
WINNEBAGO
COMPREHENSIVE
MANAGEMENT
PLAN

FEDERAL AID PROJECT FW-19-P-1

MANAGEMENT OF THE LAKE WINNEBAGO SYSTEM

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PREFACE

The Lake Winnebago System (Figure 1) is one of Wisconsin's most significant water resources. Composed of Lakes Winnebago, Butte des Morts, Winneconne and Poygan, plus their main tributary waters of the upper Fox and Wolf Rivers, the system comprises 17% of the state's surface water acreage. The lakes average 7 feet in depth, and receive water from 6000 square miles of watershed. These factors combine to result in a highly productive warm water system that is difficult to manage in the face of abundant conflicting uses. At 137,700 acres, Lake Winnebago is the state's largest inland lake. The system, located in east central Wisconsin, is within 75 miles of over 2 million people and receives heavy recreational use by boaters, anglers, swimmers, hunters and trappers. The waters of the system are also heavily used for industrial and domestic water supply, waste assimilation and disposal, and hydro power. In addition, aquatic plants such as wild celery and sago pondweed tubers are harvested commercially, and there is an active commercial set-line fishery for catfish.

Water levels of the lakes are controlled by dams located at each of the two outlets of Lake Winnebago at Neenah and Menasha. These dams date back to the 1850's, and raised the water levels of the lakes 2.5-3.0 feet to form what is known as the Winnebago Pool. The dams were originally constructed to manage water levels for commercial navigation as the system was an important trade and exploration route for early settlers. Based on historical accounts and records, the system once supported extensive growths of emergent and submergent rooted aquatic plants. The Upriver Lakes (Butte des Mort, Winneconne and Poygan) were described as river marshes rather than lakes, and Lake Winnebago was bordered by vast shallow bays and marshes. In the 1700's, the entire system supported lush stands of wild rice (Titus, 1930). Increases in water levels and subsequent management of the levels for navigation and commerce, water pollution, and other factors resulted in the loss of tens of thousands of acres of wetland habitat. Without the buffering effect of the shoreline marshes, shorelines have been eroded by wind, wave, and ice action.

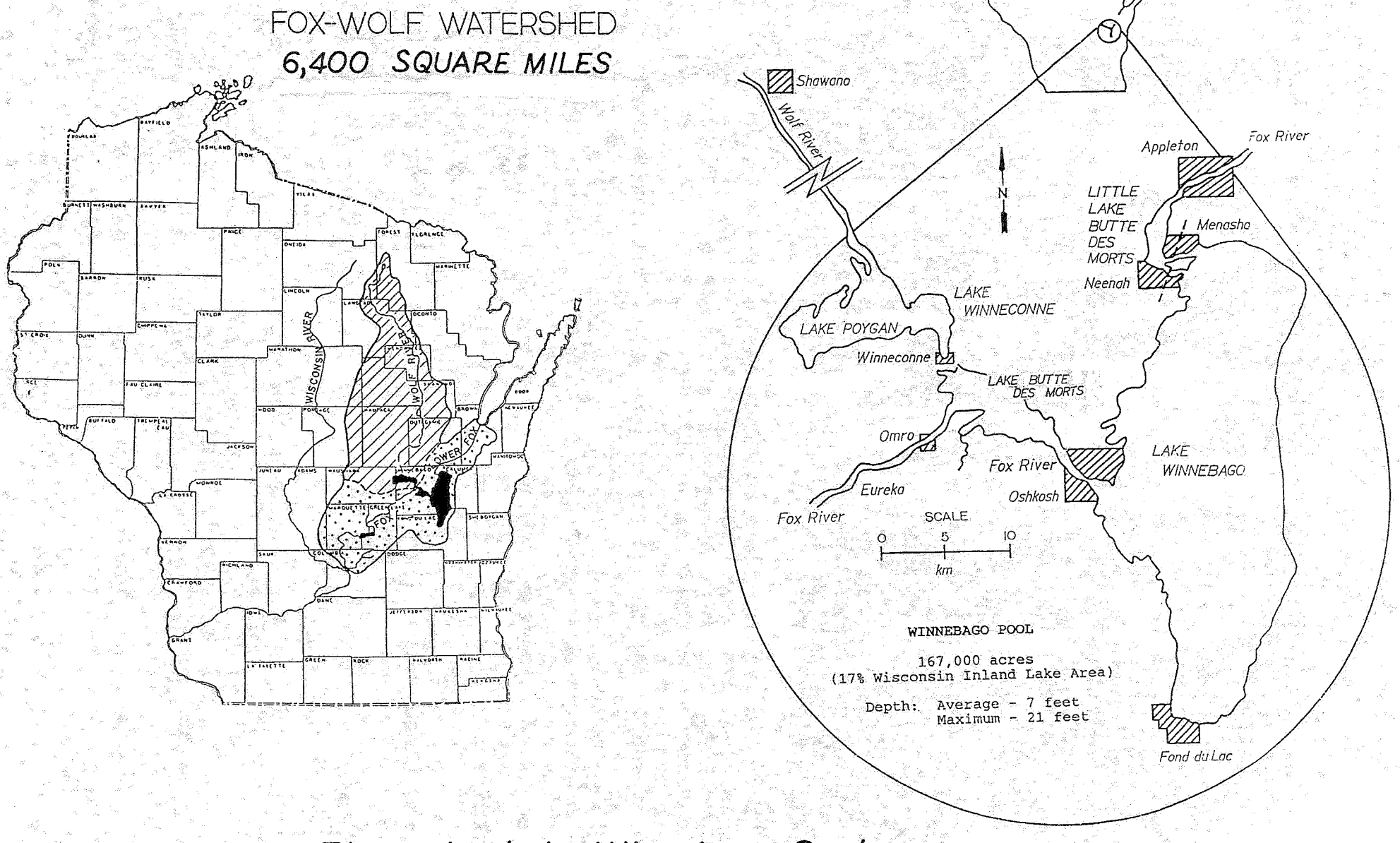

Figure 1. Lake Winnebago System

Waters of the Winnebago System have probably always been fertile, but they are now described as highly eutrophic primarily due to poor agricultural practices in the watershed. Over time, the poor land use practices have accelerated loadings of nonpoint pollution to the system in the form of excess nutrient and sediment runoff. Approximately 1.5 million pounds of phosphorus is entering the Winnebago lakes annually. With large areas of rooted aquatic plants no longer available to trap the excess nutrients, they are channeled into nuisance algal blooms. The excess algae further shade the water and impair rooted vegetation growth. Excess sediments no longer trapped and stabilized by vegetation, fill in boating channels, cover fish spawning areas, and further cloud the water.

These alterations and the resulting loss of wetland habitat have directly affected the abundance and diversity of fish and wildlife. In particular, there have been substantial reductions in duck use, especially canvasbacks, during spring and fall migrations. In the sport fishery, present habitat favors open water fish such as sheepshead and gizzard shad, while species such as northern pike, bass, yellow perch and other panfish have experienced declines.

Given the amount of use received by the resources of the Winnebago System and the long standing nature of its management problems, intensive management is needed to maintain and improve a variety of beneficial public use opportunities. Past efforts to manage the system have been hampered by the sheer size of the watershed, the complexity of ecological and use-related factors that drive the system's management, and conflicting interests among various users. The system is managed by the Wisconsin Departments of Natural Resources and Agriculture, the US Army Corps of Engineers, and by many other local, state, and federal agencies. For the most part each group has, in the past, focussed on a single issue or resource. Though valuable, these efforts were too small and narrow in perspective to result in effective holistic management of the resources of the system.

For these reasons the Winnebago Management Project was initiated to develop and implement a long range plan that would fully integrate DNR programs with those of other agencies, and, especially with the various interests of the system's resource users.

This document, the Winnebago Comprehensive Management Plan (WCMP), is the result of that effort. It is a conceptual plan that identifies resource use and management needs for the system, sets clear objectives to address those needs, and lists options for management activities. Some of the activities outlined in the WCMP are already part of either a DNR or some other agency's programs. Other activities will require various legal permits, possibly legislation, or at least further study to fully implement. Most of the activites will require some involvement

by citizens and other interested groups in the scheduling, funding or review of specific projects taken from the plan and submitted for implementation. A portion of this involvement will occur through the WCMP User (Citizens) Committee which will continue to function as a group responsible for providing imput to the DNR on the status of Winnebago System resource management. Implementation of various management options, over time, should move the resource stakeholders collectively towards accomplishing the objectives stated in this plan.

Approved 5 September 1989:

Henry Liebzeit, Chair WCMP User Committee

Melvin Wickert, Co-Chair WCMP User Committee

Charles Higgs, DNR Lake Michigan District Director

Carroll Besadny, DNR Secretary

Goal of the Winnebago Comprehensive Management Plan:

TO RESTORE, IMPROVE, AND MAINTAIN THE ECOLOGICAL DIVERSITY AND QUALITY, AND BENEFICIAL USES OF THE FISH, WILDLIFE AND WATER RESOURCES OF THE WINNEBAGO SYSTEM.

CONTENTS

This document is divided into three major sections:

Objectives and Management Options,
Problems, and
the Planning Process,

to clearly show what management course is proposed for the Winnebago System resources, why this course is proposed, and how it came to be proposed.

OBJECTIVES AND MANAGEMENT OPTIONS

Resource stakeholders with an interest in the Winnebago System developed the following management course for the system. After extensive public discussion, objectives for the management and use of the system's resources were produced, followed by the development of lists of management options. Some of the options will require legal permits, legislation or at least further study to be be realized. (Options that will probably require legal permits are marked with a **(#)** in the text.) Implementation of management options though, over time, will move the resources of the system towards the desired state identified in the objectives.

OBJECTIVES ARE NUMBERED, UNDERLINED, AND IDENTIFIED AS BEING IN ONE OF THE THREE FOLLOWING PRIORITY CATEGORIES:

Critical (C)

Work necessary to protect and enhance the system's fish, wildlife, and water resources, and the associated reasonable use of those resources, which addresses the main problems that limit resource quality and quantity.

Important (I)

Work having a high impact on programs or resources which involve fish, wildlife and water management or use.

Moderately Important (M)

Routine work involved in the management of the system's resources, or the use of those resources.

TARGET DATE FOR OBJECTIVES IS THE YEAR 2000 UNLESS OTHERWISE NOTED

I. FISH AND WILDLIFE POPULATIONS AND HABITAT

1.0 HABITAT

1.1 C Increase quality fish and wildlife habitat on the pool lakes.

1.2 C Increase the relative abundance of desirable submergent and emergent aquatic macrophyte beds by 100%, including an increase in wild celery beds in the Upriver Lakes from 280 to 800 hectares (700-2000 acres).

1.3 I Increase desirable macroinvertebrates (Pelecypoda, Gastropoda, Ephemeroptera, Chironomidae) densities in April and October to 8000-10,000 per square meter.

Management Options:

a. **rebuild channel boundaries of the Fox River where it enters Lake Butte des Morts, the Wolf River through both the Boom Cut and the original mouth, and also the Wolf River channel between Lake Poygan and Lake Winneconne (the Hindenburg Line) (Figure 2 & 3) (#)**

   (Boundaries would be a series of breakwalls, windbreaks, and dikes that would enclose and/or protect designated "Habitat Restoration Areas". Legislation authorizing construction has been drafted and an Environmental Impact Statement is being prepared evaluating the proposed structures.)

b. **construct waterfowl nesting islands and shoals within Upriver Lakes Habitat Restoration Areas using clean dredge spoils taken from adjacent navigational channels (#)**

c. **construct an island (suggested name: Harris Island) in Lake Winnebago on the northern tip (Long Point Reef) (Figure 4) to provide additional rock and vegetation littoral habitat, and to provide a permanent navigational marker (#)**

d. **reconstruct and armor Nelson's Point on the Wolf River at Fremont to prevent further loss of wetland habitat at the entrance to Partridge Lake, and to redevelop an adequate navigational channel adjacent to the point (#)**

e. **identify habitat management needs of the upper Fox and Wolf River walleye and northern pike spawning marshes and**

