Walleye 2021 - An Updated Walleye Management Plan for Wisconsin

Wisconsin Walleye Management Team (WI Walleye Team)

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Executive Summary

This document updates Wisconsin's Walleye Management Plan (published in 1998), the guide for all Wisconsin Department of Natural Resource activities related to walleye. The 1998 plan contained 7 goals related to walleye management activities. This update retains 4 of those goals, combines 3 others (stocking and related issues), and creates two new goals related to partnerships and sustainability/rehabilitation. The updated goals in this plan (not listed in any order of importance) are:

- Identify, protect, enhance, maintain, and restore critical habitats for walleye and sauger using an ecosystem-based approach.
- Provide a variety of opportunities for the catch and harvest of walleye and sauger (including harvest for food, tribal harvest, quality catch, and trophy opportunities).
- Ensure that adequate information on the status and trends of walleye and sauger populations, fisheries, and user preferences is consistently available for science-based decision-making.
- Administer an outreach program aimed at developing an appreciation for the walleye/sauger fisheries of Wisconsin, promoting realistic expectations based on population status and biological potential, and creating roles for partners in conservation and management.
- Develop, maintain, and continually evaluate walleye stocking strategies for Wisconsin waters to ensure that strategies are biologically sound and cost-effective.
- Strengthen and establish partnerships with tribes, private groups, fishing industry representatives, and local units of government to increase management capacity.
- Work toward long-term sustainability of walleye populations by maintaining population and ecosystem resiliency and developing effective rehabilitation strategies.

The contents of this plan were developed following an expansive public input process that provided several avenues for participation. We also propose various ways in which interested stakeholders can remain engaged going forward.

We propose 49 actions that will improve walleye and sauger management in Wisconsin. Although we believe all are important, some will have more broad implications. Some of the most influential actions include:

- Examining support for a statewide 3-daily bag limit to simplify regulations and provide additional protection to populations.
- Develop a "Walleye Lakes of Concern" plan, outlining lake-specific collaborative strategies to address recruitment failure and population decline.
- Updating information sharing to connect people with walleye fishing/harvest opportunities, including creation of online resources for viewing survey results.
- More clearly establishing roles for the many partners that want to assist with walleye management activities.

This update also includes statewide and local "issue statements" that address some of the most pressing management issues around the state and any actions we propose in response.

Introduction

Walleye *(Sander vitreus)* or "Ogaa" (Ojibwe) are a premier sportfish for anglers in Wisconsin and are the main species harvested by Ojibwe Tribes in Wisconsin. Walleye are estimated to attract 1.8 million hours of targeted angling effort annually and are the individual species with the highest level of interest from the angling public (Holsman et al. 2017 and Figure 1). Walleye are also one of the most intensely managed species in Wisconsin, with hundreds of thousands of fingerlings and millions of fry stocked annually, considerable survey effort dedicated to monitoring populations, and a sophisticated system of managing sport angler and tribal harvest in the state's Ceded Territory (Staggs et al. 1990, Hansen et al. 2015).

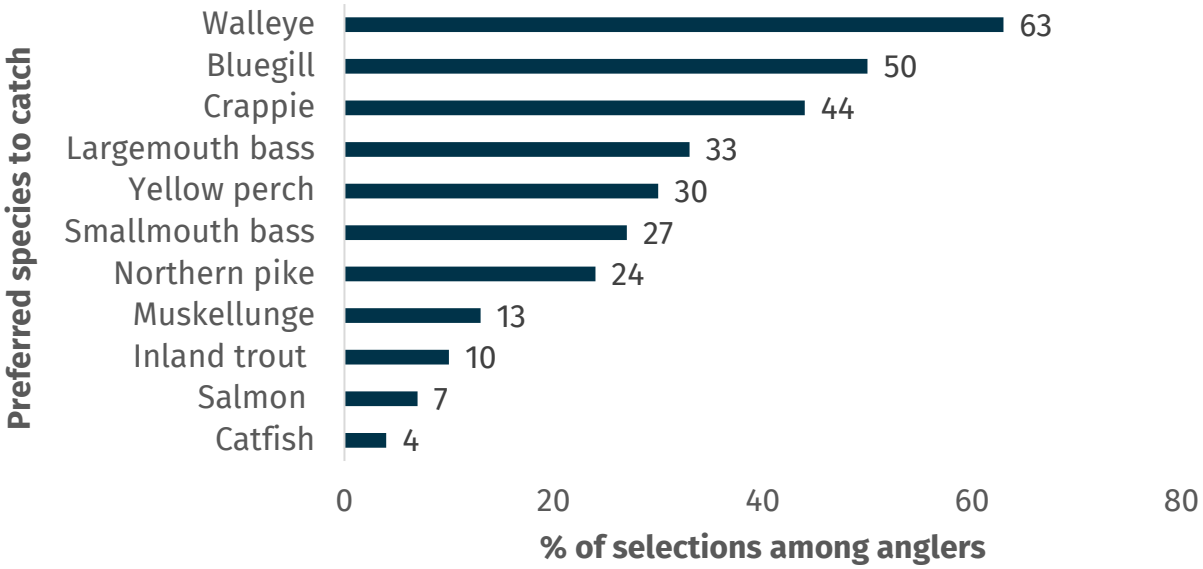
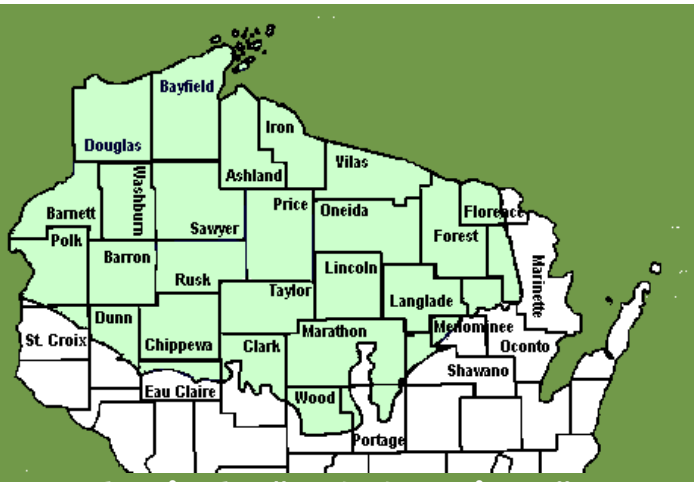


Figure 1. Percentage of anglers indicating various fish species were in their top three for preferred catch in a random mail/online survey conducted in 2020 as a part of the update of this plan.

Current walleye management activities of the Wisconsin Department of Natural Resources (DNR) have been guided by a plan completed in 1998 (found here). This plan was ambitious, detailed, and groundbreaking. It involved statewide trend analyses and considerable public input. The goals and objectives developed in that plan were highly relevant at the time and have largely served the Wisconsin walleye fishery well, particularly when natural recruitment primarily replenished walleye populations.

However, perhaps more so than any other species, walleye have been in flux in Wisconsin over the last two decades. Many of the most consequential current management issues, such as recruitment failure and climate change, were not addressed in the 1998 plan. Additionally, the 1998 plan did not encompass management of sauger, a species that many anglers, and most of the State's fishing regulations, treat similarly to walleye. There have also been great advances in our understanding of walleye through research, changes to stocking practices, advances in the field of conservation genetics, and significant technological improvements that facilitate better collection and sharing of information. Ensuring that our management actions meet the challenges of the times (such as climate change, recruitment declines, and new stocking/rehabilitation strategies) and takes advantage of new information and opportunities were driving factors in updating this plan.



What is the "Ceded Territory"?

Throughout this plan you'll see numerous references to Wisconsin's Ceded Territory, a 22,400 square mile area of northern Wisconsin that was ceded to the United States by the Lake Superior Ojibwe Tribes in 1837 and 1842. This area includes 2,300 lakes larger than 25 acres, including 919 walleye lakes (380,000 surface acres). Each year, a portion of these lakes are subject to special fisheries regulations because of Ojibwe off-reservation treaty rights that are mandated by Federal Court rulings.

Although the 1998 plan was statewide in scope, there are many management issues that are unique to "Great Waters" of the state, such as the Mississippi River, Lake Winnebago, Green Bay, Lake Superior, and Lake Michigan, that were not given specific attention previously. It should be noted that this plan serves to compliment, not supersede, any existing management plans or inter-governmental agreements for these or other individual waterbodies (see Appendix A for a summary of other plans). We do, however, offer guidance and potential solutions for issues facing Wisconsin's "Great Waters", which include some of the state's most popular and prolific walleye fisheries.

Walleye anglers in Wisconsin are highly engaged, and this process to update the walleye plan provided an excellent opportunity to have meaningful interactions with people about walleye management successes and failures, preferences and dislikes, and future directions. We are deeply grateful to the **over five thousand stakeholders** that volunteered their time to participate in the planning process through the various input avenues that were offered. Input to this planning process commonly included support for science-based management and collaborative problem-solving. We hope that all who have been involved can see clearly how their input was incorporated in this plan.

As this plan will detail, the challenges facing walleye in Wisconsin, and across the Midwest, are complex. We expect that quick fixes will be rare, and successes will most-often be hard-fought, but we are encouraged by the demonstrated strength of our partnerships with the sovereign tribes of Wisconsin, lake groups and sporting organizations, and local units of government that share our goal of maintaining healthy walleye populations. This plan aims to provide a unifying strategy for all parties participating in walleye management in Wisconsin. We also used this opportunity to better coordinate within DNR by seeking collaboration with our Healthy Lakes Program, environmental law enforcement, Office of Applied Science (OAS), and various water resource specialists.

This plan is intended to serve as a guide for walleye management for the next 10 years, but advances in science and understanding of walleye populations, changing environmental conditions, or shifting public priorities may lead to deviations from the direction set forth in the plan. After 10 years, we will revisit this plan and determine what further updates are needed based on successes and failures, and new challenges and opportunities.

How to read this plan like a pro

After some of the introductory sections, this plan is broadly organized by different types of major management activity, largely following the structure of the 1998 Plan. We updated (or created) goals related to each of these management activities. For example, the information related to habitat begins on page 21.

GOALS: Broad statements about how we want to approach an activity

OBJECTIVES: Lay out more detailed direction that identify the scope of a goal

ACTIONS: Specific things that we propose to do that will help achieve the goals and objectives. **These are bolded as they appear in the plan.**

Some topics did not fit cleanly into one specific goal, or, required more in-depth discussion. Often, these were issues raised during our public input process. You can find **Issue Statements** beginning on page 62, with sections for statewide and regional issues. Here we offer some background information on the issue and any actions that we propose in response.

Current Resource Status and Management Capacity

Statement on Current Resource Status

Walleye are native to the large river systems of Wisconsin, including, but not limited to, the Mississippi, Wisconsin, Wolf, Fox, Rock, Black, Chippewa, and Flambeau rivers and their major tributaries, as well as Lake Michigan (including Green Bay), and Lake Superior. Walleye were also widely introduced to other inland lakes in Wisconsin by DNR (and predecessor agencies) in the 20th century. Some of these introduced populations became self-sustaining through natural reproduction, while many others rely on stocking to persist.

Walleye are popular table fare, and along with bluegill, consistently rank as Wisconsin's favorite fish to catch and eat (Figure 1). Like bluegill, a walleye of legal harvest length is likely to be kept by an angler; catch-and-release rates are low for (legal length) walleye relative to many other species. Unlike bluegill, however, walleye are an apex predator species, comparatively slow-growing, and characterized by widely variable survival of year-classes, even in healthy, thriving, naturally reproducing populations. Similarly, survival of stocked walleye is also quite variable, even year-to-year in the same lake.

The number of walleye populations sustained primarily by natural reproduction across the state has declined, historically and especially since 2000. A phenomenon of a "recruitment bottleneck" has been identified in many of the recent declines. What's observed in short is: 1) abundance of adult fish to successfully spawn appears adequate in most cases; 2) the fish spawn successfully- eggs are laid, fertilized, develop, and typically hatch; 3) juvenile walleye are present for about 2 months, but then abruptly disappear around the beginning of July. These "failed year classes" ultimately result in significant declines in adult populations when they happen repeatedly; what complicates matters is that occasional failed year classes are also a normal phenomenon in walleye populations supported by natural reproduction because recruitment is often dictated by a suite of environmental conditions (e.g., water temperature, prey availability).

Some Wisconsin walleye populations continue to see steady natural reproduction. Green Bay, the Wisconsin River, the Mississippi River, the Winnebago System offer destination fisheries, sustained entirely by natural reproduction. Naturally reproducing walleye populations in many northern Wisconsin lakes also remain strong, particularly in those lakes associated with river systems, but the overall number of these self-sustaining populations is in a period of continuing decline. Research to identify the cause of the "recruitment bottleneck" is ongoing, and strategies to counteract this trend are discussed more in the section for Goal 7.

Since 1985, there has been a "joint fishery" between Wisconsin anglers and six Lake Superior Ojibwe tribes who were signatories of treaties between themselves and the Unites States in 1837 and 1842. In those treaties, the Lake Superior Ojibwe tribes reserved their right to hunt, fish, and gather on land they ceded to the United States, which later became incorporated as Wisconsin. Those reserved rights were affirmed by US Appellate Court, and Ojibwe harvest by traditional methods (spearing and netting) resumed in 1985. Ojibwe spear and net harvest is a tightly monitored and regulated activity, governed by lake-specific nightly harvest permits, nightly harvest-reporting, and length limits. Ojibwe members' typical harvest includes a total

of 30,000-40,000 walleye annually from Ceded Territory lakes; anglers typically harvest >200,000 walleye annually from Ceded Territory lakes. In lakes where angling and spearing occur, anglers harvest about 2 walleye to every 1 speared; tribal members may also fish those lakes by hook and line (which is included in creel statistics) and in winter with set lines.

Description of Current Management Capacity

Personnel

There are around 40 fisheries biologists and 77 full-time fisheries technicians employed by DNR that spend at least some portion of their time working on walleye management, though the amount of focus on walleye varies widely depending on the region and other resources within a local management area. The DNR maintains a standing "Walleye Team" (referred to in this document as the "WI Walleye Team") that deals with statewide walleye management and policy issues. The Walleye Team has representatives from each region and includes research and hatchery staff. DNR has a "Treaty Team" in northern Wisconsin made up of two biologists and two supervisors, four technicians, three full-time and around 15 part-time creel clerks. The Treaty Team devotes almost all their effort towards walleye and muskellunge assessments, including population estimates and creel surveys (more on the Treaty Team in Appendix B). OAS has four research scientists, three fisheries biologists, and six fisheries technicians that collect data that primarily conduct research to support management decisions related to walleye and other species. DNR also maintains research partnerships with several in-state and out-of-state universities.

DNR employs 28 hatchery staff that devote a significant number of hours towards raising walleye each year. Currently, walleye are reared at five DNR facilities responsible for meeting state walleye stocking requests. Many tribes also have their own hatcheries or ponds with staff and funding to raise fish. Many cooperators and private hatcheries also rear walleye that are stocked into public waters.

The Great Lakes Indian Fish and Wildlife Commission (GLIFWC) employs 4.5 full-time inland fisheries biologists, two full time technicians, and eight part-time technicians that spend a significant portion of their time working on walleye issues. Additional seasonal staff are hired in spring to monitor harvest. Many individual tribes have dedicated fisheries or aquatic biologists, often working alongside a hatchery manager. GLIFWC has two representatives on the WI Walleye Team.

Surveys and regulations

As compared to many other species, walleye are relatively easy to capture and quantify in fishery-independent surveys, and DNR and GLIFWC are world-wide leaders in monitoring of walleye populations. The science of quantifying adult walleye numbers in natural systems began in the 1930s, and over time became more sophisticated and consistent. However, the annual window to estimate adult walleye population size is very narrow- a few weeks after ice-out- and it is labor-intensive. DNR, GLIFWC, and other partners conduct between 50-75 walleye population estimates throughout the state. Around 16 angler creel surveys are conducted on walleye lakes annually by DNR. Population estimates and creel surveys are considerably more common within the state's Ceded Territory.

DNR, GLIFWC, and tribes also routinely survey walleye year-class strength in the fall-months on around 250-300 lakes statewide. These surveys are less labor-intensive than population estimates and provide data on year-class strength of naturally reproducing populations and survival of stocked fish.

Regulations are set based on population data from surveys, user preferences, and resulting waterbody-specific objectives. The DNR regulation "toolbox" (see Appendix C) includes regulations intended to deliver consumptive, quality, memorable, and trophy fishing opportunities. "Special regulations", or those existing outside of the standard toolbox options, are relatively rare but are used for high profile resources with unique population dynamics and other special circumstances.

Stocking

Over the past 150 years, billions of walleye have been stocked throughout Wisconsin (2.3B since 1972). Evaluations of the length of fish stocked, survival of stocked fish, and development of management goals and objectives resulted in DNR changing emphasis from stocking all waters with fry to developing individual lake recommendations and stocking different lengths. Stocking recommendations are based on a stocking guidance document that considers factors such as the demonstrated need for stocking, past success of stocking, quality of access and proximity to users, and resource use and interest.

During 2013-2015 DNR transitioned the majority of its walleye stocking from June-stocked "small fingerlings" (about 1.5" fish) to September-October stocked "fall fingerling" walleye (> 6"), through a program known as the *Wisconsin Walleye Initiative*. DNR and partners now stock between 800,000-1,000,000 fall fingerling walleye annually. Additionally, over one million small fingerlings and over 10 million walleye fry are stocked annually. These statistics largely reflect the combined current capacity for walleye stocking in the state (more information on stocking on pages 44-50 and Appendix G). Although significantly more expensive than producing fry or small fingerling walleye for stocking, fall fingerling walleye generally have more consistent survival and return to adulthood, and importantly, are stocked after the "recruitment bottleneck" described previously. The returns to anglers from the Wisconsin Walleye Initiative are beginning to be realized and assessed; stocked walleye typically take 3-5 years before reaching harvestable length. The initial evaluation period will continue from 2021-2027.

Private, tribal, and federal partners stock significant numbers of walleye as well (see page 46 for more). Private groups maintain cooperative agreements with DNR to hatch and/or rear fish. Private groups are also able to purchase fish from private fish farms to stock into public waters under a stocking permit from DNR. Each of the six Lake Superior Ojibwe tribes operates their own hatchery and several other tribes operate ponds for rearing walleye and other fish.

Habitat

Walleye are primarily a riverine species but can adapt to lacustrine (lake) environments. They require relatively cool, clean (but not necessarily clear) water to survive and thrive. The species generally spawns on cobblestone-sized rocks with either flowing water or significant

wave action washing over those rocks. The rock is not enough by itself; the eggs must remain circulating in relatively cool water while they develop- dramatic swings in spring temperatures are often associated with increased mortality of eggs and fry (larvae). Winnebago System walleye spawn in large wetland marshes and are a notable exception.

“Walleye habitat” extends beyond spawning habitat- the species is relatively sensitive to sunlight and warm water and need to be able to find shelter from bright daytime light either by retreating to deep water (if it has enough oxygen) or sheltered, cool areas fed by groundwater. Availability of suitable prey is also important at all life stages.

Surveys, evaluations, and enhancements of walleye habitat are relatively rare compared to other management actions (e.g. stocking) for several reasons. Statewide survey protocols for walleye habitat have been lacking. Staff and funding have also been limited for these kinds of activities. DNR Fisheries maintains several habitat crews around the state, but their focus was previously coldwater trout/salmon projects (recent changes may lead to these staff working on more work on coolwater habitat projects). Additionally, some walleye habitat components are difficult or impossible to manipulate (e.g. water clarity, depth). An emphasis on healthy watersheds and shorelines may provide some of the most positive, yet often perceived to be indirect, benefits to walleye.

Summary of Previous Plan

We reviewed the 1998 version of Wisconsin's Walleye Management Plan (*Moving Walleye Into the 21st Century*) as an early step in the update process. We will refer to the prior version as the "1998 Plan" and this update as the "2020 Plan" (the year planning was initiated) throughout this document.

In our review (which can be read here in full), we found the 1998 Plan to be ambitious and forward-thinking. Indeed, this plan has served Wisconsin well. A mail survey was implemented prior to creation of the 1998 Plan, allowing some comparisons of how angler perceptions have changed over time. Anglers participating in our 2020 mail/online survey (8,812 in total) gave DNR better ratings for walleye management and had better reviews of their fishing today than in the mid-90s before initial plan creation (Figures 2, 3). However, there is still much work to do, and we want to create an updated 2020 Plan that builds upon the successes of the 1998 Plan, while meeting new and serious challenges that have emerged since.

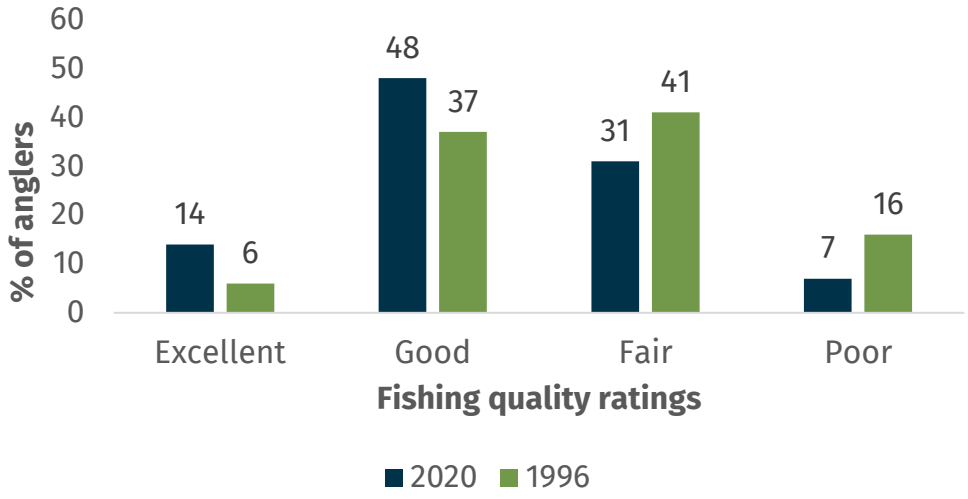


Figure 2. Comparison of overall walleye fishing quality ratings between the present survey and the 1996 edition (from random mail/online survey).

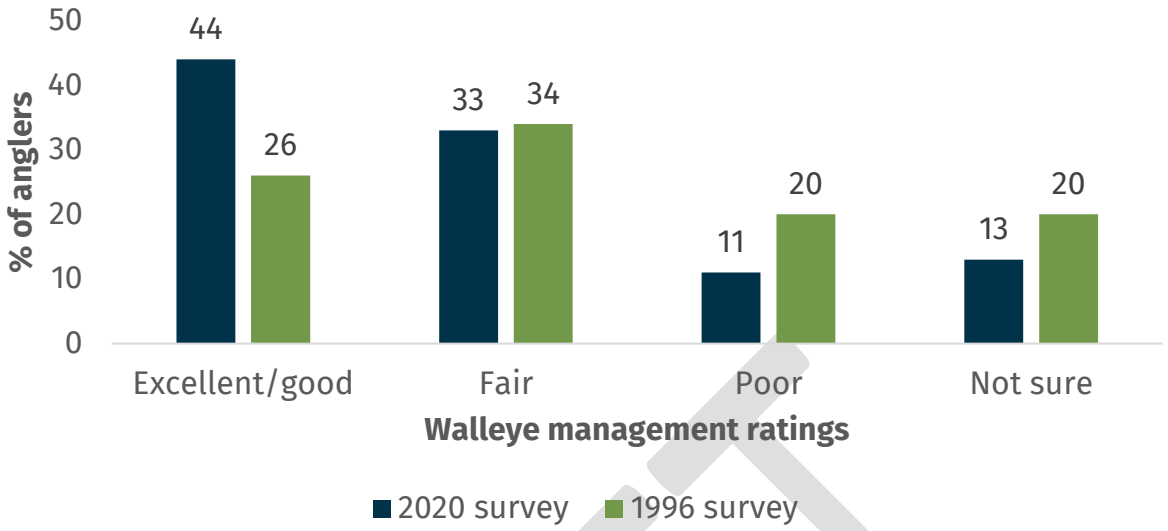


Figure 3. Comparison of angler opinions on the job the DNR is doing with walleye management between the current survey and one implemented in 1996 (from random mail/online survey).

These were the seven goals included in the 1998 Plan (keywords bolded):

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 waters.

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

Within those goals there were numerous objectives, each with specific actions or deliverable products that were identified. We chose to focus our review on the actions/products. We examined actions/products individually, and classified each as “Complete”, “Partially Complete/Needs More Work”, “Continuous or Ongoing”, “Incomplete”, or “Obsolete” (Table 1). We consulted available reports, handbooks, and databases, and interviewed staff with specific subject matter expertise to make these determinations.

Our review serves as a "progress report" for work completed since 1998 and a starting point for updating goals, objectives, and actions for the 2020 Plan. The "Critical Habitat" goal had the least fully complete designations. "Genetic Integrity" was the goal with the most complete actions. "Educational Opportunities" was the goal with the most obsolete ratings, due in large part to how communications and technology have changed since 1998.

Table 1. Progress towards the 55 management actions or products outlined in Wisconsin's Walleye Management Plan (1998) as of spring 2020, broken down by goal.

