WISCONSIN'S WALLEYE MANAGEMENT PLAN: Moving Management into the 21st Century

Wisconsin Department of Natural Resources
Bureau of Fisheries Management and Habitat Protection

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Wisconsin's

Walleye Management Plan:

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by Steven Hewett and Timothy Simonson

**Bureau of Fisheries Management
and Habitat Protection**

**Wisconsin Department of Natural Resources
Madison, Wisconsin**

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EXECUTIVE SUMMARY

The Walleye Management Planning Committee held a series of meetings from 1994 through 1997, with the charge of identifying and addressing key statewide walleye management issues and revising statewide walleye management goals. The committee identified a number of issues that were important to the members, various publics, and other stakeholders. The specific issues are listed later in this report and ranged from habitat protection, hydropower impacts, user conflicts, angler regulations and the role of stocking. These issues were distilled into seven specific goals for walleye management in Wisconsin:

1 Protect, develop, maintain, and restore critical habitats for natural stocks of walleye and associated fish and aquatic communities;
2 Provide a variety of opportunities for the catch and harvest of walleye (including harvest for food, tribal harvest, quality catch, and trophy opportunities);
3 Ensure that adequate information on the status and trends of walleye populations, fisheries, and angler preferences is consistently available for decision-making;
4 Maintain the genetic integrity of naturally reproducing walleye populations;
5 Provide educational opportunities to develop an appreciation for the fisheries resources of Wisconsin and to promote realistic angling expectations based on the productivity of the waters.
6 Develop a biologically sound and cost effective walleye stocking strategy for Wisconsin.
7 Ensure an integrated propagation program incorporating state, federal, tribal, private, and cooperative producers.

Reaching these goals will result in enhancing, improving and maintaining fishable populations, where appropriate, within balanced aquatic communities. The committee concluded that protecting and improving habitat was perhaps the most important key to improving our fisheries resources. The committee has also proposed a set of regulation categories to address the variation found in walleye waters within the state. The goal of the regulation categories is to increase the variety of fishing opportunities for state anglers by providing increased opportunities where possible and restricting harvest where necessary to improve the sizes or abundances of adult walleye. The committee also suggests that the stocking guidelines for walleye be revised and that the cooperation and coordination between all providers within the state be improved.

The planning process followed by the Walleye Management Planning Committee is discussed in a section of the report. All committee products were discussed with various walleye stakeholders outside the committee. As part of the process, the committee developed and conducted a mail survey on walleye management and the status of walleye fishing. Once a draft plan was developed by the committee, a series of 26 public workshops were conducted throughout the state from August through October 1995, to give interested citizens an opportunity to provide input on the issues of concern and to comment on the progress of the committee and on angler regulation proposals for local lakes. Comments from the public workshops were incorporated into this plan, which was finalized in 1997.

INTRODUCTION

***Vision Statement*: Enhance, maintain, and improve fishable walleye populations, where appropriate, within balanced aquatic communities; ensuring the protection of Wisconsin's aquatic natural resources.**

Partnerships are crucial to the successful implementation of the proposals in this walleye management plan. The committee recognized very early in the process that most of the issues discussed go beyond single species concerns; many issues are at the levels of the aquatic community, the water basin, or the ecosystem. This plan incorporates goals and strategies that are outside the jurisdiction of any one organization or agency. The committee's hope is that this document provides a focus for various groups to use in the development of specific projects related to aquatic management. This guide provides our recommendations for the types of projects and partnerships that need to develop to ensure the future of Wisconsin's resources. We have listed some of the key groups that we feel are crucial partners in fulfilling the objectives of this plan. We recognize that we have not been all inclusive and hope that anyone with an interest in improving the status of our fisheries in general (as well as walleye in particular) will get involved in following through on these recommendations.

This statewide plan is the product of a Walleye Management Planning Committee first formed in 1994 and charged with identifying and addressing key statewide walleye management issues. A number of these issues were identified by the members of the committee. Other issues were identified through an angler mail survey, public meetings, and by members of an advisory committee on walleye stocking issues. Roughly 30 issues were identified through this process, ranging from concerns over habitat protection, angler opportunities, user conflicts, genetic integrity of populations, overharvest, and public education. Each specific issue is listed and discussed in a later section of this report (see Index).

Improvements at both major walleye hatcheries in the state, increased concern about detrimental impacts of walleye stocking on other fish species and on genetically distinct walleye stocks and a need to examine cost-effectiveness of various walleye stocking practices lead to the formation of a walleye stocking subcommittee in 1995, incorporating additional outside interests with external and internal expertise. This group was asked to review walleye stocking practices and make recommendations for future direction of the program. The stocking components of the plan were developed using the same process as was used for the overall management plan. Where there was existing data or literature, the recommendations are an attempt to incorporate that information into our management plan. In cases where little data or literature existed, the committee recommended strategies to collect new information on the issue. The objectives and recommendations are meant to help solve the issue statements and shed new light on walleye stocking practices in Wisconsin.

The committee reviewed walleye life history and habitat requirements, the history of walleye regulations in Wisconsin, walleye population status and harvest trends, and developed a survey to assess public opinions on general and specific fishing experiences, and opinions on walleye management options. These reports are attached as appendices to this plan. The

committee developed seven key goals that address the issues and concerns that were identified in the issue development stage. After identifying the goals, we developed management objectives and specified strategies to address the goals. Those objectives and goals make up the largest portion of this plan.

WALLEYE MANAGEMENT GOALS

The following seven goals were developed from the issues identified by the committee. The goals of the statewide walleye management plan are to manage Wisconsin's walleye populations and aquatic communities in order to:

1 Protect, develop, maintain, and restore critical habitats for natural stocks of walleye and associated fish and aquatic communities;

2 Provide a variety of opportunities for the catch and harvest of walleye (including harvest for food, tribal harvest, quality catch, and trophy opportunities);

3 Ensure that adequate information on the status and trends of walleye populations, fisheries, and angler preferences is consistently available for decision-making;

4 Maintain the genetic integrity of naturally reproducing walleye populations;

5 Provide educational opportunities to develop an appreciation for the fisheries resources of Wisconsin and to promote realistic angling expectations based on the productivity of the waters.

6 Develop a biologically sound and cost effective walleye stocking strategy for Wisconsin.

7 Ensure an integrated propagation program incorporating state, federal, tribal, private, and cooperative producers.

OBJECTIVES AND MANAGEMENT RECOMMENDATIONS

Overview

The Walleye Management Planning Committee spent a great deal of time discussing objectives for how to reach the goals that had been identified. The committee recognized that habitat protection and enhancement was the key area of importance for the future of Wisconsin's fisheries. Objectives were developed for each of the goals of the management plan: 1) habitat protection and enhancement; 2) regulation and management; 3) fisheries and aquatic community assessment; 4) genetic integrity, 5) public involvement, information and education, 6) biologically sound stocking practices, and 7) integrated stocking practices and coordination across providers.

Strategies were identified to reach each objective and implementation goals were identified. The latter include identifying responsible parties or partners and identifying products or results that would provide an evaluation of the progress toward meeting the objectives of the management plan. These products and results provide a target that will allow the evaluation of the success of this plan. An annual meeting, including appropriate partners, will provide a focus point for the committee to review progress toward the management goals of this plan.

The following sections describe specific strategies, list measurable products, and identify some of the potential partners or responsible parties to meet the objectives proposed by the committee to fulfill the goals identified and listed in the prior section.

Goal 1: Protect, develop, maintain, and restore critical habitats for natural stocks of walleye and associated fish and aquatic communities.

Objectives

1.1 Identify critical walleye habitat statewide.

1.2 Ensure protection of critical habitats through various jurisdictions' water quality, shoreline, and watershed protection programs and permit processes.

1.3 Rehabilitate/enhance habitat and water quality in walleye waters.

1.4 Mitigate negative impacts of dams and hydro power operations on fish communities.

Strategies and Implementation for Objectives 1.1, 1.2, 1.3, and 1.4.

A. **Strategy**: Identify critical habitats on walleye waters through joint local and state efforts;
Product / Result: Number of waters surveyed for critical habitat. Development of handbook methodology for habitat evaluation. Creation of accessible database on habitat in Wisconsin waters.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Lake Organizations, Native American Tribes.

B. **Strategy**: Manage aquatic habitats regionally within watersheds.
Product / Result: Incorporation of aquatic habitat management into water basin planning efforts and lake management plans.Integration of habitat management and fisheries management.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Water Division of DNR, Lake Organizations, Native American Tribes.

C. **Strategy**: Rehabilitate or restore critical aquatic habitat, e.g., shoreline fish nursery and food production areas, spawning areas, etc.
Product / Result: Number of rehabilitation/restoration projects funded. Review and publication of habitat restoration methods and efforts.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Lake Organizations, Sports Clubs, Native American Tribes.

D. **Strategy**: Develop guidelines for aquatic habitat restoration and management including aquatic plant management.
Product / Result: Completion of a handbook on habitat restoration/ management, including plant management.
Responsible Parties: Water Division, Bureau of Fisheries Management and Habitat Protection, Lake Organizations, Sports Clubs, Native American Tribes.

E. **Strategy**: Work with dam and hydro power interests through the FERC process to document impacts of hydro operations, and mitigate negative effects.
Product / Result: Number of studies completed; number of mitigation projects completed.
Responsible Parties: Water Division, Bureau of Fisheries Management and Habitat Protection, Dam Owners/Operators, Lake Organizations.

F. **Strategy**: Protect sensitive habitat areas from boat traffic through creation and maintenance of voluntary (perhaps) seasonal "no entry zones", utilizing local lake management organizations, conservation clubs, etc., to install signs and promote habitat protection.
Product / Result: Number of sensitive habitat areas established.This is a very important issue and some components of the problem should be addressed at the legislative level.
Responsible Parties: Local Governments, Bureau of Fisheries Management and Habitat Protection, Lake Organizations, Sports Clubs.

G. **Strategy**: Enforce Chapter 30 permits to protect shoreline spawning and nursery habitat.
Product / Result: Number of applications modified to protect spawning/nursery habitat.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Lake Organizations, Sports Clubs. Lake shore property owners.

H. **Strategy**: Develop/enforce shore and wetland zoning ordinances to protect lake shoreline and stream bank buffer areas and prevent improper overdevelopment in the watershed.
Product / Result: Development of shore and wetland zoning ordinances that protect critical areas.
Responsible Parties: Municipalities, Lake Organizations, Sports Clubs.

I. **Strategy**: Implement non-point pollution controls to improve water quality, especially in southern waters.
Product / Result: Number of Best Management Practices installed.
Responsible Parties: Wisconsin Department of Natural Resources, County and Municipal Governments.

J. **Strategy**: Purchase critical habitats where necessary to ensure protection or enhancement.
Product / Result: Amount of critical habitat (from A.) in public/private ownership/protected from development. Public and Departmental support for the Wild Lakes Initiative is very important.
Responsible Parties: Land Division, Water Division, Bureau of Fisheries Management and Habitat Protection, Lake Organizations, Sports Clubs. Lake shore property owners.

K. **Strategy**: Utilize available public and private funds to identify management problems and solutions.
Product / Result: Number of cooperative/externally funded projects initiated/completed.

Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Committee, Lake Organizations and Districts, Sports Clubs. Lake shore property owners.

L. **Strategy**: Implement a public information program on the identification and importance of aquatic habitat, especially related to maintenance of healthy walleye populations.
Product / Result: Development of a publication on the importance of habitat. Publication and distribution of educational materials to schools and publics.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Lake Organizations, Lake Districts, UW Extension, Sports Clubs.

Goal 2: Provide a variety of opportunities for the catch and harvest of walleye (including harvest for food, tribal harvest, quality catch, and trophy opportunities).

Objectives

2.1 Establish walleye fishery objectives, and develop and implement management and regulation strategies based upon a statewide walleye waters classification system by 1997.

2.2 Provide diverse harvest and angling opportunities by 1997.

Strategies and Implementation for Objective 2.1 and 2.2

A. **Strategy**: Utilize a management classification model to set management objectives for walleye waters maintained primarily through natural reproduction: This classification model is based on the current status of the walleye population and on the characteristics of adult abundance, juvenile abundance, growth rates, and amount of fishing pressure. This classification represents a conceptual framework for walleye management goals and objectives.
Product / Result: Number of walleye waters classified/managed under the classification system.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, with public support.
Product / Result: Establishment of management objectives.
Responsible Parties: Walleye Management Planning Committee.

B. **Strategy**: For walleye waters that are maintained primarily through stocking, some of the same regulation categories are useful, but there is no relationship between the number of large walleye and the number of juvenile walleye, so the above model is not appropriate. Generally, densities of adults and juveniles will be much lower, from 2 -3 adults per acre, but growth rates are usually high. Stocked waters are managed to 1) provide additional fishing opportunities for walleye, 2) provide panfish control, 3) augment intermittent natural reproduction, or 4) establish self-sustained populations. Therefore, minimum length limits are generally most suitable because they help to maintain moderate densities of adult walleye. Without at least moderate densities of adults, fishing would be poor, and panfish control would be ineffective.
Product / Result: Establishment of management objectives for stocked waters.
Responsible Parties: Walleye Management Planning Committee.
Product / Result: Number of walleye waters classified/managed under the classification system.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, with public support.

C. **Strategy**: Coordinate walleye management objectives and implementation of walleye management strategies with tribes in the ceded territory.

Product / Result: Coordination of management objectives with the Indian tribes of Wisconsin.
Responsible Parties: Treaty Fisheries Coordinator, Treaty Working Group, Administration.

D. **Strategy**: Develop a regulation implementation process which allows greater flexibility and timeliness in responding with necessary actions to changing natural conditions.
Product / Result: Development of guidelines for flexibility in regulation implementation. Development and implementation of new procedures for adaptively managing waters.
Responsible Parties: Walleye Management Planning Committee, Bureau of Fisheries Management and Habitat Protection, Public, Conservation Congress, legislature.

E. **Strategy**: Periodically review angler preferences and attitudes through survey methods that identify the various angler and public groups that are important to the status of the fisheries, so that public input into walleye management is maintained.
Responsible Parties: Walleye Management Planning Committee, Bureau of Fisheries Management and Habitat Protection, Public.
Product / Result: Survey angler attitudes and preferences every 5 to 10 years.

2.3 Better define the impacts of various levels of exploitation on walleye populations and fisheries by 2010.

Strategies and Implementation for Objective 2.3

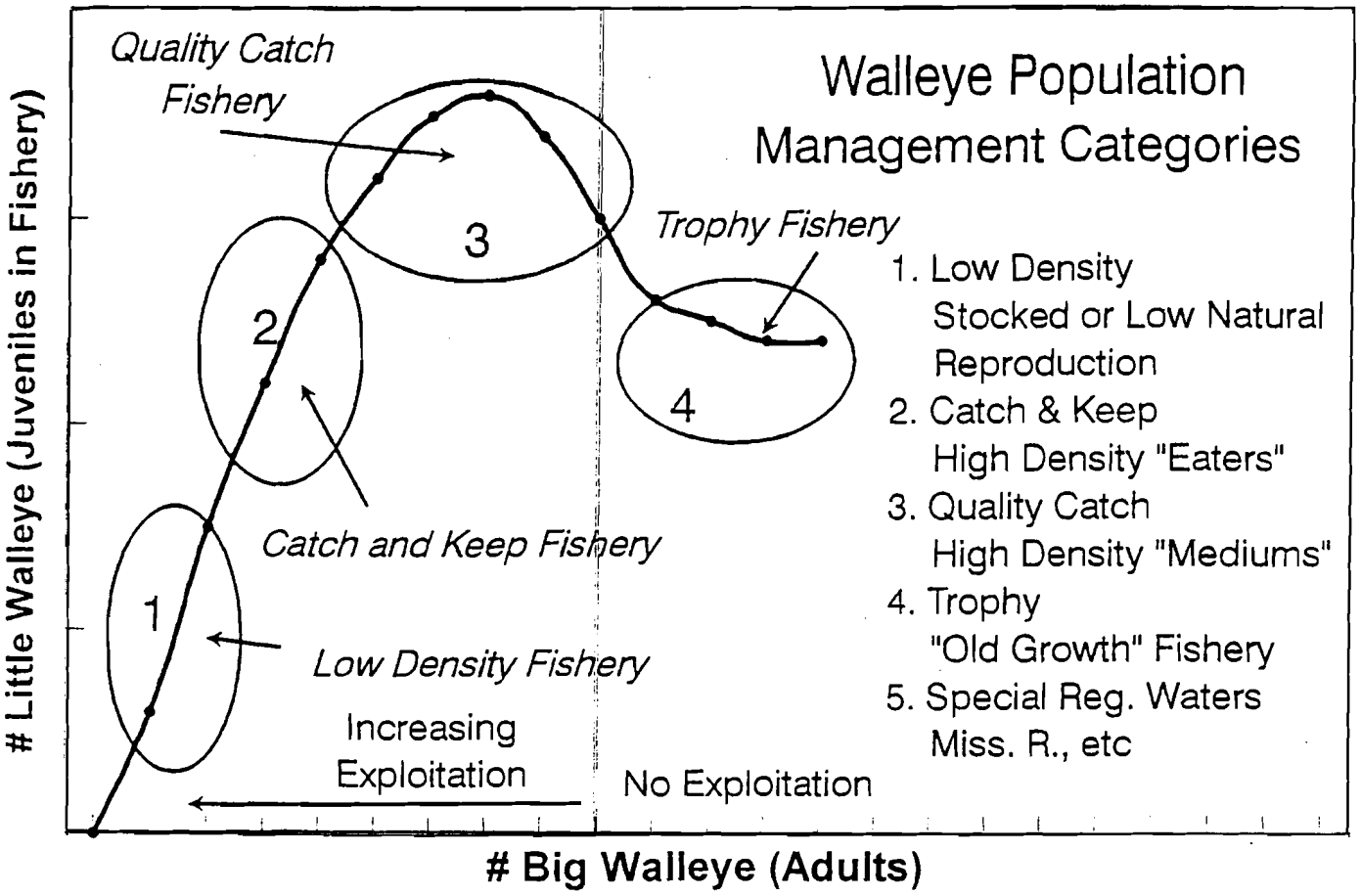
A. **Strategy**: Examine impacts of sustained exploitation at different levels (0-50%) on natural walleye populations and aquatic communities.
Product / Result: Report on an evaluation of sustained harvest by 2010.
Responsible Parties: Bureau of Integrated Science Services, Bureau of Fisheries Management and Habitat Protection, Walleye Management Planning Committee.

2.4 Manage walleye stocks to maintain harvestable populations with a minimum of 5 year classes represented in the spawning stock and a minimum of 3 adults per acre.

Strategies and Implementation for Objective 2.4

A. **Strategy**: Implement walleye management program based on Wisconsin Walleye Waters Classification System (see Objective 2.1) by 1997. Survey representative sample of walleye waters annually.
Product / Result: Occurrence of 5 or more adult year classes in 80% of lake surveys of natural walleye populations. Development of survey guidelines for sampling a subset of waters annually. Update current sampling protocols in handbook.
Responsible Parties: Regional fisheries and habitat staff, Bureau of Fisheries and Habitat Protection.

Conceptual Model for Classifying Wisconsin's Walleye Fisheries



Natural Reproduction Waters

Category	Classification	Possible Regulation Options	Predicted Outcomes
1.	Remnant Low Density	- Discontinue walleye management - 28" minimum length limit, 1 bag	-Shift in top predator -Increase adult density
2.	Recovering/ Declining	- 15" minimum length limit, 3 bag - 18" minimum length limit, 3 bag	-Increase adult density, catch rates and harvest of quality fish
3.	Sustainable	- No minimum length limit, 5 bag - 1 over 14", 3 bag - 14"-18" protected slot, 3 bag, but only 1 over 18"	-Optimize harvest and maintain adult density
4.	Trophy, Low density, Community restoration	- 28" minimum length limit, 1 bag	-Improve/maintain adult density and size-structure -Increase predator density to help restore balanced community.

Stocked Waters

Category	Classification	Regulation Options	Predicted Outcomes
A.	Stocked fishery	- 15" minimum length limit, 3 bag - 18" minimum length limit, 3 bag	Maintain stocked fishery
B.	-Community Restoration -Establish self-sustaining fishery -or Trophy	-28" minimum length limit, 1 bag	Increase predator density Increase adult density to maximize potential for natural reproduction

Special Waters

Category	Classification	Regulation Options	Predicted Outcomes

Goal 3: Ensure that adequate information on the status and trends of walleye populations, fisheries, and angler preferences is consistently available for decision-making.

Objectives

3.1 Maintain comprehensive, up-to-date statewide information on walleye populations and fisheries, and their associated aquatic communities and habitats.

