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Lake Michigan Integrated Fisheries Management Plan 1995 - 2001

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by

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INTRODUCTION

The Lake Michigan Integrated Fisheries Management Plan (Plan) will guide the management of sport and commercial fisheries in Wisconsin waters of Lake Michigan during the years 1995 through 2001.

It is in the nature of a management plan like this one to focus on problems, but there are many reasons for optimism about the future of sport and commercial fishing in Lake Michigan, and about the health of the ecosystem. Lake Michigan supports a commercial fishery that takes in over five million pounds of lake whitefish, yellow perch, rainbow smelt, and chubs annually, and an exceptional and very popular sport fishery. The overall catch rates (fish caught per angler-hour) reported by charter captains in 1993 and 1994 were higher than in any other year since we began compiling this statistic in 1976. Non-charter anglers spend over three million hours annually fishing for salmon, trout, walleye, yellow perch, and smallmouth bass in Lake Michigan. New strains of rainbow trout and brown trout have enriched the sport fishery. The Lake Michigan sport fishery continues to draw anglers from other states; according to a national survey conducted in 1991, 21% of the fishing days in Wisconsin by non-residents were on the Great Lakes, and most of those were on Lake Michigan[1]. A sustained program of sea lamprey control has kept that pest in check, allowing us to maintain our diverse salmon and trout fishery. Contaminant levels in sport fish have declined sharply over the past fifteen years. The lakewide program of stocking chinook salmon and other salmon and trout resulted in the 1980's in the decline of alewives to the point where native chubs, yellow perch, and possibly other species rebounded from previously depressed levels.

This Plan was developed with the benefit of extensive public involvement (see PUBLIC PARTICIPATION, below), and reflects full consideration of the opinions of all segments of the interested public. The public involvement process brought out numerous points of disagreement, some involving questions of basic policy. In the APPENDIX we summarize and respond to the concerns expressed in comments to the draft Plan released in March, 1994.

The term "Integrated" in the title indicates our intention to develop a fisheries management program that complements and utilizes other Department programs and that recognizes the roles of the other state, federal, and tribal agencies -- our partners in the management of the Great Lakes and their fisheries (see PARTNERS, below). We do not attempt here to present a plan that encompases all activities and programs related to Lake Michigan that are conducted by other Department programs or by our partners in Great Lakes fisheries management.

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[1] U.S. Department of the Interior, Fish and Wildlife Service and U.S. Department of Commerce, Bureau of Census. 1993. 1991 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. U.S. Government Printing Office, Washington, DC.

We are presenting here an ambitious agenda of work that will test our energies and resources over the next three biennial budgeting and planning cycles, and we realize that we may not achieve all of the proposed objectives or employ all of the proposed tactics. We considered presenting a streamlined Plan, but to do so would understate the challenges and needs of fisheries management on Lake Michigan. We realize that our scope for action may be limited by budgets and priorities established outside the Fisheries Management Program.

SUMMARY

This Plan is built around three goals: 1) A diverse, balanced, and healthy ecosystem. 2) A diverse multi-species sport fishery within the productive capacity of the lake. 3) A stable commercial fishery within the productive capacity of the lake.

Ecosystem

In support of a diverse, balanced, and healthy ecosystem our objectives are 1) to protect, maintain, and enhance fish habitat, 2) to protect and restore native species, 3) to develop strategies that deal with undesirable non-indigenous species, and 4) to employ the best available information, methods, and technologies.

Some of our work to improve fish habitat will focus on specific species. We can assess the extent of degraded spawning habitat for walleye and northern pike, and take steps to restore spawning habitat that has been lost. We are already assessing the feasibility of constructing a lake trout spawning reef in Lake Michigan and we will move forward with that project if it offers a good chance of stimulating natural reproduction by lake trout.

We will also address the broad topic of land use practices and their impacts on fish. We propose, among other things, to work with others in the Department to develop a guidance document describing best land use practices from a fisheries perspective, to pursue land acquisition for the purpose of protecting critical fish habitat, and to work with those involved in aquatic plant control efforts to assure compatibility of control methods with fish habitat needs.

We are concerned about waterway alterations, especially dams, and will continue to be involved in dam relicensing activities of the Federal Energy Regulatory Commission and to encourage the removal of dams where sea lamprey spawning can be effectively controlled. Filling behind bulkhead lines (shorelines established by ordinance) can also destroy fish habitat and we propose to assess habitats landward of bulkhead lines and, where appropriate, recommend protective measures.

Lake Michigan has experienced the loss or depletion of several native species. Lake trout disappeared from the Lake by the mid 1950's, and, despite extensive stocking, significant natural reproduction by lake trout in Lake Michigan has still not been documented. The Department will continue to support efforts to re-establish a self-sustaining population. Other native species of special interest to us are the lake herring, the lake sturgeon, and the Great Lakes spotted musky. The Plan also addresses natural reproduction by walleyes, which has been disappointing in some areas.

The Great Lakes have been plagued by invasions of non-indigenous species. Sea lamprey and alewives have been especially damaging to the native ecosystem. Although both of those species have been controlled, effective control measures may not be found for some

invading species. The program outlined here addresses preventing future invasions, controlling the dispersal of non-indigenous species now in the Great Lakes, and understanding the impacts of non-indigenous species.

The alewife has a special place among non-indigenous species in Lake Michigan because it not only adversely effects native species but also serves as forage to support a valuable sport fishery. The abundance of alewives was effectively controlled by stocking Pacific salmon, starting in the mid 1960's. We believe that control program was responsible for the resurgence of chubs, yellow perch, and other native fish species in the 1980's. Now we face the challenge of sustaining alewives at a level sufficient to support the sport fishery but also compatible with restoration of native species.

Sport Fishing

Lake Michigan supports a diverse sport fishery featuring several species of salmon and trout, walleye, yellow perch, and smallmouth bass. Our objectives are 1) to sustain a mix of salmon and trout that can be supported by the ecosystem and that allows harvests similar to those seen over the past several years (see Table 1, under Goal II), 2) to sustain a lake trout harvest compatible with the lake trout restoration program, 3) to identify and correct facility problems in the Department's fish hatchery system, 4) to provide better nearshore fishing opportunities, 5) to increase public awareness of the fishery, and 6) to reduce unethical fishing practices.

In addressing those objectives, the Plan calls for us to improve our knowledge in a number of areas. We face the challenge of understanding, first, how management actions, especially stocking, affect the forage base for salmon and trout (primarily alewives, but also chubs and rainbow smelt) and, second, what numbers of salmon and trout can be supported by the changing forage community. We need good lakewide surveys of the forage fish community and lakewide assessments of the movement and abundance of salmon and trout. We do not yet understand fully the factors controlling the occurrence of diseases such as bacterial kidney disease, early mortality syndrome, and EED. We can choose between stocking coho salmon as yearlings or, at lower cost, as fingerlings, but we are not yet certain how much better, if at all, the yearlings will perform. Hatchery production of a number of our salmon and trout species is affected by excessive mortality of swim-up fry (early mortality syndrome), but we do not yet know what causes the problem. We need to know more about the distribution and amount of suitable habitat that is available for walleyes, northern pike, smallmouth bass, and yellow perch. We need to closely monitor changes in yellow perch populations.

Several sport fishing rule changes proposed during development of this Plan have already been adopted. We have 1) extended the lake trout season so that it runs from March 1 through October 31, 2) closed tributaries to Green Bay to fishing from March 2 through the day before opening day, with designated sections of nine main tributaries remaining open, 3) created spawning refuges in the Sensiba discharge area to the Suamico River and immediately

below the De Pere dam, 4) created a seasonal refuge in the immediate vicinity of the new Root River steelhead facility, and 5) added a section of the Peshtigo River to the list of exclusions from the winter night fishing prohibition.

The Plan proposes the following additional sport fishing rule changes: 1) Allow trolling for fish other than lake trout in the Midlake Refuge. 2) Extend by two weeks in September the period when night fishing is prohibited in most Lake Michigan tributary streams. 3) Continue the Root River refuge.

The Plan calls for us to 1) work with the charter industry and Law Enforcement to improve charter reporting compliance, 2) develop operating plans for the Kewaunee River and Root River fish production facilities, 3) address the problem of deteriorating fish hatchery facilities, 4) work with the private sector and municipalities for agreements to open additional public fishing areas for shore fishing and small boat launching, 5) work with the charter industry and others to inform the public about sport fishing opportunities on Lake Michigan, and 6) work with Michigan, Indiana, and Illinois to implement a strategy, including bag limit reductions and commercial quota reductions, to protect the declining yellow perch population in southern Lake Michigan.

Earlier drafts of the Plan called for establishment of the Manitowoc-Branch River Fishery Area, a step that was approved by the Natural Resources Board at its September, 1994, meeting.

Commercial Fishing

For the commercial fishery, as for the sport fishery, we have set broad harvest targets (see Table 2, under Goal III). Our other objectives are 1) to seek adequate funding for commercial fishery management, 2) to further reduce mortality of non-target species, 3) to improve compliance with catch reporting requirements, 4) to increase public awareness of the benefits of the Lake Michigan commercial fishing industry, and 5) to enhance the viability and stability of that industry.

We have identified several areas where we need to know more. We need to improve our population and harvest assessments for all commercial species. For example, we will seek to develop juvenile lake whitefish surveys that provide reliable estimates of year class strength. To limit non-target mortality we need to continue to explore modifications in gear and fishing practices. We lack good estimates of the impact of the yellow perch commercial fishery in Green Bay on walleye. As a way to improve catch reporting, we would like to explore satellite communication technologies for instantaneous catch reporting. In view of declining adult yellow perch abundance in Green Bay and Lake Michigan we clearly need to know more about the factors controlling yellow perch reproduction and survival.

Several commercial fishing rule change proposed during development of the Plan have already been adopted. We have 1) increased the total allowable commercial harvest in the

northern chub fishing zone by 100,000, 2) lowered the trigger level for stopping that fishery during the spring quota period, 3) allowed over harvests in the northern chub fishing zone during the first two quota periods to be deducted from the total allowable harvest in subsequent quota periods, 4) established a trigger level for terminating the racehorse fishery for rainbow smelt, 5) extended the trap net season south of Cave Point (but retained the requirement that trap nets be removed from the water by June 28), and 6) lowered the total allowable commercial harvest of yellow perch from Green Bay. We have also proposed an increase in the total allowable commercial harvest of lake whitefish.

