Fishery Management Plan

Chequamegon Waters (Miller Dam Flowage)
Taylor County, Wisconsin

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FOREWORD AND ACKNOWLEDGMENTS

This is a long-term strategic plan that will guide our fishery management efforts on Chequamegon Waters, also known as the Miller Dam Flowage, for many years to come. We believe our fishery management plans should be based upon a shared vision that is developed by combining broad-based survey information from statewide anglers and interactive input from local stakeholders. From those sources we determine user preferences in light of ecosystem capability. We believe the goals of a good plan must reflect the shared vision between users and managers; and measurable objectives must be set so we know whether selected strategies are succeeding or failing. We believe in making good tries and learning from failure. Part of that process involves amending strategic plans (like this document) when failure dictates that we either develop more realistic objectives or change our strategies to achieve reasonable objectives. This plan should be updated as needed in the decades that follow.

We call this a "long-term strategic plan" because the goals and objectives are relatively timeless, and because we possess neither the wisdom nor the authority to commit DNR or partner resources to a specific operational schedule of funding and action. Each year will bring its own fiscal constraints and operational priorities, so we must remain flexible in our implementation of proposed actions. Because there are so many complex and inter-related strategies, we have chosen to forego the lengthy process required to secure statewide DNR approval at this time. We will do our best to justify actions we believe necessary to realize our shared vision to DNR leaders and the general public as time and circumstances permit. We promise only to consult this plan at least once annually as we allocate our time and resources to the many important projects before us.

We want to thank the Miller Dam Lake Association for hosting our local stakeholder visioning session at the Jump River Community Center on March 5, 2005. Their continued support for this process and this plan has given us the energy and enthusiasm needed to aggressively pursue implementation and to expand this process to other lakes in Taylor County and the Upper Chippewa Basin.

We also want to thank the 50 local stakeholders who gave up an entire Saturday afternoon in order to help us develop the vision that forms the backbone of this plan. We are very pleased to incorporate their input at this appropriate stage in the planning process; and we look forward to their continued support for the actions we believe will be necessary to achieve the shared vision. We can settle for nothing less in an area where the quality of fishing means so much to our livelihoods and our quality of life.

--Jeff Scheirer and Dave Neuswanger

BACKGROUND

Habitat Characteristics and Productivity

Chequamegon Waters is a 2714-acre impoundment on the Yellow River, a major tributary to the Chippewa River. The flowage lies within the boundaries of the Chequamegon-Nicolet National Forest in western Taylor County. Several dams were built at this site in the last hundred years, creating flowages of various sizes. The original logging dam (8-10 feet high) was destroyed by fire in 1911. Later, a smaller rock roller dam (5 feet high) impounded about 100 acres near Beaver Creek. The modern-day structure is a 12-foot-high concrete roller dam completed in 1967. The dam is owned and operated by Taylor County and regulated by the Wisconsin Department of Natural Resources.

Chequamegon Waters is the largest waterbody in Taylor County. Maximum depth is 22 feet, average depth is 5 feet, and 39% of the reservoir is less than 3 feet deep. Bottom materials in the shallow area near shore are mostly muck (80%) with smaller amounts of sand (10%) and gravel (10%).

The watershed or land area that drains into Chequamegon Waters encompasses 125 square miles of forest with numerous wetlands and very little agricultural production. Eleven streams flow into the reservoir, including Bear Creek and Weasel Creek on the north end and Johns Creek and Beaver Creek on the south end. The largest tributary is the Yellow River which contributes about 80% of inflow to the reservoir. Average annual discharge from Miller Dam was 123 cubic feet per second (cfs) in 2001 and 151 cfs in 2002.

Tannins, lignins, and other organic compounds draining from wetlands contribute brown-stained water to the Flowage. Abundant algae are also part of the cause for low water clarity. Secchi disk visibility averages only about 3 feet. Low water clarity inhibits light penetration and limits the maximum depth where rooted aquatic plants can grow. High concentrations of total phosphorus (78 parts per billion) and chlorophyll *a,* an index of algal biomass (33 parts per billion), allow us to classify the flowage as highly eutrophic. Eutrophic waters are enriched with nutrients making them very fertile and productive biologically. Phosphorus apparently stems from natural sources, and its concentration is about twice that expected in an undeveloped watershed. The reservoir retains little or none of the Yellow River system's phosphorus load. Chequamegon Waters is considered a softwater reservoir based on its low alkalinity (17 parts per million) and low calcium hardness (21 parts per million). Its slightly alkaline pH ranges from 7.0 to 9.9 and averages 7.7.

Lasting thermal stratification and formation of a true hypolimnion (cold bottom layer of water deficient in dissolved oxygen) are rare. The large surface area and shallow average depth of the flowage allow wind-induced currents to keep the lake well mixed most of the time. However, during calm periods in summer the lower 6 to 10 feet of the water column often has reduced dissolved oxygen concentrations.

Human Development and Public Access

The permit that authorized construction of the dam lists recreation as its primary purpose. The reservoir and its surrounding public land and facilities offer diverse recreational opportunities, including fishing, waterfowl hunting, trapping, wildlife viewing, boating, wild rice gathering, and camping. Recreation is important to the local economy. There are no traditional resorts on the reservoir, but several established businesses provide services for recreational activities, including a private campground, a bait shop, rental cabins, and a winter sports area.

The U.S. Forest Service and Taylor County maintain four public landings with boat ramps, boarding docks, and parking for vehicles and trailers. A town road offers drive-on access for icefishing, and several unimproved public sites provide carry-in access and make-shift landings. Although some sites occasionally become congested during peak seasons, collectively these facilities exceed the capacity guidelines for public access to a waterbody of this size.

Over 88% of the 34 shoreline miles bordering Chequamegon Waters and its islands are held in public ownership. Thirty miles of frontage lie within the Chequamegon-Nicolet National Forest. On the eastern shore the U.S. Forest Service maintains a 78-unit campground, two swimming beaches, a boat ramp, a playground, and the trailhead for the Perkinstown Motorized Trail, a two-way trail developed for all-terrain vehicles, motorcycles, and snowmobiles. Taylor County owns a portion of the lakebed and maintains a park with picnic and boat launching facilities at County G. Shore fishing opportunities are readily available on all public frontage, at the U. S. Forest Service fishing pier, causeways, campgrounds, and tailwaters. Most of the privately-owned frontage is concentrated at the northern third of the reservoir and near the dam.

