	1,220
4. Reduce...Contaminated Sedments.	1,500	406,900	200	2,800			1,700	409,700
5. Continue Control of..800...								
6. Protect Wetlands 8 Habitat.	1,160	11,600	300	2,700	S2,450	$5,370	3,910	19,670
7. Reduce/Control Problem Fish.			260	2,010	0	1,010	260	3,020
8. Increase...Predator Fish.			5	649			5	649
9. Reduce Sediment Resuspension.					1,050	11,375	1,050	11,375
10. Reduce Bacteria Inputs...					0	100	0	100
11. Eliminate Toxicity...Nonpoint Sources...			1,405	6,130	675	12,090	2,080	18,220
12. Create a Coordinating Council.	0	0					0	0
13. Increase Public Awareness...and Support.	43	150	0	0			43	150
14. Enhance Shoreline...Use.	0	0	730	730	10	250	740	980
15. Monitor...to Evaluate Effectiveness.					0	25	0	25
16. Conduct Research...			55	300	700	2,200	755	2,500
Total Plan Cost**	$54,148	$554,100	$9,225	$53,939	$4,885	$32,420	S68,258	S640,459

* It is not possible to estimate the costs of all recommendations
** Costs will be spread out over a 5 - 20 year period.

Implementation Priorities, Costs, and Schedule

Table 30 summarizes implementation priorities, estimated costs, and schedules for all the Plan's recommendations. The priorities are indicated as high, moderate, and low in two areas: how it affects the key action and the entire plan. Table 30 also shows a schedule for implementation of plan recommendations. A key to abbreviations used in Table 30 is found below.

Key to Abbreviations Used in Table 30

Costs

-	No applicable cost.
TBD	To be determined (often by a feasibility study).
*	Part of an ongoing cost.
a	Cost included in another recommendation.
b	Cost would apply to statewide or national program, not specific to the RAP.
c	Required by state law. No new costs specifically attributable to RAP recommendations.

Schedule

C	Ongoing activity that should be continued.
X	Major new initiative or project that should be completed by an indicated date.

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Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority Action	Priority Plan	Cost Ranges (S1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
1.	REDUCE PHOSPHORUS INPUTS TO THE RIVER AND BAY FROM NONPOINT AND POINT SOURCES		HIGH																				
	Water Quality Standards 8 Point Source Control																						
1.1	Further evaluate phosphorus point source loads and treatment plant capabilities, making reductions as soon as possible.	High	High																				
	a. Routinely monitor discharges					*	*			X	C	C	C	C	C	C	C	C	C	C	C		
	b. Conduct feasibility studies...			400	4,000				X	X													
	c. Reduce as soon as possible...					43	1,386		X	X													
	d. Use consensus approach to establish... reductions for point and nonpoint source									X													
1.2	Establish phosphorus water quality standards.	High	High																				
	a. Establish...by administrative rule			*	*						X												
	b. Review and revise...					*	*							X			X			X			
1.3	Establish wasteload allocation for phosphorus if necessary to achieve desired reductions.	High	High																				
	a. Accelerate NPS control efforts...			a	a	a	a		X	C	C	C	C	C	C	C	C	C	C	C	C		
	b. Initiate WLA...			5	100					X	X	X											
	c. Establish...by administrative rule			*	*							X											
	d. Incorporate...into WPDES permits			*	*	*	*					X	X	X	X	X	X						
	e. Reduce phosphorus loads...			a	a	a	a		C	C	C	C	C	C	C	C	X						
	Nonpoint Source Control																						
1.4	Implement comprehensive watershed management projects to reduce phosphorus loads and other	High	High																				

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	pollutants from MPS.																						
	a. Implement East River...watershed project			(2,000)a	(5,000)a				X														
	b. Investigate alternative approaches...			0	50						X												
	c. Implement...projects in 11 watersheds			51,000	51,000				X	X	X	X	X	X	X	X	X	X	X	C	C	C	
	d. Implement projects in 0-30 other watersheds			0	80,000						X	(Implementation schedule to be determined)											
1.5	Seek innovative and alternative ways to achieve NPS management objectives.	High	High																				
	a. Initiate cooperative effort...			0	50				X														
	b. Complete report										X												
	c. Implement report										X	C	C	C	C	C	C	C	C	C	C	C	C
1.6	Require and use construction erosion and stormwater runoff controls.	Mod.	Mod.		-	100	200		X	X	X	C	C	C	C	C	C	C	C	C	C	C	C
1.7	Require the use of shoreland buffer and green strips.	High	Mod.																				
	a. ...Use shoreland and wetland zoning			*	*	*				C	C	C	C	C	C	C	C	C	C	C	C	C	C
	b. Evaluate need for additional protection			0	50					X	X	X											
	c. Implement any needed programs			6,050	22,550								X	X	X	X	X						
1.8	Adopt animal waste management ordinances and use best management practices.	Mod.	Mod.			0	100		X	X	X	C	C	C	C	C	C	C	C	C	C	C	C
1.9	Consider in-river phosphorus removal.	High-Mod.	Mod.																				
	a. Complete preliminary feasibility study			0	10						X												
	b. Complete detailed study			0	40	0																	
	c. Implement...as appropriate			0	15,000	0	1,500																

SUMMARY OF KEY ACTION N1

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	Target Years for Implementation 87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
High Priority	7	5	81,405	135,200	43	1,386																
Moderate Priority	2	4	6,050	37,650	100	1,800																
Low Priority																						
Total Key Action #1	9	9	57,455	157,850	143	1,686																
2. REDUCE SEDIMENT AND SUSPENDED SOLIDS INPUTS		HIGH																				
2.1 Include additional land in conservation reserve program.	Mod.	Mod.	b	b	b	b				X												
SUMMARY OF KEY ACTION #2																						
High Priority																						
Moderate Priority																						
Low Priority																						
Total Key Action #2	1	1	0	0	0	0																
3. ELIMINATE TOXICITY OF...POINT SOURCE DISCHARGES		HIGH																				
Water Quality Standards																						
3.1 Complete rule adoption for water quality stds. standards and...effluent setting procedures for toxic substances.	High	High																				
a. Develop rules				*				X														
b. Adopt rules			*	*				X														
c. Incorporate limits into WPDES permits			C*	C*	C*	C*		X	X	X	X	X	X									
d. Strengthen risk assessment and management...				-	(50)b	(100)b			X													
e. Review and revise rules					*	*					X			X			X			X		

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION Reco miendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
3.2 Adopt antidegradation and mixing zone rules to protect Lower Green Bay.	Mod.	Mod.	*	*	*	*		X			X			X			X			X		
Control Discharges of PCB and Other Bioaccumulating Substances																						
3.3 Adopt WO d health standards for PCB and other bioaccumulating substances.	High	High	(20)b	(200)b	*	*		X			X			X			X			X		
3.4 Identify all PCB sources.	High	Mod.																				
a. Below DePere Dam			70	70			P	P														
b. Above DePere Dam			100	400		-	X	X	X	X												
3.5 Use fish tissue monitoring to track and flag... dioxins and toxins.	High	Mod.																				
a. ...Monitor dioxins and furans in fish					9	9			X	C	C	C	C	C	C	C	C	C	C	C	C	C
b. If "necessary"... initiate control program			TBD	TBD	TBD	TBD			X	C	C	C	C	C	C	C	C	C	C	C	C	C
3.6 Monitor and control discharges of PCB and other bioaccumulating substances.	High	High																				
a. Routine monitor discharges			c	c	c	c		X	C	C	X	C	C	C	C	C	C	C	C	C	C	C
b. Initiate reduction program			c	c	c	c			C	C	C	C	C	C	C	C	C	C	C	C	C	C
c. Evaluate need for categorical limits			20	100					X													
Control Acute and Chronic Toxicity																						
3.7 Establish water quality standards and effluent limits for toxicants that recognize additive effects.	High	High																				

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	a. ...Establish standards and "effluent limits"			*	*	*	*		X														
	b. Strengthen WDNR's...capability...				·	(50)b	(100)b			X	X	X											
	c. Periodically review and revise...			*	*	*	*			C	C	C	C	C	C	C	C	C	C	C	C	C	C
3.8	Evaluate and control ammonia toxicity.	High	High																				
	a. Determine all...sources...			20	150	*	*		X	X	X	X	X	X									
	b. Establish...effluent limits and compliance			c	c	e	c		X	X	X	X	X	X	C	C	C	C	C	C	C	C	C
	c. Control other sources									(To be determined by a)													
3.9	Monitor and control discharges of acute and chronic toxicity.	High	High			(270)c	(800)c	X	X	X	X	X	C	C	C	C	C	C	C	C	C	C	C
3.10	Identify areas where chronic toxicity in discharge mixing zones may jeopardize fish and aquatic life uses and identify steps to remedy, if necessary.	Mod.	Mod.																				
	a. Identify spawning and other areas...			*	*				X	X													
	b. Evaluate...impacts of chronic toxicity...			50	500						X	X											
	c. If necessary,...require...in WPDES permits			TBD	TBD	TBD	TBD					X	X	X	X	X	X	C	C	C	C	C	C
	Increase Monitoring Capabilities																						
3.11	Establish and use standard tests for toxcity monitoring.	Mod.-High	Mod.																				
	a. Establish standard bioassay tests, etc.			*			•		X	X													
	b. ...Use tests...to evaluate and control...			a	a	a	a			C	C	C	C	C	C	C	C	C	C	C	C	C	C
3.12	Increase WDNR Capabilities for Monitoring Toxics.	High	Mod.																				
	a. Increase laboratory capabilities			*	*	*	*		X	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	b. Establish biological monitoring...			TBD	TBD	TBD	TBD			X	C	C	C	C	C	C	C	C	C	C	C	C	C