The Plan calls for us to 1) review total allowable commercial harvests (quotas) every two years, 2) establish, as a principle of allocating yellow perch, that sport and commercial fishers each receive half, by numbers, of the total harvest, 3) work with other states to allocate and jointly manage shared stocks, 4) explore possible methods of protecting commercial fishers from capricious reallocations of quotas, and 5) work with Michigan, Indiana, and Illinois to develop and implement a strategy, including commercial quota reductions, to protect the declining yellow perch population in southern Lake Michigan.

LAKE MICHIGAN INTEGRATED FISHERIES MANAGEMENT PLAN

This plan is guided by the broad goal of fisheries management in Wisconsin, as stated in the Wisconsin Administrative Code:

> *The goal of fish management is to provide opportunities for the optimum use and enjoyment of Wisconsin's aquatic resources, both sport and commercial. A healthy and diverse environment is essential to meet this goal and shall be promoted through management programs.*

It is our intent to manage the fisheries of Lake Michigan for the following goals:

Goal 1. A diverse, balanced, and healthy ecosystem. This means an ecosystem that sustains desired sport and commercial fishing activity, but also contains as much of the natural variety of species and strains as possible and that is resistant to dramatic changes in species abundance. The ecosystem management tools available to fisheries management are limited, so we focus in this Plan on enhancing fish habitat, protecting native fish species, and dealing with non-indigenous species.

Goal 2. A diverse multi-species sport fishery within the productive capacity of the lake. This goal expresses our desire for varied sport fishing opportunities in Lake Michigan, but it also acknowledges the dependence of the sport fishery on the productive capacity of the ecosystem. The diverse sport fishery will include brook, brown, rainbow and lake trout, coho and chinook salmon, walleye, smallmouth bass, northern pike, and yellow perch. It will include fishing opportunities in tributaries, from shore and piers, and on the open lake.

Goal 3. A stable commercial fishery within the productive capacity of the lake. The emphasis here is on stability, again with recognition of the limitations of the ecosystem. Within this goal we address the challenges of adequately funding our commercial fishing management program, minimizing mortality of non-target species, improving the catch reporting system, streamlining administrative procedures, and seeking ways to protect commercial quota holders from capricious reallocations of quotas.

For each of those goals, several objectives are specified below. While the goals are intended to be broadly stated and unquantified, we have drafted the objectives with the idea of providing targets against which success of the Plan can be measured. We have attempted to provide sufficient background information to let you understand why we consider that objective to be important. For each objective we have identified one or more problems that must be faced in order to achieve the objective and for each problem we have listed one or more tactics, the specific things we will consider doing to resolve the problem. The order of presentation of goals, objectives, problems, and tactics does not necessarily reflect Department priorities.

GOAL I - A diverse, balanced, and healthy ecosystem.

A diverse, balanced, and healthy ecosystem will sustain desired sport and commercial fishing activity, while retaining as much of the natural variety of species and strains as possible and that resisting dramatic changes in species abundance. The ecosystem management tools available to fisheries management are limited, so we focus in this Plan on enhancing fish habitat, protecting native fish species, and dealing with non-indigenous species.

Objective A. Protect, maintain, and enhance habitat for game and non-game fish species.

Although manipulation of fish populations is possible by a variety of techniques (e.g. fish stocking, regulation of harvest), ultimately an abundant, diverse, and stable fish community depends on the availability of suitable habitat for the desired species. By the broadest definition, suitable habitat includes those physical, chemical, and biological factors which are needed to satisfying the essential requirements of a species, allowing it to survive in an aquatic environment. Left to natural processes these factors would continually change, subtly modifying habitats.

Human activity, however, has accelerated the rate of change in habitat. Filling or dredging wetlands and littoral areas, diverting runoff and changing drainage patterns in watersheds, releasing contaminants into the air and water, increasing nutrient loading, and releasing chemical pollutants have degraded fish habitat. We must seek to protect undisturbed habitat, maintain functioning habitat, and, if possible, improve or create habitat beneficial to both game and non-game species.

Problem 1 Walleye and northern pike spawning habitats are degraded.

Urbanization and industrialization of the lower reaches of many major Lake Michigan tributaries have resulted in extensive filling of wetlands. Also, fills behind established bulkhead lines (bulkhead lines are legally established shorelines, see Problem 6, below) reduce shallow water habitat. Mitigating these losses with rock rip-rap appears to be one method of increasing walleye natural reproduction.

Ditches on the west shore of Green Bay are very important northern pike spawning and nursery areas and are used increasingly by adult walleyes with unknown success. These ditches vary substantially in their quality as spawning and nursery habitat. We can improve this habitat. Major west-shore tributaries also have substantial walleye spawning runs but appear to have limited reproductive success, for reasons which are poorly understood. Possible causes appear to be interference from large sucker runs and/or dewatering of spawning areas because of hydro-electric operations or natural flow fluctuations. In addressing this problem we will work closely with Department programs for Law Enforcement and Water Regulations and Zoning.

Tactic: Continue evaluating enhanced walleye spawning habitat in the Fox River.
Tactic: Restore/enhance walleye spawning habitat in other areas of the Fox River and lower Green Bay.
Tactic: Evaluate the desirability of enhancing walleye and northern pike spawning habitat in the Menomonee and Milwaukee Rivers.
Tactic: Determine factors limiting walleye reproduction in major Green Bay west-shore rivers, and develop strategies to improve reproduction.
Tactic: Inventory northern pike spawning habitat in Green Bay.
Tactic: Assess enhancement methods for northern pike spawning and nursery habitat.
Tactic: Work with highway departments to enhance northern pike habitat in roadside ditches.

Problem 2 Lake trout reproduction may be hindered by degraded habitat.

After stocking lake trout from shore for about 15 years and finding no evidence of natural reproduction, researchers concluded in the early 1980's that not enough attention was being paid to the importance of suitable spawning substrate. Consequently, during the past decade much of the lake trout restoration effort has focused on locating suitable spawning habitat and then concentrating stocking on those sites. Yet the rare occurrences of confirmed egg deposition and hatching success by lake trout in Lake Michigan have not been found on these natural reefs but rather on rocks piled near piers, breakwalls, or water intake pipes. Natural spawning reefs may no longer be capable of supporting natural reproduction. With support from the Environmental Protection Agency, we are currently assessing the advisability of constructing an artificial lake trout spawning reef in or near the Clay Banks Refuge. The Clay Banks Refuge area is under consideration for the artificial reef because stocking there has resulted in the establishment of a substantial population of spawning adults[2]

Tactic: Construct and study an artificial lake trout spawning reef, if that can substantially enhance the lake trout restoration effort.

Problem 3 Some land use practices can lead to nonpoint source pollution in our tributaries and estuaries.

While most people are familiar with the dramatic effects of point source pollution (e.g., direct discharge of untreated waste water into a stream or lake and resultant fish mortality), nonpoint source pollution has been largely overlooked in the past because it is not as conspicuous in its effects. Nonpoint source pollution can be the result of industrial or

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[2] Holey, M., M. Coshun, M. Toneys, and W.H. Horns. 1993. Progress toward lake trout rehabilitation in Wisconsin waters of Lake Michigan from 1986-1992. Administrative Report No. 35, Bureau of Fisheries Management, Wisconsin Department of Natural Resources. Madison, Wisconsin.

manufactoring processes, but also develops from land use practices related to contruction, agriculture, and other activities. If improperly managed, land use practices can result in increased sediment, nutrient, organic-chemical, and heavy-metal loadings to streams, while creating abnormal flow rates. All have negative effects on aquatic communities by destroying habitat, increasing turbidity, lowering dissolved oxygen levels, disrupting food webs, decreasing diversity and increasing the abundance of undesirable species.

Through the Nonpoint Source Pollution Abatement Program the Department shares the cost of installing best management practices in designated priority watersheds. Department staff work with counties to recommend watershed selection to the Land and Water Conservation Board. The Department also acquires and protects sensitive lands through the Stewardship Program. Fisheries Management can provide information to help assure that, in the selection of priority watersheds and in the designation of lands for protection or acquisition, the Land and Water Conservation Board and the Department recognize Lake Michigan fisheries needs. A single guidance document describing best management practices from a fisheries perpective is not now available for that purpose.

Federal participation in nonpoint pollution control efforts includes assistance in implementing Remedial Action Plans and development of a Lake Michigan Lakewide Management Plan (LaMP). Additionally, the Environmental Protection Agency and the National Oceanic and Atmospheric Administration work with Wisconsin to develop a Coastal Nonpoint Pollution Control Program.

Tactic: Work with the Nonpoint Source Program to develop a guidance document describing best management practices from a fisheries perspective.
Tactic: Work with the Nonpoint Source Program and county officials to include consideration of Lake Michigan fishery objectives in selection of priority watersheds by the Land and Water Conservation Board.
Tactic: Utilize the best management practices guidance document to help educate the public about effects of land use practices on water quality.
Tactic: Develop specific land acquisition and protection goals related to fisheries habitat needs, for implementation by the Stewardship Program.
Tactic: Provide information to federal agencies and Department environmental quality programs to support programs that protect water quality and provide a diversity of habitats for fish.

Problem 4 Aquatic plant control may affect fish populations.

When found in high abundance, aquatic plant communities composed of rooted macrophytes and algae are frequently viewed as nuisances by some lake shore property owners. Under these circumstances individuals or property owner associations will attempt to reduce aquatic

plant abundance along their shorelines using a variety of control techniques. These methods can be classified into three categories; physical, chemical and biological. In Wisconsin physical (harvesting, bottom covers, dredging, raking) and chemical (herbicides) controls are generally used. Permits for chemical treatment of aquatic plants are handled in the Department's Aquatic Plant Management Program. Physical removal of aquatic plants does not require a permit and may be conducted by municipalities and others.

The impacts that aquatic plant control has on fish communities varies with the type of fish community present and the extent of the control measures. Chemicals may directly affect fish and plant control measures will affect fish habitat. Optimal amounts of vegetation are critical for successful breeding, rearing, and growth of fish throughout their life. However, optimal habitat and plant densities vary between fish species. Also, particular species of plants afford better habitat than do others. Some of the high-value plant species may not recover after control as more aggressive or non-indigenous species fill vacant areas.

Tactic: Work with the Aquatic Plant Management Program, municipalities, and others involved in aquatic plant control efforts to assure compatibility of control methods with fish habitat needs.

Problem 5 Dams and other waterway alterations limit the movement of fish in rivers and can degrade fish habitat.