Historical Perspective on the Fishery

In the absence of quantitative information from creel surveys, our observations and anglers' reports lead us to believe that Chequamegon Waters Flowage receives moderately high fishing pressure throughout the open water and ice covered periods. Observations of 20-30 boats and 75-100 ice fishing shanties would be considered as typical daily use. Officers of the Miller Dam Lake Association explained that 500-1,000 anglers per day could be considered as a ballpark estimate of typical fishing effort during early winter, 2005-2006.

Effort often is concentrated on weekends when anglers compete in fishing tournaments. In 2005 the Department granted permission for sponsors to hold five fishing tournaments on Chequamegon Waters Flowage. An estimated 1,500 anglers competed in a six-hour ice fishing contest on January 25, 2005, and 40-80 participants competed in four permitted bass angling tournaments held from June through September 2005. An unknown number of non-permitted fishing contests also takes place on this reservoir each year. As of 2006, competitions involving fewer than 20 boats, 40 participants, or $500 in prize value do not require a permit from the Department.

We can characterize the fish community in Chequamegon Waters from survey results, but we know little about the abundance and size distribution of individual fish populations. Twenty-four fish species were captured in electrofishing and netting surveys conducted from 1960 to 2002. Fish species composition is similar to that in other regional waters where largemouth bass and northern pike are the principal predators. Bluegill and black crappie are the most abundant panfish. These four species were among the most popular sport fish species of interest to participants in the 3/5/05 visioning session.

Walleye were found in samples collected before the Fowage was filled in 1967, but not afterward. DNR tried to establish a walleye fishery by stocking 1.2 million inch-long fry in 1967. Subsequent surveys revealed that no fry survived to yearlings, and all walleye stocking was discontinued.

Before dam construction, muskellunge probably inhabited much of the Yellow River. We suspect that muskellunge from the Chippewa River at times still use a 7-mile reach of the lower Yellow River between Lake Wissota and the dam in Cadott, which has prevented fish from moving further upstream since 1915. Muskellunge were absent from all historic and contemporary fish samples collected in the Yellow River and in Chequamegon Waters. Participants in the 3/5/05 visioning session affirmed that they had no interest in establishing a muskellunge fishery in the Flowage.

A fish kill occurred in Chequamegon Waters during the winter of 1976-1977. Winterkills usually are linked to decreased dissolved oxygen concentrations. Under the ice and sunlight-blocking snow, respiring organisms and decaying organic material can consume oxygen at rate than can it can be produced by photosynthesis or introduced by tributary streams. Fish die directly from suffocation or indirectly from stresses that reduce their tolerance to parasites and disease. Shallow, eutrophic systems like Chequamegon Waters are more susceptible to winterkill than deeper, less fertile waters. Fish do seem to have a limited ability to adapt to declining oxygen levels by moving toward tributaries or open water where conditions are more favorable. Consequently, loss of entire fish populations from winterkill is unlikely in most cases.

We found no records to quantify the extent of the die-off in 1976-1977, but the "severe winterkill" was described in subsequent survey reports as "…massive, dramatically reducing the fish population." The long cold winter and reduced inflow following the drought in 1976 were cited as contributing factors. As an emergency response, a pump-cascade aerator was operated at one site early in 1977, possibly helping to avert a total winterkill. Northern pike fry and largemouth bass fingerlings were stocked from 1977 to 1985 in an effort to restore losses to those populations.

A permanent aeration system was installed in 1988 and improved in 1993. The aerator is located in the Taylor County Park adjacent to the Yellow River inlet. Miller Dam Lake Association operates the system from January through March as a preventative measure regardless of dissolved oxygen levels.

Chequamegon Waters experienced another fish kill in the late winter and early spring of 1991. Shortly after the ice melted, DNR Fisheries staff observed a few dead panfish and approximately 100 dead largemouth bass between 8 and 18 inches long. They also saw many bass and other species alive. Initially, bass mortality seemed to be minor – restricted to fish that had failed to seek refuge in the higher-oxygen waters of the main creek channel. But this initial optimistic assessment was revised from "minor mortality" to "massive mortality" based upon the low capture rate of largemouth bass (17/hour) and the near absence of bass longer than 12 inches in a late May electrofishing survey conducted when water temperature was 76°F. DNR then concluded that the majority of older adult bass had been killed, and that most survivors were only 1 to 3 years old. DNR's Fish Health Laboratory found parasitic roundworms (*Philometra sp.*) in tissue from bass that were showing visible signs of distress in early May. But parasites alone rarely kill fish. Compounding stresses from high bass population density, low winter oxygen levels in parts of the Flowage, rapidly rising spring water temperature, fungal infection, and roundworms were cited in a news release as apparent contributors to bass mortality. From 1991 to 1994, largemouth bass adults, yearlings, and fingerlings from state and private hatcheries and other lakes were stocked to rehabilitate the bass population. No bass have been stocked since 1994.

Fish stocking was done to establish a fishery in the new impoundment and to restore populations following fish kills and other declines, but there are no records of stocking during 1968-1975, 1986-1990, and 2003-2006.

Chequamegon Waters received millions of northern pike fry (less than 1 inch long) in 1967 and annually from 1977 to 1985. According to a 1994 DNR summary, northern pike reproduction had declined to a point where natural reproduction could not maintain the population. DNR began a restocking program aimed at restoring the pike fishery to the point where adults could provide sufficient reproduction and recruitment to maintain a stable population. Nearly 36,500 northern pike fingerlings (5 to 9 inches long) were stocked annually from 1991 through 2002.

From 1999 to 2001 the Miller Dam Lake Association constructed about 50 timber fish cribs, which were placed in several clusters in the deepest part of the Flowage.

Aquatic Community Overview

Aquatic plants provide food, cover, spawning substrate, and nesting habitat for many species and life stages. Emergent and submergent plants control erosion by dampening wave action. As expected in this nutrient-rich ecosystem, aquatic plants grow in most shallow areas of the Flowage at moderate to high density. In 2002 the U.S. Forest Service identified 34 aquatic plant species in Chequamegon Waters and rated the following plants as common or abundant:

arrowhead	clasping leaf pondweed	common bladderwort
common burreed	coontail	elodea
flat stem pondweed	small and large duckweed	wild rice

In the early 1990s wild rice was introduced into Chequamegon Waters by the U.S. Forest Service to enhance food and habitat for waterfowl and other wildlife. Wild rice has become established as a self-sustaining population. We are unaware of any surveys that mapped the coverage of wild rice in the impoundment, but the population appears to be expanding since its introduction. Wild rice rarely grows in water deeper than five feet. Because poor water clarity limits the depth of light penetration in Chequamegon Waters, it is unlikely that wild rice will colonize areas deeper than 4 feet.