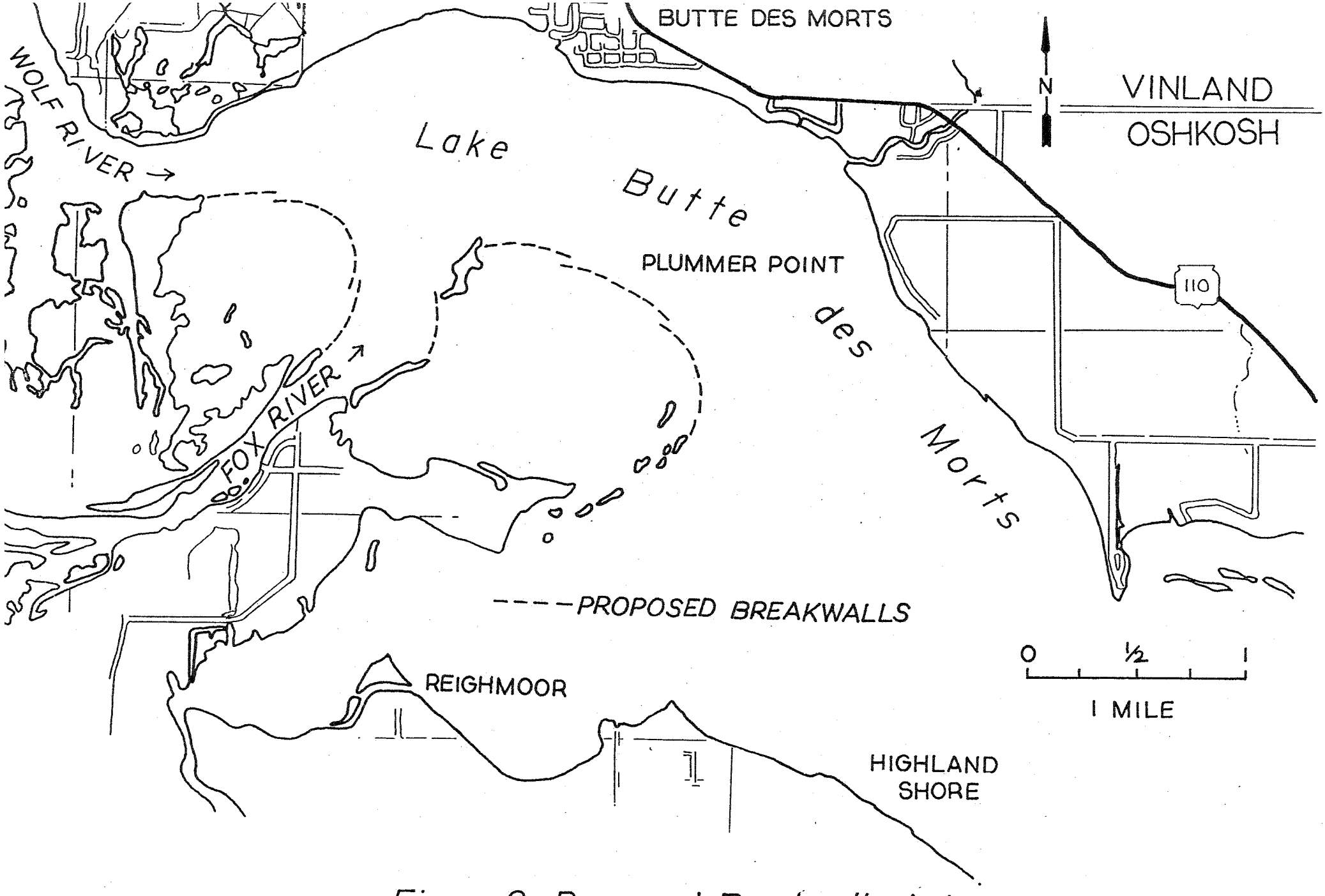

Figure 2. Proposed Breakwalls, Lake Butte des Morts

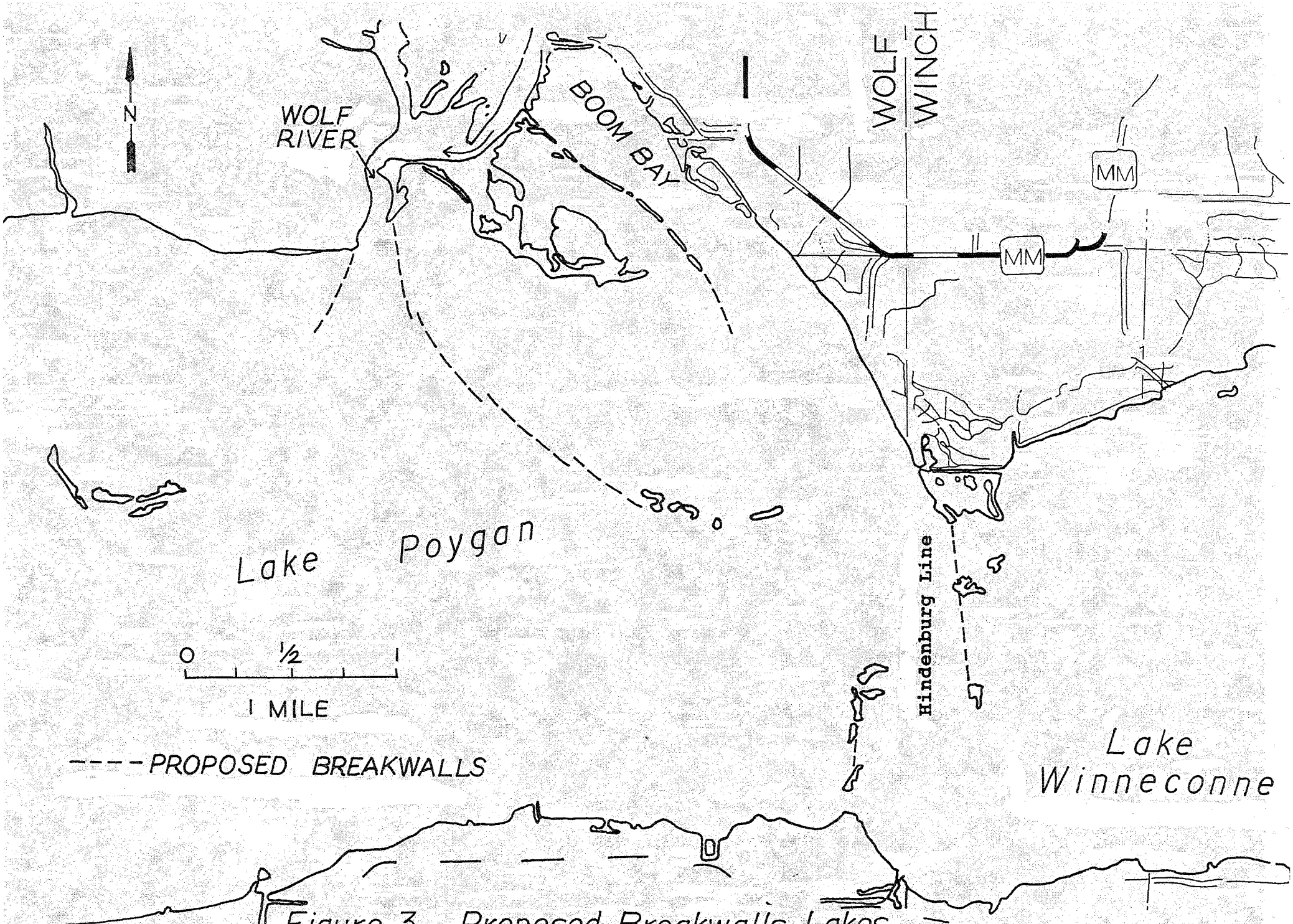

Figure 3. Proposed Breakwalls, Lakes Poygan and Winneconne

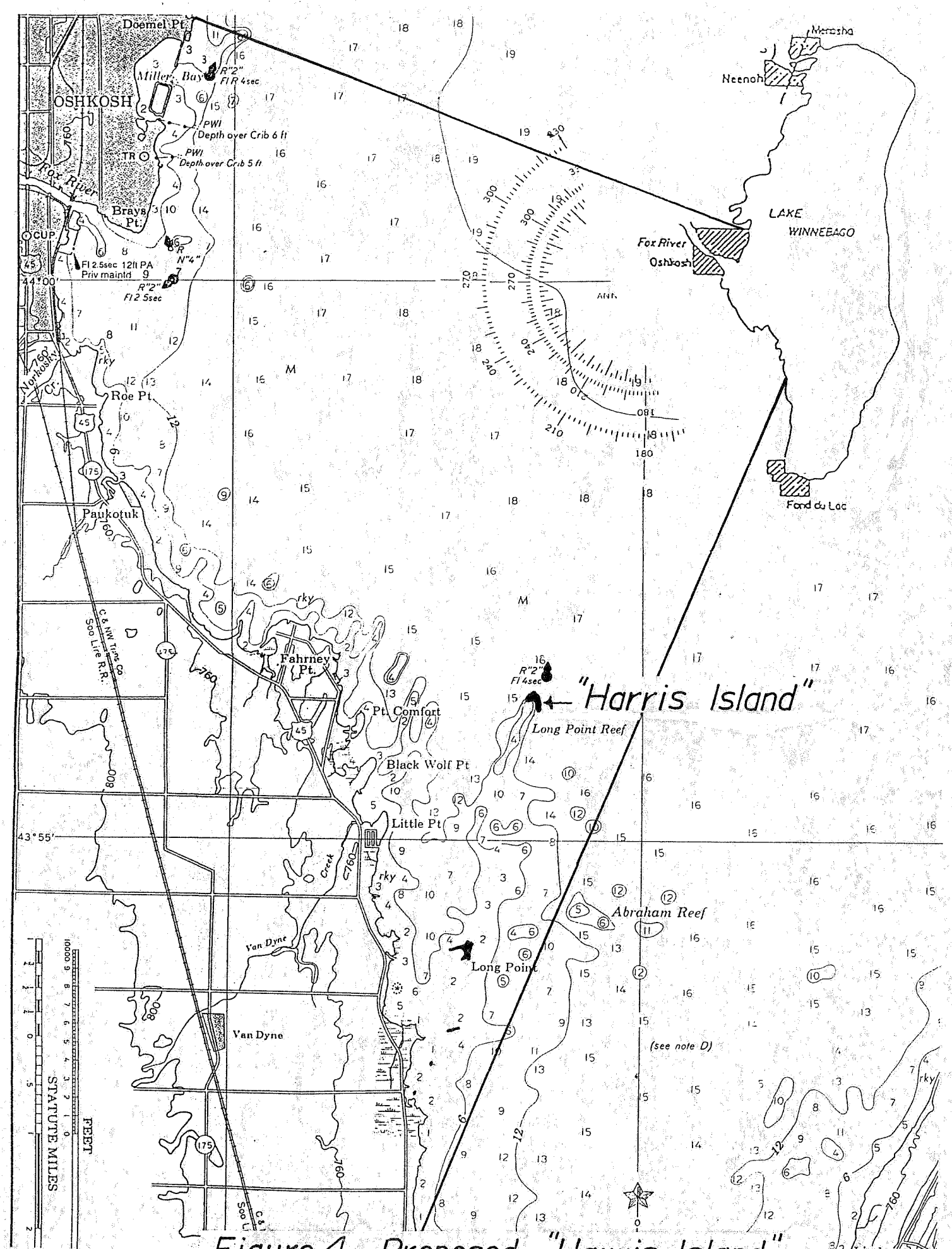

Figure 4. Proposed "Harris Island"

implement management actions through joint DNR/landowner/sportsmen's clubs efforts

f. survey and monitor aquatic macrophyte abundance and distribution on pool lakes

g. plant desirable macrophyte species in designated habitat restoration areas

h. determine the impact of aquatic plant harvesting on macrophyte communities and water quality and make necessary management and regulation recommendations

i. control local carp populations through spot treatment, removal, fish traps, attractants, etc.

j. determine the feasibility of purple loosestrife control and the impact of accelerated colonization within system wetlands

k. legislate tax incentives/cost sharing for private wetland/marsh management activities for fish and wildlife habitat improvement, including riprapping

purchase critical habitat 7.1 a-d

nonpoint pollution abatement 9.0 a-y

minimize human vs habitat/wildlife conflicts 16.2 b-e

2.0 WATER LEVELS

2.1 C Develop an acceptable water level management regime that maximizes the system's potential to produce aquatic habitat, while balancing the system's various resource users' needs, by the year 1991.

Management Options:

a. continue the Corps of Engineer's Water Level Management Work Group to allow participation of the various water level interests in discussion and implementation of the best possible, and most acceptable water level management regime for the pool

b. change the summer target for pool water levels

from 3.0' Oshkosh Gauge (15.8 inches over crest of Menasha dam)
to 2.85' (14.0 inches) (the actual achievable stable summer level)

c. determine feasibility of reducing the winter drawdown range

from 1.0' - 0.6' (8.0 - 12.0 in. below the crest)

to 1.3' - 1.0' (4.6 - 8.0 in. below the crest)

(less severe winter drawdown and a return to pre 1983 winter drawdown levels) to minimize adverse effects of extreme dewatering of marshes on vegetation and furbearers, and facilitate spring filling of the pool to the summer target level)

d. implement a public information/education program to describe the background, reasons, restrictions, limits and complexity of, and responsibilities for, water level management and its biological and social impacts on the Winnebago System

e. install electronic or staff gauge stations at Fond du Lac and Menasha, and hire or enlist volunteer staff gauge readers at Tustin and Winneconne

f. model the relationships between water levels of the Upriver Lakes, the lower Wolf River, and Lake Winnebago to determine impacts of various levels on habitat, lake and river front property, boating, and municipal and industrial water users on the pool and lower Fox River

g. evaluate the impact of existing upper Fox River low head dams on flood mitigation

h. create a cooperative flood management work group between Omro, Berlin and other interested municipalities

i. dredge channels so boats can tolerate naturally occurring lower water levels (#)

3.0 FISHERIES

3.1 C <u>Prevent sea lamprey and other exotic fish species from entering the Winnebago System by 1989.</u>

Management Options:

a. **create a fish barrier at Rapide Croche lock and dam**

(Note: In 1988 the Corps of Engineers closed the Rapide Croche lock, modified the sluice gates on the dam, and installed spillway modifications to complete the barrier.)

b. **continue lamprey and other exotic fisheries surveillance below the barrier at Rapide Croche**

3.2 I Develop and define biomass estimates for Lake Winnebago fish populations, determine relative abundance of populations in the Upriver Lakes, and identify the system's fisheries management stocks/areas by 1995.

Management Options:

a. **conduct an annual standard fish community assessment of Lake Winnebago fish populations**

b. **determine the relative abundance of fish species in the Upriver Lakes habitat restoration areas**

3.3 I Manage the Lake Winnebago lake sturgeon population at the current level of 1 adult per 6 acres, and develop, by 1991, lake sturgeon management objectives for the Upriver Lakes.

Management Options:

a. **continue to estimate size of the Lake Winnebago adult sturgeon population every five years**

b. **determine the population dynamics of lake sturgeon in the Upriver Lakes**

f. **riprap critical habitat and sturgeon spawning areas (#)**

3.4 I Determine current population dynamics of Winnebago System walleye and sauger populations and expand active management program by 1991.

Management Options:

a. **review historic walleye and sauger abundance, harvest, growth and recruitment data**

b. **develop assessment procedures to provide annual estimates of relative abundance of adults, year class strength, and growth and mortality rates**

c. **determine the habitat enhancement needs of walleye spawning marshes on the Wolf and upper Fox Rivers**

d. **determine the impact of angling effort and boat traffic on concentrations of saugers on nearshore spawning areas of Lake Winnebago, and on walleyes on upstream spawning marshes**

g. **construct a fishway at the Eureka Dam on the upper Fox River to allow the migration of walleyes, and other important fish species, to their traditional upstream spawning areas, and facilitate movement of fry downstream (#)**

(Note: The fishway was constructed in 1988 with Federal Dingel-Johnson funds and is currently fully operational. Walleyes freely used the fishway during the 1989 spring run reaching traditional spawning areas above Berlin.)

3.5 I Increase the annual removal of sheepshead from Lake Winnebago from current 1.5 million pounds to 3.5 million pounds by 1990.

Management Options:

a. **work with commercial fisheries interests to develop gear, markets, and other incentives to increase commercial removal of sheepshead from Lake Winnebago**

b. **establish future, post 1990, sheepshead removal levels using recommendations of current Lake Winnebago fisheries community assessment**

3.6 I Increase the northern pike population in the Upriver Lakes to 3 adults per acre, and the yellow perch population of fish larger than 8 inches from the current 5 fish per acre to 20 fish per acre in the pool.

Management Options:

a. stock northern pike to re-establish viable population if adequate recruitment does not occur naturally

maintain higher winter pool water levels 2.1 c

construct breakwalls in Upriver Lakes 1.0 a

enhance spawning marsh habitat 1.0 e

plant aquatic vegetation 1.0 g

remove more sheepshead 3.5 a

reduce nonpoint pollution 9.0 a-y

eliminate carbon monoxide kills on Fox River 10.1 a

restrict public access into spawning marshes 16.2 c

3.7 I Develop angler exploitation estimates by 1993.

Management Options:

a. develop and implement a system wide creel census (2 year creel census was implemented in January 1989)

b. review set line harvest and impact on Winnebago System fish populations

3.8 C Determine the impact of currents generated by the Mercury Marine Test Facility on Fox River fish populations, by 1990.

Management Options:

a. determine the impact of current from motors at the Mercury Marine Test Facility on fish attempting to use the Fox River corridor through Oshkosh, and use study results to make appropriate management recommendations

4.0 WILDLIFE

4.1 I Increase diving duck use days, in both spring and fall on Lake Winnebago from 70,000-100,000 to 500,000 annually,

and on the Upriver Lakes from 50,000-70,000 to 400,000 annually.

4.2 I Increase local production of dabbling ducks by 500%.

4.3 I Increase migrant dabbling duck use days on the Winnebago Pool by 500%.

Management Options:

a. monitor trends in duck activity

b. determine extent of local dabbling duck breeding

maintain stable summer pool water levels 2.1 b

maintain higher winter pool water levels 2.2 c

construct breakwalls in Upriver Lakes 1.0 a

create shoals and waterfowl nesting islands 1.0 b

plant aquatic vegetation 1.0 g

purchase critical habitat areas 7.1 a-d

reduce nonpoint pollution 9.0 a-y

create seasonal open water refuges 16.2 b

minimize human vs habitat/wildlife conflicts 16.2 d

5.0 ENDANGERED RESOURCES

5.1 I Maintain an annual breeding population on the Winnebago Pool Lakes, of at least 260 pairs of Forster's terns and 100 pairs of common terns, with an average annual production of 1 young per nesting pair.

Management Options:

a. conduct annual surveys of nesting pairs, determine young production and recruitment, limiting factors, and feeding habitat requirements (consult statewide Forster's and common tern recovery plans for implementation details)

b. develop cooperative agreement with landowners to allow limited management of common tern nesting habitat (manipulation of herbaceous and woody vegetation on

island sites), and to discourage visits to island colony sites from May 1 to August 15

c. place artificial nesting platforms for Forster's terns at key Upriver Lakes locations to maintain population of 260 nesting pairs:

* 100 to 200 at Poygan E, W and WW (east cane beds)
* 50 to 150 at Clark's Point (Hindenburg Line cane beds)
* 20 to 60 at Terrell's Island

d. maintain stable water levels during critical nesting and hatching periods, May 1 - August 15

e. limit human access to, and disturbance of nesting and foraging habitats from May 1 to August 15

f. monitor stability of cane beds (Phragmites australis)

create shoals and waterfowl nesting islands 1.1 b

6.0 TOXIC CONTAMINATION OF FISH AND WILDLIFE

6.1 I Determine the extent of toxic contamination and disease in the system's fish and wildlife populations by 1990.

Management Options:

a. periodically monitor contaminant levels in ducks and key sport fish species (e.g. walleye, sheepshead, sturgeon and catfish)

eliminate carbon monoxide kills on Fox River 10.1 a

test sediments for contaminants 11.0 g

7.0 LAND ACQUISITION

7.1 I Inventory and acquire critical fisheries and wildlife habitat areas within the system, and reevaluate acquisition priorities and activities by 1991.

Management Options:

a. review DNR acquisition priorities for Winnebago area

b. create an acquisition project for the Upriver Lakes Habitat Restoration Program

c. purchase other critical habitat areas in existing acquisition projects on the system

d. work with private clubs and foundations to provide acquisition moneys, set aside critical private lands, etc.

e. create computerized data base of critical habitat areas and acquisition plans

8.0 RESOURCE INFORMATION MANAGEMENT

8.1 I Develop a Winnebago resource information management system to coordinate system wide data gathering, compilation and assimilation by 1991.

Management Options:

a. work with the DNR Bureau of Information Management and other programs to develop a Winnebago Geobased Information System (GIS) using the new computer work station donated by Sturgeon for Tomorrow

b. have local, regional, state and federal agencies work jointly wherever possible to collect and merge resource information such as land use, wetlands, ownership, flood plains, land cover, topography, etc

c. develop an information library of relevant reports and data

II. WATER QUALITY

9.0 NUTRIENT AND SEDIMENT POLLUTION

9.1 C Decrease phosphorus loadings to the system by 33% from 1.5 to 1.0 million pounds annually to achieve an average in-lake summer total phosphorous concentration of 90 ug/l.

9.2 C Increase average summer water clarity to achieve an average summer Secchi disc reading of 1.0 meters on the Winnebago Pool, with a reading of 1.7 meters in critical habitat areas on the Upriver Lakes.

9.3 I Decrease algal populations in the pool to achieve a summer average chlorophyll level that remains below 35 ug/l.

9.4 C Reduce suspended solids to achieve a concentration of 10 to 12 ppm in critical habitat areas of the pool.

Management Options:

a. by the year 2000 implement large and small scale nonpoint source Priority Watershed projects in:

Large Scale (> 10 sq. miles)

Upper Fox River Basin

Barnes Creek	25.0 sq. miles
East Branch Fond du Lac River	77.1 sq. miles
Eight Mile/Rush-Waukau Creeks	16.6 sq. miles
Lake Winnebago East	80.1 sq. miles
Neenah Creek/Mason Lake	177.0 sq. miles

Wolf River Basin

Embarrass River Basin	251.0 sq. miles
Middle Wolf River Basin	127.5 sq. miles
Pigeon River Basin	114.5 sq. miles
Walla Walla Creek Basin	97.0 sq. miles

Small Scale (< 10 sq. miles)

Upper Fox River Basin

Big Lake Butte des Morts	6.2 sq. miles
Daggets Creek	8.4 sq. miles
Lake Winnebago West	6.4 sq. miles
Little Green Lake	2.8 sq. miles
Rush Lake	8.4 sq. miles

Wolf River Basin

Arrowhead River Basin 8.2 sq. miles

b. implement an "urban composite" nonpoint source Priorty Watershed project encompassing the areas within the civil boundaries of Fond du Lac, Oshkosh, Neenah, and Menasha

c. maintain natural drainageways and wetlands instead of storm sewers and pipes, wherever possible, especially in urban fringe areas

d. establish a natural area/green belt along Sawyer Creek in City of Oshkosh and Town of Algoma from Highway 41 upstream

e. control upland soil erosion and sediment delivery through implementation of best management practices (BMP) for water quality, that also maximize the production of upland habitat and wildlife

f. establish lake/river green belts/buffer strips, with emphasis for implementation through the new greenbelt provisions of the Conservation Reserve Program (CRP).

g. encourage enrollment of highly erodible land into CRP

h. implement county soil erosion and animal waste control plans

i. make buffer strips a BMP under NR 120

j. restore upstream macrophyte growth and wetlands (perched and streamside) to filter out solids and nutrients

k. riprap and armor shorelines to control bank erosion (#)

l. apply agricultural and urban fertilizers more efficiently and incorporate animal waste into UW-Extension formulas for fertilizer application

m. adopt county/municipal soil erosion, construction site erosion, and animal waste control ordinances

n. adopt a statewide mandate that requires urban stormwater management planning for all development projects in urban areas including mandatory on-site construction erosion control in all sensitive areas, conservancy areas, and flood plains

o. charge a fee as part of the cost of a building permit to pay for on site stormwater management planning (charge back similar to charge backs for sewers and roads)

p. increase application and/or granting fees for chapter 30 permits for operations that may have a negative impact on local water quality (eg. impact of dredged side channels)

q. use shoreland zoning ordinances for all lands that have the potential to increase nonpoint pollution, especially pasturing, row cropping and manure storage

r. adopt legislation to prevent/restrict pasturing of livestock adjacent to all navigable surface waters

s. implement a statewide regulatory nonpoint program (Act 297 and NR 243)

t. provide an educational program on stormwater management for county and city planners, engineers and other interested persons, through joint effort by DNR and UW-Extension

u. preserve environmentally sensitive areas identifed in sewer sevice area plans for the subbasins of the Fox-Wolf watershed

v. implement a neighbor to neighbor land conservation/nonpoint abatement program

w. create a conservation easement program to protect streambanks through the DNR

x. determine cost of requiring small sewage treatment facilities (pop < 2500) to remove phosphorous down to 1 ppm and the potential impact on phosphorous load reduction and development

y. complete sewer system installation around the Winnebago Pool lakes

maintain stable summer pool water levels 2.1 a

construct breakwalls in Upriver Lakes 1.2 a

reduce the carp population 1.2 i

10.0 FOX RIVER FISH KILLS

10.1 C Eliminate carbon monoxide pollution of the Fox River at Oshkosh, and its acute and latent affect on system fish populations by April 1, 1989.