GOAL#. KEYWORD	COMPLETE	PARTIALLY COMPLETE	CONTINUOUS /ONGOING	INCOMPLETE	OBSOLETE
1. Critical Habitats	0	9	2	1	0
2. Opportunities for catch and harvest	1	3	1	1	0
3. Information (Data)	1	3	2	0	0
4. Genetic Integrity	5	1	0	1	1
5. Educational Opportunities	1	2	0	0	4
6. Stocking Strategy	5	0	5	1	0
7. Integrated Propagation	2	1	0	1	0
TOTAL	**15**	**20**	**10**	**5**	**5**

This review also allowed our planning team to identify current management issues that were not included in the 1998 Plan that may need to be included in the 2020 Plan. These topics included, but are not limited to:

- Season structure and year-round fishing opportunities
- Interest in protection of large female walleye
- Sex-ratios of naturally reproducing and stocked populations
- Best practices to rehabilitate natural reproduction
- Importance of tributary spawning
- Yellow perch abundance/recruitment
- Managing public expectations surrounding stocking and what to do when restoration strategies that include stocking fail to produce results
- Inclusion of sauger in angling regulations and other management
- Invasive species issues (zebra mussels, rainbow smelt)
- Best practices for "Walleye wagons" - portable lake- or stream-side fish hatching rearing facilities
- Effects of climate change on fish communities

Summary of Public Input for Plan Update

In the early stages of the process to update this plan, we knew that robust and diverse public input would be needed to capture the wide-ranging viewpoints and intense passion of those who appreciate and pursue Wisconsin walleye. However, we had no way of anticipating the influences the COVID-19 pandemic would have on all aspects of life throughout 2020 and 2021, including how we interact with each other.

Our planning team had to quickly pivot away from traditional in-person meetings to the online-based input options described below. Unquestionably, online input opportunities were not ideal for some stakeholders, and the planning team and the public had to overcome technological and organizational hurdles throughout this process. However, we are proud of the work that was done under challenging circumstances, and we are appreciative of the thousands of people that contributed their time, ideas, and enthusiasm towards improving this plan. We are also excited about the idea that some of the technology brought into use to create this plan can now help accomplish some of the actions we lay out. For example, virtual meetings may allow us to connect more quickly, efficiently, and cost-effectively with stakeholders around the state on important upcoming initiatives.

Our public input process had two stages: Stage 1 (described in detail below) provided the opportunity for us to receive diverse input through multiple avenues *before* creating an initial draft of this plan. Stage 2 was designed so that the tribes and public could review the first draft of the plan and provide comments, while coordinating efforts within DNR and across other agencies. The draft plan will be further revised using the feedback we receive in Stage 2.

Stage 1 – Pre-draft input to plan update

Avenue 1 – Random Angler Online/Mail Survey

A scientifically designed random survey of anglers was used to provide an unbiased picture of public opinion on a variety of walleye management topics (Holsman and Scott 2021). The survey included 50 questions about walleye fishing experiences in Wisconsin, regulation types, and other management actions. The survey was distributed to 6,750 resident and non-resident Wisconsin fishing license holders. Results were analyzed and summarized by Dr. Robert Holsman (DNR). Portions of the results are included in sections of this plan, where relevant, and the full results can be found here.

Avenue 2 – Virtual Public Stakeholder Meetings

Small group discussions with highly engaged stakeholders were viewed as a critical piece of public input, especially for building partnerships with various organizations and understanding how management actions potentially influence businesses and tourism. We held 13 virtual public meetings (via Zoom) in the regions shown in Figure 4, between October 13, 2020 and February 23, 2021. Leading up to these meetings, we asked DNR and GLIFWC fisheries staff to identify local stakeholders who might be interested in participating, generating an initial invite list of over 600 individuals. This

list included fishing guides, resort owners, bait shop owners, lake group leaders, county conservation staff, tournament organizers, local fishing and sport club leaders, tourism promoters, numerous anglers not affiliated with a business or group, and every Wisconsin Conservation Congress (WCC) delegate with an active email account on the WCC roster. We also put out press releases encouraging people to register for the meetings and posted each on the DNR's public meetings page, resulting in over 200 additional participants who self-selected to participate. Lastly, we worked with the DNR's legislative liaisons to notify legislators and invite them to participate. We sent out 883 invites for these 13 meetings, which resulted in 28 hours of total conversation about walleye management with 347 people (avg. 27/meeting) who attended.

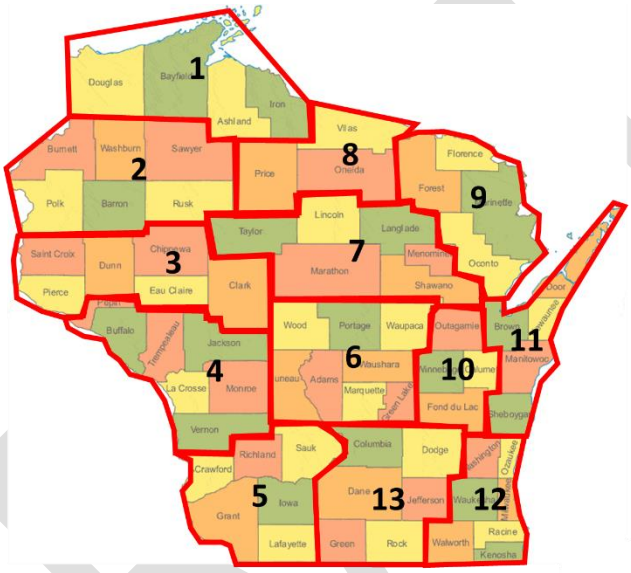


Figure 4. Regions used for virtual public meetings as a part of input gathering for this plan update.

Avenue 3 – General Input Form

It was important to the planning team that anyone could provide comments on the plan update, not just those randomly selected for the mail/online survey or those willing to contribute 2-3 hours of their time for a stakeholder meeting. We created an input form via SurveyMonkey that provided an avenue for "quick" input to the plan. The input form had 8 questions about walleye fishing experiences, management preferences, and an open comment field (full questions and a summary of results can be found in Appendix D). This input opportunity was widely advertised through press releases and social media. We also sent the link directly to groups that are often under-represented, including Wisconsin Women Fish, the Inner-City Sportsman's Club (Milwaukee), Centro Hispano (Madison), and the Hmong Mutual Assistance Association (Lacrosse). We collected 1,824 total responses with this form.

Avenue 4 – Tribal Input Meetings

The sovereign tribes of Wisconsin are key partners in resource management and have a strong interest in walleye and aquatic ecosystem health. We created specific opportunities to interact with tribal leadership, tribal members, and tribal conservation staff. Zoom meetings were held on March 2, 4, and 10, 2021 to interact with tribes. All of Wisconsin's sovereign tribes were invited to participate (Figure 5), usually through contacting their natural resource staff. We had 15 total participants representing 8 different tribes in these meetings.

Figure 5. Tribal reservations in Wisconsin and boundaries for the Treaties of 1837 and 1842 that have relevance to walleye management.

Avenue 5 - Professional conversations

There are many professionals outside of DNR's Fish Management program who are working on issues relevant to walleye management. We sought out experts in lake management and protection, law enforcement, climate, and stocking to discuss their work and identify areas of common interest or potential collaboration. We also met with Minnesota DNR fisheries biologists who are working on similar issues and had

their own management insights to share. Summaries of these conversations can be found in Appendix E, and references appear throughout this Plan.

Stage 2 – Input on draft updated plan (TO BE COMPLETED AFTER PUBLIC COMMENT PERIOD)

Accountability and Implementation Strategy

Meeting the goals established in this plan will require considerable work by numerous parties, primarily the Wisconsin Walleye Management Team (WI Walleye Team). We are clear-eyed about the fact that time, energy, and budgets that can be put towards the actions in this plan will be limited, and competition with other important priorities exists.

We believe that completion of the 49 action items outlined in this plan will require effort in addition to the regular work completed by the ~10-member WI Walleye Team (e.g. reviewing regulation change proposals, setting research priorities). We also outline several action items with estimated additional costs (these include producing informational resources and conducting angler surveys) that would be outside typical operating budget items for DNR and other management agencies. We propose this work with the expectation that we will find opportunities to cover costs and have available staff to complete all outlined projects without sacrificing current critical work such as stocking and completing surveys. We will also collaboratively work with our partners to enhance funds and staffing to complete the actions outlined in this plan (see page 23 for additional information on funding opportunities for habitat projects).

We established the strategy outlined below to be organized and accountable for the work that we propose to do and coordinate with partners to increase our capacity. This system will be used to track our progress toward completing specific actions and developing products outlined in this plan. This plan itself will become a "living record" of our progress, updated annually by the WI Walleye Team to track new accomplishments. There are tables (example below, Table 2) at the end of each goal and issue statement section that list specific actions or products that need to be delivered. Some actions may need to be done annually or continuously; those are noted as such. We will update these tables as actions are completed and post the updated record to the DNR website.

We also identify key information needs within each goal. These may be current or potential research projects for DNR, GLIFWC, and academic or agency partners (UW-Stevens Point, UW-Madison, U.S. Fish and Wildlife Service, U.S. Geological Survey), or, unanswered questions that may need to be addressed beyond this management planning process.

Within this plan there are references to "stakeholders" and "partners". We define stakeholders as anyone with an interest in the fishery, even if they are only passively involved in management. "Partners" are defined as those that currently or may in the future have an active involvement in walleye management activities in the state. Within the summary tables for each goal area we identify areas where partnerships may be useful in accomplishing work. This is designed to help partner groups and individuals easily identify opportunities to put their time and resources to use to assist in walleye management.

Table 2: Example tables for documenting progress towards walleye management actions, identifying information needs, and highlighting partnership opportunities for each goal in the 2020 Walleye Management Plan update.

ACTIONS	RESPONSIBLE PARTY(IES)	STATUS	NOTES
0A. Finish first draft of updated Walleye Management Plan	WI Walleye Team	Complete (Date)	The draft was created and posted to the DNR website for public comment

INFORMATION NEEDS
Can people easily find this document on the DNR website?

PARTNERSHIP OPPORTUNITIES		
Description of need	**Prospective partners**	**How to get involved**
Spreading awareness of plan and associated involvement opportunities	Tribes, walleye and other angling clubs, lake groups, conservation groups, outdoor media	Share the link for this plan with interested individuals or other groups that may not be aware

Management Goals, Objectives, and Actions

The following seven goals will guide our walleye management activities. These are not listed in order of importance. Additional detail on each goal is provided in the following pages. Within each goal there are more specific objectives and action items (bolded).

- Goal 1. Identify, protect, enhance, maintain, and restore critical habitats for walleye and sauger using an ecosystem-based approach.

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

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

- Goal 4. Administer an outreach program aimed at developing an appreciation for walleye/sauger fisheries of Wisconsin, promoting realistic expectations based on population status and biological potential, and creating roles for partners in conservation and management.

- Goal 5. Develop, maintain, and continually evaluate walleye stocking strategies for Wisconsin waters to ensure that strategies are biologically sound and cost-effective.

- Goal 6. Strengthen and establish partnerships with tribes, private groups, fishing industry representatives, and local units of government to increase management capacity.

- Goal 7. Work toward long-term sustainability of walleye populations by maintaining population and ecosystem resiliency and developing effective rehabilitation strategies.

Goal 1. Identify, protect, enhance, maintain, and restore critical habitats for walleye and sauger using an ecosystem-based approach.

The importance of habitat for creating and maintaining high-quality walleye and sauger fisheries seems to be universally understood among DNR biologists, tribal biologists, and stakeholders. Channeling the broad support for habitat-based work that we heard via our input avenues into meaningful action will be a challenging task (Sass et al. 2017, Raabe et al. 2020).

> ***"Habitat. Habitat. Habitat"*** *comment from stakeholder at public meeting in southwest Wisconsin when asked about what management issues should be prioritized*

Objective 1.1. Identify critical walleye habitat statewide, with an emphasis on spawning habitat and habitat used by juvenile walleye.

Some elements of walleye habitat are not well understood, particularly for spawning and key early-life stages that are difficult to study, creating a major challenge for biologists looking to direct habitat efforts. Therefore, important information will need to be gathered before some work can begin. **We can increase our understanding by supporting research aimed at delineating habitat requirements of walleye for spawning and throughout their first year of life (much of which is in progress).** This is particularly necessary in lake habitats where recruitment success has been shown to be declining from historic levels (Embke et al. 2019, Sass et al. 2021).

Natural shorelines with wood and rock are important because they contain critical substrate needed for successful walleye spawning. Development on shorelines can degrade available spawning habitat and be a source of excess nutrients into lakes, which can decrease the quality and quantity of deep water habitat. Wisconsin DNR now has standardized protocols for assessing shoreline habitat and development (Link here). **We recommend that these shoreline assessments be completed on any water with significant walleye management activities, particularly those with existing or recent natural reproduction.** Our target would be to complete shoreline habitat surveys on at least 10 walleye waters annually (100 total during the course of this plan). Surveys of this type may take a half-day for smaller lakes, and multiple days/weeks for a large lake. Costs vary accordingly, with the largest initial expense being staff or contractor time to complete the surveys with additional costs associated with data entry and processing after fieldwork is completed. These surveys, along with other available tools (e.g. Midwest Glacial Lakes Conservation Planner), will help **identify areas where landowner outreach, rehabilitation funding, or other activities may be most effective** in protecting and restoring important elements of walleye habitat.

Thermal-optical habitat has been shown to be important to walleye (Lester et al. 2004, see page 56 for more discussion), yet this concept has received far less attention historically than structural habitat. **Modeling thermal optical habitat for important walleye waters, including lakes under restoration efforts and Great Waters (Green Bay, Mississippi River, Winnebago) that have seen significant changes in water clarity, will provide a better understanding of walleye habitat limitations brought about by changing conditions.** Such modeling efforts may also be useful to identify lakes that may be more resilient to climate change. **Data**

collection protocols should be developed to provide consistency across agencies and guide partners interested in assisting with data collection.

These challenges require coordinated efforts if additional advances in walleye habitat work are going to be made beyond those outlined in the 1998 Plan. Currently, GLIFWC and DNR are each using or developing protocols to assess components of walleye habitat which may be used to determine feasibility of rehabilitation or overall resilience of populations. At minimum, **efforts should be made to coordinate these data collection efforts. Ideally, a more unified approach among agencies should be developed** soon. These kinds of habitat evaluations are new and challenging. Protocols will need to be adapted as new information comes to light and logistics are better understood.

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

Once critical habitats are identified, efforts must be made to protect them. Land acquisitions and conservation easements are effective and permanent options for habitat protection of important parcels along waterways and within watersheds that support walleye. DNR has some authority for acquisition of lands that may benefit walleye through Wild Lakes program, Forest Legacy Program, and areas within Natural Resources Board project boundaries. Partners such has county forests, U.S. Forest Service (Chequamegon and Nicollet National Forests), and land conservancies can also make acquisitions and create easements that may benefit walleye.

There are also a variety of habitat protection tools available through DNR, including critical habitat designation, streambank easements, and fish refuges. **We can build interest and proficiency in use of these tools by hosting internal workshops for DNR staff.**

Partners have a critical role to play in habitat protection. County conservationists are key partners that have demonstrated impressive creativity in tackling local habitat issues. We believe greater communication among county, state, and tribal biologists/conservationists will lead to numerous positive outcomes for walleye habitat protection and enhancement. We would like to use this plan as an opportunity to facilitate that communication by committing to **organizing a virtual walleye habitat workshop with DNR biologists, tribal biologists, lake leaders, researchers, and county conservationists in the near future.**

General water quality protections will be more directly administered by other programs within DNR and/or other entities with the recognized authority to do so. However, fisheries staff can and should communicate to partners the need for clean water and effective shoreline zoning regulations to provide quality walleye fisheries and harvest opportunities whenever possible (see also contaminants discussion on page 33). Identifying areas where water quality improvements may lead to enhanced walleye resources (e.g. Milwaukee River) will also be beneficial as will identification of waterbodies resilient to environmental change (see section for Goal 7).

Permitting processes that regulate aspects of water quality and shoreline development (aquatic plant management, Chapter 30, etc.) provide opportunities for DNR and GLIFWC biologists to provide input. Biologists should be well-versed in how different permitted

activities might influence walleye, and what permit conditions or restrictions might be appropriate to address these issues. **Communication from the WI Walleye Team on existing or emerging permitting issues will be critical and cross-training opportunities in these areas will be emphasized.**

"I would like to see a Walleye Stamp implemented in addition to a regular fishing license. This money would be specifically used for future planning, habitat improvements, and grants and projects that communities, clubs or other organizations can apply for. We can have the best plans on paper but without adequate funding you will still see partial completions of all objectives ten or more years from now." Comment from public on funding walleye work

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

We receive numerous information requests from shoreline owners about what they can do to enhance walleye habitat, particularly for spawning. Some excellent general resources on this topic already exist (here, for example). Additionally, **we propose creating a resource for shoreline owners willing to pursue rehabilitation specifically in key walleye spawning areas.** This resource will outline the ideal structural and onshore habitat for successful walleye spawning (based on scientific studies such as Raabe et al. 2020 and learned experience), permitting steps necessary to undertake work, and potential funding support (see also Appendix F).

"Fish sticks" and other shoreline woody habitat projects have become a popular habitat restoration techniques in recent years. Without question, these projects have broad merit and fisheries benefits as they seek to reestablish a structural habitat component that was once more common (Sass et al 2019). However, the direct influence of shoreline wood on walleye recruitment and production is not well understood. Ongoing research may help define the specific use of woody habitat additions to benefit walleye. In the meantime, our general guidance is to avoid woody habitat additions on known walleye spawning areas (note: prime walleye spawning areas often have too much ice scour for effective woody habitat additions to be stable and remain in place).

Specific, dedicated, and user-supported funding sources have been established for coldwater species in Wisconsin (trout and salmon stamps), which have been incredibly successful at increasing the amount of habitat work done to benefit those species (more information here). No dedicated funding source exists for warmwater or coolwater species in Wisconsin, including walleye, despite the tremendous popularity and economic importance of those species. We received numerous comments from stakeholders about support for increased funding for walleye habitat conservation and rehabilitation. Legislative action would be required to create a dedicated funding source for coolwater and warmwater habitat. Here, we scientifically endorse **the potential benefit of such funding to increase capacity for habitat work (projects, research, conservation, and rehabilitation),** while maintaining funding for other management activities.

What about adding spawning rock?

Adding rock spawning reefs to lakes and rivers has been a popular idea for several decades. These kinds of projects have been tried extensively in Wisconsin, with biologists reporting projects in at least 15 counties. Although these projects are undoubtedly popular and walleye are often observed using these areas, demonstrated increases in reproductive success have been rare. Neuswanger and Bozek (2004) found that walleye reproduction had not increased in at least 85% of lakes where spawning reef additions were evaluated. Addition of rock spawning reefs is not seen as a productive use of time and resources in *most* cases. Exceptions may include waters where degradation in spawning habitat has been well-documented.

Objective 1.4 Mitigate influences of dams, hydro power operations, and fish passage structures on fish communities while seeking opportunities for beneficial water level manipulations

Damming of flowing waters is one of the most transformational human activities for aquatic systems. Some of the most popular walleye fisheries in Wisconsin exist in reservoirs created by dams or tailwaters below dams. However, dams and damming also present numerous management challenges (Fish Passage at Dams Strategic Analysis, see also escapement issue statement on page 62).

Dams are often a limiting factor for walleye and sauger populations, particularly when they restrict access to spawning areas (see Cheng et al. 2006, for example). We must **identify areas where dams or dam operations may be restricting spawning runs** and habitat availability so those issues can be addressed through established DNR processes to determine if fish passage is feasible (see report here). Each scenario is unique and requires case-by-case attention. Expansion of aquatic invasive species can be a concern in some passage scenarios, but there are methods to optimize systematic passage accounting for invasive species (Cooper et al, 2021).

Water level management in reservoirs or certain river sections also presents opportunities for walleye enhancement. There are examples of water level management schemes designed to benefit walleye/sauger reproductive success in Wisconsin and across the Midwest. These generally include lowered water levels during fall or winter and raised/rising water level in spring to coincide with spawning (Willis 1986). Such manipulations may be one of the most powerful tools available to create favorable conditions for walleye/sauger. However, this strategy is not appropriate in all places and comes with substantial biological, economic, and social considerations. Use of water level manipulations to benefit walleye/sauger need to be carefully considered on a case-by-case basis, and even if deemed appropriate, should be used judiciously. Relatedly, water management schemes that could have negative influences on walleye by dewatering spawning areas or access at key times should be avoided. **Resources can be assembled to assist biologists on this topic and additional research may be beneficial.**

Walleye often access smaller streams or marshes (e.g. Winnebago system) for spawning. The quality of water passage structures such as culverts can determine the amount of access and water flow to critical walleye spawning marshes and tributaries. In many cases, **improvement of passage structures** can benefit and add resiliency to populations. This has already been a successful activity on the Wolf River system that has been led by local partners (Shadows on the Wolf and Walleyes for Tomorrow).

Objective 1.5 Increase understanding and effective management of other species walleye interact with

As defined by Sass et al. 2017, walleye prey would be considered "habitat" because it is required for a walleye to have fitness. Effective ecosystem-based management relies on an understanding of interactions walleye have with competitors and prey.

In recent years, considerable research effort has gone into understanding negative interactions between walleye and other species. Several of these projects are ongoing (UWSP recruitment study, DNR bass x walleye interactions study, UW and UWSP Centrarchid removal study, DNR and UWSP bullhead removal study, black crappie x walleye interactions study). **We propose continued support for these projects, and application of results as they become available.** Efforts will also be made to convey important results to partners and stakeholders, particularly when studies identify opportunities for partnership.

Ecosystem-based management for walleye also means understanding and enhancing available prey. Important prey species will vary from one system to the next. Regionally, however, yellow perch are known to be an important prey species for walleye (Becker 1983). We propose **increasing research efforts to understand yellow perch dynamics and a push for more standardized and widely used methods to monitor yellow perch populations**. Additional attention towards white sucker, gizzard shad, and various minnow species may also be beneficial. In recent years, DNR explored a "forage availability index" (also known as a "Confetti Index") during fall surveys to try to increase data on prey available for walleye. **Forage availability surveys should be more thoroughly evaluated** before broader application. **Strategies to protect or enhance prey fish populations should be developed** and may include more restrictive harvest regulations or targeted habitat projects. We must also **devote more attention to understanding availability of zooplankton and other microscopic organisms** that are critical prey items for walleye at early life stages.

Lakes that have the desired combination of healthy walleye and healthy prey communities to support them should be prioritized for additional protection (Healthy watersheds program, Critical Habitat Designation, Area of Special Natural Resource Interest designation). In some cases, this may include thermally sensitive two-story fisheries, where cisco may be a key walleye prey item. Experience on numerous other lakes has shown that an ounce of preservation may be more valuable than several pounds of cure when it comes to currently productive walleye lakes. Meaning, preservation of well-functioning, walleye-centric fish communities will be a much more effective strategy than trying to return a fishery to that status (Tingley et al. 2019).

Goal 1 (Habitat) Summary

ACTIONS	RESPONSIBLE PARTY(IES)	STATUS	NOTES
1A. Support research on spawning and age-0 walleye habitat use and requirements	DNR, GLIFWC, tribes, partner research agencies and universities	Several studies in process	While several studies are underway, additional targeted research will be beneficial, particularly efforts to understand effects of potential habitat manipulations
1B. Identify areas where dams may be restricting walleye populations, make available to FERC relicensing staff	DNR and tribal biologists, FERC specialists	Not started	Will not dictate changes at these hydroelectric projects, but will make it easier to identify which projects have walleye implications when they come up for relicensing
1C. Model thermal-optical habitat on important walleye waters	OAS, other researchers	Some work complete	Include Great Waters, such as Green Bay and Lake Winnebago
1D. Develop a unified approach to evaluating walleye habitat	DNR, GLIFWC	Coordination needed	Each organization has some protocols.
1E. Organize workshop on critical habitat designation for DNR biologists with specific emphasis on walleye habitat	DNR Fish Management	Not started	Inclusion of lake class will be important to prioritize work
1F. Organize walleye habitat workshop	WI Walleye Team, county conservationists, tribal biologists	Not started	Hydroelectric operators could also be included
1G. Create public-facing resource on shoreline restoration for optimal walleye habitat	WI Walleye Team, Extension, researchers	Not started	Would like to work with Extension and other partners (UWSP)
1H. Conduct literature review and create a resource for biologists on water level manipulations to benefit walleye	WI Walleye Team	Some work may be complete	Max Wolter has outline of literature review on this topic

INFORMATION NEEDS
Better understanding of spawning and age-0 habitat requirements and early-life bottlenecks that may be influencing recruitment and stocking success
More detail on sauger habitat requirements and rehabilitation opportunities.
What are the influences of coarse woody habitat on walleye?
How do changes in aquatic plant biomass influence available walleye habitat and what considerations should be included in aquatic plant management plans and protocols?
How can water level management be used to improve walleye/sauger populations in Wisconsin (recruitment)? How has this tool been used historically?
How do specific human activities like wake and shoreline disturbance influence walleye spawning habitat and spawning success?
Better understanding of yellow perch population dynamics and recruitment (including more standardized monitoring).
What strategies can be developed to enhance important prey fish populations (yellow perch, cisco, white sucker, minnow spp.)?
How does available microscopic and small fish prey influence walleye recruitment and stocking success? How should these things be evaluated?