Two exotic aquatic plant species are present in the Flowage—curly-leaf pondweed and Eurasian watermilfoil. These invasive perennials were first recorded in Chequamegon Waters in 2001 and 2002, but both may have been present for many years. These prolific plants can reproduce from vegetative fragments, and their distribution in the Flowage has been expanding since their discovery. Curly-leaf pondweed and Eurasian watermilfoil are adapted for rapid growth in early spring, giving them a competitive advantage over native plants. Both species thrive in alkaline, nutrient-rich waters. They prefer soft substrate and shallow water depths, and they tolerate low light and low water temperature. In mid-summer, when most aquatic plants are growing, curly-leaf pondweed plants are dying. Plant die-offs may result in a critical loss of dissolved oxygen. Decomposition can increase nutrients which contribute to algal blooms. Decaying plants can often accumulate as floating mats that produce unpleasant odors and interfere with recreation. Based on the favorable growing conditions, we can anticipate that curly-leaf pondweed and Eurasian watermilfoil will persist in Chequamegon Waters. Presently, we do not know whether these exotic species are detrimentally affecting native communities. No attempts to control their spread have been undertaken yet.

Purple loosestrife is an exotic plant that has invaded the shoreline and wetlands of Chequamegon Waters. Its local distribution has not been mapped, however. Purple loosestrife displaces native wetland vegetation and degrades wildlife habitat. As native vegetation is displaced, rare plants are often the first species to disappear. Several beetle and weevils that feed on purple loosestrife seem to offer the most promising and least disruptive long-term solution for controlling the spread of purple loosestrife. The Department may solicit cooperation from the local lake association in surveying the extent of purple loosestrife at Chequamegon Waters. If purple loosestrife stands reach a density where biological control would be effective, further cooperation may be needed for gathering, rearing, and releasing its natural insect enemies.

Rusty crayfish were first documented in Chequamegon Waters in 1993, and they have been found in the Yellow River downstream from Miller Dam. The rusty crayfish is an aggressive invader that often displaces native crayfish. In many waters, rusty crayfish have reduced aquatic plant abundance and species diversity, but their impact on the aquatic plant community is not apparent in Chequamegon Waters.

A Vision for the Chequamegon Waters Fishery

On March 5, 2005, DNR representatives Jeff Scheirer and Dave Neuswanger met with 50 local stakeholders who were willing to volunteer their time to help develop a long-term vision for the fishery of Chequamegon Waters, also known as Miller Dam Flowage on the Yellow River in Taylor County. Objectives of the meeting were to prioritize species of interest, and then to identify for those species the relative importance of numbers versus size and catch versus harvest. Attention was then focused on identifying the desired conditions (goals and objectives) that appear in this plan. Actual verbiage of goals and objectives was developed by consensus of local stakeholders in consultation with Jeff Scheirer, who served as technical advisor to the group on what was possible. However, no attention was given to methods for achieving goals and objectives (management strategies such as harvest regulations, fish stockings, and habitat preservation or enhancement). It was understood and generally agreed that professional fishery managers would select the most appropriate strategies once goals and objectives had been developed with help from local stakeholders and adjusted to incorporate what is known about statewide angler preference and the capacity of Chequamegon Waters to produce what is desired.

Detailed results of the visioning session appear in the Appendix. Similar to anglers statewide, local stakeholders in the Chequamegon Waters fishery were more interested in creating and sustaining good fishing for panfish, particularly black crappie and bluegill, than for any other species. Participants helped fill a gap in DNR data by convincing us that the Flowage is capable of producing good numbers of preferred-size panfish – black crappie over 10 inches long and bluegill over 8 inches long, and that much larger specimens of both species are known to occur. Organizers shared results of a January 25, 2005 ice fishing contest in which 1,500 anglers participated, clearly showing that preferred-size black crappie and bluegill are present and of high interest to area anglers (Table A3). An unusually high proportion of voting stakeholders (38% for crappie and 54% for bluegill) expressed a preference for size over number of these panfish species, while remaining participants preferred a more typical balance between number and size (Table A2). Most preferred a balance between catching and harvesting crappie and bluegill, but 20% favored maximum sustainable harvest for black crappie, and 8% actually favored a catch-and-release approach to managing the bluegill fishery – an unusual preference for this species. Several people expressed their concern about the effects of purportedly heavy fishing pressure on the future of the panfish fishery.

Local stakeholders ranked walleye high among fish species of interest in Chequamegon Waters, despite the fact that Flowage habitat strongly favors a fish community dominated by largemouth bass and other species of sunfish. Participants were informed why young walleyes do not survive naturally in substantial numbers in flowages of this type. DNR explained that the only way to sustain even a "bonus fishery" for walleye (one in which an occasional fish is caught incidental to other angling pursuits) would be to stock extended-growth walleye fingerlings (5-7 inches long) occasionally, because walleye of this size are capable of evading predation to some extent by largemouth bass. Considering DNR's obligation to direct its limited hatchery production of extended-growth walleye fingerlings to more suitable and traditional walleye waters, everyone seemed to understand that DNR would be unable to justify stocking such expensive fingerlings (about $1.65 per fish in today's market) into this flowage. But local stakeholders wished to reserve the option to pay for such stocking with privately raised funds to an extent consistent with achieving the goals and objectives of this plan. DNR was pleased with stakeholder flexibility and feels that having some walleyes in the fish community may help to ensure that small panfish do not become overabundant. Appropriate stocking applications are likely to be approved. Participants were significantly more interested in the size of walleye than the number of walleye available for catch (Table A2), though a majority preferred a balance between numbers and size. Very few viewed walleye as a species they would pursue with a catch-and-release ethic, so any regulation more restrictive than the statewide minimum length limit may not be appropriate at this time.

Northern pike were of medium or high interest as a sport fish to 76% of those who voted (Table A1), reflecting an unusually high level of regard for northern pike. Also, a definite voter preference for size over number, and a significant interest in catch-and-release (Table A2), suggests that northern pike may fill the niche of top predator and serve in the role of big-game fish in this flowage, much as muskellunge does in many other Northern Region waters. An objective for northern pike density was not chosen at the visioning session because DNR lacked the data upon which to set such an objective. But the size structure objective reflects local stakeholder preference for large northern pike, and Table A3 demonstrates that Chequamegon Waters is capable of producing such fish.