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority Action	Priority Plan	Cost Ranges (21,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	c. Capability for acute & chronic bioassays			(489)b	(489)b	- -				X	C	C	C	C	C	C	C	C	C	C	C	C	C
3.13	Include additional types of toxicity monitoring in laboratory certification and registration program.	Mod.	Mod.	(20)b	(20)b	b	b		X	X													
SUMMARY OF KEY ACTION #3																							
	High Priority	9	6	40	250																		
	Moderate Priority	4	7	220	970	9	9																
	Low Priority																						
	Total Key Action 13	13	13	260	1,220	9	9																
4.	REDUCE AVAILABILITY OF TOXIC SUBSTANCES FROM CONTAMINATED SEDIMENTS		HIGH																				
4.1	Determine mass and availability of PCB and other contaminants in the river system.	High	High																				
	a. Compile...existing data...			*	*		-	P															
	b. Complete Little Lake Butte des Morts Study			*	*				P														
	c. Conduct study of..."major reaches"			400	600				X	X	X												
	d. Conduct study of "other reaches"			200	300							X	X	X									
4.2	Conduct a remedial investigation/feasibility study of in-place pollution control options for the river.	High	High	400	1,000							X	X	X	X	X							
4.3	Establish federal, state and local programs to effectively clean-up in-place contaminated sediments.	High	High	b	b	b	b			X													

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority	Action Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	Target Years for Implementation 87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
4.4	Clean-up contaminated sediments based on the results of the feasibility study.	High	High																				
	a. Initiate a pilot clean-up project...			500	5,000	5	50					X	X	X	X	X							
	b. Continue clean-up projects...			0	200,000			(To be determined by 4.2 and 4.4a)															
	c. Provide for the safe ultimate disposal...			0	200,000	0	2,000	(To be determined by 4.2 and 4.4a)															
4.5	Avoid re-introduction of toxic pollutants to the river system.	High	High	a	a	a	a	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
4.6	Complete adoption of new administrative rules for disposal of dredged materials.	High	High																				
	a. Complete adoption of NR 522...			*	*				P														
	b. Complete adoption of NR 347...			*	*				P														
	c. Increase WDNR capacity to administer rule				-	(50)b	(50)b		X	C	C	C	C	C	C	C	C	C	C	C	C	C	C
4.7	Adequately evaluate and contain, as necessary, existing dredged material disposal areas so that contaminants do not re-enter the ecosystem.	Mod.	Mod.																				
	a. Evaluate...and contain...Renard Isle...			50	1,000	50	240				X												
	b. Evaluate Bay Port...and "other sites"...			50	1,000	0	100				X	X	X	X	X	X							
4.8	Coordinate navigational dredging projects and remedial measures.	Mod.	Mod.	*	*	*	*			X	C	C	C	C	C	C	C	C	C	C	C	C	C
4.9	Develop a 25-year dredge disposal plan and evaluate harbor alternatives.	High	Mod.																				
	a. Develop 25-year dredge plan...			50	250				X	X	X	X											
	b. ...Study...alternates uses of the port.			50	250				X	X	X	X											
4.10	Minimize impacts of ultimate disposal of toxic	High	Mod.																				

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
contaminants.																						
a. Develop approaches to reduce...toxicants...			0	50								X										
b. Develop guidelines for...ultimate disposal...			0	(50)b							X											
c. ...Continually evaluate new technologies...					0	(50)b			X	C	C	C	C	C	C	C	C	C	C	C	C	C
d. Evaluate...feasibility and desirability of constructing facilities...for toxic and hazardous waste disposal			0	250											X							
SUMMARY OF KEY ACTION #4																						
High Priority	8	6	1,500	406,900	5	2,050																
Moderate Priority	2	4	200	2,800	50	340																
Low Priority																						
Total Key Action #4	10	10	1,700	409,700	55	2,390																
5. CONTINUE CONTROL OF OXYGEN-DEMANDING WASTES (BOO) FROM MUNICIPAL AND INDUSTRIAL POINT SOURCE DISCHARGES		HIGH																				
5.1 Remove the bay's winter dissolved oxygen water quality standard variance.	High	High																				
a. Complete standards study...			*	*			X	P														
b. Revise water quality standard...			*	*				X	P													
c. Revise wasteload allocation if necessary			TBD	TBD	TBD	TBD				X	P											
5.2 Continue to periodically review and revise the wasteload allocations on the Lower Fox River.	High	Mod.																				
a. Continue automatic monitoring stations...					*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
b. ...Run synoptic surveys...					*	*			P	P				P	P				P	P		
c. Review and revise...model					*	*				P					P					P		

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
d. As necessary, revise..."WLA"...					*	*					P					P					P	
e. As necessary, change WPOES permits...			*	*	*	*					P					P					P	
SUMMARY OF KEY ACTION 45																						
High Priority	2	1																				
Moderate Priority		1																				
Low Priority																						
Total Key Action 15	2	2	0	0	0	0																
6. PROTECT WETLANDS AND MANAGE HABITAT AND WILDLIFE MOD.																						
6.1 Continue West Shore land acquisition.	High	High	1,000	10,000	10	100	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
6.2 Establish goals for wetland and other habitat protection and use existing authorities to achieve them.	High	High																				
a. "Identify"...important wetlands...			0	250					X	X	X	X										
b. Use existing authorities...					*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
c. ...Seek additional authorities as needed			0	50	0	1,000						X	X	X	X	X						
6.3 Continue adoption and strict enforcement of local wetland zoning.	High	High			*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
6.4 Consider additional wetland zoning.	High	Mod.																				
a. Evaluate need for additional protection			0	50							X	X										
b. Develop programs as needed			0	50																		
6.5 Encourage private wetland preservation.	High	Mod.																				
a. Develop private landowner programs			0	50	0	1,000							X	X	X	X						

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	b. Landowner should protect...			TBD	TBD	TBD	TBD	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
6.6	Change bulkhead lines as necessary to protect habitat.	High	Mod.																				
	a. Evaluate existing bulkhead lines...			0	50						X	X	X										
	b. Change...as necessary to minimize impacts			50	250									X	X	X	X	X	X	X	X		
6.7	Continue to use shore and modification permits to protect habitat and water quality.	Mod.	Mod.	*	*	*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
6.8	Seasonally limit public entry to critical habitat.	Mod.	Low																				
	a. Identify areas needing protection			0	10					X			X										
	b. Establish closed periods as appropriate					0	10	C	C	X	C	C	X	C	C	C	C	C	C	C	C	C	C
6.9	Develop and use habitat enhancement methods.	High	Mod.																				
	a. Identify methods...and provide guidelines			0	50	0	10			X	X	X											
	b. Use habitat enhancement methods			250	1,000	10	100					X	C	C	C	C	C	C	C	C	C	C	C
6.10	Consider stabilizing Cat Island.	Low	Low																				
	a. Evaluate feasibility			0	50						X												
	b. Stabilize as appropriate			1,000	1,000	0	10									X							
6.11	Dike wetlands if needed.	Mod.	Low																				
	a. Conduct feasibility study	High		0	250											X							
	b. Dike marshes as appropriate			1,000	1,000	0	10														X		
6.12	Improve Interstate-43 wetland mitigation areas.	Mod.	Low																				
	a. ...Determine best management practices			50	250								X										
	b. Implement management practices..			250	1,000	0	10						X	X	X	X	X	X					

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority: Action	Priority: Plan	Cost Ranges ($1,000) Project: Low	Project: High	Annual: Low	Annual: High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
6.13	Consider development of artificial reefs.	Low	Low																				
	a. Feasibility study			0	250											X							
	b. Construct experimental reefs...			100	1,000	0	100														X		
6.14	Provide upland bird nesting habitat.	Mod.	Low	0	250	10	50				X												
6.15	Complete purple loosestrife control plan and manage accordingly in the Area of Concern.	Low	Low																				
	a. Complete...state...strategy										P												
	b. Develop...strategy for..."AoC"			0	10									X									
	c. As appropriate, control purple loosestrife					0	100	C	C	C	C	C	C	X	C	C	C	C	C	C	C	C	C
6.16	Establish breeding sanctuaries and management programs for endangered tern populations.	High	High																				
	a. Protect Renard Isle..."as necessary"					*	*	C	C	C	C	C	C	C	X	C	C	C	C	C	C	C	C
	b. Identify additional nesting areas...			0	50						X												
	c. Establish breeding sanctuaries...			10	1,000	0	100								X								
	d. Promote tern population relocation...			0	50	0	10									C	C	C	C	C	C	C	C
	e. ...manage habitat and minimize disturbance			0	50	0	10	C	C	C	C	C	C	C	X	C	C	C	C	C	C	C	C
	f. ...Research...reproductive impairments			150	150									X									
	g. ...Monitor populations and...contaminants					0	10	C	C	C	C	C	C	C	X	C	C	C	C	C	C	C	C
6.17	Protect against outbreaks of avian disease.	Mod.	Low																				
	a. Complete plan...			*	*						P												
	b. Continue to monitor...					*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
6.18	Evaluate mink and muskrat populations in area of concern and manage as necessary.	Mod.-Low	Low																				
	a. Continue monitoring mink for contaminants					0	10	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	b. Determine harvest amounts...			0	50						X	C	C	C	C	C	C	C	C	C	C	C	C
	c. Recommend and implement management program					0	10									X	C	C	C	C	C	C	C