Management Options:

a. establish water quality standards for carbon monoxide and work with the source(s) to correct the problem on the Fox River at Oshkosh

determine impacts of currents from test motors 3.4 a

11.0 WATER QUALITY MONITORING

11.1 C Gather the appropriate Winnebago-Fox-Wolf system nutrient and sediment loading information to allow reevaluation of the WCMP water quality objectives by 1993

11.2 I Establish a well testing program to determine basin groundwater quality, by 1993

Management Options:

a. Implement water quality monitoring study to determine phosphorous inputs and outputs of the system, determine and quantify various phosphorous interactions within the system (phosphorous retention, recycling, pathways, etc.), and develop trophic model for the Winnebago System

b. monitor site specific changes in water quality as a result of implementation of habitat restoration efforts on the Upriver Lakes

c. develop groundwater quality monitoring program by testing rural well water samples for nutrients, volatile organic compounds, pesticides, etc.

d. determine the impact of dredged side channels on water quality of channels and receiving lake or stream

e. organize and implement a Self-Help Lakes Water Quality Monitoring Program on the system

(Note: The Upper Lakes Fishing Club has already volunteered for a self help program, formed a monitoring team for each of the Upriver Lakes and began collecting data in the summer of 1988.)

f. develop sediment delivery model for the Winnebago Watershed, in cooperation with Soil Conservation Service, through a graduate school program

g. initiate sampling program to test sediments in primary navigational channels for presence of toxics

12.0 WATER QUALITY STANDARDS

12.1 I Manage the water resources of the system to ensure continued maintenance of:

- dissolved oxygen concentrations at or above 5ppm
- clean surface drinking water supply
- full body contact standards

Management Options:

a. **strictly enforce waste storage and disposal by boats, especially in area marinas**

b. **maintain consistent funding for the Wisconsin Fund Septic System Grant Program**

nonpoint pollution abatement 9.0 a-y

eliminate carbon monoxide kills on Fox River 10.1 a

III. RESOURCE ADMINISTRATION AND USE

13.0 SYSTEM MANAGEMENT

13.1 C Promote the participation and coordination of management and regulatory entities with responsibilities for the protection and enhancement of the system's resources.

13.2 I Promote a regulatory strategy governing the system's resources which emphasizes uniformity of laws, regulations and ordinances.

13.3 I Develop mechanisms to provide informational summaries on Winnebago-Fox-Wolf system boating regulations, land use/zoning ordinances and regulations, resource management and planning activities, etc., by 1990.

Management Options:

a. **create two full time positions within the DNR, a Winnebago System Biologist and an Assistant Winnebago Biologist, to:**

* drive implementation and future updating of the WCMP

* coordinate and integrate Department functions, and administer selected projects on the Winnebago System

* continue to facilitate cooperation between other local, state and federal entities with responsibilities for Winnebago System resource management and use

* continue to work with users on system to ensure maintenance of adequate information exchange and public input into the resource management decision making process

b. publish a regional newsletter on system management activities

c. standardize, where possible, state legislation, boat speed limits and zones on the system, shoreland zoning ordinances, taxing schemes (one county taxes riprap, another not), fishing regulations, information on system's navigational channels, and marked restricted areas

d. have local units of government in all counties on the pool coordinate a uniform boat fee schedule for accesses, and examine other areas where programs could be coordinated

e. organize a coordinating council of jurisdiction and agency personnel and citizen resource interests involved in management and regulation of system's resources

f. provide close coordination and communication between implemetation and updating of various resource management plans developed for the Winnebago-Fox-Wolf System (WCMP, Green Bay Remedial Action Plan, Regional Planning Commission Fox River Long Range Plan, Wolf River Basin Plan, Upper Fox River Basin Plan, County Animal Waste and Soil Erosion Control Plans, and the Fox Valley Water Quality Planning Agency Areawide Water Quality Management Plan)

14.0 PUBLIC INVOLVEMENT AND EDUCATION

14.1 I Ensure that public involvement is maintained throughout implementation of the WCMP.

14.2 I Improve public awareness of the resource and use concerns, and management of the Winnebago System.

Management Options:

a. maintain functioning User Committee to continue to meet at least once a year to receive a WCMP implementation progress report from the project coordinator, and to ensure new user issues are addressed in system management activities and in the WCMP citizens participation process

b. hold regular public information exchange meetings throughout the region to discuss management of the system with state and local management authorities

c. implement a Winnebago Ecosystem Education Program, coordinated with Project Wild, to bring the local experience of the Winnebago resources into the school systems of the region

d. secure a volunteer coordinator, to work through the User Committee, to mobilize, guide and expand public volunteer efforts on system projects

e. produce videos of the WCMP experience - planning, public participation, resource base and use, implementation projects, local volunteer and financial support, to be used for making presentations to government officials, civic organizations, DNR training sessions, etc.

f. conduct periodic surveys of various user groups

g. provide opportunities for clubs and organizations to actively participate in implementation of various management projects

h. utilize existing public information/education programs such as UW Extension and CESA

publish newsletter on system management activities 13.3 b

implement a neighbor to neighbor conservation program 9.0 w

conduct workshops on stormwater management 9.0 u

create citizens Navigation Committee 17.0 a

15.0 PUBLIC ACCESS

15.1 I Evaluate the ability of present access and public use areas to facilitate use by all users, including disabled individuals, and make access and public area development recommendations by 1991.

Management Options:

a. continue to evaluate access needs on the system with the public and support feasible access development proposals including:

b. developing a centrally located, protected boat access on the east shore of Lake Winnebago (#)

c. constructing fishing pier breakwaters at the mouth of the Fond du Lac River (#)

d. developing the DNR owned Pony Creek remnant area near Tustin into an accessible shore fishing area through a joint DNR-Waushara County effort

e. expanding the Town of Poy Sippi Access on Lake Poygan to allow for parking of vehicles and trailers off the town road

f. redeveloping the Fox and Hounds Park in Omro for expanded boat launching and shore fishing (#)

16.0 USER CONFLICTS

16.1 C Minimize dangerous and destructive boat use, and boating accidents on the system.

16.2 C Eliminate/minimize environmental and property damage on the system due to boat, snowmobile and ATV traffic.

Management Options:

a. require mandatory boat safety training and certification for all persons born after January 1, 1971

b. create two open water refuges for diving ducks on Lake Poygan and one on Partridge Lake

c. create fish refuges during spring spawning runs on all state owned, and with the cooperation of landowners, on privately owned walleye spawning marshes on the system

d. limit human access into sensitive/critical wildlife use/habitat areas

e. restrict snowmobile and ATV traffic into phragmites (cane) beds

17.0 NAVIGATIONAL CHANNELS

17.1 I Develop and maintain navigational channels within the pool lakes, on the upper Fox River to Berlin, and on the Wolf River to New London, at a minimum depth of 4 feet.

17.2 I Develop a formal navigation aids program and authority responsible for the Winnebago-Fox-Wolf Waterway by 1991.

Management Options:

a. create a Winnebago System Navigation Committee (comprised of boating, angling, environmental, business, and marina interests) to advise Corps of Engineers and other government decision makers, on channel maintenance and navigational aids on the Winnebago Pool

b. dredge the mouth of the upper Fox at the west end of Lake Butte des Morts, Boom Cut in Lake Poygan, Brothertown Harbor, Calumet Harbor and Fond du Lac River mouth, and Fond du Lac Lighthouse Harbor entrance (#)

c. create a cross jurisdictional Winnebago Waterway Navigation Authority resposible for navigation aids and channel maintenance

test dredge sediments for toxics 11.0 g

construct breakwalls in Upriver Lakes 1.0 a

construct an island on Long Point Reef 1.0 c

18.0 ECONOMIC IMPORTANCE OF SYSTEM RESOURCES

18.1 I Encourage economic development and opportunity through responsible management and use of the system's fish, wildlife and water resources.

Management Options:

a. Work with area local governments, business organizations, chambers of commerce, and tourism departments to document the economic importance and value of the system's resources to recreational boating, fishing, sturgeon spearing, waterfowl hunting, and other beneficial uses, and encourage balanced resource use

b. conduct surveys of local businesses to determine attitudes towards and dependance upon system's resources

PROBLEMS AND INFORMATION NEEDS

The following resource issues and problems were used to develop the WCMP management and use objectives.

I. FISH AND WILDLIFE POPULATIONS AND HABITAT

HABITAT QUALITY

Aquatic habitat changes have occurred over the last 100 years as a result of impoundment, water level management strategies, nonpoint pollution, and other factors. The most significant change was the loss of aquatic vegetation from the system which has drastically affected the quality of fish and wildlife habitat.

*** Loss of the shoreline marshes and the deepwater emergent and submergent vegetation beds limits the abundance of waterfowl, waterbirds, furbearers and desirable fish species.**

*** Loss of aquatic vegetation accelerates the decline of water quality**

The disappearance of large amounts of aquatic vegetation has resulted in a loss of fish and wildlife habitat or a reduction in habitat quality in many areas of the Winnebago system. Important factors contributing to the decline of aquatic vegetation in the Winnebago Pool include high and fluctuating water levels, declining water quality, and the direct physical impact of waves and rough fish feeding and spawning activities (Harriman 1970, Harrison 1970, McKee and Laudon 1972, Laumer 1977, Sloey and Spangler 1977). Currently, poor water clarity due to suspended sediments and algae is the greatest factor limiting vegetation growth (Kahl, 1988). The decline in the abundance of aquatic vegetation has led to a subsequent decline in the number and abundance of many wetland wildlife species.

The Winnebago Pool, especially the Upriver Lakes and their adjacent marshes, provided abundant, high quality habitat for breeding and migrating waterfowl and other waterbirds, furbearers, and a diverse warmwater fishery through the late 1950s (Figure 5). By the mid to late 1960's, most of the in-lake vegetation and much of the adjacent marshland had disappeared, and waterfowl use of these lakes declined dramatically (Kahl, 1988). Emergent vegetation is important to many species of breeding waterfowl and waterbirds, including the state endangered Forster's tern. It provides cover and nesting materials, habitat for such foods as invertebrates and small fish, and seeds for migrating waterfowl. Submergent vegetation provides food directly as seeds, tubers, and vegetative material, and indirectly as habitat for invertebrates used by waterfowl and waterbirds, especially migrating canvasbacks and other diving ducks. Muskrats depend on emergent vegetation for cover, lodge building materials, and food. Mink benefit from emergent vegetation for cover, and from the production of muskrats, an important mink food source. Fish populations, especially a bass-northern pike-panfish community, benefit from emergent vegetation

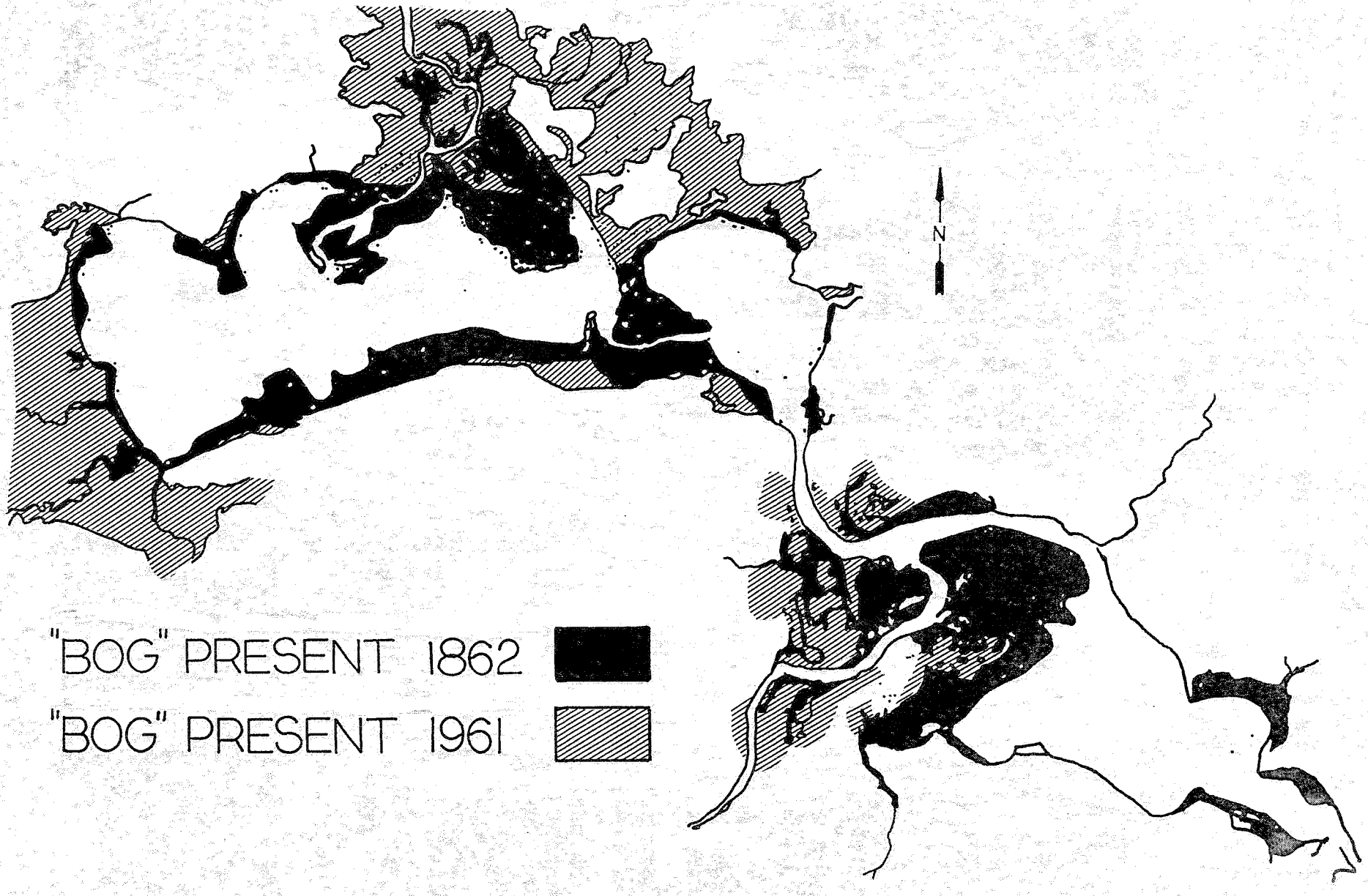

Figure 5. "Bog" Marsh Loss Upriver Lakes, 1862-1961

spawning sites, cover, and food production areas.

The loss of aquatic vegetation accelerates the decline of water quality by:

exposure of unstable sediments, organic detritus and nutrients for resuspension by waves

increased wave action due to loss of breakwater effects of aquatic vegetation

greater availability of nutrients to phytoplankton

reduction of game fish populations allowing unchecked growth of rough fish populations

*** Excessive winter dewatering of the system decreases the quantity and quality of muskrat habitat.**

(See Water Level Management narrative on page 29)

*** Too much open water and the shallow nature of the lakes favors warmwater pelagic species such as sheepshead and gizzard shad.**

*** The system does not provide adequate spawning, nursery, and food production habitat for all of the desirable fish species.**

Some fish populations, such as walleye, sauger and lake sturgeon, have continued to maintain relatively stable numbers in spite of deterioration of the system's water quality and habitat. Others like sheepshead, white bass and gizzard shad have thrived as a result of the changed conditions, while some, such as northern pike, largemouth bass, panfish and muskellunge, have experienced significant reductions in numbers. The current status of each species is a result of its response to habitat changes occurring during the last 80 years. The loss of vegetation on the Upriver Lakes has significantly diminished the ability of those waters to support their traditional bass-northern pike- panfish assemblage.

*** Low-head dams impact migration of fish**

Low-head dams, especially during low water level years, prevent or inhibit the migration of spawning adults to traditional upstream spawning sites. On the other hand, when water velocity is high, low-head dams such as the Eureka Dam, can be very detrimental to fry which can be killed either as the pass over, or are trapped in the eddies below the dam.

