Fishery Management Plan

Grindstone Lake

Sawyer County, Wisconsin

March, 2008

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FOREWORD AND ACKNOWLEDGMENTS

This is a long-term strategic plan that will guide our fishery management efforts on Grindstone Lake for many years to come. We believe our fishery management plans should be based upon a shared vision that is developed by combining information from fisheries surveys, statewide angler surveys, onsite creel surveys, and interactive input from local stakeholders and tribes. 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. 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 Grindstone Lake Association for hosting our local stakeholder visioning session at the Hayward Senior Center on July 23, 2005. We also want to thank the 16 local stakeholders who gave up an entire Saturday afternoon in order to help us develop the vision that forms the backbone of this plan. Finally, we thank the aquatic resource management professionals at LCO Conservation for meeting with us to provide input on behalf of the Lac Courte Oreilles Band of Ojibwe, thus ensuring that all interests are considered in this Plan. We are very pleased to incorporate everyone's input at this appropriate stage in the planning process; and we look forward to continuing 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.

-- Frank Pratt, Max Wolter, and Dave Neuswanger

BACKGROUND

Habitat Characteristics and Productivity

Grindstone Lake is a large, deep, clear, natural drainage lake at the headwaters of the Couderay River in northwestern Sawyer County (Table 1). It is connected to Grindstone Springs through Grindstone Creek, and outlets to Lac Courte Oreilles (LCO) and the rest of the LCO Chain. Those downstream lakes, LCO, Little Lac Courte Oreilles, and the Billy Boy Flowage have already been covered in a recent LCO Fishery Management Plan (Neuswanger and Pratt 2007).

Grindstone Creek is the primary source of lake water to Grindstone Lake. About three quarters of Grindstone's water volume flows to LCO either as direct surface run-off, or indirectly as ground water infiltration. Direct precipitation accounts for about 20% of Grindstone Lake's water budget and phosphorous loading. With phosphorous levels of only 1-12 ppb Grindstone would be classed as early-mesotrophic (moderately productive). There is enough organic production to deplete oxygen in the deepest thermal layers during summer stratification. About 30% of the total phosphorous loading is the result of human activities, primarily agriculture and residential development.

Table 1. Grindstone Lake limnology.

Limnological Parameter	**Absolute or Mean Value**
Physical Characteristics:	
Surface area	3,111 acres
Volume	92,111 acre-feet
Maximum Depth	60 feet
Mean Depth	30 feet
Littoral zone	33% of lake area < 20 feet deep
Water Clarity	19 feet Secchi disc reading (range 11-33 feet)
Shoreline Distance	10.5 miles
Shoreline Development Index	1.34
Water Residence Time	3.6 years
Water Source -Grindstone Springs	57%
- Surface Run-Off	22%
- Direct Rainfall	21%
Watershed Area	20.1 square miles
-Forested Watershed	64%
-Residential Watershed	17%
-Agricultural Watershed	12%
-Wild Wetland Watershed	7 %
Normal outlet flow	6 cubic feet per second
Chemistry and Primary Productivity:	
Specific conductance	117 ppm (range 113-123)
Total Dissolved Solids	73 ppm (range 64-77)
Methyl Purple Alkalinity	53 ppm (range 52-55)
pH	7.5 (range 7.1-8.6)
Chlorophyll a	2 ppb (range 1-12)
Total Phosphorous	13 ppb (range 8-20)
Phosphorous Source-Surface Run-Off	48%
-Grindstone Springs	31%
-Atmospheric	21%

This table is a compilation based on Sather and Threinen (1969), WDNR water quality data, and Tyrolt (2000).

Grindstone's littoral area is comprised mostly of hard substrates including sand, gravel, and rock with the exception of several small bays behind the islands on the west/southwest shoreline which have a soft, detritus-based substrate that support more aquatic vegetation than the rest of the lake.

Human Development and Public Access

Residential development is moderate to heavy, with an average of 215 feet between shoreline residences. The current shoreline zoning for new construction, dictates a minimum 75-foot set-back and a 35-foot wide, vegetated, shoreline buffer. There has been a steady transition from smaller, seasonal residences to larger, newer, and more permanent residences. Working resorts have declined markedly. Table 2 describes changes in the riparian property make-up. The Northwoods Beach Subdivision represents considerable "back-lot" development on the land bridge between Grindstone and LCO. That development is responsible for the unusually high percentage of residential development in the watershed represented in Table 1.