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority: Action	Priority: Plan	Cost Ranges ($1,000) Project: Low	Project: High	Annual: Low	Annual: High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
6.19	Inventory nongame species along the West Shore and develop management program if needed.	Mod.-Low	Low																				
	a. ...Inventory...and..."management plan"			50	250											X							
	b. Implement management program...					0	10											X					
SUMMARY OF KEY ACTION 06																							
	High Priority	8	4	1,160	11,600	10	1,230																
	Moderate Priority	8	6	300	1,500	10	1,110																
	Low Priority	3	9	2,450	5,370	10	220																
	TOTAL KEY ACTION #6	19	19	3,910	18,470	30	2,660																
7.	CONTROL POPULATIONS OF PROBLEM FISH		MOD.																				
7.1	Complete development of a program to prevent sea lamprey migration.	High	Mod.																				
	a. Complete plan...			*	*				P														
	b. Implement plan			10	1,000	0	10			(To be determined by "a")													
	c. Continue...monitoring...					*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
7.2	Conduct pilot project to evaluate and manage carp populations.	Mod.-High	Mod.																				
	a. Develop study design...			0	10						X												
	b. Complete project			250	1,000									X									
	c. "Ongoing management"...based on...project					0	1,000			(To be determined by "b")													
7.3	Manage alewife as necessary.	Low	Low																				
	a. Complete research and evaluate need...			0	10				P		X												
	b. If "necessary"...evaluate control methods			0	50										X								

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project ' Low	Project ' Nigh	Annual Low	Annual High	Target Years for Implementation 87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	c. ...Control...if needed				-	10	100	(To be determined by "b")															
7.4	Evaluate potential for white perch to impact the Green Bay fishery.	Low	Low	10	250																		
SUMMARY OF KEY ACTION #7																							
	High Priority	1	0																				
	Moderate Priority	1	2	260	2,010	0	1,010																
	Low Priority	2	2	10	310	10	100																
	TOTAL KEY ACTION #7	4	4	270	2,320	10	1,110																
8.	INCREASE NUMBERS OF PREDATOR FISH		MOO.																				
8.1	Continue and expand walleye management program.	High	Mod.																				
	a. Complete study of potential spawning areas			*	*		-			P													
	b. Continue to monitor walleye reproduction...					*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
	c. ...Monitor...contaminants, issue...advisories					*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C		
	d. Assess...options for reducing..."exposure"			0	10						X												
	e. ...Study...reproductive impairments			5	214		-							x									
	f. Protect and improve walleye spawning areas			0	250	0	100										X						
8.2	Continue perch management programs and complete research projects.	High	Mod.																				
	a. "Continue perch management program...					*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	b. Complete perch-alewife research study			*	*				P														
	c. Complete perch sport fishery economic study			*	*				P														
	d. Review and revise perch management program					*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
8.3	Initiate program to evaluate and manage	High-	Mod.																				

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	Target Years for Implementation 87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	northern pike populations.	Mod.																					
	a. Identify factors...limiting...population			0	50						X	X	X										
	b. Study potential spawning areas			0	50						X	X	X										
	c. Stock...if necessary...and evaluate					10	50			(To be determined by "a")													
	d. Protect and improve spawning areas			0	50	0	10										X						
8.4	Initiate effort to re•introduce...(muskies) to Lower Green Bay as water quality improves.	Mod.	Mod.																				
	a. Evaluate habitat and...feasibility			0	25			X	X		X												
	b. ...Stock...and evaluate success					0	10			X	X	C	C	C	C	C	C	C	C	C	C	C	C
SUMMARY OF KEY ACTION #8																							
	High Priority	3																					
	Moderate Priority	1	4	5	649	10	170																
	Low Priority																						
	TOTAL KEY ACTION #8	4	4	5	649	10	170																
9.	REDUCE SEDIMENT RESUSPENSION		LOU																				
9.1	Consider pilot projects to control suspended sediments.	Mod.	Low																				
	a. Evaluate desirability and feasibility			0	25								X										
	b. Initiate projects as appropriate			0	50	0	10			(To be determined by "a")													
9.2	Consider spoil bed stabilization.	Mod.	Low																				
	a. Conduct feasibility study			50	250													X					
	b. Stabilize spoil beds as appropriate			1,000	10,000	0	100			(To be determined by "a")													
9.3	Determine causes and manage turbidity.	Mod.	Low																				

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
a. Determine relative...contributions...			0	25						X												
b. Determine sources of...sediments			0	25								X										
c. Develop...management program...			0	1,000	0	100						C	C	C	C	C	C	C	C	C	C	C
SUMMARY OF KEY ACTION N9																						
High Priority																						
Moderate Priority	3		1,050	11,375	0	210																
Low Priority		3																				
TOTAL KEY ACTION 19	3	3	1,050	11,375	0	210																
10. REDUCE BACTERIA INPUTS FROM POINT AND NONPOINT SOURCES		LOW																				
10.1 Recognize swimming as a desired use of the bay and river when reviewing and revising applicable water quality standards.	High	Low	'	*	*	*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
10.2 Disinfect municipal wastewater treatment plant discharges as needed to protect swimming and other recreational uses of the bay and river.	High	Mod.	c	c	c	c	C	X	X	X	X	X	C	C	C	C	C	C	C	C	C	C
10.3 Control failing septic systems.	Mod.	Low																				
a. Identify areas with failing septic systems			0	50									X									
b. ...Correct problems			c	c	c	c	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
10.4 Control industrial discharges as needed to protect swimming and other recreational uses of the river.	low	Low																				

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	a. Assess need to control...			0	50							X											
	b. As necessary, revise rules...			*	*	*	*			(To be determined by "a")													
	c. As necessary, incorporate...into WPDES...			*	*	*	*			(To be determined by "a")													
SUMMARY OF KEY ACTION 010																							
	High Priority	2																					
	Moderate Priority	1	1																				
	Low Priority	1	3	0	100																		
	TOTAL KEY ACTION 010	4	4	0	100	0	0																
11.	VIRTUALLY ELIMINATE TOXICITY CAUSED BY NONPOINT AND ATMOSPHERIC SOURCES		Mod.																				
11.1	Evaluate and control runoff of toxic substances from all watershed sources.	High	Mod.	a	a	a	a			(To be determined see recommendation 1.4)													
11.2	Evaluate and, as necessary, control urban stormwater discharges.	High-Mod.	Mod.																				
	a. Monitor selected outfalls...			15	200				X	X													
	b. Develop guidelines for evaluation...			*	*	*	*		X														
	c. Develop stormwater water quality management plans...			100	500					X	X	X	X										
	d. Adopt ordinances...for developing areas			*	*	0	100			X	X	X	X	X	C	C	C	C	C	C	C	C	C
	e. When...source of toxicants...use BMPs...			TBD	TBD	TBD	TBD			X	X	X	X	X	C	C	C	C	C	C	C	C	C
11.3	Prevent chemical and coal pile runoff.	High-Mod.	Low	100	5,000	1	50		X	X	X												
11.4	Initiate industrial lot and urban runoff			50	1,000					X	X	X	X	X									

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	control demonstration projects.																						
11.5	Assess possible impacts of pesticide and herbicide use and control as necessary.	Mod.	Low																				
	a. Evaluate usage...bulk distribution sites...			10	50					X													
	b. Monitor or evaluate...			10	400							X											
	c. ...Recommend "BMPs" and "strategy"...				50									X									
	d. As necessary, reduce impacts			TBD	TBD	TBD	TBD								X	X	X X	C	C	C	C	C	C
11.6	Evaluate and control contributions of toxic substances from landfill.	High	Mod.																				
	a. ...Adequate close and cover..."sites"...			c	e	c	e	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	b. Inventory and evaluate sites..."near" river			640	4,000				X	X	X	X											
	c. Investigate "water" and wildlife contamination at sites			a	a					X	X	X											
	d. If "necessary"...hydraulically isolate the site...			TBDc	TBDc	TBDc	TBDc			(To be determined by "b" and "c")													
	e. ...Restrict development on sites...unless no adverse impacts			0	100				X														
11.7	Evaluate potential for groundwater contamination from other land uses to impact the bey and river and control as necessary.	Mod.	Low																				
	a. Establish priorities...			0	10					X													
	b. Monitor sites of concern...			30	400						X	X	X	X									
	c. Monitor ecosystem...			10	500						X	X	X	X									
	d. Develop management..."strategy"			a	a										X								
	e. Require clean-up or management			TBD	TBD	TBD	TBD				X	X	X	X	X	X	X						
11.8	Investigate sites of past coal gas manufacturing.	Mod.	Low																				

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION		Priority		Cost Ranges ($1,000) Project		Annual		Target Years for Implementation															
Recommendation		Action	Plan	Low	High	Low	High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	a. Identify...and evaluate...			80	4,000		.		X														
	b. Take remedial steps, if...problem exists			TBD	TBD	TBD	TBD	(To be determined by "a")															
11.9	Monitor fuel storage tank for leaks and spills, and initiate measures to prevent and correct as necessary.	Low	Low																				
	a. Implement rules requiring...monitoring			c	c	e	c			X	X												
	b. Monitor...develop spill plan...			c	c	c	c	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	c. Provide secondary containment			b	b	b	b			X													
	d. ...Report teaks...and restore environment			c	c	e	c	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
11.10	Evaluate and minimize impacts of spills on the river and bay.	Low	Low																				
	a. Rapidly report and clean up spills			0	50	0	10			X	C	C	C	C	C	C	C	C	C	C	C	C	C
	b. Evaluate impacts of past spills			0	100					X	X	X	X	X									
11.11	Determine atmospheric deposition's contribution to toxic substances found in the bay and river and establish loader goals.	High	Mod.																				
	a. Estimate gross atmospheric loadings...			0	50				X														
	b. New monitoring...including deposition			400	600				X	X													
	c. Refine atmospheric load estimates...			a	a	a	a					X											
	d. Establish load reduction goals			0	50											X							
11.12	Identify emission sources that may be contributing to atmospheric depositions of toxic substances to the bay and river.	Mod.	Low																				
	a. Inventory...sources of air emission...			10	30								X										
	b. Verify source emissions...			375	500								X										
	c. Estimate total loadings to the atmosphere			a	a									X									