WATER LEVEL MANAGEMENT

Aquatic habitat changes have occurred over the last 100 years as a result of impoundment and water level management strategies which annually allowed a rapid water level increase in spring and early summer, resulting in relatively high levels on the pool, subsequently followed by gradually decreasing levels into late fall, and a drawdown in winter.

*** A water level management strategy adopted in 1983 is suspected of inhibiting the restoration of wetland habitat, and having a negative impact on fish and furbearer populations**

*** Legal and social restrictions limit the extent to which the water levels can be manipulated for fish and wildlife interests alone**

Water levels on the pool have been managed by the Corps of Engineers since the late 1800's for commercial navigation. Current pool water levels during the summer are approximately 2.5 to 3 feet higher than naturally occurring levels (prior to dam construction), and 5 to 12 inches higher in the winter (Figure 6). The Corps is required by law to maintain levels within seasonal maximums and minimums, 3.45 ft. on the Oshkosh Gauge (21.25" over the crest of the Menasha dam), and -0.3 ft. (24" below the crest) respectively. Effective management of fish and wildlife habitat could be accomplished within these limits. The actual acceptable degree of water level manipulation though, is influenced by the water quantity needs of industries on the lower Fox River, the water supply needs of the City of Oshkosh, and the demands of boaters, lakeshore property owners, an other interests on the pool.

Negotiations between the industries, the Fox Valley Water Quality Planning Agency, and the Department of Natural Resources, determined wasteload allocations for the lower Fox River. These allocations divide up the natural capacity of the river to assimilate waste products between various dischargers on the river. Wasteload allocations become more restrictive with lower flows and higher water temperatures from May through October. These flows are maintained by releasing water stored in the Winnebago Pool during low inflow periods (especially late summer when water temperatures are high). The City of Oshkosh, along with other municipalities, uses Lake Winnebago as a source of drinking water. If the water level goes below 2.7 ft on the Oshkosh gauge (12.8 inches over the crest of the Menasha dam) in late summer, a potential water shortage occurs as the Oshkosh water works is unable to draw an adequate quantity of raw water into the algae pre-treatment pond (Tom Konrad, personal communication).

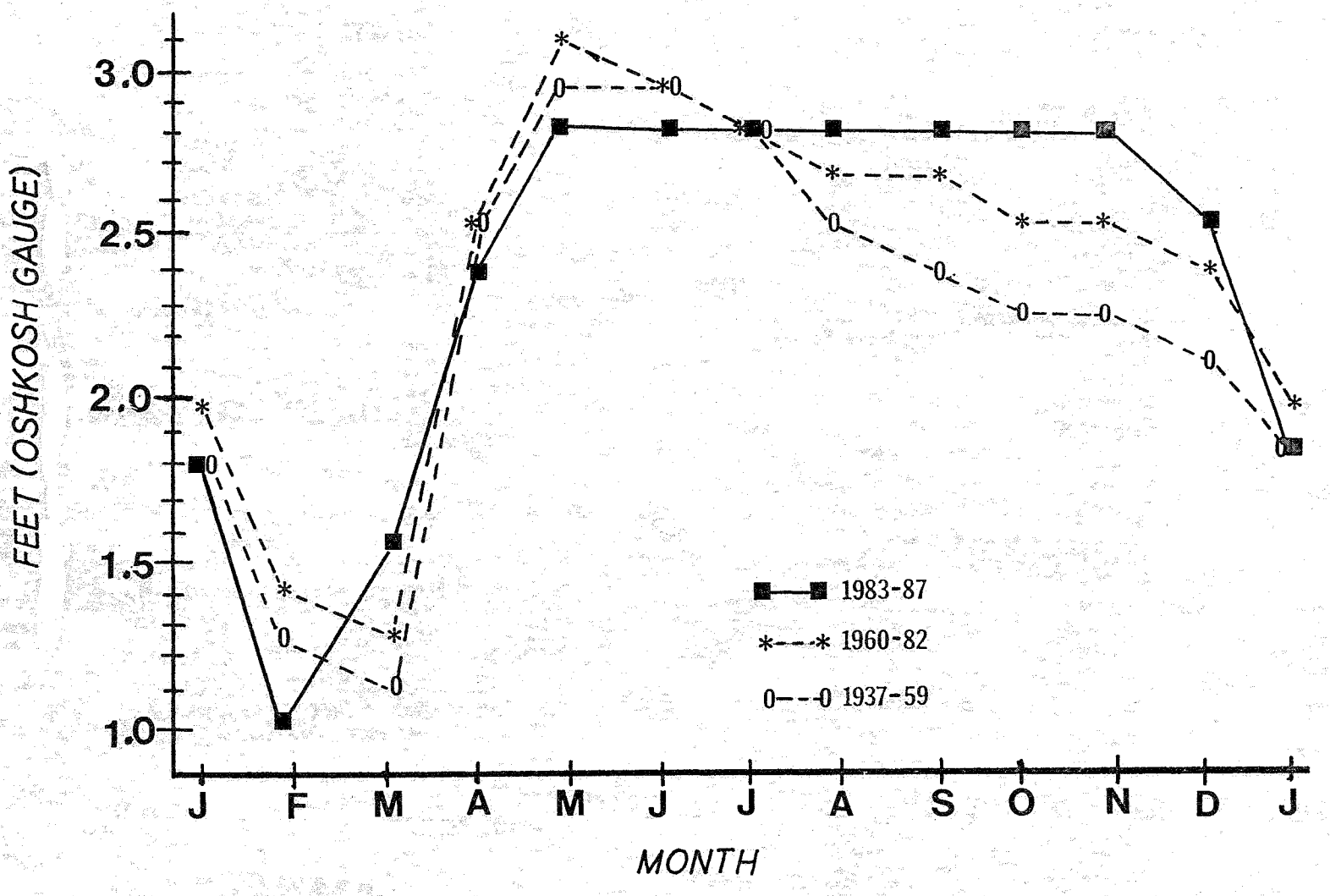

Figure 6. Average Monthly Water Levels, Winnebago Pool, 1937-1987

Over the past 100 years tens of thousands of acres of emergent and submergent wetlands have disappeared from the system, especially on the Upriver Lakes as a result of water level manipulations and the deterioration of pool water quality due to nonpoint pollution. In 1983, a new water level management strategy was implemented for the pool which attempted to minimize wetland destruction on the system. The new strategy draws the pool down 6 to 8 inches lower in winter than the traditional drawdown, so subsequent filling during spring runoff, in theory, will not tear out floating "bog" mats as the pool level is raised to the summer target level (3.0 ft. on the Oshkosh gauge, 15.8 inches over the dam crest). Recent Department research indicates that the new excessively low winter water levels may actually be inhibiting the re-establishment of habitat due to freeze/dry out of plants in the winter. They may also be responsible for killing fish trapped in shallow bays and channels under the ice during the drawdown. The abnormally high fall water levels required by the new strategy, when combined with the excessively low winter levels, have an extreme negative impact on furbearers, especially muskrats. The subsequent lower than average early spring levels also do not allow adequate use of spawning marshes by northern pike, perch and in some areas walleyes.

*** High water levels on the pool result in habitat loss through wave erosion of shoreline and marsh during the open water season.**

(See Habitat Quality Narrative on page 26)

*** Shoreline and marsh edge erosion in the lakes and rivers has accelerated due to high summer water levels and wave action**

*** Historical water level management practices, coupled with poor water quality has reduced the photic zone, and led to loss of deep water submergent and emergent vegetation beds**

Long term high water from impoundment, and short term high spring and/or summer levels, have contributed significantly to marsh loss on the Winnebago system, especially on the Upriver Lakes. Today, gradual erosion of many unprotected shorelines and shoreline marshes exists throughout the entire system. A 100 foot section of shoreline that erodes inward 5 feet, and to a depth of 1 foot delivers 20 to 25 tons of sediment into the adjacent waters. On the Upriver Lakes there are currently 12 miles of shoreline that need protection from erosive forces. (Winnebago County Soil Erosion Control Plan, 1988).

High water levels and marsh loss also create a larger water surface area, contributing to greater wind fetch which results in increased wave height and strength. Strong waves and currents in areas where marsh has been lost causes resuspension and transport of sediments, sometimes creating an environment too deep for the reestablishment of aquatic plants. Resuspension of sediments and nutrients also contributes to poor water clarity, further preventing the reestablishment of aquatic plants by reducing the depth of the photic zone.

*** Low winter levels (fall drawdown) are not sufficient to support wintering muskrats.**

Winter water levels on the Upriver Lakes and adjacent rivers and marshes are up to two and a half feet lower than summer levels. These lower levels reduce the amount of habitat available for muskrats, limiting population size. Lower winter levels also increase the chance of muskrats being frozen into their lodges, increasing winter mortality. The dewatering under the current water level regimen begins in the fall when the muskrats are building their huts, and is accelerated when ice cover is formed. Stable fall levels (October and November) followed by a less severe winter drawdown are critical to reestablishment and survival of a healthy muskrat population.

SPECIES ABUNDANCE AND DIVERSITY

Loss of habitat has reduced the number and abundance of fish and wildlife species and habitat types in the lake system.

*** Loss of submergent vegetation has led to a decline in diving duck use and the abundance of certain desirable fish species.**

*** Loss of emergent vegetation has led to a decline in dabbling ducks, furbearers, terns, and certain desirable fish species.**

*** The abundance of many species of aquatic macrophytes has declined.**

*** Purple loosestrife threatens existing marsh areas.**

*** Continued loss of aquatic vegetation increases opportunity for purple loosestrife invasion.**

*** Unchecked upland vegetative growth on private islands precludes common tern colony stability and may limit nesting success.**

(See Habitat Quality narrative, page 26)

As the natural balance and diversity of wetland habitat is lost, altered, or otherwise changed, the opportunity for invasion by undesirable exotic plant species such as purple loosestrife increases. As the diversity and quality of the wetland habitat decreases, so does the diversity and abundance of the wildlife species using this habitat.

*** Overabundance of sheepshead results in a nuisance fishery and may negatively impact the game fishery.**

Lake Winnebago walleyes, saugers, yellow perch, white bass, and lake sturgeon provide a very popular sport fishery for Wisconsin anglers.

Historically, sheepshead have at times been very abundant in Lake Winnebago. Population estimates for 1986 indicate the lake supported 80 million drum compared to a total of 8.5 million sport fish (walleyes, saugers, yellow perch, and white bass)(Coshun, 1987). Sheepshead overabundance may be causing excessive interspecific competition for food, cover, and space. This competition and possible predation by sheepshead on desirable fish species may be suppressing sport fish numbers, and producing sport fish populations with narrow age and size distributions, slow growth rates, and poor condition. Research (Priegel, 1967) supports general public sentiment that sport fish populations and sport fishing can be improved by reducing the sheepshead population.

*** The exotic marine fishes, the sea lamprey and white perch, pose a serious potential threat to the stability of the entire fish population of the Winnebago-Fox-Wolf System.**

The improvement in water quality of the lower Fox River has provided an environment suitable for sea lamprey invasion and colonization. Sea Lampreys are well established in Green Bay and have been found in or at the mouth of every major Green Bay tributary, including the Fox River. Without a permanent fish barrier in place, operation of the locks and dams on the lower river would facilitate the movement of the sea lamprey into the Winnebago System during its spawning run. The movement of sea lampreys through a lock system into large warmwater systems has been documented in other Great Lakes states (John Heinrich, personal communication), and has resulted in serious predation as well as control problems. Once in the Winnebago System, the sea lamprey would find over 500 miles of optimum spawning habitat in

the Wolf and upper Fox Rivers.

White perch followed the invasion route of sea lampreys through the man-made shipping canals connecting the Great Lakes, and have become well established in lower Green Bay and the lower Fox River. White perch are known to directly compete with yellow perch for food (Schaeffer and Margraf, 1986), and to feed upon the eggs of walleyes, perch and white bass (Schaeffer and Margraf, 1987).

*** Carp cause localized and seasonal water turbidity and destruction of aquatic vegetation.**

Carp may affect the ecosystem in several ways. They disturb the littoral habitat by uprooting macrophytes, resuspending sediments and nutrients, which cause turbidity and may compete with other species for benthic food sources (Threinen and Helm, 1954; Tyron, 1954; King and Hunt, 1967).

Over the past 50 years, state rough fish crews and private contract fisherman have used mechanical removal to harvest and attempt to control carp populations of the Winnebago Pool Lakes. In recent years the DNR Calumet Harbor crew has removed an average of 25,000 pounds of carp annually from Lake Winnebago. From 1966 to 1983 contract fishermen have removed 8.3 million pounds from the Upriver Lakes, with annual removals ranging from over 1 million pounds in 1976 to 100,000 in 1983. The decreasing harvest trend may be an indication of population control in the Upriver Lakes, although population densities do reach destructive levels during the spawning concentration. These concentrations in June and July often occur in sensitive habitat areas and result in increased water turbidity and loss of vegetation, reducing available food for more desirable fish species.

*** Small size of walleyes and saugers results in periodic angler dissatisfaction.**

While Lake Winnebago ranks high on the list as a top walleye and sauger producer, it is not known for producing trophy walleyes and saugers. When a large year class of young small fish is present, or a year class of a desirable size fish is absent, anglers become dissatisfied and often complain about the size of Lake Winnebago walleyes and saugers and DNR management efforts. A number of factors can affect the hatching success and survival of various year classes of game fish including spring water levels and temperature, abundance of food items for different fish age classes, and the carbon monoxide pollution on the Fox River at Oshkosh. The cycles of the conditions affecting the fish populations in the Winnebago System are generally well matched with DNR managers' response to problems and the public demand for action.

*** Low abundance of other desirable game and non-game species results in lack of diversified fishing opportunities.**

The Lake Winnebago system is known for good walleye, sauger and white bass fishing. The lake is also known for its unique sturgeon fishery and its large population of sheepshead. Other species that anglers seek in the system, which are not as abundant, include northern pike, muskies, perch, bass, crappies, catfish and others. The differences in abundance of these species can be traced to habitat preference and availability. The habitat that is preferred, or critical habitat that is required, by these species is lacking or deteriorating in the Lake Winnebago system. The system has lost much of its aquatic macrophyte habitat. This has left a pelagic like condition more suitable for the species that presently dominate the population. The alteration of habitat has also played an important role in determining which forage fish and non-game species are abundant or present.

INFORMATION NEEDS

Poor understanding of some of the relationships between fish and wildlife, their habitat, and man has contributed to various management problems in the past. The following information needs were identified by the WCMP Biota and Habitat Committee. Some are currently being addressed in specific management and research projects.

*** Fish species movements and management stocks within the system**

Except for documented spawning runs, the seasonal movement, and distribution of various fish species and communities within the Lake Winnebago system is relatively unknown. Management stocks of major species of importance are not well defined making management decisions, such as the need for size limits, closed areas, etc., difficult. This leads to much public speculation about what is best for a favorite fishery. Especially perplexing to manage is the lake sturgeon population in Lake Winnebago and Upriver Lakes. The Upriver Lakes are now managed separately, although existing data is not adequate to answer questions surrounding the current management policies. Many questions about population size and distribution of certain species of interest (walleyes, saugers, perch, sheepshead, white bass) will be addressed as part of the current assessment of sheepshead removal, and the scheduled system wide year round creel survey.

*** Food habits and food availability (with specific reference to invertebrates)**

Knowledge of food habits and their affect on survival, growth, and compatibility is important when attempting to explain relationships in fish and wildlife communities.

Food habit studies on Lake Winnebago fisheries were conducted throughout the 1960's and have concentrated on the walleye (studies by Priegel). Comparatively short term studies on saugers, yellow perch, lake sturgeon and freshwater drum were conducted in the past. The last food habit study on Lake Winnebago was accomplished by Weber and Les for yellow perch in the mid 1970's. Food habits of white bass in lake Winnebago have not been thoroughly studied.

Food habits and availability of major food items for major wildlife species, especially migrating waterfowl and nesting terns, have received little study or documentation on the Winnebago System.

Meaningful management decisions require current information on food habits and availability, and on the potential for interactions between species. Invertebrates are an important food item for most species of waterfowl, and many species of fish. Monitoring of invertebrate populations is needed to make management decisions. It is also a very useful tool in evaluating changes in water quality.

*** Effect of water level management strategies on fish and fish habitat.**

(See Water Level Management narrative, page 29)

*** Angler Exploitation and Pressure**

Angling pressure and exploitation impact sport fish abundance and population dynamics. Information in the form of technical bulletins, publications, study papers, and memos on sport harvest and fishing pressure, between the years 1932-1983 exists in the Oshkosh area office fish management files (Priegel, Wirth, Folz, Meyers), although a year round comprehensive creel survey has never been done for the Winnebago System. The last complete summer creel survey on Lake Winnebago was conducted during May-September 1979 (Meyer, 1980), with the only complete winter creel census conducted in the winter of 1959-1961. The lake sturgeon harvest has been consistently surveyed through a license and registration program since 1960.

Information on angler exploitation and fishing pressure on all sport fish in the Lake Winnebago system is needed. The current

Lake Winnebago Sheepshead Removal Assessment Project (assessment of the effects of sheepshead removal on the fish community dynamics of Lake Winnebago) has been designed to provide this information. Mark-recapture information from tagging studies and long range, comprehensive creel surveys will provide the necessary data.

*** Fisheries mortality, growth rates, and recruitment**

Knowledge of fish population characteristics such as mortality, growth rates, and recruitment is essential for management of most fisheries.

Currently available information on these parameters for the Lake Winnebago system fish community consists of studies by Priegel, Wirth, Weber, Les, Meyers, Folz, and Staggs. These studies provide mortality information for sheepshead, walleyes, saugers, and yellow perch. Adult growth information on drum, lake sturgeon, walleyes, saugers, and yellow perch is also available. Young of the year growth information is available for white bass and crappies. Recruitment of lake sturgeon has also been studied.

Much of this data was taken from fish collected by bottom trawls during the years 1955-1984. Gear and methods were changed during those years to maximize the catch of marketable size drum and minimize game fish catches. Sampling was done in areas where drum were thought to be most concentrated. Because of these factors the data collected did not provide the appropriate information needed to make meaningful management decisions.