Most major Lake Michigan tributaries have been dammed (if the Besadny Fisheries Facility on the Kewaunee River is counted as a dam, all tributaries have been dammed). These dams restrict both upstream and downstream movement of fish. The dams can benefit fisheries by preventing sea lamprey from reaching suitable spawning habitat and limiting upstream migrations of other detrimental species, but they can have major negative effects. They can restrict access of many native species to large areas of spawning and nursery habitat and divide populations into genetically isolated sub-populations. The native species affected can include smallmouth bass, walleye, musky, northern pike, lake whitefish, and lake sturgeon. Blockage of the upstream migration for anadromous fish also limits stream fishing opportunities. These issues are discussed in detail for the Menominee River in the Menominee River Fisheries Plan[3]. Hydroelectric dams are operated under licenses granted by the Federal Energy Regulatory Commission (FERC). When a license expires, FERC has the opportunity to deny relicensing or to require the construction of fish ladders or other structures to allow safe passage of fish. Department biologists provide expert advice to FERC during the relicensing process. Alterations of waterways for other purposes are regulated by the Department through the Bureau of Water Regulation and Zoning. Some old

[3]Wisconsin Department of Natural Resources and Michigan Department of Natural Resources. 1992. Menominee River Fisheries Plan. 48 pp.

dams do not stop the upstream passage of anadromous fish, but angling for those fish is regulated by inland rules which include a closed winter season.

Tactic: Continue to advise the Federal Energy Regulatory Commission during relicensing of dams.
Tactic: Encourage the removal of selected dams on streams where sea lamprey spawning can be effectively controlled, or look for methods to pass sturgeon and other migratory species over those dams.
Tactic: Continue to advise the Bureau of Water Regulation and Zoning and local zoning agencies about fishery impacts of waterway alterations.
Tactic: Open areas above dams to year round fishing for anadromous fish with a Great Lakes Salmon Stamp, if those dams do not stop the upstream passage of those fish.

Problem 6 Filling behind bulkhead lines and related shoreline development sometimes destroy fish habitat.

Valuable fish habitat, including some of the last remaining wetlands on Lake Michigan, lie behind bulkhead lines. Bulkhead lines are established by municipalities (township, city, or village) with approval by the Department. Currently, bulkhead lines must conform as nearly as possible to the existing shoreline. However, past approvals established lines which were significant distances from the natural shoreline. The law allows property owners to build structures or place fill in the waterway out to a bulkhead line without further permits from the Department, although it does not remove the responsibility to obtain federal permits.

Most municipalities do not have long range land usage plans to regulate the activities that may occur along a shoreline. In practice this means that once a bulkhead line is established a riparian can conduct projects behind the line that would not be allowed if the bulkhead line did not exist. While one property owner may choose not to develop the shoreline, when ownership changes, the next riparian may choose to fill out to the bulkhead line and in the process destroy valuable habitat.

Tactic: Work with local municipalities to remove bulkhead lines by ordinance where appropriate.
Tactic: Determine the value of habitats landward of bulkhead lines and, where appropriate recommend protection measures.
Tactic: Advise the Bureau of Water Regulation and Zoning and local zoning agencies about fishery impacts of lakeshore development.

Objective B. Protect and restore native species.

Human activities in the Lake Michigan basin, through water quality degradation, habitat modification, intentional and unintentional introduction of non-indigenous species, and sport and commercial fishing, have had profound effects on native fish populations. The Lake Michigan system as a whole has been sufficiently altered that it is not feasible to completely restore the pre-settlement native fish community. However, rehabilitation of populations of some native species could promote diversity and stability within the ecosystem, while also, in some cases, providing additional recreational or commercial opportunities.

Problem 1 We have not succeeded in reestablishing naturally self-sustaining stocks of lake trout.

Wisconsin and neighboring states began a lakewide program to restore native lake trout in Lake Michigan almost 30 years ago. Through a joint state and federal program, tens of millions of juvenile lake trout stocked over the years have demonstrated good survival and growth. Stocking and protective measures have focused in areas thought to be suitable for reproduction. The Department has worked with commercial fishers and the U.S. Fish and Wildlife Service to stock millions of fertile lake trout eggs on Jacksonport Deep Reef. Aggregations of adult lake trout capable of producing viable eggs and sperm are now found inshore during the fall spawning season along the coast from Door County south to the state border. However, natural reproduction has not been documented[4]. Factors that might limit natural reproduction include contaminants, predation by alewives, and genetic adaptations.

Tactic: Continue to assess the performance of different lake trout strains.
Tactic: Evaluate alternative stocking techniques.
Tactic: Cooperate with investigators conducting early life history studies addressing factors limiting natural reproduction.
Tactic: Determine the distribution and abundance of lake trout fry and juveniles.
Tactic: Continue to search for suitable natural spawning habitat.

Problem 2 Natural walleye recruitment does not sustain acceptable fisheries in some areas of Green Bay.

The objective of walleye rehabilitation efforts in Green Bay is to re-establish self-sustaining populations. We want to sustain walleye populations that provide one component of a diverse sport fish community that also includes northern pike, smallmouth bass, and yellow

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[4] Holey, M., M. Coshun, M. Toneys, and W.H. Horns. 1993. Progress toward lake trout rehabilitation in Wisconsin waters of Lake Michigan from 1986-1992. Administrative Report No. 35, Bureau of Fisheries Management, Wisconsin Department of Natural Resources. Madison, Wisconsin.

perch. To quickly establish high-density populations, intensive stocking of walleye was conducted in various areas of Green Bay. Survival was good and within a few years high-density populations were achieved. During this period the season on walleye remained open and, as abundance increased, exceptionally good catch rates created a nationally recognized sport fishery. Walleye stocking was discontinued in Green Bay in 1984. Natural reproduction maintained the lower Green Bay population, but, because of insufficient natural reproduction, walleye abundance in other areas has declined from levels achieved through stocking. Although some local populations may be self-sustaining, anglers are dissatisfied by catch rates where abundances are low. Stocking was resumed in Sturgeon Bay in 1994.

Tactic: Determine factors affecting recruitment of walleyes in Green Bay.
Tactic: Complete ongoing investigations assessing natural reproduction.
Tactic: Employ maintenance stocking when and where appropriate amd work with private groups to supplement rearing capability.
Tactic: Explore other areas for limited walleye fisheries.
Tactic: Improve harvest estimates, emphasizing night fishing.

Problem 3 Many native species are locally extinct.

The fish community in Lake Michigan is best described as disturbed and unstable. The natural balance has been dramatically altered by pollution, non-indigenous species, habitat destruction and over fishing. Some species which were an integral part of the fish community have all but disappeared. Several closely related deep-water cisco species were once found in Lake Michigan, but only the bloater chub remains in abundance. Lake herring were once abundant in Green Bay and Lake Michigan. Commercial herring harvest reached a high of 24.2 million pounds in 1908. The last year with a harvest over one million pounds was 1956. The harvest declined to 30,000 pounds in 1960 and 1,000 pounds in 1966. Re-establishment of lake herring would complement the forage base and provide sport and commercial fishing opportunities. However, commercial fishers have expressed concern about the effect of lake herring on lake whitefish.

The restoration of lake sturgeon in the Menominee River is discussed in the Menominee River Fisheries Plan, currently under development by the Wisconsin and Michigan Departments of Natural Resources.

Great Lakes strain spotted muskellunge existed historically in Green Bay and Lake Michigan. Records indicate 3,000 pounds were harvested in 1884. There appear to have been remnant populations at least into the 1930's. Re-establishment of a musky population would complement other top predators, add stability to the fish community, and provide additional fishing opportunities.

Tactic: Evaluate the feasibility of restoring lake herring to Lake Michigan.
Tactic: Continue ongoing efforts to re-establish lake sturgeon.
Tactic: Continue ongoing efforts to re-establish Great Lakes spotted muskies.
Tactic: Investigate factors limiting native fishes (e.g., interaction between lake whitefish and herring).

Problem 4 Alewives, at high population levels, may affect native species.

High alewife population levels may have had a negative impact on many native fish populations, most notably chubs and yellow perch. Their mode of impact may have included direct predation on early life stages of other species as well as competition for food. Although alewife population levels are currently relatively low, if left unchecked they could well return to previous high levels. To date the most effective alewife control mechanism found has been the stocking of Pacific salmon. If it is possible, we would like to sustain alewives at abundances sufficient to support the salmon and trout populations but low enough to allow rehabilitation of native species.

Tactic: Continued judicious stocking of salmon and trout.
Tactic: Continue to study the impact of alewives on native species.

Problem 5 Cormorants may affect fish populations.

Historically cormorant populations have fluctuated dramatically. Between 1950 and the early 1970's bio-accumulation of pesticides and other industrial compounds combined with human activities (especially shooting) devastated cormorant populations on the Great Lakes. In the early to mid 1970's the population began to increase dramatically across the prairie provinces of Canada and eastern North America. The cormorant diet consists strictly of live fish. The impact of the increasing predation pressure on the fish populations of Green Bay is not well understood.

Tactic: Encourage and support a bioenergetics analysis of the impact of cormorants on native species in Green Bay.

Objective C. Develop and evaluate strategies that deal with non-indigenous species.

Many of the species present in Lake Michigan are non-indigenous species. Most were the unintentional result of human activities while some were intentionally stocked. New invasions continue. Some of these non-indigenous species, such as sea lamprey, alewives, and zebra mussels have had undesirable impacts on the ecosystem. Prevention of further invasions is the best protection for the lake ecosystem. Although sea lamprey have been reduced through a federally coordinated program and alewives have been reduced through the

stocking of salmon and trout, very few effective control methods are available once non-indigenous species are established.

Problem 1 Non-indigenous species keep coming and existing populations continue to expand. Elimination of established non-indigenous species is not possible and control can be extremely expensive.

Non-indigenous species have invaded the Great Lakes since the settlement of the region by Europeans. Since the early 1800's 136 non-indigenous species have become established in the Great Lakes. Approximately ten percent of these have had notable impacts on the ecosystem. The rate of invasion has been increasing. Almost one-third of all non-indigenous species now present have entered the Great Lakes since 1959. This increased invasion rate was largely due to the opening of the St. Lawrence Seaway, allowing greatly increased importation of non-indigenous species in the ballast water of seagoing vessels. Although recent Coast Guard regulations will slow the importation of non-indigenous species in ballast water, the problem will persist. Non-indigenous species can also be imported with bait fish and by other methods.