Table 2. Shoreline development history on Grindstone Lake.

Year	Residences	Resorts/Private
1967	113	17
2005	256	2
Percent Change +/-	+ 127%	-88%

From Sather and Threinen (1969), and Tyrolt and Eck (Personal Communications). The increase in private residences probably is an under-estimate, based on the 243 new residences from ground up new construction. Most, if not all, of the additional individual family units resulting from the break-up of the 15 resorts may not be represented here.

Prior to 1998, compliance to the buffer zone guidelines was essentially voluntary, and not widely practiced. The public is now starting to embrace the buffer zone philosophy, including restoring buffers on older, "grandfathered" developments. There have been proposals to convert the existing cranberry bog (located adjacent to the south shoreline) to residential lots and restore some wild wetland at that site, although that plan appears to have been tabled.

If we do not consider commercial timber harvest a significant human watershed effect, then more than 70% of Grindstone's watershed is wild, and less than 30% is directly impacted by human development (Table 1). So far, this small degree of human development has resulted in minimal nutrient input and associated eutrophication. Management actions should strive to maintain this state.

Most of Grindstone's lakeshore is under private ownership and control. There is only about 0.8 miles of public frontage, including two State-owned islands, 14 undeveloped platted access sites, and two developed access sites (one Town and one State). The State access site off CTH "K" at the southwest corner of the lake was purchased and developed in the late 1970's. It has a concrete ramp, handicap accessible roll-out boarding dock, and parking area for 50 car-trailer units. This access area was dredged in fall of 2005 to remove a hazardous rock bar making launching and loading of boats easier during low-water conditions. Such dredging needs to be done periodically to maintain safe access.

Lake groups have been active participants in habitat projects by funding, constructing, and placing plastic modular fish cribs over the last 20 years. Since 1987, close to 500 plastic, modular structures have been sited at a depth of 12-18 feet in the south and southwestern corner of this lake. Recently, there has been a resurgence in habitat restoration interest by the private sector. This

agency is now advocating a shift in emphasis- away from deepwater structure toward shoreline restoration (including buffer zones and big woody cover).

Historical Perspective on the Fishery and Fishery Overview

Grindstone has a 40-year history of intensive management for walleye (*Sander vitreus*) and muskellunge (*Esox masquinongy*). Management survey records date back to the early 1950's, but the first comprehensive management survey took place in 1976. Comprehensive Treaty evaluation surveys (surveys associated with monitoring the fish community, measuring angling effort and harvest and setting safe harvest levels for tribal spearing) followed in 1987, 1994, 1997, 2000, 2003, 2006, 2009, 2012 and most recently in 2015. The term "comprehensive" indicates multiple gears, population estimates for select species of importance, creel census, and a year-round fish community focus. There have been numerous other surveys since 1978 that have mostly focused on evaluating walleye and muskellunge stocking and reproduction.

Originally, Grindstone was not a native walleye lake but rather was dominated by smallmouth bass (*Micropterus dolomieu*) as the main predator species. For the most part walleye are native to this region but were more typically a river species that was absent from lakes not directly connected to large river habitats. They became established in many lakes after years of stocking, which typically commenced in the mid-1930's. Grindstone's limnology and habitat has always appealed to managers as optimally suited to walleye. In Grindstone, *regular* walleye stocking commenced in 1977 and the population became self-sustaining by 1984 (the 1976 population estimate showed a remnant population of about 400, extremely old, and extremely large walleyes). LCO went through the same transition but it took another 20 years for natural reproduction to assert itself, there (Pratt, 1976, 1980). There is evidence of a relationship between cisco (*Coregonus artedi*) and walleye in the lakes of the Couderay drainage, based on observations from seining data in LCO. When cisco populations are high, walleye seem to have a hard time producing year classes. In the early 1980's when Grindstone's cisco population declined, walleye reproduction appeared to improve in response. In LCO, cisco have only recently declined and walleye have only recently shown any natural reproduction (Neuswanger and Pratt, 2006). Records indicate that Grindstone was a native, self-sustaining muskellunge lake. The lake has a history of producing trophy muskellunge, including one 59 lb. world record in 1939. Voluntary catch and release for muskellunge became popular in the early 1980's, and was followed by a mandated 50-inch minimum size limit in 1998. Northern pike (*Esox lucius*) showed up in the 1960's and slowly colonized the system.