The current Lake Winnebago Sheepshead Removal Assessment Project is based on a random sample design and standard methodology which should result in more useful information on mortality rates, growth rates, and recruitment.

*** Fish biomass estimates**

Knowledge of fish biomass as a measure of standing crop and how it affects mortality and growth is important in the management of fish communities.

Freshwater drum biomass estimates have been made in the past based upon data collected by bottom trawls. These trawls were conducted only in areas thought to hold heavy concentrations of fish. Certain areas of the lake were not accessible to the trawler. Because of these factors biomass estimates for sport fish are lacking.

Biomass and biomass distribution estimates for drum and sport fish can be reliably accomplished by collecting length, weight, and age data from sample trawls. The current Sheepshead Removal Assessment Project on Lake Winnebago has been designed to provide this information.

*** Extent of dabbling duck breeding success on Upriver Lakes**

Little is known about the number of breeding dabbling ducks on the Upriver Lakes. The only information available is from casual observations reported by DNR workers or other interested parties. These observations generally indicate that mallards and blue winged teal are the major breeding species, with an apparent long term decline occurring in numbers of breeding pairs, especially teal. Baseline information is necessary to determine any effect on breeding pair numbers resulting from habitat restoration efforts.

*** Status of nesting gulls**

There is little data on the status of nesting ring-billed gulls (Larus delawarensis) and herring gulls (Larus argentatus) in the Winnebago Pool Lakes. Nesting ring-billed gulls compete with common terns for nesting habitat (Matteson 1988) and their numbers need to be monitored to determine if gull control measures are necessary at colony sites.

*** Forster's and common tern nesting success**

There is scant data on hatching and fledging success for Forster's and common terns in the Winnebago Pool Lakes. Research is needed to document and to evaluate factors affecting nesting success.

*** Inventory of nongame resources**

An inventory of nongame resources is needed to complement existing data on game resources and to provide a thorough understanding of plant and animal communities that comprise the Winnebago System.

*** Diving duck migration and harassment on Lake Winnebago**

Qualitative information and observations show a decline since the late 1970's, in spring and fall diving duck use of Lake Winnebago. Public and professional opinions lay the blame for the decline on increased boat traffic on the lake occurring earlier in spring and later in fall, along with a major multiyear dieoff of snails and possibly fingernail clams prior to 1984. There is a need to document open water duck hunting activity, diving duck disturbance from boating activity, and macroinvertebrate densities and distribution.

*** Impact of commercial plant harvesters on aquatic plant communities**

Commercial harvesting of aquatic plants has occurred on the system for many years. Plant harvest operations appear to conflict with some of the proposed habitat restoration activities on the pool lakes, although little to no information exists to show whether these operations have a positive, negative or negligible impact on aquatic plant communities.

II. WATER QUALITY

The Winnebago-Fox-Wolf drainage is a 6400 square mile watershed, 90% of which drains into the Winnebago Pool Lakes (Figure 1). Nonpoint pollution from that drainage has caused severe deterioration of water quality in the lakes and has contributed to the disruption and disappearance of tens of thousands of acres of prime wetland habitat.

WATER QUALITY PLANNING

The task of planning and implementing management strategies that ultimately result in improvement in the water quality of the Winnebago System is complex and falls within the responsibility of many agencies and governmental units. These agencies and their roles are:

Wisconsin Department of Natural Resources

Primary Roles: Planning, Implementation, Program and Agency Coordination

The DNR is legislatively mandated through NR 121, Wisc. Adm. Code, to develop water quality management plans or Basin Plans for 19 basins in the state (Figure 7). Plans are updated every five years and serve the following purposes:

* to identify and rank water quality problems in the basin in order to set water quality management activity priorities, and to provide guidance for management activities for specific lakes and streams.

* to guide and direct the public, designated management agencies, state and federal agencies, and local units of government in their efforts to protect and improve Wisconsin's water resources.

* to insure that water quality objectives and standards for significant and/or impacted waterbodies in the basin are appropriate.

* to identify socioeconomic concerns and secondary impacts which should be considered when water quality decisions are being made.

* to anticipate future management activities necessary for water quality protection.

* to integrate and coordinate DNR programs for managing both surface and groundwater resources in Wisconsin.

* to incorporate concerns of the public and increase public awareness that protection and improvement of water quality is everyones responsibility.

Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP)

Primary Roles: Planning, Implementation, Program and Agency Coordination

DATCP has been working with the agricultural communities, County Land Conservation Departments and other agencies for many years to identify water quality problems resulting from agriculture land use and management practices and to implement remedial action. The new nonpoint pollution abatement program in Wisconsin is a joint effort between DATCP and DNR which combined previous independent nonpoint programs.

Fox Valley Water Quality Planning Agency (FVWQPA)

Primary Role: Planning

FVWQPA was created in 1975 by action of the East Central Wisconsin Regional Planning Commission and the Brown County Planning Commission as one of three areawide planning agencies in the state responsible for water quality planning for complex water quality problem areas--the Lower Fox River Valley, Dane County and Southeast Wisconsin.(Figure 6). These agencies were designated pursuant to Section 208 of PL 92-500 (Clean Water Act).

The designated FVWQPA planning area (Figure 7) consists of portions of Brown, Calumet, Outagamie, Winnebago and Fond du Lac Counties. The agency receives its funding from local governmental units and the DNR, and has the following water quality responsibilities:

Figure 7. Wisconsin Water Quality Management Planning Areas

* to identify all forms of water pollution in the area

* to develop sound and area wide solutions for these problems

* to recommend appropriate management authorities to correct these problems

* to help insure that these solutions are implemented

County Land Conservation Departments

Primary Roles: Planning, Implementation

Each county in Wisconsin has a Land Conservation Department which is a part of county government and serves residents through advice, engineering, expertise, and, when available, cost sharing assistance to resolve land use and environmental protection problems. The Department serves under the County Land Conservation Committee and is responsible for:

* conducting natural resource inventories

* assessing environmental problems associated with the use of land and related natural resources

* developing plans, programs, and projects to protect and conserve soil, water and related natural resources

* developing and adopting standards and specifications for management practices to control soil erosion, sedimentation, and water pollution

* distributing funds to help landowners install soil and water conservation practices

* conducting educational programs for adults and children to increase understanding of natural resource problems and how to solve them

* furnishing various kinds of assistance to private land owners and local government, including: planning, and financial and technical assistance.

Soil Conservation Service

Primary Role: Agricultural Land Use Planning

The SCS is an agency of the US Department of Agriculture which assists County Land Conservation Departments, and other agencies, in:

* inventorying land resources - soils, land use capability, etc.

* assisting land users in developing resource conservation plans

* providing specifications, standards, and guidelines for selection, design, layout, installation and maintenance of management practices and engineering measures to control runoff, soil erosion, and sedimentation, and for farm animal waste management

Agricultural Stabilization and Conservation Service

Primary Role: Implementation (financial program support)

The ASCS is also an agency of the US Dept Of Agriculture, and administers federally funded programs providing cost sharing and incentive payments to farmers to encourage the use of practices that will reduce soil erosion and water pollution, increase timber production, improve waterfowl nesting habitat, and generally enhance the rural environment and productivity of agricultural lands.

East Central Wisconsin Regional Planning Commission

Primary Roles: Planning and Project Review

The East Central Wisconsin Regional Planning Commission is formed under Wisconsin statute 66.945 for the purpose of preparing and adopting a master (comprehensive) plan for the physical development of the region. The East Central region consists of ten counties and covers all of the Winnebago pool lakes area. The East Central comprehensive plan is advisory to local units of government and state agencies in the areas of land use, transportation, open space, economic development and environmental management.

East Central is also a federally designated metropolitan clearinghouse whose function is to review federal and various state grants and programs for consistancy with the regional comprehensive plan. Under its responsibilities the Commission also reviews wastewater treatment and collection facilities with consistancy with sewer service area (20 year development) plans for area communities.

The University of Wisconsin System and Extension

Primary Role: Program Support (education, research)

The University of Wisconsin System and its Extension Services furnish educational materials and research capabilities relating to the development, use, management, and understanding of soil, water, wildlife and other land related resources.

NONPOINT SOURCE POLLUTION

Nonpoint source information presented in this plan serves the following management needs:

1. Provides the necessary information, and documents the need for designating large and small-scale Priority Watershed projects in the Upper Fox-Wolf-Winnebago basin.

2. Identifies local and regional nonpoint source priority areas.

3. Identifies monitoring needed to document current water quality of the Winnebago Pool , and to document the effectiveness of nonpoint controls implemented in the watershed.

Nutrients and sediments are the major nonpoint pollutants responsible for the degradation of water quality within the Winnebago System. The primary nutrient of concern is phosphorus, with a current annual loading estimate of 1.5 million pounds per year (Jim Baumann, personal communication) (Figure 8). Nutrients and sediments from watershed sources, as well as from recycling and resuspension of nutrients and sediments within the system, have negatively impacted fish and wildlife populations by reducing the abundance of aquatic macrophytes and aquatic macro-invertebrates.

The loss of diverse aquatic communities associated with the aquatic plant stands resulted in the subsequent reduction of the quantity and quality of fish and wildlife habitat - loss of fish spawning and rearing areas, shelter for adult fish and the production of fish and wildlife food items such as periphyton and invertebrates (McLaughlin,1985). Declining water quality has affected aquatic vegetation primarily by reducing the photic zone, increasing siltation and epiphytic algae growth on aquatic macrophytes, thus inhibiting and/or interfering with photosynthesis and respiration. Macro-invertebrate populations have been affected by declining water quality through a reduction in aquatic vegetation, alteration of bottom substrates, siltation on organisms, and reduction of dissolved oxygen levels at or near the sediment surface. Furthermore, loss of aquatic vegetation may have indirectly affected the abundance of other species of macro-invertebrates not directly dependent on vegetation, especially mollusks which are an important food item for migrating canvasbacks, lesser scaup and other diving ducks.

Nutrients

The Winnebago Pool is hyper eutrophic in nature due to the excessive nutrient loading from a variety of potential sources including:

animal wastes - feed lots, pastures, manure storage areas, uncontrolled access by cattle to streams, improper spreading practices

failing septic systems

drainage ditches after watershed hydraulics have been altered

applied or natural nutrients attached to sediments from agriculture fields and construction sites

urban runoff from lawns and pet waste directly routed into the waterway through storm sewers

the failure of sewage treatment facilities to remove enough phosphorus from effluent

industrial discharges

phosphorus recirculated through algal blooms and subsequent dieoffs

release of phosphorus from in-lake resuspension of sediments

Problems and Symptoms Associated With Excessive Nutrient Inputs

*** Excessive nutrients entering the system drive the recurring production of nuisance algal blooms and algae induced turbidity**

Excessive algal blooms are an indication of nutrient overabundance, especially phosphorus. Blue-green algae are inefficient components of the food chain and are not the most desired food of zooplankton, thus decreasing the availability of important zooplankton for fish and wildlife populations. The presence of algal blooms increases turbidity reducing the photic zone which in turn has a negative impact upon aquatic macrophytes. The loss of these, further impacts other forms of life dependent upon them including macro-invertebrates and fish. Another problem results when the decay of blue-green algae increases biochemical oxygen demand and lowers dissolved oxygen levels. In addition, some blue-green algae species are toxic to fish and other aquatic life.

*** Excessive algae induced turbidity results in poor colonization and survival of aquatic plants**

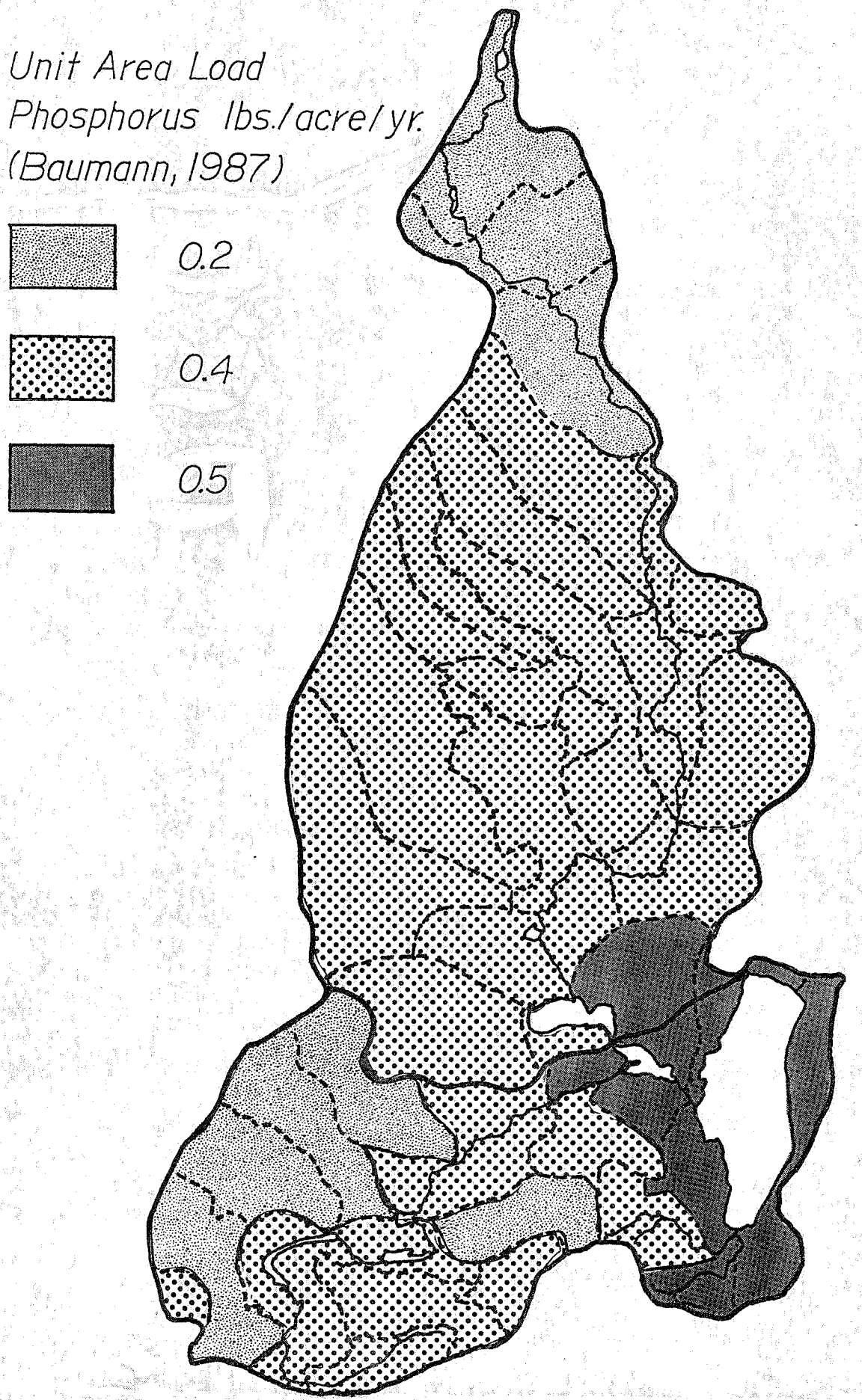

Figure 8. Estimated Phosphorus Loadings Wolf and Upper Fox River Subwatersheds

Both excessive algal blooms and turbidity from other sources reduce the ability of aquatic-macrophytes to survive because light penetration to photosynthetic tissue of plants is reduced. Loss of this important component of the aquatic ecosystem has impacts on many other forms of aquatic life. Also dense mats of filamentous algae and phytoplankton lodges on new shoots of emergent vegetation often breaking or collapsing the stems.

*** Nuisance algal blooms lower aesthetics for water recreation activities**

Clear water is considered aesthetically desirable and is the standard for comparison. Turbidity, algal blooms and floating algal mats are unappealing to the eye and reduce the perception of water purity. The presence of these discourages water related activities.

*** Algal die-offs result in low dissolved oxygen**

When algal blooms or other organic material decays, heavy biochemical oxygen demand results in low dissolved oxygen levels. Low oxygen levels, especially near bottom sediments during stratification, reduce the abundance of aquatic macro-invertebrates, and in certain areas, may result in fish kills.

*** Excessive algal populations decrease the quality of the system's aquatic habitat for fish and wildlife**

The above problems of excessive algal blooms, algal mats, turbidity, and low dissolved oxygen are indicators of low quality habitat for fish and wildlife. As water quality is reduced, forms of life dependent upon clean water and high oxygen levels are replaced by more tolerant species.

*** Excessive nutrients cause an imbalance in trophic state or ecological stability of the system**

The waters of the Lake Winnebago system are considered hyper-eutrophic due to problems from nutrient loading from agricultural runoff, municipal wastes, septic systems and other sources. As a result, the stability of various levels of organisms in the system is low, and subject to regular relatively high fluctuations in numbers and types. Imbalance leads to poor utilization of the productivity of the system, degradation of desirable habitat, and overabundance of tolerant undesirable species (e.g. rough fish), etc..

*** Excessive algae in Lake Winnebago results in poor potable water and higher treatment costs**

Drinking water treatment costs for the city of Oshkosh are up to 8 to 10 times higher than average due to operations necessary to remove excess algae from the raw water taken from Lake Winnebago. (Tom Konrad, personal communication).

Sediments

Excessive sediments entering and circulating within the Winnebago System contribute to problems of excessive nutrients, siltation of boat channels, and the degradation of fish and wildlife habitat.