Strategies and Implementation for Objective 3.1

A. **Strategy**: Implement statewide survey design that adequately samples walleye abundance, harvest rates, and major aquatic community trends of waters within the various walleye management categories for future decision making.
Product / Result: Continue to conduct walleye populations assessments and creel surveys annually on a representative sample (15-30 annually) of walleye waters. Survey each major water at least once each 10 years, and more frequently if possible.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, GLIFWC, University System.

B. **Strategy**: Conduct comprehensive fish community and habitat surveys on a sufficient number of representative walleye waters annually.
Product / Result: Conduct comprehensive fish community and habitat assessments annually on a representative group of waters (10 annually).
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, GLIFWC.

C. **Strategy**: Conduct index surveys on a sufficient number of walleye waters annually.
Product / Result: Conduct comprehensive index surveys annually on a range of Wisconsin waters (10-30 annually).
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Great Lakes Indian Fish and Wildlife Commission, lake organizations.

D. **Strategy**: Use volunteers (clubs, lake organizations, etc) for collection of long term fishery and habitat data.
Product / Result: Develop volunteer sampling programs, with guidelines and forms (at least one lake in each basin during each biennial planning cycle).
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Lake Organizations/Districts, Sport Clubs, Property Owners, Resort Associations, Guides.

E. **Strategy**: Include public input in decision to change management goals on a particular water.
Product / Result: Revision of management handbook and guidelines.
Responsible Parties: Regional fisheries biologists, lake organizations, anglers, Native American Tribes, Bureau of Fisheries Management and Habitat Protection.

Goal 4: Maintain the genetic integrity of naturally reproducing walleye populations.

Objectives

4.1 Determine if there are performance benefits to genetically distinct stocks and develop a propagation program that incorporates these benefits.

4.2 Examine the extent of the walleye stocking program historically, what it's effects have been on genetic integrity of walleye and where stocks have originated from.

4.3 Insure walleye stocking does not have a negative impact on lakes with natural reproducing walleye populations and make recommendations on when to stock in waters with natural reproduction.

Strategies and Implementation for Objectives 4.1, 4.2 and 4.3.

A. **Strategy**: Identify self-sustaining walleye populations to be maintained and preserved.
Product / Result: Identification and listing of self-sustaining walleye populations.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Great Lakes Indian Fish and Wildlife Commission, Native American Tribes.

B. **Strategy**: Complete ongoing walleye genetics study for Wisconsin and use results in review of historic and future stocking practices by 1998.
Product / Result: Utilize study results in the establishment of stocking criteria that maintain and enhance the genetic integrity of Wisconsin walleye populations. Develop report describing distribution of genetic variation and stock structure.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Stocking Subcommittee, tribal, federal, private producers.

C. **Strategy**: Summarize historic walleye stocking data and use results to help set up stock performance project. Potential broodstock lakes should have historic data examined to determine impact on study design.
Product / Result: Produce stock performance project report and identify potential broodstock lakes.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Stocking Subcommittee, tribal, federal, private producers.

D. **Strategy**: Develop and conduct performance studies on various stocks.
Product / Result: Develop study team to address issues such as study design, funding, personnel, commitment and propagation facilities
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Stocking Subcommittee, tribal, federal, private producers.

E. **Strategy**: Classify all walleye waters as either having populations sustained through stocking or by natural reproduction.
Product / Result: Develop guidelines for classification system of other state waters. This classification should reflect management goals for future management of the walleye stock within the water. Develop specific definitions of naturally reproducing waters.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Stocking Subcommittee, tribal, federal, private producers.

F. **Strategy**: Implement interim stocking guidelines to protect existing genetic strains until performance studies complete. Base these on proposed genetic stock boundaries but exclude landlocked put, grow and take lakes.
Product / Result: Development of interim guidelines for stocking.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Stocking Subcommittee, tribal, federal, private producers.

E.1. Waters with walleye populations sustained through natural reproduction should not be stocked except under unusual circumstances..
E.2. Natural reproducing waters with unusual circumstances requiring stocking, such as a declining fishery, if stocked, should take broodstock from same water body.
E.3. Drainage lakes or rivers with populations maintained by stocking should use a regional stock at all times.
E.4. Stocking with the objective of restoring natural reproduction should use brood source from the same watershed and from a similar type of lake or river.
E.5. Landlocked lakes with no natural reproduction should use a regional stock whenever possible.
E.6. Proposed stock boundaries are the Lake Superior, Lake Michigan including the upper Fox, Upper Mississippi (includes Wisconsin, St. Croix, Chippewa), Mainstem Mississippi Drainage (to first barrier on tributaries) and Rock Drainage.

G. **Strategy**: Use population objectives for optimum number of year classes in a walleye population to help make stocking decisions. Discontinue stocking program if natural reproduction meets the management goals for the water. A management plan may include mitigation for habitat loss and regulation changes as well as stocking.
Product / Result: Revision of management handbook and guidelines.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Regional fisheries biologists, Walleye Management Stocking Subcommittee, tribal, federal, private producers.

H. **Strategy**: A mechanism must be developed to provide private producers with access to any and all strains identified as important to maintain genetic integrity of natural populations.
Product / Result: Department review of possible mechanisms for providing fish to the private sector.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Stocking subcommittee, other producers.

Goal 5: Provide educational opportunities to develop an appreciation for the fisheries resources of Wisconsin and to promote realistic angling expectations based on the productivity of the waters.

Objectives

5.1 Maintain pro-active public involvement program in management of Wisconsin's walleye waters.

5.2 Improve public understanding of walleye biology and management options for Wisconsin's walleye waters.

Strategies and Implementation for Objectives 5.1 and 5.2

A. **Strategy**: Hold an annual meeting of the Walleye Management Planning Committee each year to review the progress of plan implementation, make necessary recommendations for implementation priorities, address new issues, and to maintain involvement of this diverse group of walleye interests in statewide walleye management.
Product / Result: Hold annual meeting to review progress of plan implementation.
Responsible Parties: Walleye Management Planning Committee, Regional fisheries biologists.

B.**Strategy**: Form a Walleye Public Relations and Information Subcommittee (including members of the Planning Committee) to implement public relations and information activities to promote sound management of Wisconsin's walleye stocks and improve public understanding of walleye biology and management.
Product / Result: Subcommittee on Public Relations and Information formed.
Responsible Parties: Walleye Management Planning Committee, Public Relations and Information Subcommittee.

C. **Strategy**: Produce a statewide publication describing the Wisconsin Walleye Management Plan that includes a summary of the plan, the Walleye Waters Classification System, walleye life history, typical walleye fisheries, realistic expectations for Wisconsin's walleye fisheries, etc.
Product / Result: Statewide publication completed and distributed.
Responsible Parties: Walleye Management Planning Committee, Public Relations and Information Subcommittee.

D. **Strategy**: Utilize news releases to highlight completion of walleye management plan, and, over time, implementation of various recommendations from the plan.
Product / Result: Complete new releases as needed to promote the plan and its implementation.
Responsible Parties: Walleye Management Planning Committee, Public Relations and Information Subcommittee, Regional fisheries biologists.

E. **Strategy**: Work with television (Outdoor Wisconsin, other fishing shows, etc.) to describe the walleye management issues.
Product / Result: Completion of a TV special or spot.
Responsible Parties: Walleye Management Planning Committee, Public Relations and Information Subcommittee.

F. **Strategy**: Produce a statewide walleye management newsletter and/or walleye management handouts for distribution to interested publics through bait shops, resorts, fishing clubs, tribal functions, Chambers of Commerce, etc.
Product / Result: Produce a walleye newsletter (see also C.).
Responsible Parties: Walleye Management Planning Committee, Public Relations and Information Subcommittee.

G. **Strategy**: Develop walleye management element for use in the Angler Education Program. Include a focus on middle and high school education programs.
Product / Result: Completion of a walleye element for the Angler Education Program.
Responsible Parties: Walleye Management Planning Committee, Public Relations and Information Subcommittee.

Goal 6: Develop a biologically sound and cost effective walleye stocking strategy for Wisconsin waters.

Objectives

6.1 Examine the cost effectiveness and efficiency of current walleye propagation and stocking practices, and make recommendations for future operations by 2005.

Strategies and Implementation for Objectives 6.1

A. **Strategy**: Form a Walleye Stocking Subcommittee to review walleye propagation and stocking practices and make recommendations on quantity and quality of walleyes propagated and when and where walleye should be stocked by 1998.
Product / Result: Review of current stocking guidelines and establishment of new stocking criteria by 1998. Incorporation of genetic studies into stocking guidelines.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Planning Committee, Stocking subcommittee, tribal, federal, private producers.

6.2 Develop a walleye stocking plan that has stocking rates and sizes that insure the most cost-effective stocking strategy for fisheries management.

6.3 Insure DNR propagation system uses the most efficient propagation and distribution techniques.

6.4 Identify types of waters where stocking is successful, base stocking decisions on the biology of the system and incorporate the latest survey information in walleye stocking decisions.

6.5 Determine the relationship between stocking and angler demand and insure stocking policies incorporate angler needs for stocked walleye waters.

6.6 Determine the effects of walleye stocking on existing fisheries community integrity and attempt to minimize negative impacts on existing communities.

Strategies for objectives 6.2, 6.3, 6.4, 6.5 and 6.6

A. **Strategy**: Develop sound biological criteria for all stocking.
Product / Result: Revise Fisheries Management Handbook stocking criteria by 1998.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Stocking subcommittee, other producers.

B. **Strategy**: Establish a survey and database system which provides managers with sufficient access to data and information to make sound biological decisions.
Product / Result: Revise and establish survey and database system by 1999.

Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Stocking subcommittee, other producers.

C. **Strategy**: Establish management goals by lake including stocking strategies and public input.
Product / Result: Revise and establish survey and database system by 1999.
Responsible Parties: Regional Fisheries and Habitat Management staff, Bureau of Fisheries Management and Habitat Protection, lake organizations, Native American tribes.

D. **Strategy**: A mechanism must be developed to provide private producers with access to any and all strains identified as important to maintain genetic integrity of natural populations. The Department of Natural Resources should explore the possibility of providing fish to the private sector for propagation purposes.
Product / Result: Department review of possible mechanisms for providing fish to the private sector.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Walleye Management Stocking subcommittee, other producers.

E. **Strategy**: Compile and analyze data from successful walleye stocking situations and apply to other waters.
Product / Result: Develop a critical review and analysis of past and current stocking evaluations.
Responsible Parties: Regional fisheries staff, Bureau of Fisheries Management and Habitat Protection, other producers.

F. **Strategy**: Need to maintain flexibility in size and age of walleye available for stocking to assure that we use the most cost effective techniques for producing walleye fisheries.
Product / Result: Review and revise stocking guidelines to maintain flexibility.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, other producers.

G. **Strategy**: Use the latest information on stocking practices to insure stocking success is not limited by how the fish are stocked. For example, within practical limits, walleye should be stocked at water temperature less than 70^0 F.
Product / Result: Review and revise guidelines as new information is available.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, other producers.

H. **Strategy**: The Department of Natural Resources should complete an evaluation of the cost effectiveness of stocking normal production fingerlings vs. extended growth fingerlings.
Product / Result: Review and analyze stocking evaluations of extended growth fingerling stockings.

Responsible Parties: Bureau of Fisheries Management and Habitat Protection, other producers.

I. **Strategy**: Summarize the cost effectiveness of stocking walleye.
Product / Result: Review and summarize current information on cost effectiveness of stocking by December 1998.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, other producers.

J. **Strategy**: Do not introduce walleye into established non-walleye communities waters, unless impacts have been evaluated through an Environmental Impact Statement.
Product / Result: Revise guidelines for walleye introductions.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, other producers.

K. **Strategy**: Summarize all existing data on walleye interaction with other species.
Product / Result: Produce report on walleye interactions.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, Bureau of Integrated Science Services.

Goal 7: Ensure an integrated propagation program incorporating state, federal, tribal, private, and cooperative producers.

Objectives

7.1 Define the role of state, private, federal, tribal and cooperative providers and insure economic impacts on providers are understood.

7.2 Develop feedback mechanisms to private and public providers and assure all providers use the same terminology and consistent stocking policies.

7.3 Increase public understanding on the real benefits of stocking.

Strategies and Implementation for Objectives 7.1, 7.2 and 7.3

A. **Strategy**: Base stocking standards on biological standards. Develop a public input system to help develop these standards.
Product / Result: Revise guidelines and standards for walleye stocking in management handbook.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, other producers.

B. Require reports on stocking are provided by the managers to either the public, private or tribal producer.
Product / Result: Revise guidelines and standards for walleye stocking in management handbook.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, other producers.

C. Develop a system for public feedback on stocking effectiveness.
Product / Result: Meet with local publics to get feedback on angler satisfaction with walleye fishing in specific waters.
Responsible Parties: Regional fisheries biologists, Bureau of Fisheries Management and Habitat Protection, Conservation Congress.

D. Develop standards for fish importation for stocking.
Product / Result: Revise guidelines and standards for fish importation in management handbook.
Responsible Parties: Bureau of Fisheries Management and Habitat Protection, other producers.

WALLEYE MANAGEMENT ISSUE STATEMENTS

The Walleye Management Planning Committee identified 13 initial key issues concerning walleye management in Wisconsin's waters. Several additional issues were identified through public input at meetings or through the angler survey. Finally, an additional set of issues specific to stocking as a management practice were identified through a subcommittee reviewing stocking practices. A fuller discussion of each issue appears after the initial list.

1 Habitat loss, poor water quality, and shoreline development are diminishing the productivity of some walleye waters;
2 Hydropower facilities and operations are limiting the productivity of some walleye waters or negatively impacting the quality of walleye fisheries;
3 The diversity of Wisconsin waters limits the effectiveness of a single management or regulation strategy;
4 Biologists often have insufficient data (including community dynamics) upon which to base management decisions, particularly for individual waters;
5 In general, most anglers are unfamiliar with walleye population dynamics, management options, and management goals;
6 Stocked walleye lakes consistently have lower densities than natural populations;
7 Overharvest of walleye may be a factor in overall declines in walleye numbers in many waters;
8 Harvest has greatly reduced the numbers of large (quality size) walleye in many waters;
9 There are not enough opportunities for trophy walleye fishing;
10 The current harvest format in the ceded territory restricts tribal harvest to less than 50% of harvest on a lake by lake basis;
11 Walleye populations are naturally variable and, thus, can interact strongly with other components of the fish community; walleye can greatly impact, or be impacted by, other fishes;
12 Contaminant levels in fish flesh are a problem in some waters;
13 Hooking mortality may be a problem with minimum length limits;
14 User conflicts affect the quality of fishing experiences in Wisconsin;
15 Catching too few walleye overall, and too few large walleye;
16 Tribal harvest of walleye in the ceded territory continues to be contentious;
17 Overexploitation may be occurring seasonally, particularly during spring on river systems and during the ice fishing season;
18 Current stocking strategies, including stocking rates and sizes, may not provide the most cost-effective walleye stocking strategy;
19 The propagation system needs to improve efficiency and distribution policies;
20 Walleyes are not always stocked in the best waters for success;
21 Stocking decisions don't always incorporate the biology of the system and latest survey information;
22 Is there a relationship between angler participation and stocking policy?
23 There is a need for stocked walleye waters. Stocking is a useful tool in walleye management;
24 Are there performance benefits to genetically distinct stocks?

25 Walleye have been historically stocked throughout the state without regard to origin of stock and their effects on native stocks;
26 Stocked walleyes have a negative impact on natural reproducing walleye populations;
27 There is poor communication and cooperation between state, private, federal, tribal and cooperative providers;
28 There is no feedback mechanism to private and public providers to assure all producers are using the same terminology and policies;
29 The relative role of stocking in walleye management is often misunderstood;
30 The impacts of walleye introductions on fish communities are inadequately evaluated and sometimes unpredictable and can sometimes result in negative impacts;

The following section describes each issue in a little more detail, as raised by the members of the Walleye Management Planning Committee, the angler mail survey respondents, or by people at the public meetings held around the state.

1) Habitat loss, poor water quality and shoreline development are diminishing the productivity of some walleye waters.

Loss of habitat has a direct effect on fish communities, affecting their success of spawning, growth, and survival. Habitat changes can be natural, such as the gradual filling in of shallow bays. However, it is most often accelerated, or made more severe, by human activities. Loss of habitat can occur in many forms. The filling in of marsh areas bordering lakes and streams destroys critical spawning habitat and diminishes the filtering capacity of the wetland, resulting in poorer water quality. Increasing shoreline development, sea-wall construction, and in-lake modifications, such as sand blankets and the removal of aquatic vegetation, greatly change or destroy the near-shore areas of our lakes and streams. These shallow areas, known as littoral zones, are important for egg deposition, nursery and hiding areas for newly hatched fish, and as food production areas for juvenile fish and their prey items. While the addition of one cottage or development on a lake may seem inconsequential, the cumulative total of lost habitat areas can have a substantial effect on many waters. Various recreational activities can have a direct negative effect on habitat quality, particularly on water clarity and on aquatic plants in near-shore areas that provide habitat for young fish. Finally, one of the most difficult problems affecting fish populations, directly and indirectly, is the problem of non-point source pollution. The variety of factors affecting habitat loss can act synergistically to negatively impact aquatic communities.

2) Hydropower facilities and operations are limiting the productivity of some walleye waters.

Dams and hydropower facilities on most of our major river systems were built with little or no regard to the natural communities that evolved in those systems. Migration and movement of walleye in certain waters was blocked by dams with no access to sites above or below the dam. The ability of walleye and other species to have access to traditional spawning, feeding, or wintering areas was blocked. Hydropower operations also directly affect many populations by killing juvenile or adult fish that pass through the facility

turbines. "Peaking" operations can have disastrous effects on the areas below. Streams below these facilities experience "drought - flood" conditions on a daily basis, as the dam holds water back for a period, then releases it. Aquatic life is first "high and dry," then subjected to torrential flows, and the cycle repeats. Without some natural stability, most aquatic life in these areas vanishes.

3) **The diversity of Wisconsin waters limits the effectiveness of a single management or regulation strategy.**

Wisconsin has over 1000 lakes (730,000+ acres) and over 140 rivers (3,000+ miles) with walleye populations. Walleyes are found in a wide range of habitats from lakes less than 20 acres to the 137,708 acre Lake Winnebago, Green Bay, reservoirs, flowages, and large river systems. Lake habitats range from shallow, productive systems to large, deep, unproductive systems. Growth rates vary widely; walleye that have survived four summers of growth can range from 11.5 inches to over 18 inches. Sixty percent of walleye lakes (by area) are supported by strong natural reproduction while the rest have intermittent or no natural reproduction; many of the latter waters are supported by stocking. Some walleye waters receive heavy angling pressure while others are lightly fished; many waters in the north also have tribal harvest. Fish communities containing walleye are also quite diverse. With this tremendous variability in habitat, productivity, growth, reproductive success, harvest, and associated fish species, a number of management / regulation strategies are needed to maintain quality walleye fisheries, both individually and collectively. The current statewide 15 inch minimum size limit (with exceptions based on growth rate or contaminants) is not flexible enough for successful management of these diverse aquatic systems.

4) **Biologists often have insufficient data (including community dynamics) upon which to base management decisions, particularly for individual waters.**

Biologists use information they gather about natural communities and fish populations to make a wide range of management and regulation decisions. Fisheries biologists have been collecting biological information since the early 1950's, but not always on the same water body, at the same time of year, or with the same gear, or using the same techniques and definitions. Inconsistencies in surveys and survey design make it difficult to follow long term trends in walleye populations, especially as part of whole aquatic communities. With the advent of the treaty fisheries, the increased popularity of sport angling, and the general increases in stresses placed on walleye populations and their habitats and communities, the need for quality, long-term data has never been greater. Since 1990, we have had a standardized survey program in place in the ceded territory, but have not had a similar effort state-wide. We see the need for a comprehensive community survey program which assesses both short and long term trends in fisheries communities.

5) **In general, most anglers are unfamiliar with walleye population dynamics, management options, and management goals.**

Wisconsin anglers generally hold walleye in high esteem as a game and food fish. Therefore, anglers might prefer to have walleye fishing opportunities in nearly all waters of the state. They also expect these walleye fisheries to produce consistent (sustained) high quality walleye populations and to produce consistent fishing success. In contrast to expectations, many Wisconsin waters do not (and probably will not) support walleye populations. Many other waters have walleye fisheries due only to intensive intervention by man. Limiting factors in waters with poor or no walleye fisheries include: lack of spawning habitat, lack of other habitat needs, lack of adequate prey for young or adults, negative interactions with other species, and a variety of abiotic factors. Anglers traditionally suggest simplistic solutions to these limitations: 1) If walleye don't exist in a water body, the proposed solution is to stock walleye. 2) If those walleye fail to establish a self-sustaining population, the solution is to stock more walleye. 3) If the population of walleye produced does not sustain a desirable catch rate, the solution is to stock walleye at a higher rate. Unfortunately, simply stocking more walleye will rarely satisfy these concerns. Anglers expect relatively good, consistent fishing success through time; among the popular game fish, walleye is probably the most variable species in abundance from year to year. Even natural walleye populations are highly variable in numbers through time. A relatively late age-at-maturity, combined with generally low survival of eggs and young, leads to sporadic reproduction and wide fluctuations in the numbers of spawning walleye. Densities of adult walleye in Wisconsin waters vary over 100 fold in different lakes and years. Long-term data from Escanaba Lake suggest that walleye adult populations can change up to 70% from one year to the next due to natural fluctuations.