Statewide angling regulations apply to northern pike and panfish (bluegill (*Lepomis macrochyrus*), black crappie (*Pomoxis nigromaculatus*), yellow perch (*Perca flavescens*)) in Grindstone Lake, while, muskellunge, walleye, and bass are subject to special regulations. The 14-18 inch protected length interval ("slot") for walleyes went into effect in 1995. Grindstone Lake is in the northern bass zone which delays the harvest season of smallmouth bass until the third weekend in June. In 2018, regulations for bass began to treat the two species separately, with no minimum length limit for largemouth bass (*Micropterus salmoides*) and an 18-inch minimum length limit and 1-daily bag limit for smallmouth bass (the combined daily bag limit for bass is still 5). There is no minimum size for northern pike. However, Grindstone was a "control" lake in the data set for the statewide evaluation of high northern pike size limits (Pratt, 2005). The daily bag limit for panfish is 25 in aggregate. Cisco may be seined with a 25-lb. daily bag limit. Grindstone is also one of only seven waters in Sawyer County where motor trolling with three lines per angler is legal (on most waters of Sawyer County anglers can only troll with one line per angler and a maximum of 3 lines per boat, as of 2018).

Table 3. Fishery characteristics of Grindstone Lake based on on-site, completed-trip interviews during a 2015-16 DNR creel survey. Species are listed in order of preference identified in public meetings conducted in 2005 (Tables A1 and A2). Historical creel survey data can be found in Appendix B.

Species	Relative Angler Effort (% of all angling effort)	Average Number of Hours to Catch a Targeted Fish	Estimated Total Angler Catch*	Estimated Total Angler Harvest*
Walleye	34.2	3.5	3,0705	667
Yellow perch	8.8	0.5	14,561	2,683
Black crappie	1.8	17.8	37	37
Muskellunge	7.5	125	39	0
Smallmouth	32.3	0.2	11,772	61
Bluegill	8.2	0.6	13,819	4,159
Trout**	No current fishery**	**	**	**
N. pike	1.9	18.3	248	79
Rock bass	2.4	0.8	2,623	253
Largemouth	2.3	5.2	402	10

* These numbers are expanded estimates of the total number of fish of each species caught or harvested, regardless of whether the species was actually being targeted by anglers interviewed. Total fishing pressure was computed at 9.4 hrs./acre in 2015-16 but has been measured as high as 14 hrs./acre in past creel censuses.

** Anglers expressed moderate interest in two-story trout management for this lake. In the 2005 visioning session, participants rated trout of greater interest than the existing fisheries for largemouth bass, northern pike, and rock bass.

Comprehensive Treaty surveys are needed to set safe harvest levels for off-Reservation tribal harvest and evaluate exploitation rates in sport angling fisheries. These were conducted in 1986, 1994, 2000, 2003, 2006, 2009, 2012, and 2015. Grindstone is unique in that it is a "trend" lake for Treaty surveys. Trend status means that it is surveyed every three years. This frequency is about four times more often than most other Treaty lakes in the region. In the post -Voigt decision era (after 1986), this water has been a popular site for off-Reservation Tribal spearing. The eastern half of the lake is on the LCO Reservation and has always been open to on-Reservation spearing. That component of the tribal fishery is unregulated and the amount of harvest is largely unknown.. Off-Reservation spring harvest is regulated through a strict quota and permit system and typically ranges from 90 to 500 walleyes per year, with a long-term average of about 300. In the past, the daily bag limit fluctuated based on amounts of tribal harvest. In 2015, that "sliding bag limit" system was changed and the bag limit is held at 3 per day from one year to the next.

Other past management includes forage harvest for the Spooner hatchery. In the early 1980's Grindstone Lake was a popular seining site for bluntnose minnows (*Pimephales notatus*) and blacknose shiners (*Notropis heterolepis*) used as forage for muskellunge culture. In fact, the hatchery's 750' haul seine was even used as a survey tool in 1976. Forage harvest of wild minnows has since been phased out in reaction to hatchery upgrades, public pressure, and at the request of the local fishery manager. The program was very unpopular with the public and the magnitude of harvest entailed some risk to the lake's natural food base.