Sediments entering the system's waters come primarily from:

eroding croplands

eroding shorelines, marsh edges and stream banks

construction sites - roads, residential, commercial

resuspension in lake due to wave action, rough fish, boat activity, bottom jetting for aquatic plant harvesting

wind borne sediment

Problems/Symptoms Associated With Sediments:

*** Sediments cause excessive turbidity and degrade aquatic habitat for fish and wildlife**

Turbidity caused by the presence of suspended solids and algae in the water restricts light penetration into the water column resulting in a shallow photic zone. Restricted light penetration inhibits desirable rooted aquatic plants (macrophytes), reduces desirable aquatic insect populations, and limits visibility for site-feeding fish species. The 5% photic zone in the Upriver Lakes during 1975-1981 extended to a depth of approximately 57-87 inches in lake Poygan and 58-62 inches in Lake Butte des Morts, and limited submergent vegetation to depths less than 55-67 inches and 47-53 inches for the two lakes respectively (Kahl 1988).

High water levels resulting in undermining and loss of emergent vegetation may cause release of internal sediments. It is

felt that the loss of large sections of "bog", especially in the Upriver Lakes in the last 80 years, has caused significant sediment resuspension and transport.

*** Sediments eroding into the waterway act as a delivery mechanism for carrying phosphorus and chemicals into the system**

Sediments eroding from farmlands and urban sites can act as a transport mechanism to carry phosphorus and chemicals into the waterway.

*** Excessive sediments moving into and through the system silt-in harbors and boat channels**

Excessive sediment loading into the system results in serious problems for boat navigation due to shoaling and filling of channels and harbors. This silting-in problem is aggravated by the minimal dredging undertaken by the Corps of Engineers since the early 1960's.

(see Inadequate Channel Depths narrative page 65)

*** Sediments can cover fish spawning areas and other critical habitat and organisms**

Sediments cover spawning substrates and degrade habitat areas critical to the maintenance of healthy fish communities. They also can cover less mobile organisms, especially certain macroinvertebrates, and reduce growth and reproduction.

*** Excessive sediments lower the aesthetic value of the waterway**

Sedimentation creates muddy brown water which is not aesthetically pleasing.

*** Loss of sediments from cropland results in loss of agricultural field fertility and increased use of applied fertilizers**

Loss of sediments from cropland lowers the natural productivity of the land, which in turn may encourage the increased use of applied chemical fertilizers. Subsequent runoff from these areas has a greater potential to carry excess chemicals (fertilizers as well as pesticides) into the adjacent water system.

WINNEBAGO WATERSHED NONPOINT SOURCE PRIORITY AREAS

Significant nonpoint pollution areas in the Upper Fox and Wolf River

Basins were identified and prioritized collectively by the Land Conservation Departments of the Counties in the watershed, and staff from other state and federal agencies. Sub-basins were placed into one of three priority categories, high, medium or low, based upon draft Priority Watershed Selection Procedures developed by Wisconsin Departments of Agriculture and Natural Resources. Problems were generally identified as being barnyard/feedlot runoff, soil erosion, and/or groundwater contamination. The most current information available concerning erosion rates, barnyard inventories, and groundwater surveys, as well as county planning activities was used to describe the nonpoint source problems in the watershed. Barnyard/feedlot operations were rated for their nonpoint pollution hazard according to the Agricultural Research Service Feedlot Model (ARS Model). Soil erosion was measured as tons lost per acre per year (T/A/YR).

Watersheds designated with an asterisk (*) are priority strips, one or two miles wide, along Winnebago County streams and lakes.

Upper Fox River Basin (Figure 9.)

High	**Map Index Letter**
Neenah Creek/Mason Lake	A

177 square miles (94.0 - Adams Co.,
43.0 - Marquette Co.
40.0 - Columbia Co.)

Soil erosion problem, especially streambank erosion, in Neenah Creek/Mason Lake watershed is the worst in Adams County. Has several barnyard/feedlot operations that would rate high on ARS scale, although barnyard and streambank inventories are incomplete.

Little Green Lake B

2.8 square miles (Green Lake Co.)

Small watershed with severe soil erosion problems (6.4 T/A/YR), along with six channelized inflowing tributaries negatively affecting trophic status of Little Green Lake.

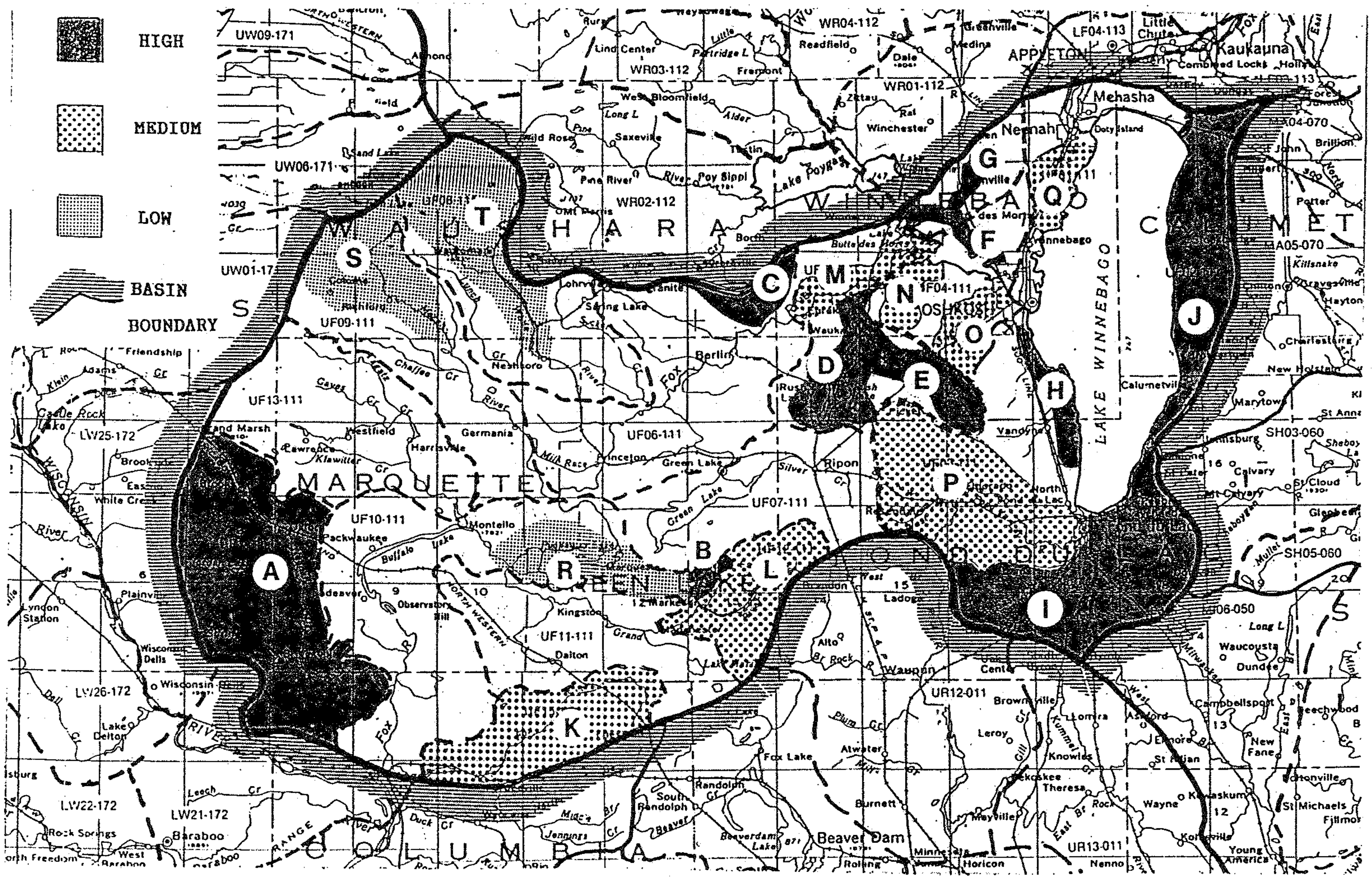

Figure 9. Nonpoint Source Priority Areas - Upper Fox River Basin

Barnes Creek C

25 square miles (Waushara Co.)

Soil erosion rate of 3.5 T/A/YR, occurring mostly on B-slope, silty clay and loam soils. Approximately twenty (20) barnyard/feedlot operations could be rated in an ARS model ranking of medium or higher, although complete barnyard and sediment loading inventories need to be done.

Rush Lake* D

17.3 square miles (Winnebago Co.)
(8.4 sq. mi. cropland)

Average critical soil erosion rate in excess of 3 T/A/YR. Two (2) critical, and three (3) high priority barnyard/feedlot operations. (Note: priority area around Rush Lake is approximately two miles wide. Despite vast wetland areas around the lake, pollutants have direct access into lake through a series of old existing drainage ditches.)

Eight Mile/Rush-Waukau Creeks* E

24.8 square miles (Winnebago Co.)
(16.6 sq. mi. cropland)

Average critical soil erosion rate in excess of 3 T/A/YR. Seven (7) critical barnyard/feedlot operations, one (1) high priority, and four (4) medium ranked operations.

Big Lake Butte des Morts* F

12.2 square miles (Winnebago Co.)
(6.2 sq. mi. cropland)

Average critical soil erosion rate in excess of 3.0 T/A/YR. Animal waste problems from two (2) critical barnyard/feedlot operations, four (4) high priority operations, and one medium ranked operation. (Note: excludes south shore area in Town of Algoma)

Daggets Creek* G

8.4 square miles (Winnebago Co.)
(6.9 sq. mi. cropland)

Average critical soil erosion rate in excess of 3.0 T/A/YR. Three barnyard/feedlot operations ranked critical, with two ranked high priority.

Lake Winnebago West* H

11.4 square miles (Winnebago Co.)
(6.4 sq. mi. cropland)

Critical soil erosion rate in excess of 3.0 T/A/YR. Two (2) critical barnyard/feedlot operations, one (1) high priority operation, and one (1) medium ranked operation.

East Branch Fond du Lac River I

77.1 square miles (Fond du Lac Co.)

Critical soil erosion rate of 6.0 T/A/YR. The largest single sediment contributor to Lake Winnebago. Also has significant animal waste problems, although inventories need to be done.

Lake Winnebago East J

90.1 square miles (46.3 - Calumet County,
44.4 - Fond du Lac County)

Critical animal waste and soil erosion problems intensified by steep slopes along east shore of Lake Winnebago. Average soil loss in Calumet County portion is 2.7 T/A/YR, with a 1301 ft. gully/ sq. mile cropland ratio. Average soil loss for Fond du Lac County portion is 4 to 5 T/A/YR. Numerous eroding tributaries and lack or loss of wetlands throughout sub-basin facilitate accelerated nutrient and sediment delivery directly into Lake Winnebago.

Medium

Swan Lake K

69.0 square miles (74.0 - Columbia Co.,
5.0 - Green Lake Co.)

Headwaters of the Upper Fox River. Second worst animal waste problem area in Columbia County.

Upper Grand River L
(Excluding Little Green Lake Watershed)

54.0 square miles (43.0 - Green Lake Co., 11.0 Fond du Lac Co.)

Critical soil erosion rate of 8.0 T/A/YR, along with significant animal waste problems from several barnyard/feedlot operations.

Fox River* M

20.6 square miles (Winnebago Co.)
(11.0 sq. mi. cropland)

Average soil erosion rate between 2.0 and 3.0 T/A/YR. Animal waste problems from seven (7) critical barnyard/feedlot operations; two (2) high priority, and one (1) medium ranked operation.

Spring Brook* N

11.7 square miles (Winnebago Co.)
(10.0 sq. mi. cropland)

Average soil erosion rate between 2.0 and 3.0 T/A/YR. Three (3) barnyard/feedlot operations ranked critical, two (2) high priority and six (6) medium. Critical animal waste problem from two barnyard/feedlot operations.

Sawyer Creek* O

6.2 square miles (Winnebago Co.)
(5.4 sq. mi. cropland)

Average soil erosion rate between 2.0 and 3.0 T/A/YR. Five (5) critical barnyard/feedlot operations. Also potential critical urban runoff problems within City of Oshkosh.

West Branch Fond du Lac River P

97.0 square miles (Fond du Lac Co.)

Significant animal waste and soil erosion problems.

Neenah Slough Q

7.2 square miles (Winnebago Co.)
(5.2 sq. mi. cropland)

Average critical soil erosion rate of 3.0 or more T/A/YR, with one (1) critical, one (1) high, and one (1) medium priority barnyard/feedlot operations. Also critical urban runoff, and channelization problems in City of Neenah.

Low

Lake Puckaway R

40.0 square miles (31.0 - Green Lake Co.,
9.0 - Marquette Co.)

Average soil erosion rates of 2.0 T/A/YR. Some isolated areas in watershed of high erosion rates, in addition to significant shoreline erosion on the lake.

Mecan River S

58.0 square miles (Waushara Co.)

Potential groundwater problems linked to several barnyard/feedlot operations due to sandy to sandy loam soils.

White River T

77.0 square miles (Waushara Co.)

Average erosion rate of 2.5 T/A/YR, although greatest erosion is occurring at a few key sites. Several high priority barnyard/feedlot operations.

Wolf River Basin (Figure 10.)

High — Map Index Letter

Middle Wolf River — A

127.5 square miles (13.0 - Waupaca Co.,
32.5 - Outagamie Co.,
82.0 - Shawano Co.)

Watershed had the highest score for potential of water pollution from animal waste in Shawano County. In Waupaca County portion, identified problem primarily soil erosion at a rate of 3.1 T/A/YR.

Embarrass River (including North Branch) — B

251 square miles (69.0 - Waupaca Co.,
153.0 - Shawano Co.,
29.0 - Outagamie Co.)

Critical animal waste and soil erosion problems. In Shawano County, scored second highest animal waste threat, along with critical soil erosion in the Town of Grant. Potential groundwater problems in Town of Matteson, Waupaca Co.

Pigeon River — C

114.5 square miles (71.0 - Waupaca Co.,
43.5 - Shawano Co.)

Critical animal waste and soil erosion problems. Watershed ranked second worst in both Waupaca and Shawano Counties, using groundwater weighted method with a critical average soil erosion rate of 3.7 T/A/YR.

Walla Walla Creek — D

97 square miles (59.0 - Waupaca Co.,
26.0 - Waushara Co.,
12.0 - Winnebago Co.)

Ranked number one in the Waupaca County Animal Waste Management Plan with both surface and groundwater

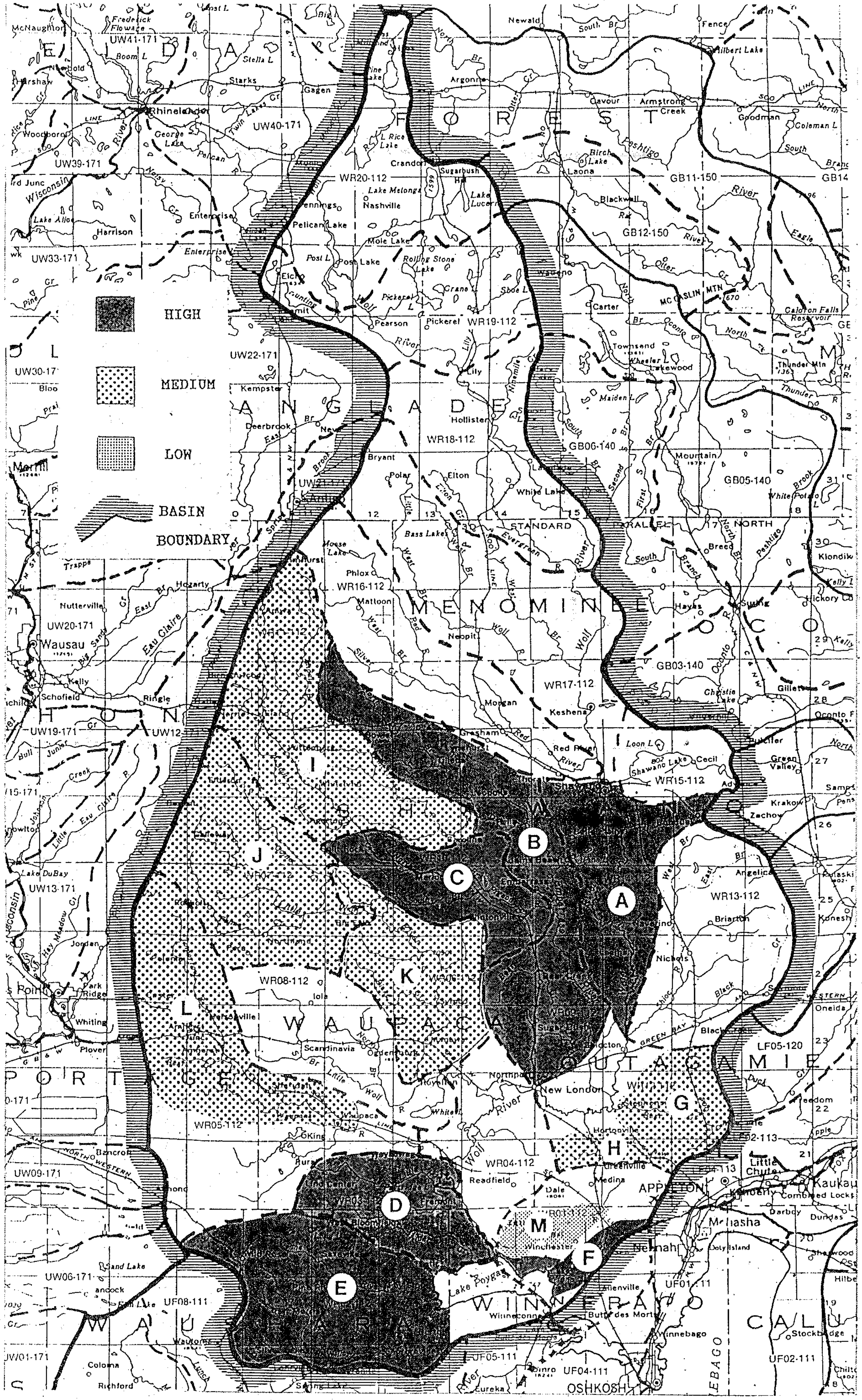

Figure 10. Nonpoint Source Priority Areas
Wolf River Basin

concerns. Also, substantial number of medium to high priority barnyard/feedlot operations exist in Waushara County portion, with many of these draining directly into Lake Poygan through man-made ditches. In Winnebago County portion three (3) barnyard/feedlot operations ranked critical, one (1) high priority, and three (3) medium. Average soil erosion rates of 3.1 T/A/YR in Waupaca Co., 3.5 T/A/YR in Waushara Co., and from 2.0 to 3.0 T/A/YR in Winnebago Co. portion.