PARTNERSHIP OPPORTUNITIES		
Description of need	**Prospective partners**	**How to get involved**
Purchase conservation easements and other land protections along waters and within watersheds that support walleye.	Land conservancies, conservation groups, sporting groups, other associations	Will need to be approached on a case by case basis, opportunities will vary by area
Engage landowners and policymakers about walleye habitat protection and restoration	County conservationists, local units of government, lake group leaders, sporting clubs	Share this plan and habitat related resources (more information coming soon)
Collect data needed to characterize thermal optical habitat	Lake groups, local conservation groups, walleye clubs, tribes	Guidance will need to be created
Conduct shoreline habitat surveys	County conservationists, lake groups, sporting clubs	Go here to learn more
Engage policymakers on the importance of funding coolwater and warmwater habitat projects and assessments	Angling groups, lake associations, conservation organizations	Share your experiences related to walleye and the importance of habitat. Help others make the connection between healthy habitat and great fisheries.
Support improvement of passage structures where walleye spawning runs may be influenced	Local units of government, walleye clubs	Fund projects to replace older passage structures that are inadequate. Work with local biologists.

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

> ***"I love to eat walleye. However, I prefer to catch bigger walleye more than bringing home dinner. The regulations you have for De Pere are perfect for spring fishing."*** *One of hundreds of comments we received on angling regulations and opportunities through our public input form. Opinions varied widely.*

When it comes to attitudes toward walleye/sauger opportunities, no two Wisconsinites (or visitors) are the same. Our public input revealed wide-ranging preferences for the types of angling and harvesting experiences people seek, from healthy fish for the table to big fish for the wall. Fortunately, Wisconsin offers a plethora of walleye and sauger opportunities in all corners of the state. This plan aims to align management strategies with the types of opportunities people want to pursue.

Objective 2.1 Provide diverse harvest and angling opportunities.

The following statements describe our overall strategy for managing walleye opportunities:

- Walleye are primarily managed for harvest-oriented opportunities, based on strong harvest interest from anglers and tribal members. "Catching keeper size walleye" was the most important factor for anglers to consider a walleye fishing trip a success in our mail/online survey.

- Even when managing primarily for harvest, we must still consider long-term sustainability of populations. This will almost always require restricting overall harvest numbers and may in many cases require restricting harvest of biologically important sizes of walleye. We heard strong support for more generally restrictive regulations in our public input process (see pages 90-94 and report here).

- Long-term sustainability of walleye populations is especially important for Ceded Territory Tribes that depend on walleye harvest for subsistence. We recognize a responsibility to maintain or improve walleye populations so that harvest opportunities are sustained for future generations.

- The strongest harvest interest exists for walleye between 14 and 18 inches with declining interest in small/juvenile and large/assumed-female walleye, but there is an uptick in interest in very large fish, presumably as a trophy (mail/online survey results). Similarly, anglers were more likely to identify 16-18-inch walleye as their *preferred* size for keeping. Opportunities to allow harvest of walleye in this size range should be provided when biologically possible.

- Protective and harvest slot length limits were supported by a majority of anglers (54-56% depending on type of slot) in our mail/online survey and were frequently supported in public input comments. Additionally, most anglers in northern WI supported special regulations being “used often” or “tailored to specific waters” (63% combined). Southern WI anglers were more likely to not have an opinion on the use of special regulations.

- Some interest in trophy fishing for walleye exists, though only a minority of walleye anglers expressed interest in these specific opportunities. Trophy fisheries for walleye could be offered on a limited basis across the state in biologically appropriate waterbodies (lower-density populations with good growth and survival).

- Continuous open seasons on rivers provide popular fishing opportunities at a time of year when other fishing options are limited. These populations should be monitored closely, and regulations should focus on preventing overfishing from occurring during seasonal walleye migrations (e.g. spring spawning run), while retaining year-round opportunities (see issue statement on page 72).

- Walleye tournaments are popular among some anglers who enjoy a competitive element to their fishing. Tournaments should be managed to minimize influences on populations. See issue statement on tournaments on page 64.

- Many anglers choose their fishing destination based on what opportunities are available to them locally. Where possible, walleye fishing opportunities should be created and maintained near human population centers. Tourism interest should also be a factor considered in management.

- Lakes, and lake classes, that do not have suitable habitat to support walleye should be managed for other species.

These management strategy tenets should be communicated to biologists, policymakers, and the public, and should be considered when stocking, regulations, or other activities are being proposed. Management actions that run counter to these tenets may require special justification.

Objective 2.2 Ensure that regulations are delivering sustainable and desirable fisheries

Angling regulations were one of the most intensely discussed areas of walleye/sauger management across all our public input avenues (See appendix D). Anglers had diverse views on regulation philosophy and perceived effectiveness. Harvest or protected slot length limits are a generally popular concept, while anglers are more divided on minimum length limits (and what that minimum length should be).

The Wisconsin DNR manages most walleye waters under regulations found in the “toolbox” (table C1 in Appendix C). These five regulation options are applied based on biological data and social acceptance. We found more acceptance for some toolbox options over others. For example, the Ceded Territory Slot (15-inch minimum length limit, no harvest between 20-24 inches, and only one over 24 inches) was relatively popular, while the 14-18” protected slot

was more controversial. One of the major efforts we propose as a part of this updated plan is a **comprehensive review of the angling regulation toolbox available to DNR biologists**. This review will be completed by 2023 (some early analyses on this topic have been initiated), and outcomes could include addition of new toolbox options and eliminating or combining existing options. Initial objectives for this review would be:

1. Develop new toolbox options for rehabilitation scenarios, as necessary
2. Examine existing "no minimum length limit" toolbox options to determine effectiveness and alternatives
3. Explore use of protected slots for larger lengths of walleye that are less desired for harvest but may be biologically important

The Wisconsin Inland Fisheries Technical Working Group and various stakeholders will be engaged in this toolbox review. The Technical Working Group (TWG) is comprised of representatives from DNR and GLIFWC, meets at least twice a year, and is responsible for setting safe harvest levels for walleye, share data, and coordinate plans, among other duties.

Objective 2.3 Manage an appropriate balance between regulation complexity and simplicity

There is a necessary balance between regulation complexity, where tailored lake-specific regulations may enhance fisheries, and simplicity which benefits angler understandability and increases compliance. Results of our mail/online survey found general support for more complex regulatory schemes, where regulations vary across the landscape, provided those regulations deliver better fishery outcomes. We also note that only 2% of those responding to our public input form identified "not understanding regulations" as something that negatively influenced their fishing experience (Appendix D). It should be noted that these input avenues targeted current anglers, which does not provide us with the ability to determine if/how regulation complexity might be a barrier to *potential* anglers. Although we found little evidence that regulation complexity negatively influenced *current* angler fishing experiences, we should still seek out common-sense opportunities to simplify regulations. Rule simplification should be sought particularly in instances where a regulation does not have strong biological justification or complexity may lead to enforcement issues.

As an early step to promote simplicity, we propose **introducing an advisory question to the WCC to create more uniform bag limits across the state (Note: advisory questions are designed to gauge public support for a proposal, this plan does not dictate that these changes must occur)**.

Proposal description: Many areas of the state have a 3-daily bag limit, including the Ceded Territory, Lake Winnebago and tributaries, and many southern counties, while parts of the state have a 5-daily bag limit. This proposal would create a more uniform statewide bag limit. Our mail/online survey found support for a reduction to a 3-daily bag for southern Wisconsin waters (Figure 6, most waters in the north are already managed with a 3-daily bag limit). Mississippi River, Green Bay, and other border waters may need to be handled on an individual basis in coordination with other states. Language on this proposal is being drafted concurrently with the creation of this plan.

If supported in concept, this proposal could be advanced as a formal rule-change proposal. More proposals could be developed in future rule change cycles.

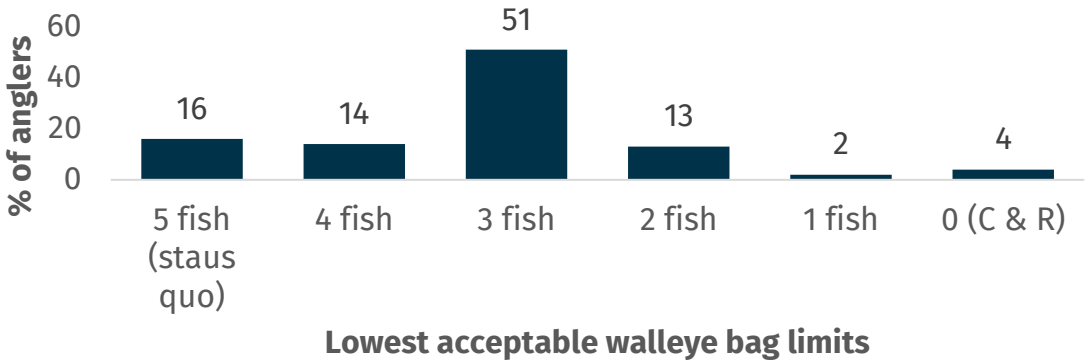


Figure 6. Percentage of walleye anglers' response to lowest acceptable bag limit for Southern Wisconsin waters (from 2020 random mail/online survey). "C + R" means a catch-and-release only fishery.

Objective 2.4 Better define and communicate expectations for walleye fisheries based on biological and physical data, including lake class

It is important that we establish and communicate expectations for different kinds of walleye fisheries (e.g. natural reproducing vs stocked-only). This information will help create more appropriate management goals for individual waterbodies and may also help anglers and tribal harvesters develop more realistic expectations for their own time on the water.

Wisconsin has thousands of lakes with widely varied characteristics and capacity to support certain fisheries. Communicating fishery expectations by "lake class" (Rypel et al. 2019) will be important. **Summaries of key walleye metrics (e.g., adult density/catch rate, size structure, recruitment strength) by lake class should be produced and disseminated to biologists as a reference document.** Furthermore, we should communicate with public on the (relatively) new lake class system being used by DNR Fisheries Management to add context to their understanding of different walleye fisheries. For example, we know some lake classes support a higher relative abundance of walleye than others (Figure 7). Communication about lake class expectations can also be done through an updated Wisconsin Walleye Waters resource (see page 42 for more) and other outreach materials.

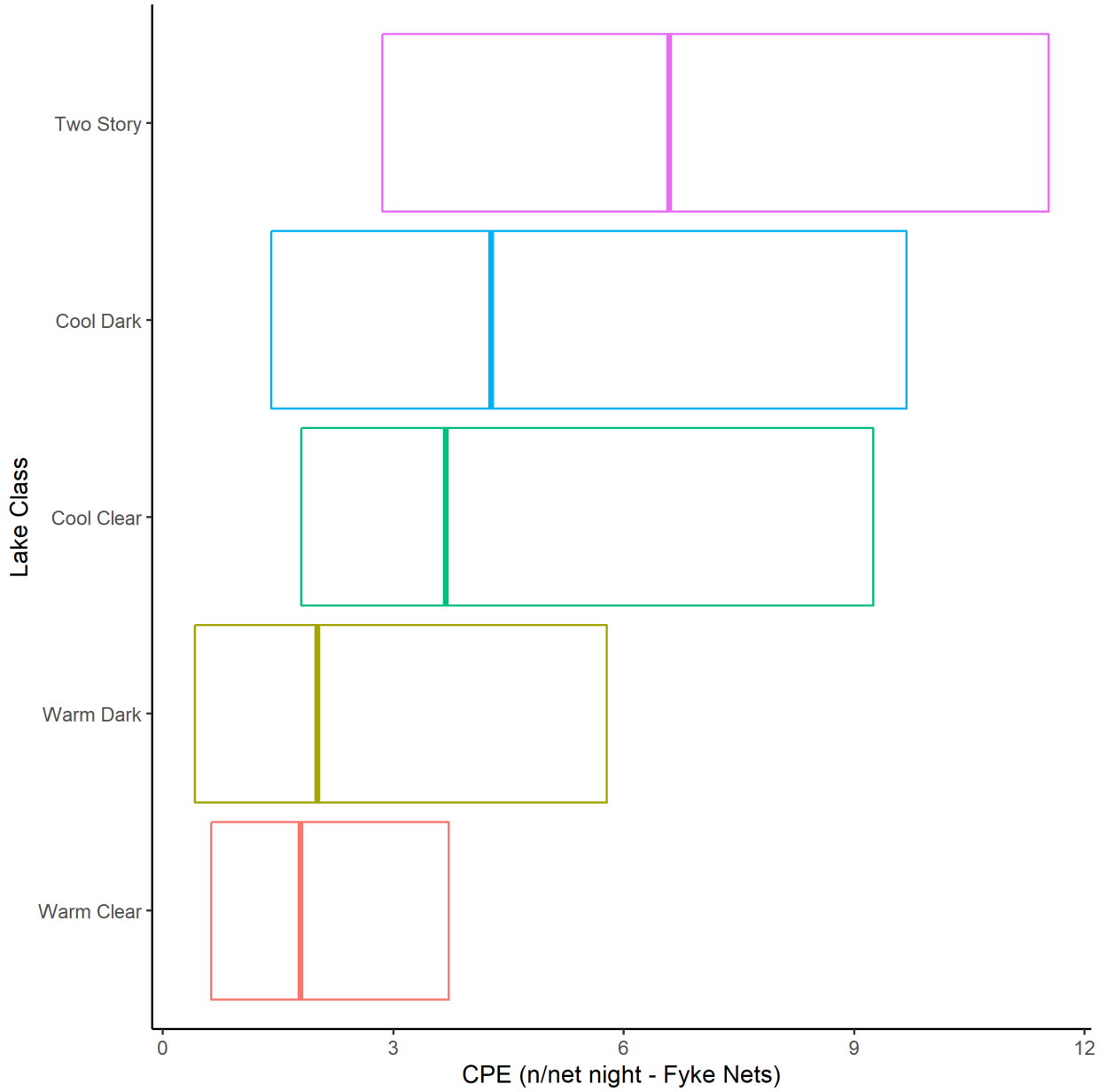


Figure 7. Walleye catch per effort (CPE) from DNR fyke netting surveys across different lake classes that support walleye fisheries. The boxes represent the 25th-75th percentile of catch rates in each lake type, with the crossbar being the median.

Objective 2.5 Manage naturally reproducing walleye populations to maintain a minimum of 5-year classes represented in the spawning stock and a minimum of 3 adults per acre.

Populations with at least 3 adults (see Appendix B for info on how population abundance is estimated) per acre and multiple year classes present provide the most consistent angling action and harvest opportunities. This abundance standard should be applied to all waters with sufficient natural reproduction (Nate et al. 2000). Maintaining populations at this density is becoming increasingly challenging as recruitment declines have become widespread (Rypel et al. 2018). More restrictive regulations may be necessary in many lakes

to maintain or achieve this standard (Embke 2019) as stocking in itself is often not able to meet this abundance standard. Other strategies to address declining recruitment and adult densities are discussed in Goal 7. It may be more difficult to develop population estimates for riverine populations, requiring more localized standards of abundance (or more likely, relative abundance).

Objective 2.6 Manage primarily stocked walleye populations to maintain a minimum of 1.5 adults per acre.

Stocked walleye populations should not be expected to maintain adult densities that are as abundant as naturally reproducing populations (Nate et al. 2000). As such, an appropriate minimum standard for adults per acre should be lower for stocked fisheries. A density of 1.5 adults per acre, or greater, will provide some angling opportunities and may include many waters with fast growth and high ultimate size structure. Lakes that are unable to meet this abundance standard after three stocked year classes have reached adulthood should not be considered for future stocking by DNR and should be managed for other species that are better suited to the habitat. Temporary exceptions can be made for special circumstances, including early rehabilitation scenarios. This standard should be reflected in DNR stocking guidance.

Objective 2.7 Provide safe and healthy consumption opportunities

Walleye are being managed for consumption opportunities in most instances. As such, consumption advisories should be issued when critical levels of contaminants such as methyl mercury or polychlorinated biphenyls (PCBs) are detected. Polyfluoroalkyl substances (PFAS), a relatively new contaminant type, should also be examined in walleye populations where they have been found or are suspected to occur. **Sufficient numbers of walleye waters should be tested for contaminants annually**, including testing of walleye, other gamefish and panfish, and with special sampling occurring as needed. New consumption advisories should be highlighted in press releases, the DNR website, and in the “Choose Wisely” consumption guidance created by DNR bi-annually. New consumption advisories should also be communicated directly to tribal communities. GLIFWC also monitors mercury contamination in walleye and produces color-coded maps with fish consumption advisory information for tribal harvesters that are distributed among tribal communities annually.

Waters with moderate contaminant issues should have regulations that allow harvest of the healthiest sizes of walleye. Waters with excessive contaminant issues may be opportunities for non-consumptive fisheries, such as trophy opportunities.

Goal 2 (Opportunities) Summary

ACTIONS	RESPONSIBLE PARTY(IES)	STATUS	NOTES
2A. Review regulations toolbox, propose modifications as needed	WI Walleye Team	Not started	Target deadline March 2023
2B. Advance WCC advisory questions aimed at increasing regulation simplicity and consistency	WI Walleye Team, Policy Specialists	Being drafted	Introduce for 2022 WCC Spring Hearings if possible
2C. Produce summaries of walleye metrics by lake class for biologists and public	WI Walleye Team	Some information available to biologists	Provide info on web in easy-to-digest format
2D. Continue to evaluate walleye populations for consumption risk, now including PFAS contaminants	DNR and GLIFWC Environmental Toxicologists	Ongoing	Will require coordinating with biologists to collect samples in areas of interest

INFORMATION NEEDS
What other proposals should be considered to reduce regulation complexity where biological benefits are not being observed, either statewide or locally?
How far are most anglers willing to travel for a day of walleye fishing? How does that relate to fishing quality?
Would anglers find benefits of standard regulation signage at boat landings and other access points? (Signs currently vary by area)

PARTNERSHIP OPPORTUNITIES		
Description of need	**Prospective partners**	**How to get involved**
Create awareness of consumption advisories within communities	Tribal conservation staff, lake groups, county health professionals	Go here for more information
Promote walleye fishing opportunities	DNR biologists and communications specialists, local tourism promoters	Help share resources that are created, like the updated Wisconsin Walleye Waters.

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

"Let the science determine the management." Quote from stakeholder at a public meeting in northwestern Wisconsin.

Successful management of fisheries is highly dependent on up-to-date, relevant information for decision making and identification of issues. Walleye are the most intensely monitored fish species in Wisconsin. Still, opportunities exist to broaden and enhance data collection. Greater coordination among various agencies tasked with monitoring populations, adoption of new strategies and technologies, and fostering information sharing internally and externally will lead to increased quantity and quality of available data. Additionally, advances in data accessibility/sharing, usability, and visualization will lead to increased application and enhanced interpretation of all available information.

Objective 3.1 Maintain comprehensive up-to-date statewide information on walleye/sauger populations

Biological information is gathered through a variety of survey types performed by crews across the state (Table 3, and more detail on some survey types in Appendix B). Surveys range in complexity depending on the volume and type of data they are intended to collect. Mark-recapture methods provide an estimate of the total number of walleye (usually just adults) in a waterbody. These spring surveys are time and labor intensive but offer the most comprehensive picture of a walleye population (we are not aware of instances where these surveys are completed for sauger). In the Ceded Territory, population estimate surveys are accompanied by a creel survey that estimates angler catch and harvest of walleyes in some cases. Less intensive surveys are also performed and generate some relative measure of walleye/sauger abundance, often referred to as catch-per-unit effort (example: number of walleye/sauger per net per night). Relative abundance data can be useful for detecting trends in populations, describing size structure of a population, and estimating mortality. Fall recruitment surveys focus on young-of-the-year and age-1 walleye to assess trends in natural reproduction or stocking success.

Table 3. Description of surveys commonly conducted in Wisconsin to gather data on walleye and sauger populations.

SURVEY TYPE	DESCRIPTION/PURPOSE	TARGET NUMBER OF SURVEYS (ANNUAL)
Population Estimate	Typically, a mark-recapture survey employing separate gear types (two). Results in an estimate of the total number of adult walleye in the waterbody	50-70 in Ceded Territory, 5-10 outside of Ceded Territory
Angler creel	A standardized survey of completed angler trips, used to estimate effort, catch, harvest and associated rates.	16-25 in Ceded Territory, 3-5 outside of Ceded Territory
Index or "Catch Per Effort"	A survey effort that generates information on catch rate and size structure but does not estimate the number of total adults. Typically netting on lakes and electrofishing on rivers and Great Waters. Can be compared to other index surveys.	20-40, covering a range of lake classes and including annual assessments on Great Waters
Fall Recruitment	Electrofishing surveys designed to index year class strength of age-0 (born that spring) and age-1 (born previous spring) walleye. Also useful for assessing stocking survival one year after a stocking event.	100-200, including both stocked and naturally reproducing waters

Data on age estimates of walleye/sauger are critical for understanding growth and year class contribution. Our recommended protocol for collecting and analyzing age structures for walleye and sauger follows what is already used in Wisconsin's Ceded Territory. Those **aging protocols were recently approved and should become standard practice statewide**.

Recent analyses have shown that additional data on weight of walleye should also be collected (often, only the length of fish are recorded in surveys) to generate more reliable estimates of production in systems. **We recommend a subset of walleye in targeted surveys be weighed and those data be recorded in the fisheries management database.** Weighing walleye following the same protocol as age structure collection (using the same fish for both subsamples) will provide an adequate sample size. Although traditional survey methods described above provide a wealth of critical data, we must also seek out new methods to obtain information that may be more cost effective. For example, Environmental DNA (or "eDNA") has shown some promise as a low-cost means to estimate walleye abundance (Spear et al. 2020). If more thoroughly validated, **eDNA methodology should be incorporated into the larger DNR monitoring program** as a complement (not replacement) to other survey techniques that would broaden our scope of data collection. This will require partnership and collaboration with other agencies and universities.

Objective 3.2 Maintain an unbiased perspective on angler attitudes

Social data are as critically important as biological data in managing fisheries. Knowledge of angler preference can help guide walleye/sauger management, within biologically realistic limits. The development of this management plan has generated a large amount of data on user preferences and attitudes towards walleye/sauger fisheries that will help guide us in the near future. Scientifically designed **social data collection (similar to the mail/online survey referenced in this plan) should be repeated on a regular basis** to track important changes in attitudes towards management strategies, preferences for different types of opportunities, or user conflict issues (e.g. Tingley et al. 2019). Users should also be integrated, where possible, into the management decision making process.

Objective 3.3 Increase collaboration among Wisconsin DNR programs and with other agencies on walleye management issues

The walleye management world extends well beyond the Wisconsin DNR's Fish Management Program and Great Lakes Indian Fish and Wildlife Commission (GLIFWC). Numerous other programs within DNR (e.g. Water Quality and Waterways programs) manage elements of habitat, environmental/conservation law enforcement, and social issues that are either directly or indirectly related to walleye. Increased coordination and collaboration among these groups will be beneficial, particularly in generating and sharing data. We plan to **seek out opportunities to engage with professionals in other programs within DNR** as guest presenters or participants in Walleye Team meetings to catalyze collaboration with other programs.

There is also a vast amount of experience and information to be gained from interactions with other Midwestern states/agencies that have significant walleye management programs (e.g. Minnesota and Michigan). Traditional venues for sharing information would include professional conferences, publications, and multi-state technical committees. **We seek to maintain participation in traditional information sharing venues,** including a DNR Walleye Team member presence on the North Central Division of the American Fisheries Society's Walleye Technical Committee, while also **looking to expand cross-state communication**. This planning process has already spurred productive conversations with Minnesota DNR on stocking strategies (Appendix E), with more meetings planned to discuss walleye angling regulations, fish community interactions, and angler engagement.

Objective 3.4 Develop tools to best utilize information for science-based management

The DNR Fisheries Management program, GLIFWC, and other partners collect and store a wealth of information on walleye populations, but all these data hold lesser value without proper tools for analysis and interpretation. We plan to **further develop and acquire tools to collect, access, and analyze walleye data.** These tools include up-to-date programs that allow staff to easily collect biological and social data, increase data accessibility for managers, assist biologists in visualizing and interpreting data, and quickly and efficiently calculate and present relevant population metrics. The development of such products should

be viewed against the backdrop that science-based decision-making is an important mainstay for natural resource management in the state of Wisconsin.

Objective 3.5 Provide resources to keep fisheries management professionals up to date on the latest research that may be pertinent to walleye management in Wisconsin

Walleye waters in Wisconsin should be consistently managed based on the best available scientific information from all available sources. OAS, GLIFWC, and many of the Midwestern universities and associated USGS cooperative fishery research units have ongoing walleye studies that are specific to Wisconsin or other Midwestern states. Studies of other fish species, communities, fisheries, and habitats may have additional implications for walleye management in Wisconsin. Important research findings from peer-reviewed studies should be incorporated into the science-based decision-making process when they become available and should replace outdated or less applicable studies or professional judgment when appropriate. Managers should carefully consider how new information applies to individual waterbodies within each region, so that research findings are incorporated where appropriate.

To accomplish this, OAS and/or other research partners (e.g. GLIFWC, universities, USGS coop units) will **provide an annual update to the walleye team on the findings of any studies** that have recently been completed or published that have important implications for walleye management. This update will include key findings of each study, and how or where those findings are likely to be applicable for managers. Walleye team will help disseminate relevant results to biologists and other staff and incorporate findings into our broader management strategy.