6) **Stocked walleye lakes consistently have lower densities of walleye than naturally reproducing populations.**

Stocking has often been seen by both biologists and the public as a panacea for protection, rehabilitation, and creation of new fisheries. Recent evidence suggests that stocked walleye lakes consistently support densities of one-third to one-half of naturally reproducing lakes. In some lakes, stocking has been successful in creating self-sustaining populations. A review of propagation and stocking practices is needed to see if stocking success can be improved. Stocking as a management practice is a valuable tool to increase the diversity of angling opportunities in portions of the state with few naturally reproducing populations, where waters dominated by other piscivores may still provide some habitat for adult walleye. Many lakes have been stocked which do not have adequate spawning habitat or in which walleye success is limited by other factors. These lakes have often been adversely affected through negative effects on the native fish community, particularly if those communities were dominated by bass and panfish. Recent concerns over the integrity of genetic stocks and effects on biodiversity cast further doubt on stocking as a management tool in some situations. Unfortunately, many of fisheries' customers have viewed stocking as the most important job we do.

7) **Overharvest of walleye may be a factor in overall declines in walleye numbers in many waters.**

Most available walleye abundance estimates in Wisconsin have been collected since the mid-1980's. Unfortunately, we have virtually no biological information about how many walleye were present in our lakes back in the "good old days". However, there is an apparent trend toward decreasing walleye abundance in lakes with natural reproduction since 1970. Average numbers of adult walleye per acre in these lakes were 6.1 during the 1970's, 5.8 from 1980-84, 4.8 from 1985-89, and 4.1 from 1990-94. No trend appears in lakes which depend on stocking to maintain the walleye fishery. Stocked waters have been more consistent at between 2 to 3 adults per acre. Other factors such as habitat loss may also have contributed to declining adult walleye abundance. With updated management practices, increased habitat protection and enhancement, and more appropriate angler regulations, our goal is to increase average numbers of adult walleye per acre by 1 adult per acre (>5 adults per acre) by 2005.

8) Harvest has greatly reduced the numbers of large (quality size) walleye in many waters.

Walleye are still abundant in waters with good natural reproduction but many waters have fewer big walleye than in the past. Unexploited walleye fisheries (some still exist in Canada) are comprised mainly of larger fish. Studies there have shown that even low levels of fishing can greatly reduce the numbers of these big walleye in a short time. Survey information in Wisconsin on waters with no size limits on walleye show that most are less than 13 inches long and numbers decline sharply at larger sizes. Such poor size structure in many walleye populations is likely due to selective harvest of larger walleye. Season lengths, seasonal bag and/or size limits, limitations on the number of lines allowed per angler, and an evaluation of the impacts of night fishing all may be appropriate methods to consider in the future. Proposed regulation changes that incorporate "one-over" and "slot" limits, should provide additional protection to adult fish, that may reduce exploitation rates and increase densities of adult walleye.

9) There are not enough opportunities for trophy walleye fishing.

Demand exists among a portion of the angling public for trophy opportunities for walleye. Many anglers travel great distances to have a chance at catching a trophy walleye (i.e., Lake Erie, Bay de Noc, Columbia River, etc). In Wisconsin, these trophy-type opportunities are uncommon, but where they do exist (Fox River), angler use is high. Initially, it was not clear what size of walleye constituted a trophy in the views of anglers. Our survey of licensed anglers suggested that walleye 28 inches or larger are most frequently considered trophies. Proposed waters for trophy management would have to be of some minimum size with a history of being able to produce large walleye. Large lakes with a cisco-based food chain may be most appropriate. Trophy lakes for walleye might not be supported by the general public or local riparians initially. The potential impact of a trophy management plan on other components of the fish community would have to be considered. The potential demand for trophy fisheries for walleye was also unclear. Our survey of anglers suggested that nearly 70% supported the establishment of at least a few trophy lakes (50 lakes statewide was the most common response).

10) The current harvest format in the ceded territory restricts tribal harvest to less than 50% of the harvest on a lake-by-lake basis.

The Chippewa tribes have the right to harvest walleye off-reservation, in the waters of the ceded territory. The tribes would like the opportunity to take 50%of the walleye harvest on a lake by lake basis, but they feel that the current safe harvest system restricts their spring spearing harvest to below that level. The tribes would prefer a system where all harvest is managed by a quota, set on a lake by lake basis, with the quota split 50/50 between tribal and state anglers. The Department of Natural Resources feels that high efficiency methods of harvest, such as spearing, require a quota management system and that relatively low efficiency methods of harvest, such as angling, do not. The Department feels that a risk level of one chance in forty of harvest in excess of 35%of a population is the maximum acceptable for the management of walleye populations in Wisconsin's waters. A remaining issue with the tribes is what target level of harvest should be split 50/50.

11) Walleye populations are naturally variable and, thus, can interact strongly with other components of the fish community; walleye can greatly impact, or be impacted by, other fishes.

Walleye and other fish populations fluctuate for a variety of reasons. Factors that could affect natural fluctuations include climate and weather, water levels, exploitation, interactions with other fish species (such as predation), and habitat changes. Walleye population fluctuations are made more extreme by the natural history of walleye. The age at first maturity is relatively high. Survival of eggs and larvae is very low. Conditions are seldom perfect for successful reproduction, leading to strong year classes only once every four to five years. By chance, some populations may go through longer periods between strong year classes and others may have several successful year classes in a row. Negative relationships have been noted between walleye and some other fish species. For example, large populations of black crappie and cisco are thought to negatively impact walleye recruitment. High density populations of many species may inhibit successful reproduction of walleye through predation on eggs and young. Whether or not musky populations impact walleye is an issue raised by some anglers; however, no specific negative impacts have been documented. Generally, muskellunge populations exist at densities too low to impact walleye populations. In fact, many of the better known walleye fisheries are also popular for their muskellunge fishing. Conversely, walleye can negatively impact growth and/or survival of other fishes in certain lakes. For example, introduced walleye can eliminate or greatly reduce other fisheries (e.g., smallmouth bass). The relationship between the densities and survival of various fishes that are preyed upon by walleye and walleye year class success are still relatively poorly studied.

12) Contaminant levels in fish flesh are a problem in some waters.

Moderate to high levels of mercury have been detected in some walleye stocks across Wisconsin and consumption advisories have been issued to protect people who regularly eat walleye. The appropriateness of some advisories has been questioned by some anglers. The use of size limits for stocks with high levels of mercury has also been questioned and

contamination is one of the criteria used for exempting walleye waters from the 15-inch length limit. More study is needed to determine the actual risk of consuming mercury-contaminated fish. Most anglers consume very few walleye and yet may change their fishing habits based on health advisories. Size limits may not be appropriate for waters where moderate to high levels of mercury have been found. Rather, harvest of small walleye might be encouraged, with harvest of large fish restricted. Such regulation policies may provide an additional opportunity to develop "trophy" fisheries. However, stocks with high levels of mercury contamination often, but not always, have relatively slow growth rates.

13) Hooking mortality may be a problem with minimum length limits.

Excessive mortality of walleye that are caught and released could negate the potential benefits of the 15 inch size limit, or of any other restrictive regulations that may be proposed. The potential problem becomes magnified when anglers catch and release a large number of sub-legal fish for every legal size fish harvested. If hooking mortality rates are high, the total number of walleye killed could exceed an angler's daily bag limit. However, the few hooking mortality studies that have been conducted for walleye suggest that mortality rates are low (0.8%, 1.1%, and 5%). Higher mortality rates have been measured (around 20%) for walleyes caught, kept, and then released in walleye tournaments when water temperatures exceed the mid-60s. The problem of hooking mortality may be more a perceived problem than an actual problem; nonetheless it may hinder acceptance of restrictive size limits for walleye. Our survey of walleye anglers and our public workshops held around the state suggested that this issue was not a major concern for most anglers. Better hooking mortality studies still need to be done on Wisconsin waters under the conditions (water depth > 30 feet, temperatures > 70 degrees, regulations, etc) that may effect mortality of released fish.

14) User conflicts affect the quality of fishing experiences in Wisconsin.

In both the angler survey and in the public meetings,anglers listed user conflicts as a factor which affected the quality of their angling experience. On some lakes, angling is very difficult or nearly impossible on weekend days or holidays. Jet skis were listed as the number one problem, but other recreational users were also mentioned.

15) Catching too few walleye overall, and too few large walleye.

A frequent comment was that anglers were catching too few big walleye or too few walleye overall. Anglers felt that the quality of their fishing experience, in terms of the number of walleye caught, had declined.

16) Tribal harvest of walleye in the ceded territory continues to be contentious.

Many anglers stated that the key to improving walleye fishing was to reduce tribal spearing on northern Wisconsin lakes. The total exploitation rate on walleyes in the ceded territory has declined with the more restrictive regulations that have been in place since spearing became an issue. Exploitation rates have been well within the levels of harvest agreed to be

the upper limits by biologists in court and those levels are under the levels of harvest that many waters were experiencing by anglers alone prior to the Chippewa off-reservation harvest. Tribal harvest accounts for 25 to 30 thousand walleye out of about 120 lakes annually in the ceded territory. Angler harvest is projected to be about 125 thousand on those same lakes. Tribal harvest can represent about 20-30% of total harvest on lakes with a 15 inch size limit and only about 10% on lakes with no size limit for anglers. On the later lakes, anglers are harvesting some fish which are immature and unavailable for tribal harvest.

17) Overharvest may be occurring seasonally, particularly during spring on river systems and during the ice fishing season.

Public comments at a recent series of public meetings often included concerns that too many walleye, or too many large walleye were being harvested at specific times of the year or by specific methods. Many comments suggested that too much walleye harvest was occurring in March and April on large river systems, particularly below dams. There was also a concern that too many large walleye were being harvested by ice-fishermen during night-long fishing. Angler harvest survey results show that 50% of the total annual harvest of walleye on some river populations occurs during the two months of March and October. Angler harvest surveys from lakes however, show that a low percent of the total walleye harvest occurs during the ice fishing season. Mean size of fish harvested may be somewhat higher during ice fishing, but that factor has not been fully studied.

WALLEYE STOCKING ISSUES STATEMENTS

18) Current stocking strategies, including stocking rates and sizes, may not provide the most cost-effective walleye stocking strategy.

The Department of Natural Resources is limited in the amount of walleye that can be produced to stock lakes. Because of this limitation not all walleye stocking quota requests are filled. There is also concern that the size of walleye stocked by the department is not effective in creating or maintaining walleye populations. There is some evidence that larger walleye survive better and return more fish to creel. However, because it costs significantly more to raise larger fish, it is unknown whether stocking large fish is a cost effective management strategy. Evidence from southern lakes indicates that stocking fry might achieve the same success as fingerling walleye. If true then it would be more cost effective to stock fry in these waters. The rates at which we stock walleye may be limited by the availability of fish rather than the biology of the system. However, if we cut or eliminate public relations stocking and limit stocking in low survival waters, there will be enough fish available. There is some concern that stocking densities might not be adequate to promote a self-sustaining walleye population.

19) Propagation system needs to improve efficiency and distribution policies.

There is a perception that the DNR propagation system does not always employ the most efficient strategies for raising and distributing fish. Certainly, before the renovations at the

Spooner and Woodruff hatcheries, most walleye were raised off site in leased ponds. These travel costs added significantly to the overall cost of raising fish. Once renovation of these hatcheries is complete, most walleye will be raised on hatchery grounds. This will reduce harvest and distribution cost. We might also increase the purchase of forage species from outside suppliers. Traditionally, all walleye stocked were raised at either the Spooner or Woodruff hatchery. Cost to stock walleye in the southern part of the state were significant. With changes in the propagation system, walleye for the southern part of the state are being raised in Lake Mills. Distribution cost should be less. Finally, since most walleye stocking occurs in the hot summer months, there is some concern that overall survivability is less than stocking during the cooler fall months.

20) Walleyes are not always stocked in the best waters for success.

Data from walleye stocking literature indicates that, at best, only 50% of initial walleye introductions are successful in developing a self sustaining walleye population. Walleyes stocked to maintain populations have an even lower success rate. Because of the walleye stocking is highly variable and difficult to predict, there are few guiding principles on which waters will have successful walleye populations after stocking. Further, data from Wisconsin and other states/provinces indicates that walleye stocking success is highly variable. There also appears to be year class variations in stocking success, similar to walleye natural reproduction. Finally, there is some concern that stocking decisions are, at times, politically based. In fact, our own 10% stock back policy has no good biological basis and was an attempt to show good faith in returning fish to the water.

21) Stocking decisions don't always incorporate the biology of the system and latest survey information.

There is some concern that not all stocking decisions are based on the best biological information. Because we are not able to survey all waters in the state on a regular basis, information for making stocking decisions is not always current. Often these decisions are made on limited and out-of-date information. Because survey funding is limited, not all stocking events are evaluated. Further, because most reproduction evaluations occur during the fall of the year and stocking decisions are made in early summer, the most current information is not available for use in making these decisions. Most of the reproduction information is at least 2 years old before any stocking can occur.

22) Is there a relationship between angler participation and stocking policy?

Historically, the number one priority for fisheries management has been propagation and stocking of fish. Certainly, the public image of fisheries management is that stocking is the most important thing we do. We have cultivated that image by providing information that suggests stocking is the panacea for all fisheries problems. Because of this traditional approach to fisheries management, there might be a relationship between the anglers and stocked lakes. There is probably a perception among anglers that stocked waters are more

productive and provide better opportunities to catch walleye. This perception could mean that some anglers buy licenses, because we stock waters.

23) There is a need for stocked walleye waters. Stocking is a useful tool in walleye management.

Fisheries Management has cultivated a need for stocked waters by traditionally providing fish for stocking in all corners of the state. We have created artificial walleye fisheries in areas that did not have walleye populations. Many anglers appreciate a walleye fishery within short distances. There might be a positive correlation between the number of licenses sold and the number of artificial walleye fisheries created. Further, it could be that angling tourism is Wisconsin is important, because of the number of waters stocked with walleye. Certainly it draws walleye anglers to areas that did not historically have walleye populations. Whether the number of licensed walleye anglers will decrease if stocking decreases is unknown.

24) Are there performance benefits to genetically distinct stocks?

With the improvement of genetic techniques, we can find genetically distinct populations throughout the state. Using this information, the number of stocks in the state can be broken down in a variety of ways. Although we might be able to determine genetic differences in stocks from around the state, there are some questions on whether there are also performance differences among these stocks. Performance differences could be changes in egg survival, growth, fecundity, or some other measure that decreases stock fitness and survival. Performance differences could be survival, which directly affect cost effectiveness of the propagation program. Genetically distinct populations are likely to respond differently to the same environment. Evaluation of stock-specific performance and fitness differences among waters would help to better assess benefits and risks of alternative stocking strategies.

25) Walleye have been historically stocked throughout the state without regard to origin of stock and their effects on native stocks.

The fisheries management program has a long history of propagating and stocking walleye throughout the state. This program began in the late 1870's, with the first walleye propagated from the Lake Winnebago system. Until the early 1900's, all walleye stocked in the state were from the Winnebago system. Propagation efforts moved north and expanded to cover the entire state during the early 1900's. By the year 1910, there had been 77,904,996 walleye stocked in Wisconsin. Walleye were probably originally found in the large river systems and large drainage lakes throughout Wisconsin. Most walleye populations found in small drainage and seepage lakes were the result of the walleye propagation program. Because of the long history of walleye propagation, we do not understand the effects of our stocking program on native walleye stocks.

26) Stocked walleyes have a negative impact on natural reproducing walleye populations.

If there are genetically distinct walleye populations that also have performance differences, theoretically stocking these fish into a different stock of walleye could result in lower fitness of the overall population. This phenomena, called outbreeding depression, occurs when stocks that are genetically distant interbreed. This results in lower overall fitness of the offspring and less chance for future success. Although this has never been demonstrated for walleye, there has been extensive work done on largemouth bass. Outbreeding depression occurs when bass from northern Illinois breed with southern Illinois bass, resulting in lower survival and reproduction of the offspring, when the offspring are stocked back into either northern or southern Illinois waters. Further, recent work in Minnesota suggests that stocking walleye suppresses adjacent year classes, which results in no net benefit to the population. Combined with the implications of stock management and research showing the negative impacts of stocking on naturally reproduced year classes, lakes with sufficient natural reproduction should not be stocked.

27) There is poor communication and cooperation between state, private, federal, tribal and cooperative providers.

There are a number of state, private, federal, tribal and other cooperators propagating and stocking walleye in Wisconsin. Traditionally there has been poor communication among the various providers. Although a number of entities provide propagated walleye, the state has to approve all off-reservation stocking permits. Often the recommendations of the biologist do not agree with the lake association or other interested groups. Finally, because there has been poor communication between these groups, there are terminology and policy differences between the various providers. This has lead to conflicts over numbers and size of fish received from the various cooperators.

28) There is no feedback mechanism to private and public providers to assure all producers are using the same terminology and policies.

Currently, there are no structured feedback mechanisms from managers to either private or public providers on the performance of their product. In order to assess the validity of stocking as a management strategy, often managers request an evaluation of stocking, . This might require marking of walleye stocked or some other extended work beyond normal stocking procedure. Because there is no formal feedback loop, after assessment of stocking, results have not been consistently reported back to producers. This leaves producers with little or no information to improve their product. Finally, because there is no feedback loop, there is concern that stocking policies and terminology differ between the private and public producers.

29) The relative role of stocking in walleye management is often misunderstood.

Because fisheries management has a long history of stocking, it is commonly perceived by many members of the public that stocking is our sole activity. Often stocking success, especially historically, has been overstated. This has lead many members of the public to view stocking as a panacea to all fisheries management problems. Unfortunately, stocking evaluations suggest that only 50% of new introductions are effective in creating a walleye

population. Maintenance and enhancement efforts lead to even lower success rates. Waters supported entirely by stocking have much lower walleye densities and are often dominated by other top predators that also support fisheries. Anglers catch walleye at a substantially lower rate in stocked waters than in waters supported by natural reproduction. New evidence from genetic efforts suggest that stocking walleye into natural reproducing populations might have deleterious effects on the growth and/or survival of natural fish. While there have not yet been any field evaluations of genetics effects for walleye, stocking fish on top of natural year classes may be causing some negative effects. Most of the scientific evidence on stocking is relatively new in comparison to propagation efforts. A new education effort needs to be developed to more accurately portray the costs and benefits of stocking.

30) The impacts of walleye introductions on fish communities are inadequately evaluated and sometimes unpredictable and can sometimes result in negative impacts.

Walleye are most often the top predator in any community, and as such can have significant impact on the structure of the fisheries community. There is a large body of anecdotal evidence that suggests a negative interaction between largemouth bass and walleye. Further, upon stocking, Escanaba Lake converted from a smallmouth dominated fishery to walleye dominated fishery, with few smallmouth bass left. Walleye stocking has also used successfully, in some instances, to control or reduce the number of panfish. Certainly, if walleye stocking is successful, then the fish community structure is likely to change. There will probably be a reduction in other predators and a decrease in the prey base. These can be viewed as positive or negative influences, depending on the species of choice. Unfortunately, there has been little work done on the impact of walleye stocking on fish communities. There certainly is a cost of changing fish communities to a common endpoint versus accepting some diversity of communities at a much reduced cost.

PLAN IMPLEMENTATION

Begin implementation of walleye management plan immediately, with full implementation by 1998.

Report on progress toward plan implementation annually to walleye interests.

Plan implementation has been underway as the Walleye Management Planning Committee has met and developed objectives. The plan that has developed incorporates a broad range of issues, objectives, and strategies that obviously lie outside the jurisdiction or scope of any one agency or group. The issues and strategies suggested by the committee require the coordination and working together of a broad range of interested parties. In addition, the Walleye Management Planning Committee has proposed strategies and action items that include and also go beyond the narrow focus of walleye management to the broader picture of maintaining and improving aquatic habitat for all species and communities. In the prior sections on strategies, the plan tried to identify some of the key players involved in various issues that we have addressed. Key partners and parties include the Department of Natural Resources, lake organizations of various types, county, municipal, and local governments, the Native American Tribes, state, tribal, Federal and private hatcheries, angler groups, tourism representatives, resort owners, fishing guides, fishing clubs, conservation groups, the Great Lakes Indian Fish and Wildlife Commission, the Forest Service, U. S. Fish and Wildlife Service, other federal agencies, lake shore owners, and the fishers and public of Wisconsin.