Pine/Willow Rivers E

216.0 square miles (Waushara Co.)

Clear hardwater streams that drain the center two thirds of Waushara County. Substantial critical animal waste problems exist in eastern half of watershed, although detailed inventories need to be done. Soil erosion, at rates above 2.0 T/A/YR, combined with local animal waste delivery and instream erosion have resulted in accelerated deterioration of trophic status of mill ponds located on the Pine River and Willow Creek.

Arrowhead River* F

10.0 square miles (Winnebago Co.)
(8.2 sq. mi. cropland)

Critical soil erosion rate in excess of 3 T/A/YR. Three (3) barnyard/feedlot operations ranked high, and two (2) medium.

Medium

Bear Creek G

72.0 square miles (Outagamie Co.)

Primary problem is cropland erosion, with a few high priority barnyard/feedlot operations. Has high potential for successful correction of the problems through implementation of stream and waterway buffer strips.

Black Otter Creek H

23.0 square miles (Outagamie Co.)

Runoff of nutrients and sediments from crop fields and a few high priority barnyard/feedlot operations causing accelerated eutrophication of Black Otter Lake, an impoundment on Black Otter Creek.

West Branch Embarrass River I
(Middle and South Branches)

236.0 square miles (205.0 - Shawano Co.,
31.0 - Marathon Co.)

Mix of soil erosion and animal waste problems, with some locally significant areas. Most of the natural buffer areas along streams are intact and undisturbed.

Upper Little Wolf River J

190 square miles (51.0 - Waupaca Co.,
20.0 - Shawano Co.,
55.0 - Portage Co.,
54.0 - Marathon Co.)

Local significant animal waste problems. Soil erosion rate of 2.2 T/A/YR. Greatest threat from nonpoint source nutrients is to groundwater due to sandy nature of soils.

Lower Little Wolf River K

137.0 square miles (Waupaca Co.)

Critical soil erosion and animal waste problems. Rated as a medium priority since half of critical sites are being addressed currently through Ag 165 funding.

Tomorrow River L

169.0 square miles (140.0 - Portage Co.,
29.0 - Waupaca Co.)

Critical local surface water problems due to animal waste. Highest concentrations of livestock in Portage County occur at Amherst on Tomorrow River. Greatest

overall water quality threat in watershed is to the groundwater from excess nutrients due to sandy nature of soils.

Low

Rat River* M

18.4 square miles (Winnebago Co.)
(6.9 sq. mi. cropland)

Average soil erosion rate below 2.0 T/A/YR. Five (5) barnyard/feedlot operations ranked critical, two (2) high priority, and four (4) medium.

FOX RIVER FISH KILLS

Fish kills have been occurring regularly in the Fox River at Oshkosh since the late 1950's. Fish and water resource managers speculated over the years that the kills were possibly caused by a number of factors including temperature changes, spawning stress, fish population abundance, toxics from unidentified sources and other possible factors. In 1987 and 1988 the kills intensified and the Department of Natural Resources responded by assigning a team of water and fishery research specialists to study the problem and identify the cause or causes. After two years of intensive study the DNR research team found that carbon monoxide, an odorless and colorless gas, was the primary factor causing the fish kills on the river. The source of the carbon monoxide was identified as the Mercury Marine motor testing facility located on the Fox River in Oshkosh. The facility tests outboard and inboard motors at docks located on the river which discharge motor exhaust containing the carbon monoxide directly into the water. The test motor prop wash creates a back eddy current that can lead up or downstream depending on river flow and wind direction. These conditions appear to affect the distribution of toxic concentrations of carbon monoxide. Factors such as warm water temperatures and materials suspended in the water, such as algae, place natural stress on fish, especially in the summer months. The additional stress of carbon monoxide during this period explains why fish kills are more severe in the summer. When carbon monoxide concentrations are high enough, fish living in the area or attempting to swim through the area unknowingly absorb carbon monoxide into their blood which suffocates them. Because this type of pollution problem is very

unique, there are currently no standards in Wisconsin water quality laws which specifically limits the amount of carbon monoxide a discharger can release into a water body. However, water quality standards do prohibit the discharge to surface waters of any substance at a concentration that is toxic to fish and other aquatic life. Managers have serious concerns over the acute and latent affect carbon monoxide may have on, not only adult and juvenile fish, but also fish fry that migrate through the river system. The Fox River through Oshkosh is the route used by hundreds of thousands of fish on their annual spawning runs up the Wolf and upper Fox Rivers, and the route used by the resultant fish fry drifting back to Lake Winnebago.

INFORMATION NEEDS

*** Determine phosphorus budget of the Winnebago Pool Lakes**

Specific information on the water quality of the Winnebago System is limited, especially regarding nutrients. There are no current ongoing programs in DNR or other agencies to collect the short or long term information necessary to allow adequate assessment of any efforts to reduce nutrient or sediment loading. There is a critical need to implement a water quality monitoring program on the Winnebago System that will allow assessment of nonpoint control efforts upstream, and begin to show the actual relationships between phosphorus delivery and how it is retained and utilized in the system.

*** Determine water quality impact of dredged side channels**

Excavated lateral channels have been constructed along the shores of the Winnebago Pool Lakes for many years. Many of these were constructed prior to regulations that now scrutinize such projects. With the expansion of sanitary sewers around the lakes, the DNR is receiving more and more applications to construct side channels in areas that were earlier unacceptable for development due to tight soils. While channels may have a positive impact on some fish species like black crappies and bluegills, they also raise a potentially significant water quality concern. Water quality specialists suspect that channels can act as a conduit for rapid transport of nonpoint pollution (nutrients, sediments, chemicals, etc) directly into adjacent lakes. Other concerns include: nuisance vegetation and algae in the channel; alteration or filling of adjacent wetlands or sensitive habitats; increased human disturbance of potential critical habitat areas; loss and/or development of adjacent upland habitats; creation of carp spawning areas; and zoning and planning problems. Little information currently exists to

substantiate the effects or environmental concerns resulting from side channel construction, or reduce the suspected effects by modifying channel design.

RESOURCE ADMINISTRATION AND USE

The following issues were identified and evaluated in terms of the impact each has or could have on reasonable uses of the resources of the Winnebago System by boaters, anglers, trappers, hunters, lakeshore property owners, naturalists, resort/marina owner/operators, tourists and others.

USER ISSUES

*** Lack of Unified Resource Management Plan Involving All Agencies and Public Interests**

The lack of any unified resource management plan and policy involving all agencies with management and/or regulatory responsibility on the Winnebago System affect **all groups that have a stake in the resources of the system.** It has led to conflicts between and within groups of managers as well as the public, and has contributed to the significant deterioration and loss of valuable fish and wildlife resources.

*** Lack of Education and Coordination in Enforcement of Laws and Policies**

Lack of education, uniformity and coordination in enforcement of laws and policies create confusion and conflict between users and law enforcement personnel. Regulations are especially complex from the standpoint of developing and enforcing necessary and appropriate laws. Inadequate regulations, insufficient numbers of law enforcement personnel, and the large number of jurisdictional areas covering the system, results in a reduction in the quality of user experience. Public awareness of outdoor recreational ethics, as well as laws needs to be enhanced.

*** Public Access and Use Areas**

Inadequate public access may prevent certain user groups from realizing the benefits of using the system. All accesses on the system (boat, shore fishing areas, winter access, piers and breakwalls) should be designed to facilitate use by **all users,** including **individuals with disabilities.** Also, non-uniform fee schedules from one governmental unit to another may cause excessive use of certain accesses and areas of the system. Public accesses

placed in inappropriate areas can create problems for **lakeshore property owners** through litter, trespass, noise, increased boat traffic, and possible increased shoreline erosion.

(Through the WCMP planning process, the public identified current specific needs for access enhancement or new access purchase and development. These needs have been translated into management options and are listed on page 22.)

*** Dangerous and Destructive Boat Use**

Dangerous and destructive boat use is a major issue concerning many of the users of the system's resources. All **boaters** are negatively affected by the unsafe practices of those thoughtless ones who increase the chance for accidents and reduce the areas where travel is safe. **Marina Owners** may experience public relations problems with the non-recreational boating and non-boating public. **Anglers, hunters, trappers,** and **naturalists** may be directly affected by unsafe boating practices and indirectly affected by destruction of fish and wildlife habitat, and harassment of fish and wildlife populations. **Shoreline property owners** may suffer damage or loss of shoreline/marsh areas.

*** Lower Fox River Industrial Water Requirements and Water Level Fluctuations**

The use of the system by **anglers, hunters, trappers and naturalists** is affected by the lower Fox River industrial water requirements. Since water is needed on a daily basis by downstream industrial users for waste assimilation and/or power generation, the Winnebago Pool must be maintained at a level which is 1 to 3 feet higher than the natural water level of the lakes. High water, along with poor water quality (due to sediments, algal blooms, pollution, etc.), have resulted in the loss of many of the original beds of vegetation in the lakes. This vegetation was the foundation for the abundant fish and game resources that once inhabited the system. Some desirable species are still able to maintain stable populations (sturgeon) but other undesirable species of plants and animals are better adapted to live in the current environment the system now offers (sheepshead, carp, purple loosestrife). Water level fluctuations during a one year period may have a negative effect upon the abundance of fish and wildlife resources. A quick rise in water levels in early summer, for instance, will destroy wild rice stands by tearing the plants out of the bottom while they are in their floating leaf stage. Attempting to maintain a summer level of 3.0 ft on the Oshkosh gauge (15.8 inches over the crest of the Menasha dam), as required by the current water level management

strategy, allows less flood handling capacity than the previous summer average of 2.7 ft (Prior to 1983). The higher summer water levels, though, have a positive impact on **boating** activity, and many **marinas.**

Water level fluctuations are a result of natural water inflow into the system and human capability to manage that inflow with the water control structures placed on the system. The water level of the pool is controlled by the Corps of Engineers within minimum and maximum levels set by law. At times, due to circumstances beyond their control water level fluctuations occur within the minimum and maximum levels that negatively impact resources and user groups. **Boaters** and **resort/marina owners** are at times frustrated by fluctuating water levels especially when the water levels are unusually low. High water may affect shoreline facilities as well as cause excessive bank erosion. Some **lakeshore property owners** have lost hundreds of acres of marshes and wetlands due to maintenance of high summer water levels aggravated by deteriorating water quality. Although this loss of marsh vegetation may make access to the lake easier for boating, it has a profound effect on the ecological health of the lake system. The use of the system's resources by **farmers** is negatively impacted by maintening high summer water levels, along with water level fluctuations through the loss of farming opportunities on low agriculture fields adjacent to the lakes and streams of the system. **Anglers, hunters, trappers, naturalists and some lakeshore property owners** would benefit from consistently lower water levels, which would make environmental conditions in the system much more favorable to development and maintenance of wetland habitat.

(see water level management narrative page 29)

*** Inadequate Channel Depths**

River edge marsh loss and resultant disappearance of defined channels has facilitated the filling in of navigational channels with sediment. The lack of significant government sponsored maintenance dredging since the early 1960's has negatively impacted **boaters** and some **resort/marina owners.** The greatest channel problems result from inadequate depths at the mouths of the Fox River (west end of Lake Butte des Mort) and the Wolf River (original mouth and Boom Cut), and at the entrance to the Fond du Lac Harbor and River.

*** Dredging**

Although dredging can be considered a management tool, it can cause problems for some user groups, especially if done inadequately or improperly. In that dredging is primarily done to create and/or maintain navigational channels, **boaters** receive the greatest

benefits from dredging activities. Some past dredging activities, however, have also benefited fish and wildlife populations. For example, prior to their disappearance, dredge spoil banks at the mouth of the Fox River in western Lake Butte des Mort prevented the turbid river water from flowing through adjacent marshes, and protected the marsh from wind and wave action. For many years the dredge banks effectively maintained spawning, nursery and food production areas for the fish and wildlife populations that thrived in the area.

Excavated side channels though, can result in poor water quality within the channel and reduced aesthetics. Loss of adjacent upland wildlife habitat to residential development also usually follows this type of channelization. Dredging of wetlands has occured for many years often resulting in the loss of aquatic habitat, and the fish and wildlife resources associated with that habitat. Well designed and placed dredging activities can benefit **anglers, trappers, hunters, naturalists,** and **resort/marina owners** but if poorly designed or located, they can be more of a problem than a benefit.

(see narrative on side channels, page 62)

*** Closing One or More of the Lower Fox River Locks**

Closing one or more of the locks on the lower Fox River could create problems for **boaters with large boats, local marina owners, and "river locked" property owners.** There may also be a potential impact on **industries** along the lower Fox if no other means of transportation is available to move large machinery into the Fox Valley other than the locks. The economic impact from closing one of the center locks, on the lower Fox River Communities is estimated to be a loss of $1.5 million from a base of $72.0 million. In 1988, only three locks out of 17 were in operation. Time will allow more accurate estimates to be developed on the impacts resulting from lock closures.

*** Insufficient Riprapping**

Riprapping is a major management tool that has been effectively used on the Winnebago system to prevent shore, bank, and marsh loss, maintain the integrity of navigational channels, and create fish and wildlife habitat. Most of the marsh and habitat loss has occurred because critical areas lack protection during periods of high water and strong wave action. Insufficient riprapping has negative affects on **all users.**

*** Streambank and Shoreline Erosion**

Streambank and shoreline erosion results in excessive sediment loading to the system. **Boaters** are negatively affected as channels silt in, and uprooted trees create navigational hazards. **Lakeshore property owners** and **resort/marina owners** may suffer actual property loss and decrease in property/business value. **Anglers, trappers, hunters** and **naturalists** are negatively affected by the impact of the excessive sediment load on fish and wildlife populations; for example the smothering of spawning areas, and the decrease in water clarity and aesthetics.

*** Inadequate Protection and Enhancement of Critical Habitat Areas and Fish and Wildlife Populations**

Inadequate protection of fish and wildlife breeding/brood rearing areas, spawning/nursery areas, food production and feeding areas, concentrations of migrating, spawning, or feeding animals, or inadequate regulations (too liberal bag limits and/or seasons) can result in loss of fish and game populations as well as critical habitat. **Anglers, trappers, hunters, naturalists, resort owners and tourists** are all affected by the loss habitat, and fish and game resources.

*** Loss of Fish and Wildlife Habitat**

Significant loss of fish and wildlife habitat (aquatic plants) from the Winnebago System has occurred over the years due to a number of factors including high and fluctuating water levels, deteriorating water quality (decreased water clarity), filling and dredging of wetlands, and proliferation of rough fish and purple loosestrife. All user groups are affected by this loss to some extent. **Boaters** have lost navigation channels once well defined by "bogs" and emergent aquatic plants on the Fox River at the west end of Lake Butte des Mort and in Lake Poygan at the mouth of the Wolf River. The loss of the aquatic plant communities along these river stretches has resulted in excessive siltation and filling in of the adjacent navigational channels. **Anglers, trappers, hunters** and **naturalists** have lost the abundance and diversity of recreational opportunities that once were supported by the extensive fish and wildlife habitat. Some **lakeshore property owners** have lost hundreds of acres of marsh. Some marshes which were once used as hay fields, are now open water. Habitat loss, and the resultant loss of fish and wildlife recreational opportunities, reduces lakshore property value not only for the owner but also for resale. **Resort/marina owner/operators** are affected negatively through the loss of fish and wildlife associated business opportunities.

*** Rough Fish**

Rough fish, mainly carp and sheepshead, also diminish the quality of the fishery resource by disturbing aquatic vegetation/habitat and lowering water quality. They destroy or prevent game fish spawning, and compete with game fish for limited food and space, thereby affecting **anglers, trappers, hunters, naturalists, lakeshore property owners, resort owners, and tourists.**

(see narrative on carp page 34)

*** Sea Lamprey**

Sea lampreys, although not found in the system yet, would if established, significantly affect **anglers, naturalists,** and **tourists** by diminishing the quality and lowering the abundance of the game fishery. The recreational and economic value of **lakeshore properties** and **resorts and marinas** would decrease with the loss of the fisheries recreational base.

*** Agricultural and Urban Runoff**

Agricultural and urban runoff containing pesticides, fertilizers, road salt, sludge, and animal waste, are significant nonpoint problems that negatively impact the quality and quantity of fish and wildlife by destroying habitat and lowering water quality thereby affecting **anglers, hunters, trappers, lakeshore property owners, resort owners and naturalists. Farmers**, by protecting the natural productivity of their land, would benefit economically by controlling runoff and reducing fertilizer and pesticide costs.

*** Septic Tank Runoff**

Septic tank runoff can be a critical problem that degrades water quality in general and poses greater problems in specific locations especially for **lakeshore property owners, anglers and resort/marina owners.** Nutrients from failing septic systems promote excessive algae and/or aquatic plant growth and causes reduced oxygen levels.

*** Toxics**

Conventional toxics have not been identified as a major environmental concern on the Winnebago Pool Lakes or upper Fox and Wolf River, except for a PCB problem in Buffalo Lake, Marquette County. The unique toxic problem of the carbon monoxide induced fish kills in the Fox River in Oshkosh is of grave concern to

anglers, boaters, property owners, and businesses along the river. The potential toxic threat from other, unknown, sources (abandoned landfills and fuel tanks) is generally unknown at this time. Toxics when present pose a serious threat to the survival of fish and game populations and safety of **users** of the resources. It is important that all sources must be identified and corrective action taken.