Other species present include white sucker (*Catostomus commersonii*), shorthead redhorse (*Moxostoma macrolepidotum*), greater redhorse (*Moxostoma valenciennesi*), spottail shiner (*Cyprinella spiloptera*), blacknose dace (*Rhinichthys obtusus*), golden shiner (*Notomigonus cryoseleucas*), common shiner (*Luxilus cornutus*), blacknose shiner (*Notropis heterolepis*), trout perch (*Percopsis omiscomaycus*), log perch, johnny darter (*Percina caprodes*), rainbow darter

(*Etheostoma caerruleum*), pumpkinseed (*Lepomis gibbosus*), longear sunfish (*Lepomis megalotis*), tadpole madtom (*Noturus gyrinus*), black bullhead (*Ameiurus melas*), yellow bullhead (*Ameiurus natalis*), and brown bullhead (*Ameiurus nebulosus*), longnose gar (*Lepisosteus osseus*), slimy sculpin (*Cottus cognatus*), and brook trout (*Salvelinus fontinalis*, seasonal migrants from Grindstone Creek and Springs). Lake sturgeon (*Acipenser fulvescens*) and channel catfish (*Ictalurus punctatus*) occur downstream, in lower Couderay River, but are not known to be present in upper Couderay watershed- probably due to the barrier effects of the Billy Boy Flowage dam.

Aquatic Community and Exotics

Many species of aquatic plants inhabit this moderately productive lake. Weed beds tend to be sparse to low density in the main lake, but are heavier and denser in the bays. Weed beds are particularly prevalent behind the islands and in the Little Grindstone area at the southeast corner of the lake. Some of the most common macrophytes include Canada waterweed (*Elodea canadensis*), fern pondweed (*Potamogeton robbinsonsii*), coontail (*Ceratophyllum demersum*), muskgrass (*Chara spp*.), water buttercup (*Ranunculus spp*.), water milfoil (*Myriophyllum spp*.), bullrush (*Juncus*), and wild celery (*Vallisneria americana*). Planktonic algae are rarely abundant enough to assert any noticeable "bloom" effects, and there are no indications of any nuisance blue-green algae species. High water clarity delimits a photic zone of about 20 feet depth. Along with big woody cover, and diverse substrates, plants are a major component of production and habitat for all life stages of fish in Grindstone Lake. Macrophytes are of special significance to the early life history of the Esocids (pike and muskellunge), yellow perch, and black crappie.

It has already been acknowledged that both walleye and northern pike are "naturalized", but are not native to this water. Additionally, black crappie were not originally native to northern Wisconsin and probably were introduced by "rescue" field transfers from the Mississippi River in the early 1900s.

Several common invasive species are present in Grindstone Lake. Banded mystery snail (*Viviparus georgianus*) was discovered in 2013. Rusty crayfish (*Orconectes rusticus*) and purple loosetrife (*Lythrum salicaria*) were discovered in 2014. The two aquatic invasives (mystery snail, rusty crayfish) present in Grindstone Lake are typically not managed actively and do not present any known risks to the Grindstone Lake ecosystem or recreational capacity. Programs exist to control purple loosestrife. One viral fish disease, Esocid lymphosarcoma is known to be present in several nearby lakes, most notably the Chippewa Flowage and Nelson Lake. Additionally, like all accessible waters in the region, the lake is at constant risk from introduction of more exotics. The 1996 exotics survey (Teresa Wolfe, personal communication) revealed that 50% of the boaters who launch at the State access site on Grindstone Lake had already visited other waters within that week and about 20% had come from waters already infested with one or more exotic species. The good news is that most boaters interviewed had heard of the threat of invasive species and said they actively practiced the control methods recommended to curb the spread of exotics.

A Vision for the Grindstone Lake Fishery

On July 23, 2005, DNR representatives Frank Pratt and Dave Neuswanger met with approximately 16 local stakeholders who were willing to volunteer their time to help develop a long-term vision for the fishery of 3,111-acre Grindstone Lake in Sawyer 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 Frank Pratt, 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 by local stakeholders and adjusted to incorporate what is known about statewide angler preference and the capacity of Grindstone Lake to produce what is desired.

Following the general stakeholder visioning session, Frank Pratt and Dave Neuswanger also met with designated representatives of the Lac Courte Oreilles Band of Ojibwe Indians whose reservation surrounds approximately half the lake shoreline. To the best of our ability, the traditional fishing interests of the Tribe have been incorporated into this plan based upon input from their representatives.