Once a non-indigenous species becomes established, eradication is virtually impossible and control, even if possible, can be extremely expensive. Millions of dollars per year have been spent on sea lamprey control since the early 1960's, yet lamprey endure. Other non-indigenous species, including the carp and zebra mussel, may never be successfully controlled. Ruffe, now established in Western Lake Superior may invade Lake Michigan within the next several years. Department fishery biologists were the first to discover ruffe in Lake Superior and have worked since 1987 to identify and pursue feasible strategies to control the spread of ruffe to other areas. Starting January 1, 1995, for example, the harvesting of fish from Lake Superior for use as bait will be prohibited.

Tactic: Encourage the development of methods to strictly regulate ballast water exchanges that affect the Great Lakes.
Tactic: Encourage continued exploration of practical control and harvest methods for carp and other undesirable non-indigenous species.
Tactic: Promote public understanding of the non-indigenous species problem.
Tactic: Develop additional strategies for controlling inadvertent transport of non-indigenous species by bait dealers, the aquarium industry, and recreational boaters.
Tactic: Continue to work with the Ruffe Control Committee to identify and pursue feasible measures to limit the expansion of the current range of ruffe in Lake Superior.
Tactic: Support sea lamprey control efforts funded by the Great Lakes Fishery Commission.

Problem 2 The impacts of non-indigenous species are not well understood.

Unintentionally introduced non-indigenous species, such as the sea lamprey and alewife have had dramatic impacts on the Lake Michigan fish community. The impacts of more recently established unintentionally introduced species, such as white perch, zebra mussel and spiny-tailed water flea have yet to be realized. Other species such as the ruffe, which is moving east in Lake Superior, also pose a threat to the Lake Michigan fish community. The development of appropriate response strategies will require knowledge of the distribution, abundance, natural history, and ecological interactions of the non-indigenous species.

Tactic: Monitor trends in white perch and ruffe.
Tactic: Investigate population dynamics of non-indigenous fish species and their interactions in the Lake Michigan ecosystem.

Problem 3 We do not know what level of salmon and trout stocking, if any, will hold alewives at levels compatible with rehabilitation of native species while not depleting alewives to the point where they cannot support salmon and trout fisheries desired by anglers.

Over the last 30 years we have witnessed dramatic changes in the relative abundance of alewives. The initial rapid population explosion was concurrent with population collapses of numerous native species. During the 1960's alewives were viewed as a nuisance, and non-native salmon and trout were stocked to control them. An important sport fishery for the stocked salmon and trout developed. Salmon and trout stocking continued to increase into the late 1980's. Eventually, salmon and trout predation demand surpassed the available supply of alewives. As the alewife population oscillated and then decreased, some of the native species, notably chubs and yellow perch staged comebacks. The evidence linking alewife population changes with population changes experienced by those native species is circumstantial but convincing. Alewives are no longer viewed solely as a nuisance, however, but also as a valuable forage fish which supports salmon and trout sport fisheries. If it is possible, we would like to sustain alewives at abundances sufficient to support the salmon and trout populations but low enough to allow rehabilitation of native species.

Tactic: Determine salmon and trout stocking levels that are suitable to control alewives at a level that supports healthy salmon and trout populations while allowing native species to thrive.

Objective D. Employ the best available information, methods, and technologies in the management of the fisheries of Lake Michigan.

Problem 1: The demands of fisheries management leave little time for the continuing education of fisheries management personnel.

Well educated personnel and good equipment enable efficient and progressive management. Keeping up with new research requires an investment of time and money in continuing education. Advancements in field and laboratory equipment enable data collection that previously was very difficult or impossible to collect. We can take advantage of these advances only if we invest in the new technology and train our personnel in its use.

Tactic: Increase effective continuing education and training of Fisheries Management personnel.

GOAL II - A diverse multi-species sport fishery within the productive capacity of the lake.

Objective A. Develop a salmon and trout species mix within ecosystem capacity which supports sport harvests within target ranges (see Table 1) and reflects angler preferences.

Sport harvest objectives shown in Table 1 are proposed for the six salmon and trout species stocked. For comparison, Table 1 summarizes sport harvests during recent years. Harvest objectives reflect the lower return of chinook salmon since 1988, the improved steelhead fishery, and the limitations on lake trout harvest required by the lake trout rehabilitation program. The mix of six salmon and trout species will provide variety in the anglers catch and fishing opportunities throughout the fishing season.

We will continue to sustain this fishery through a stocking program similar to that employed in recent years. The distribution of stocked salmon and trout other than lake trout along the Wisconsin shoreline is determined primarily using a procedure called the stocking rationale model[5], which considers past catch data, past stocking, and the distribution of fishery access facilities (i.e., ramps, moorings, piers, shoreline, and streams) and is intended to maximize angler opportunity and catch.

Table 1. Estimated recent annual sport harvests (numbers of fish) from Wisconsin waters of Lake Michigan and target ranges for 1995-2001.

	ANNUAL HARVESTS		TARGET RANGES	
SPECIES	years	average	low	high
Brook Trout	1986-1993	3,472	1,725	5,219
Brown Trout	1986-1993	61,323	49,564	73,082
Rainbow Trout	1987-1993	73,243	53,017	93,469
Chinook Salmon	1988-1993	135,217	95,014	175,420
Coho Salmon	1986-1993	92,474	59,657	125,291
Lake Trout	1990-1993	68,704	50,000	82,000

The salmon and trout program must recognize the limitations of the ecosystem. When salmon and trout stocking began in Lake Michigan in the 1960's, lake trout had been

[5] Krueger, C.C. and Terrence R. Dehring. 1986. A procedure to allocate the annual stocking of salmonids in the Wisconsin waters of Lake Michigan. Fish Management Report 127, Bureau of Fisheries Management, Wisconsin Department of Natural Resources, Madison, WI.

extirpated and burbot were very scarce. Alewife were abundant and provided plentiful forage for stocked salmon and trout. As the numbers of salmon and trout increased through the 1970's and peaked in the 1980's, forage fish populations changed. Alewife levels declined and have remained low. Chub populations increased dramatically and chubs became the most abundant planktivore. Diet studies in our waters indicated that salmon and trout continued to feed primarily on alewife and made little use of the abundant chubs. Concern developed that the high level of stocking was more than the reduced alewife populations could support. The chinook catch declined after 1987, an indication the high sport harvests of the mid 1980's could not be sustained. Bioenergetics models indicate that chinook salmon had a greater impact on alewives than any other species. In 1991 chinook salmon stocking was reduced 27% and commercial harvest of alewife was prohibited to help stabilize the alewife population.

Problem 1 The available forage in Lake Michigan can only support a limited predator stocking level, one which may not meet angler expectations.

Although non-native salmon and trout were originally stocked in an attempt to control an undesirable alewife population, stocking of salmon and trout has continued in order to sustain an important sport fishery. Salmon stocking levels in the late 1980's probably exceeded the capacity of the alewife population to support them. Some sport anglers who experienced exceptional fishing associated with the initial large salmon populations have come to expect this unsustainable predator population to continue. In the future, predator stocking levels should be linked to the available forage base. Anglers will need to recognize the limits of Lake Michigan ecosystem to support sport fish populations.

The forage base in Lake Michigan is currently being assessed by the National Biological Survey through the Lake Michigan Interagency Fish Stock Assessment Research Project. That project is supported by each of the four states bordering Lake Michigan with funds made available through the Federal Aid in Sport Fish Restoration program. Annual lakewide trawl surveys are also conducted by the U.S. Fish and Wildlife Service.

If further limitations on stocking are necessary, the geographical distribution of stocked fish will be increasingly important.

Tactic: Continue to support lakewide forage surveys.
Tactic: Match stocking to forage using the best available data and computer models.
Tactic: Continue to limit commercial harvest of forage.
Tactic: Encourage the U.S. Fish and Wildlife Service to include Green Bay in lakewide forage surveys.
Tactic: Run the stocking rationale model every two years using current information about sport harvests and available facilities and compare actual stocking with what is suggested by the stocking rationale model.

Problem 2 Accurate sport harvest estimates are difficult and expensive to obtain.

Our knowledge of sport harvests is based on creel surveys funded largely from revenues from the sale of Great Lakes Salmon and Trout Stamps and on reports submitted by charter captains. Because states differ in creel survey methods and because the accuracy of our creel survey has ben challenged, we are working with the other states through the Lake Michigan Technical Committee to review creel survey methods and to explore methods of improving comparability, efficiency, and accuracy.

The charter reporting system needs improvement. A large percentage of charter captains send their monthly reports late. In 1993, 42% of all charter captains sent in at least one late report and in each month an average of 13% of all reports were late. Charter captains have recently complained that some captains are misleading the Department by misreporting the number of fish caught or by failing to report trips. In 1987, twenty-two charter captains were charged with failure to report or with inaccurately reporting their monthly sport trolling activities in Sheboygan. This resulted in over $10,000 dollars in fines, costs, and assessments against those captains. In 1990, wardens conducted an investigation into charter activities in Algoma and Kewaunee based on the sale of one-day fishing licenses in those ports. Of the 744 surveys returned, 579 indicated possible inaccurate reporting and 139 indicated trips which were not reported by the licensed sport troller.

Tactic: Continue to work with other states to evaluate creel survey methods and to improve comparability, efficiency, and accuracy.
Tactic: Develop a cooperative project with Law Enforcement to improve charter reporting compliance.
Tactic: Improve charter industry cooperation to enhance the quality of reporting.
Tactic: Explore alternatives to charter reports.

Problem 3 Population dynamics of salmon and trout are not adequately understood.

Until recently, agencies stocking salmon and trout into Lake Michigan believed information collected through creel surveys or at spawning weirs was sufficient to adequately manage those species. However, the mysterious and devastating mortality of adult chinook in Lake Michigan beginning around 1988 changed that thinking. Most biologists now admit that their inadequate or outdated information on growth, diet, mortality, health, and movement of the general chinook population in the lake has delayed reaching a consensus on the cause of and solution to the mortality problem.

Tactic: Develop appropriate assessment techniques.
Tactic: Participate with other agencies in lakewide stock assessments, including early life history studies.
Tactic: Integrate population information with other agencies for a lakewide understanding.

Problem 4: In recent years chinook salmon and other species have experienced an unacceptably high prevalence of bacterial kidney disease and other diseases.

Prior to 1988, the chinook sport fishery in Lake Michigan held a national reputation of excellence. The fish were big and plentiful in the sport fishery and in weir harvests. Their presence spurred an increase in local businesses such as charter operators, marina development, sport shops, etc. In spring of 1988, the first of a series of disease outbreaks occurred in chinook. Concurrently, the 1988 chinook sport harvest declined by 50% compared to previous years. Weir returns were also below average.