Goal 3 (Data and Monitoring) Summary

ACTIONS	RESPONSIBLE PARTY(IES)	STATUS	NOTES
3A. Conduct the target number of surveys (various types) needed to inform management	DNR, GLIFWC, Tribes	Ongoing	Desire for more creel surveys in all parts of the state
3B. Standardize population estimate and aging methodology and outputs across Wisconsin	WI Walleye Team, database manager		Handbook updates
3C. Continue to collect social data on walleye management preferences	Bureau of Environmental Analysis and Sustainability (DNR)	To be repeated at regular intervals	Next social survey targeted for 2030
3D. Engage with other professionals within DNR	WI Walleye Team	Continuous	
3E. Maintain walleye team member on the North Central Division Walleye Technical Committee	WI Walleye Team	Continuous	Team member Lawrence Eslinger currently chairs this committee
3F. Share management experiences with other agencies	WI Walleye Team	Continuous	Additional meetings are being scheduled with Minnesota DNR
3G. Develop and acquire tools to access, analyze, and visualize walleye data	WI Walleye Team, DNR Fisheries database staff, DNR IT staff		Some tools are available internally, but public-facing tools have yet to be approved for wide use
3H. Provide updates on research findings to managers	OAS/GLIFWC/WI Walleye Team	Continuous (annual)	Updates can also be shared with partners working on relevant projects

INFORMATION NEEDS
Can eDNA be used as a part of the monitoring picture for walleye in Wisconsin?
Updated length/weight data for Wisconsin walleye populations
Is there a relationship between walleye relative catch per effort and estimates of actual abundance that would be useful for managers?

PARTNERSHIP OPPORTUNITIES		
Description of need	**Prospective partners**	**How to get involved**
eDNA sample collection	UW, UWSP, lake associations	More information will be provided in the future
Supporting creel efforts outside of the Ceded Territory	Angling clubs, lake associations	Check with local biologist about potential creel surveys in your area that might need volunteers or funding support.
Citizen water quality monitoring	Lake associations, angling clubs	Find out if your waterbody has a citizen water quality monitoring program. Go here to find out and start one if it doesn't exist: https://dnr.wisconsin.gov/topic/lakes/clmn
Funding for special projects (reward tag studies, economic impact studies, creels, survey equipment)	Walleye clubs, lake associations, tournament organizers	Will vary based on area. Funding opportunities for larger projects may be brought to groups directly, others may be coordinated by local biologists.

Goal 4. Administer an outreach program aimed at developing an appreciation for the walleye/sauger fisheries of Wisconsin, promoting realistic expectations based on population status and biological potential, and creating roles for partners in conservation and management.

Outreach and public engagement are key elements of any successful fisheries management program. Outreach can be defined as information sharing with the public. For example, outreach would include sharing survey results or information on where anglers might want to fish. Engagement is how we involve the public and include their voice and preferences in management of *their* natural resources. The strategies outlined here are designed to adapt our walleye outreach and engagement strategies to a new communication landscape and work towards realistic expectations for walleye/sauger fisheries.

> ***"A good day on the water is not always filling a cooler full of fish"*** *comment from stakeholder at a meeting in Northwestern Wisconsin about anglers and expectations.*

Objective 4.1 Maintain pro-active public engagement in management of Wisconsin's walleye/sauger waters.

There are several established means for public engagement on fish management issues in Wisconsin, with the foremost being the Wisconsin Conservation Congress (WCC). We plan to continue to work closely with the WCC, including representation on the WI Walleye Management Team from WCC delegates and seeking input via advisory and rule change proposals. Other traditional input options include public comment periods on major planning efforts, issue-specific public meetings, and general communication with biologists. Tribes also have processes for engaging members on fisheries issues, which should continue to be supported.

We propose expanding engagement opportunities for walleye management beyond the traditional options. We will **provide regular or requested updates to the DNR's citizen-based Fisheries Advisory Council**. To maintain connections and information sharing, we plan to **maintain an email distribution list (GovDelivery) of interested walleye stakeholders**. The list of over 1,700 individuals and groups generated during our public input phase would be a suitable starting point and would help us to quickly connect with a diverse, statewide audience to share information on research results, partnership opportunities, and more. We also plan to **make an input form available on the DNR website where people can continuously share comments or suggestions** with our Walleye Management Team.

Objective 4.2 Improve public understanding of walleye/sauger biology, opportunities, and management strategies.

Our outreach surrounding this plan, and walleye management in general, will greatly benefit from a central hub for information. We propose **maintaining a dedicated page on the Wisconsin DNR website (dnr.wisconsin.gov) that can be the home for this plan and most of**

the public-facing resources we will create. This website should be updated continually as new resources become available.

We also want to meet walleye anglers where they already are. Strategies to reach walleye anglers might include signage at boat ramps, reports left at bait shops, and presentations at sport shows and club meetings. We also propose fully leveraging available technology to record and post presentations so they can reach a wider audience.

Better information on walleye fishing opportunities was an expressed desire from anglers across the state. *Wisconsin Walleye Waters* was a publication produced by Wisconsin DNR starting in 1971, but this book has not been updated for some time. We propose to **produce an updated version of *Wisconsin Walleye Waters***. Details on final format (print vs. online only) will need to be determined. Other information could be added to this resource that might help anglers contextualize walleye fishing experiences and management, such as recent population estimates and information about lake classes.

Relatedly, the Walleye Management Team will **support efforts to make survey, stocking, and opportunity information more available to anglers via online resources**. For example, a portal where survey data can be easily summarized and accessed by the public should be developed (this may end up being related to the *Wisconsin Walleye Waters* update). Such resources would help anglers explore walleye fishing opportunities locally and when planning destination fishing trips. The annual fishing forecast produced by DNR Fisheries will continue to be a good outlet to highlight projects and opportunities.

We are also interested in **seeking out high-influence information sharing opportunities**. One example would be the *Wisconsin Lakes Conference*, where we could disseminate information on walleye habitat to numerous lake leaders around the state. **Creating opportunities for the public to experience management through hands-on opportunities, such as field days and demonstrations,** will also be tremendously valuable. Information sharing through press releases, magazine articles, and newspapers will continue to be valuable. New media opportunities, such as YouTube and podcasts, may help us expand our message to a broader audience.

Goal 4 (Outreach and Engagement) Summary

ACTIONS	RESPONSIBLE PARTY(IES)	STATUS	NOTES
4A. Create and maintain email distribution list of walleye stakeholders	WI Walleye Team	Functional, but will need to be formalized	Can use list generated during outreach for this plan as starting point, convert to GovDelivery
4B. Maintain dedicated page on Wisconsin DNR website for walleye resources, including continuous input form.	WI Walleye Team, web specialists	Page exists, will need to be updated	Current management plan page can be updated to meet this need. Comments received through the form will be reviewed at least once annually.
4C. Create updated Wisconsin Walleye Waters resource	WI Walleye Team	Not yet started	
4D. Make survey and stocking data more available through online tools	WI Walleye Team, FM Database coordinator, GLIFWC	Tools are in development	Some tools already in late stages of development by both DNR and GLIFWC
4E. Hold field learning days to engage the public and stakeholders about walleye survey techniques and management	DNR, GLIFWC, and tribal biologists	Some already happening around the state	Should be done by region/work unit, collaborations between DNR and GLIFWC when possible

INFORMATION NEEDS
What other communication mediums should be emphasized for future outreach?
What role can partners play in amplifying our messages about walleye management (e.g. guides)?
What in-person events are best for reaching walleye anglers (ice fishing shows, general sport shows, etc.)?

PARTNERSHIP OPPORTUNITIES		
Description of need	**Prospective partners**	**How to get involved**
Funding to print and distribute Wisconsin Walleye Waters publication	Walleye clubs, tourism grants	Contact WI Walleye Team if interested in this project: max.wolter@wisconsin.gov

Goal 5. Develop, maintain, and continually evaluate walleye stocking strategies for Wisconsin waters to ensure that strategies are biologically sound and cost-effective.

In an ideal world, all fish populations would be supported by natural reproduction of wild fish. However, we know there are a variety of circumstances where stocking is needed to maintain and rehabilitate populations. Wisconsin has a long history of stocking walleye and stocking practices have evolved greatly over the years (see Appendix G for summary). It will be important to communicate to stakeholders that stocking is just *one* tool, not *the only* tool, to enhance and restore walleye populations. We heard strong support for stocking in our public input process, but also a desire to see stocking used only where biologically appropriate. The objectives and actions outlined below are aimed at coordinating the stocking efforts of the DNR, private groups, and tribes to ensure that stocking resources are being used appropriately and efficiently.

> ***"Stocking seems to be one of the most effective ways at maintaining a decent fishable population in some lakes. We must research why stocking is working in some lakes and why it is not in other lakes to try to replicate the success."*** *Comment from public input form*

Objective 5.1 Maintain the genetic integrity of naturally reproducing walleye populations.

Our understanding and application of conservation genetics has advanced greatly since the 1998 Plan. Current stocking practices identify several "genetic management units" (GMUs, see inset box) that are, in effect, boundaries for how we distribute stocked fish across the landscape (Bootsma et al. 2021). Currently, DNR facilities raise walleye representing the Chippewa River, Wisconsin River, Rock/Fox River, and Lake Michigan genetic management units. We currently rely on partners to help obtain walleye from the Mississippi mainstem genetic management unit. DNR currently does not raise walleye from the Lake Superior genetic management unit. However, we are hopeful that other partners (Bad River Tribe) may be able to help meet any existing demand.

What are "GMUs" and why do we have them?

Genetic Management Units (or "GMUs") are geographic areas where fish have similar genetic composition. In most cases, GMUs are major river watersheds that fish have evolved within (for example: Wisconsin River drainage). GMUs can be used to guide stocking decisions to ensure that the most genetically appropriate fish are being stocked. GMUs are useful for preserving natural genetic variation and maintaining evolutionarily derived traits that are important for population health.

Wisconsin DNR does not maintain captive walleye broodstock, but rather goes into selected waters of GMU's each year to take eggs from wild fish. This practice ensures that wild genetics are always available to our hatcheries. Selection of brood sources should be carefully considered. Ideal brood sources are sustained through natural reproduction, have a large population size, and are accessible to the associated hatchery. The two large DNR hatcheries in northern Wisconsin (Art Oehmcke, Woodruff and Governor Thompson, Spooner

hatcheries) have a rotation of 3 (or more) lakes, with several backup lakes available as well. Lake Michigan walleye are currently obtained from the Menominee River and raised at Wild Rose. Rock/Fox walleye are obtained from Lake Delevan. Additional brood sources for Lake Michigan and Rock/Fox walleye should be identified and added to a rotation if possible. We ask that tribal brood collection follow these same genetic protocols and some of the same brood sources may be used.

Private stocking should also follow these genetic standards. Maintaining an efficient and fair process for getting genetically appropriate stocking products to private and tribal stocking partners will be important going forward. Progress has already been made on this front in recent years, but WI Walleye Team and DNR Fish Culture will need to continue to develop the process and manage relationships with partners and stakeholders.

We recognize fish health (disease) risks associated with gathering gametes from wild or feral waters and demonstrate a commitment that the best disinfection protocols will be used to ensure healthy eggs are brought into our hatcheries and healthy fish are stocked from state, tribal, and private facilities.

Objective 5.2 Ensure that walleye stocking guidance incorporates the most appropriate biological and social factors when determining how state stocking resources are allocated

The DNR stocks upwards of 19.4 million fry, 1.4 million small fingerling, and over 500,000 large fingerling walleye annually (average from 2016-2020). This large volume of stocking across a broad and diverse landscape requires an effective priority system to coordinate distribution to the most appropriate waters. DNR's walleye stocking guidance was updated concurrently with the management planning process and we were able to benefit from our stocking discussions and comments received during the public input phase of this plan.

Some of the important factors for prioritization of stocking identified by stakeholders and partners include:

- Rehabilitation scenarios, where stocked walleye might help reestablish natural reproduction
- Effectiveness, or waters with high stocking survival
- Demonstrated use, or waters where angling or tribal harvest interest are high
- Proximity to population centers
- Tourism interest

Although our current stocking guidance emphasizes these areas, our understanding of them may change over time. For example, as the Wisconsin Walleye Initiative (discussed more below) evaluation progresses, we expect to learn more about stocking effectiveness. Those results, along with any other information relevant to stocking strategy and prioritization, should be incorporated into DNR stocking guidance. **Therefore, we propose to revisit and update our stocking guidance every five years, with 2026 being the next planned update.**

Objective 5.3 Ensure an integrated and efficient statewide propagation strategy incorporating state, federal, tribal, private, and cooperative producers

Stocking in Wisconsin is a partnership of state, coop, tribal, federal, and private efforts (Figure 8). This can create challenges to coordinating an effective statewide program that delivers appropriate stocked products to the waters that will benefit most.

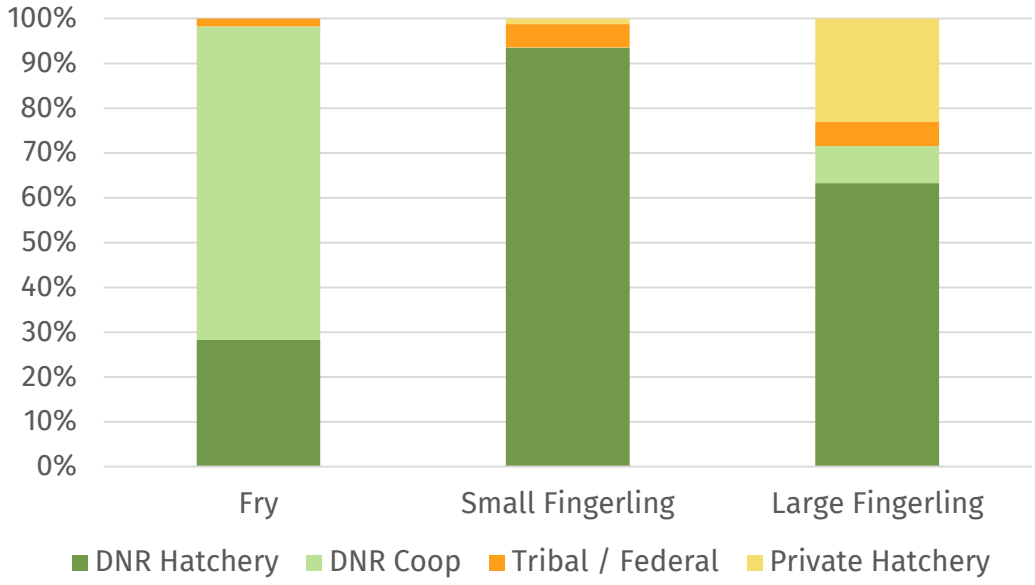


Figure 8. 2019 walleye stocking in Wisconsin by stocking source (Note: 2019 data is shown as it is the most recent data that is uninfluenced by COVID disruptions). Totals for each stocking product in 2019 are 13.8 million fry, 2.3 million small fingerlings, and 854,000 large fingerlings.

DNR biologists should work at a local level with non-DNR entities to identify any unmet stocking needs or opportunities in their area. DNR stocking plans are usually set relatively early in the calendar year, allowing time for partners to coordinate their own activities after communicating with biologists.

We also propose to jointly develop resources to help DNR biologists and Fish Culture staff, private groups, and tribes stock more effectively. We will **create a "stocking best practices" resource** based on scientific literature and learned experience. Within this document we can address questions groups commonly have about how to stock effectively (timing, rates, sizes, need for scatter planting, etc.). This document will also help determine if stocking is the most effective tool in given circumstances. This will be made available via the DNR website. **We will also ask DNR biologists and Fish Culture staff to carefully review stocking instructions** (location for stocking, timing, other important factors) for individual lakes to ensure that stocking plans are sound and efficient.

It should also be understood that decisions made about stocking can have economic impacts on local communities and private growers. These impacts should be considered at any juncture where stocking decisions are being made. Better engagement with the business community (see pages 64 and 71) will provide insights into these economic components of walleye management and stocking.

During the process of updating this plan we discovered numerous errors and omissions in our internal historical stocking database. **Stocking data should be reviewed, and the database corrected to provide a better record of stocking history.**

Objective 5.4 Ensure walleye stocking does not have a negative influence on lakes with naturally reproducing walleye populations and make recommendations on when to stock in waters with declining natural reproduction.

Walleye stocking should be used selectively where the most benefit will be realized. Similarly, walleye stocking should be avoided in instances where effects could be negative. Stocking on top of natural reproduction has been shown to be inefficient at best, and harmful in some cases (Li et al. 2011). Stocking should be avoided in lakes where sufficient natural reproduction has been documented to preserve important genetic traits. Lakes with young-of-year catch rates greater than 15 per mile should not be considered for stocking. **A list of naturally reproducing walleye waters should be maintained** to build understanding of where stocking is not needed and why.

There may be situations where natural recruitment has been shown to be declining and stocking is being considered as a rehabilitation strategy. Stocking could be initiated after five years of depressed natural reproduction (at least 3 surveys in 5-year span, all surveys below 15 young of year per mile cutoff).

Sex-ratio of stocked walleye has emerged as an issue of concern in recent years. Examination of large fingerling walleye produced at the Governor Thompson Hatchery in Spooner and the Art Oehmcke Hatchery in Woodruff in 2020 indicated sex ratios that were skewed towards females. This discovery prompted several immediate actions by DNR, including evaluation of hatchery practices and additional histological sampling of walleye produced at hatcheries (some tribal hatcheries are being included in that sampling). Investigations into this issue are ongoing as of the drafting of this plan. Until resolved, **sex-ratio of stocked products (and resulting adult populations) should be carefully monitored** to ensure that stocked fisheries mimic natural sex-ratios to the greatest extent possible. This may also require more **investigation into the sex ratio of natural populations and the importance of sex ratio in driving successful natural reproduction in the wild.**

Objective 5.5 Examine the cost effectiveness and efficiency of current walleye propagation and stocking practices and make recommendations for future operations

DNR Fish Culture staff are constantly searching for ways to improve efficiency and develop cost savings when producing fish for stocking. Still, raising fish is an endeavor with many built in expenses. Performance of fish in the wild provides the other half of the cost-benefit equation. The most efficient stocking is achieved when rearing is done in the most affordable manner and performance/survival of stocked fish is high.

There have been numerous stocking evaluations in Wisconsin and elsewhere that have informed current stocking practices (Fielder 1992 and Jennings et al. 2005, Jacobson and Anderson 2007, to name a few). However, one of the largest-ever stocking evaluations is ongoing. The Wisconsin Walleye Initiative has been in place since 2013 and has resulted in the stocking of over 4.2 million large fingerling walleye through 2020 by DNR and partners. An

evaluation framework is in place to determine the success of these stocked fish in lakes across the state. This evaluation will run through the year 2027. The data generated from this evaluation will have huge implications for our stocking strategy and will **inform our understanding of stocking effectiveness and efficiency** (particularly when it comes to stocking rate and types of lakes where large fingerling stocking is successful). Stocking guidance will be updated to reflect results of this evaluation. Consideration will be given to the success of stocked walleye in restoring natural reproduction as well as overall survival. **Smaller scale stocking evaluations that might include other hatchery products should also be supported**, along with studies that might improve probability of restoring natural reproduction or production efficiency.

Fry have historically been a significant component of the walleye stocking portfolio in Wisconsin and remain the primary walleye stocking product in neighboring states (See Appendices E and G). Currently, fish health protocols do not allow for fry to be hatched and stocked from most DNR facilities as it is not possible to complete the necessary health testing during that life stage. At this time, the only walleye fry being stocked in Wisconsin are the product of lakeside rearing facilities, often run by partners (see walleye wagons section on pages 67-69), where walleye gametes are never officially removed from the source waters. We have not documented a strong desire from local biologists or the public to return to fry stocking in most scenarios where other stocking products are now being used. Still, there may be select circumstances where the option for DNR fry stocking would be beneficial (research, specific lake types where it might be cost-effective, rehabilitation scenarios). Similarly, field transfers of adult fish may have niche utility, especially in rehabilitation scenarios. Transfers are also challenging because of health testing requirements and timing. Changes in fish health policies, currently overseen by the Department of Agriculture, Trade, and Consumer Protection (DATCP), would be necessary for fry stocking to resume from DNR hatcheries and field transfers to be a more feasible option.

Common walleye stocking products defined

Fry are stocked shortly after hatching (in spring or early summer) when they are still less than a half an inch in length. Fry are typically stocked at a very high rate, sometimes thousands per acre, because only a small percentage are expected to survive. Fry are the least expensive to produce.

Small fingerlings are stocked in early summer and are reared on zooplankton. They average 1.5-2.5 inches in length at time of stocking and are typically stocked at a rate of 35 per acre.

Large fingerlings, sometimes known as "extended growth" fingerlings, are initially fed zooplankton and are then fed minnows. They are stocked at 6-8 inches of length in the fall. They are stocked at lower rates (often 5 or 10 per acre), due to assumed higher survival compared to other products, however they are more expensive to produce.

Objective 5.6 Increase public understanding on stocking effectiveness and alternative actions

From our public input we know stocking is a very popular management activity. The appeal of adding fish is very simple and powerful. But decades of fisheries management and research have shown that end results of stocking are usually much more complex than many in the public may understand initially. Stocking survival can be very low in many situations. There

may also be times where stocking is the selected tool, based on its popularity, but it does not actually address the management issue (e.g. habitat is limiting for walleye).

The outreach surrounding this plan should emphasize that stocking is just one of several tools available to biologists and partners. We must **communicate the realities of stocking and highlight other productive initiatives groups can undertake to improve walleye populations and/or the associated fish community**. We propose adding this kind of information to the "stocking best practices" resource, which should be used to educate groups interested in stocking.

Goal 5 (Stocking) Summary

ACTIONS	RESPONSIBLE PARTY(IES)	STATUS	NOTES
5A. Update stocking guidance every 5 years	WI Walleye Team	Next update in 2026	
5B. Update list of naturally reproducing walleye waters and make available to partners	WI Walleye Team	Annual	
5C. Create a best stocking practices resource that also discusses stocking limitations	WI Walleye Team, DNR Fish Culture	Not yet started	Target fall 2022
5D. Complete Walleye Stocking Initiative evaluation	WI and GLIFWC?	Ongoing	Evaluation scheduled to run through 2027 to sample all target lakes
5E. Monitor sex ratio of stocked products	WI and tribal hatcheries	Already in progress	Tribal hatcheries can be included in this effort

INFORMATION NEEDS
Investigate sex ratio of stocked products and better understand the role of sex ratio in reproductive success
What is the most efficient stocking rate for large fingerling walleye?
What rearing practices are most effective for contribution to natural reproduction?
How does stocking success vary across lake classes?
How does catch rate of stocked fingerlings at age-1 correlate to adult population abundance later?
How does timing of fry stocking contribute to the ultimate success of a year class?
Is predator avoidance a factor in success of stocked products, and can such traits be selected for in hatchery practices?
Does thermal tolerance differ among walleye stocks in Wisconsin, and what implications does that have for climate change?

PARTNERSHIP OPPORTUNITIES		
Description of need	**Prospective partners**	**How to get involved**
Work with local biologists to coordinate private and tribal stocking activities	Tribal conservations staff, lake associations, walleye clubs	Contact local biologist to find out about local stocking opportunities and acquire stocking permits
Raise walleye from genetic management units not being raised by DNR or other hatcheries	Tribal or federal hatcheries, support from lake associations or fishing clubs	Current need exists for Lake Superior GMU
Volunteer to mark or tag walleye as a part of stocking evaluations	Individuals or groups	Contact local biologist for projects in your area.

Goal 6. Strengthen and establish partnerships with tribes, private groups, fishing industry representatives, and local units of government to increase management capacity

Effective partnerships will be fundamentally important to help meet the challenges of effective walleye management and accomplish the ambitious work detailed in this plan. In this goal, we lay out some principles for effective partnerships.

> ***"I would like to see more efforts like on the Minocqua chain. Cooperative efforts between the DNR, tribal agencies, and public stakeholders has made a great turnaround in a very short time period. If those kind of efforts could be expanded to other heavily exploited waters there should be enough walleye for both sport and tribal anglers."*** *Comment from our public input form.*

Objective 6.1 Work with the sovereign tribes in Wisconsin to enhance walleye resources

The sovereign tribes of Wisconsin are key partners in resource management. The six Bands of Lake Superior Ojibwe retain off-reservation tribal harvest rights from the Treaties of 1837 and 1842 and walleye are the main species harvested in these Treaty subsistence fisheries. Tribal communities across the state have a long-standing value of preserving resources for at least seven future generations. Tribes within and outside of the Ceded Territory also manage on-reservation waters, many of which contain walleye. In this plan, we recognize that partnering with tribes is critical for protecting walleye populations through the seventh generation. We are committed to working with tribes to improve and protect walleye populations and recognize that tribes have additional management interest and authority in on-reservation waters. As such, tribes are highly engaged in the management of shared fisheries resources in northern Wisconsin.

To foster partnerships with tribal communities, mutual respect and effective communication on shared Ceded Territory walleye populations, management issues, and populations of concern is critical. As walleye management moves into the future, additional and unanticipated challenges are likely to appear. A relationship that is built on open and honest communication will help strengthen the partnerships and provide the foundation to meet these challenges.

We had productive meetings with tribal leaders and communities as a part of this planning process, and we have identified several areas where our plan can directly address tribal concerns (see contaminants on page 33 and stocking best practices on page 46, as examples). Expanding opportunities for partnership between the state, tribes, and private groups will benefit the overall walleye management program and was a concept that was strongly supported by the public.

There are numerous local examples of partnership between tribes, DNR, and private groups to improve walleye populations (such as: Sand Lake, Sawyer County, Kentuck Lake, Vilas/Forest County, and the Minocqua Chain Oneida County). The Walleye Lakes of Concern pilot project (discussed more in Goal 7 and Appendix H) is an excellent example of what

partnership might look like going forward. Here, tribes voluntarily agreed to reduce walleye harvest and very restrictive angling regulations are being applied to four lakes where more dedicated restoration strategies are needed. The tribes and the state will also jointly develop and share the load for implementing other rehabilitation strategies and monitoring these populations as they hopefully begin the road to recovery. These kinds of well-coordinated partnerships should be promoted elsewhere, and efforts should be made to better define the role of other partners.