The visioning session began with 24 local stakeholders in attendance to hear Frank Pratt's presentation and ask questions about the status of the Grindstone Lake fishery. But obligations to other meetings or events pared that number down to 16 by the time we began determining preferences and setting goals. Walleye were the most important species to those who stayed to help develop this Plan (Table A1). Respondents clearly preferred a balance between numbers and sizes of walleye, as well as a balanced approach to harvest (Table A2). This tells us that most participants did not desire a "catch-and-release trophy fishery" for walleye, but neither did they desire a strictly "numbers" fishery where the goal is maximum sustainable harvest regardless of size. Objectives were set accordingly. Because Grindstone Lake has such ideal habitat for walleye, we believe the ambitious objectives for density and size structure are attainable.

Yellow perch and black crappie were the species most preferred after walleye among local stakeholders in the Grindstone Lake fishery. Though these species were of near equal importance (Table A1), but participants had different expectations of the two species. Local stakeholders did not expect or desire a high density of yellow perch, but they indicated an almost unanimous preference for perch of large size (Table A2). Unfortunately, that desire is not consistent with their other moderate preference for a perch fishery managed to maximize harvest in a sustainable way. It is not likely that we can satisfy both interests, especially when perch density probably never will be high if other objectives for predator density are achieved. We did not have time at the visioning session to discuss goals for yellow perch, but we have chosen objectives and strategies that we believe are consistent with stakeholder interest in large size, yet realistic with respect to expected density and the number that can be harvested and still allow us to meet size structure objectives. We did have time to develop a goal and size structure objective for black crappie at the visioning session; but we have since concluded that the original goal of low to moderate crappie density is probably unrealistically high in a clear-water lake with a moderate to high density of walleye. The

stakeholder-desired balance between numbers and size (Table A2) simply may not be possible, but we can and will strive to achieve the realistic size structure objectives chosen for black crappie.

Muskellunge were of moderate or high importance to a slight majority of visioning session participants (Table A1). Everyone at the session preferred a catch-and-release approach to musky fishing, and half the respondents indicated a clear preference for size over number of fish (Table A2). Our goal for muskellunge was selected accordingly, calling for a population of low to moderate density with exceptionally good size structure – both realistic expectations considering our reliance on stocking and the demonstrated ability of Grindstone Lake muskellunge to attain very large sizes.

Smallmouth bass were almost as important as muskellunge to local stakeholders in the Grindstone Lake fishery (Table A1). There was minor harvest interest in smallmouth bass, but most visioning session participants generally released any smallmouth bass caught (Table A2). Respondents leaned in the direction of preferring size over number; and everyone agreed to establish some fairly ambitious size structure objectives in order to capitalize on a unique, high-quality fishery. We did not actually select an objective for density at the visioning session, but we made our best attempt to describe how we would approach that challenge under Objective 5.1.

There was insufficient interest in other species to spend time developing specific goals and objectives at the visioning session (Table A1). Local stakeholders indicated a moderate interest in bluegill, even though bluegill habitat in Grindstone Lake is restricted to just a few acres of shallow weedy bays. Participants ranged widely in their attitude toward trout. A minority indicated a moderate or high interest in developing a trout fishery, even though trout do not exist currently in Grindstone Lake (other than the occasional migrant brook trout from Grindstone Springs). The amount of interest expressed was not deemed to be enough to pursue trout management goals for Grindstone Lake at this time. There was generally low interest in northern pike and rock bass, despite the presence of some trophy-size pike and high numbers of preferred-size rock bass. As difficult as it is to focus any meaningful amount of management attention on individual waters in the Northern Region of Wisconsin, we must focus our efforts on the species thought by stakeholders to be of greatest importance at Grindstone Lake – the species for which objectives have been developed in this plan.

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.

Two criticisms of the later drafts of these Fishery Management Plans in Sawyer County is the amount of time that elapsed between Visioning Sessions (2005, in this case) and plan implementation (2018), and whether the number of stakeholders at the Visioning Session was adequate. To address these concerns, we conducted a follow-up survey of anglers on Grindstone and other area lakes to gauge whether preferences were consistent over time and under a larger sample size. We found overwhelming similarities in the feedback we received between the online format and in-person sessions. We believe this gives support for management goals and species preferences included in this plan. A summary of the results from the online survey can be found in Appendix C.

THE PLAN

The following goals and objectives were developed with significant input from stakeholders in the fishery. We agree they are desirable and achievable. Stakeholders were not consulted about management strategies. Recommended strategies represent a local consensus agreement between Plan authors regarding actions necessary to achieve the goals and objectives

GOAL 1: **WALLEYE:** A walleye population of moderate to high density with a moderate proportion of quality-size fish.