Largemouth bass were of medium or high interest to 63% of local stakeholders (Table A1). Some of those who indicated little or no interest in the largemouth bass sport fishery may have voted that way based upon their claim that bass tournaments and club anglers have monopolized boat landings and parking areas on summer weekends. Apparently far more small tournaments and club outings are occurring than DNR is tracking because current law does not require a fishing tournament permit for events involving fewer than 20 boats. Local stakeholders who feel the lake has been overrun by competitive anglers in 10- to 19-boat events would like to see us require and restrict the number of permits for smaller events, too, in order to avoid swamping the access areas. Despite feelings of resentment due to user conflicts, local stakeholders were aware of the quality of their largemouth bass fishery. Many displayed a preference for size over number, and a majority (54%) preferred a catch-and-release approach to the bass fishery (Table A2). Stakeholder-driven objectives reflect a desire for continued bass fishing with some fish available in the memorable size range.

Yellow perch and smallmouth bass were of interest to many local stakeholders, but they were of distinctly less interest than the other panfish or largemouth bass (Table A1). Nobody seemed to mind that, near the end of the meeting, we did not have time to discuss specific goals and objectives for yellow perch or smallmouth bass; but DNR reserves the right to establish such objectives consistent with other known preferences and the overall plan for the fishery.

A couple participants suggested that we give some consideration to channel catfish, but low or nonexistent interest among a majority of voters (62%) suggests that our limited management dollars be spent elsewhere. Reaction to bullheads was similar (Table A1).

Though not highly relevant to management of the fishery, the topic of wild rice expansion generated some discussion at the end of the visioning session. Some lake users were upset about the degree to which wild rice has expanded into shallow bays and thoroughfares, making boater access difficult or impossible in places where people have traditionally traveled. Because the maximum rooting depth of wild rice is about four to five feet, the expansion of wild rice will be limited by physical factors. Nonetheless, folks were encouraged to establish a dialogue with the U.S. Forest Service who established wild rice at the Flowage, and with the Great Lakes Indian Fish and Wildlife Commission, to see what, if anything, can be done to moderate the expansion of this grain-producing plant important to both waterfowl and to the native and non-native people who participate in its harvest.

Overall, this was a very positive session in which everyone, including DNR representatives, learned a great deal. We are confident that we can develop strategies that reflect the preferences and desires of local stakeholders and other anglers who visit the area.

FISHERY MANAGEMENT PLAN

GOAL 1: A black crappie population of moderate density with a moderate proportion of preferred-size fish.

Objective 1.1: Currently we lack an agency-accepted standard method to assess the relative abundance of black crappie. Until an assessment method is chosen, we will consider a late spring or mid fall fyke net capture rate of 10-20 black crappie 5 inches and longer per net-night to be somewhat indicative of the desired moderate density.

Objective 1.2: Of all black crappie 5 inches and longer captured by fyke netting in late spring or mid fall, 30-50% should be 10 inches or longer (RSD_{10}= 30-50%).

Black Crappie Status and Management Strategies:

We have no survey data for black crappies captured by fyke netting in late spring or mid fall to assess the population status relative to Objectives 1.1 and 1.2. Small samples of panfish were collected by electrofishing in May and September in several years. However, because of the limited sampling effort (12 to 18 minutes) and the selective vulnerability of panfish to electrofishing gear at those times, we do not consider those samples to adequately represent the abundance and size distribution of black crappie.

Until we can sample black crappies by fyke netting at meaningful times, information from two mid-summer fyke net samples offers the closest surrogate by which we can cautiously compare current population status to the interim objectives.

Table 1. Catch rate and Relative Stock Density (RSD) of black crappie captured in large fyke nets in Chequamegon Waters during mid summer, 1998 and 2002.

Dates	Net-Nights	Catch Rate (No. ≥ 5"/Net-Night)	RSD_{10}	RSD_{12}
July 27-30, 1998	22	10.9	22.5	0.8
August 12-15, 2002	18	10.5	10.6	1.6

Catch rates of stock-size black crappies (5 inches and longer) captured in large fyke nets was similar in mid summer of 1998 and 2002 (Table 1), and those catch rates were near the lower end of the proposed objective range for late spring or mid fall samples. The proportion of preferred-size fish (RSD_{10}) in the length distributions of black crappies in mid-summer fyke net samples fell short of the performance standard in Objective 1.2 in both 1998 and 2002 (Table 1). The proportion of memorable-size crappies 12 inches and longer (RSD_{12}) was less than 2% in samples from both years.

No age data are available to assess the growth rate of crappies in Chequamegon Waters. Anglers' catches registered in fishing contests (Table A3) and photographed at the local bait shop reveal that black crappies have potential to reach 14 inches long in this fertile system. Harvest of black crappies has not been quantified through a creel survey, but we suspect that anglers take a substantial portion of the population each year. Our belief is based on local reports of good to excellent fishing, observations of heavy fishing pressure, and anglers' preference, both locally and statewide, to catch and keep black crappies. According to the bait shop owner, ice fishermen were catching fewer crappies in winter 2005-2006 than in recent years.

Crappie populations are known to be particularly cyclic and sensitive to exploitation by angling. Their abundance often fluctuates with reproductive success, and it can decline precipitously when anglers harvest a high percentage of the adult population, rebounding only after fishing pressure subsides and more young fish are recruited to the population. Fluctuations in crappie abundance related to harvest will most likely continue in the wake of heavy fishing pressure, though more restrictive harvest regulations could help to distribute the harvest more equitably among anglers and years.

In our opinion, it is unlikely that we will achieve Objective 1.2 under current regulations that permit anglers to harvest 25 panfish daily of any species with no minimum length limit. We suspect low values for RSD_{10} and RSD_{12} from the summer fyke net samples in 1998 and 2002 are symptomatic of anglers selectively harvesting a high proportion of the largest crappies in the population. Consequently, some combination of reduced daily bag limit and minimum length limit may be necessary in order to achieve desired crappie population size structure. A simple bag limit reduction may improve numbers but have no impact or even a negative influence on size. A simple minimum length limit runs the risk of stockpiling fish just under the legal length for harvest, adversely affecting growth rate. We hope there will be better options available for managers to use in the near future; and so we await the recommendations of DNR's Panfish Standing Team – a group of biologists from throughout the State charged with developing more effective sampling methods and management options for panfish in Wisconsin. In the meantime, we will try to obtain a representative sample of the crappie population with appropriate gear at an appropriate time.

GOAL 2: A bluegill population of moderate density with a moderate to high proportion of preferred-size fish and a low proportion (a measurable presence) of memorable-size fish.