During the spring dead and dying chinook salmon were found on beaches and struggling near the surface. Affected fish ranged in size from one to 16 pounds. Dead fish did not have any measurable visceral body fat, suggesting that lack of food played a role in the die-offs. By this time alewife abundance had declined sharply in Lake Michigan. In response to bioenergetics analyses suggesting that the predatory demands of stocked salmon and trout were exceeding the capacity of the forage base, Wisconsin, Illinois, and Indiana reduced chinook stocking levels.

Department biologists were assigned to the Fish Health Committee, a team of fish health experts working under the auspices of the Great Lakes Fishery Commission, to address the BKD problem. In recent years cooperative studies have been implemented to determine the origin of the fish that were dying and the age at which they were affected. Diseases affecting the fish included not only bacterial kidney disease (BKD), but also anemia due to the presence of an intestinal parasite, bacterial gill disease (BGD), and infection by a variety of other bacteria. Since 1988 the prevalence of BKD has increased in coho and steelhead and has been detected in lake trout and brown trout from Lake Michigan.

Several strategies have been developed to control the transmission of BKD in both chinook and coho salmon. Those strategies are 1) culling brood stock with clinical signs of BKD, 2) disinfecting the surfaces of eggs with iodophors, 3) rearing chinook and coho under optimal conditions, and 4) treating the fish with erythromycin thiocyanate for 21 days one or more times during rearing. Other studies were initiated to better understand the diet composition of chinook and other salmon and trout as it relates to fish survival and growth. Data from a variety of sources indicate that since 1988 the prevalence of BKD has declined in Wisconsin waters.

Tactic: Continue to seek and evaluate disease free and/or resistant salmon.
Tactic: Continue efforts to control BKD, and evaluate the success of specific strategies.
Tactic: Determine age-specific mortality rates of chinook salmon in spring die-offs.
Tactic: Continue studies of salmon and trout diets and their relation to forage abundance and type.

Problem 5 Coho harvests and returns to the weirs have been erratic.

Since 1988, Wisconsin's Lake Michigan coho program has been based entirely on stocking accelerated-growth fall-fingerling coho. Prior to fall 1988, the majority of coho stocked by Wisconsin into Lake Michigan were yearlings. From 1984-1989, when the sport harvest was dominated by coho stocked as yearlings, the average annual harvest was 125,000 coho. Sport harvests have declined since the accelerated-growth program was put in place. However, because a substantial portion of the Wisconsin coho harvest consists of fish stocked as yearlings in Michigan, it is not clear that the accelerated-growth program is the cause the reduced catches.

Tactic: Stock both yearling and fingerling coho salmon and assess the success of each.

Problem 6 Production of several salmon and trout species from feral brood stocks has been limited by early mortality syndrome.

As early as 1973 coho salmon in Wisconsin and Michigan exhibited excessive mortality of swim-up fry. In recent years a similar problem, referred to as early mortality syndrome, has affected not only coho salmon, but also chinook salmon, steelhead, and, possibly, Seeforellen brown trout. There is some indication that lake trout in federal hatcheries are also affected. The syndrome, which occurs at the time of swim-up or earlier, is characterized by inability to maintain equilibrium, lethargy, failure to eat, changes in color, and, finally, death. Early mortality syndrome is a Great Lakes basin-wide problem that has been observed not only in production facilities of all states bordering Lake Michigan, but also in Pennsylvania, New York, and Ontario. In cooperation with management agencies in other states and with the University of Wisconsin we are investigating the problem.

Tactic: Continue cooperative investigations exploring the roles of bacteria, viruses, contaminants, nutritional deficiencies, and genetic factors in this syndrome.
Tactic: Explore ecological factors such as alterations in the food web that might explain or contribute to this problem.

Problem 7 Brood river weir operation and stocking procedures have not been well defined.

The following specific concerns have been raised regarding weir operation in the Kewaunee and Root Rivers: 1) Gametes are not always collected throughout the duration of a spawning run to assure genetic diversity and to maintain desired traits. 2) Upstream passage of surplus fish for sport fishing has been inconsistent.

Elevated stocking in brood rivers is scheduled to assure adequate returns of spawning fish for gamete collection, while still allowing sufficient upstream passage of fish to sustain popular stream fisheries. Procedures should be continually evaluated in an attempt to increase

efficiency, reduce mortality, and maximize returns. Because large numbers of several salmon and trout species are present in brood rivers (Kewaunee and Root) concurrently, concern has been raised about competition and predation among those species.

Tactic: Develop operation plans for the Kewaunee River and Root River facilities.
Tactic: Evaluate stocking strategies considering a) size at stocking, b) time of stocking, c) location of stocking, d) methods of stocking, e) health standards, f) quality assurance, and g) interactions among stocked species present in brood rivers.
Tactic: Assess the capacities of the Kewaunee and Root River ecosystems to support and withstand spawning runs generated by currently projected stocking of all salmon and trout species.
Tactic: Continue the refuge in the immediate vicinity of the new Root River steelhead facility. [In May of 1994, the Natural Resources Board created a temporary refuge, to take effect on January 1, 1995. Without further NRB action, the refuge will expire on December 31, 1995.]

Problem 8 Public expectations of stocking and harvest may not be realistic given current conditions in Lake Michigan.

Stocking and harvest levels attained from 1985 through 1987 are considered by many anglers to be reasonable goals for fisheries management. However, those stocking levels and harvests are probably not realistic in Lake Michigan today because the forage base has drastically changed. Alewives, the preferred food for Pacific salmon in Lake Michigan remained abundant into the early 1980's but then declined to low levels of abundance. Today the forage fish community of Lake Michigan is dominated by chubs, a species not readily available to Pacific salmon because of their preference for deep, cold water. In response to lower alewife abundance and a decline in the standard weight of chinook salmon, the Department reduced chinook salmon stocking by 10% from 2,740,000 to 2,378,000 fish in 1986. In 1991, Department further reduced chinook salmon stocking by 27% from 2,379,000 to 1,740,000 fish. In 1992, Wisconsin, Illinois and Indiana agreed to reduce stocking by 25% from current levels, except that Wisconsin cut stocking based on 1990 levels. We believe that declining alewife abundance contributed to the increased incidence of bacterial kidney disease that caused survival and harvest of Pacific salmon to decline rapidly after 1987. New target harvest levels have been set that reflect the current conditions of Lake Michigan which include lower alewife abundance and continued disease problems.

Tactic: Provide informational materials to improve public understanding of this problem.
Tactic: Periodically survey angler species preferences.

Objective B. Maintain a lake trout harvest consistent with lake-wide management objectives.

Since 1985 Wisconsin has participated in the Lakewide Management Plan for Lake Trout Rehabilitation in Lake Michigan[6]. That plan established a total annual mortality rate goal of 40% for all waters of Lake Michigan except Green Bay and the northern reaches of the Lake. In the 1986 Lake Michigan Fisheries Management Plan[7], that goal is translated into acceptable harvest levels for Wisconsin waters. Within Wisconsin waters annual harvests of 82,000 in the sport fishery and 47,000 in the commercial fishery (non-target mortality) are considered to be compatible with the lakewide target of 40% total annual mortality. The challenge is to balance demands for harvest with the need to protect fish for the rehabilitation program.

Problem 1 Fluctuating exploitation rates produce a risk of over harvest.

Interest in the sport harvest of lake trout for the past 20 years has fluctuated. As the sport fishery developed, growing angler pressure resulted in a lake trout harvest from Wisconsin waters of Lake Michigan exceeding 100,000 fish annually. By the mid 1980's more restrictive sport fishing rules became necessary to reduce the annual harvest to 82,000 fish in Wisconsin waters. In recent years, however, the sport harvest dropped well below that goal, so in 1994 the Natural Resources Board approved an extension of the lake trout season. In the future more adjustments in allowable harvest are inevitable as we try to balance goals for lake trout restoration against a fluctuating sport harvest.

Lake trout harvest by the charter industry can be a large portion of the lake trout sport catch but seems to vary inversely with the availability of other salmon and trout species. Recently, in years considered to be good for coho salmon and rainbow trout, lake trout comprised 21% (1993) to 24% (1992) of the sport harvest. During years perceived to be poor for other salmon and trout, lake trout comprised 31% (1990) to 29% (1991) of the sport harvest. Unless a desirable mix of species exists, the 40% total annual mortality level for lake trout may be exceeded.

Tactic: Monitor sport harvest and adjust open seasons, refuges, and bag limits as needed in order to help meet the lakewide goal of 40% annual mortality.
Tactic: Maintain a mix of salmon and trout species.

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[6] Appendix B in Holey, M. 1990. Lake Michigan Lake Trout Assessment Plan. Administrative Report No. 32, Bureau of Fisheries Management, Department of Natural Resources, Madison, Wisconsin.

[7] Kernen, L.T. 1985. Lake Michigan Fisheries Management Plan. 1986. Administrative Report No. 25, Bureau of Fisheries Management, Wisconsin Department of Natural Resources, Madison, Wisconsin.

Problem 2 Other mortality factors, especially predation by sea lamprey, limit our ability to control mortality.

There are a number of factors besides sport fishing and non-target mortality in commercial nets that affect lake trout survival. Health and condition of fish at time of stocking can affect survival shortly after stocking. Starting in 1995 the U.S. Fish and Wildlife Service, which produces all lake trout stocked into Lake Michigan, will rear lake trout at higher food rations, thus producing larger fish for stocking as yearlings. We believe that this will enhance the survival of stocked fish. In a field study coordinated by the Lake Michigan Technical Committee of the Great Lakes Fishery Commission, the new rearing strategy will be evaluated.

Sea lamprey predation is a continuing problem. Where standard treatments cannot be done effectively, sea lamprey populations are increasing. In recent years adequate funding for sea lamprey control has been in doubt. Because the U.S. Fish and Wildlife Service produces all lake trout that are stocked in Lake Michigan and handles the sea lamprey control program, with funding from the Great Lakes Fishery Commission, there is little that the Department can do to directly address these problems.

Tactic: Identify and quantify other mortality factors.
Tactic: Support adequate and stable federal funding for the sea lamprey control program.

Problem 3 The Midlake Refuge meets the objective of limiting lake trout mortality, but unnecessarily restricts angling for other species.

The Midlake Refuge was created to protect lake trout stocks as part of the lake trout rehabilitation program. Currently all fishing, both sport and commercial, is banned within this area. There is no biological reason to protect other sport fish species in these waters and non-target mortality of lake trout caught while sport trolling for other salmon and trout should be very low.