In our conversations, tribes repeatedly highlighted the amount of time it takes for angling regulations to be changed as a barrier to effective partnership. The typical 2-4-year process of implementing more restrictive angling regulations to protect a walleye population in decline is a major point of frustration (consider also, that because lakes are surveyed on rotations, issues may not be detected immediately either). An inequity occurs because tribal harvest can be altered almost instantaneously in response to an identified issue, while angling regulation changes have a lag. Emergency rules provide a faster rule change avenue and have been used in recent years but may not be the preferred tool for frequent or wide-spread regulation changes in response to population declines. We discuss rule change timeliness more on pages 69-70. Any means to update our regulatory processes to become more responsive, particularly when populations are in serious decline, will create more effective partnership opportunities with tribes.

An additional area where partnerships can be enhanced is the incorporation of traditional ecological knowledge (TEK) into our management process. **Developing spaces where TEK from elders, Voigt Taskforce representatives, harvesters, and tribal conservation staff can be shared** with biologists, administrators, and anglers and be “braided”” into our decision-making framework with other knowledge systems will be beneficial. TEK can be especially valuable when it comes to complex ecological issues, understanding context of environmental issues, or areas where we have little empirical data from other knowledge systems to support decisions.

6.2 Work with private groups and individuals to create greater capacity for walleye/sauger management activities

Walleye clubs, lake associations, and other conservation-focused organizations provide another powerful type of partnership opportunity. These grassroots groups are enthusiastic about projects to monitor and enhance walleye/sauger populations, and can provide volunteer labor and fundraising help, among other resources. One method for kickstarting partnerships is this plan itself, which outlines explicit partnership opportunities within each

goal and subject area. We have also **created a "Resources for Prospective Partners" information area** (see Appendix F).

Channeling the resources and energy of private groups into meaningful projects is one of the main challenges inherent to partnering on walleye projects. This requires continued and effective communication and expectation setting. Compromise and adaptability among groups is often required as well.

What sorts of things are private partners already doing to support walleye management?

There is so much great work already being done by private partners, including: volunteer water quality monitoring, AIS prevention activities, habitat projects, assisting with fish surveys, amplifying DNR messaging and meeting notices, supporting (or opposing!) regulation change proposals, advocating for healthy land use and watersheds, and more!

In other words, there are lots of ways for you or your organization to get involved and help walleye succeed!

Historically, groups have been highly engaged in stocking, and there are cases where this is the most effective use of their time and money. But many waters may require other management actions that are more complex, less inherently popular than stocking, and often more expensive. It will be incumbent on the WI Walleye Team and local biologists to communicate the importance of these kinds of projects and clearly define the various roles that partners can play. This may include connecting groups to walleye-related projects that are seeking funding through email distribution lists (a recent example included private funding support for research on links between aquatic plants and fish communities).

Most volunteer activities are organized at the local level and not at the statewide scale. Groups or individuals interested in volunteering or partnering on local walleye projects should contact the DNR biologist in their area. Biologists should, in turn, take advantage of those opportunities when possible and seek out new partnerships with groups interested in walleye management.

Goal 6 (Partnerships) Summary

ACTIONS	RESPONSIBLE PARTY(IES)	STATUS	NOTES
6A. Incorporate Traditional Ecological Knowledge into management	DNR, GLIFWC, Tribes	Continuous	This is often done informally
6B. Manage and update the "resources for prospective partners" document	WI Walleye Team	Continuous	Available in Appendix F. Links may need to be checked, added, or updated over time
6C. Maintain open lines of communication between partners	DNR, GLIFWC, Tribes, Lake groups	Continuous	

INFORMATION NEEDS
What are the most appealing kinds of projects for private partners?
Is it possible to use a broad collective of organizations to fund projects/research with statewide significance?

PARTNERSHIP OPPORTUNITIES		
Description of need	**Prospective partners**	**How to get involved**
Join a group that partners in walleye management in Wisconsin!	Any individual	See Appendix F for a list of clubs and organizations dedicated to walleye
Find a project your group is passionate about to support	Fishing clubs, lake associations, tournament organizers	See Appendix F for resources
Contact your local fisheries biologist to hear about opportunities specific to your area	Groups or individuals	Go here to find the contact information for the biologist(s) in your area: https://dnr.wisconsin.gov/topic/Fishing/people/fisheriesbiologists.html

Goal 7. Work toward long-term sustainability of walleye populations by maintaining population and ecosystem resiliency and developing effective rehabilitation strategies

The objectives within this section attempt to address recruitment failure and other serious factors leading to walleye population decline and maintain resilient and sustainable populations. The objectives are designed to create a logical workflow: educate stakeholders on how climate change and other stressors are influencing walleye, identify lakes that are resilient to environmental stressors, determine management direction for lakes based on that resiliency, and apply lake-specific, collaborative and adaptive actions to rehabilitate populations where necessary.

Objective 7.1 Communicate the influences of climate change on walleye populations and aquatic ecosystems that support walleye

> ***"Still having naturally reproducing walleye in Wisconsin in the year 2100"*** *Suggested goal from a stakeholder during one of our public input meetings*

It has become clear that climate change in combination with other stressors is now the defining management challenge for walleye (Hansen et al. 2017, Rypel et al. 2019). Climate change can affect walleye habitats in numerous ways, including warming water, changing water clarity, mismatches between spawning and prey availability, and altering precipitation patterns (Wisconsin Initiative on Climate Change Impacts, GLIFWC Climate Vulnerability Assessment). Other climate-driven influences were noted by stakeholders during our input process, including large flooding events filling in deep holes on rivers that used to hold walleye, mismatches between spring runoff and walleye spawn timing in rivers, and more favorable conditions for detrimental aquatic invasive species and competitor species to walleye.

5 ways climate change is already influencing walleye

Creating more inconsistent spawning conditions

Making lakes clearer than walleye prefer

Creating extreme precipitation events that can alter riverine habitats

Negatively influencing recruitment of important prey species, like yellow perch

Communicating the links between climate change and the cumulative influence of walleye population stressors will be a necessary yet challenging step towards development of solutions and mitigation strategies, particularly since this issue is not well-recognized by the public. In our mail/online survey, anglers ranked climate change very low (10th ranking) in comparison to other threats such as overharvest and invasive species.

We propose to **create a public-facing summary of climate-related influences on walleye/sauger (and/or contribute towards similar project by partners)**. Understanding and communicating the human influences (cultural, economic, loss of opportunities) should also be central to messaging on climate, particularly as it pertains to environmental justice. Understanding **climate influences should be tied to research priorities** for DNR and research partners.

Results of past and future research on climate should be communicated to stakeholders in ways that are effective at building consensus and action, not courting controversy or creating despair. We plan to work with the American Fisheries Society and their Climate Ambassador Program, Wisconsin Initiative on Climate Change Impacts, Extension, Midwest Glacial Lakes Partnership, University of Wisconsin, GLIFWC Climate Change Program, the USGS Midwest Climate Adaptation Science Center, the Wisconsin Lakes Convention, SeaGrant, and other trusted organizations and partners to **develop communication strategies surrounding climate impacts**.

Objective 7.2 Understand elements of population resiliency and classify walleye populations accordingly

Resiliency based on Lake Water Quality

The physical, chemical, and environmental characteristics of lakes, and their associated watersheds, determine their ability to support and sustain viable walleye populations, as well as their susceptibility to climate change. The physiological requirements of walleye are best met in lakes with an abundance of coolwater habitat (Raabe et al. 2020). Water temperature and dissolved oxygen profile data in lakes are necessary pieces of information to identify waters with greater amounts of coolwater habitat.

Walleye have a *tapetum lucidum*, a specialized structure within their eyes which makes them sensitive to light, but also gives them a competitive advantage over other species in low-light conditions (Raabe et al. 2020). Lester et al. (2004) found an optimum water clarity for walleye productivity of about 2m (6 ft) Secchi depth. The water clarity – water temperature relationship defines the thermal-optical habitat area (TOHA) available to walleye within

lakes. Lester et al. (2004) found that walleye production increased proportionally with TOHA in association with lake nutrient levels.

Water temperature, dissolved oxygen, and water clarity data needed to estimate TOHA are being collected by a variety of partners (internal and external). **Identification of the data needs, and standard methods to acquire these data to analyze these critical walleye habitats within Wisconsin lakes should be developed by the Walleye Team**. Upon completion, these needs and recommended collection protocols should be communicated directly to all partners in hopes of acquiring the necessary information to identify optimal walleye habitat areas in lakes.

Resiliency based on Physical Lake Attributes

Physical lake characteristics have also been found to be influential in sustaining viable walleye populations. Walleye were originally native to large river and interconnected drainage lake systems in Wisconsin (Becker 1983) prior to the wide introduction and establishment of walleye populations via stocking. In Wisconsin and throughout the Midwest today, walleye tend to be most successful in large river systems that often include reservoir systems and interconnected lakes (Raabe et al. 2020). As such, fish passage barriers may also play a role in accessibility to a variety of critical habitats (see Goal 1).

Walleye generally perform better in larger lakes compared to smaller ones (Nate et al. 2000 and 2001, Hansen et al. 2015, Raabe et al. 2020). Larger lakes are thought to have the ability to harbor higher abundances of walleye because of having greater habitat and food web complexity necessary to support each walleye life stage (Raabe et al. 2020). However, Raabe et al. (2020) also identified that walleye may just need the space within lakes, not already occupied by other competitors and predators to succeed. Smaller lakes can still harbor sustainable walleye populations; however, lake habitat and fish community characteristics need to be much more simplified in those cases for walleye to thrive (e.g. Johnson et al. 1977).

Methods are needed to identify the availability of high-quality walleye spawning and nursery habitats to differentiate lakes with respect to the amount of habitat present to support these critical early life stages (see also Goal 1). This will further allow for identification of more walleye resilient lakes. Field assessments to determine high quality walleye spawning habitats are time intensive, and potentially impractical on a large scale within a timely manner. Nonetheless, the Walleye Team should evaluate what related data are available, and what efforts have been made (e.g. critical habitat designations, nearshore substrate inventory) with an objective of **recommending an approach to quantify walleye spawning habitat across lakes**.

Resiliency based on Fish Community Characteristics of Lakes

The Technical Working Group (TWG) maintains an annually updated walleye classification system to assign walleye recruitment source as either being natural, stocked, or a combination of natural and stocked sources for walleye waters in the Ceded Territory of Wisconsin. **The Walleye Team should consider classifying all walleye waters statewide using the same (or similar) classification system.** This would be advantageous for providing a historical record of walleye recruitment source, which provides ease for quickly identifying

long-term self-sustaining walleye populations (through natural reproduction) vs. those that have had an extensive history of needing some level of stocking to be sustained.

All waters have a limited amount of fish biomass (e.g. pounds of fish) they can support. This reality highlights the fact that fish species are going to interact through competition for those available finite resources (e.g. space and food). Winners and losers will emerge, where the species best supported by the lake habitats (chemical and physical) and dominant fish community members will prevail over the long-term. Acknowledging this, understanding positive and negative species interactions with walleye will aid in identifying lake fish communities that are more conducive of supporting and sustaining resilient walleye populations. Interactions across trophic levels are just as important. Relatively high levels of annual young-of-year yellow perch production is a key characteristic in many sustainable walleye populations that may indicate greater resiliency.

Conclusions on Walleye Resiliency

Using the information incorporated above, the **DNR Walleye Team will develop a Walleye lake classification system that identifies the most resilient lakes** predicted to foster the appropriate physical, chemical, and biological conditions necessary for walleye to thrive under anticipated climate change projections. GLIFWC has developed a similar program that could be adopted or be the basis of how DNR approaches this task. Several modeling efforts such as Hansen at al. (2015) and Hansen et al. (2017) will also provide highly relevant data.

Objective 7.3 Develop management direction for individual waters based on expected climate resiliency

Once lakes have been classified based on their expected resiliency, decisions may need to be made about management direction if the factor(s) negatively influencing walleye are within direct managerial control. This is management using the Safe Operating Space (SOS) concept. The SOS concept acknowledges factors outside of managerial and identifies factors that can be controlled to keep walleye in a SOS (Carpenter et al. 2017; Hansen et al. 2019). It is important to note that lakes shown to have low resiliency may not necessarily see formal walleye management end, but the mode of operation may change in the near- or long-term future.

The Resist-Accept-Direct framework (Schuurman et al. 2020, 2021; Lynch et al. 2021; Thompson et al. 2021) may also provide a logical means for determining management direction for walleye waters at various points along the spectrum of expected resiliency. A summary of each direction is provided below (Table 4), along with possible examples of management response.

Table 4. An outline of the Resist-Accept-Direct management framework with theoretical examples for Wisconsin walleye.

DIRECTION	WHAT IT MEANS	WHAT MANAGEMENT MIGHT LOOK LIKE
Resist	Resisting the trajectory of change, maintaining current, or restoring historical conditions	Using available tools to protect habitats and populations that continue to have strong natural reproduction Intensive rehabilitation strategies to restore natural reproduction where it is deemed feasible
Accept	Accept the trajectory of change, do not try to intervene	Accept that some waters may not have natural reproduction and may become stocked fisheries Accept that some waters may be better managed with other species as the focal point in the fishery
Direct	Direct the trajectory of change towards desirable outcomes	Identify waters that can be highly productive stocked fisheries, even under expected climate outcomes Identify opportunities to provide fisheries for other popular species

We expect these decisions to be very difficult. We also strongly emphasize that decisions should not be made without considerable tribal and stakeholder input, as the options outlined above could, in some cases, lead to significant changes in management direction. These conversations and decisions should happen at the local level (as opposed to being "handed down" statewide).

The WI Walleye Team will do whatever is needed to assist local biologists as they evaluate and determine management direction for their individual waters. This may include collaborating with other DNR species teams to identify areas of overlapping interest, summarizing relevant studies and case histories that might provide management roadmaps, and offering expert consultation.

Objective 7.4 Develop rehabilitation strategies that meet environmental challenges walleye face today

New strategies may be needed for walleye populations experiencing recruitment decline, but where other habitat conditions appear to be resilient and suitable (these lakes would fall into the "resist" category described in Table 4). Currently, typical rehabilitation efforts would include more restrictive angling regulations (18" minimum length limit, 3-daily bag limit most common), large fingerling stocking, and in some cases more liberal regulations for competitor species such as largemouth bass. This combination of actions has not been sufficient to restore natural recruitment in most cases (unpublished data from ongoing DNR bass x walleye study).

Integrated and adaptive approaches will likely be needed to rehabilitate walleye populations where they have declined. Rehabilitation programs should seek to improve natural reproduction using a variety of strategies in concert. Adaptive management approaches should be considered, so that managers and partners are able to adjust rehabilitation efforts based on observed population responses. Indeed, more conservative harvest management

approaches for rehabilitation scenarios were well supported by the public based on results of our mail survey. Majorities favored the temporary use of 28" minimum length limit/1 daily bag limit or catch and release regulations to rehabilitate populations (closing fishing altogether was not supported). Conservative harvest strategies and protection of habitat may be needed even on lakes that are not part of an active rehabilitation project to prevent harvest and development pressure from causing these walleye populations to decline as considered in Post et al. (2008).

The "Walleye Lakes of Concern" (WLOC) pilot plan currently in development for four lakes in Vilas and Oneida counties may offer a template for other rehabilitation efforts. A more detailed summary of the plan's history and development to date are offered in Appendix H. The goal of the plan is to restore natural reproduction in waters where it historically occurred and contemporarily seems most feasible. Current WLOC lakes were carefully selected by DNR and GLIFWC biologists and Lac du Flambeau Band of Lake Superior Ojibwe (LDF) representatives, with input from local lake groups and WCC. The restoration strategy for the pilot lakes incorporates planned harvest reductions in the angling and tribal fisheries, stocking, and habitat monitoring and enhancements (if deemed feasible). Fish population monitoring efforts will also be increased as feasible. Other rehabilitation strategies that could be considered in future WLOC efforts might include, but would not be limited to, more liberalized regulations for other species, alternative stocking strategies/sizes/frequencies (possibly including fry stocking or field transfers), and habitat improvements/rehabilitation.

The WLOC plan could be expanded beyond the four pilot lakes. This will only be possible with continued partnership between the tribes, DNR, and other stakeholders from lake selection through implementation.

We propose adding up to 12 more lakes to the WLOC plan by 2024. Lake selection must be made carefully, and should consider the overall quality of habitat, expected lake and watershed resiliency, and the previous strength of natural reproduction and adult density, along with social concerns. Each lake included in the WLOC plan should have lake-specific prescriptive actions to maximize odds of restoring natural reproduction using all available tools. This may at times require applying strategies that are "outside of the box" compared to typical management responses. The WLOC plan will need to be highly adaptive, to incorporate new information from research and observed results, and incorporate new strategies that may emerge. Population responses to WLOC prescriptions are unlikely to be immediate. Each water should be evaluated for a minimum of 10 years.

If rehabilitation efforts on WLOC waters show positive results, those strategies could be applied on other waters meeting similar habitat requirements. Ultimately, we may be able to produce some "best management practices for rehabilitation" based on what is learned.

Goal 7 (Resiliency and Rehabilitation) Summary

ACTIONS	RESPONSIBLE PARTY(IES)	STATUS	NOTES
7A. Create a public facing summary of climate impacts on walleye/sauger	OAS	Not started, but some info available	Some information already available through Wisconsin Initiative on Climate Change Impacts
7B. Communicate climate impacts on walleye	WI Walleye Team, Office of Communications	Continuous	Several appropriate outlets
7C. Classify walleye waters based on resiliency and recruitment source	OAS, WI Walleye Team	Not started, but some info available	Several data sources available to start this effort
7D. Develop information needs and protocols to collect data for describing thermal optical habitat	WI Walleye Team, OAS	Not started	Can work with Minnesota researchers who are undertaking similar efforts
7E. Develop management direction for individual waters based on resiliency	DNR and GLIFWC biologists, with support from OAS and WI Walleye Team	Ongoing	This will be a long-term activity with no specific completion date
7G. Develop Walleye Lakes of Concern Plan and rehabilitation strategies	DNR, GLIFWC, tribes, other groups	Pilot has begun	Four lakes currently enrolled. Other lakes could be added over time.

INFORMATION NEEDS
What are the most effective methods for rehabilitating walleye populations in decline?
What are the most palatable alternatives to managing for walleye (i.e. other species) for waters that may not be resilient to climate change?

PARTNERSHIP OPPORTUNITIES		
Description of need	**Prospective partners**	**How to get involved**
Communicate the importance of healthy watersheds to maintain climate resiliency	County Conservationists, lake leaders, other conservation groups and stakeholders	Go here or here for more information that can be shared and to find resources.
Develop Lakes of Concern Program	Tribes, GLIFWC, Lake leaders, other conservation groups	Look for information locally as the program is developed
Gather data to quantify thermal-optical habitat	Lake associations, walleye clubs, tribal conservation staff	More information will be shared as protocols are developed

Statewide issue statements and actions

Invasive species influences and prevention

Aquatic invasive species (AIS) have incredible potential for disrupting and altering ecosystems (Latzka et al. 2016). Several AIS that have already been observed in Wisconsin can be particularly detrimental to walleye. Rainbow smelt have been shown to reduce walleye recruitment when they become established in lakes (Mercado-Silva et al. 2007). Zebra and quagga mussels can filter planktonic organisms in the water column, reducing available prey for critical life stages of walleye and changing water clarity/optical habitat (Hansen et al. 2020). Preventing the spread of these and other AIS will be critical to maintaining walleye stocks throughout the state. The DNR and other partners already have a detailed AIS prevention and management program (link here). This plan supports those efforts. Messaging specific to the influences of AIS on walleye may be powerful since the species is popular and effects of certain AIS on walleye are well documented. The WI Walleye Team should work with AIS coordinators to develop such messaging.

Dam Escapement

Escapement of reservoir walleye over dams is a known issue that can have management significance. In some cases, escapement of walleye may be comparable to other sources of mortality and can structure population abundances (Weber and Flammang 2018). Although, in many instances, popular downstream fisheries are supported by escaped fish. Escapement of walleye is positively related to spring water discharge rates (Weber et al. 2013). Solutions to escapement are few but may include barrier netting or other screening methods. Non-physical barriers including strobe lights, sound, and bubble curtains have been evaluated but have shown limited success and are challenging to implement (Flammang et al. 2014). Passage structures that allow upstream return movements of escaped fish may be feasible in select situations. Using stocking locations that are further away from dams may be beneficial, but our understanding of the effectiveness of that strategy is mostly anecdotal. Managers and other partners should, at minimum, be aware of escapement as a factor influencing dynamics of reservoir walleye populations. Prevention methods will need to be determined on a case-by-case basis.

Sauger Management

Sauger were not included in the 1998 Plan, but this important species is included throughout this updated plan. Stakeholders expressed very positive views of sauger in areas of the state where they exist and 73% of anglers in our mail/online survey said they get the same satisfaction from catching sauger as they do walleye. Sauger are often a harvest surrogate when walleye are not biting or legal length walleye are not being caught. The most notable sauger fisheries in the state are found in the Mississippi and Lower Wisconsin rivers, where they can be abundant and occasionally reach great size. Stakeholders familiar with some of these high-profile waters have noted declines in sauger catch rates that seem to correspond to increasing water clarity, which is very much in line with their biology (Becker 1983). This warrants further exploration, and an **analysis of sauger population trends should be completed**. Sauger are rarely stocked in Wisconsin (except for a sauger enhancement effort

on the Winnebago system being conducted by Walleyes for Tomorrow), leaving habitat management and regulations as the two most direct tools to influence populations.

Sauger generally benefit from the same types of habitat management strategies as walleye, including:

- Maintaining or restoring connectivity in riverine systems
- Maintaining and developing suitable overwintering habitat
- See pages 21-27 for more discussion of habitat objectives

Sauger regulation strategies currently vary regionally (Table 5). Season dates are consistent between walleye and sauger on all major waters. A combined bag limit approach is used in all cases, but there are waters where only a designated number of one species can be included in the total bag. Length limits vary by species, likely reflecting the differing biology and growth rates. The following considerations should be considered by biologists setting regulations in waters where sauger are a part of the fishery:

- Season dates should be consistent between the two species.
- A combined bag limit approach is generally appropriate.
- Walleye x sauger hybrids (or "saugeye") should be considered sauger for the purposes of setting regulations due to difficulties in identification. This will more often give the angler the benefit-of-the-doubt since length limits for sauger are usually smaller.
- Differing length limits are appropriate only if supported by population data (growth rates, mortality rates, age at maturity) for both species. Signage and outreach to aid in species identification may need to accompany these regulations.
- "Carve outs" that would allow for the harvest of trophy-sized sauger could be considered. For example, the current 20-28" length limit on the middle portion of the Wisconsin River forces anglers to release trophy sauger, including a potential new state record. Less restrictive upper length limits for sauger would be considered if population data also support such a regulation.

Table 5. Angling regulations for walleye and sauger for large Wisconsin waters where both exist. See the Wisconsin angling regulations for more detail on regulations for individual waters.

WATERS	LENGTH LIMIT	DAILY BAG LIMIT	SEASON
Lake Superior	Same, 15" minimum	5 combined	Same
Lake Michigan and Green Bay	Same, 15" minimum	5 combined	Same
Mississippi River and other WI-MN and WI-IA border waters	No minimum for sauger, 15" minimum for walleye with other length restrictions that vary by pool	Combined, varies by pool	Same
Lake Winnebago System	Same, no minimum	3 combined, only one may be sauger or hybrid	Same
Wisconsin River upstream Prairie du Sac Dam	Same, 15" minimum, no harvest 20-28", 1 over 28"	5 combined	Same
Wisconsin River downstream Prairie du Sac Dam	18" minimum for walleye, 15" minimum for sauger and hybrids	3 combined	Same

Walleye Fishing Tournaments

Approximately 60+ permitted tournaments specifically targeting walleye are held in Wisconsin annually. Other tournaments may not be walleye-specific but still may include walleye as one of several targeted species. Tournaments were a frequent topic of discussion and comment during our public input gathering. Many anglers and local communities recognize walleye tournaments as an economic benefit. However, there are also concerns about influences of tournaments on walleye populations due to unintentional mortality under "catch-hold-release" tournament formats (where fish are held, transported to a weigh in site, then released). Mortality of walleye caught and held in these traditional tournament formats can be relatively high, both initially and delayed, and is influenced by predictable factors such as water temperature (Table 6). Tournament mortality is almost always a very small fraction of the *total* walleye mortality on larger waterbodies (Goeman 1991) and tournament influences may not be biologically meaningful on an individual water. Still, the social influences and public perceptions associated with dead fish at tournaments can be significant. Biological and social concerns associated with tournaments can be greatly minimized by more modern "catch-photo-release" (CPR), otherwise known as "immediate release", formats. This tournament format is already increasing in popularity (Figure 9). Under CPR formats mortality of fish would be minimal. Several prominent tournaments in Wisconsin have already shifted to CPR formats.

Tournament organizers we spoke with during this planning process reported several additional benefits of the CPR format beyond minimizing mortality of fish. For example, CPR tournaments are not restricted by length limits, meaning events can be effectively held on waters where regulations prohibit possession of certain lengths of walleye (e.g. protected

slot limits). Contrastingly, there are technological and logistical hurdles to switching from a "catch-hold-release" to CPR format. This plan proposes two actions related to walleye tournaments**: First, the DNR's Walleye Team will conduct an updated review of studies of tournament influences and practices** and make it available for biologists reviewing and setting conditions for catch-hold-release tournaments through the Fisheries Management Handbook. Second, the DNR's Walleye Team will **create resources about how to hold CPR format tournaments and facilitate connections among tournament organizers** to speed the transition to CPR format for those organizers who may be interested in adapting.