Objective 2.1: Currently we lack an effective method to assess the relative abundance of bluegill. Until an assessment method is chosen, we will consider a late spring electrofishing capture rate of 75-150 bluegill 3 inches and longer per hour of directed effort to be somewhat indicative of the desired moderate density.

Objective 2.2: Of all bluegill 3 inches and longer (stock size) captured by electrofishing in late spring, 15-20% should be 8 inches or longer (RSD_8 = 15-20%) and 1-2% should be 10 inches or longer (RSD_{10} = 1-2%).

Bluegill Status and Management Strategies:

Similar to our dilemma with black crappie, we also lack meaningful information to evaluate the status of bluegill in Chequamegon Waters. Lacking late spring electrofishing data altogether, we examined fyke net data collected in mid summer of 1998 and 2002 in order to get some idea of bluegill population size structure as reflected by fyke nets. We do not know how to interpret fyke net catch rates for bluegill, but we are encouraged to see at least a few fish over 8 inches (Table 2).

Table 2. Catch rate and Relative Stock Density (RSD) of bluegill captured in large fyke nets in Chequamegon Waters during mid summer, 1998 and 2002.

Dates	Net-Nights	Catch Rate (No. ≥3"/Net-Night)	RSD_8	RSD_{10}
July 27-30, 1998	22	12.9	2.8	0
August 12-15, 2002	18	51.3	2.6	0

If we knew that mid-summer fyke net samples accurately reflected bluegill population size structure, we would conclude that we are currently far short of achieving Objective 2.2. But the fact is that large adult bluegill can be quite pelagic (open-water dwelling) during mid summer, and so the biggest fish in the population may not have been vulnerable to our near-shore capture method at that point in time. However, the mere fact that we captured any bluegill over 8 inches long reveals the potential of the Flowage to produce them, as corroborated by visioning session participants. We did not capture bluegill over 10 inches long, but anglers tell us there are some. The local bait shop owner reported that ice fishermen harvested a number of bluegills 9-11 inches long in January, 2006. The longest bluegill ever measured at the bait shop was 12.75 inches.

The potential of bluegill to achieve preferred (≥8 inches) and even memorable (≥10 inches) size in Chequamegon Waters is further supported by age analysis based upon scale samples collected in 1998. At that time, Flowage bluegill grew faster than the average bluegill in Wisconsin, reaching 6 inches in 3-4 years and 8 inches in only 5-6 years.[1]

As with black crappie, it is unlikely that we will achieve the bluegill size structure objective (2.2) under current regulations that permit anglers to harvest 25 panfish daily of any species with no minimum length limit. We cannot conclude that low RSD_8 for bluegill in summer fyke net samples in 1998 and 2002 reflect true population status. But if these data are even remotely indicative of actual status, the current state is symptomatic of anglers selectively harvesting a high proportion of the largest bluegill in the population. As with black crappie, some combination of reduced daily bag limit and minimum length limit may be necessary in order to achieve desired bluegill population size structure. A simple bag limit reduction may increase numbers but have no impact or even a negative influence on size. A simple minimum length limit runs the risk of stockpiling fish just under the legal length for harvest, adversely affecting growth rate. We hope there will be better options available for managers to use in the near future; and so we await the recommendations of DNR's Panfish Standing Team – a group of biologists from throughout the State charged with developing more effective sampling methods and management options for panfish in Wisconsin. In the meantime, we will try to obtain a representative sample of the bluegill population with appropriate gear at an appropriate time.

GOAL 3: A "bonus fishery" for walleye, characterized by a walleye population of low density with a moderate proportion of preferred-size fish.

Objective 3.1: 0.5-1.0 adult walleye per acre in spring population estimates

Objective 3.2: Of all walleye 10 inches and longer (stock size) captured by fyke netting in early spring, 20-40% should be 20 inches or longer (RSD_{20} = 20-40%).

Walleye Status and Management Strategies:

Because anglers occasionally catch large walleyes in the Flowage, we believe that Chequamegon Waters and the Yellow River upstream currently support a walleye population with very low density (less than 0.5 adult per acre). With limited harvest, low-density walleye populations typically include a substantial proportion of preferred-sized fish 20 inches and longer. This characterization of the walleye population is consistent with accounts from local anglers and bait retailers who explained that while catching a walleye is rare, those caught are usually large.

[1] No adjustment was applied to bluegill length at age to account for their gain during part of the growing season in the year of capture.

Walleyes may spawn on the limited gravel in the reservoir. However, based on long-distance movements documented in radio-telemetry studies on other river systems, we suspect that most walleyes spawn in the Yellow River upstream from the Flowage. Regardless of where spawning occurs; it is unlikely that natural reproduction alone will increase walleye population density. Facing predation from abundant largemouth bass and black crappie, too few small walleye survive and grow to contribute to the fishery. This is one reason why DNR will not stock the traditional small fingerlings (1.5-2.0 inches long) into Chequamegon Waters. Stocking "extended-growth" walleye fingerlings (5-7 inches long) that are capable of evading predation by largemouth bass would be necessary to create and maintain the "bonus" walleye fishery that local stakeholders desire.

Stakeholders interested in providing a bonus walleye fishery that meets Objective 3.1 in Chequamegon Waters will have to assume the primary role by purchasing extended-growth walleye fingerlings for stocking. Beyond reviewing stocking permit applications and obtaining incidental information about walleyes during surveys of other species, the Department will not be able to commit public resources to this effort. State-operated fish hatcheries have limited capacity and funding to produce large walleye fingerlings, and the entire annual production will continue to be allocated to other waters with physical conditions and fish communities better suited for walleye fisheries. Assuming 20-30% post-stocking survival (highly variable), the stocking density should not exceed one extended-growth walleye fingerling per acre in any given year. These fish, when available from private fish dealers, are expensive ($1.50-$2.00 each in 2006) and usually are deliverable sometime in September in northern Wisconsin.

If stakeholders choose to purchase large walleye fingerlings from a private fish dealer, an approved stocking permit from the Department is required before any fish may be stocked. Fish stocking permit applications are available at any DNR Service Center. Applications for stocking fish in Chequamegon Waters should be submitted to:

Fisheries Biologist, Wisconsin DNR
Park Falls Service Center
875 S. 4th Ave.
Park Falls, WI 54552

Walleye are known to interact with other fish populations. For instance, predation by walleye can improve the size composition of panfish populations like crappie and bluegill by keeping their abundance in check so that intra-specific competition does not impede growth. In the near absence of natural recruitment, we should be able to closely control walleye population density through permitted stockings of a conservative number of extended-growth walleye fingerlings. Therefore, we believe the desired bonus fishery for walleye can be established without conflicting with higher-priority goals for panfish. In fact, a low-density population of walleye may help to achieve management goals for black crappie and bluegill by preying upon young panfish in years when their reproductive survival is excessive. If survey information or other evidence indicates that walleye density exceeds Objective 3.1 to the detriment of panfish populations, then stocking should be suspended until walleye density drops to within the desired range.