Tactic: Reconsider opening the Midlake Refuge to trolling for other species, while continuing to protect lake trout and continuing to prohibit commercial fishing in the refuge. [This rule change proposal was presented at public hearings in April of 1994. It was not presented to the Natural Resources Board for adoption because it was voted down in Conservation Congress balloting.]

Objective C. Identify and correct facility problems within the propagation system.

The current salmon and trout sport fishery in Lake Michigan, and particularly in Wisconsin's waters, is almost entirely dependent on artificial fish propagation and stocking. Since the stocking of salmon and trout was implemented on a large scale, one new hatchery (Kettle

Morraine Springs) and two egg-collection facilities (one on the Kewaunee River and one on the Root River) have been added to the Department's Lake Michigan coldwater propagation system. The Department has also acquired the former USFWS hatchery at Lake Mills, which produces both coolwater fish (walleye, northern pike, smallmouth bass) for inland stocking and, currently, coho salmon for Lake Michigan. The remainder of the substantial increase in the number and pounds of trout and salmon required to meet Lake Michigan stocking quotas has been produced by the existing facilities to the point of overcrowding their rearing capacity, with a subsequent reduction in the quality of the fish produced. These problems have been compounded by the closure of two of Department's coldwater propagation facilities (Hayward and Crystal Springs) in the early 1980's, due to funding shortfalls. Further closures are under consideration because of Department-wide funding constraints.

Problem 1 Production is limited by "worn-out" facilities, and major maintenance/development funding has been difficult to obtain.

Most of the Department's coldwater facilities were built during the 1920's-30's, and all but three depend on a "gravity-flow" water supply, either from artesian groundwater or surface water sources. Sporadic development has occurred over the years, but nothing significant since the early 1980's, when Kettle Moraine Springs was renovated. Two of our primary coldwater hatcheries serving Lake Michigan, Nevin and Wild Rose, are seeing continuing erosion of their production capability due to plain physical collapse of rearing units.

Even if we had adequate, structurally sound rearing units at all of our hatcheries, the limitation of the current rearing water supplies would be the primary control on production capacity. At most facilities, the available water supply is being fully utilized. The dependence of many of those facilities on artesian groundwater flow for their rearing water has been a source of problems in recent years. This is due to the application of modern environmental protection standards to those artesian water supplies.

Because of a recent increase in the price of Great Lakes Salmon and Trout Stamps revenues to have increased, despite a decline in Stamp sales. Nevertheless, the Great Lakes Salmon and Trout Stamp account is not adequate to resolve all facility problems.

Tactic: Stress quality over quantity of the fish produced at Department hatcheries, and reduce overloading.
Tactic: Establish a long-range hatchery major maintenance/ renovation plan and utilize it in all budget planning.
Tactic: Develop a standard schedule for ongoing hatchery facility maintenance with adequate funding, to reduce the need for major maintenance on an emergency basis.
Tactic: Use increased revenues to the Great Lakes Salmon and Trout Stamp account for Great Lakes coldwater facilities maintenance and development.

Tactic: Develop and fully utilize the potential of cooperative rearing of fish destined for Lake Michigan.

Tactic: Assess the advantages and disadvantages of having Department facilities rear only those fish that require special handling or are unique species or strains, and contract with private hatcheries to raise the rest.

Objective D. Provide near shore fishing opportunities.

There is a strong public demand for nearshore fishing opportunities on Lake Michigan. Currently excellent nearshore opportunities exist, but often these have limited public access or are only available seasonally. Construction of additional access points, or improvement of those currently existing, could increase the availability of the nearshore resources to both small boat and pedestrian anglers. Experimentation with native coolwater fish species or other strains of salmon and trout might expand these opportunities also. Care must be taken to ensure that the effects of these efforts on existing fisheries are understood.

Problem 1 Yellow perch recruitment is highly variable.

The objective of yellow perch management in the Wisconsin waters of Lake Michigan and Green Bay is to achieve, over the long term, a 50/50 split by numbers between the commercial and sport harvests. In order to achieve this objective, the commercial yellow perch harvest is managed through a quota allocation system which requires extensive and long-term harvest and population information. Changes in recruitment to the yellow perch population can significantly affect the allowable harvest levels for both the commercial and sport fisheries.

In southern Lake Michigan natural reproduction has been poor for five consecutive years. The adult population has already declined to the point where sport fishing has been affected. During December of 1994, the Department fishery managers met with counterparts from Michigan, Indiana, and Illinois, and with sport and commercial fishers to discuss the problem and consider management options. In January of 1995, the chief fisheries officials for Michigan, Indiana, Illinois, and Wisconsin agreed to recommend a joint lakewide strategy to protect the remaining yellow perch population.

In Green Bay the adult yellow perch population has also declined, although the recent history of natural reproduction has not been as poor as in southern Lake Michigan. In July, 1994, the Natural Resources Board adopted emergency order FM-43-94(E), reducing the total allowable annual commercial harvest by 25%. That reduction was made permanent by the Natural Resources Board in October, 1994.

Tactic: Monitor yellow perch recruitment and population trends in Green Bay and southern Lake Michigan and adjust sport and commercial regulations as needed to

maintain approximately equal harvests (by numbers) between sport and commercial fishers, over the long term.
Tactic: Work with Michigan, Indiana, and Illinois to implement the strategy to protect the remaining yellow perch population in southern Lake Michigan. In Wisconsin this strategy is embodied in proposed order FM-2-95, which will be considered in public hearings in March, 1995. This proposal calls for a 65% reduction in the total allowable commercial harvest from zones 2 and 3, a reduction in the sport bag limit in Lake Michigan from 50 to 25, and a closure of the yellow perch sport fishery in Lake Michigan during June (the commercial fishery is already closed from April 30 through September 15).
Tactic: Investigate possible causes of poor reproduction by yellow perch.

Problem 2 Current salmon and trout populations provide limited pier and near-shore fishing opportunities.

For many years as the Lake Michigan salmon and trout fishery developed, there were ample opportunities for anglers on or near shore to catch a variety of trout and salmon from early spring to late fall. Rainbow trout, brown trout, lake trout, and brook trout, along with chinook salmon, provided a somewhat predictable fishery for these anglers. Changes over the past decade in stocking methods, genetic strains, available forage, and other factors have caused shore fisheries for salmon and trout to decline in many areas. Because some of the foregoing factors, especially nearshore forage, are not within our control, it might not be possible to restore nearshore fisheries to past levels.

Tactic: Seek near-shore salmon and trout strains.
Tactic: Consider stocking lake trout and/or splake nearshore as alternatives to brook trout.

Problem 3 Access to nearshore fishing opportunities is limited.

Access to nearshore fishing is often limiting. Small boats cannot safely make long runs on Lake Michigan to reach productive areas. Pedestrian anglers are restricted to fishing areas of Lake Michigan and tributary rivers that are accessible by foot and where parking is available. Those areas are often crowded. Through acquisition of land and access rights, the Department can expand fishing opportunities. For example, the Natural Resources Board recently approved a plan to acquire land along the Manitowoc and Branch Rivers.

Tactic: Work with private sector and municipalities for agreements to open additional public fishing areas for pedestrians and small boats.

Problem 4 Cool and warm-water fisheries desired by anglers in Lake Michigan and its tributaries may be in conflict with habitat limitations and management objectives.

Currently, many of Wisconsin's Lake Michigan tributary streams are managed for anadromous cold-water species of trout and salmon. These rivers not only are host to returning adult fish, but are the location of stocking of thousands of young trout and salmon. Some anglers in the Milwaukee area have requested significant stocking of walleye in the Milwaukee River. However, enhancement of warm-water species by stocking in the same rivers may be in direct conflict with the current management for salmon and trout stream fishing. The lower reaches of Lake Michigan tributaries provide limited habitat for warm-water species. Stocking of warm-water species may cause heavy losses of stocked salmon and trout through predation. Limited increases in harvest opportunities for warm-water species can be expected in most tributaries.

Tactic: Survey and describe existing warm-water habitat (habitat needed by walleyes, northern pike, smallmouth bass, yellow perch, and muskies), and describe what it could support.
Tactic: Assess impacts of enhanced populations on other species.
Tactic: Stock limited numbers of walleyes in the Milwaukee River to assess potential impacts of a walleye stocking program on other species.

Objective E. Increase public awareness of the sport fishery resources of Lake Michigan.

Lake Michigan offers diverse sport fishing opportunities. Full utilization of those opportunities and support by the public for programs to enhance them require continued public information efforts.

Problem 1 The Lake Michigan sport fishery is losing clients.

Fishing effort on Lake Michigan has declined in recent years. Interest in fishing in Lake Michigan fishing may be enhanced by the provision to the public of better information about fishing opportunities and Department programs. The ability of the charter fishing industry to promote itself in sport shows and publications would be improved if the Department could provide attractive materials describing the sport fishery.

Tactic: Develop a periodic Lake Michigan newsletter.
Tactic: Develop a colorful glossy brochure informing the public about sport fishing opportunities in Lake Michigan.

Objective F. Develop angling regulations that discourage unethical practices.

Snagging and the use of snag hooks was completely banned on Lake Michigan, Green Bay, and the tributary streams by 1987. Concentrations of spawning walleye, northern pike, trout, and salmon in Lake Michigan and Green Bay tributaries attract anglers. Many anglers are intentionally snagging these vulnerable fish or retaining foul-hooked fish. We want to give anglers the clear message that we do not want unethical angling practices on our waters. This will require restrictions on gear, closed seasons, and fish refuges. Some additional restrictions are necessary to maintain legitimate fishing opportunities and clean up the unacceptable practices. Because new regulations must be enforcible, it is essential to involve Department law enforcement staff in the rule development process.

In recent years spawning walleyes and northern pike have attracted large numbers of anglers employing snagging and foul hooking techniques. In response the Natural Resources Board in 1994 adopted rules closing tributaries to Green Bay to fishing during the spring spawning period, with designated sections of nine main tributaries remaining open, and created seasonal fish refuges at the Sensiba discharge area to the Suamico River and below the De Pere Dam.

Problem 1 Snagging and foul-hooking are at unacceptable levels.

Illegal snagging still continues on the tributary streams. Because illegal snagging often occurs after dark, night fishing is currently prohibited in most Lake Michigan tributaries from October 1 through the first Saturday in May. However, large numbers of salmon and trout begin migrating into those streams before October 1, so an extension of the night fishing prohibition is needed.