Table 6. Summary of walleye and sauger tournament mortality and important contributing factors reported in peer-reviewed studies and management agency reports.

STUDY	LOCATION (YEAR)	Weigh in/Initial mortality (%)	Delayed mortality (%)	Total mortality (%)	Important factors
Fielder and Johnson 1994	South Dakota (1990-1991)	13.2 - 18.4	5.5 - 8.4	20.5 - 22.8	Wind, water temperature
Goemen 1991	Minnesota (1989)	1 - 6.2	5.7 - 47.1	40 (average)	Wind, tournament procedures
Graeb at al. 2005	South Dakota (2003)	-	1 - 79	1 – 79	Water temperature
Hoffman et al. 1996	Wisconsin (1991-1992)	-	0 - 18	34 – 80	Water temperature
Schramm Jr. et al. 2010	MI, MN, ND, SD, WI (1996-1997)	3 - 54	-	-	Water temperature, depth of catch, live well oxygen
Boland 1991	Mississippi River (1988-1990)	0.5 - 24	37 - 78	-	Water temperature

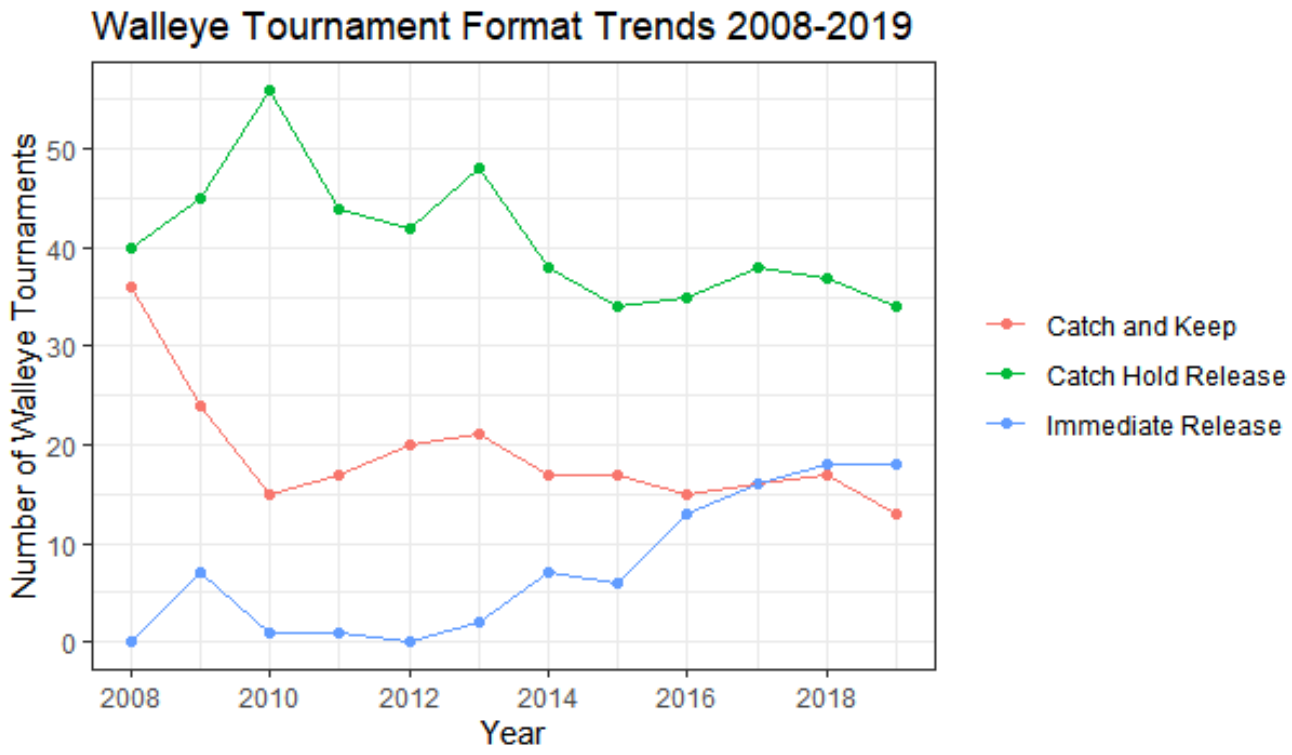


Figure 9. Number of walleye tournaments in Wisconsin since 2007, separated by tournament type. "Immediate release" includes "Catch-photo-release" or "CPR" format tournaments.

Technology and Angler Efficiency

Recent advances in fishing technology (360° and side-scan sonar, 3D sonar, "flashers", GPS assisted trolling motors) and online mass information sharing have led to concerns that angler efficiency may be rapidly increasing, leading to greater risk of overexploitation, particularly in species managed for harvest like walleye (Cooke et al. 2021). Research into the effects of modern fishing technology is limited, but initial results from a study in Wisconsin found significant effects of technology on catch and harvest rates among panfish ice anglers (Feiner et al. 2020). Research has also shown that walleye catch rates are "hyper-stable" (Hansen et al. 2005, Mrnak et al. 2018), meaning that declines in population size don't necessarily lead to declines in angler catch rate. Technology may be a contributing factor to hyperstability in walleye and other species. **Creel surveys can be employed to better understand the relationships between technology and catch rates** (similar to Feiner et al. 2020 but including open water angling). **Historic creel data can be used to analyze for long-term trends in angler efficiency** that might be linked to technological advances. Results of these efforts will help us better understand the changing landscape of fishing and develop appropriate management responses.

Hooking Mortality

Hooking mortality emerged as a concern among anglers and tribal communities during input surveys and meetings. Hooking mortality would be defined as the portion of fish that die after being caught and released (either voluntarily or because they were not legal length).

From a fish management standpoint, hooking mortality is often lumped under natural mortality, as the fish are not included in harvest estimates and specific hooking mortality rates for individual populations are usually not known.

Studies of walleye and sauger have shown that general angling typically leads to low rates of hooking mortality (Table 7). However, these same studies have also found certain factors that can lead to higher hooking mortality. Live bait fishing can lead to higher hooking mortality rates, as fish are more likely to be hooked deeper and suffer internal injuries when compared to artificial bait fishing (Payer et al. 1987), though some studies using live bait still showed very low hooking mortality (Fletcher 1987). Higher temperature commonly leads to increased hooking mortality rates, when studied, with increases observed when water temperature exceeds 18 or 20C (64 or 68F, Reeves and Bruesewitz 2007). One of the most influential factors that leads to high hooking mortality is depth of capture. Walleye and sauger caught at depths of 10 meters (33 feet) or greater have shown significantly higher rates of hooking mortality in several studies (Talmadge and Staples 2011, Meerbeek and Hoxmeier 2011), due in large part to barotrauma (injury caused by a rapid change in pressure).

This plan does not aim to create regulations to specifically address hooking mortality, as they would likely be unpopular and often difficult to enforce (e.g. it would not be possible to regulate the depth at which anglers are fishing). However, we **present this information so that anglers can be better informed** about their influences. We hope that promoting this kind of information will allow anglers to make more ethical decisions about their fishing practices. Some ways anglers can minimize hooking mortality could include:

- Targeting walleye/sauger at times of the day/year when they are more likely to be shallower than 10m (33 feet)
- Switching to target warmwater species (such as bass, panfish, or catfish) when surface water temperature is high
- Using artificial baits when you don't intend to harvest walleye/sauger or expect to catch significant numbers of undersize or slot-protected fish
- Use of circle hooks with live bait, which generally lead to lower rates of serious hooking injury

Unfortunately, climate change may exacerbate this issue. Warming water will lead to more days with an elevated risk of hooking mortality and may also drive fish deeper in the water column to find thermal refuge.

Table 7. Summary of walleye and sauger hooking mortality reported in peer-reviewed studies and management agency reports.

SPECIES	STUDY	INVESTIGATION TYPE	REPORTED HOOKING MORTALITY
Walleye	Fletcher 1987	General angling	1.1% angling
	Payer et al. 1987	Live bait vs. artificial	10% live bait, 0% artificial
	Reeves and Bruesewitz 2007	Water temperature/month	0% in May, 12.2% in July-August
	Schaefer 1989	General angling, multiple lure types	0.8% overall
	Talmadge and Staples 2011	Depth of capture	31% (rate increased with depth)
	Twardek et al. 2018	Ice angling, live bait vs. artificials, hook type	6.9% overall
Sauger	Meerbeek and Hoxmeier 2011	Depth of capture	26.4% (rate increased with depth)
	Betolli et al. 2011	Depth of capture and lure type	4% and 12% (two different methods for estimation)

Walleye wagons and cooperative stocking

Partners can play an important role in supporting stocking efforts and working collaboratively on stocking has value in building relationships. Often, this includes partners purchasing fish from private hatcheries to stock into waterbodies under a private stocking permit. But there are situations where lakeside rearing facilities, often called “walleye wagons” are operated by private groups under permits and permission from DNR to produce fry for stocking into the lake where the wagon is located. There are many walleye wagons already in operation around the state with various designs and capacities. Cooperative rearing agreements are also used, where private partners will receive eggs, fry, or fingerlings from DNR and raise them up to length where they can be stocked (this differs from “private stocking” where groups are purchasing fish from a grower and stocking them directly with no further rearing).

There is a workload for DNR staff and partners when coordinating and operating walleye wagons and cooperative stocking, meaning these tools should be used judiciously. The following guidance should be used to evaluate the need for any new or proposed walleye wagons or other cooperative rearing efforts:

- The walleye wagon or cooperative stocking should fill an unmet need. One of the greatest beneficial uses of walleye wagons may be waters where walleye of a specific genetic strain are not available through other hatcheries or stocking walleye of other sizes has been shown to be ineffective.
- Walleye wagons are typically not necessary on lakes where other successful stocking options are available. Similarly, stocking of any kind should not occur where sufficient natural reproduction currently exists or habitat is insufficient

(acreage, depth, available prey, fish community) to support walleye. Groups need to work with local biologists to determine appropriateness of individual waters.

All stocking, whether conducted by DNR or partners, should be objective-based. In some cases, the objective may be to restore natural reproduction. In many other cases, the objective is simply to provide a fishable population of walleye where natural reproduction is not expected (common in the southern portion of the state). In either case, partners and biologists should work together to determine what constitutes a successful stocking. The following process and standards can be used as guidelines for coordinating operation of privately-run walleye wagons and cooperative stockings:

- A plan should be developed between the cooperating group and the local biologist that details when and how the stocking will be evaluated. This plan should include the duration of the evaluation period. The simplest evaluation plan would include fall electrofishing in years when fry are stocked to determine initial survival. Estimating total adult population size is also a strong option and may be more appropriate for cooperative stockings where large fingerlings are produced.
- Hatchery construction, inspections, permit applications, and other preparatory steps should be completed by the partnering group well ahead of walleye spawning season to reduce workload on DNR staff during the busy spring season and ensure that the hatchery is fully operational. The "Stocking best practices document" referenced on page 46 may provide more details on setup and permitting.
- In mixed recruitment fisheries (low amount of natural reproduction or other stocking source) it may be necessary to delineate sources of fish when evaluating a walleye wagon or cooperative stocking. This could be done through marking of fry or other stocked fish, or through genetic analysis. Fin tissue or dorsal spine samples should be taken from all adults during gamete collection if genetic analysis is a desired means for evaluating a stocking event. The cost of running a genetic analysis to determine stocking success should be built into the overall walleye stocking plan for the waterbody and could be funded by partner groups (plan for around $20 for every sample run).
- It is recommended that other stocking not occur during years when walleye wagons or cooperative stocking are being evaluated to simplify analyses and results.
- In most cases, walleye wagons and cooperative stocking could be considered successful if:
    - They create year classes of >5/mile in fall electrofishing surveys during stocked years or >2 per mile age-1 yearlings the following fall. For comparison, in *naturally-recruiting* (no stocking) walleye populations, 10-15/mile of young-of-the-year (YOY) and 3-5/mile of age-1 are thought to be minimum benchmarks to expect contributing adult year classes in the future.

    - They create an adult fishery of >1.5 per acre when multiple year classes are present. This same standard is used by DNR as a benchmark for stocking success.
- Individual waterbody criteria for success may need to be developed in specific restoration scenarios.
- A stocking that has been determined to be successful should continue to be evaluated periodically, since stocking success can change over time. Evaluations may also identify practices that can make stocking more effective.

Walleye wagons and cooperative stockings (along with stocking done by DNR) that do not meet criteria for success may be recommended to be discontinued, as efforts could then be focused elsewhere (e.g. habitat projects).

Regulation Complexity and Responsiveness

Complexity of regulations (number of different regulations on the landscape and complicated individual regulations) was a major area of interest for our planning team, as it is a concern among some anglers and policymakers. We approached this issue in several ways. First, we devoted a portion of each stakeholder meeting to discussing regulation complexity and getting feedback on angler preferences. Second, we incorporated several questions in our mail/online survey about regulation complexity. Both input avenues yielded the same response: anglers were generally supportive of complexity, particularly if it created better management scenarios on important waterbodies. “One-size-fits-all” approaches that might result in poor fits for certain waterbodies were not favored.

Still, regulation complexity without a biological necessity should be avoided. There are several areas within this plan where we outline a path to eliminate sources of complexity, without reducing opportunities or diminishing the quality of individual fisheries. Generally, our proposals to reduce complexity lean towards more conservative management, another theme from our public input.

We offer this guidance to DNR biologists and those working through the Wisconsin Conservation Congress on future walleye regulations:

- Season dates – Most waters will follow the general “gamefish season” in Wisconsin, while some rivers may offer year-round open seasons. Special seasons that differ from the “gamefish season” should not be used as the primary means to regulate harvest. Date-regulated refuges are an option for special circumstances.
- Length and bag – Toolbox regulations for length and bag limits should be used as often as possible. A toolbox review will be completed as a part of this plan (see Page 29), and some options may be added or modified. A revised toolbox may provide suitable alternatives for lakes where special regulations may be under consideration.
- Border waters – Managing regulations on border waters with other states will always be a challenge, and most are likely to incorporate elements from each state’s larger regulatory scheme. Where possible, matching bag limits of

border waters to Wisconsin's statewide (or regional, in the case of the Ceded Territory) bag limit is a higher priority than matching the statewide or regional length limits. Length limits can then be set at appropriate levels for that waterbody.

- Regulation boundaries – If anglers can boat from one waterbody to another connected waterbody the walleye regulations should be the same and should meet the needs of the connected waterbody most in need of protection. The only exceptions may be when there is strong biological support for differing regulations *and* an easily identifiable, permanent physical landmark (bridge, lock, or dam) can be used as the boundary.

There were additional concerns about the amount of time it takes for regulations to be changed, which can often be 2-4 years from discovery of a biological issue to implementation of a new regulation in response (assuming emergency regulations are not justified). This can be significant, particularly in cases when a population is experiencing recruitment decline and maintaining adult abundance may be important to increase odds of successful spawning (Sass et al. 2021). Most of the regulation change process exists outside the scope of this plan. However, we offer the following options for expedient regulation changes for walleye now and in the future:

- Form B – recent changes to administrative code now allow for a faster rule change process *when reverting to the statewide regulation*.
- Emergency rules – Use of the emergency rule process should be reserved for true emergencies on high-profile waters, but there is a precedent for use in the case of walleye recruitment issues.
- Modifying rule change process – This would require legislative action but might be particularly useful in rehabilitation scenarios.

We would also like to **better understand the influences a multi-year fishing regulation rule change process may be having on biologically sensitive populations**. In other words, would a more responsive angling regulation change process lead to better outcomes when attempting to rehabilitate a population in decline? This question should be explored through modeling approaches, provided adequate data are available.

Tourism and Opportunities

Walleye fishing is an important component of tourism in many areas of the state. We visited with several tourism promoters during our stakeholder meetings to hear their perspectives on how walleye-related fishing tourism can be improved. Most tourism promoters, particularly in the North, emphasized angler catch rate as the critical factor in being able to attract anglers to a region. Our mail online survey also identified that anglers who fish walleye in Canada or other states do so primarily because they feel they "catch more walleye". Simply put, people want to have a high level of confidence that the fish will be there if they are going to commit to a destination. Opportunities to harvest a lot of fish or catch trophies were considered secondary. Our management should reflect this hierarchy, when possible, and provide at least a few high-density walleye populations in most regions of the state.

Information on population status, access, and fish behavior (e.g. timing of post-spawn) can be used to help promote quality fishing opportunities. Such information can be made available to tourism promoters in various formats. A periodically updated "Wisconsin Walleye Waters" resource (see page 42) will likely be the most comprehensive means to deliver most of this information. Many other items within this plan will aid tourism indirectly (e.g. efforts to increase stocking efficiency), but some may have direct influences as well. Speeding the shift to catch-photo-release tournament formats may allow for increased tournament participation with reduced influences on walleye populations. Efforts to increase regulation consistency (page 30) may give visiting anglers more confidence in their understanding of local regulations. Stocking guidance that takes tourism and economic concerns into account as one (of many) factors when allocating hatchery resources can also help resorts and businesses that rely on tourism dollars. **We plan to check in with tourism promoters after some actions of this plan have been implemented to get feedback and additional suggestions.**

Fishing guides and gifting of fish

Several concerns related to fishing guides emerged during our public input process. More generally, we heard concern that fishing guides, as skilled anglers who spend a lot of time on the water, could be contributing to declines in populations. More specifically, there seems to be a perception of fairness surrounding the practice of guides "gifting" their own personal limit to clients after a day of fishing. This practice is currently legal but is the subject of a current Wisconsin Conservation Congress resolution. We will allow that issue to be worked out through the Conservation Congress, as our current understanding of the issue relates more to fairness and sportsmanship than a biological threat to the resource.

However, the perception of guides as self-interested "super users" of walleye resources should not be applied universally. There are a wide range of viewpoints and attitudes among guides, just as there are among non-guide anglers. Many guides who participated in our planning process, from all areas of the state, talked passionately about their personal conservation ethics and desire to be stewards of the resources they rely on for their income. This mentality, coupled with the elevated status guides hold in the fishing community because of their expertise and time spent on the water, make them ideal messengers for walleye conservation initiatives. **We propose forming a contact list of guides around the state that can be consulted on walleye issues and used as advocates for management actions.** The guides who participated in our stakeholder meetings would make an excellent base for this roster.

Year-round seasons and law enforcement on spring spawning runs

One of the most common concerns among walleye anglers was the long-term health of walleye populations in waters where fishing and harvest are allowed during spring spawning runs. This includes many of the state's large rivers (Wisconsin, Mississippi, Lower Chippewa, Rock, Wolf, Fox, and Green Bay tributaries). Year-round harvest, including during spawning season, does not appear to be having deleterious influences on most riverine populations, as they remain some of the healthiest in the state in terms of recruitment and catch rates. Additionally, year-round seasons offer exceptional angling opportunities at times of the year,

particularly spring, when few other fishing opportunities exist. We asked anglers in our mail/online survey about regulation preferences for large rivers with year-round seasons. A plurality (39%) of river anglers felt no change was necessary, while 26% supported more restrictive regulations during spring spawning runs, and just 12% felt walleye harvest should be closed in the spring (following the statewide gamefish season).

Based on public support for current regulations, these year-round walleye fishing opportunities should be preserved, if it is demonstrated that populations can be sustained at satisfactory levels. **Consistent monitoring of important river populations** will allow detection of trends and issues of concern that would determine if more conservative management efforts are warranted in the future. Should more restrictive regulations become necessary, seasonal reduced bag limits during times when fish concentrate should be the first option considered. Such regulations have been used on many of the larger tributaries to Green Bay and are considered successful by local biologists at reducing harvest while still allowing opportunity.

These spring concentrations of fish and anglers also lead to legitimate concerns about effective enforcement of angling regulations. Conservation wardens in Wisconsin and neighboring states are certainly well-aware of the importance of enforcement during spring walleye runs. See Appendix E for a summary of a conversation about this and other issues. **The WI Walleye Team will continue to work closely with conservation law enforcement (DNR and other agencies) to develop strategies for effective enforcement of walleye regulations.** Specific law enforcement strategies are intentionally not detailed in this plan to avoid limiting their effectiveness.

Anglers also have an important role to play when ensuring that angling and other environmental regulations are being followed. First, anglers can educate themselves and others they fish with on the importance of regulations as a tool to prevent over-exploitation of our valuable natural resources. Second, anglers who witness violations can provide anonymous reports to the DNR tip line (1-800-TIP-WDNR).

Local Issue Statements

Tribal harvest misconceptions and aggression toward tribal harvesters

Lake Superior Ojibwe tribal harvest rights in Wisconsin's Ceded Territory were reserved in the Treaties of 1837 and 1842 and were reaffirmed in the 1980s (more information here). Since then, a shared walleye fishery has existed in Ceded Territory waters. Even after several decades, misconceptions about the tribal fishery are still common among some non-tribal Wisconsinites and visitors (as evidenced by comments received during this planning process), occasionally leading to altercations or harassment of tribal members, in some cases carrying the potential for violence. This behavior is completely and unequivocally unacceptable. The root of some of these issues is societal, and certainly cannot be fully resolved with a resource management plan. However, there is always a responsibility among resource professionals to share relevant and accurate information to inform the public. This responsibility carries greater importance when misinformation may be contributing to animosity and reduced ability to work cooperatively among tribal and non-tribal people. Some of the most prevalent items of misconception about the tribal fishery in Wisconsin are presented below in Table 8, along with additional information explaining why the item is a misconception.

Table 8. Common misconceptions about the tribal fishery in Wisconsin's Ceded Territory and information addressing the misconception.

MISCONCEPTION	REALITY
"Tribal members can harvest as many walleye as they want"	Tribal harvest on off-reservation waters is managed under a strict quota system, with safe harvest levels established for each individual waterbody. Harvesters must be issued a permit to harvest. Harvest is monitored and recorded nightly by creel teams assigned to each individual water.
"Tribal harvesters take all the big female walleye"	Individual tribal harvest permits allow for the harvest of no more than 2 walleye over 20 inches. In recent years, the average length of walleye harvested by tribal members is 15.5 inches, and only 10-15% of the total tribal harvest each year is females.
"Tribal members take more walleye than anglers"	Tribal harvest in recent years has averaged around 30,000 walleye annually (more information here). Anglers harvest an estimated average of 234,000 walleye annually in Wisconsin's Ceded Territory.
"If tribes are going to harvest walleye, they should help restock the lakes"	Tribes do a significant amount of walleye stocking in Wisconsin. Tribal hatcheries stock between 75,000-125,000 large fingerling walleye annually, in addition to 7 to 11 million fry (GLIFWC data)

We do not believe discussing tribal harvest should be avoided. In fact, this plan seeks to make relevant statistics and informational items more available to those interested in better understanding the shared harvest model in Wisconsin's Ceded Territory. **Sharing information on tribal harvest traditions *and* non-tribal angler experiences may also help counteract**

misconceptions and build trust. That increased trust is a necessary basis for more effective partnership to improve walleye populations (see Goal 6 for more). This is truly a case where a rising tide (more walleye) raises all ships (better opportunities). **Highlighting cooperative management efforts** will also be productive to demonstrate that many partners are working together to enhance walleye populations.

Southeast Wisconsin 18-inch minimum and 3-daily bag limit

Our public meetings in southeastern Wisconsin revealed some confusion and lack of acceptance among some stakeholders regarding the relatively new 18-inch minimum length limit and 3 daily bag limit that was implemented in 6 counties in 2018. Many expressed a desire for a slot length limit that would "protect spawners", presumably with the belief this would increase natural reproduction. However, most lakes in this area of the state are stocked-only fisheries, where habitat is not suitable for walleye reproduction. These lakes generally support fast walleye growth rates. As such, an 18-inch minimum length limit increases yield, by allowing walleye to add more length before they become available for harvest.

Milwaukee River Walleye Management

The Milwaukee River was once home to a native walleye population. Due to habitat degradation, the population needed to be sustained through stocking. Walleye fry were stocked in the 1980's and extended growth fingerling stocking began in 1995. The extended growth fingerling stocking provided popular fishing opportunities. That stocking was discontinued in 2007 due to non-availability of Lake Michigan strain walleye from a VHS-free waterbody. Since then, the number of remaining walleye in the estuary has declined. However, recent habitat improvements, including dam removals along the river and water quality improvement projects make reintroduction of walleye a more promising proposition. The return of walleye in the Milwaukee River would provide an exciting and accessible fishery in Wisconsin's most populous urban area. **We support the development of a Milwaukee River fisheries management plan that includes management options for popular gamefish, including walleye.** Stocking should utilize native Lake Michigan genetics and introduce walleye in a manner that minimizes interactions with other popular gamefish (stocked salmonids). Flexibility in stocking location and timing will likely be required, and follow-up evaluations of stocking success and influences should be conducted.

Wisconsin River Regulation Consistency

The Wisconsin River provides some of the best walleye fishing opportunities in the state and is enjoyed by countless anglers. Because the Wisconsin is a very long river that passes through several important social and ecological boundaries, various regulations are used on different stretches. This creates inconsistencies and potential for confusion. The most obvious inconsistencies occur between Rhinelander and Wausau, where the Wisconsin River passes through several small flowages, crosses county lines, and passes out of Wisconsin's Ceded Territory. Along this stretch the season structure, length, and bag limits change for walleye (see Figure 10). The length limit change in this area is slight (20-24" protected slot, compared to 20-28" protected slot), and unlikely to be biologically meaningful. There are also bag limit changes on the lower Wisconsin River (5 above Prairie du Sac Dam and 3

below). We believe these issues can be partially addressed through the strategy outlined in Goal 2, where broader-scale changes could create more consistency.