We recommend no special regulations for walleyes in Chequamegon Waters. The statewide rules now in effect (15-inch minimum length limit, daily limit 5) seem adequate to achieve Objectives 3.1 and 3.2. Based upon creel surveys conducted throughout the Ceded Territory, it is evident that a vast majority of anglers never harvest more than one or two walleyes daily even when the bag limit is five. Walleye at the desired low density will grow fast in this productive system, helping to achieve the desired proportion of fish of preferred size. Further restrictions would imply a greater emphasis on walleye than actually exists and would be out of alignment with stakeholder interest in harvesting an occasionally caught walleye rather than releasing a high proportion of those caught (Table A2).

GOAL 4: A northern pike population of low to moderate density with a moderate proportion of preferred-size fish.

Objective 4.1: 2 to 3 adult northern pike per acre in spring population estimates.

Objective 4.2: Of all northern pike 14 inches and longer captured by fyke netting in early spring, 5-10% should be 28 inches or longer (RSD-28 = 5-10%); and 1-2% should be 34 inches or longer (RSD-34 = 1-2%) .

Northern Pike Status and Management Strategies:

Nearly all samples of the fish community have included northern pike, but all recent samples by netting and electrofishing were too small (0-14 individuals) to provide any useful information about the current status of the pike population. Because northern pike are not easily captured by electrofishing gear, we will try to obtain a sample by netting during the spawning period to estimate population density and assess size distribution in relation to the targets in Objectives 4.1 and 4.2.

Scale analysis from a very small sample of 12 northern pike captured in Chequamegon Waters in 1998 indicated faster growth than the statewide average for ages 2 to 6. Pike were already 21 inches long (quality size) part way through their fourth growing season. However, inferences about growth rate of northern pike should be viewed with caution when age is determined from scales, especially such a small sample of scales. Interpretation of scales tends to underestimate true age, especially for pike age 4 and older, making the growth rate appear faster than it actually is. Pike older than age 4 should be aged from cleithral bones, which are located just behind the gills. Because annual marks on cleithral bones are easier to see than those on scales, age determination is less ambiguous. Although cleithral bones yield more accurate estimates of age than scales do, removing cleithral bones requires sacrificing the fish. With cooperation from contestants and the lake association, cleithral bones taken from pike harvested in the annual ice fishing tournament could provide a sufficient sample to evaluate pike growth rate in Chequamegon Waters.

Chequamegon Waters has ample productive capability for northern pike to reach memorable size (34 inches long), and the system may have the potential for pike to reach trophy size (44 inches and longer). In winter 2005-2006 anglers registered several pike exceeding 40 inches and 20 pounds in a "big fish" contest at the local bait shop. The Flowage's capacity to produce large northern pike has apparently existed for decades. A faded newspaper clipping from the late 1970s shows an angler holding a 28-pound northern pike from Miller Dam Flowage. A note in the lake file dated July 5, 1981 documents five anglers who caught 25 northern pike (their daily limits) that weighed a total of 218 pounds.

From these circumstantial indicators, it appears that the pike population has continuously produced a sustainable surplus of large fish for harvest, even with moderate to heavy fishing pressure. At first glance the old adage, "If it's not broke, don't fix it," might point us toward "status quo" management for northern pike. Presently, anglers may take five pike per day with no minimum length limit. However, a Minnesota study suggests that recreational anglers there are selectively harvesting the largest northern pike, resulting in many populations with high densities of small fish. At Chequamegon Waters, management aimed at producing large pike may very well require tighter restrictions on the harvest of large fish. Our first order of business for pike will be to conduct a quantitative population estimate based on valid mark-recapture techniques in order to compare the current status with the desired density and size objectives for the pike population. With that information in hand, findings of the Minnesota study will be helpful in deciding whether or not to implement more restrictive harvest regulations for northern pike at Chequamegon Waters, where fishing pressure targeting pike is perceived to be high.

GOAL 5: A largemouth bass population of moderate density with a low proportion of memorable-size fish.

Objective 5.1: Electrofishing capture rates for 8-inch and longer largemouth bass of 40-60 per hour during the bass spawning season.

Objective 5.2: Of all largemouth bass 8 inches and longer (stock size) captured by electrofishing during the bass spawning season, 2-4% should be 20 inches or longer.

Largemouth Bass Status and Management Strategies:

Chequamegon Waters has become well-known for the quality of its largemouth bass fishery, drawing many anglers from nearby and distant parts of Wisconsin and neighboring states. We have no data to quantify harvest, but we suspect that most anglers practice catch-and-release when fishing for largemouth bass at Miller Dam Flowage, including virtually all who participate in permitted fishing tournaments.

Ideally, we would assess population status from samples of largemouth bass captured by electrofishing during their active spawning period in late May and early June when bass of all sizes can be expected to be equally vulnerable to capture by our shallow-water electrofishing gear. However, the only recent spring electrofishing surveys at Chequamegon Waters were conducted on May 6 and May 23, 2002 (Table 3) when water temperatures ranged from 51 to 58°F and bass were not yet nesting. Therefore, we are unwilling to conclude anything about the bass population on the basis of those samples.

Table 3. Catch rates, Proportional Stock Density (PSD), and Relative Stock Density (RSD) of largemouth bass captured by electrofishing in Chequamegon Waters, 1998 and 2002.

Date	Electrofishing Hours	Catch Rate (No. ≥8"/Hour)	PSD	RSD_{15}	RSD_{20}
September 21, 1998	2.2	36	83	28	0
May 6, 2002	1.6	10	63	31	0
May 23, 2002	1.7	7	75	33	0
September 17, 2002	1.7	38	67	19	0

Fishery managers in Missouri abandoned fall electrofishing for assessing largemouth bass populations in clear lakes that had deep-water structure because the largest bass in those waters occupied deep structure in the fall and could not be captured by shoreline electrofishing. However, Missouri biologists also found that bass of all sizes could be captured by nighttime electrofishing in early fall in shallow lakes with reduced water clarity, ample cover near shore, and little or no deep-water structure. Physical conditions in Chequamegon Waters match those in Missouri waters where fall electrofishing was considered a legitimate sampling method. In the future, we will attempt to obtain representative samples of the Chequamegon Waters largemouth bass population by electrofishing during the bass spawning period. In the meantime, the two electrofishing surveys conducted in September 1998 and 2002 should allow us to draw modest generalizations about largemouth bass in the Flowage.