This document has allowed the committee to put together our thoughts on what problems we see at the current time and our suggestions on working to improve the fisheries resources of Wisconsin. The walleye management plan is a guide that identifies those areas that the committee, as a group, feels are important areas for spending dollars, time, and energy to improve our aquatic resources. Any plan is only paper unless it is followed up with work and implementation of the proposals put forward. Through an annual meeting and communication of the progress various groups are making on issues discussed in the plan, we hope to provide a focus that can help to guide the management of Wisconsin waters. Key issues that the committee identified will be used in program guidance within the Bureau of Fisheries and Habitat Protection of the DNR and, hopefully, used by other groups or agencies interested in improving fishing and the aquatic resources of Wisconsin.

Joint and single agency efforts, and public volunteers, with funding potentially coming from a variety of traditional and non-traditional sources, will assist in implementing the Wisconsin Walleye Management Plan. The Department of Natural Resources is committed to ensuring that public involvement is a living part of managing Wisconsin's walleye and aquatic resources. Ultimately, this plan will be administered by the Department of Natural Resources, through the Bureau of Fisheries Management and Habitat Protection, and through cooperative projects and partnerships with public and private groups and individuals interested in walleye management.

The Walleye Management Planning Committee will continue to function as a formal group, representing a cross section of various Wisconsin walleye interests, to work with the Department

and other agencies, as well as the public, to implement and update the MANAGEMENT PLAN. Department fisheries biologists work with DNR and other agency staff, and the public, to continue to pursue funding for projects through traditional Department sources, and from non-traditional sources outside the agency (e.g., private foundations, industry, local fund raising, user groups, other federal and state grant programs, volunteers, etc.). The Department or other responsible agencies, working with the public, will determine the feasibility of and develop cost estimates for implementation of various management options suggested in the Walleye Management Plan.

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

PLANNING PROCESS

The Walleye Management Planning Committee held a series of meetings from 1994 through 1996 to develop a draft plan which identified current key statewide walleye management issues, and recommended actions for addressing those issues. All planning products, eg. issues, objectives, recommendations, were discussed with various walleye stakeholders outside the committee, including the general public and DNR administration, during the planning process. The planning process included the basic planning work by the committee with input from various statewide walleye interests through a variety of information gathering and exchange techniques.

As part of the process to gather information from the public on Wisconsin walleye management, the Planning Committee developed and conducted a survey of Wisconsin anglers. The survey was sent out to over 2000 anglers randomly selected from fishing license sales, pro-rated by each County. Surveys were also sent out to specific groups including fishing guides, resort owners, walleye club members, walleye tournament anglers, delegates of the Wisconsin Conservation Congress, and DNR fisheries biologists. Survey questions examined general fishing attitudes and opinions and walleye-specific fishing attitudes and opinions. The main themes from general anglers, based on a 67% response rate, were:

* The most preferred fish for angling were walleyes
* Anglers would like to try a variety of regulations in walleye management
* Most anglers feel the DNR could do a better job of walleye management
* Most anglers preferred the minimum size limit to stay at 13-15"
* Most anglers preferred 3-5 bag limit
* Most anglers felt that the quality of fishing has decreased over time

Once a draft plan was developed by the committee, a series of public workshops were conducted throughout the state from August through October 1995, to give interested citizens the opportunity to provide input on the issues of concern and to comment on the progress of the committee . Workshops were held in Delavan, West Bend, Wauwautosa, Cable, Park Falls, Rhinelander, Superior, Crandon, Hurley, Barron, Eagle River, Janesville, Spooner, Merrill, Madison, Boulder Junction, Chippewa Falls, La Crosse, Hayward, New London, Marinette, Green Bay, Chilton, Oshkosh, Wisconsin Rapids, and Woodruff. Comments from the public workshops were incorporated into the plan, which was finalized in March 1997.

Locations of Public Workshops on the Walleye Management Plan

ACKNOWLEDGEMENTS

The Wisconsin Walleye Management Plan was developed by the Walleye Management Planning Committee composed of those individuals and groups listed on page i. In addition, the following individuals and groups were either on the mailing list or attended some meetings and provided additional comments or input to the development of the plan.

Dan Anderson	Governor's Northern Office
Randy Armsbury	Hayward Guides Association
Rand Atkinson	Conservation Congress Warmwater Study Committee
Gary Engberg	Sauk Prairie Chamber of Commerce
Charlie Grimm	Yahara Fishing Club
Mark Noll	Mississippi River Study Committee, Conservation Congress
Jim Kalkofen	Professional Walleye Trail
Perry Reas	Turtle-Flambeau Resort Association
Jeff Speros	Hayward Lakes Resort Association
Stanley Solheim	WI Division of Tourism
Ron Schmitz	Falling Rock Walleye Club
Jerry Carow	WDNR Law Enforcement, Ladysmith
Mike Ross	Wisconsin Council of Sport Fishing Organizations

Governor's Council on Natural Resources in Northern Wisconsin

We would also like to thank Lee Kernen, former Director of the Bureau of Fisheries Management and Habitat Protection for providing the guidance and support necessary to carry through this project. We would like to thank the biologists from all around the state for their assistance in fulfilling requests for information, their help in developing mailing lists for the mail survey, assistance with the public meetings, and their other efforts to help fulfill some of the goals of this committee.

WISCONSIN WALLEYE MANAGEMENT PLAN

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Walleye Life History and Habitat

Walleye are found in a variety of habitats across Wisconsin. They inhabit rivers, reservoirs and lakes. They were native to the major drainage systems of the state and were stocked into many land locked lakes. In some lakes they have spawned successfully and have developed self sustaining populations. Other lakes apparently have either poor spawning habitat or inadequate food supplies to spawn successfully. Walleye are most common in larger lakes (> 500 acres) and the larger river systems of the state and are not common in lakes under 100 to 200 acres in size.

Spawning habitat may be the most critical bottleneck in the life history of walleye. Walleyes spawn over a variety of habitats including, gravel, cobble rip-rap and flooded vegetation. The life history of walleye is that of a long-lived species which produces a large number of small eggs each year that are broadcast across suitable habitat with no further parental care. Habitat, weather, predation, and the availability of suitable food items for the young walleye affect the success of walleye reproduction each year.

The most important spawning habitat in lakes is wind-swept gravel and cobble shorelines. Walleyes may spawn on rock reefs away from shore if the bottom surface consists of clean rock or gravel. Shallow water is preferred because wave action is able to keep the rock surface clean and many crevices form between rocks. The eggs initially stick to the rock surface until they become water hardened. The eggs then fall into crevices between rocks where they are protected from predation and abrasion. Water levels are critical during spawning and egg incubation for access to the rocky areas. The eggs perish on sand or silt bottoms.

Walleyes sometime move into streams and rivers that flow into or out of lakes to spawn over gravel or rock bottoms. The eggs are deposited, harden and then drop into the crevices. The eggs are protected during incubation and the fry then move into the lake where they feed on zooplankton and small insect larvae.

Walleyes migrate up to 100 miles or more in larger river systems such as the Mississippi, Fox and Wolf Rivers to find suitable spawning habitat. Walleyes spawn in flooded marshes along the Fox and Wolf Rivers. They seek out marshes where water flows through the marsh providing adequate oxygen levels. Water levels must be high enough during the incubation period to allow the fry to hatch and quickly move into the river. Walleyes in the Mississippi River use both rocky areas and flooded vegetation. Dams can prevent spawning migration to prime habitat on some river systems.

Survival of larval and young walleye also represents a critical bottleneck. The number of young that survive from eggs produced in a given year (a year class) is highly variable from year to year. Most years do not produce a large year class, in fact, only one year in four or five may be successful and contribute significantly to the adult population. Larval and young walleye must successfully avoid being eaten; their switch from yolk sac to feeding on their own much match the timing of the increase in plankton prey in the spring; later in the summer, small prey fishes must be available at the time when young walleye switch from a diet of plankton and

insects to one of fish; and the young must avoid predators and have sufficient reserves built up by fall to survive the first winter. The odds of survival for any one walleye are very small.

Little is know about the habitat requirements of juvenile walleye. Food sources probably determine where they are found. Escapement cover may be important but, they are commonly found along shore areas at night.

Adult walleyes utilize a variety of habitats. Water clarity or light penetration probably determines where they are found during daylight hours. In very turbid waters they are sometimes found in very shallow areas during the day. In clear water they generally move to deeper water or in the shade of woody debris and vegetation. Divers have found walleyes laying in the shade of submerged structure and aquatic plants during daylight. At night they move to areas where food is available. Those areas include shallow shorelines, reefs, weed lines and mud-flats.

Water quality is important to walleye populations. While they can thrive in turbid waters, they must have adequate oxygen supplies to survive. They are generally considered a cool water species but also inhabit shallow reservoirs that have fairly high summer temperatures.

Efforts to improve walleye spawning habitat have had varying degrees of success. The most common method of habitat improvement in lakes has been the placement of course gravel and cobble along windswept shorelines. The east shoreline is generally the best location because prevailing winds wash the shoreline and keep the rock and crevices clean. Rocks with high calcium content such as limestone should be avoided since algae tend to thrive on the surface of such rock. Granite type rocks are a better choice. Water level management is important to the success of such efforts.

Management of marsh vegetation is of great importance in those river systems where the walleyes spawn over flooded vegetation. The promotion of grasses rather than woody vegetation is one key element. The other key is to direct sufficient flow into the marshes so the eggs are well oxygenated and the fry can escape the marsh with the flowing water after hatching.

Protection of key spawning habitat through water regulation laws is an important aspect of walleye management. These laws protect the nature of the shoreline, water levels and wetlands. Shoreline protection efforts should be limited to the use of small rip-rap rather than sea-walls. Sand blankets can also destroy important rocky habitat. Wetlands in the watershed need to be protected so that water levels are sustained over a longer period of time rather than rising and falling quickly.

The protection and enhancement of suitable habitat for spawning, growth, and survival are key factors for ensuring abundant walleye populations and balanced aquatic communities into the future.

WALLEYE REGULATIONS

Types of Regulations

The following is a brief explanation of the types of regulations available for walleye management. What follows is a history of the use of these regulations for walleye management in Wisconsin, the effectiveness of these regulations, and some biological and sociological considerations for the use of certain regulations for walleye management.

Season Length

Closed seasons are generally put in place to prevent excessive harvest of **overall numbers** of fish during times of seasonal concentration. Protection of "spawners" to allow egg deposition is rarely a necessary consideration for walleye since a few females can lay a tremendous number of eggs. A harvested female walleye will not contribute any eggs whether it is caught in April or in September. Research has shown that the success of walleye reproduction is more dependent on weather conditions than on the number of spawning females. Total numbers harvested (males, females and juveniles) is the important factor. Walleye harvest could be greatly reduced in lakes with an additional closed season in May or on rivers by a closed season in late winter and spring.

Daily Bag Limits

Bag limits are far less effective than length limits in reducing walleye harvest since few anglers consistently catch a limit especially at 5 fish per day. Catch records estimate that reducing bag limits from the current 5 fish per day would result in the following reductions in walleye harvest; 4/day - 5%, 3/day - 14%, 2/day - 27%, and 1/day - 51%.

Minimum Length Limits

A minimum length limit functions to increase numbers of walleye under the minimum length. Once significant numbers of walleye grow over the minimum length, harvest opportunities increase, but the immediate impact is a big decrease in harvest. This is most important in waters with low numbers of walleye or where harvest is very high. Minimum length limits are also more effective where walleye growth rates are good and can even be counterproductive where growth is very slow. High angling pressure may keep few walleye from surviving much past the minimum length.

Maximum Length Limits

A maximum length limit functions to increase numbers of walleye over the maximum length. This type of regulation has seldom been used but provides maximum protection for the largest individuals in a population. Maximum length limits are designed to increase the density of large walleye (above the maximum length) by providing maximum protection to those individuals. High angling pressure may prevent significant numbers of walleye from reaching the maximum length limit. Angler desire to be able to harvest a "trophy" walleye limits the support for maximum length limits.

Slot Length Limits

Slot limits focus on improving the numbers and catch rates, but not harvest, of "mid-size" walleye. Protected slot length limits would allow harvest of walleye smaller and larger than a specified length range but no harvest within that range. Slot limits are most appropriate where there are good numbers of walleye already (i.e. good natural reproduction) where you can "afford" harvest of fish smaller than the slot. Once walleye grow larger than the protected slot length range, harvest opportunities for large walleye should improve. An overview of the slot length concept follows:

Width
- wide enough so fish don't grow through it too rapidly (at least two growing seasons)
- narrow enough not to stockpile fish in protected slot

Low End
- most critical part
- low enough to ensure adequate numbers of fish get into the slot
- high enough to provide meaningful harvest below slot

High End
- low enough to eventually harvest a significant portion of the population (growth of males is main consideration; if too high no males will ever be harvested once they enter the slot and yet will never be trophies)
- high enough to accomplish quality goals

"One-Over" Length Specific Bag Limits

One-over regulations are similar to slot length limits in some respects. Both regulations are designed to increase the numbers of medium and large walleyes while still allowing harvest of smaller walleye. Both regulations are appropriate only where there are already good numbers of walleye but few large ones. One-over regulations however do not afford "complete" protection to a length range of walleye but allow at least some harvest of all size walleye. A one-over regulation is really a reduced bag limit on larger walleye. Remember that bag limits are far less effective than length limits. Since few anglers catch more than one large walleye daily, a one-over length needs to be quite low in order to have a meaningful reduction of the harvest of larger walleye. Analysis of angler harvest information for Wisconsin prior to 1990 when anglers could take 5 walleye per day of any length shows the following percent harvest reductions with various one-overs; one-over 20" - 0.7%, one-over 18" - 2.0%, one-over 15" - 11.0%. A one-over 20" limit such as that in Ontario would be totally ineffective in Wisconsin since we have fewer large walleye to work with.

Trophy Regulations

The goal of trophy regulations is to maximize the potential for catching a really large walleye and could be accomplished in several ways. A maximum length limit could be used which would allow harvest of smaller walleye but no harvest once they grew larger than the maximum length limit. In this instance, a photograph would have to be the "trophy" taken home. A high minimum length limit could also be used combined with a one daily bag limit. No small walleye could be kept and only one walleye larger than the high minimum length could be kept for the wall. In either case, waters selected should have good growth rates and a known capacity to produce numbers of truly trophy size walleye.

A Brief History of Walleye Management in the Inland Waters of Wisconsin: 60 years of change (1935 - 1995)

Any attempt at revising the walleye management plan in Wisconsin should begin with a look at the past. Only when we look at what management practices were used in the past, and how effective they were, can we begin to address management options that will guide the fishery to a desired state in the future.

From 1935 to 1995, walleye regulations were nearly as dynamic as walleye populations. In the inland and boundary waters of Wisconsin, the primary management activities have been closed seasons, daily bag limits, and minimum length limits.

Season Lengths

From 1935 to 1938, the open season ran from the second Saturday in May to March 1, but from 1938 to 1954, the season closed on January 15. In the 1954-55 season, the state was split into northern (north of Hwy. 29) and southern zones (south of Hwy. 29), with different seasons. The southern zone opened April 30 (last Saturday?) and closed February 15 and the northern zone opened on the second Saturday in May and closed on February 15. This pattern continued until 1993, when the southern zone was changed to a later opening date, the first Saturday in May??. The two zones were combined into one statewide zone again the next year, 1964, opening on the first Saturday in May and closing on February 15. This season structure continued until 1974, when the season closed March 1. This season length has remained to present. Basically, we have come full circle and have essentially the same season as what we had in 1935.

Daily Bag Limits

In 1935, the daily bag limit for walleye was 10 fish. This was changed to 7 in 1936, and continued for 12 years until 1948, when the daily bag limit was reduced to 5 fish. The daily bag limit remained at 5 fish until 1960, when the limit was changed to include a total of 5 fish in aggregate with sauger and walleye x sauger hybrids. The daily bag limit of 5 in aggregate with sauger and hybrids has remained in effect to the present. In 1989, a sliding bag limit was established that required a reduction in the daily bag limit in lakes within the ceded territory where the Chippewa intend to exercise their ability to harvest walleye by spearing at more than 1% of the safe harvest level. The bag limit is reduced to 4, 3, 2, 1, or 0, depending upon the proportion of the safe harvest that is declared.

Minimum Length Limits

The minimum length limit for walleye in 1935 was 13 inches. The next year, in 1936, the minimum was increased to 15 inches, but was changed back to 13 inches the following year, 1937. This rule remained in effect for 20 years, but in 1957, the minimum length limit was eliminated for walleye in, at that time, the southern zone. The "northern zone" followed the next year, 1958, and no minimum size limit was in effect from 1958 to 1966. In 1966, 12 counties in north western Wisconsin (Ashland, Barron, Bayfield, Burnett, Chippewa, Douglas, Polk, Price, Rusk, Sawyer, Taylor, and Washburn Counties) reinstated the 13 inch minimum length limit, while waters in the other counties remained with no minimum length limit. These waters in north west Wisconsin slowly dwindled

down to 4 counties until 1990, when a 15" minimum was initiated statewide. After 1990, a mechanism was put in place to exempt some waters from the 15" minimum, based on slow growth or problems with contaminants. Today, over 100 walleye waters are exempt from the 15" minimum length limit.

Other Regulations

Today, we have a season from the first Saturday in May to March 1, with a daily bag limit of 5 fish and a minimum length limit of 15 inches. We have had limited experience with other types of regulations, including a trophy minimum length limit and a "one-over" length-specific bag limit.

In 1989, we instituted a seasonal trophy minimum length limit on the Fox River from Green Bay up to the dam in DePere. From March 2 to the day preceding the first Saturday in May, only 1 walleye may be kept and it must be 28" or more in length.

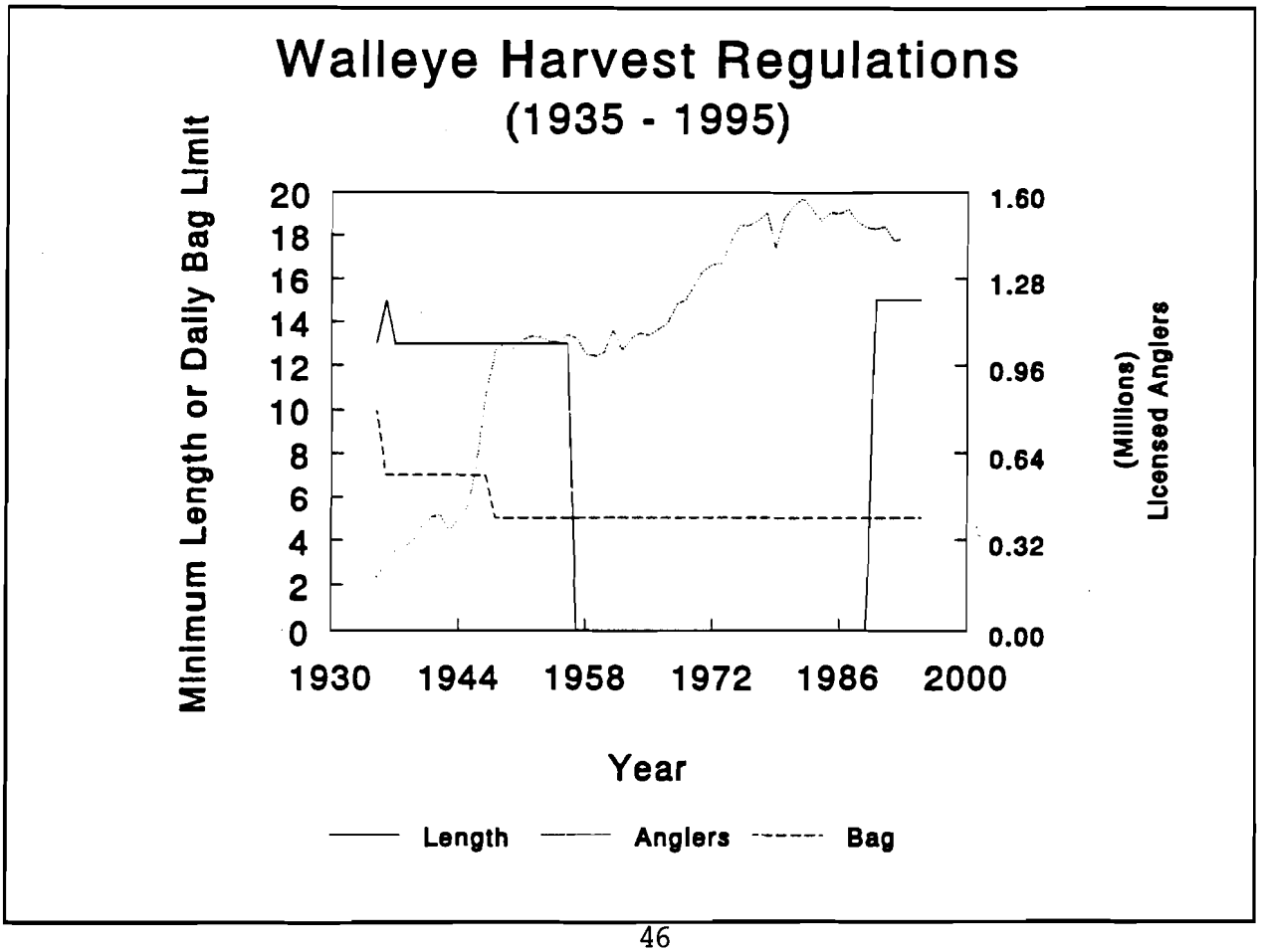
In 1992, we implemented a "one-over" type of regulation on Lake Superior and its tributaries. The rule specifies that only one walleye (or sauger) larger than 20" may be kept, with a minimum length limit of 15", and a daily bag limit of 5 fish in total.