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
11.13 Require emission controls that control toxics consider toxics secondary impacts on water quality and human health.	Mod.	Mod.																				
a. Complete adoption of toxic air emission rules.				*				X														
b. Develop capability to evaluate secondary effects			250	500								X										
c. Evaluate existing authority...			0	50								X										
d. Develop and propose legislation...													X									
e. Require through rules appropriate...controls			0	100											X							
11.14 Participate in development of regional, national and international strategies to reduce toxic contaminants in the atmosphere.	Mod.	Low	*	*		*	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
SUMMARY OF KEY ACTION #11																						
High Priority																						
Moderate Priority																						
Low Priority																						
TOTAL KEY ACTION #11			2,080	18,240	1	160																
12. CREATE A COORDINATING COUNCIL AND INSTITUTIONAL STRUCTURE FOR PLAN IMPLEMENTATION		HIGH																				
12.1 Establish a coordinating council and institution structure to facilitate plan implementation.	High	High																				
a. Set up interim implementation committee			*	*	*	*		X														
b. Establish council based on "a"				-	200	200			X													
c. Evaluate success											(5 years after establishment)											

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority		Cost Ranges ($1,000) Project		Annual		Target Years for Implementation															
		Action	Plan	Low	High	Low	High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
SUMMARY KEY ACTION ITEM 012																							
	High Priority	1	1			0	200																
	Moderate Priority																						
	Low Priority																						
	TOTAL KEY ACTION 012	1	1	0	0	200	200																
13.	INCREASE PUBLIC AWARENESS OF, PARTICIPATION IN AND SUPPORT FOR RIVER AND BAY RESTORATION EFFORTS		HIGH																				
13.1	Include opportunities for public participation and input on major decisions that affect the bay and river.	High	High	18	50	17	45	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
13.2	Develop public information programs.	High	High	25	100	50	100																
	a. Provide information to the public...							C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	b. Publish periodic newsletter...							C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	c. Promote...bay cleanup day...etc.							C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	d. Periodically brief opinion leaders...							C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	e. Provide information to economic groups							C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	f. Maintain information repositories...							C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	g. Develop...nature trails...							C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	h. Exchange information...research symposium							C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
13.3	Develop education programs.	High	High			25	25																
	a. Aquatic supplement to Project Wild									X													
	b. Develop..."bay" field trips...for teachers								X	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	c. ...University credit course...for teachers								X	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION Recommendation		Priority: Action	Priority: Plan	Cost Ranges ($1,000) Project: Low	Project: High	Annual: Low	Annual: High	Target Years for Implementation: 87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	d. Work with area school administrators...								X	C	C	C	C	C	C	C	C	C	C	C	C	C	C
13.4	Make water quality information easily accessible and understandable.	Mod.	Low			1	20		X	C	C	C	C	C	C	C	C	C	C	C	C	C	C
13.5	Encourage inclusion of both economic and environmental viewpoints on policy advisory boards.	Mod.	Mod.	0	0	0	0		C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
13.6	Consider forming a bay and river interest group or coalition.	Mod.	Mod.			2	2	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
SUMMARY OF KEY ACTION 013																							
	High Priority			43	150	92	170																
	Moderate Priority			0	0	2	2																
	Low Priority					1	20																
	TOTAL KEY ACTION 013			43	150	95	192																
14.	ENHANCE PUBLIC AND PRIVATE SHORELINE USES																						
14.1	Evaluate and upgrade boat launch facilities as necessary.	High	Mod.	560	560																		
	a. ...Evaluate adequacy...of existing sites...									X													
	b. ...Evaluate need for...additional...sites										X												
	c. ...Upgrade and build...										X	X	X	X	X	X							
	d. ...Evaluate financing alternatives										X												
14.2	Encourage development of marina facilities if environmentally and federally sound.	Mod.	Mod.			7	7	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority	Action Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
14.3	Evaluate potential for developing a swimming beach in the Area of Concern.	High	Mod.	150	150	35	35																
	a. Continue to monitor bacteria and clarity...							C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
	b. ...Evaluate feasibility...																						
	c. "If appropriate, develop swimming beach"																						
14.4	Develop shoreline fishing facilities.	Mod.	Low	10	250						X	C	C	C	C	C	C	C	C	C	C	C	C
14.5	Protect and develop recreational and environmental corridors.	High	Mod.	TBD	TBD	TBD	TBO																
	a. Develop strategy																						
	b. Implement strategy																						
14.6	Accelerate efforts to revitalize waterfronts and enhance the shoreline.	Mod.	Low	TBD	TBD	TBD	TBD	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
14.7	Through cooperative efforts, develop management plan and program for Renard Isle (Kidney Island)	Mod.	Mod.	20	20											X							
14.8	Improve air quality and associated aesthetics.	Mod.	Mod.	TBD	TBD	TBD	TBD				X												
	a. Evaluate need and develop strategy																						
	b. Implement strategy																						

SUMMARY OF KEY ACTION #14

	Project Low	Project High	Annual Low	Annual High
High Priority	0	0	0	0
Moderate Priority	730	730	42	42
Low Priority	10	250		
TOTAL KEY ACTION #14	740	980	42	42

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual Nigh	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
15.	MONITOR TO EVALUATE EFFECTIVENESS OF REMEDIAL ACTIONS, TRACK TRENDS AND IDENTIFY NEW PROBLEMS																						
15.1	Develop a remedial action plan surveillance program for toxic substances and routinely report on findings.	High	High	a	a	a	a			X	C	C	C	C	C	C	C	C	C	C	C	C	C
15.2	Increase fish and wildlife tissue monitoring to evaluate trends end develop consumption advisories.	High	High																				
	a. Expand fish tissue program...include				-	(3)*	15			X	C	C	C	C	C	C	C	C	C	C	C	C	C
	b. Develop wildlife tissue monitoring program				-	1	3			X	C	C	C	C	C	C	C	C	C	C	C	C	C
15.3	Periodically monitor loads of PCB's, phosphorus, sediment and other substances of concern from the river to the bay.	Mod.	Mod.			10	100			C													
15.4	Monitor trophic status.	High	High																				
	a. Synoptic survey and 2 bay stations					3	10		X	X	C	C	C	C	C	C	C	C	C	C	C	C	C
	b. Periodic zoo plankton and phytoplankton monitoring					9	25			X			X			X			X			X	X
15.5	Increase bacteria monitoring in bay and river.	Low	low			0	10			X	C	C	C	C	C	C	C	C	C	C	C	C	C
15.6	Monitor waterfowl population trends.	High	Low			2	5			(To be determined)													
15.7	Monitor endangered tern species population trends and reproductive success in Area of Concern.																						
	a. Expand annual monitor for population trends					5	5		X	C	C	C	C	C	C	C	C	C	C	C	C	C	C

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority	Action Plan	Cost Ranges (S1,000) Project Low	Project High	Annual Low	Annual High	Target Tears for Implementation 87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	b. Periodically monitor reproductive success				-	6	18		X			X			X			X			X	X	X
15.8	Continue monitoring fish population trends and harvest.	High	High					C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
15.9	Continue to monitor benthic (bottom dwelling) organisms.	High	Mod.			10	20	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C
15.10	Periodically map macrophytes (rooted aquatic plants) in the bay.	High	Low																				
	a. Initial study			0	25							X	X										
	b. Trend analysis					0	10														X	X	X
15.11	Periodically measure public attitudes.	Mod.	Mod.			5	50				X					X					X	X	X
15.12	Periodically measure people's use of the bay and river.	High	Mod.			5	50				X					X					X	X	X
15.13	Collect and update socioeconomic and demographic information that will help in assessment of management options for the bay and river.	Mod.	Low			5	100			X	C	C	C	C	C	C	C	C	C	C	C	C	C
SUMMARY OF KEY ACTION #15																							
	High Priority																						
	Moderate Priority																						
	Low Priority																						
	TOTAL KEY ACTION #15			0	25	61	421																
16.	RESEARCH TO BETTER UNDERSTAND THE ECOSYSTEM, ITS																						

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION	Recommendation	Priority	Priority	Cost Ranges ($1,000) Project		Annual		Target Years for Implementation															
			Action Plan	Low	High	Low	High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
	PROBLEMS AND HOW TO REMEDY THEM																						
16.1	Complete mass balance study of toxic substances.	High	High	(4000)b	(7000)b			- X	X	X	X												
16.2	Determine causes of walleye and bird reproductive impairments.	Mod.	Mod.																				
	a. Conduct walleye study			(50)a	(214)a							x											
	b. Conduct tern study			(150)a	(150)a					(To be determined)													
16.3	Conduct exposure and expanded epidemiological study.	Mod.	Mod.																				
	a. Complete existing study									X													
	b. New study to assess use and exposure			50	200					(To be determined by "a")													
	c. Use results to focus on clean-up education program					0	10				X	C	C	C	C	C	C	C	C	C	C	C	C
16.4	Study benthic (bottom dwelling) organisms to determine why population numbers are low.	Mod.	Mod.	5	100					X	X												
16.5	Continue to evaluate trophic dynamics.	Low	Low	100	200					(To be determined)													
16.6	Complete comprehensive studies of fish in Area of Concern.	High	High																				
	a. Complete survey of Fox River fish			*	*				X	X													
	b. Complete habitat mapping			*					X	X													
	C. Complete Sea Grant fish biomass study			*	*				X	X													
16.7	Conduct study to evaluate potential for "top down" management in the Area of Concern.	Low	Low	500	1,000																X		
16.8	Improve capability to analyze water resource	Mod.	Low	100	1,000					X	X	X	X										

Table 30. Lower Green Bay Remedial Action Plan Implementation Priorities, Cost Estimates and Schedule

KEY ACTION Recommendation	Priority Action	Priority Plan	Cost Ranges ($1,000) Project Low	Project High	Annual Low	Annual High	87	88	89	90	91	92	93	94	95	96	97	98	99	00	05	10
alternatives and seek solutions that will benefit both the environment and the economy.																						
16.9 Develop and evaluate new technology to clean up, control or mitigate toxic contaminants in sediment (in-place pollution).	High	High	b	b	-	-		X	X	X	X	X										
SUMMARY OF KEY ACTION ITEM #16																						
High Priority																						
Moderate Priority																						
Low Priority																						
TOTAL KEY ACTION #16			755	2,500	0	10																
TOTAL KEY ACTIONS			68,268	623,579	656	9,260																

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VI. BIBLIOGRAPHY AND

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LOWER GREEN BAY REMEDIAL ACTION PLAN:

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APPENDIX A: PROCESS FOR PLAN PREPARATION AND CITIZEN INPUT

Appendix A: Process for Plan Preparation

The Lower Green Bay Remedial Action Plan (RAP) was developed by the Wisconsin Department of Natural Resources (WDNR) in cooperation with other agencies and citizens of northeast Wisconsin. Over 70 people directly participated on the Citizens Advisory Committee and four Technical Advisory Committees (Biota and Habitat Management, Toxic Substances Management, Nutrients and Eutrophication Management, and Institutional Management).