Largemouth bass catch rate did not change appreciably between 1998 and 2002 (Table 3), possibly indicating a stable population. These fall catch rates were below the range selected to index the desired population density (Objective 5.1), but we can draw no conclusions based upon fall survey data. Some participants at the visioning session were of the opinion that largemouth bass density was currently at the desired level. The proportion of quality-size and preferred-size fish was relatively high, but PSD and RSD_{15} declined in fall samples between 1998 and 2002 (Table 3).

Again, we are unable to draw conclusions about trends because we do not yet know if fall electrofishing samples at Chequamegon Waters accurately represent true population size structure. No memorable-size fish (bass ≥ 20") were captured in either survey, and reports of such fish by anglers suggest they are quite rare. Experienced anglers who reported fishing 1920 hours in a bass tournament league over the last ten years caught only one largemouth bass longer than 20 inches in Chequamegon Waters during those organized fishing events.

In 1998 the growth rate of largemouth bass in Chequamegon Waters was slower than statewide average. Ages determined from scales collected in late September 1998 revealed that largemouth bass reached the minimum length limit (14 inches) in 7 to 8 years. Regardless of actual population size structure, this should be a red flag of caution regarding any thoughts of increasing the minimum length limit. If fish are already growing slowly because of high density and intra-specific competition, then protecting even more fish will not help. Once we are confident in the relative density and actual size structure of the Chequamegon Waters largemouth bass population, we will know whether to recommend that we "stay the course" with the statewide minimum length limit or consider some other harvest regulation, such as a slot length limit, that would allow some harvest of slower-growing small fish while protecting enough mid-size fish (perhaps 14-18 inches) to ensure that our size structure objective (RSD_{20} = 2-4%) is met.

If future surveys reveal that high abundance of largemouth bass is causing imbalance in the predator-prey community or impeding attainment of bass population objectives, it may be necessary to actively promote selective harvest of surplus small bass until density returns to the objective level. A late spring electrofishing survey during the bass nesting season should be a high priority in the upcoming biennium work plan. In the meantime, we are interested in working with the lake association and volunteer anglers in documenting the catch rates and size distribution of fish they are catching while fishing.

GOAL 6: A diverse native fish community that fluctuates in species composition but generally experiences no net loss of native fish species and provides adequate forage for sport fish populations.

Objective 6.1: No net loss of native fish or other aquatic species either in the Flowage or in the Yellow River downstream, as documented by periodic baseline monitoring surveys.

Objective 6.2: Adequate forage, as reflected by satisfactory growth rates and condition factors of sport fish populations managed under Goals 1-5.

General Ecosystem Status and Management Strategies:

Adequate year-round water quality is vital to maintain sport fish populations with acceptable growth rates and size structures. In such a shallow, highly eutrophic system, we can offer no assurances that occasional summerkill or winterkill conditions will not develop. However, we can take steps to minimize the frequency and impact of such events.

Wild rice has colonized the lakebed where the diffusers for the aeration system lie. The rice stalks that remain after the growing season impede water circulation, reducing the operational effectiveness of the aerator by decreasing the size of the hole opened through the ice. In winter 2004-2005 the aerator opened only narrow slots (2-3 feet wide) directly above the diffuser lines. In October 2005, after the growing season for wild rice had ended, Department staff removed the dead rice stalks from a corridor about 20 feet wide at each diffuser line in an attempt to improve the aerator's performance. Shortly after operation began in January 2006, the open water corridors were nearly ten times wider than in the previous winter. However, rice stalks prevented water circulation between the corridors. As a result, the open water was still not one continuous area above the diffusers as it had been before wild rice colonized that portion of the Flowage.

In February 2006 Department staff and officers of the Miller Dam Lake Association discussed options to restore the efficiency of the aeration system so that it may continue to provide refuge for some fish if dissolved oxygen drops below tolerable concentrations in other parts of the Flowage. We dismissed the option of extending the diffuser lines about 100 feet to the river channel beyond the depth where rice will grow. We were concerned that the aerator's potential to increase dissolved oxygen, largely obtained by circulating liquid water and exposing it to the atmosphere, would not be fully optimized if inflowing water from the Yellow River moved quickly downstream under the ice again.

Instead, we concluded that removing dead stalks after the end of the wild rice growing season was the preferred alternative for restoring the aeration system's efficiency to the level it had been before wild rice colonized that area. Because wild rice is an annual plant that grows from seed each year, annual maintenance will be necessary to achieve this objective. According to the plain language in the rules governing wild rice conservation (Chapter NR 19.09 (1) (a), Wisconsin Administrative Code), approval from the Department for removing dead rice stalks is not required because the rice is no longer growing. To ensure that the growing season is completed and that rice seeds have fallen from the stalk, no vegetative material should be removed until after the first week of October. To further ensure that the recommended solution does compromise the intent of laws and regulations established to protect wild rice in navigable waters, removal of dead rice stalks should be confined to the area immediately surrounding the diffuser portion of the aeration lines. The Department does not have sufficient staff or funding to participate in this annual activity. If the lake association chooses to adopt this recommendation, then the group will have to provide the resources necessary to complete the annual project.

Introduction of invasive exotic species should be discouraged by the Miller Dam Lake Association via direct communications to their membership and appropriate signing at local businesses and public access areas. In order to inventory the extent to which exotic plant species have become established, it may be possible for DNR's Upper Chippewa Basin Water Resources Biologist to conduct a cursory aquatic plant survey with the assistance of lake association volunteers

Support for good shoreland management along the privately-owned north shore would help to prevent high nutrient levels from increasing further to a point where summerkill or winterkill conditions become unavoidable. Maintaining wild shorelines and wide buffer strips between managed lawns and the lake will be helpful in achieving the goals and objectives of this plan. Minimizing the input of phosphorus and nitrogen from lawns or faulty septic systems will minimize plant growth and the ultimate decay of those plants that depletes oxygen and kills fish. Wild shorelines can exist on well-managed private properties as well as public lands.