Of all the types of regulations described in the first section, only the slot length limit and the maximum length limit have not been used for walleye management in Wisconsin.

History of Walleye Regulations in Wisconsin

Following is a chronological summary of angling regulations for walleye in Wisconsin.

1881 - Fishing season closed from February 1 to May 1
1909 - Twelve (12) inch minimum length limit established statewide
1917 - Daily bag limit of ten (10) established statewide
1935 - Minimum length limit raised to thirteen (13) inches in all waters except boundary waters
1936 - Daily bag limit reduced to seven (7) statewide
1949 - Daily bag limit reduced to five (5) statewide
1958 - Minimum length limit abolished statewide except boundary waters
1966 - Thirteen (13) inch minimum length limit re-established in 12 counties in northwestern Wisconsin
1972 - Number of counties in northwestern WI having 13 inch minimum length limit reduced to 10 counties
1976 - Number of counties in northwestern WI having 13 inch minimum length limit reduced to 5 counties
1980 - Number of counties in northwestern WI having 13 inch minimum length limit reduced to 4 counties
1989 - Annual sliding daily bag limit reduction system (from 5 to 4,3,2,1,or 0) in response to Chippewa tribal harvest declarations established for roughly northern one-third of state
1990 - Fifteen (15) inch minimum length limit established statewide except in waters with slow growth or mercury contamination



Effectiveness of Past Walleye Regulations

Walleye population surveys and angler harvest (creel) surveys throughout the state from 1960 to 1990 suggest that angling regulations prior to 1989 had little effect on walleye angling harvest. Most walleye populations peaked in numbers at about 13 inches whether or not a 13 inch minimum length limit was in place but numbers declined at larger sizes. This may have been partly due to voluntary release of walleye smaller than 13 inches. Few anglers caught a limit of five walleye (or even four or three) on a regular basis.

Still, biological information tends to support angling perception that current walleye populations are less abundant overall and contain fewer large walleye than in the past. If harvest has been a major factor in decline, then reducing harvest through more restrictive angling regulations should be a major consideration in rebuilding walleye populations. No matter what regulations are considered they will have to "hurt" in order to work. In other words they will need to reduce harvest far enough to expect a positive response in a reasonably short time. Following are some principles to consider with various potential angling regulations for walleye.

Underlying Biological Issues

Walleye are a long lived species which mature at a relatively old age. For these reasons, it will take considerable time (5 to 10 years probably) for the full impact of any angling regulation to be realized.

Walleye abundance fluctuates widely due to natural factors and can be extreme. These natural fluctuations will add to or subtract from the effects of any angling regulation at any one point in time.

Walleye are highly efficient predators. Increasing numbers and/or sizes of walleye through angling regulations may have negative impacts on other fish species in a particular water.

Predicted Responses of Walleye Fisheries to Proposed Regulations

Tim Simonson
Bureau of Fisheries Management and Habitat Protection

Responses of walleye populations and resulting changes in walleye fishing to the proposed regulation categories were examined by modeling three different types of "typical" walleye populations under several regulation scenarios over a 50 year period using MANSIM, a model developed for walleye by the Ontario Ministry of Natural Resources.

"Exempt" Lakes

Simulated "Exempt" lakes had relatively high density, natural reproduction walleye populations that currently do not have a minimum length limit because of slow growth. The 50-year averages were generally the poorest for most population statistics under the current regulations (i.e., no minimum length limit). The average walleye density was 15.88 fish/acre, of which about 4.65/acre were fishable (11" or larger). The 3 bag, 1 over 14" regulation was estimated to provide the highest harvest rate, with a spawning stock density slightly higher than the current regulation provides; spawning stock biomass was also relatively high with the 3 bag, 1 over 14". The protected slot limits provided higher spawning stock densities and biomass, had lower projected harvest rates and higher projected catch rates than the 3 bag, 1 over 14". Minimum size limits higher than 15" provided little or no harvest, but relatively high catch rates.

"Average" lakes

Simulated "Average" lakes had moderate density populaitons with natural reproduction and average growth rates. Most of these currently have a 15" minimum length limit and a daily bag limit of 5. The existing regulation yielded a projected spawning stock density of 4.99 adult walleye per acre; the no minimum and 3 bag, 1 over 14" options resulted in lower adult densities and had higher projected harvest rates. The 14" to 18" protected slot length limit resulted in sightly higher adult densities and harvest rates than the existing regulations. A reduction in the daily bag limit from 5 to 3, resulted in modest improvement in adult density but did not result in better catch or harvest rates.

"Stocked" lakes

These class represented lakes with relatively low density, fast growing walleye populations with either poor recruitment or with a fishery sustained primarily through stocking. The current 15" minimum, 5 daily bag limit yielded a projected density of 2.2 adults/acre. Higher densities were predicted for higher minimum length limits (both 18" and 28"); harvest rates (number of walleye harvested per hour) were only slightly lower for the 18" minimum. The 28" minimum resulted in the highest catch rates of walleye, with a relatively low harvest of very large fish. The highest harvest rate was predicted for the 3 bag, 1 over 14" regulation, but lower adult densities resulted. In the model, it was assumed that staocking was successful in regularly contributing to recruitment in these waters.

Summary

When the new regulation categories were applied to the proper waters, the

modeling predicted that (Table 1):

1) Spawning stocks would increase from 4% to 34%, depending on the regulation and lake type;

2) Catch rates (number per hour) would increase from 5% to 20%, depending on the regulation, except on "exempt"-type waters that currently have a 15" minimum length limit;

3) Harvest rates will decline for waters that go from a 15" to an 18" minimum length limits and for "exempt"-type waters that go from no minimum length limit to a 14 to 18" protected slot length limit. Waters that experience reduced harvest rates will see increases in catch rates and average size of fish harvested. However, contrary to these predictions, we have empirical data from Lake Mendota that show that harvest rates have increased slightly after several years under the 18" minimum and intensive stocking;

4) Harvest rates will increase for other waters with the 1>14" or 14 to 18" "sustainable harvest" regulation options.

These are predicted **LONG TERM** effects; the actual short- and long-term responses could vary from these predictions, due to changes in factors such as angler behavior, etc.

Parameter estimates used in the model are presented in Table 2.

Table 1. Percent change from existing regulations in selected estimates of population and fishery statistics for different water types.

Existing Regulation/ Lake type	Proposed Regulation	Fishable Stock (no./acre)	Spawning stock (lbs./acre)	Catch (no./hr)	Harvest (no./hr)
No Minimum, 5 bag/"Exempt"	1>14, 3 bag	+18%	+7%	+14%	+13%
	14-18, 3 bag	+40%	+11%	+18%	-13%
15" minimum, 5 bag/"Exempt"	1>14, 3 bag	-31%	+4%	-19%	+89%
	14-18, 3 bag	-11%	+7%	-16%	+44%
15" minimum, 5 bag/"Average"	14-18, 3 bag	+4%	+26%	+5%	+8%
	18", 3 bag	+16%	+22%	+10%	-15%
15" minimum, 5 bag/"Stocked"	18", 3 bag	+22%	+34%	+20%	-20%

Table 2. Population and fishery parameters and variables for three different types of walleye fisheries in Wisconsin. Parameter estimates used for the "stocked" waters were unrecoverable due to a disk error.

	Type of walleye population	
Parameter	"Exempt"	"Average"
Length-Weight:		
slope	0.0000022	0.0000015
intercept	3.2	3.292
Von Bertalanffy		
L inf (mm)	630	700
K	0.21	0.19
t0	0.00	0.00
SD of TL at Age	40	50
TL at first spawning (mm)	358	358
SD ln(recruitment to Age 1)	0.9	0.9
Stock-Recruit parameters	4, 1.8, 4	4, 1.8, 4
Natural Mortality		
Immature	0.25	0.1
Mature	0.2	0.1
Fishery Parameters		
Minimum TL kept	280	280
Hooking mortality (5)	0.05	0.05
Catchability (q)	0.015	0.015
Effort; Mean (rod-hours/angler-day)	2.8	2.8
Effort; Total (rod-hours/hectare)	37	40
Harvest/rod-hour	0.08	0.038

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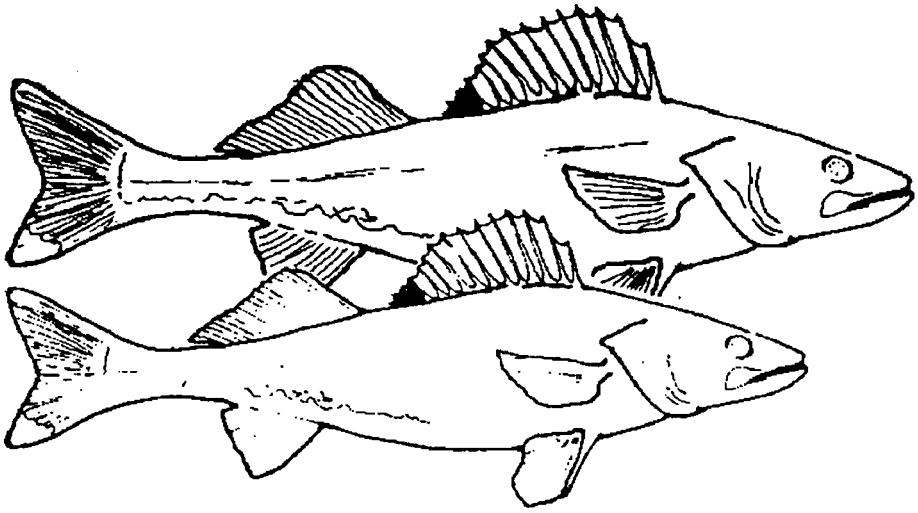
The Relative Abundance and Size-Structure of Walleye Populations in Wisconsin: 1968-1994



Prepared by:

Size-Structure Sub-Committee
of the
Walleye Managment Planning Committee

Kendall Kamke
Dennis Scholl
Tim Simonson and
Steve Hewett

with technical assistance from
Doug Beard

Background

The abundance of adult walleye populations depends upon several factors. One overriding influence is reproductive success, which is highly tied to weather conditions during the spawning period and early developmental stages. Another important factor can be the number of adults that are sexually mature and able to spawn. The high variability (or instability) in the numbers of adult walleye from year to year that has commonly been observed for walleye populations is often considered "normal" and is often attributed to weather conditions during spawning.

However, the interaction of these two factors, weather and adult spawners, probably determines the relative stability of the population. With few adults spawning, and the subsequent numbers of walleye added to the population is highly dependent on the timing of optimal weather conditions. These spawning adults will be subject to mortality throughout the year, with the highest source probably due to angling. If few young survive, the remaining adults become fewer and more reliant on good weather the next spawning season to increase their numbers. With relatively large numbers of spawning adults, the number of walleye in the population in subsequent years is less dependent on perfect weather conditions. An adult population made up of many mature age classes will be more stable because the occasional poor reproductive year will not make or break the population, and there will be plenty of adults ready to spawn again the next year. Conversely, a relatively large year-class one year can impact subsequent year classes through predation or competition for available resources, even if environmental conditions are perfect for walleye reproduction.

The size-structure of walleye populations, and the quality of fishing, is directly linked to the stability in abundance; the more year classes that exist in the population, the larger variety of sizes that will be available. Populations with many age groups present, and more older individuals, tend to be more stable than populations with few adult year-classes. Fishing quality can be defined many ways, but two factors are central to the concept: catch rates (how often or how many fish caught), which are generally related to adult walleye abundance, and fish size (how large the fish caught are), which is dependent upon the size-structure of the population.

Analyses

We examined trends in the relative abundance and size structure of walleye populations in Wisconsin from 1968 to 1994. We assembled all surveys for walleye that were reported by Fisheries Management personnel. The number of lakes sampled each year is presented in Table 1. We only used fyke net surveys during the early spring for further analyses so that all data would be comparable over time. Only fish 10 inches or larger in total length were included in the analyses to account for differences in mesh sizes used in different surveys. We felt that largest mesh used during the period of interest would retain all 10 inch and larger walleye.

We determined the average catch of walleye (10 inches and larger) per net-lift in each lake sampled. We then averaged the lake-by-lake averages for each year and plotted the values over the time periods of interest. We also examined changes in size-structure over time by plotting the average catch of walleye per net-lift in various size groups (15 inches and larger, 20 inches and larger, and 25 inches and larger).

A more direct analysis of trends in size-structure was conducted by comparing the average size of walleye over the time period. We took the average size of walleye from each net-lifts for a lake, averaged the lake- by-lake averages for each year, and plotted the values over the study period.

A final analysis of size-structure was conducted by examing the average proportional stock density (PSD) of walleye each year. PSD is a ratio that represents the proportion of "quality" sized walleye (15 inches and larger) in the population relative to the number of "stock" sized walleye (10 inches and larger). This ratio shows the percentage of fish in the population that are 15 inches or larger.

Results

The number of lakes sampled each year for walleye ranged from 4 to 47, and averaged 20 per year. But, prior to 1985, the average number of lakes sampled was 15. From 1985 to present, the average number of lakes sampled was 28.

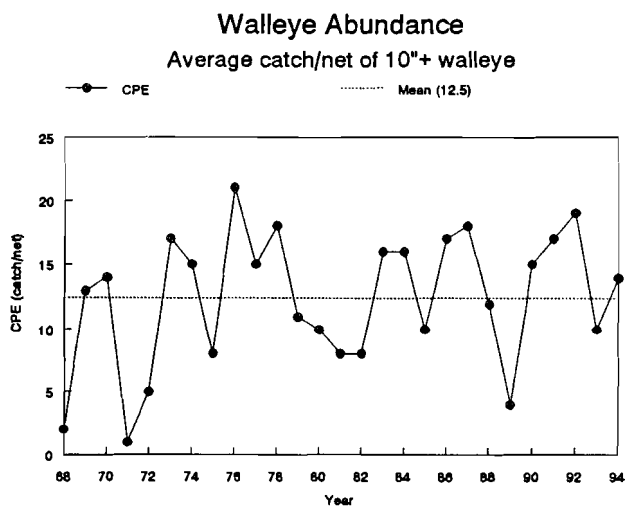


Figure 1. Average annual relative abundance of walleye (10 inches and larger) from 1968 to 1994.

We saw very wide fluctuations in the relative abundance of walleye populations from year to year in Wisconsin (Figure 1), primarily because many of our fisheries are probably dependent on 1 or 2 good year-classes. The number of walleye per net-lift over the period from 1968-1994 averaged 12.5, but ranged from less than 1to 21.

There does not appear to be a decernable trend, either increasing or decreasing, but 4

of the last 5 years and 6 of the last 10 years have shown above average abundance for walleye 10 inches or larger.

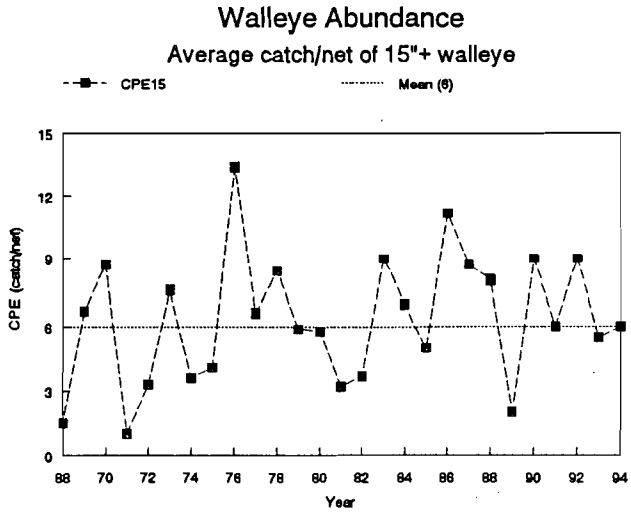


Figure 2. Average annual relative abundance of walleye (15 inches and larger) from 1968-1994.

We also found wide fluctuations in the relative abundance of walleye that were 15 inches or larger (Figure 2). The number of walleye per net-lift, over the period from 1968-1994, averaged 6 (about half that of all fish 10 inches and larger), and ranged from less than 1 to 13. There does not appear to be a decernable trend, either increasing or decreasing. Two of the last 5 years and 5 of the last 10 years where above average in terms of abundance of 15 inch and larger fish.

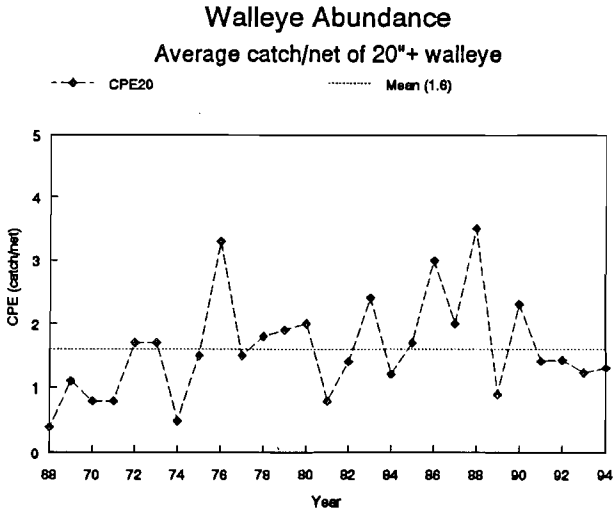


Figure 3. Average annual relative abundance of walleye (20 inches and larger) in Wisconsin waters from 1968-1994.

Again, we saw large fluctuations from year to year in the relative abundance of walleye that were 20 inches and larger (Figure 3) and of walleye 25 inches and larger. The number of 20-inch and larger walleye per net-lift over this period averaged 1.6, and ranged from than 0.4 to 3.5. There does not appear to be a decernable trend, either increasing or decreasing, but 4 of the last 5 years and 5 of the last 10 years have had abundance levels that were lower than the long-term average. The number of 25-inch and larger walleye per net-lift (not Shown) averaged 0.4 fish per net-lift, and ranged from 0.08 to 1. Seven of the last 10 years have had below avaerage relative abundance of fish 25 inches and larger.

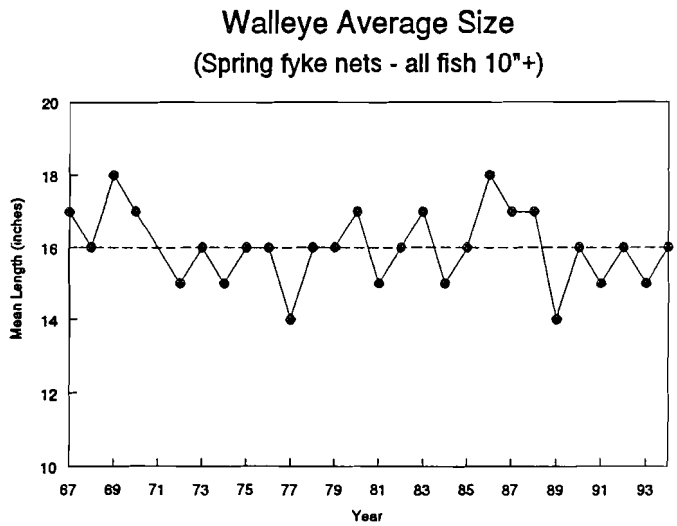


Figure 4. Average length of walleye (10 inches and larger) captured in fyke nets during spring, 1968-1994.

The average length of all walleye 10 inches and larger has not changed over the period of record (Figure 4). The average length of walleye during this period was 16 inches. Only 3 of the last 10 years have had below average length, relative to the long term mean.