The RAP builds on past efforts. These include the Fox River Water Quality Planning Agency's Water Quality Management Plan, the Great Lakes Fishery Commission's Great Lakes ecosystems rehabilitation studies (GLER Reports), Bay-Lake Regional Planning Commission's Future of the Bay Effort, Sea Grant research and many others.

Two workshops, one for researchers (Harris <u>et al.,</u> 1987) and one for resource managers (Persson, 1986) helped identify current Bay and River management activities, known problems and potential objectives for the plan. A research symposium was held to share research and monitoring results.

Using this information and suggestions of many people, a "Scope of Study" for the Remedial Action Plan (WDNR, 1986) was developed. The Study identified the problems which the Plan should address and the process which should be used in preparing the Plan (Figure A-1).

The Secretary of the Department of Natural Resources invited individuals representing local governments, industry, commerce, citizen groups and agencies with management responsibilities for the Bay and River to participate on the Citizens Advisory Committee (CAC). The role of this committee was to advise the WDNR on objectives for management of the lower Bay and strategies to meet those objectives. The CAC met monthly since January, 1986 until the completion of the Plan. Fox Valley Water Quality Agency provided staff support for the committee (FVWQPA, 1986-88).

During the preparation of the Scope of Study, the CAC identified the ten most pressing problems that should be addressed by the Plan:

* Toxics
* Dredging and Dredge Spoil Disposal
* Habitat Loss
* Conflicting Water Uses
* Sedimentation
* Nutrients and Eutrophication
* Nonpoint Sources of Pollution
* High and Low Water Levels
* Should Dredging Continue?
* Shoreland Use

In order to develop specific actions to remedy these problems, the CAC defined a "Desired Future State" for the Lower Bay and River. The "Desired Future State" describes a healthy bay environment, a balanced edible sport/commercial fishery, water-based recreational opportunities, good water quality, balanced shoreline use, productive wildlife and plant communities, and an economical transportation network. It provided a guidepost for the CAC to gauge plan objectives and recommendations (reference Chapter III of the Plan).

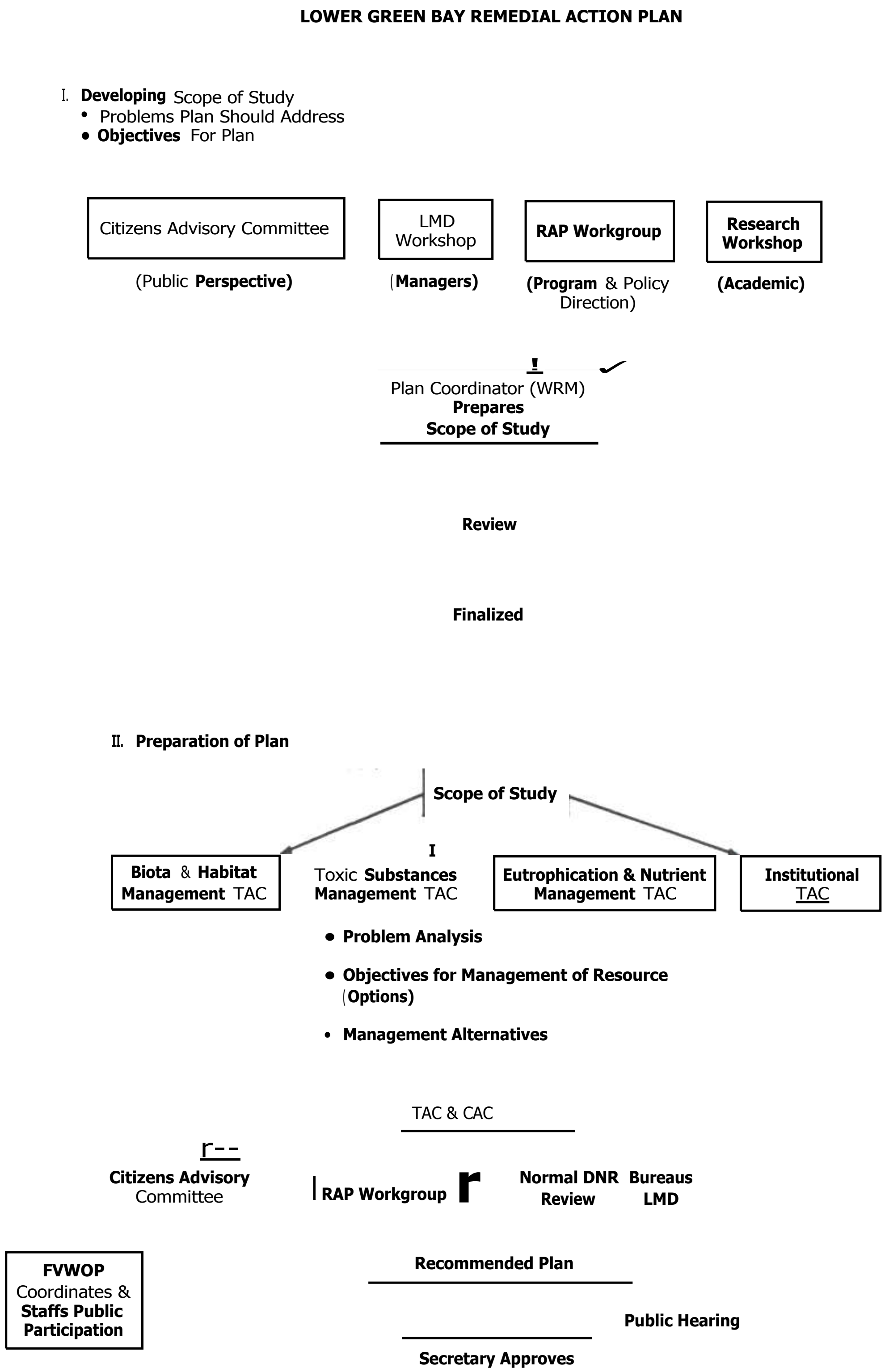

Figure A-1. The Lower Green Bay Remedial Action Plan's Development Process

Other citizen input was obtained from questionnaires and comments at public meetings and hearings. Two questionnaires were widely distributed to local citizens to find out how they view their water resources and what improvements they feel are necessary (FVWQPA, 1986; Persson, 1987). Also, to keep area residents informed during plan development, a bi-monthly newsletter -- NEWSRAP -- was distributed (FVWQPA, 1986-88) and public meetings were held to review the initial reports and the draft plan.

Four technical advisory committees (TACs) were established early in the planning effort to further study and analyze the ten most pressing problems which are identified above. The TACs also recommended resource management alternatives. Members of the TACs included academic scientists and researchers, other experts from the community, and WDNR and other agency resource managers. The TACs and a detailed description of their issue areas are listed below.

<u>Toxic Substances Management Technical Advisory Committee</u>

* Toxic substances' impact on biota and human health
* Existing toxic sources and their management
* In-place contaminated sediment and its management
* Ultimate disposal of toxic wastes and contaminated sediment

<u>Nutrient and Eutrophication Management Technical Advisory Committee</u>

* Nutrient management
* Sediment loading management
* Ecosystem management to reduce eutrophic conditions and improve aesthetics
* Dissolved oxygen in lower Green Bay
* Bacteria and viruses

<u>Biota and Habitat Management Technical Advisory Committee</u>

* Fisheries management
* Wildlife and endangered species management
* Habitat protection and management

<u>Institutional Technical Advisory Committee</u>

* Recreational uses and access
* Socio-economic impacts of restored uses
* Institutional responsibilities and capabilities for management of the Bay
* Relationship between the Remedial Action Plan and local planning
* Institutional opportunities for plan implementation
* Public perceptions

As a result of their discussions and findings, each TAC prepared a report which: 1) identifies problems that impair uses of the Lower Fox River/Lower Green Bay ecosystem; 2) establishes goals and objectives to rehabilitate the ecosystem by the year 2000; and 3) proposes alternative management strategies to protect and restore beneficial uses to the Area of Concern. These four reports (Toxic Substances Management, Institutional Management, Biota and

Habitat Management, and Nutrient and Eutrophication Management TAC reports) provide the technical basis for this Lower Green Bay Remedial Action Plan.

The TAC reports were evaluated by the Lower Green Bay Citizens Advisory Committee, other TAC members, citizens, and WDNR resource managers and program staff. An informal public hearing was held on the TAC Reports in early 1987 and a questionnaire was used to obtain additional public comment on the TAC Reports (Persson, 1987). A draft Remedial Action Plan was prepared based on the TAC reports and their subsequent evaluation.

A public informational meeting was held in September, 1987 on the draft Plan and a formal public hearing in October, 1987. A 30-day public comment period followed the hearing. A summary of testimony and comments on the Plan is available (Persson, 1988).

The Plan, after public review and comment are incorporated, will be approved by the Secretary of the Department as part of Wisconsin's Water Quality Management Plan in February, 1988. The Plan will be sent to the Water Quality Board of the International Joint Commission as part of Wisconsin's contribution to Great Lakes water quality. Plan implementation activities are scheduled to begin in March, 1988 with the formation of the Interim Implementation Committee.