The U.S. Forest Service has expressed concerns about insufficient discharge to maintain aquatic life and instream habitat in the Yellow River downstream when inflow to the reservoir is low. Present operation appears to give reservoir level maintenance priority over discharge. In the early 1990's Forest Service staff documented dead and dying mussels in the tailwaters when there was virtually no discharge from Miller Dam. Bottom dwelling organisms with limited mobility, such as mussels and insect larvae, cannot adapt to suddenly reduced streamflow that degrades water quality and dewaters habitat. Exposed mussels and other aquatic life in isolated pools quickly succumb to lethal temperatures, desiccation, oxygen depletion, and predators. The ellipse mussel, listed as threatened under Wisconsin Endangered Species Act, is present in the Yellow River upstream from Miller Dam, and its occurrence downstream is highly probable. Chapter 31 of Wisconsin's Statutes authorizes the Department of Natural Resources to regulate levels and flows in the interest of public rights in navigable waters. Staff from the WDNR, USFS, and Taylor County Forest Department should resume dialogue on reservoir operation and establish a plan to ensure sufficient discharge for the protection of water quality, aquatic life, and recreation in the Yellow River system.

Summary of Management Recommendations

We will try to obtain a representative sample of the crappie population with appropriate gear at an appropriate time.

We will try to obtain a representative sample of the bluegill population with appropriate gear at an appropriate time.

Cooperation and funding from external partners will be necessary to create and maintain the desired "bonus" walleye fishery in Chequamegon Waters. If stakeholders choose to purchase large walleye fingerlings from a private fish dealer, an approved stocking permit from the Department is required before any fish may be stocked. Stocking density should not exceed one extended-growth walleye fingerling per acre in any given year. We recommend no special regulations for walleyes in Chequamegon Waters.

Our first order of business for pike will be to conduct a quantitative population estimate based on valid mark-recapture techniques in order to compare the current status with the desired density and size objectives for the pike population. With cooperation from contestants and the lake association, cleithral bones taken from pike harvested in the annual ice fishing tournament could provide a sufficient sample to evaluate pike growth rate in Chequamegon Waters.

A late spring electrofishing survey during the bass nesting season should be a high priority in the upcoming biennium work plan. In the meantime, we are interested in working with the lake association and volunteer anglers in documenting the catch rates and size distribution of fish they are catching while fishing.

We concluded that removing dead wild rice stalks after the end of each growing season was the preferred alternative for restoring the aeration system's efficiency to the level it had been before wild rice colonized that area. If the lake association chooses to adopt this recommendation, then the group will have to provide the resources necessary to complete the annual project.

Introduction of invasive exotic species should be discouraged by the Miller Dam Lake Association via direct communications to their membership and appropriate signing at local businesses and public access areas. In order to inventory the extent to which exotic plant species have become established, it may be possible for DNR's Upper Chippewa Basin Water Resources Biologist to conduct a cursory aquatic plant survey with the assistance of lake association volunteers.

Support for good shoreland management along the privately-owned north shore would help to prevent high nutrient levels from increasing further to a point where summerkill or winterkill conditions become unavoidable. Maintaining wild shorelines and wide buffer strips between managed lawns and the lake will be helpful in achieving the goals and objectives of this plan.

Staff from the WDNR, USFS, and Taylor County Forest Department should resume dialogue on reservoir operation and establish a plan to ensure sufficient downstream discharge for the protection of water quality, aquatic life, and recreation in the Yellow River system.

APPENDIX

Results of Visioning Session for Local Stakeholders in the Fishery of Chequamegon Waters (Miller Dam Flowage) in Taylor County

Date: March 5, 2005
Time: 1:00 p.m. to 5:00 p.m.
Place: Jump River Community Center
Facilitator: Dave Neuswanger, Fisheries Supervisor, Upper Chippewa Basin, WDNR
Technical Advisor: Jeff Scheirer, Senior Fisheries Biologist, Price/Rusk/Taylor counties, WDNR
Profile of 50 Participants (more than one affiliation possible per person):

Lakeside Landowners – 6
Area Anglers – 42
Fishing Guides – 0
Business Owners – 4
Others – 3 (county dam operator; USFS fishery biologist; State Rep. Mary Williams)

Table A1. Levels of sport fishing interest among visioning session participants in Chequamegon Waters (Miller Dam Flowage) fish species nominated for consideration.

Fish Species Nominated	Level of Participant Fishing Interest			
	High	Medium	Low	None
Black Crappie	43	2	4	1
Bluegill	40	9	0	0
Walleye	25	9	11	0
Northern Pike	22	13	10	1
Largemouth Bass	22	7	8	9
Yellow Perch	9	17	11	6
Smallmouth Bass	7	8	15	8
Channel Catfish	3	12	11	13
Muskellunge	2	7	6	27
Bullheads	0	9	5	26

Table A2. Preferences for numbers versus size and catch versus harvest among visioning session participants for fish species perceived to be most important in Chequamegon Waters.

Important Fish Species	Preference for Numbers versus Size			Preference for Catch-and-Release versus Harvest		
	Emphasis on Number over Size	Prefer Balance	Emphasis on Size over Number	Emphasis on Catch and Release	Prefer Balance	Emphasis on Maximum Sustainable Harvest
Black Crappie	0	28	17	0	36	9
Bluegill	0	22	26	4	44	0
Walleye	0	23	18	3	38	0
Northern Pike	0	16	25	10	30	1
Largemouth Bass	0	18	15	21	16	2

Table A3. Angler-caught fish recorded by organizers during a 6-hour ice-fishing contest in which 1,500 anglers participated at Chequamegon Waters on January 25, 2005.

Length (Inches)	Black Crappie	Bluegill	Yellow Perch	Largemouth Bass	Northern Pike
6.0 – 6.9		1	2		
7.0 – 7.9	1	4	6		
8.0 – 8.9	1	13	4		
9.0 – 9.9	1		1		
10.0 – 10.9	6				
11.0 – 11.9	5				
12.0 – 12.9	3				
13.0 – 13.9	3				
14.0 – 14.9					
15.0 – 15.9					
16.0 – 16.9				1	
17.0 – 17.9				3	
18.0 – 18.9				2	
19.0 – 19.9				3	
20.0 – 20.9					1
21.0 – 21.9					
22.0 – 22.9					1
23.0 – 23.9					
24.0 – 24.9					
25.0 – 25.9					2
26.0 – 26.9					1
27.0 – 27.9					2
28.0 – 28.9					1
29.0 – 29.9					
30.0 – 30.9					3
31.0 – 31.9					
32.0 – 32.9					1
33.0 – 33.9					1
34.0 – 34.9					2
35.0 – 35.9					