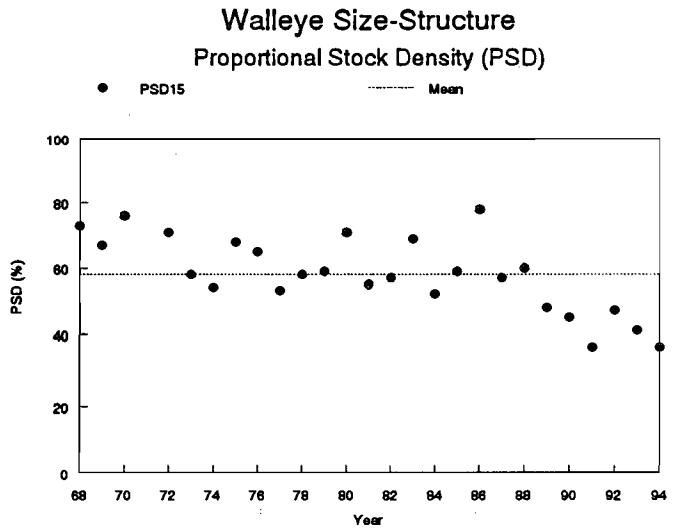


Figure 5. Proportional Stock Density for walleye populations in Wisconsin from 1968-1994.

The proportion of walleye 15 inches and larger (PSD) showed no real trend, but over the last 6 years, the PSD has been well below average, indicating an increasing proportion of small fish less than 15 inches in length (Figure 5). This corresponds to the implementation of the 15 inch length limit in 1990.

Summary

The overall abundance of walleye has not changed substantially during the period from 1968 to 1995 in Wisconsin waters, nor has the abundance of walleye over the last 10 years. The abundance of large fish has generally been lower over the last ten years. These levels of abundance are not unusual, given historic levels and the degree of variability that has been observed. What is unusual, however, is that the number of large walleye (20 inches and larger) has been consistently below average over the past 4 to 5 years; it is rare to see several years in a row of below average abundances for large walleye.

The average size of fish captured in fyke nets has not changed appreciably over this period, but the proportion of fish less than 15 inches in length has increased, due mainly to the establishment of the 15-inch minimum length limit for walleye in 1990. This has resulted in a decline in the PSD for walleye over the last 6 years, which was not due to fewer fish 15 inches and larger, but because the abundance of fish less than 15 inches has increased.

The high degree of variability in the abundance and size-structure of walleye from year to year that is suspected to be weather-related may also be due, in part, to sampling bias. Small sample sizes during the earlier years of this period undoubtedly increased the variance of these estimates. Estimates based on samples collected prior to about 1985 may not be representative of all walleye waters in the state.

In summary, Wisconsin walleye populations today have numbers similar to historic levels, but are made up of more small walleye (and fewer large walleye) than in previous years.

Table 1. The number of lakes sampled each year that were used to examine trends in the relative abundance and size structure of walleye in Wisconsin waters from 1968 to 1994.

Year	Number of waters included in this analysis
1968	8
1969	8
1970	5
1971	4
1972	6
1973	21
1974	9
1975	16
1976	17
1977	21
1978	24
1979	15
1980	22
1981	28
1982	13
1983	25
1984	16
1985	16
1986	26
1987	14
1988	25
1989	12
1990	36
1991	47
1992	32
1993	40
1994	31

The Abundance and Recruitment of Walleye Populations in Wisconsin

Prepared by:

Population/Recruitment Sub-Committee of the
Walleye Managment Planning Committee

Steve Hewett
Tim Simonson and
Steve AveLallemant

July 1996

Status of walleye absolute abundance measures and recruitment in Wisconsin waters

Abundance and Recruitment

Walleye are the most variable of our game fish species with regard to abundance in the lakes of Wisconsin. Walleye populations vary tremendously from lake to lake and from year to year in any given lake. This variation is a reflection of their natural history. Walleye are long-lived and typically mature between the ages of 3-5 for males and 4-6 for females. Their pattern of broadcasting large numbers of eggs in the cobble along rocky, windswept shorelines in the early spring and the subsequent survival of the eggs, larval stages, and young contribute to highly variable survival of the young produced each year. Typical patterns are for boom-or-bust years with either a large number of young surviving the first year and entering the population or for very little survival through the first year.

Escanaba Lake represents the largest, long-term dataset for Wisconsin waters in which we have

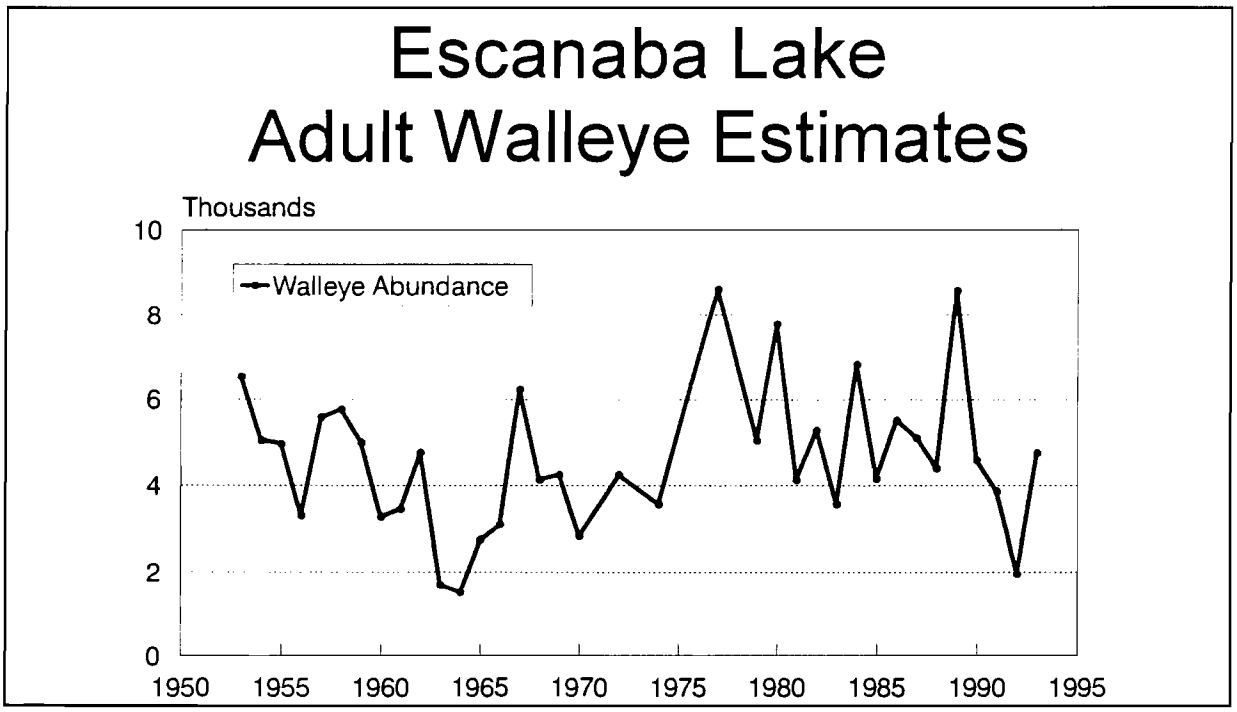


Figure 1. Abundance of adult walleye (age-3 and older) in Escanaba Lake.

absolute walleye abundance estimates. We have mark-recapture population estimates dating from the 1950s to the present time. The abundance of age-3 and older walleye has fluctuated from under 2,000 to over 8,000 walleye over that time period (Figure 1).

Relatively few other absolute population abundance estimates have been made compared to the number of lakes in which we have other relative measures of abundance from netting or shocking surveys. Since 1985, 20-40 population estimates have been made each year on lakes in northern

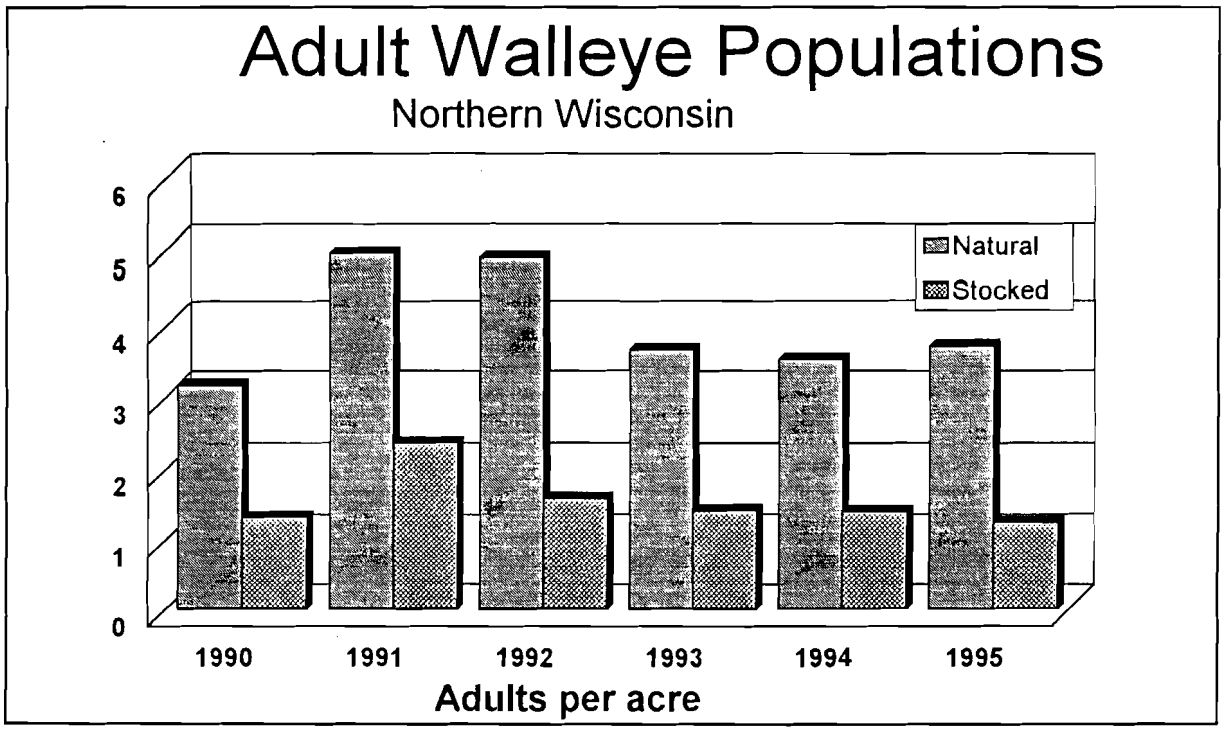


Figure 2. Abundance of adult (mature) walleye in Wisconsin lakes, 1990-1995.

Wisconsin, as a result of the Chippewa treaty litigation. This has resulted in a large dataset of

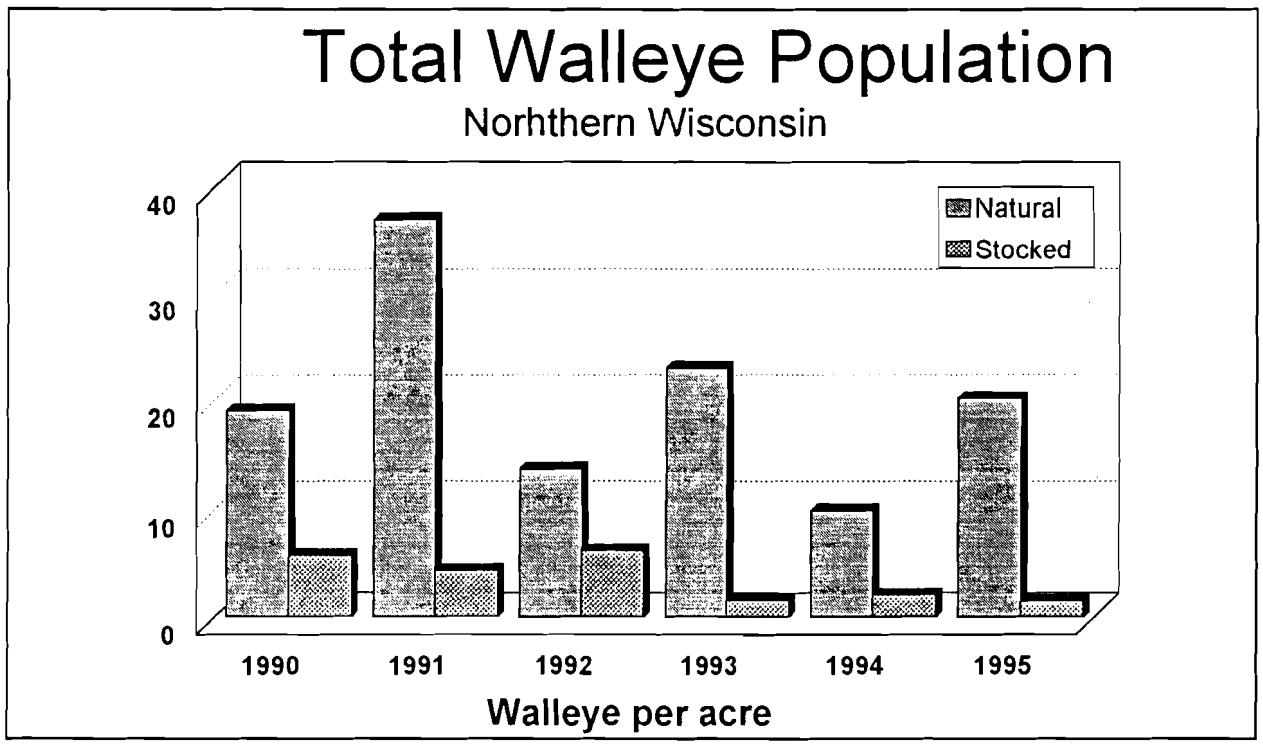


Figure 3. Total walleye abundance (all ages) in Wisconsin lakes, 1990-1995.

population estimates that have all been collected under identical procedures and definitions of adult and total population size. Wisconsin walleye populations that are maintained by natural reproduction average between 3-5 adults per acre (Figure 2) and about 20 individuals of all ages per acre (Figure 3). There is a wide degree of variation from one lake to the next and from one year to the next as seen in Escanaba (above).

The distribution of adult densities, when compared across population estimates (Figure 4) shows that most naturally reproducing populations have between 2-5 adults walleye per acre. A low

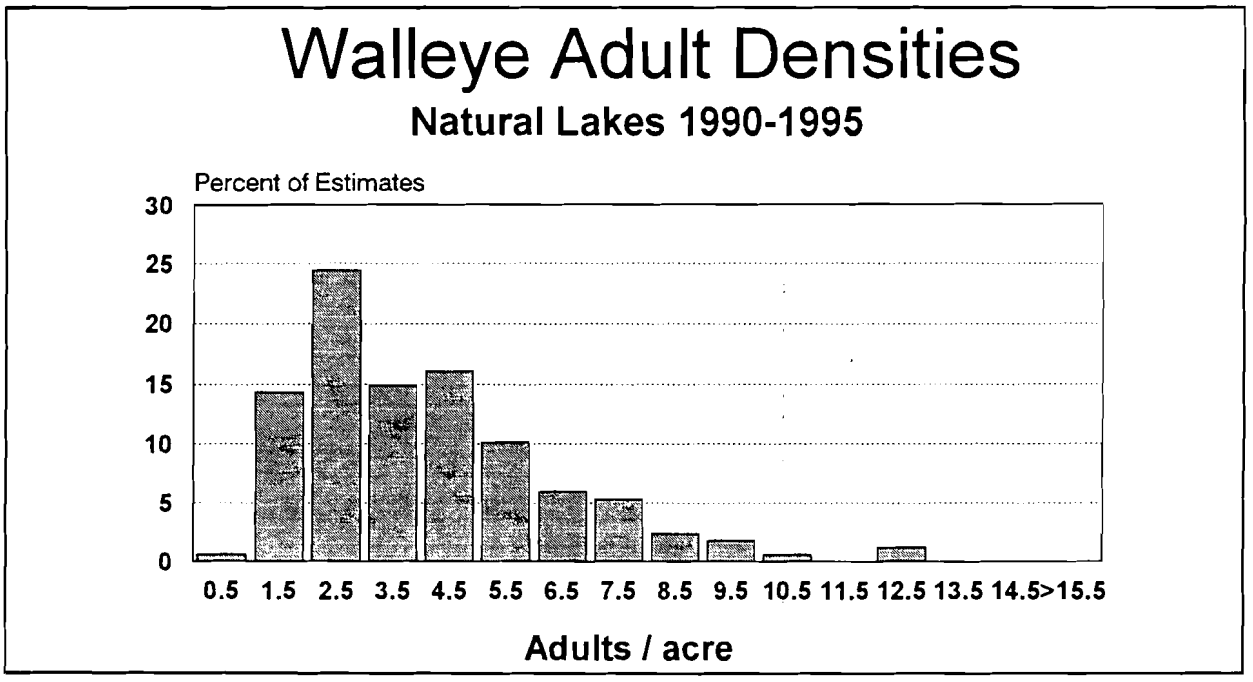


Figure 4. Frequency distribution of adult walleye densities across Wisconsin lakes.

proportion of populations are below 1 adult per acre or above 10 adults per acre. 15% of population estimates of walleye in naturally reproducing lakes are below 2 adults per acre.

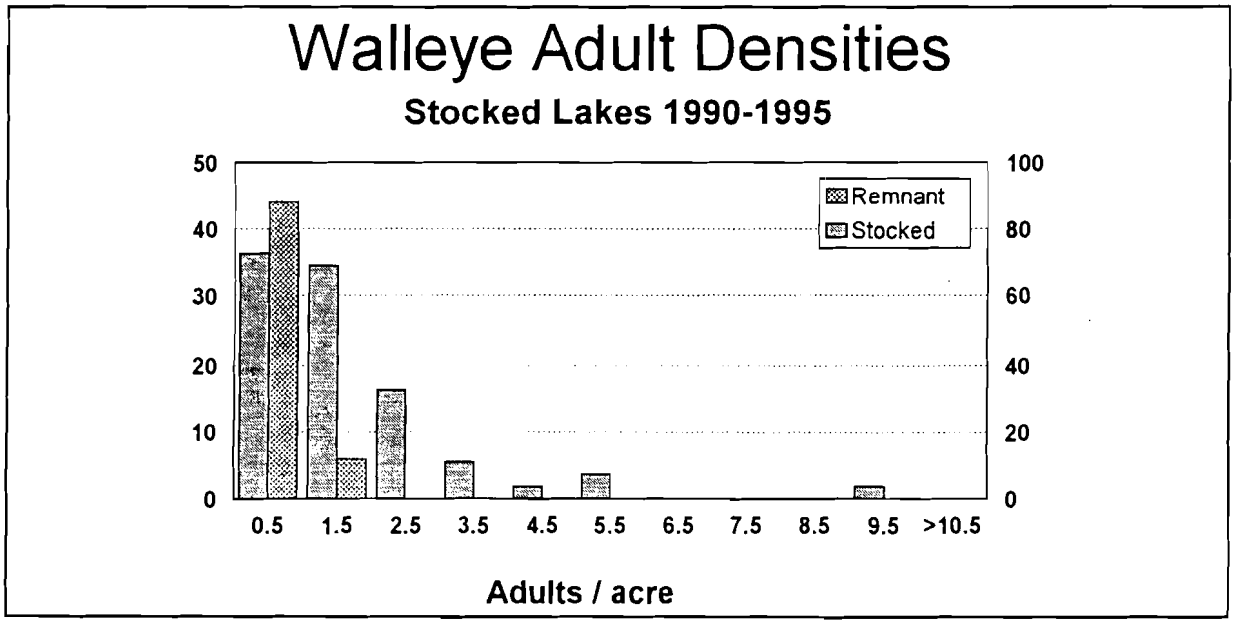


Figure 5. Frequency distribution of adult walleye densities in lakes maintained primarily through stocking.

For lakes that have walleye populations that are maintained primarily through stocking, adult population densities average under 2 adults per acre (Figure 2 and Figure 5). Most stocked waters are maintained through stocking because past stockings of walleye have failed to produce a substantial amount of natural reproduction. That failure may be because of spawning habitat limitations, other habitat factors, lake productivity, or community interactions. Stocked waters, in general, do less well than waters in which walleye are naturally reproducing. Many of the stocked waters are dominated by other predators and may represent centrarchid-bass lakes or northern pike waters.