INFORMATION NEEDS

*** Determine the relationships between water levels of the Upriver Lakes, the lower Wolf and Lake Winnebago**

The relationships between water level control actions taken by the Corps of Engineers at the Neenah-Menasha dams, and the water levels of each pool lake and portions of the upper Fox and Wolf Rivers, are not well documented. The distance upstream on the Wolf or upper Fox where the actual pool or reservoir effect of the lakes is felt, will vary almost daily depending on wind, rainfall, and air temperature. It is not known, though, what distances are effected. These unknowns have led to many problems and "finger pointing" by water front property owners who claim various water levels have caused them hardship or property damage. There is a serious need to document what variables affect water levels in the lakes and rivers, and to launch a public information effort to explain what the variables are and which ones can be controlled.

*** Determine the water level dynamics of the upper Fox River, including control limits of dams and factors that cause flooding**

Water level dynamics of the upper Fox River are not widely understood by the general public. There is a need to assemble existing information, identify new information needs and work with the public in the upper Fox River communities to understand what can and cannot be done to alleviate recurring flooding problems in their areas.

*** Evaluation of current user access needs, current use levels and use saturation points**

The Winnebago System is blessed with a relatively large number of public access points for boating and shore activities. It is not

known, though, whether the system provides an adequate variety of accesses for all users, including disabled individuals, what the overall current use levels are, and whether some areas are overused.

*** Documentation of economic importance and value of the Winnebago System's resources**

Much of the quality of life and economy of the region is based on the resources of the Winnebago System. Documentation of the relative economic importance of these resources provides insight into their political, social, and biological significance.

THE PLANNING PROCESS

The Winnebago planning project began in June 1986 with the goal to produce a long range management plan for the Winnebago System by July 1988. A planning coordinator developed and facilitated a process through which citizens of the region served or contributed in many different capacities to develop a public plan for the system, the Winnebago Comprehensive Mangement Plan (WCMP). The completed plan will guide the Department of Natural Resources management and research activities on the system for many years. The plan should also help other agencies with system resource responsibilities in their program planning as well. The first draft of the plan was completed in late 1988 and 2500 copies were sent out for review.

Prior to the start of the planning process, the planning coordinator conducted an extensive appraisal of individuals, agencies and organizations with a stake in the management and/or use of the Winnebago System's resources. This appraisal resulted in a solid understanding of individuals/groups who were potential planning committee members, administrators from the DNR and other state, federal and local agencies with a need to be kept informed, and private citizens and citizen's organizations whose support would also be necessary to develop and implement the WCMP.

The following mechanisms were used to facilitate the planning, and to develop and maintain administrative and citizens support throughout the planning process and into implementation:

Planning Committees

A management and research workshop on the Winnebago System and subsequent extensive issue analysis sessions conducted in the fall of 1986 initially identified priority problems which, in turn, were used to define the planning committee structure. Issues were categorized into four main groups: Fisheries and Wildlife Populations and Habitat, Water Quality, User Conflicts and Education, and Agency

Coordination. Three planning committees were formed to address fish and wildlife, water quality and user conflict problems and began meeting in April 1987 with the charge:

1. to identify problems that impair the ecological diversity and quality and/or the use and management of Winnebago System's resources

2. to draft goals and objectives for the desired state of the system

3. to propose and evaluate alternative management strategies that would achieve the intentions of the project goal

The three committees met a total of 19 times from April 1987 through April 1988. Committee members invested over 2500 hours of effort in regular meetings, plus uncounted effort gathering materials, writing, and meeting in subcommittees. All meeting minutes and planning products were produced and distributed by committee staff persons. Each planning product (problem identification, objectives, recommendations) was, upon initial drafting, thoroughly reviewed and discussed through the citizens participation process, and with agency administrators through executive briefings.

Biota and Habitat Committee (BHC)

Problem Areas:

* Habitat restoration, management and protection
* Fisheries, wildlife and endangered resources management and research

Members:	
Jim Raber - Chair	DNR District Wildlife Staff Specialist
Ron Bruch - Co-Chair	DNR Winnebago Project Coordinator
Art Techlow - Staff	DNR " " Assistant
Jim Anderson	Outagamie County Naturalist
Jim Bonetti	Fox River Proj Supv-Corp of Engineers
Dale Brege	DNR Fish Manager - Upper Fox
John Dunn	DNR Winnebago Wildlife Manager
Mark Endris	DNR Winnebago Fisheries Manager
Steve Sisbach	DNR Water Regulation Manager
Dan Folz	DNR Oshkosh Area Fish Manager
Mike Foy	DNR Wildlife Private Lands Specialist
Gary Jolin	DNR Oshkosh Area Wildlife Manager
Rich Kahl	DNR Wildlife Researcher
James Kempinger	DNR Fisheries Researcher
Lee Kernen	DNR Bureau of Fisheries Management
Sumner Matteson	DNR Bureau of Endangered Resources

Lee Meyers	DNR District Fisheries Biologist
James Moore	DNR District Fish Staff Specialist
Gordon Priegel	DNR " " " "
Bill Shaw	DNR Bureau of Information Management
Fred Spangler	University of Wisconsin-Oshkosh
Doug Welch	DNR Winnebago Fisheries Biologist
John Wetzel	DNR Bureau of Wildlife Management

Nutrient and Eutrophication Committee (NEC)

Problem Areas:

* Nutrient and sediment management

Members:

Ron Bruch - Chair	DNR Winnebago Project Coordinator
Tim Rasman~ - CoChair	DNR District Water Resource Biologist
Katherine Rill - Staff	DNR Winnebago Project Assistant
Rock Anderson	Calumet Co. Land Conservation Dept.
Jim Baumann~	DNR Bureau of Water Resources Mgmt.
Jim Beasom	Wisconsin Paper Council
Roy Burton	Outagamie Co. Land Conservtion Dept.
Bruce Bushweiler	Waupaca Co. Land Conservation Dept.
Larry Decker~	Soil Conservation Service
William Elman~	Fox Valley Water Quality Plng. Agency
Vicky Harris~	DNR District Water Quality Planner
Jim Hebbe	Green Lake Co. Land Cons. Agent
Steve Hoffland	DATCP Madison
Tom Konrad	Oshkosh Water Supply and Treatment
Kyle Kidney	Columbia Co. Land Conservation Dept.
Gary Le Bouton	Waushara Co. Land Conservation Dept.
Lynn Mathias	Fond du Lac Co. Land Cons. Dept.
Mike Mischuk	Inst. Paper Chemistry Researcher
Ron Ostrowski	Shawano Co. Land Conservation Dept.
Mike Reif	DNR Area Environmental Specialist
Jim Schedgick	DNR Industrial Wastewater
Ken Schindler	DNR Bureau Information Management
Mark Sesing	DNR Area Water Resource Manager
William Sloey	Univ. of Wisconsin-Oshkosh
Tony Smith	Adams Co. Dept. of Land Conservation
Pete Van Airsdale	Winnebago Co. Lnd. & Wtr. Cons. Dept.
Tim Victor	Portage Co. Land Conservation Dept.

~Member of similar committee that contributed to the development of the Green Bay and Lower Fox River Remedial Action Plan (1986-87).

User Committee (UC)

Problem Areas:

* User conflicts
* Public Information/Education
* Access and public use areas

Members:

Henry Liebzeit - Chair	Conservation Congress
Mel Wickert - Co-chair	Winnebago Waterways Association
Ron Bruch - Staff	DNR Winnebago Project Coordinator
John Anderson	Conservation Congress
Mike Arrowood	Winnebago Area Cons. Alliance
Mark Beilfuss	DNR Law Enf. Spec. - Wolf River
Bob Bergstrom	Wis. Council Sport Fishing Org.
Sally Benjamin	DNR Citizens Participation Spec.
Buzz Carpenter	Harbormaster - Winneconne
Jeff Christensen	Winnebago Co. Parks Director
Dave Crehore	DNR Public Information Spec.
Norma Edinger	Resort Owner/Operator
Elward Engle	DNR Area Land Agent
Gerald Frey	Lakeshore Property Owner
Gary Galow	Boating Interest
Jim Geffers	Lakeshore Property Owner
Harlan Kiesow	East Central Wis. Reg. Plng. Comm.
William Kramer	Waupaca Co. Board
Art Kutnink	Marina Owner/Operator
Albert March	Lakeshore Property Owner
Don Meton	Winnebago Audubon Society
Carrie Morgan	DNR Environmental Education
Pat Nichols	League of Women Voters
Joe Olson	Farmer
Jeff Pagels	DNR Community Services Spec.
Tom Pleine	Businessman/lakeshore Prop. Own.
Leonard Rosenbaum	Fond du Lac Co. Board/Farmer
Dave Schmidt	Wolf River Boating Interest
Jim Schuette	Outagamie Co. Board
Pete Van Airsdale	Winnebago Co. Lnd & Wtr Cons. Dept.
Robert Wrchota	Conservation Interest/Prop. Own.
Ralph Zimmerman	Wisconsin Furfarmers Association

Citizens Participation Plan

The project coordinator, with the help of members from the User Committee, conducted the citizens participation process in parallel with the committee planning process. For each step of the planning process (issues, goals, objectives, recommendations, implementation), stakeholders were identified, necessary information exchanges were determined, and techniques were developed to ensure appropriate and effective public participation. In addition to citizens of the region, the participation plan also involved planning committee members, and other agency administrators and field staff (including DNR) not serving on a committee.

Extensive efforts were made to ensure citizens had opportunities to become involved in the Winnebago planning and decision making process. Specific techniques used to ensure participation included:

* developing a computerized mailing list of 1000 individuals and groups to facilitate mailing project information, public information meeting announcements, news releases, etc;

* conducting dozens of personal interviews with a wide range of user interests to introduce the project and gain an understanding of various views on management and use of system's resources;

* establishing the User Committee with membership primarily composed of citizens and planning responsibilities on an equal level with the other planning committees (the UC was **not** a citizens advisory committee);

* holding 19 Public Information Exchange Meetings throughout the region the discuss various planning products with the public, as they were developed. Meetings were moderated by a volunteer from the User Committee and were run to facilitate maximum information exchange with the attendees through small working groups. All information received at the meetings was recorded, summarized and used in plan development. Summaries were then sent out to all meeting attendees;

* making project presentations to dozens of citizen organizations including sportsmens clubs, boating clubs, business development organizations, Kiwanis, Rotary Clubs, church groups, etc.,

* developing a poster series describing the project which was displayed at area sportshows, planning and citizens meetings, and other places;

* working closely with the media to maintain area and statewide exposure and understanding of the project.

Executive Briefings

To develop and maintain administrative support for the development and implementation of the project, regular briefings and consultations were held with line administrators in the DNR Lake Michigan District. To gain support from levels beyond the DNR district lines, and to foster interdisciplinary and interagency coordination, executive briefings on project processes and progress were regularly held with two upper level administrative groups: DNR Bureau Chiefs and Division Administrators, and Administrators from other state, federal and local agencies with responsibility for the system's resources. This included mayors of the area's major municipalities, and county administrators. These groups were given personal briefings and opportunities to comment on planning committee products developed with the help of staff from the various bureaus, agencies and governments.

Summary

All planning efforts were facilitated to maximize opportunities for meaningful imput into the development of the plan from known agency and public interests. Openess, honesty and fair play were considered of utmost importance to draw out ideas, facts and feelings about the Winnebago resources and was the basis of all planning techniques and procedures used. Equal emphasis was placed on the development and implementation of a fair and adequate planning process, as was placed on the plan that was ultimately developed. The specfic details including the steps taken during the planning prcess will be the subject of a separate report.

WCMP IMPLEMENTATION

Joint and single agency efforts, and public volunteers, with funding potentially coming from a variety of traditional and non-traditional sources, will implement the Winnebago Comprehensive Management Plan. The Department of Natural Resources is committed to creating and maintaining two positions, the Winnebago System Biologist and Assistant Biologist at the Oshkosh Office to be stewards of the plan and "bulldog" implementation. The Department is also committed to ensuring that public involvement and program integration is a living part of Winnebago System resource management.

The Winnebago System Biologist and Assistant will work with DNR and other agency staff, and the public, to continue to pursue funding for projects through traditional Department sources, and from non-traditional sources outside the agency, eg. private foundations, industry, local fund raising, user groups, other federal and state grant programs, volunteers, etc.. The User Committee will continue to function as a group, representing a cross section of various Winnebago resource interests, to work with the Department and other agencies, and the public to implement and update the WCMP.

The Department or other responsible agencies, working with the public, will determine the feasiblity of and develop cost estimates for implementation of various management options selected by resource interests of the region. The WCMP planning teams submitted projects from the plan that fall within the DNR's responsibility, into the Department's internal funding competition for the 1989-91 biennium. These efforts were initiated prior to formal completion of the plan in an attempt to secure some new funding to begin WCMP implementation as soon as possible. Funding for 8 new fish, wildlife, habitat and water quality projects was approved and became available July 1, 1989. The User Committee has selected its 1989-95 implementation priorities and have had cost estimates and summaries prepared for various options which will be forwarded to the appropriate agencies and government officials.

The Winnebago Comprehensive Management Plan is a guide and tool developed through the hard work of the many groups and individuals having a stake in the long term management of the resources of the Winnebago System. The plan will not implement nor update itself. It will be implemented and made a living plan only through continued dedication and hard work by people who enjoy and depend on the recreational and commercial opportunities offered by the tremendous resources of the Winnebago System.

GLOSSARY

Act 297
A regulatory nonpoint source program dealing with any nonpoint pollution other than animal waste, described in Wisconsin State Statute 144.025.

AG 165
The soil erosion management program described in the Wisconsin Administrative Code. (AG 165 and AG 160 have been merged into AG 166 - soil and water resources management program.)

angler effort
An estimate of the actual number of hours anglers collectively expend attempting to catch and/or harvest fish from a lake or stream over a certain time period.

angler exploitation estimates
Estimates of sport fishing harvest. Usually developed from a comprehensive creel census.

aquatic macrophyte
An aquatic plant that is larger than microscopic in size, e.g. coontail, wild rice, etc.

ARS model
Agricultural Research Service Feedlot Model. A mathematical procedure for evaluating and ranking pollution hazards of barnyard/feedlot operations.

benthic
The bottom region of a body of water.

biomass
The total weight of a particular plant or animal population in a specific area, e.g. the biomass of sheepshead in Lake Winnebago is approximately 70 million pounds.

BMP's (best management practices)
These are best horticultural and management practices that protect all the resources in a given area to the best ability.

Chapter 30 permit
A Wisconsin Administrative Code rule requiring a DNR permit for any physical alteration to a navigable body of water.

chlorophyll
The pigment in plants that makes them green and allows them to produce cellular energy from sunlight. By measuring the amount of chlorophyll in a water sample, we can estimate how much algae was in the sample.

creel census
A scheduled survey or census of anglers on a lake or stream, which will provide estimates of harvest and angler effort.

CRP (Conservation Reserve Program)
An agriculture program under the Federal Farm Bill that pays farmers to not farm highly erodible croplands for a period of 10 years.

dabbling duck
Ducks that feed on the surface, e.g. mallards, teal, etc.

diving duck
Ducks that dive for their food, e.g. scaup, canvasbacks, etc. Some species dive to depths greater than 40 to 50 feet.

duck use-days
A measurement of duck use of a specific lake or wetland area. Ten ducks staying on Lake Poygan for ten days equals one hundred duck use days.

estuary
The area where a river flows into a lake.

eutrophic
Used to describe a lake or pond rich in dissolved nutrients.

GIS (geobased information system)
A computerized resource information system including maps of habitats, wetlands, cover types, soils, land practices, fish spawning areas, duck feeding and nesting areas, shoreline use, public access, etc., etc.

hectare
A metric system unit of area measurement. One hectare is the approximate equivalent of 2.47 acres.

invertebrate
Animals without backbones, e.g. zooplankton, insects, snails, clams, crayfish, etc.

littoral
The shore region of a body of water.

macroinvertebrate
An invertebrate large enough to be seen with the naked eye.

Chironomidae - lakeflies
Ephemeroptera - mayflies
Gastropoda - snails
Peleycepoda - clams

mollusks
The group of animals to which snails and clams belong.

non-point pollution (NPS - non-point source)
Pollution getting into surface water (lakes and streams) that comes from a broad area, not from a pipe, e.g. barnyard/feedlot runoff, soil erosion, improperly spread manure, urban road runoff, construction site erosion and runoff, etc.

NR 120
The nonpoint source pollution abatement program described in the Wisconsin Administrative Code.

NR 243
Animal waste management regulation described in the Wisconsin Administrative Code.

Oshkosh gauge
The water level gauge at Oshkosh that measures the stage height of Lake Winnebago. The average summer water level of Lake Winnebago over the last thirty year has been 2.7 feet on the Oshkosh gauge, or 12.5 inches over the crest of the dams at Neenah-Menasha.

pelagic
Occupying the free open water area of a lake or stream

periphyton
Microorganisms attached to submerged objects.

phosphorus
A natural element used by living organisms in the storage of cellular energy. Poor land use practices result in loss of phosphorus from soil, animal waste, and applied fertilizers as runoff into streams and lakes. It is estimated that 1.5 million pounds of phosphorus is coming into the Winnebago pool lakes every year, resulting in excessive algal blooms, poor water quality, loss of desirable habitat, increased water supply treatment costs, and other problems.

photic zone
: The uppermost layer of a body of water through which enough sunlight penetrates to allow photosynthesis to take place in aquatic plants.

Secchi disc
: A metal disc about 10 inches in diameter, with a rope attached to the center, that is lowered into a lake to measure water clarity.

trophic
: Having to do with how nutrients are cycled through an ecosystem.

ug/l (micrograms per liter)
: A measurement of concentration of a substance, such as chlorophyll in a water sample. In a liter (a little over a quart) of water, 35 ug would be equivalent to about 1 thousandth of an ounce.

unit area load
: The average rate (how much over a specific time) a substance, such as phosphorus, is delivered from a specific area of land (one acre) into a lake or stream.

year class
: In fishery terms, all the fish of one species that hatch in a given year.

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