Objective 1.1: 2-5 adult walleye per acre in spring population estimates.
Objective 1.2: Of all walleye 10 inches and longer captured by fyke netting in early spring, 50-70% should be 15 inches or longer (RSD_{15} = 50-70%) and 5-20% should be 20 inches or longer (RSD_{20} = 5-20%).

Walleye Status and Management Strategies (Local DNR Recommendations)

Since we visit Grindstone Lake every three years for Treaty-trend surveys and annually for fall recruitment surveys we have a useful amount of walleye data. Our most recent comprehensive survey occurred in 2015. The population estimate from this and previous surveys suggest that the "adult/acre" target established in Objective 1.1 has only occasionally been met, and only on the lower end of the target range. In the last four surveys, walleye density has averaged 1.6/acre and was 2.4/acre at the highest (Table 4),

Table 4. Walleye population estimate history on Grindstone Lake.

Survey Year	Population Estimate (Number of adults)	Population Estimate (Number per acre)	Population Estimate CV*
1994	3,916	1.26	0.07
2000	3,682	1.18	0.09
2003	6,658	2.14	0.08
2006	3,500	1.13	0.09
2009	5,891	1.89	0.07
2012	4,439	1.43	0.08
2015	7,383	2.37	0.05

* CV stands for Coefficient of Variation, which is used as a measure of estimate reliability. The CV's for all these surveys would be considered reliable.

We will continue fall electro-fishing to monitor walleye reproductive success and build on a continuous fall age-0 data set that goes back to 1990. Fall recruitment data is critical to evaluation of slot regulations because it allows us to quantify the effects of weak and strong year classes on subsequent catch and harvest. Grindstone Lake's fall catch for age-0 walleye averages 54 young-of-the-year (YOY) per mile since 1990 and ranges from 5 to 179 per mile. Values fall into the 40-80 per mile range about one third of the time. By applying Serns' Index (Serns 1982), these recruitment numbers project an average fall YOY density of 11.5 per acre, with a 50% occurrence interval of 10-20 per acre (Figure 1).

Grindstone's walleye recruitment history appears counter to trends seen in most other walleye lakes in the Upper Chippewa Basin. Over the course of the last decade, the trend in most lakes in this region appears to be downward, even in some of the better walleye lakes. Over this time period many former naturally reproducing walleye lakes have required active restoration

efforts. Grindstone Lake has avoided these recruitment issues to this point and it continues to be rare to see weak year classes. The 2006 year class was the strongest seen in recent history which resulted in an increase in the estimated population size in the 2009 estimate. Implicit in this statement is our belief that fall reproduction is usually an accurate predictor of year class strength, and its subsequent contribution to the adult fishery. In other words, we do not think that juvenile walleye mortality rates are abnormally high in Grindstone Lake.