Recruitment

The survival of young walleye is highly variable. On average only one year in 3-5 years is successful. As a result, walleye populations tend to be dominated by particular year-classes of fish. Many waters each year have very poor recruitment of young-of-year to the fall or next spring. We examined fall young-of-year surveys for the patterns of recruitment in walleye in Wisconsin waters. In many river sytems, fall shocking surveys are done at specific sites or transects to determine a relative abundance of young walleye. Electro-shocking surveys of lake shorelines in September and October are also used to determine relative abundance of young walleye. Usually the entire shoreline is shocked or specific index stations are shocked on larger lakes where it is difficult to shock the entire shoreline. The relative abundance of young walleye is measured as the number of young-of-year netted per mile of shoreline shocked. The average abundance of young-of-year walleye is 20 YOY per mile. Roughly 50% of lakes surveyed average less than 15 YOY per mile and 15% have between 0 and 5 YOY per mile. The distribution of the abundance of young walleye is highly skewed with many lakes having very few YOY and other lakes showing very high abundances (up to several hundred per mile).

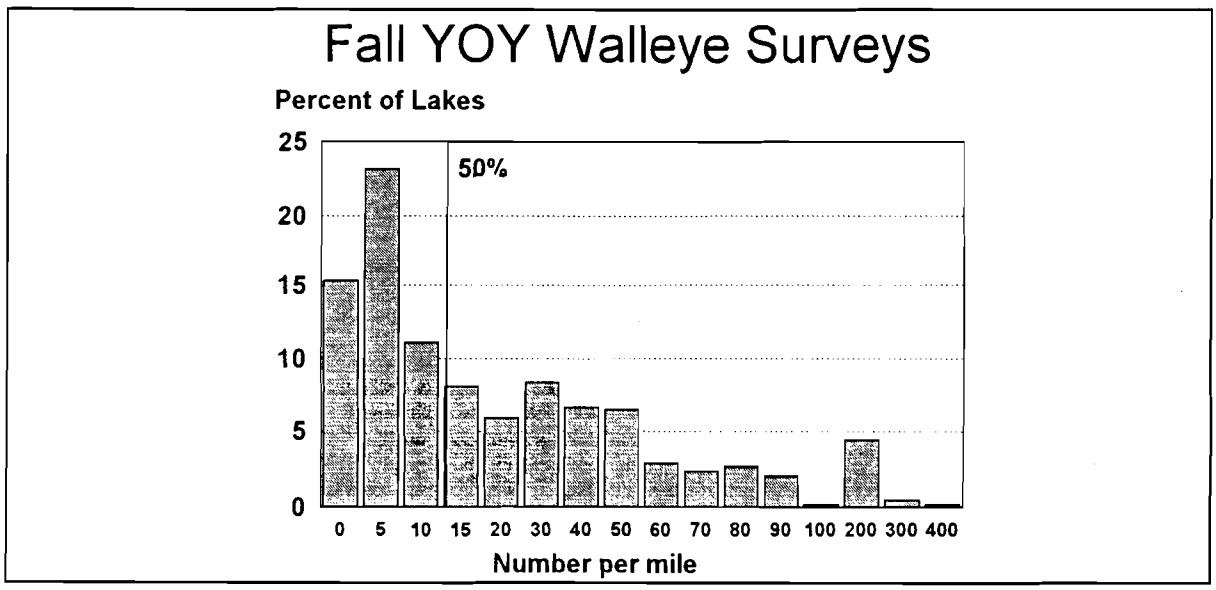


Figure 6. Frequency distribution of the number of young-of-year walleye sampled per mile of shoreline in fall eletroshocking surveys on Wisconsin lakes.

In evaluating the abundance of YOY walleye, we've chosen a cut-off of 100 YOY per mile to represent very successful reproductive years. The average number of lakes with strong reproduction is about 6% per year. However, there is a wide range of variation from year to year. The pattern of YOY abundance suggests that regional trends exist and that patterns of strong year-classes may occur across a range of lakes in the same years. The most likely explanation for

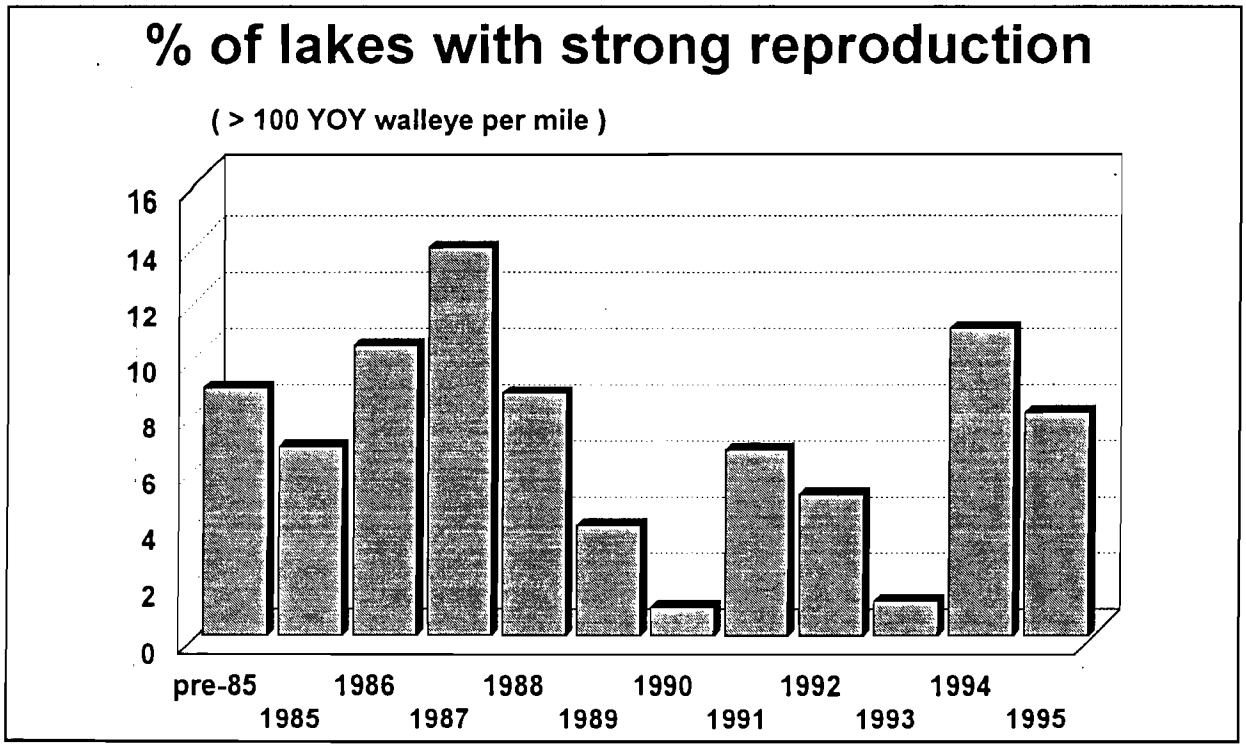


Figure 7. Proportion of lakes surveyed with strong reproduction of young-of-year walleye in fall electroshocking surveys.

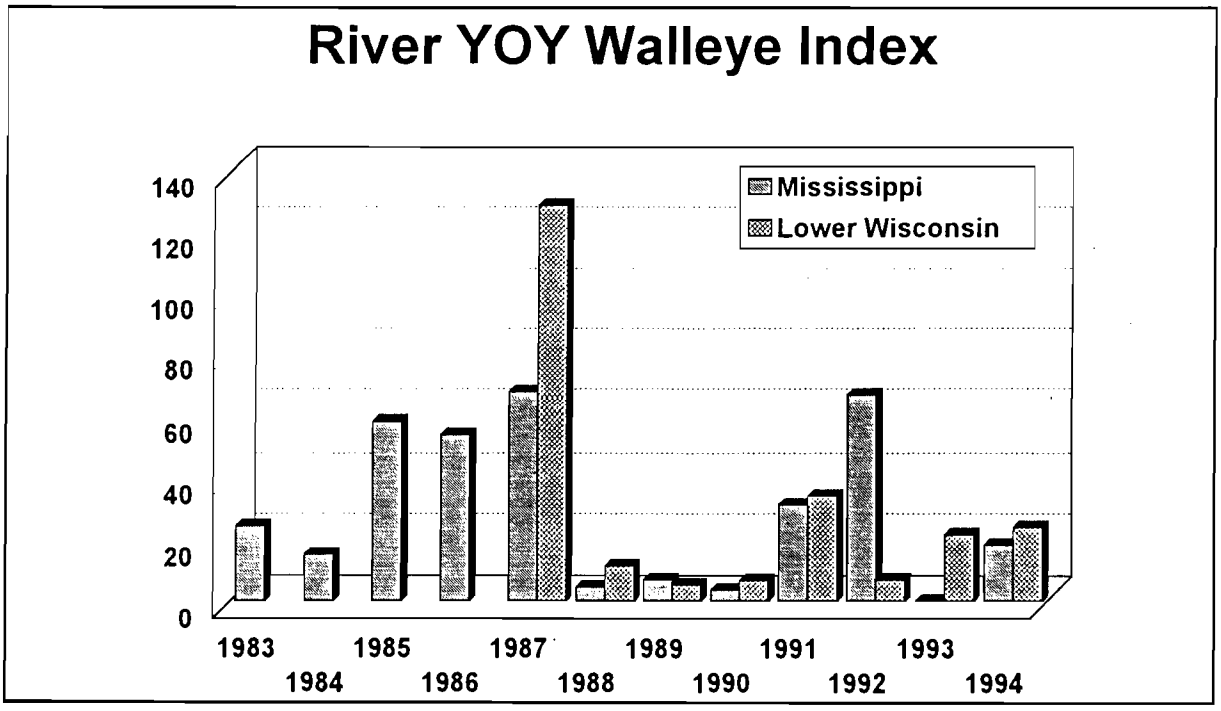


Figure 8. Young-of-year walleye index values for river surveys on the Mississippi and Wisconsin Rivers.

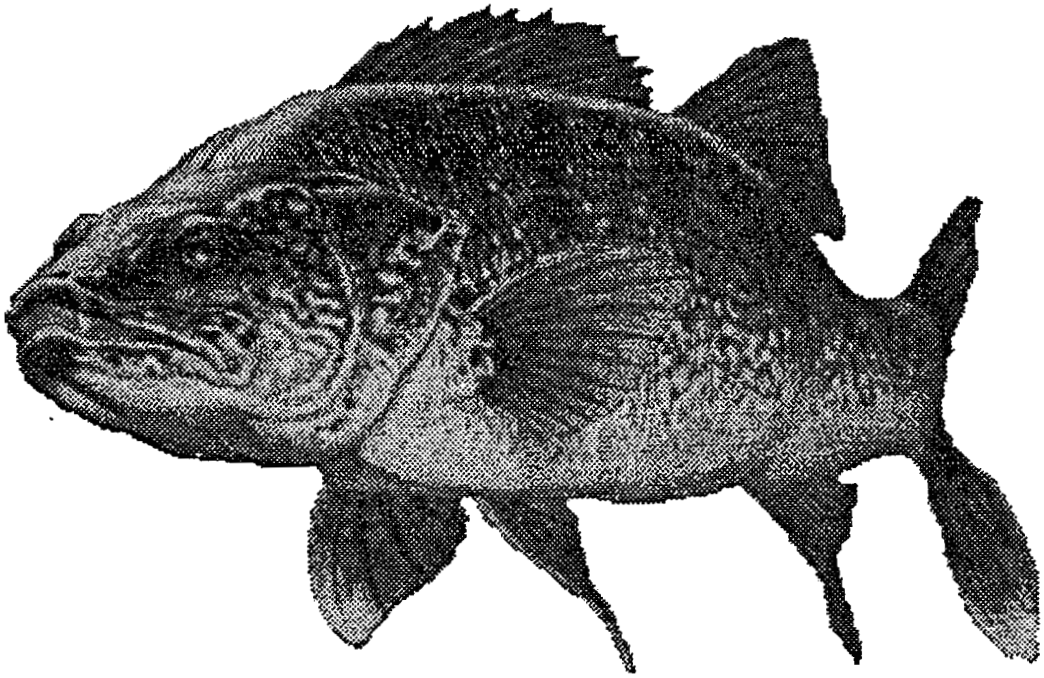
these patterns is weather driven events during the spring when the eggs and larvae are vulnerable or to patterns of warm or cool summers that may affect growth or prey availability. In both lakes and rivers (Figure 7 and 8), the mid-1980s provided good year classes of walleye. The YOY index for rivers fell dramatically in 1988 through 1990. This represented a drought period in Wisconsin that began in the summer of 1987. It is interesting that the lake recruitment numbers consistently declined during this same period, suggesting that as the drought continued, it had an increasing effect on walleye populations in lakes as well as river populations. Recent years have shown good year classes in a variety of waters in 1991 (rivers and lakes), and in 1994 and 1995 for lakes. The year-classes from 1994 and 1995 represent the first two back-to-back strong year classes for lakes since 1986-1888.

The pattern of YOY abundance in the fall surveys suggests that there will be a period of years in which strong year classes will be missing from the walleye fisheries of Wisconsin. Walleye growth is much faster in the Mississippi and Wisconsin Rivers than in northern lakes. This may result in a shorter period of time in which the effects of the relatively poor recruitment years are noticeable in the river fisheries.

Summary

Abundances of adult walleye have been relatively steady since methods of estimating adult walleye population densities were standardized about 1990. Total population abundances have been much more variable and are strongly effected by the pattern of year classes coming into a population. Walleye recruitment has been highly variable from 1985 to 1995 with a number of relatively "poor" year classes represented in 1989-1990, 1992 and 1993 in Wisconsin lakes. Walleye management needs to recognize the highly variable nature of walleye populations and develop strategies to deal with that variability. The period of the late 1980s appeared to be a time of reduced survival of young to their first fall. Recent years have seen an increase in the catch rates of young walleye in the fall recruitment surveys. If these potential year classes survive to become adults, then we may see an upswing in walleye adult densities in the near future.

WISCONSIN ANGLER SURVEY
Walleye Management in the 90's



Bureau of Fisheries Management
July 1995

Wisconsin Department of Natural Resources

WISCONSIN
DEPT. OF NATURAL RESOURCES

Walleye Angler Survey

SUMMARY

This report describes the results of a mail survey asking anglers about:

1) **their general fishing activities,**
2) **their walleye fishing experiences,**
3) **their opinions on walleye management options and regulations, and**
4) **some aspects of their personal background.**

The Walleye Management Planning Committee developed this angler survey to assess angler expectations, experiences, and desires with regard to walleye in Wisconsin. The goal of the committee is to revise the statewide walleye management plan for inland waters. Surveys were mailed to members of the following groups: randomly chosen anglers (from license sales in each county), resort owners, walleye guides, walleye club members, tournament anglers, Conservation Congress members, and DNR fisheries managers.

Highlights of the survey suggest that **most respondents:**

- fish only in Wisconsin (68%); those that fish outside WI do so because they feel they catch more (64%) and/or larger (50%) walleyes elsewhere.

- fish most for walleye in northeast Wisconsin (27%), the Winnebago system (23%), or southern Wisconsin (17%). Anglers also fish for walleye in northwest Wisconsin (15%), the Mississippi River (9%), the lower Wisconsin River system (8%), and the Great Lakes (1%).

- spend about 25% of their fishing time targeting walleye. Anglers fish for a wide variety of fish species, preferring walleye, bluegill, crappie, northern pike, largemouth and smallmouth bass, and yellow perch.

- are not satisfied with walleye fishing (64%) in Wisconsin, but rate overall quality of recent fishing experiences as fair or good (78%).

- think that the number of walleye has declined over the last 10 years (59%)

- think that the number of large walleye (>20") has declined over the last ten years (65%)

- feel that some waters in Wisconsin should be managed for **TROPHY** walleye fishing (70%); most that do (56%) think from 1 to 25% of the walleye waters should be managed for trophies.

- think a 28" to 30" walleye is a trophy.

- feel that the DNR is doing only a fair job of managing the walleye fishery (34%); 26% feel the DNR is doing a good or excellent job; 20% feel the DNR is doing a poor job; and **20% were not sure.**

- do not belong to fishing clubs (86%).

- subscribe to fishing or outdoor related magazines (61%).

- do not participate in fishing tournaments (93%).

- are generally aware of the Spring Fish and Game Hearings, held in conjunction with the Conservation Congress (64%); about 20% attended 1 or more of these hearings over the last 5 years.

- **do not** think complex fishing regulations influence the quality of their fishing experience (90%).

- do not cite simpler regulations as a reason for fishing outside of Wisconsin (95%).

- support a reduction on the daily bag limit from 5 to 3 to protect the resource (70%).

- are split on the concept of having no minimum length limit (39% support; 42% oppose; 19% aren't sure).

- support the use of minimum length limits (80% support; 10% oppose; 10% aren't sure).

- support a slot length limit or a one-over bag limit (58% & 67%) but would oppose a maximum length limit (43%).

- think most waters (25-75%) should be managed for keep-and-eat fisheries.

- given the chance to keep any size walleye, would not keep fish under 12 inches (88%); 57% would not keep any under 14"; 34% would not keep any under 15".

- would keep between 3 (20%) and 5 (35%) walleye if there were no daily bag limit.

- feel that user conflicts are the most important factor affecting the quality of their fishing experiences.

- are concerned about the long-term impacts of tribal spearing on ceded territory lakes.

In general, respondents are not satisfied with the current status of the walleye fisheries in Wisconsin, and would like to have a broader range of fishing experiences available within the state. Respondents are willing to accept more conservative regulations and more complicated regulations, if they will lead to an improved walleye fishery in Wisconsin. Anglers are genuinely concerned about the impact of habitat loss and shoreline development on walleye populations.

INTRODUCTION

The walleye is one of Wisconsin's most popular game fish. Current statewide regulations include a 15 inch minimum size limit, with some waters exempt for slow growth or mercury contamination; a season from the first Saturday in May until March 1 (with some river systems open year-round); and a daily bag limit of 5 walleye. In the Chippewa Ceded Territory (roughly the northern third of Wisconsin), tribal harvest averages 25,000 walleye on roughly 120 lakes a year. The angler harvest is adjusted to accommodate the tribal harvest through a sliding bag limit system, whereby the angler daily bag limit is reduced proportional to the tribal declaration. For most lakes declared for tribal harvest, the daily bag limits for state anglers are either 2 or 3.

This report describes some of the results of a mail survey asking anglers about: 1) their general fishing activities, 2) their walleye fishing experiences, 3) their opinions on walleye management options and regulations, and 4) some aspects of their personal background. The Walleye Management Planning Committee, consisting of representatives from DNR fisheries managers from each district, Tourism, resort owners, guides, walleye club members, conservation congress, anglers, and other interested parties, developed the survey to aid in the revision and updating of the statewide, inland walleye management plan. The survey questions were reviewed and approved by the Bureau of Research. The Committee felt that it was very important to seek the viewpoint of a variety of the users groups that are concerned with fisheries management, and developed mailing lists for the following groups: randomly chosen anglers (from license sales in each county), resort owners, walleye guides, walleye club members, tournament anglers, Conservation Congress members, and fisheries managers from around the state.

METHODS

A random sample of Wisconsin anglers was drawn from the license sales records of each county of the state. Fisheries Management staff went to each county court house or other repository of angler license forms and entered angler names and addresses into the survey database. A random sample of resort owners was drawn from several mailing lists that were available. Tournament anglers were drawn from mailing lists of two tournament organizations, Professional Walleye Trail and Masters Walleye Circuit. Club members were drawn randomly from mailing lists provided by Walleyes for Tomorrow, Falling Rock Walleye Club, and Walleyes Unlimited. Walleye guides were sampled from the list in Wisconsin Licensed Charter Captains and Fishing Guides, a publication of the Wisconsin Department of Development. All voting members of the Conservation Congress and all DNR fisheries managers were included in the mailing list for the survey.

Four mailings were sent to the random sample of anglers and to the resort owners: 1) an advance letter announcing that they would shortly be receiving a survey, 2) the survey with return postage paid and a cover letter, 3) a follow-up reminder letter, and 4) a final letter with an additional copy of the return postage paid survey. The other groups received only a single mailing of the survey with a cover letter. The number of surveys mailed and returned are listed in Table 1. Data from the surveys were entered and analyzed using SAS statistical software.

Table 1. Numbers of surveys mailed and surveys returned for user groups in the survey mailing.

GROUP	SURVEYS MAILED	SURVEYS RETURNED	RETURN RATE
Wisconsin Anglers	1847	1155	63%
Resort Owners	290	222	77%
Walleye Guides	317	182	57%
Walleye Club Members	458	219	48%
Conservation Congress	216	112	52%
Tournament Anglers	556	294	53%
Fisheries Managers	102	74	73%

RESULTS

General Fishing Activities -

We asked anglers which species of fish they normally fished for and which of those species were their favorites, ranked first, second, and third. Over 50% of anglers included the following species as fish that they normally fished for: bluegill, walleye, crappie, northern pike, largemouth bass, and yellow perch. 31% of anglers listed walleye as the most favorite fish that they prefer to catch; largemouth bass (15%) and bluegill (13%) were the other two highest species. Walleye was also the highest ranked for the second favorite fish to catch (19%), followed by bluegill (15%) and crappie (13%). For third favorite fish to catch, bluegill ranked first (17%) followed by crappie (14%) and walleye (12%).