0135E

<u>LOWER GREEN BAY REMEDIAL ACTION PLAN:</u>

for the Lower Fox River and Lower Green Bay

Area of Concern

APPENDIX B: GLOSSARY FOR WORDS AND ABBREVIATIONS

USED IN THIS PLAN

GLOSSARY FOR TERMS AND ABBREVIATION FOUND IN THIS PLAN

Abbreviations

208 plans:	See Areawide Water Quality Management Plans.
ACP:	See Agricultural Conservation Program.
AOC:	See Area of Concern.
ASCS:	Agricultural Stabilization Conservation Service of the U.S. Department of Agriculture.
BACT:	Best Available Control Technology.
BCT:	Best Conventional Technology.
BMP:	See Best Management Practice.
BOO:	See Biochemical Oxygen Demand.
BPT:	Best Practicable Technology.
CDF:	See Confined Disposal Facility.
COE:	United States Army Corps of Engineers.
CFS:	Cubic Feet Per Second.
CSO:	Combined Sewer Overflow.
DO:	See Dissolved Oxygen.
EPA:	U.S. Environmental Protection Agency.
FVWQPA:	Fox Valley Water Quality Planning Agency.
GLFC:	Great Lakes Fishery Commission.
GBMSD:	Green Bay Metropolitan Sewerage District.
IJC:	See International Joint Commission.
LC_{50}:	Lethal concentration for 50% of the test population exposed to a toxicant substance.
LCCs:	Land Conservation Committees (of county boards).
LD_{50}:	Lethal dose for 50% of the test population exposed to a toxicant substance.
MGD:	Million of Gallons Per Day; a measurement of water flow.
mg/L:	Milligrams Per Liter.
ng/L	Nanogram Per Liter; equals 1 part per trillion (ppt).
NO_2:	Nitrogen Dioxide.
NOAA:	National Oceanic and Atmospheric Administration.
NPDES:	National Pollution Discharge Elimination System.
O&M:	Operation and Maintenance.
PAHs:	See Polyaromatic Hydrocarbons.
PCBs:	See Polychlorinated Biphenyls.
POTW:	See publicly owned treatment works.

PPM:	Parts Per Million; a unit of measure of concentration.
RAP:	See Remedial Action Plan.
RPCS:	Regional Planning Commissions.
RCRA:	See Resource Conservation and Recovery Act of 1976.
SCS:	Soil Conservation Service of the United States Department of Agriculture.
SO_2:	Sulfur Dioxide.
SS:	See Suspended Solids.
TSCA:	Toxic Substances Control Act.
ug/L:	Microgram Per Liter; equals 1 part per billion (ppb).
USDA:	United States Department of Agriculture.
USEPA:	United States Environmental Protection Agency.
USFWS:	United State Fish and Wildlife Service, U. S. Department of Interior.
USGS:	United States Geological Survey.
USLE:	Universal Soil Loss Equation.
USGB:	University of Wisconsin – Green Bay.
UWEX:	See University of Wisconsin Extension.
VOC:	Volatile Organic Compounds.
WDATCP:	Wisconsin Department of Agriculture, Trade and Consumer Protection.
WDHSS:	Wisconsin Department of Health and Social Services.
WDILHR:	Wisconsin Department of Industry, Labor and Human Relations.
WDNR:	Wisconsin Department of Natural Resources.
WDOA:	Wisconsin Department of Administration.
WDOD:	Wisconsin Department of Development.
WDOT:	Wisconsin Department of Transportation.
WGNHS:	Wisconsin Geologic and Natural History Survey.
WLA:	See Wasteload Allocation.
WPDES:	See Wisconsin Pollution Discharge Elimination System.
WSLH:	Wisconsin State Laboratory of Hygiene.
WWTP:	Wastewater Treatment Plant.

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.

ADDITIVITY:
The characteristic property of a mixture of toxicants that exhibit a cumulative toxic effect equal to the arithmetic sum of the individual toxicants.

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% 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.

AIR POLLUTION:
Contamination of the atmosphere by human activities.

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. Thus 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 which states 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.

ASSIMILATIVE CAPACITY:
The ability of a water body to purify itself of pollutants.

AVAILABILITY:
The degree to which toxic substances or other pollutants that are present in sediments or elsewhere in the ecosystem 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. The amount of oxygen, pH, temperature and other conditions in the water can affect availability.

BACTERIA:
Single-cell, microscopic organisms. Some can cause disease, and some are important in the stabilization of organic wastes.

BASIN PLAN:
See "Areawide Water Quality Management Plan".

BENTHIC ORGANISMS (BENTHOS):
The 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 from its food. Chemicals move through the food chain and tend to end up at higher concentrations 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 thus 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 which 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 which indicate how far into a stream or lake an adjacent property owner has the right to fill. Many of these lines were established many years ago and allow substantial filling of the bed of the River and Bay. Other environmental laws may limit filling to some degree.

CARCINOGENIC:
A chemical capable of causing cancer.

CATEGORICAL LIMITS:
All point source discharges are required to provide a basic level of treatment. For municipal wastewater treatment plants this is secondary treatment (30 mg/l effluent limits for SS and BOO). For industry the level is dependent 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 which contain chlorine, carbon and hydrocarbon. Generally refers to pesticides and herbicides that can be toxic. Examples include PCBs and pesticides such as DDT and dieldrin.

CHLOROPHYLL-A:
A green pigment in plants used as an indicator of plant and algae productivity.

CHRONIC TOXICITY:
The effects of long-term exposure of organisms to concentrations of a toxic chemical that are not lethal is injurious or debilitating to an organism in one or more ways. An example of the effect of chronic toxicity could be 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 for the containment and disposal 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 disturbing the soil only slightly. In this way a protective layer of plant residue stays in the surface; erosion is decreased.

CONSUMPTION ADVISORY:
A health warning issued by WDNR and WDHSS that recommends that 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, as a pollutant suggests that there is too much of the material present.

CONVENTIONAL POLLUTANTS:
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 has been banned because of its persistence in the environment.

DIOXIN (2,3,7,8-tetrachlorodibenzo-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 are often due to inadequate wastewater treatment. The Department of Natural Resources considers 5 ppm DO necessary for fish and aquatic life.

DREDGING:
Removal of sediment from the bottom of water bodies.

ECOSYSTEM:
The interacting system of a biological community and its nonliving surrounding.

EFFLUENT:
Solid, liquid or gas wastes (byproducts) which are disposed on land, in water or in air. As used in the RAP generally means wastewater discharges.

EFFLUENT LIMITS:
The Department of Natural Resources issues WPDES permits that establish the maximum amount of pollutant that can be discharged to a receiving stream. Limits depend on the pollutant involved 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 rates, 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.

FLUORANTHENE:
A polyaromatic hydrocarbon (PAH) with toxic properties.

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

FOOD CHAIN:
A sequence of organisms in which each uses the next as a food source.

FORSTER'S TERN:
A bird that is an endangered species in Wisconsin.

FURANS (2,3,7,8-tetra-chloro-dibenzofurans):
A chlorinated organic compound which is highly toxic.

GREEN STRIPS:
See buffer strip.

GROUNDWATER:
Underground water-bearing areas generally within the boundaries of a watershed, which fill internal passageways of porous geologic formations (aquifers) with water which flows in response to gravity and pressure. Often used by 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-term 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 of a large family of chemicals containing carbon and hydrogen in various combinations.

HYPEREUTROPHIC:
Refers to a lake with excessive fertility. Extreme algae blooms and low dissolved oxygen are characteristic.

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 past 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, compacting the wastes to the smallest practical volume, and applying cover 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.

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

LDso:
Lethal dose for 50% 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 or inking 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 after measured by its 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 "Oligotrophic.")

MILLIGRAMS PER LITER (mg/1):
A measure of the concentration of substance in water. For most pollution measurement this is the equivalent to "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 in which 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 is one-third of the lowest flow that occurs once every 10 years for a seven day period.

NEWSRAP:
A newsletter published by the Fox Valley Water Quality Planning Agency which contains information on the Lower Green Bay Remedial Action Plan.

NONPOINT SOURCE POLLUTION (NPS):
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; may be a virus, bacterium, protozoan, etc.

PELAGIC:
Referring to open water portion of a lake.

PESTICIDE:
Any chemical agent used for control of 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 most alkaline.

PHENOLS:
Organic compounds that are the byproducts of petroleum refining, textile, dye, and resin manufacture. How 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 over fertile 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, and recent surveys have found PCBs in every section for the country, even those remote from PCB manufacturers.

POLYCHLORINATED ORGANIC COMPOUNDS:
A group of toxic chemicals which contains 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 discharges are required to monitor for 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 set 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 discharges 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 plan owned by a city, village or other unit of government.

RAP:
See Remedial Action Plan.

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RECYCLING:
The process by which waste materials are transformed into new products.

REMEDIAL ACTION PLAN:
A plan designed to restore beneficial uses to a Great Lakes Area of Concern.

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 which regulates hazardous wastes, to eliminate open dumping and to promote solid waste management programs.

RIPRAP:
Broken rock, cobbles, or boulders placed on the bank of a stream to protect it against erosion.

RULE:
Refers to Wisconsin administrative rules. See Wisconsin Administrative Code.

RUNOFF:
Water from rain, snow melt, or irrigation that flows over the ground surface and returns to streams. Runoff can collect pollutants from air or land and carry them to receiving waters.

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

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

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

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

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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 which provides for cleanup of major hazardous landfills and land disposal areas.

SUSPENDED SOLIDS (SS):
Small particles of solid pollutants suspended in water.

SYNERGISM:
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 of immunologic abnormalties, cancer, genetic mutations, or development of physiological manfunctions, 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 a 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 a stream. Results in the limit on the amount (in pounds) of a 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:
Those 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 3% of this fund is available for repair or replacement of private, onsite sewer systems.

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

$olidWaste 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.