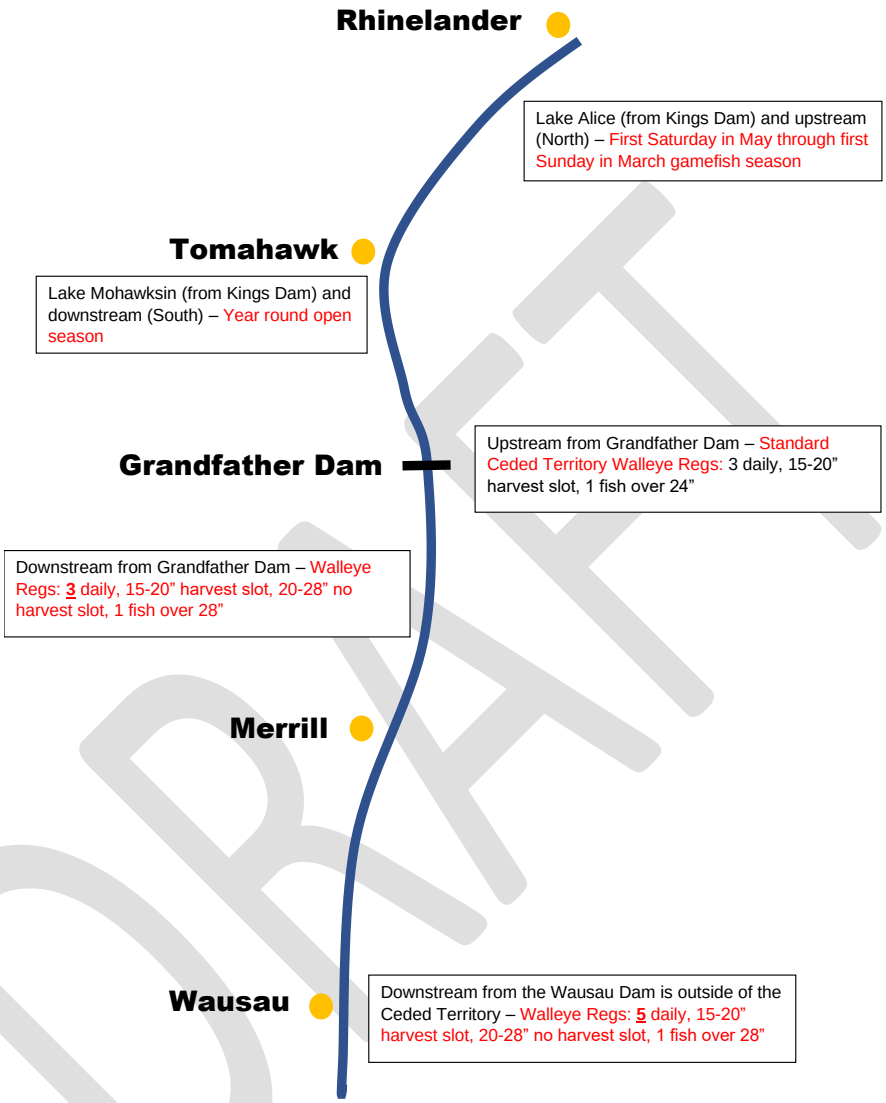


Figure 10. Map explaining changes in walleye angling regulations and seasons along the Wisconsin River in the Rhinelander-Wausau reach.

Minocqua Chain Walleye Management

The Minocqua Chain is a 5,929-acre chain of seven lakes in Oneida County, Wisconsin. Historically, the Chain had a walleye population sustained primarily by natural reproduction except for supplemental stocking in Lake Tomahawk. Adult walleye numbers fell due to a decline in recruitment that began in the early 2000s. An 18-inch minimum length limit restricting walleye harvest and a no-minimum length limit encouraging bass harvest were implemented in 2011 to address the walleye decline. Additionally, extended growth walleye stocking began in the chain in 2012. In 2015, a cooperative walleye rehabilitation project

seeking to restore a healthy, self-sustaining walleye population in the chain was developed by DNR, GLIFWC, Lac du Flambeau Band of Lake Superior Ojibwe, and the Headwaters Basin Chapter of Walleyes for Tomorrow. Specific goals of the project identified measurable metrics for the adult and juvenile walleye populations. Also associated with the rehabilitation project, the chain was closed to walleye harvest beginning in 2015, where only catch and release angling and no tribal harvest was allowed. Rehabilitation efforts have shown some positive results in rebuilding the walleye population, as adult population metric goals were achieved by 2021. However, significant natural walleye recruitment has not returned, and the juvenile population metric goals have not been achieved as of 2021. The rehabilitation project partners convene annually, and this project has helped strengthen mutual efforts to protect and enhance this important walleye resource.

Mississippi River Recent Walleye Regulation Changes

The Wisconsin DNR, Minnesota DNR, and Iowa DNR recently promulgated new walleye regulations on Upper Mississippi River Pools 3-8 WI/MN Boundary Waters and Pools 9-12 WI/IA/MN Boundary waters. Recent changes in habitat conditions and changing climate conditions required State Fish and Wildlife Agencies to take a proactive approach to walleye regulations in order to protect this valuable fisheries resource. The walleye regulation promulgated in WI/MN Boundary Waters Pools 3-8 retains a 15-inch minimum length limit on walleye, with only 1 walleye now allowed over 20 inches and 4 fish bag limit in aggregate with sauger (no minimize length limit on sauger). The walleye regulation promulgated in WI/IA Boundary Waters Pools 9-12 is a 15-inch minimum length limit on walleye with a protected slot limit of 20-27 inches and 1 walleye allowed over 27 inches with a 6 fish bag limit in aggregate with sauger (no minimum length limit on sauger). Population monitoring continues, under a cooperative interagency approach, and data will be used to determine effects of the regulation changes.

Green Bay Length Limits, Bag Limits, and Seasons

The Green Bay walleye fishery has developed over the last 20 years as highlighted by attracting anglers from around the state of Wisconsin and the Midwest with the hosting of national walleye tournaments. The Green Bay fishery is estimated to derive an annual economic benefit valued at $264 million (Winden 2019). The daily harvest limit allows one fish in the spring months and 5 fish during the remaining season. The minimum length limit is 15 inches. DNR creel estimates for 2019 were 217,000 caught and 122,000 harvested. Based on 2019-20 annual spring spawning surveys conducted on the Menominee and Fox rivers, the walleye fishery is supported by more than 12 year classes although ages 4-6 composed 50% of the current fishery. Fall recruitment surveys indicated good annual year class strength and the current fishery is largely supported by the 2013 and 2018 year classes. As strong year classes mature and become available to creel anglers frequently comment “Where are all of the big fish?”. Available data indicate that big fish remain in the population, but the overall biomass may be skewed to younger fish based on strong year classes. The angling regulations have been in place for several years, and while population and angler effort/harvest monitoring will continue, there are no active plans to adjust the daily limit, minimum length limit, or season.

Statewide and Regional Issues Summary

ACTIONS	RESPONSIBLE PARTY(IES)	STATUS	NOTES
8A. Effectively manage sauger habitat and regulations to provide angling opportunities	DNR	Continuous	Applicable for large rivers
8B. Conduct trend analyses for statewide and/or major sauger populations	DNR Great Waters Biologists	Not started	Key waters include Mississippi, Wisconsin River, Green Bay, Winnebago
8C. Review studies related to walleye tournaments	WI Walleye Team	Initial review complete	Summary included in plan
8D. Develop resources to help organizers transition to "CPR" tournament formats	WI Walleye Team, tournament organizers	Not started	Will reach out to organizers of recent permitted tournaments
8E. Educate anglers on factors that contribute to hooking mortality, and "best practices" they can adopt	WI Walleye Team, guides, other stakeholder groups	Summary included in this plan; more outreach needed (Wolter WON article)	Good initiative to engage guides
8F. Establish standards for walleye wagons and cooperative stockings, work with partners to develop evaluation plans	WI Walleye Team and biologists	Standards detailed here, local plans and evaluations will be continuous	Standards match those used by DNR
8G. Continue to engage with tourism promoters after elements of this plan have been accomplished	WI Walleye Team	Target 2025	
8H. Develop contact list of walleye guides for future outreach	WI Walleye Team, guides		Use existing network from planning process as starting point
8I. Share information on tribal harvest traditions, dispel misconceptions, and highlight cooperative management efforts	WI Walleye Team, GLIFWC	Some information included in plan	
8J. Support development of a plan for managing walleye in Milwaukee River	Local biologist, WI Walleye Team	Draft started	Milwaukee estuary management plan in early draft stage as of early 2021.

INFORMATION NEEDS
How significant is dam escapement of walleye in Wisconsin? What opportunities does it provide? What strategies can be used to prevent escapement where it is unwanted?
How have advances in angling technology changed angler efficiency, and what impacts might that have on management?
Gather necessary data to identify trends in riverine fisheries
Would a faster regulation change process lead to better outcomes in rehabilitation scenarios?

PARTNERSHIP OPPORTUNITIES		
Description of need	**Prospective partners**	**How to get involved**
Help create, fund, and distribute signage and other materials to assist in identification of walleye, sauger, and their hybrids	Walleye clubs	Contact local biologist
Support evaluations of private stockings, including walleye wagons	Walleye clubs, lake associations	Contact local biologist
Support efforts to educate anglers on fishing regulations and enforcement, particularly during spring fisheries	Walleye clubs, guides	

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Appendices

Appendix A. Other Plans of Interest

It is important to acknowledge existing waterbody-specific plans that cover walleye management. These are most commonly for large waterbodies with considerable public interest. Plans for many smaller lakes/rivers are not listed here but are no less important.

This statewide walleye management plan seeks to complement existing waterbody-specific plans by providing tools and guidance to help make the visions for these waters their reality. Each of the plans highlighted below outline walleye management efforts on large waterbodies with considerable public interest. The specific structure of these plans varies. The most walleye-relevant goals, objectives, tactics, or actions are listed here. A link is provided for each plan for those interested in more information.

Lake Michigan Integrated Fisheries Management Plan (2017-2026) Link here

Objective: Identify, evaluate, restore and/or enhance spawning and nursery habitats for game and non-game fish species focusing on walleye, sturgeon, northern pike, Great Lakes spotted muskellunge, lake whitefish, yellow perch and sturgeon.

Objective: Maintain and/or restore self-sustaining walleye populations to support sport fisheries.

Objective: Investigate and develop additional incubating and rearing space for the production of Great Lakes spotted Musky and walleye.

Lake Superior Fisheries Management Plan (2020-2029) Link here

Tactic 1: Evaluate the potential for self-sustaining populations of walleye and yellow perch in Chequamegon Bay recognizing that walleye are key predators on yellow perch.

Tactic 2: Improve understanding of status and trends of walleye and yellow perch to inform development of regulations that maintain excellent fisheries.

Tactic 3: Improve understanding of stock structure of walleye populations in Wisconsin tributaries of Lake Superior and assess contributions from locations beyond the St. Louis River and Chequamegon Bay.

Lake Winnebago Walleye Management Plan (2018) Link here

Goal: Conduct annual assessments to monitor the Winnebago walleye population, the overall fish community, and AIS to allow for proactive decision-making regarding overall management strategies

Goal: Protect, maintain, and create walleye spawning habitat throughout the Winnebago System.

Goal: Engage the WFAC, local conservation clubs, and the public in Winnebago walleye management and provide educational outreach opportunities to various user groups to promote a greater understanding of Winnebago walleye management.

Goal: Implement proper harvest regulations in a timely manner based on results from walleye population assessments, while also maintaining an effective law enforcement program that incorporates public outreach.

Note: There are numerous objectives and tactics within each goal, which you can read by following the above link.

Upper Mississippi River Fisheries Plan (2010) Link here

Goal: Restore and maintain the biological diversity of the Upper Mississippi River (UMR) biota and the richness of its native fish fauna.

Goal: Restore and maintain aquatic habitat and the ecological integrity of the UMR.

Goal: Provide improved and sustainable recreational and commercial fishing opportunities on the UMR through unified UMRCC state management strategies.

Goal: Slow or eliminate the spread or introduction of aquatic nuisance species, including pathogens to the UMR.

Goal: Inform, educate, and involve the public in resource issues affecting the UMR

Appendix B. Summary of DNR Treaty Fisheries Work Units

In late 1980's, DNR was challenged with accommodating Treaty-guaranteed walleye harvest by Ojibwe tribal members on northern Wisconsin fisheries that were already heavily exploited by other users. The DNR's Fisheries Management program determined that the existing Biologist – Technician teams were an effective way to survey and manage fisheries, but improvements were needed in several key areas. Two Treaty Fisheries Teams were formed to address these needs. First, more fisheries survey data and information were needed, with an emphasis on walleye. The local biologists were conducting a good number of surveys, but more population estimates needed to be conducted, and angler creel surveys were needed to monitor harvest by state-licensed anglers. Second, the survey methods and data collected by local biologists needed to be standardized, and the data formats and summaries needed to be uniformly housed in one place. The Treaty Units became a data clearinghouse for Ceded Territory fisheries data and results. Finally, the Treaty Units were made a point of contact for coordinating fisheries data sharing and related communications with Great Lakes Indian Fish and Wildlife Commission (GLIFWC) and six bands of Lake Superior Ojibwe with Treaty-guaranteed harvest rights. Formal negotiations between the tribes and the state of Wisconsin occur through the DNR Secretary's or Governor's office, but a state-tribal-GLIFWC Technical Working Group (TWG) was formed as a formal place to exchange information and resolve issues at the field level.

Treaty Fisheries work units were formed in Spooner (Treaty West) and Woodruff (Treaty East). The work units each currently consist of a Team Supervisor, Fisheries Biologist, two Fisheries Management Technicians Advanced, one (Woodruff) or two (Spooner) 11-month permanent Creel Survey Technicians and about 15 limited term or seasonal Creel Survey Technicians. The two Treaty work units perform a combined total of about 30 fall electrofishing surveys, 16 or more spring walleye population estimates and 16 angler creel surveys in a typical year.

Fall electrofishing surveys are used to gauge recruitment: the number of young fish entering the population. The surveys target young-of-year (YOY) and one-year-old (age-1) walleye, along with juveniles of other species. The YOY walleye have made it through their first summer of life and are typically 5 to 8 inches in length. Age-1 walleye have made it through two summers and are about 8 to 11 inches in length. Usually the entire shoreline of the lake is electrofished at night with 3-person crews at about 2 miles per hour when water temperature is between 50 and 68F. On some larger waters index stations are used and less than the entire shoreline is surveyed. The number of YOY and age-1 walleye collected per mile of shoreline is used to index walleye recruitment. The median number of YOY walleye in Ceded Territory lakes supported by Natural Reproduction (NR) is 9 per mile, and this value appears to be a good minimum benchmark of recruitment: enough fish produced to see a noticeable year class when they mature at about age 4. An adult population is supported when we have at least one moderate to strong year class every 3 to 4 years. The Treaty work units perform about 45 to 50 boat-nights of fall electrofishing annually, and they complete surveys on about 30 lakes (some lakes require multiple boats to cover the shoreline). The total number of surveys completed is influenced by how rapidly the water cools and the number of rainy nights when a survey can't be conducted. We budget about $150 in mileage

and equipment costs, and 24 hours of staff time (including office time to analyze data and draft a report) for each electrofishing boat-night.

Spring adult walleye population estimates are performed right after ice-out at surface water temperatures in the 40's. Fyke nets are set on gravel spawning areas. Two-person crews lift the nets daily to count, measure and apply a fin clip or other mark to the adult walleye. Adults include any walleye that is sexually mature and all walleye 15 inches or longer, regardless of maturity. When an adequate number of walleye are marked (at least 10% of the adult population is a minimum benchmark), the nets are removed. This is typically after about 5 to 7 days of netting. The entire shoreline is then electrofished at night. Adult walleye are collected and examined for marks during the electrofishing run. The ratio of marked to unmarked fish is used along with the known number of marked fish at large in the lake and the total number of fish captured by electrofishing to estimate the adult walleye population and the population of each sex of fish. A netting crew can complete population estimates on two lakes per year by starting with early ice-out lakes and moving to deeper and more northerly lakes that lose their ice later. Lakes larger than about 1,500 acres may require additional netting crews to mark enough walleye for an estimate. Each electrofishing crew can reasonably cover about 6 to 8 miles of shoreline, so multiple boats are sent when there is more shoreline. We budget about $600 in travel and equipment costs and 120 hours of staff time for each survey (including office time to analyze data and write a report).

Angler creel surveys are conducted on some of the lakes where we performed a spring walleye survey, about 16 lakes per year across the Ceded Territory. The creel surveys are conducted during the gamefish season and span the first Saturday in May through the first Sunday the following March. However, the month of November is omitted because of very low fishing effort during that month. A creel clerk is assigned to each lake for 40 hours a week. A shift is assigned during all holiday and weekend days, and the remaining shifts are assigned to random weekdays. The clerks are provided a boat during the summer and on most lakes a snowmobile is provided during winter. We collect 3 pieces of data in the creel: instantaneous counts are the number of anglers fishing at a random point in time. We collect two counts during each creel shift, and these values are averaged for the month to estimate angler effort. Second, angler parties are interviewed at the completion of their fishing trip. Among other things we record the species targeted, the number caught, and the number kept. These data are combined with the total effort to estimate effort directed at different species, catch, harvest, and their associated rates. The third piece is biological data on harvested fish: species, length, and fin clips given to gamefish during the spring survey. The biological data provide a picture of the length of fish harvested by anglers. The fin clip results are used to estimate exploitation, the proportion of the adult population removed by angling. For each 9-month creel survey, we budget about $10,000 in mileage, travel expenses and equipment costs, 1,600 creel clerk hours and 250 permanent staff hours to provide logistical support, enter and analyze data and write a report.

Appendix C. History of Walleye Angling Regulations in Wisconsin

One of the primary tools used by fisheries resource managers is angler regulations, which consists of three main components: season length, bag limits and length limits.

The first attempt to manage walleye, and other species, through regulation occurred in 1881 when a closed season from February 1 to May 1 was established statewide. The adoption of length-based regulations first occurred in 1909 when a statewide 12" minimum was implemented. Bag limit restrictions were first established for walleye in 1917 when a statewide 10 bag limit was established. Although there were few changes in walleye fishing regulations from 1881 to 1934, the years that followed would see changes more regularly. Statewide minimum length limits changed more often after 1934 and broad regional regulations were introduced as well as regulations for individual water bodies. In 1935, a statewide minimum length limit of 13" was established and would remain until it was removed in 1958 and replaced with a "no minimum" length limit statewide. Although a statewide no minimum length limit would stay in effect on all inland waters through 1989, there was a 13" minimum length limit established specifically for counties in northwest Wisconsin from 1966-1989. The number of counties considered to be NW Wisconsin varied from 12 counties (1966) until the area was modified to include just 10 (1972), then 5 (1976), and finally only 4 (1980) counties. The statewide minimum of 15" was established in 1990 and has covered all inland waters until today. However, in 2016, waters in the Wisconsin's Ceded Territory were given a different "standard" regulation of a 15" minimum length limit with a protected slot from 20"-24", which is the present regulation. The addition of the 20-24" protected slot served to eliminate the "sliding bag" system which had previously been used in the Ceded Territory, and led to bag limits that varied by water body and by year based on tribal harvest.

Season length has been less variable, but there were some notable changes through time. From 1935-1938 the walleye season ran from May 15 to March 1. Although the start date of the season remained basically the same, the end of the season was changed to January 15 from 1938-1954. In 1954, season lengths were separated into two zones, north and south (separated by State Hwy 29), with the northern zone opening May 15 (or near in a few years) and the southern zone opening May 1 (or near in a few years); both zone's season ended on February 15. In 1964, the zones were abandoned, and walleye fishing season was set from the second Saturday in May to February 15. This continued until 1973 when the season end was changed to March 1. Starting in 1974, and continuing to present, the season was changed to open the first Saturday in May and close after the first Sunday in March.

Statewide walleye bag limits changed a couple times since 1917 but have remained relatively the same for quite some time. The 10-daily walleye bag limit was in effect from 1917-1936. In 1936 the walleye daily bag limit was reduced to 7 and this remained through 1948. In 1949, the statewide walleye bag limit was reduced to 5 and remains as the standard for statewide management. One exception to this standard bag limit was started in 1989 in the Ceded Territory and was known as a sliding bag limit. This system adjusted bag limits on individual waters within the Ceded Territory depending on tribal spearing harvest numbers. The goal of this adjustment was to reduce angling harvest in lakes where tribal harvest occurred, so that total harvest was unlikely to exceed 35% harvest of the adult walleye population. The sliding

bag limit was removed in 2015 and replaced with a standard 3 bag limit per waterbody as concerns were raised by stakeholders over the uncertainty of bag limits on individual waters come fishing opener, among other logistical challenges.

Walleye Toolbox Regulations

Not all walleye populations are managed with the statewide default regulation. DNR developed a standard set of length and bag limit-based regulations that are used for fisheries management and are referred to as "toolbox regulations". The current walleye regulations available in the toolbox are detailed along with their objectives below (Table C1).

Table C1. The walleye regulations "toolbox" currently used by Wisconsin Department of Natural Resources, with descriptions of the angling opportunity being provided, examples of best use, and objectives.

OPPORTUNITY	REGULATION(S)	WHERE USED	OBJECTIVES
Consumptive	No minimum length limit No minimum length limit with only one walleye allowed over 14" No minimum length limit with protected slot of 14-18" and only one walleye allowed over 18"	Best utilized in self-sustaining, high density, slow-growing populations	Maximize yield and/or reduce predation/competition
Quality	15" minimum length limit 15" minimum length limit with 20"-24" protected slot and only one walleye allowed over 24"	Standard statewide regulations with the second one being used in the Ceded Territories of Wisconsin	Sustain/increase walleye densities; protect many juvenile walleye; maintain current conditions
Memorable	18" minimum length limit, 3 daily bag limit	Best utilized in walleye fisheries where rehabilitation is needed or to maximize yield in more southern waters.	Maintain/increase density of moderate/large adults, protect juvenile walleye, and allow multiple spawning opportunities to improve natural reproduction and/or increase predation
Trophy	28" minimum length limit, 1 daily bag limit	Best utilized in walleye fisheries needing rehabilitation or trophy fisheries.	Increase survival/density of moderate/old individuals and/or maximize predation on smaller fishes

Although use of these toolbox regulations is encouraged and most common, there are opportunities for fisheries managers to develop “experimental” or “special” regulations outside the toolbox. These proposed regulations must include strong documentation for the change and be accompanied by a plan to evaluate the effectiveness of the regulation. All proposals are peer-reviewed for justification, enforceability, and completeness by Fisheries Team Supervisors, District Fish Supervisors, the Walleye Management Team, and the Bureaus of Law Enforcement and Legal Services. Final approval rests with the District Fisheries Supervisors, Fisheries Management Bureau Director and other member of the Fisheries Management Policy Team (in addition to review by the Wisconsin Conservation Congress, Natural Resources Board, and legislature). Experimental regulations are few and far between in recent history but include those shown in table C2.

Table C2. Special regulations for walleye in Wisconsin that have been used (or are in use) since 1990.

REGULATION	WATERBODIES	TIME FRAME
Catch and release	Forest Lake (Fond du Lac Co.) and Minocqua Chain (Oneida Co.)	Currently in use
15” minimum length limit with 20”-28” protected slot, only one walleye allowed over 28”	Wisconsin River (multiple counties)	Currently in use
12” minimum length limit with only 1 walleye allowed over 15” may be kept	Turtle Flambeau Flowage and some connected waters (Iron Co.)	Currently in use
16” minimum length limit	Balsam Lake (Polk Co.)	1990-1992
20” minimum length limit	Lac La Belle (Waukesha Co.)	1990-2014

Appendix D. Public Input Form Questions and Results

An online form to gather public input for this planning process was created using Survey Monkey. This form was designed to be a "quick" input option that could be widely shared. As such, the link to the form was included in press releases, DNR social media, and emails to stakeholder groups with further distribution encouraged. The form went live on September 25, 2020 and was closed on March 1, 2021.

The questions selected for this form were intended to gauge general angling experiences, identify perceptions of problems, develop rough preferences for management efforts, and collect other comments or observations. There was also a place for respondents to leave contact information if they wanted to participate in other stages of the planning process (963 people left an email address and were assumed to be interested in being contacted again).

Questions and corresponding answer options are shown below. General results are shown for all questions, while more detailed results are shown for questions 2, 3, and 7. The planning team reviewed the collective responses and individual comments before drafting this management plan. Additionally, these responses will be made available to local biologists who have an interest in results from anglers either living or fishing in their management area.

Summary of Results

The form was completed by 1,824 people (though some people skipped individual questions) from across Wisconsin and neighboring states (Figure D1). Most (73.0%) respondents reported 20 years or more of walleye fishing experience in Wisconsin (Question 1) and were residents (97%, Question 2). The most reported waters/areas for walleye fishing in Wisconsin were Lake Winnebago, Vilas County, Green Bay, Oneida County, Sawyer County, and the Wisconsin River (Question 3, county results shown in Figure D2).