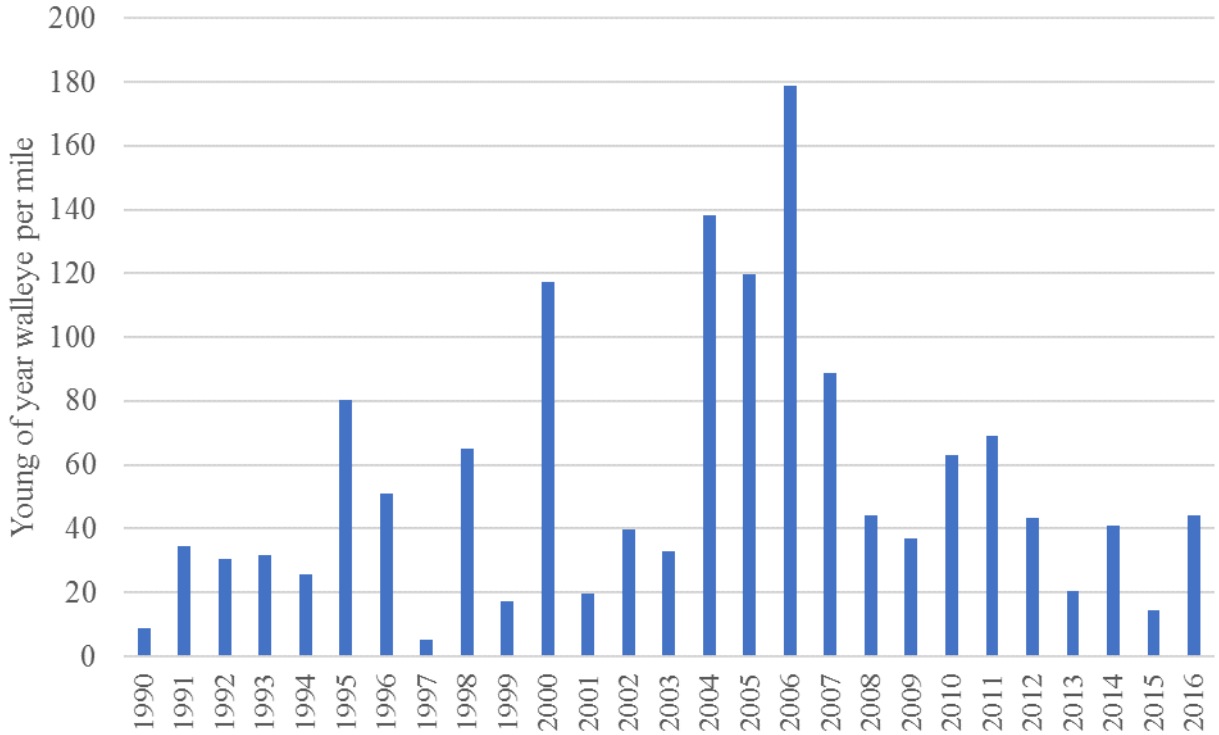

Figure 1: Grindstone Lake fall electro-fishing capture per unit effort (CPE) for age 0, young-of-year (YOY) walleye by year from 1990-2016. Young of year per mile is based on fall electro-fishing covering the entire shoreline.

Because of strong and consistent recruitment, Grindstone has been classified as naturally reproducing (NR) walleye lake. As a result, stocking of small fingerlings was suspended in 1983. Provided that natural reproduction continues at rates similar to what has been observed in the past, stocking is unlikely to be an effective tool in Grindstone Lake and would not be a wise use of State, Tribal, or private resources. Annual fall monitoring of walleye recruitment will allow us to determine if recruitment ever becomes low enough to warrant stocking efforts.

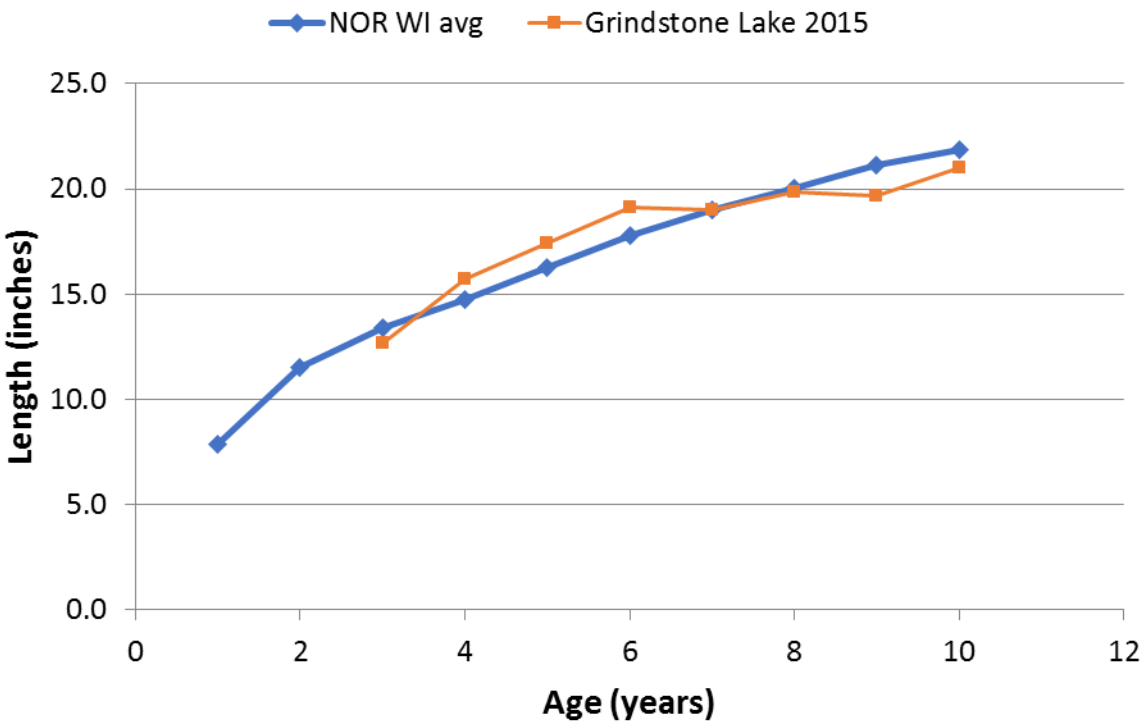

Figure 2. Average walleye length at age in Grindstone Lake based on estimated age from spines. The average for all lakes in northern Wisconsin is shown in compariosn.