Roughly equal proportions of anglers claimed that the number of days that they have spent fishing in Wisconsin in the last 12 months was 6-15, 15-30, or over 30 (27-29%). The responses across other surveyed groups were similar with the exception of tournament anglers in which 78% of the respondents fished over 30 days, and guides with 88% fishing over 30 days a year. 36 percent of anglers stated that the number of days that they fish in Wisconsin has increased in the past 5 years compared to 28 percent that had decreased. Tournament anglers differed the most with 70% stating that the number of days they spend fishing in Wisconsin has increased with 12% of tournament anglers stating that the number of days spent fishing in Wisconsin had decreased. The quality of recent fishing experiences in Wisconsin was rated excellent by 6% of anglers, good by 37%, fair by 41%, and poor by 16% of anglers. 11% of conservation congress members felt their recent experiences to be excellent as did 15% of walleye guides. Resort owners rated recent quality of fishing experiences the

lowest of the surveyed groups with 28% ranking the quality as poor. 19% of walleye guides and 12% of conservation congress members rated recent fishing quality as poor, while 10% of tournament anglers and club members rated recent experiences as poor.

Anglers were given a choice of 14 problems that they felt influenced or threatened the quality of their fishing experiences. The list of problems was developed through the committee members listing those factors that they most often heard in complaints by anglers and those that the members felt affected angler pleasure. The choices were: 1) user conflicts (other boaters, jet skis, waterskiers, etc), 2) not catching many fish, 3) catching too many small fish, 4) loss of fish habitat, 5) catching too few big fish, 6) overharvest of fish, 7) too many contaminants in fish, 8) shoreline development (houses, piers, structures, etc), 9) lack of public access to lakes, 10) length limits too high, 11) regulations are too complicated, 12) bag limits are too small, 13) hooking mortality may be high on small fish, and 14) not enough stocking of fish. The problem that was ranked first by anglers was user conflicts, followed by not catching many fish, catching too many small fish, and loss of fish habitat. Over 30% of anglers felt that each of these factors affected the quality of their fishing experiences. Length limits, bag limits, complicated regulations, and hooking mortality were the four lowest ranking problems with 4-12% of anglers listing these factors as important.

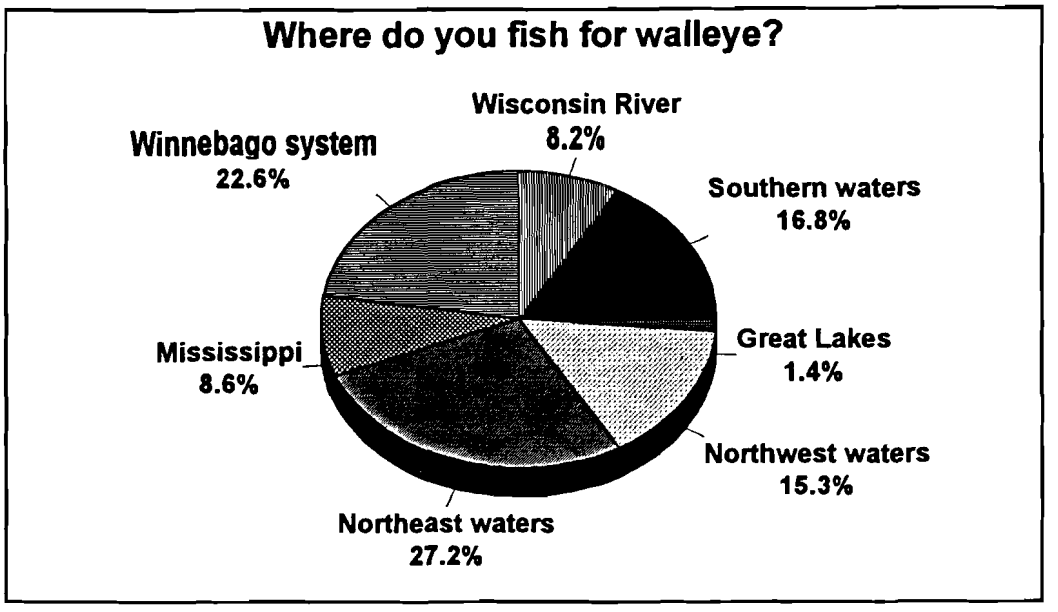
Not catching many fish, not enough stocking, and overharvest of fish were the top three concerns of resort owners. Tournament anglers ranked their top four concerns as overharvest of fish, catching too many small fish, loss of fish habitat, and user conflicts. Club members ranked loss of fish habitat first followed by user conflicts, not catching many fish, and catching too many small fish. Conservation Congress members ranked three concerns well above all others: user conflicts, overharvest of fish, and loss of fish habitat, respectively. Walleye guides ranked user conflicts highest, followed by overharvest of fish and not enough stocking. Fisheries managers ranked the top four problems as user conflicts, loss of fish habitat, shoreline development, and overharvest of fish.

67% of anglers and 69% of resort owners spent 0 days fishing outside of Wisconsin the past year. Only 14% of each of these two groups spent more than 6 days fishing outside of Wisconsin. In contrast, roughly 20% of tournament anglers and club members fished at least 30 days outside of Wisconsin. More tournament anglers, guides, and club members said that the number of days spent fishing outside Wisconsin had increased than said the number of days had decreased. For anglers, resort owners, and Conservation Congress members, more responded that the number of days fishing outside of Wisconsin had decreased rather than increased. A large proportion of all groups (33%-66%) said that there had been no change in the number of days spent fishing outside of Wisconsin.

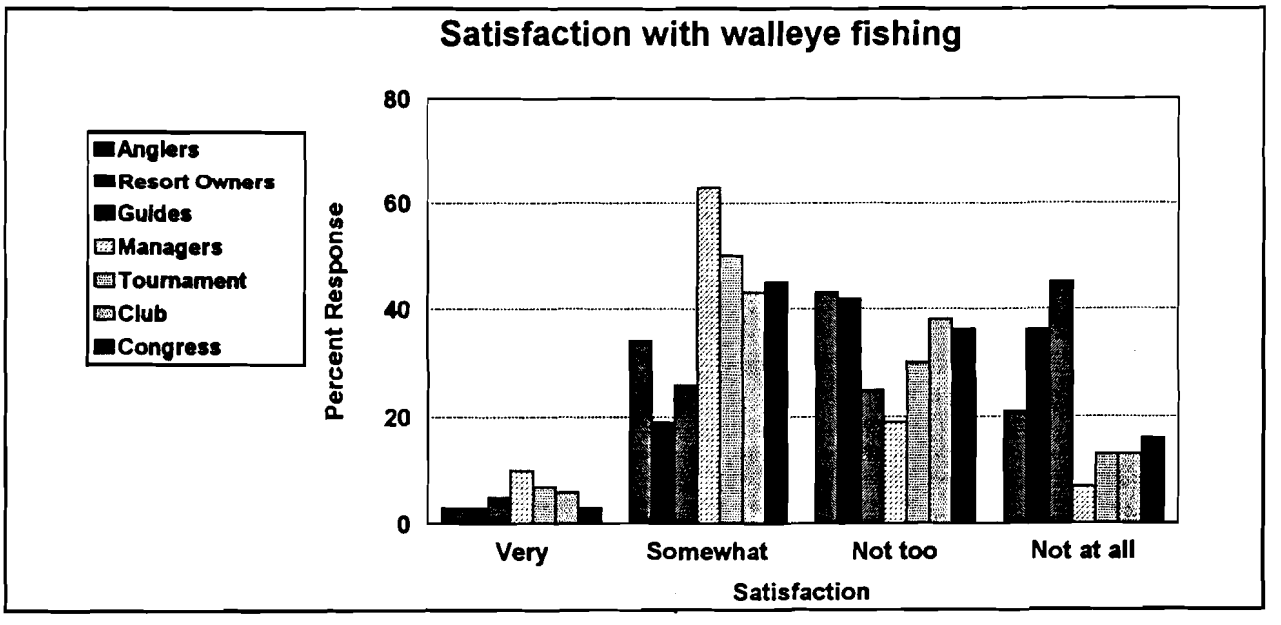
Walleye Fishing Experiences -

We asked how satisfied anglers were with walleye fishing, where they fish for walleye, how much of their fishing time was spent fishing for walleye, whether the number of days spent fishing for walleye had increased, decreased, or stayed the same, and whether they felt that the number of walleye or the number of large walleye had increased, decreased, or stayed the same over the past 10 years.

Anglers responding to the survey fish for walleye all over the state (Figure 1). The northern highlands area is fished by 27% of anglers, followed by the Winnebago system with 23%. The river systems of the Wisconsin and Mississippi are fished by 8 and 9% respectively. Tournament anglers fished most often in the Wisconsin River and Winnebago system, while club members fished most often in the Mississippi River and the Winnebago system. 87% of walleye guides fish in northeast waters, northwest waters, or the Winnebago system.



The majority of anglers ranked the quality of their recent walleye fishing experiences as somewhat satisfactory or not too satisfactory. A strong difference between user groups was apparent in the responses to this question. In general, those groups that spend the most time fishing for walleye (tournament anglers, club members, and Conservation Congress members



with the exception of the walleye guides) were more satisfied with walleye fishing than those groups that perceive the quality of fishing as directly affecting them financially (resort owners and guides). Randomly chosen anglers were intermediate in their responses.

The amount of fishing time that is spent fishing for walleye varied drastically across survey groups with most anglers choosing 1-25% (36% of responses) or 26-50% (26% of responses) while 59% of tournament anglers said that they fished for walleye 76-100% of their fishing time. Club members were nearly equally divided between 1-25%, 26-50%, 51-75%, and 76-99%. 53% of resort owners chose either 1-25% or 26-50% of their time as spent on walleye fishing. 15% of anglers surveyed reported that 0% of their fishing time was spent fishing for walleye, as did 13% of resort owners.

With the exceptions of tournament anglers and club members, 15-24% of respondents reported that the number of days spent fishing for walleye had increased, compared to 28-42% that reported the number of days spent fishing for walleye had decreased. Random anglers responded as 23% increasing and 29% decreasing. Club members reported equal proportions increasing or decreasing their walleye fishing days (34% and 32%, respectively), while 62% of tournament anglers reported that their days fishing for walleye had increased.

Based on recent fishing experiences, 10-24% of survey groups felt that walleye numbers had increased within the last 10 years, while 20-75% felt that numbers of walleye had decreased. 34-78% of the different groups felt that the number of walleye greater than 20 inches in Wisconsin had decreased, while only 3-20% felt that the number of walleye over 20 inches had increased.

When asked the reasons for fishing for walleye outside of Wisconsin, the respondents were allowed to circle any number of 11 different reasons. The top two responses were because they caught more walleye or caught larger walleye, with a better outdoor experience and fewer other people ranking after the first two reasons. Smaller minimum length limits, simpler regulations, and larger bag limits all rated consistently at the bottom of the list for all surveyed groups.

Walleye Fishing Preferences -

Walleye size to keep. In the absence of any size limit, very few members of any of the surveyed groups said that they would keep a walleye under 12 inches. For randomly chosen anglers, 16% said they would keep a walleye at 12 inches, 15% at 13 inches, 22% at 14 inches, 24% at 15 inches, and 11% said that a walleye would have to be over 15 inches before they would keep it. In general 1/4 to 1/3 of each surveyed group said that a walleye had to be 15 inches before they would keep it.Walleye guides had the lowest size preference for walleye, with 29% saying that they would keep a walleye at 13 inches and 24% preferring 14 inches. Only 28% of walleye guides preferred to keep walleye at 15 inches or longer compared to 34-52% for the other surveyed groups.

Walleye trophy length. When asked how long a walleye would have to be before it would be considered a "trophy", all groups listed either "over 28 inches" (23-33%) or "over 30 inches" (23-44%) as the top two choices (range of choices was 20 inches to over 32 inches). 5-15% of the various groups chose "over 24 inches" and 5-20% chose "over 26 inches". Very few

respondents felt that a fish under 24 inches qualified as a "trophy" walleye and there was a clear break in responses with 28-30 inches being defined as a minimum size for "trophy" sized walleye.

Walleye daily bag limits. The preferred number of walleye to take home per day, in the absence of any daily bag limit, was variable. 34% of anglers would prefer to take home 5 walleye, with 16% preferring 4, 20% preferring 3, and 14% preferring 2 or fewer walleye per day. 8% of tournament anglers and 6% of club members preferred to take home no walleye (catch and release only). Three and five walleye were the most common choices for all groups surveyed.

Walleye Management Options -

The survey asked for respondents opinions on seven different types of potential walleye regulations: minimum size limits, no minimum size limits, reduced bag limits, slot length limits, "one-over" length limits, maximum length limits, and "trophy" length limits. Respondents were asked if they would "definitely support", "probably support", "not sure", "probably oppose", or "definitely oppose" each type of regulation.

In general, all surveyed groups were strongly in support of having or trying 5 of the 7 potential types of regulations. The two regulations that did not receive strong support were the regulations for "no minimum size limit" and "maximum size limits". The following tables list the percentages of each group that support or oppose each of the regulation categories.

Reduce Walleye Daily Bag Limit to 3

	Anglers	Resorts	Tourn.	Clubs	C.C.	Guides	Fish Mgmt
Support	69%	67%	66%	73%	75%	66%	94%
Oppose	18%	22%	24%	19%	17%	28%	5%

Anglers were asked if they would support a statewide daily bag limit of 3 if it would help improve walleye populations and help improve stability in regulations in the ceded territory. Support was consistently near 70% for all groups except managers and opposition was consistently around 20%.

No Minimum Length Limit for Walleye

	Anglers	Resorts	Tourn.	Clubs	C.C.	Guides	Fish Mgmt
Support	38%	31%	28%	30%	48%	52%	73%
Oppose	41%	46%	62%	54%	34%	39%	22%

When anglers were asked about whether they would support no size limit in some waters, the surprising answer was that most groups do not strongly support having walleye waters with no minimum size limit. The two exceptions were guides and managers. Some waters currently are managed with no minimum size limit if growth rates are low or if older fish have high mercury contamination.

Minimum Length Limits for Walleye

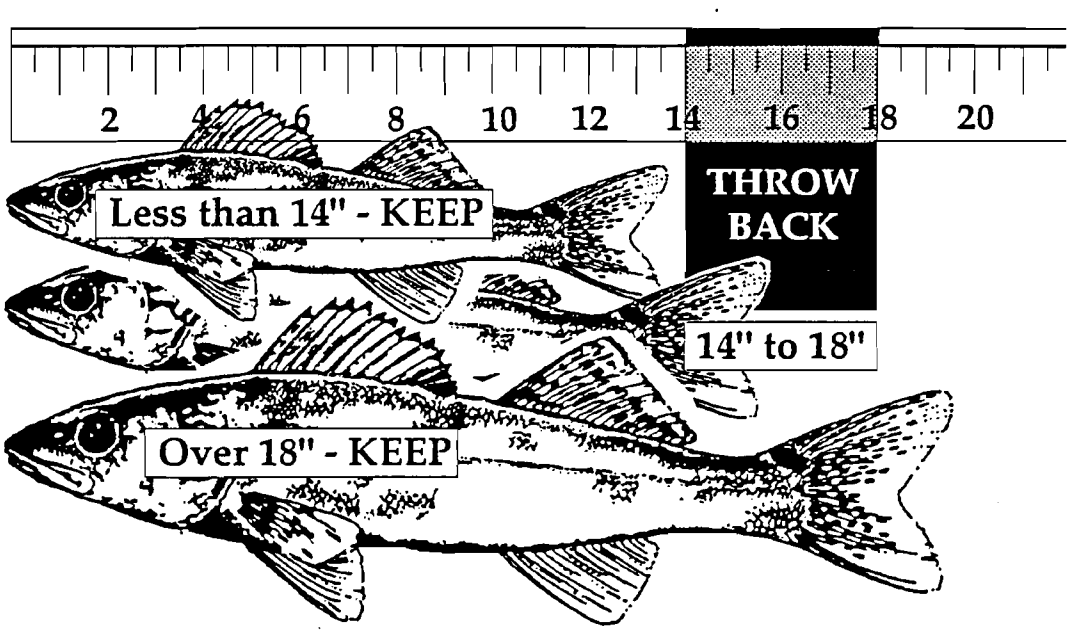
	Anglers	Resorts	Tourn.	Clubs	C.C.	Guides	Fish Mgmt
Support	80%	77%	88%	90%	82%	68%	87%
Oppose	9%	10%	9%	8%	8%	24%	9%

Support for minimum length limits for walleye is very strong, over 80% support minimum length limits in most user groups. Only walleye guides have less support and more opposition to minimum length limits. Even in that group, supporters outnumber those opposing 3 to 1.

Slot Size Length Limits for Walleye

	Anglers	Resorts	Tourn.	Clubs	C.C.	Guides	Fish Mgmt
Support	56%	58%	86%	71%	57%	79%	59%
Oppose	26%	22%	10%	18%	32%	18%	35%

Slot length limits are supported across all survey groups, with the strongest support in those groups that do the most fishing for walleye: club members, guides, and tournament anglers. Slot limits involve protecting a middle size range of walleye from harvest. Fish either above or below the slot limits can be kept but those fish within the limits would have to be released. A protected slot of 14" to 18" for example, would not allow any harvest of fish between 14" and 18". This may help to protect fish as they mature and allow adults to reproduce several times before being harvested.



Maximum Length Limits for Walleye

	Anglers	Resorts	Tourn.	Clubs	C.C.	Guides	Fish Mgmt
Support	36%	35%	35%	52%	37%	50%	61%
Oppose	43%	39%	47%	31%	45%	42%	30%

Maximum length limits would act as an upper cap to the harvest of large fish. Fish larger than the maximum length limit could not be harvested. This regulation would provide the maximum protection to the largest, mature fish. There is not strong support for this type of regulation among the survey respondents. About equal numbers of respondents oppose and support this regulation. This regulation may be interpreted by some as taking away the opportunity to keep that "once-in-a-lifetime" trophy fish, if it is caught on a lake with this regulation in place.

"1-Over" Length Limits for Walleye

	Anglers	Resorts	Tourn.	Clubs	C.C.	Guides	Fish Mgmt
Support	66%	66%	88%	85%	74%	82%	77%
Oppose	18%	19%	6%	7%	15%	11%	15%

A "one-over" length limit would allow the harvest of only one fish above some cut-off size limit, and the rest of the daily bag limit would have to be met with fish under the cut-off size. This regulation may help to protect larger fish or help to spread the harvest of those

larger fish across more anglers. For this regulation to be effective the cut-off size limit may need to be fairly low (e.g. 14").

"Trophy" Walleye Regulations							
	Anglers	Resorts	Tourn.	Clubs	C.C.	Guides	Fish Mgmt
Support	67%	60%	86%	78%	63%	71%	65%
Oppose	17%	22%	8%	11%	19%	19%	21%

Trophy regulations on some waters are supported by a majority of all survey groups. Tournament anglers and club members show the strongest support, with the weakest support coming from resort owners. Across all groups, when asked how many of Wisconsin's 1000 walleye waters should be managed for "trophy" walleye, the most common response was about 50 waters. A "trophy" regulation would most likely be a combination of a high minimum size limit and a low daily bag, for example, a minimum size of 28 inches and a daily bag limit of one.

The results suggest that anglers and other groups interested in the walleye fishery and walleye management are interested in improving the status of walleye fishing in Wisconsin and are willing to support some additional types of regulations to achieve that aim.

Personal Background -

In the survey, we asked a number of questions about the individual's background and fishing-related activities. 14% of anglers belong to fishing clubs and 61% subscribe to fishing magazines or outdoor magazines that include articles about fishing. Only 7% of anglers have participated in an organized walleye fishing tournament in the past 5 years.

Each spring, the Department holds public hearings on fishing regulations in each county, in conjunction with the annual Conservation Congress meetings. 37% of anglers were not aware of these hearings, 44% were aware but have not attended any during the past five years, and 19% of anglers had attended 1 or more of these hearings in the past 5 years.

Males represented 86% of the angler respondents and the average age of angler respondents was 42 (range of ages represented was 14 to 72).

Comments -

Many respondents took the opportunity to add comments at the end of the survey. After reading through many of the comments, we created 20 categories that included most of the topics of the comments received. Tribal spearing in the ceded territory represented the largest single category of comments (36%). Types of other comments that were most frequent included comments about fishing for other species, comments or questions on specific lakes or rivers, the 15-inch size limit, stocking policy, catch and release, habitat concerns, comments on regulations in general, user conflicts, tournament fishing, overharvest of fish, enforcement problems, and information requests.