Our survey asked anglers to report some generalities about how their walleye fishing experiences have changed over time (Question 4). Anglers reported catching fewer walleye than they used to, as opposed to more (net 51.5%) and fewer big walleye, opposed to more (net 36.7%). Most strikingly, respondents reported more fishing pressure, as opposed to less, by a wide margin (net 64.2%). Only 6.2% of respondents reported that very little has changed over time.

Respondents were asked to select from a list the problems that they felt were negatively affecting their fishing quality (Question 5). This question was repeated from the 1996 and 2020 mail/online survey. The top response was "Fish are being overharvested" and the next most common response was, relatedly, "not enough fish are being stocked". Both point to a perception that there are not enough fish on the landscape or that anglers are not experiencing the catch rates they expect. User conflicts, habitat loss, and "not catching many fish" were also common answers. Many respondents (31.3%) chose an "other" option for this question where they could fill in their own response option. Top "other" responses could be broadly categorized as concerns about tribal harvest, tournaments, behavior of other anglers, and regulation issues, though there were many other topics raised as well.

Respondents were asked: “Which of the following issues would you like to see prioritized in an updated walleye management plan?”. The most popular response related to evaluating regulations, followed by evaluating stocking, and restoring degraded habitat.

Finally, a comment field was provided for open-ended responses and notes that would be shared with our planning team. Those comments are summarized in Table D3 and revealed several areas that we attempt to address within this plan.

Questions and Response Data

Question 1. How many years have you fished for walleye in Wisconsin? *Note: response options are shown in the order they appeared.*

4 years or less – 4.2% of responses

5-10 years – 9.2%

11-15 years – 6.7%

16-20 years - 6.9%

20 years or more – 73.0%

Question 2. Where do you live? (Wisconsin residents specify county, non-residents specify state)

Options included all Wisconsin counties, neighboring states, and “other state not listed” – around 3% were non-residents of Wisconsin. See figure D1 for results.

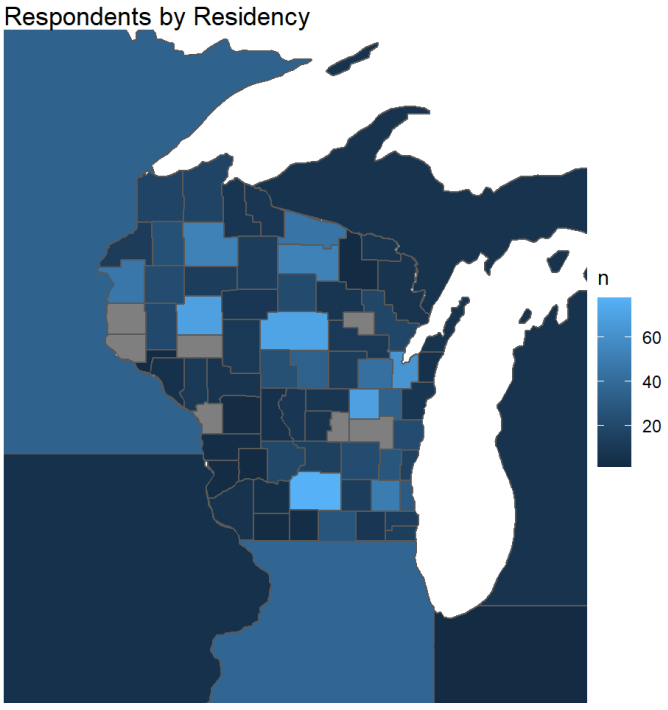

Figure D1. Locations (counties and neighboring states) where survey respondents live.

Question 3. Where do you do most of your walleye fishing in Wisconsin? (counties are listed along with options for large waterbodies that span several counties)

Options included all Wisconsin counties (72% in aggregate, see Figure D2) and popular large waterbodies that span multiple counties, including: Lake Superior (0.8%), Lake Michigan (0.2%), Green Bay (9.1%), Lake Winnebago (10.5%), Wisconsin River (5.2%), and Mississippi River (2.3%)

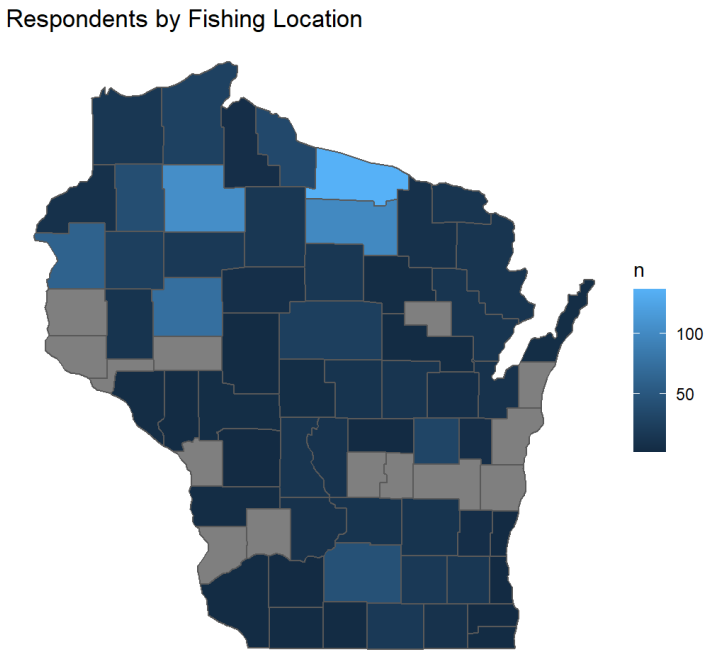

Figure D2. Locations (counties) where survey respondents said they did most of their walleye fishing in Wisconsin. Note that the above map does not show responses for people fishing the Great Waters that were listed as response options.

Question 4. Which of these changes have you observed during your years of walleye fishing in Wisconsin (check all that apply)?

More walleye than there used to be – 10.8%

Less walleye than there used to be – 62.4%

More big walleye than there used to be – 9.0%

Less big walleye than there used to be - 46.5%

There is more angling pressure where I fish for walleye – 67.7%

There is less angling pressure where I fish for walleye – 3.5%

Very little has changed, in my opinion – 6.2%

Question 5. Your fishing quality may be affected by a variety of influences. From the list below, please check the most important problem(s) that you think have influenced or threatened the quality of your fishing experiences. (Check one or more) **This question was repeated from the 1996 and 2020 mail/online surveys*

Fish are being over-harvested 50.7%

Too few fish are being stocked – 31.2%

User conflicts (boaters, jet skis, anglers, etc.) – 27.6%

Loss of fish habitat/poor water quality – 27.6%

Catching too many small fish – 23.9%

Not catching many fish – 27.0%

Shoreline development – 18.9%

Catching too few big fish – 15.9%

Length limits are too high – 9.8%

Hooking mortality is excessive - 6.7%

Lack of public access – 6.2%

Contaminants in the fish (mercury, PCBs, etc.) – 6.1%

Daily bag limit is too small – 4.1%

I don't feel confident I understand the regulations – 2.0%

Other (please specify)

Question 6. Which of the following issues would you like to see prioritized in an updated walleye management plan?

Taking a closer look at how fishing regulations and seasons are used to manage harvest – 32.0%

Developing strategies to increase stocking efficiency – 21.9%

Restoration of degraded walleye habitat – 18.3%

Protection of existing critical walleye habitat – 14.6%

Research to better understand natural reproduction issues 11.2%

Increasing angler outreach efforts, including sharing information on fishing opportunities – 2.1%

Question 7. What other comments would you like to share with the planning team?

(Open comment field, see Table D1 for response summary)

Question 8. Would you like to receive emails about future opportunities to comment on this plan as drafts are developed and available for review? If yes, please leave an email address. Otherwise leave blank.

(Open field to receive email contact information for further follow-up, 963 respondents elected to leave an email address)

All 1,121 comments left on the survey were read by Walleye Team co-lead Max Wolter. Many comments were selected to be shared with the entire planning team and some are quoted in other parts of this plan. Comments were broadly categorized into topic areas (Table D3). More specific issues within those topics are highlighted and were addressed as a part of the planning process.

Table D1. General topic areas and related issues that were frequently mentioned in comments on the public input form.

TOPIC	ISSUES
Regulations	Regulations not being protective enough, regulations being ineffective, regulation complexity, general concern about overharvest, spring spawning protection
Stocking	General interest in more stocking, where to stock
Habitat/competitors	Interest in more liberal regulations for potential competitor species (largemouth bass and northern pike most common), shoreline development, water quality, water level management
Social issues	Enforcement of regulations/violations, tournaments, tribal harvest in Ceded Territory, recreational conflicts (wake boating most common), fishing guides
Surveying/information sharing	Concern about lack of available data for making decisions, interest in research (recruitment and stocking success most common)
Miscellaneous	Access issues, funding suggestions, partnership opportunities

Appendix E. Professional Conversation Summaries

We specifically sought out expertise and ideas of professionals from outside of our Wisconsin DNR Walleye Management Team in the form of a series of conversations. Professionals were selected for these conversations based on their demonstrated expertise in relevant subject areas, including habitat, climate change, law enforcement, and stocking. These conversations were held via Zoom and included the invited professional(s) and members of the WI Walleye Team. They typically lasted an hour but were often supplemented with follow-up emails and sharing of additional resources.

Brief summaries of these conversations are included below:

Dr. Catherine Hein – DNR Water Resources Management Specialist - January 28, 2021

Dr. Hein discussed the new Lakeshore Habitat Monitoring Protocol being used by DNR and partnering counties, aquatic consultants, and lake associations. This project establishes consistent protocols to collect field data on shoreline habitat and then map and analyze that habitat. These data can be used to prioritize shoreline restoration efforts, particularly when paired with observations or other data sources identifying critical walleye spawning areas. These surveys may also provide data inputs needed to describe thermal optical habitat available to walleye. This project is still in early phases, but there is great potential to incorporate fisheries objectives, many of which could benefit walleye.

Dr. Alex Latzka (DNR Fisheries Biologist - Advanced) and Paul Cunningham (WI DNR Natural Resource Staff Specialist) – February 18, 2021

Mr. Cunningham discussed his involvement with the DNR Climate Action Team and guidance the team has created for management planning efforts. Paul shared the "A Blueprint for DNR Climate Action" document and we have worked to incorporate those action items into this updated plan. Dr. Latzka discussed the climate resources available through Wisconsin Initiative on Climate Change Impacts (WICCI), which are referenced in several places within this plan. Both offered suggestions for how climate adaptation could be built into our walleye management program, including strategies to increase and maintain climate resiliency in walleye populations and the tools available to minimize climate impacts. Those strategies are incorporated into several areas of this plan. We also discussed trainings that may become available to help fisheries professionals become more effective at communicating climate impacts and potential solutions.

Conservation Wardens Pat Novesky, Jeffrey Lautenslager, Michael Green, Aaron Koshatka (DNR) and Matt Kniskern (GLIFWC, Captain of Enforcement Division) – February 24, 2021

Wardens shared perspectives on relevant walleye enforcement issues around the state. Major themes included challenges of enforcement during spring walleye spawning runs on large rivers with year-round open harvest seasons, staffing and time demand issues, refuges, and dealing with regulation inconsistency. Technology and social media were highlighted as important changes to how people fish and share information that can have law enforcement implications. Strategies to increase compliance and enforcement of regulations were discussed, but wardens reiterated that manned presence was still one of the most effective actions.

Dale Logsdon and Paula Phelps (Minnesota DNR Researcher and Fish Production Supervisor) – April 30, 2021

This was the first of several planned conversations between Minnesota DNR and Wisconsin DNR walleye experts. Each state gave a summary of current stocking practices and protocols. Minnesota DNR relies more heavily on fry stocking, which is made possible by a different set of fish health protocols that allow fry to be tested and stocked more quickly. Fry stocking is currently not possible in Wisconsin unless as a part of a lakeside/streamside rearing facility. Minnesota DNR uses a flowchart to determine if lakes should be stocked and what stocking product is most appropriate. They also have a standardized means of evaluating stocking success. Future conversations are being planned to discuss fishing regulation strategies, fish community interactions, and angler engagement.

Dr. Josh Raabe (UW-Stevens Point) – July 6, 2021

Dr. Raabe is an expert on walleye habitat and wrote an excellent review on the topic recently (Raabe et al. 2020). We discussed several aspects of walleye habitat management, including whether certain habitat additions (trees, shoreline rock) were beneficial for walleye. We also discussed recruitment bottlenecks and important factors that should be more thoroughly researched. Dr. Raabe outlined some of the inherent challenges in researching walleye early life history and identified the need to better understand the common factors among “walleye factories”. Water quality monitoring, specifically for temperature and clarity, was identified as a useful step to better understand habitat.

Appendix F. Prospective partner resources

Find Contacts

Find the Wisconsin DNR Fisheries Biologist for your area:
https://dnr.wisconsin.gov/topic/Fishing/people/fisheriesbiologists.html

Find other Wisconsin DNR staff:
https://dnr.wi.gov/staffdir/_newsearch/contactsearchext.aspx

See DNR and GLIFWC Walleye Resources

DNR Walleye Plan homepage: https://dnr.wisconsin.gov/topic/fishing/outreach/WalleyePlan

Wisconsin Walleye Initiative homepage:
https://dnr.wisconsin.gov/topic/Fishing/outreach/WalleyeInitiative.html

GLIFWC walleye management information: https://glifwc.org/Fisheries/Inland/

DNR Fisheries Survey Reports

Northern WI: https://dnr.wisconsin.gov/topic/Fishing/north/trtysprngsrvys.html

Statewide list: https://dnr.wisconsin.gov/topic/Fishing/reports

Find Habitat Resources and Permitting Info

Fish sticks best practices:
https://dnr.wi.gov/topic/fishing/documents/outreach/FishSticksBestPractices.pdf

Healthy Lakes Action Plan:
https://dnr.wi.gov/Aid/documents/SurfaceWater/WIHealthyLakesImplementationPlan.pdf

DNR permitting information and application: https://dnr.wisconsin.gov/permits/water

Get funding for projects

DNR grants (full list): https://dnr.wisconsin.gov/aid/Grants.html

Midwest Glacial Lakes Partnership: http://midwestglaciallakes.org/grant/

Natural Resources Foundation of Wisconsin: https://www.wisconservation.org/grants/

Join a conservation group with an interest in Walleye

Walleyes for Tomorrow (local chapter contacts): https://walleyesfortomorrow.org/events-and-calendar/

Walleyes for Northwest Wisconsin: https://www.wfnw.net/about/

Wisconsin Conservation Congress: https://dnr.wisconsin.gov/about/wcc

Get private stocking information and permit application

WI DNR Fish stocking information and database:
https://dnr.wisconsin.gov/topic/Fishing/stocking

DNR online fish stocking application form: https://cida.usgs.gov/wdnr/apex/f?p=244:1::::::

Wisconsin Aquaculture Association (list of private fish farms): https://www.wisconsinaquaculture.com/

Appendix G. History of walleye stocking in Wisconsin

The DNR fisheries management program and its predecessors have a long history of propagating and stocking walleye throughout the state. This program began in the 1880's, with the first walleye propagated from the Lake Winnebago system and hatched at the Milwaukee Hatchery. Propagation efforts moved north and expanded to cover the entire state during the late 1890's to early 1900's. Fry were the first product produced and by 1910 there had been over one billion stocked in Wisconsin lakes (1,038,660,000 – Annual and Biennial Reports of the Commissioners of Fisheries).

Until Pre-European settlement, walleye were probably originally found in the large river systems and large drainage lakes throughout Wisconsin. Most populations found in small drainage and seepage lakes are likely the result of post-European settlement introductions (Becker 1983). Some of these waters have established self-sustaining walleye populations, others are maintained through continued stocking, and others contain remnant populations. Due to the long history of walleye stocking, we do not fully understand the effects our stocking program have had on native walleye stocks.

The length of walleye stocked started to increase in the 1930s. Earthen ponds were used to grow fingerlings, typically less than six inches in length. Small fingerling production continued to increase until peaking in the early 2000s (Figure G1). Major renovations at the two large northern hatcheries in the 1990s shifted production to on site one-acre lined ponds vs off site large earthen ponds.

Over the past 150 years, billions of walleye have been stocked throughout the state with only sporadic evaluation of their contribution to walleye fisheries (2.16B since 1972 - DNR propagation database). In the late 1950's and early 1960's, the efficacy of stocking practices was first scientifically examined. Evaluations of the length of fish stocked, survival of stocked fish, and development of management goals and objectives resulted in changing emphasis from stocking all waters with fry to developing individual lake recommendations. These recommendations included the length, number, and frequency of walleye stocked. Improvements at both major walleye hatcheries in the 1990s increased small fingerling walleye production using lined ponds.

Wisconsin began using genetic management units based on drainage basins in 2002, identifying five distinct strains of walleye consisting of Lake Superior, Lake Michigan, Mississippi River Headwaters, Rock-Fox, and Mississippi River mainstem. Best management practices now include utilizing brood lakes with sufficient natural reproduction and no recent stocking, using multiple brood lakes on an annual rotation, maintaining genetic diversity, minimizing variation in number of gametes contributed from each female, and ultimately maximizing genetic variation being stocked. Ideally, each hatchery utilizes 3 or 5 brood lakes, to ensure that waters stocked on an every-other-year basis are not receiving fish from the same brood source during consecutive stocking events.

Production of large fingerling or extended growth walleye, those greater than six inches, began in 1999. An average of about 76,000 per year were stocked through 2012 (Figure G2). The Wisconsin Walleye Initiative began in 2013 and increased funding for the purchase of forage needed to produce large walleye in state hatcheries as well as the funds to purchase

them from private producers. As of 2020, Wisconsin averages about 1.1M small fingerling walleye and 800,000 large fingerling walleye stocked per year.

Walleye stocking success is highly variable and difficult to predict. Stocking success is variable within and between waterbodies and within and between years, just as there are interannual fluctuations in natural reproduction and recruitment success of walleye. Available stocking evaluations suggest that only about 50% of new stockings are effective in creating walleye populations (reviewed in Kampa and Jennings, 1999), while maintenance and enhancement efforts generally have even lower success rates. About 85% of fry stockings result in no measurable year class (DNR unpublished data). Waters supported entirely by stocking generally have much lower walleye densities than those with walleye populations sustained by natural reproduction, and subsequently, anglers tend to catch walleye at substantially lower rates in waters where the population is sustained primarily by stocking.

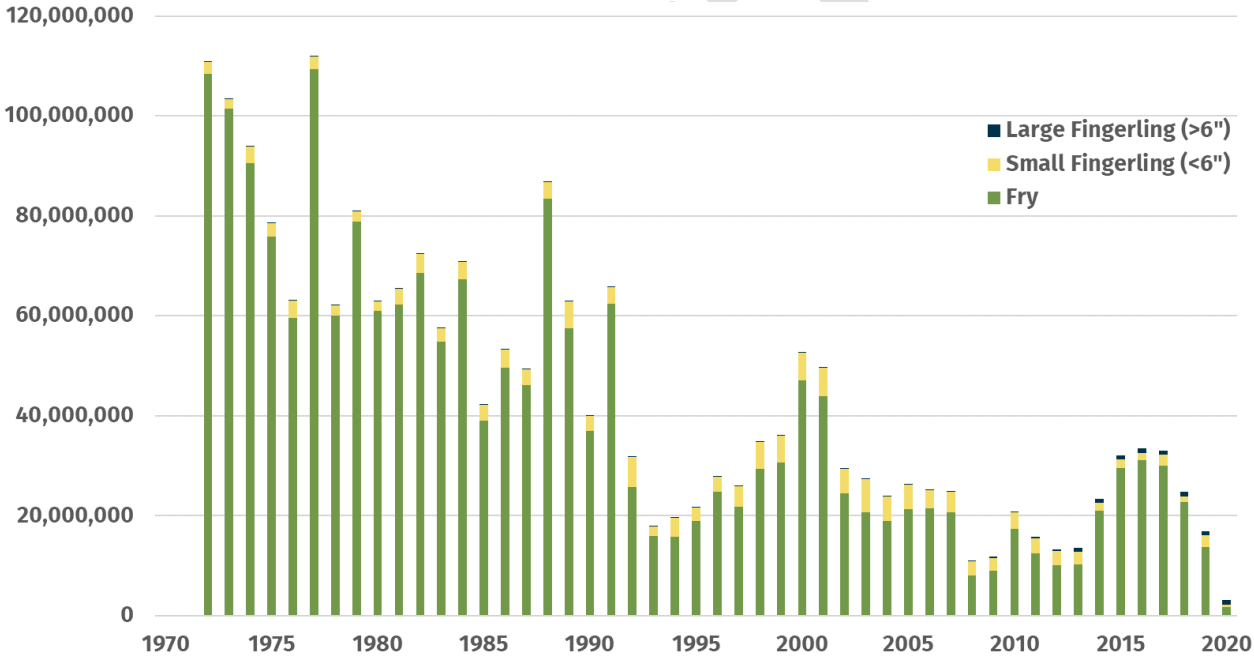

Figure G1. Common lengths of walleye stocked in Wisconsin from 1972-2020. Fry are stocked at a very small length and high per acre rate, while large fingerlings are much longer but are stocked at a lower per acre rate. Small fingerlings are intermediate.

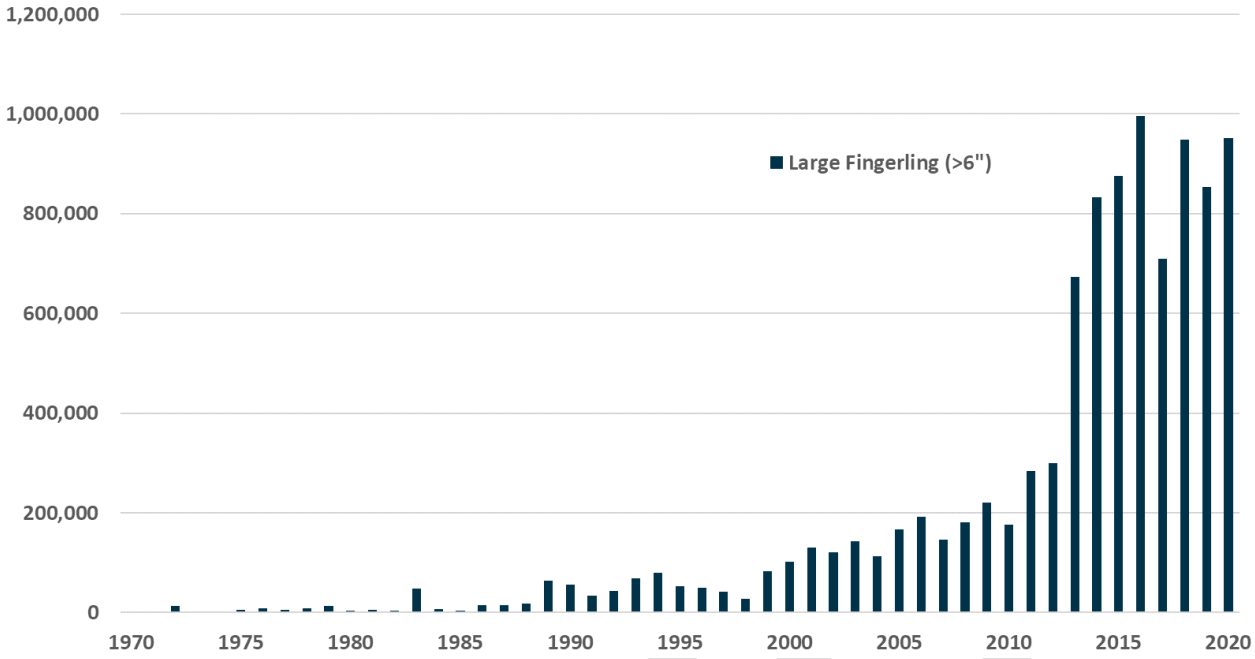

Figure G2. Large fingerling walleye stocked in Wisconsin from 1972-2020.

Appendix H. A brief description of the Walleye Lakes of Concern project development

The Walleye Lakes of Concern (WLOC) pilot program began after a discussion at the Technical Working Group (TWG) meeting about several lakes with declining walleye populations in the Lac du Flambeau (LDF) area. DNR, LDF, and GLIFWC representatives followed the TWG meeting by engaging in conversations about local fish populations and fisheries of interest. As part of these discussions, a focus on struggling walleye populations experiencing a lack of natural recruitment emerged. DNR and GLIFWC fisheries staff survey many walleye lakes each fall in northern Wisconsin to evaluate regional and lake-specific trends in walleye recruitment levels. From these data, individual lakes that once supported strong, naturally-reproducing walleye populations were identified as having concerning levels of recent walleye recruitment when compared with historical levels. It was believed that the low walleye recruitment would result in an eventual decrease of the numbers of larger walleye available to the future angling and tribal subsistence fisheries. The drafting of a WLOC management plan began as an effort to limit walleye population declines and to restore them to their prior, strong naturally-reproducing status.

In consultation and involvement with LDF and GLIFWC, DNR fisheries staff drafted the WLOC management plan with an overarching goal of promoting the restoration of sufficient walleye natural reproduction necessary to sustain the populations and fisheries they provide. Four area lakes were identified as good candidates for the restoration effort. Lake selection was made primarily upon the historical documentation in these waters of self-sustaining walleye populations over an extended period. Lake habitats and fish community attributes favoring walleye were also factors in lake selection.

Measurable objectives were established for the adult and juvenile components of the walleye population, and timelines were identified where progress towards the objectives would be evaluated. Management strategies including harvest reductions and stocking efforts were detailed for each water. Fisheries and habitat monitoring efforts were also identified, and public outreach and reporting requirements were specified. The management plan is thought to be adaptive, where new data and information may be used to update management strategies should they be deemed beneficial.