ZOOPLANKTON:
Tiny aquatic animals that fish feed on.

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LOWER GREEN BAY REMEDIAL ACTION PLAN:

for the Lower Fox River and Lower Green Bay

Area of Concern

APPENDIX H: IOC' S WATER QUALITY PROGRAM COMMI'1'1'lE 'S COMMENTS ON THE
LOWER GREEN BAY REMEDIAL ACTION PLAN AND WICONSIN 's RESPONSE

May 11, 1988

WATER QUALITY PROGRAMS COMMITTEE
CO-ORDINATED REVIEW
of the
REMEDIAL ACTION PLAN
for
LOWER GREEN BAY

Preface:

This Remedial Action Plan (RAP) was prepared under the guidelines prescribed by the Water Quality Board (WQB) before the signing of the Accord of 1987 which amended the GLWQA of 1978. Therefore, this review assesses the adequacy of this RAP against the original WQB guidelines. The WQB guidelines were amended somewhat as they were incorporated into the Accord, and these changes in structure will be recognised in the final statement regarding the way in which this RAP fits into the three phases of the new RAP guidelines in the amended Agreement.

Participation:

This coordinated review brings together the individual reviews of various members of the WQPC committees, so as to provide a wide range of expertise in reviewing the various technical details of the RAP.

Reviews (attached) were received from the following:

Surveillance Work Group	G.R. Lowry U.S. FWS
Point Source Sub-Committee	G. Sherbin Can. DOE V.J. Saulys U.S. EPA
Non Point Source Sub-Committee	J. Bredin Mich. DNR J. Nowland Can. Agr. G. Wall Can. Agr.
Sediment Sub-Committee	D. Persaud Ont. MOE
Toxics Sub-Committee	J. Reinert U.S. EPA
Science Advisory Board	A.M. Beeton U.S. NOAA J. Va.11entyne
Great Lakes Fishery Commission	C. Fetterolf GLFC

STAGE 1: WHEN A DEFINITION OF THE PROBLEM HAS BEEN COMPLETED UNDER SUBPARAGRAPHS 4(a)(i) and (ii).

1. Are the goals and objectives clear and concise?

Most of the reviewers agreed that the goals and objectives are clear and concise in a descriptive sense. For point sources, however, there remains the need for quantifiable goals in terms of both loadings and concentrations. The descriptive, ecosystem type goals are appropriate from a user point of view, but with few quantifiable objectives it will be very difficult to measure progress.

2. Are the goals and objectives consistent with the specific goals of the 1978 GLWQA?

The GLWQA specific goals (Specific Objectives) are not addressed directly. Most of the RAP objectives are consistent with Agreement objectives. The target concentration of phosphorus, however, is ten to fifteen times as high as that recommended for Lake Michigan. Historically, Lower Green Bay always has been somewhat eutrophic. The phosphorus concentration target will return the lower bay to the conditions of the 1940s which is a reasonable objective.

3. Is the information base sufficient to adequately define the problems and identify the causes?

The problems have been identified in a descriptive way, from the point of view of the user. This reflects the high level of public participation'in developing the RAP. Specific problems are identified but not quantified in many cases. For example, contaminated sediment is identified as the source for most of the PCBs but the current concentration of toxics in the sediment is not reported. Rather, the fact that there is a fish consumption advisory in effect due to higher than acceptable levels of PCB, is used to define the problem, and contaminated sediments are identified as the most important cause. Many Areas of Concern share this difficulty regarding appropriate objectives and remedial actions for contaminated sediments.

The sub-section on Land Disposal Areas should be renamed "Known or Potential Sources of Ground Water Contamination". There are many sources of ground water contamination besides landfills. Also, limiting the inventory of known or potential ground water contamination sites of concern, to those within 1/4 mile of the Lower Fox River or Lower Green Bay, may be inappropriate.

The lack of detailed characterization of the major industrial point sources and the current level of remedial action are serious weaknesses of the RAP.

STAGE II: WHEN REMEDIAL AND REGULATORY MEASURES ARE SELECTED UNDER SUBPARAGRAPHS 4(a)(iii), (iv), (v), and (vi).

4. Are the identified remedial actions sufficient to resolve the problems and restore beneficial uses?

The "Key Actions" in the RAP are a mixture of remediation and investigation. In some cases the timing and technology of the remedial action is dependent on the outcome of some of the projected studies.

From a point source perspective, no clear connection or linkage is made between point sources and beneficial use impairment. While not stated explicitly, it is assumed that the water quality standards and effluent setting procedures will be consistent with the Specific Objectives of the GLWQA.

5. Are these actions consistent with the stated goals of the RAP?

Yes! The "Key Actions" relate directly to the "Goals and Objectives" of the RAP.

6. What beneficial uses, if any, will not be restored? Does the RAP indicate why?

The RAP acknowledges that a return to a "pristine" environment is not feasible. Many of the natural marshes have been destroyed. The RAP does propose to achieve the fishable, swimable, drinkable uses. The new population of fish in the bay will be a more desireable assortment of species, from a human user point of view, but it would be very difficult to document the restoration of all of the original species. Permanent loss of some marshland habitat will have a lasting impact on the fishery.

7. Is the identified schedule for implementation of the remedial actions reasonable?

Target dates are given for many of the "Key Actions" and these appear to be realistic. In many cases, however, the "Key Action" is not a remedial action, but rather a study or data gathering activity. The "Action Recommendations" detailed within the "Key Actions" do identify specific remedial actions.

8. Have the jurisdictions and agencies responsible for implementing and regulating remedial measures been identified?

In many cases a number of agencies are identified as sharing responsibility for a remedial action. A shared responsibility often results in no responsibility. A shared activity needs to be broken out into pieces that can be undertaken by individual agencies or "work shared" under a formal multi-agency agreement. We understand that specific agency responsibility currently is being negotiated.

9. Have studies necessary to complete the RAP been identified and have schedules for their completion been established?

Yes! Many ongoing and new studies are required by the RAP. In most cases a time target has been stated.

10. Is the proposed monitoring and surveillance program sufficient to document improvements as a result of the remedial action implemented and confirm the restoration of beneficial uses?

Yes! The monitoring and surveillance program in the Plan should be sufficient to document improvements as a result of the remedial actions implemented and confirm the restoration of beneficial uses.

11. Has there been adequate and appropriate consultation with the public?

This clearly is the strongest aspect of this RAP. The public has been invited to participate in the development of the RAP from the very beginning. Due to this active involvement, there has developed a very strong public support for the proposed remedial actions.

STAGE III: WHEN MONITORING INDICATES THAT BENEFICIAL USES HAVE BEEN RESTORED UNDER SUBPARAGRAPHS.4(a)(vii) and (viii).

Stage III requirements await implementation of the RAP.

SUMMARY OF PROS AND CONS

Pros:

The RAP is well written and logical in its format. Consultation with the public has been exemplary, with formal and informal forums to discuss every phase of the RAP development. The various "stakeholders" also have been involved.

The goals and objectives have been developed from an ecosystem perspective and the Key Actions are related directly to the Goals.

Agencies responsible for remedial actions have been identified and associated costs have been estimated. Agency specific responsibilities are being negotiated.

Cons:

One of the major weaknesses of the RAP is the qualitative rather than quantitative nature of many objectives. This will make it very difficult to monitor the implementation of the remedial measures and especially the response of the system.

Responsibility for 'Remedial Actions' is assigned to a group of agencies instead of targeting individual agencies for specific tasks. This weakness is being addressed at the present time.

Significant groundwater contamination from sources other than "Land Disposal Areas within 1/4 mile of the river or bay" have been overlooked.

There is a lack of detailed characterization of point source effluents and an evaluation of current remedial measures.

OVERALL RATING

The Lower Green Bay Remedial Action Plan is a very good attempt to combine significant public involvement and an ecosystem approach in developing a working document. It is well done as far as it goes, but it lacks quantification and currently does not charge specific agencies with specific tasks.

With reference to the six categories of the WQB guidelines, this RAP, generally, is in category 4. That is:

4. Causative factors known and RAP developed, but remedial measures not fully implemented.

However, it is recognised that for the toxic substances issue - particularly contaminated sediments, the RAP is still being developed. Also, specific agency commitment has not been identified. Therefore, it must be placed in the third category also. That is:

3. Causative factors known, but RAP not developed and remedial measures not fully implemented.

POSITION WITHIN THE NEW THREE STAGE PROTOCOL

Stage 1 **requirements have been** met, but the precision of the objectives could be improved with some additional quantification.

Stage 2 requirements have been partially met, but the RAP needs better **data** on the **evaluation** of remedial measures in **place**, and could benefit from a better means to measure progress toward the objectives. Also, there needs to be specific agency responsibility for each remedial action required, as well as a timetable for achievement.

Stage 3 requirements await the results of the RAP.

RECOMMENDATIONS

The authors of the RAP are to be congratulated on the very significant work accomplished to-date and encouraged to continue the process in order to remedy the deficiencies noted.

Th

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

BOX 7921
MADISON, WISCONSIN 53707

October 21, 1988

File Ref: 8250

Ms. Carol Finch, U.S. Chair
Great Lakes Water Quality Board
Programs Committee
International Joint Commission
c/o U.S. E.P.A., Region V
Chicago, Illinois 60604

Mr. Ron Shimizu, Canadian Chair
Great Lakes Water Quality Board
Programs Committee
International Joint Commission
c/o Environment Canada
25 St. Clair Avenue East
Toronto, Ontario, Canada
M4V 1P5

Dear Ms. Finch & Mr. Shimizu:

I am writing to respond to IJC comments received at the September 16, 1988 Water Quality Board meeting. We are pleased that the plan received such a positive and favorable review. Enclosed please find a copy of the final plan that was approved by DNR Secretary Besadny on February 23, 1988. Many of the committee's comments have already been addressed in the final plan. Additional responses to the Committee's comments are outlined in Attachment 1. Changes in the final plan that address the committee's concerns are also highlighted.