Tactic: Develop appropriate gear restrictions.
Tactic: Extend by two weeks in September the period when night fishing is prohibited in most Lake Michigan tributary streams. [This rule change proposal was withdrawn from consideration by the Natural Resources Board after being voted down in balloting at the 1994 spring meetings of the Wisconsin Conservation Congress.]

Problem 2 Regulations are difficult to understand.

Management of Lake Michigan and Green Bay fish populations includes fishing regulations for the times when spawning fish move into the tributary streams. The many different characteristics of the tributaries have lead to the need for a variety of rules, restrictions, and definitions.

Tactic: Seek to clarify the regulations pamphlet.

GOAL III - A stable commercial fishery within the productive capacity of the lake.

Objective A. Sustain populations of commercial species which support harvests within target ranges (see Table 2).

We believe that the target harvest ranges shown in Table 2 are realistic and within the ecological capacity of Lake Michigan. The upper ends of some harvest ranges exceed the current total allowable commercial harvest (TACH) established in the Wisconsin Administrative Code. This reflects the fact that TACH's may be increased, if it becomes clear that increased harvests are ecologically realistic. TACH's may also be lowered, if necessary, to protect declining populations.

Table 2. Reported commercial harvests from Wisconsin waters of Lake Michigan during the 1992-93 license year and target harvest ranges for 1995-2001.

SPECIES	1992-93 HARVEST (pounds)	TARGET RANGE (pounds)
Lake Whitefish	1,151,000	500,000 - 1,300,000
Chubs	2,118,000	1,000,000 - 4,000,000
Yellow Perch		
Green Bay	396,000	300,000 - 600,000
Lake Michigan	294,000	200,000 - 500,000
Round Whitefish	16,000	40,000 - 100,000
Rainbow Smelt	1,655,488	1,000,000 - 2,500,000

Problem 1 Juvenile lake whitefish surveys do not provide reliable estimates of year class strength.

An independent estimate of lake whitefish year class strength is needed for the determination of the total allowable commercial harvest. Currently, juvenile lake whitefish abundance is estimated using a limited amount of graded mesh gill net (GMGN) fished for one or two weeks in spring. The effectiveness of the GMGN surveys in any given year is affected by weather conditions and the ability of the Department research crew to locate the juvenile lake whitefish during the survey period. The Michigan biologists currently use trawls for stock assessment, and the Department has attempted to use trawls to assess juvenile lake whitefish abundance.

Tactic: Continue to cooperate with Michigan biologists to develop reliable methods or gear.

Problem 2 Changes in fish populations sometimes require changes in total allowable commercial harvests.

Harvests of all high-value commercial species, including lake whitefish, yellow perch, chubs, round whitefish, and rainbow smelt, are limited through the establishment of total allowable commercial harvests (TACHs). Because of changes in the fish populations, it is sometimes necessary to adjust TACHs. Annual hatching success and survival of these species can be highly variable. Also, growth rates can vary in response to competition with other species or in response to environmental conditions. Variable growth rates affect harvest potential. As a result, extensive annual harvest and population information needs to be collected to follow long-term trends, which form the basis for quota recommendations. The purpose of limiting commercial harvests is to maintain abundant, fish populations that can sustain stable commercial fisheries.

The TACH of chubs from the northern chub fishing zone was recently increased by 100,000 pounds. For Green Bay, where the adult yellow perch stock is also declining, the TACH was recently reduced from 400,000 pounds to 300,000 pounds. Continued good reproduction by lake whitefish has produced an adult population that can support an increased TACH for that species. After five consequtive years of poor yellow perch recruitment in southern Lake Michigan, steps are needed to protect the remaining adult stocks.

Tactic: Maintain and improve current population and harvest assessments.
Tactic: Review TACHs every other year, unless the resource is threatened.
Tactic: Explore methods of including risk assessment in quota decisions.
Tactic: Work with Michigan, Indiana, and Illinois to develop a basin wide strategy, including quota reductions, that will protect the remaining stock of adult yellow perch in southern Lake Michigan.

Problem 3 Yellow perch are shared with sport fishers, requiring allocation.

The Department is responsible for managing the Lake Michigan fishery for both sport and commercial fishing. Historically, yellow perch have been allocated to both user groups. However, it is not possible to ensure that equal numbers of perch will be harvested each year. The sport and commercial fisheries are radically different in number of participants, effectiveness of gear, harvest response to varying yellow perch population levels, and the effect of weather on harvest. As a result, they have to be regulated differently within the dual goals of protecting the yellow perch resource and equitably allocating the long term harvest.

Tactic: Seek to achieve a 50/50 split, by numbers, over the long term.
Tactic: Seek a review by the Natural Resources Board of the 50/50 allocation policy.

Problem 4 Fisheries management is complicated because some fish populations cross jurisdictional boundaries.

Four states and the Chippewa-Ottawa Treaty Fishery Management Authority (COTFMA) share management responsibilities for the fishery resources of Lake Michigan. The Lake Michigan Committee of the Great Lakes Fishery Commission is the primary forum for discussing and resolving interjurisdictional management problems. The states each have different management strategies with differing harvest regulations for commercial fisheries. Movements of commercial fish species over state borders are known to occur but are not well understood. Thus allocation of shared stocks has been a problem for the different management agencies and commercial fishers.

Tactic: Work with other jurisdictions to allocate and manage shared stocks.

Problem 6 Contaminants prevent commercial utilization of carp.

For forty years prior to 1984, the average annual harvest of carp from Green Bay was 1.5 million pounds. In some years harvest exceeded three million pounds. Much of the harvest over these years went to the human food market, although other markets such as cut bait or animal feeds did exist. The commercial carp season was closed in 1984 primarily to prevent PCB contaminated carp from entering the human food market. Because carp from Green Bay currently contain high levels of PCB's, exceeding the Food and Drug Administration's two parts-per-million action level, they can not be sold for human consumption. The presence of PCB's also limits disposal options for carp. Recently, markets for skins and scales for use as jewelry and leather-like products have developed. Some local fishers have expressed an interest in harvesting carp for this market. A carcass disposal system was created which assured the Department that carp could not be sold for human consumption. However, no harvest occurred because the cost of disposal made the venture uneconomical.

Tactic: Provide a regulated commercial fishery for carp, if viable uses for carp, other than human consumption, are developed.

Objective B. Seek to adequately fund management of the commercial fishery through a variety of sources.

During the 1991-92 fiscal year approximately $189,000 was expended to manage commercial fisheries on Lakes Superior and Michigan, with 88% of that going to Lake Michigan. At this level of expenditures, it is not possible to adequately assess commercial stocks or estimate the non-target mortality of sport fish in commercial nets.

Problem 1 Commercial fees are inadequate to support commercial management.

Revenues from commercial license fees and general taxes do not fully cover current expenditures for management of commercial fisheries in Wisconsin waters of the Great Lakes. Approximately one-third ($61,000) of expenditures for commercial fishing management during the 1991-92 fiscal year were derived from sport license fees. This use of sport license revenues may not be appropriate.

Tactic: Explore funding options with the commercial fishing industry and sport fishing representatives.
Tactic: Manage conservatively until more funding is available.
Tactic: Identify and seek other sources of funding to pay for the program.

Objective C. Minimize or eliminate mortality of non-target species.

The incidental catch and kill of non-target species is a problem common to most commercial fisheries worldwide. The Department and Wisconsin commercial fishery have cooperatively made important progress in the past to reduce non-target fish problems. Examples of progress include: increased use of entrapment gear, elimination of large-mesh gill nets in certain areas, use of low profile small-mesh gill nets, depth and seasonal restrictions, and use of diverters in trawls. Fluctuating fisheries populations and industry practices make the problem of non-target species ever changing.

Problem 1 Commercial fishing gear kills non-target species incidentally.

The incidental catch and kill of non-target fish species continues to occur. Non-target kill negatively impacts the sport and commercial fisheries by removing otherwise useable fish from the various fish stocks. Although most of the commercial fishing gear currently in use by the Wisconsin Lake Michigan commercial fishery is somewhat selective, improvements should be encouraged where feasible.

Tactic: Encourage modifications in gear and fishing practices that reduce non-target mortality.
Tactic: Evaluate the impact of the commercial yellow perch fishery on walleye.

Problem 2 Spring drop net fishery can result in large mortality of sublegal yellow perch.

Prior to 1983, the commercial season for yellow perch included the use of drop nets during a time period from May 20 to June 30. This time period was eliminated because of a large sub-legal, yellow perch catch and mortality problem. There are no mesh size restrictions for drop nets and as a result they were fished with mesh sizes that caught more than half sub-legal fish. This resulted in substantial net retention, handling, and mortality of sub-legal

fish. A University of Wisconsin Sea Grant study estimated that 36% of sub-legal yellow perch released from drop nets die within 24 hours as a direct result of handling. Additionally, many sub-legal yellow perch that were returned to the water were eaten by gulls before they could recover. Since this portion of the drop net season was closed in 1983, the estimated number of dead yellow perch washed ashore in June has declined 90%. However, based on a subsequent Sea Grant study, it appears possible to minimize mortality of sub-legal fish through mesh size restrictions thus allowing reopening the spring season as requested by commercial fishers.

Tactic: Explore a spring drop net season with a mesh size restriction.

Objective D. Improve compliance with catch reporting requirements and develop more efficient procedures for catch reporting and quota transfers.

Management of the commercial fishery in Wisconsin waters of Lake Michigan has grown in complexity since the first quota fishery for chubs was created in 1979. Now the harvest of all commercial species is regulated by some type of quota. Managing commercial fish stocks through quota control can be very effective in protecting stocks from over harvest, but only if catch reports are timely and accurate. There is a continuing need to increase the efficiency of the system while improving the level of compliance.

Problem 1 The catch report system can be easily circumvented, resulting in under-reporting of the catch.

Most of the quotas have been allocated to individual fishermen who have had a history of harvesting a particular species. This allows each fisherman during the open season to harvest his quota when market conditions are most favorable. However, with this system incentives to under-report or not report at all are high. This is especially true for fishermen who are allowed a long season to fish small quotas for high value species, like yellow perch. Ultimately, this increases the potential for overharvest of commercial fish stocks and a needless increase in the non-target mortality of sport fish.

Tactic: Work with commercial fishers and Law Enforcement to develop a system to reduce under-reporting on catch reports.
Tactic: Review the deterrent value of existing penalties for non-compliance.
Tactic: Investigate satellite communication technologies for instantaneous catch reporting.

Objective E. Increase public awareness of the positive aspects and benefits of the Lake Michigan commercial fishing industry.