The Department is very proud of the quality of this plan and cooperative efforts that went into its development. We are fully committed to plan implementation. We recognize that achieving the goals of the plan will not necessarily be easy and will require hard work and innovative approaches by all participants.

As a first step in implementation of the plan, Secretary Besadny has established an Implementation Committee to advise the Department in implementation of the Plan (Attachment 2). This group met for the first time April 28th, 1988. The committee will help focus implementation activities and develop an annual progress report on the Lower Green Bay Remedial Action Plan. This report will identify what progress has been made in remedying any plan deficiencies and in implementation of plan recommendations. We will ask the committee to help us identify lead management agencies to implement plan recommendations for inclusion in the first report. The Department will submit copies of the report to the IJC's Water Quality Board and the United States Environmental Protection Agency.

This letter and the Water Quality Programs Committee's comments will be included in the final printed plan.

Sincerely,

Bruce J. Baker, Director
Bureau of Water Resources Management

Enc.
cc: Charles Higgs - LMD
Members of the Lower Green Bay RAP Implementation Committee

Attachment 1
Response to the Water Quality Programs Committee Review of the Lower Green Bay Remedial Action Plan

1. Goals & Objectives

The plan contains specific quantifiable objectives for restoration of the resource for many parameters and identifies additional parameters for which specific objectives are needed (Table #5 in the final plan; Table IV.3 in the draft plan). The plan identifies that these will be determined as part of the establishment of the state's administrative rules for toxic substances (NR 105 & 106). These rules have been approved by the DNR's Natural Resources Board and are currently under legislative review. Specific effluent limits for point source discharges will be set based on these rules as noted by plan recommendation #3.1. Very stringent limits for BOD and suspended solids are already in effect and have been met as noted on page 16 of the final plan (page II.7 of the draft plan) and Key Action #5. The final plan includes a table (#2, page 29) which summarizes these limits.

2. Consistency with goals of the Great Lakes Water Quality Agreement

We agree that the Remedial Action Plan's objectives are consistent with the Water Quality Agreement's objectives. Please note that the plan identifies an ambitious phosphorus reduction objective for the area of concern that will have cascading beneficial impacts on the rest of the bay and possibly Lake Michigan (reducing average total phosphorus concentrations from 190 ug/l to between 100 ug/l and 125 ug/l in the area of concern). This will require a 40 to 50 % total phosphorus load reduction from the entire 6,641 square mile Fox/Wolf River Basin. We do not believe we can change the southernmost portion of Green Bay to oligiotrophic or even mesotrophic conditions. But we are hopeful we can improve the hypereutrophic conditions now found in the area and that reduced total phosphorus loadings will also improve conditions found in the rest of Green Bay.

3. Information base sufficient to adequately define the problems and identify the causes?

The plan has worked to take full advantage of the existing data base and professional expertise and where information is insufficient, the plan makes recommendations to obtain that data. In writing the plan and technical reports the strategy was to work with the technical experts and researchers who best knew the area and to summarize and draw conclusions from their knowledge and existing publications. We did not recompile existing data that was available elsewhere. We realize that this approach may have made it difficult for those that are reviewing the plan and who are not familiar with the data base.

The Toxic Substance Management Technical Advisory Committee's (TAC's) report summarizes existing sediment data. We also realized the need to compile existing sediment data prior to initiating studies called for in recommendations 4.2 and 4.3. This has been done in a separate report entitled "Lower Fox River and Green Bay Harbor PCB Sediment Sampling Data (October, 1987). An additional research project on Little Lake Butte des Morts nears completion. Major new studies (recommendations 4.2 and 16.1) are being initiated with the EPA Mass Balance Project and a study of the Fox River Sediments for which the legislature recently authorized $250,000.

The Toxic Substance Management TAC's report summarizes some of the existing information on point source discharges. We recognized the need to supplement this data and have completed a separate report entitled "Estimated Loading of Toxic Substances to the Lower Fox River from Point Sources (May, 1988) which does so. The monitoring that is being required under reissued WPDES permits (and proposed NR 106) will ensure that there is a better data base in the future. Improved computerization should make this data easier to evaluate.

Key action # 11 (Virtually eliminate toxicity caused by nonpoint and atmospheric sources), especially recommendations 11.6 through 11.10, address many different potential sources of groundwater contamination. Priority has been given to those directly adjacent to the river and bay because we believe they have the greatest potential to affect the river and bay. We would be interested in knowing specifically the other sources believed to be important by the reviewers.

#4. Are the identified remedial actions sufficient to resolve the problems and restore beneficial uses?

We believe, as noted, the establishment of water quality standards and associated effluent limits will be adequate to restore beneficial uses and will be consistent with the Great Lake Water Quality Agreement.

#6. Beneficial Uses.

Please note that the RAP does not provide for re-establishing drinking water as a use of the AOC within the 15 year time-frame of the plan. Even with the proposed improvements, water quality suitable for drinking supplies will probably not be obtained within the AOC by 2000. In addition the subtle, long-term chronic effects of toxics are too poorly understood to risk additional exposure. The RAP recognizes drinking water as a long-term desirable use for the AOC and that existing drinking water supplies in the rest of Green Bay need to be protected.

#7. Is the identified schedule for implementation of the remedial actions reasonable?

Note that most studies are listed as a necessary step to achieve a specific action called for in a recommendation. The exceptions are monitoring studies to evaluate trends and effectiveness of remedial actions.

#8. Have the jurisdictions and agencies responsible for implementing and regulating remedial measures been identified?

We recognize the need to identify lead or responsible agencies for the plan's various recommendations. We believe that this can be best done as part of the initial implementation efforts of the plan. Secretary Besadny has invited agency, local government and citizen representations to participate on an advisory Implementation Committee. The first meeting of the committee was held on April 28, 1988. Local and state agency participants have responded very positively. WDNR has incorporated many specific RAP recommendations in its workplans for this year. We are working with other responsible agencies, through the Implementation Committee, to do the same in their workplans. We will be asking the committee to help us identify lead or responsible agencies for individual plan recommendations during the coming year.

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Attachment 2

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Carroll D Besadny
Secretary

BOX 7921
MADISON, WISCONSIN 53707

April 14, 1988 8250

Dear :

Because of your leadership and long-term interest in the Lower Fox River and Green Bay area, I invite you to participate on the Lower Green Bay and Fox River Remedial Action Plan Implementation Committee. As you may know, the Wisconsin Department of Natural Resources approved the Remedial Action Plan on February 23, 1988. The goal of the plan is to restore beneficial public uses like swimming, fishing and balanced shoreline use to the lower bay area by the year 2000. Remedial actions will also lead to improvements in the many tributaries of the Fox-Wolf River basins. Over 70 people representing a wide diversity of interests helped develop the plan.

The challenge of implementing the Remedial Action Plan now lies before us. To this end we seek your help.

Plan implementation will require the active coordination and cooperation of many interest groups and local, state and federal programs. The Department is establishing an Implementation Committee to help oversee the initial two years of this effort (please see attached materials for more information). The role of the Committee will be to: 1) advise the Department and others on plan implementation; 2) to promote cooperative efforts between government agencies and private entities; 3) to foster conflict resolution; and 4) to represent the interests of citizens, business, local government, agencies and others whose cooperation will be needed to restore and enhance the bay and river. You have been highly recommended to represent your agency or interest area.

The committee will likely meet up to six times per year with one annual public meeting. In addition, some members also may be asked to participate on one of the technical implementation subcommittees.

The first meeting of the Implementation Committee is scheduled for April 28, 1988, 2:00 - 5:00 p.m. at the Green Bay Wildlife Sanctuary Nature Center, upstairs meeting room. Please return the enclosed response form by April 15, to Victoria Harris, Plan Implementation Coordinator, to let her know if you will participate on the committee and can attend this introductory meeting.

Your ideas and actions will be vital contributions to the success of remedial efforts. We look forward to working with you to restore a healthy river and bay system that people can enjoy and that enhances both the natural environment and the economy of the lower Green Bay and Fox River area. Thank you for your help in striving for these goals.

Sincerely,

C. D. Besadny
Secretary

Attach.

cc: Victoria Harris - LMD
Lynn Persson - WR/2

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DRAFT

(For discussion on April 28, 1988)

CHARGE TO THE GREEN BAY REMEDIAL ACTION PLAN IMPLEMENTATION COMMITTEE

The Implementation Committee is established by the Secretary of the Wisconsin Department of Natural Resources to advise and assist the Department in implementing the Lower Green Bay and Fox River Remedial Action Plan. The Committee will serve for a term of two years or until a Coordinating Council is formed, whichever occurs first.

The following is the recommended charge to the committee:

1. Advise the Department (and other agencies, units of government and private organizations) on RAP implementation needs, including strategies, timing, sources of funds, available programs and coordination needs;

2. Promote cooperative efforts among governments, agencies and private organizations in managing the Lower Green Bay and Fox River ecosystem and in implementing the plan;

3. Foster conflict resolution;

4. Coordinate activities and information sharing to actively facilitate plan implementation;

5. Annually review implementation activities of organizations and individuals with implementation authority;

6. Provide an annual report to the Secretary of DNR and the public on implementation progress, the state of the bay and implementation needs for the coming three years ;

7. Help organizations obtain technical assistance and funding for implementation projects;

8. Identify and investigate conventional and non-conventional problem solving techniques for plan implementation;

9. Coordinate public information and education activities;

10. Provide opportunities for public participation in plan implementation; and

11. Represent the interests of citizens, business, government agencies and others whose cooperation will be needed to restore beneficial uses to the river and bay.

The above charge is presented for the Committee's review and discussion. It is important the Implementation Committee understand and accept their role in RAP implementation. The Committee is encouraged to review and clarify or amend the charge as appropriate, before adoption. The Department suggests that the Implementation Committee be prepared to formally adopt their charge at the next meeting.

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