Commercial fishing played an important role in the early history of Wisconsin. However, today few Wisconsin residents understand the current commercial fishery. Those residents

aware of the commercial fishery often view it as a competing and consumptive use of the Lake Michigan resource. The Wisconsin commercial fishery serves the purpose of harvesting surplus fish to provide a human food product. Increased awareness would foster a better understanding of the role a regulated commercial fishery can play in the management of Lake Michigan.

Problem 1 The public is not well informed about the Lake Michigan commercial fishery.

Although Wisconsin has had a commercial fishery in Lake Michigan since the 1800's, the general public does not have a good understanding of the current commercial fishery or Department management of it. Frequently the only time the general public sees or hears information in the media regarding the commercial fishery it is in reference to a conflict with the sport fishery.

Tactic: Provide information that describes the fishery, illustrates management goals and accomplishments, and explains the need for intensive regulations.

Problem 2 Sport and commercial fishing gear are sometimes in physical conflict.

At times commercial fishing gear can be in direct conflict with sport anglers attempting to fish Lake Michigan. Some of the conflict is the result of an inadequate understanding, by sportfishers, of the gear commercial fishers use. Another contributing problem is that some commercial fisherman don't mark their gear as clearly as they could, especially when it is in high use areas of the lake where the potential for conflict is great.

Tactic: Educate boaters and sport fishers about commercial fishing gear and how to avoid it.

Tactic: Encourage dialogue between sport and commercial fishing groups to resolve gear conflicts and adjust sport and commercial fishing regulations as needed to reduce conflict and improve the marking of commercial gear.

Objective F. Enhance the viability and stability of the commercial fishing industry.

The complexity of Great Lakes commercial fishing as a business has increased substantially in Wisconsin since the 1970s. This industry is heavily regulated because of its potential for adverse biological and social impacts. In response many fishers have left the profession. Those remaining have expanded their operations, entered into joint business relations, or taken other actions to survive financially. The current licensing and quota permit system is not easily adaptable to the needs of the modern commercial fishing business. The results are inefficiency and in some instances needless financial hardship. We should re-examine and then modify the system to make it more adaptable to the changing needs of the industry, providing biological and enforcement needs and concerns are not compromised.

Problem 1 Commercial fishers argue that the requirement for separate license fees for all boats is burdensome.

Currently a commercial fisher must pay the full license fee of $750 every time he or she wants to add or substitute a boat on a license, unless a currently licensed boat becomes disabled, is under repair, or is being sold. If this requirement were eliminated, however, there would be a loss of revenue to support management programs.

Tactic: Explore remedies that do not undermine funding for management of commercial fisheries.

Problem 2 Individual transferable quotas can be reallocated by the Lake Michigan Commercial Fishing Board, thereby jeopardizing investments.

The Department determines a total allowable commercial harvest (TACH) for each commercial species. Percentages of most of the TACHs (i.e. quotas) are allocated to individual commercial fishermen by the LMCFB, based on past fishing history. Since these quotas are transferable, many fishers have increased the size of their quotas by purchasing partial or entire quotas from other fishers at considerable cost. They do not want to risk losing that investment through reallocation of quotas by the LMCFB. This concern has been voiced by fishermen ever since the first quotas were allocated in the late 1970's.

Tactic: Explore possible methods of protecting commercial fishers from capricious reallocations of quotas.

Problem 3 Multiple licenses within a commercial fishing operation contribute to excessive paperwork and complicate quota tracking.

Commercial fishing licenses and quota permits are issued to individuals. However, many commercial fishing families and other groups possessing multiple licenses and quota permits operate as a business corporation or partnership. They argue that the current licensing system is outdated and should be replaced by one that offers a corporate commercial fishing license as an option. Further they believe the current system of one quota book / licensed boat / license is too inflexible for business associates operating more than one boat while simultaneously harvesting or transporting fish harvested under separate quotas. Commercial fishers have argued that this system forces some larger fishing businesses to operate inefficiently and at times illegally.

Tactic: Establish a dialogue with commercial fishers to explore alternatives.

MANDATE

The Wisconsin Department of Natural Resources (the Department) manages fisheries under authority of Sections 23.09 and 29.085 of the Wisconsin Statutes:

23.09: Conservation.

a) PURPOSES. The purpose of this section is to provide an adequate and flexible system for the protection, development, and use of forests, fish and game, lakes, streams, plant life, flowers, and other outdoor resources in this state.

b) DEPARTMENTAL RULES; SURVEYS; SERVICES; POWERS; LONG-RANGE PLANNING. The department may promulgate such rules, inaugurate such studies, investigations and surveys, and establish such services as it deems necessary to carry out the provisions and purposes of this section. The department shall establish long-range plans, projects, and priorities for conservation.

29.085 Department to regulate hunting and fishing in interstate waters.

The department may regulate hunting and fishing on and in all interstate boundary waters, and outlying waters specified in s. 29.01 (9) and (11). Any act of the department in so regulating the hunting and fishing on and in such interstate boundary waters and outlying waters shall be valid, all other provisions of the statutes notwithstanding, provided such powers shall be exercised pursuant to and in accordance with ss. 23.09 (2) and 29.174.

The Department also receives instruction from the Natural Resources Board through Chapter NR 1 of the Wisconsin Administrative Code:

NR 1.01 Management of fisheries and aquatic resources

(2) The goal of fish management is to provide opportunities for the optimum use and enjoyment of Wisconsin's aquatic resources, both sport and commercial. A healthy and diverse environment is essential to meet this goal and shall be promoted through management programs.

NR 1.04 Great Lakes fisheries management. The board endorses a flexible management system for the protection, development, and utilization of the waters and fish populations of the Great Lakes for the maximum public benefit.

(1) Management of the Great Lakes is of intrastate, interstate, federal and international interest; therefore, cooperation with management agencies shall be sought in developing management objectives and measures for fish stocks of common concern.

(2) The Great Lakes fisheries are to be considered part of a diverse community. The department shall promote efforts to maintain and enhance the quality of this community and its environment.

(3) Management of the fishery resources shall be based on a sound understanding of the dynamics of interacting fish stocks. The department shall conduct research and resource base inventories and collect harvest and utilization statistics on which to base sound management decisions.

(4) The fishery resources of the Great Lakes, though renewable, experience dynamic changes and are limited. The resources will be managed in accordance with sound management principles to attain optimum sustainable utilization. Management measures may include but are not limited to seasons, bag and quota limits, limitations on the type and amount of fishing gear, limitation as to participation in the fisheries and allocation of allowable harvest among various users and the establishment of restricted areas.

Finally, the Department receives additional mandates via the *Joint Strategic Plan for Management of Great Lakes Fisheries* (SGLFMP)[8]. This basin-wide management agreement was developed under the auspices of the Great Lakes Fishery Commission. Wisconsin is a signatory to SGLFMP along with the seven other Great Lakes states, the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, the Ontario Ministry of Natural Resources, and the Canada Department of Fisheries and Oceans. As a signatory, Wisconsin has agreed to a set of procedures for coordinating activities and resolving conflicts. Through SGLFMP, the Department accepts the following common goal for Great Lakes fishery agencies:

To secure fish communities, based on foundations of stable self-sustaining stocks, supplemented by judicious plantings of hatchery-reared fish, and provide from these communities an optimum contribution of fish, fishing opportunities and associated benefits to meet needs identified by society for wholesome food, recreation, employment and income, and a healthy human environment.

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[8] Great Lakes Fishery Commission. 1980. A Joint Strategic Plan for Management of Great Lakes Fisheries. Great Lakes Fishery Commission. Ann Arbor, MI.

PUBLIC PARTICIPATION

Since 1986 fisheries management in Wisconsin waters of Lake Michigan has been guided by the Lake Michigan Fisheries Management Plan[9]. The first step in development of the current plan was a thorough review of accomplishments under that plan[10]. That review was made available to interested members of the public.

Public involvement in the planning process was initiated in December of 1992 when seven public open houses were held in cities along the Lake Michigan shoreline. Approximately 150 people attended the open houses and an additional 50 submitted written comments. The comments obtained from those open houses were used to construct an issues list. That issues list reflected a very broad range of concerns. The issues list was augmented with ideas proposed by Fisheries Management staff. An Internal Project Team made of Department staff from other programs was asked to suggest additional issues. All issues were grouped into broad categories for consideration by public workshops.

Public workshops were held in February and March of 1993 and were attended by a broadly representative group of approximately 50 sport and commercial fishers. Among other things, the participants were asked to comment on the long issues list and to recommend actions by the Department. The recommendations of the workshops were compiled in a 100-page report. The open houses and workshops were our way of receiving and recording the ideas of interested members of the public. Subsequent meetings were held to respond to the recommendations that emerged from the workshops.

Those special issue meetings were held in August of 1993. Recommendations from the workshops dealing with contaminants and fish consumption advisories, walleye management, commercial fishing, and salmon and trout fisheries were discussed in separate meetings held during the first two weeks of August. At those meetings Fisheries Management provided written summaries of the recommendations that had arisen from the workshops and written statements of initial positions of Fisheries Management.

A draft Plan was circulated for public comment in March, 1994. Notice of the draft Plan was published in the Wisconsin Outdoor and Conservation Report and mailed to 361 individuals, including all who had participated in some way in the planning process. Copies of the draft plan were sent to contacts for the Wisconsin Federation of Great Lakes Sport Fishing Clubs, contacts for Wisconsin Commercial Fisheries, the Lake Michigan Commercial

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[9] Kernen, L.T. 1985. Lake Michigan Fisheries Management Plan. Administrative Report No. 25. Bureau of Fisheries Management, Wisconsin Department of Natural Resources. Madison, WI.

[10] Horns, W. (editor, with nine contributing authors). 1992. A Review of the 1986 Lake Michigan Fisheries Management Plan. Administrative Report No. 34, Bureau of Fisheries Management, Wisconsin Department of Natural Resources, Madison, WI.

Fishing Board, and the Great Lakes Study Committee of the Wisconsin Conservation Congress. Individual copies were also mailed to 70 individuals who requested a copy. On May 18, 1994, an open public meeting was held in Cleveland, Wisconsin, to discuss the draft plan and to respond to public comments.

The Plan was modified in response to comments received regarding the March, 1994, draft. An appendix summarizing and responding to all written suggestions that we received regarding the March, 1994, draft is available from the Bureau of Fisheries Management, Wisconsin Department of Natural Resources, Box 7921, Madison, Wisconsin 53707-7921.