Recent estimates (2015) of walleye growth in Grindstone Lake show a rate that tracks well with the average for lakes in northern Wisconsin (Figure 2). Growth rate may fluctuate based on available forage (primarily yellow perch) and walleye density, but Grindstone is not known to have exceptionally slow growth. Analysis of walleye growth rate should be a recurring exercise that will inform the appropriateness of fishing regulations and provide an indicator of forage base issues that may not be detected through other means.

Table 5. Numbers of walleye measured as a part of targeted survey efforts on Grindstone Lake and associated size structure metrics. RSD = Relative Stock Density.

Survey Year	Number of Adult Walleye Measured*	Average Length (inches)	% over 15 (RSD-15)	% over 20 (RSD 20)
1986	866	18.3	88	24
1987	264	18.1	84	31
1994	196	15.9	60	10
2000	618	16.1	67	4
2003	217	17.0	70	16
2006	798	17.9	82	24
2009	1,382	16.1	52	14
2012	1,365	17.0	88	7
2015	2,156	16.3	71	9

* “Adult” walleye in this case are considered to be any walleye >10 inches. Number of adult walleye measured in a given survey is not necessarily reflective of actual population abundance, rather it is more reflective of the amount of survey effort.

A 14-18 inch, protected length interval or “slot” regulation on Grindstone Lake has been in place since 1997. It is unclear if the regulation had the intended effect of improving walleye size because walleye size structure was always fairly high (Table 5). Walleye size structure has

remained relatively consistent since the pre-regulation time period (1984-1997) with >50% of all adult walleye being 15 inches or greater in all DNR netting surveys, and 70-90% typically 15 inches or greater. Quality size objectives are now met or slightly exceeded (2015 data, Figure 3). Anglers at the 2005 visioning session voted walleye as the number one species of interest, and endorse size structures commensurate to what the current regulations are already delivering.

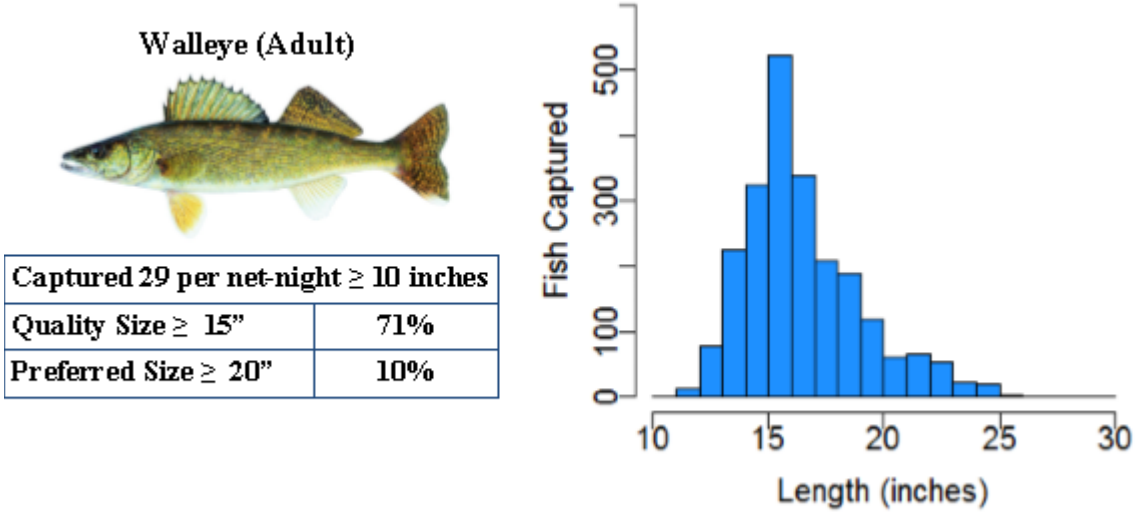

Figure 3. Catch rate, size structure, and size histogram for walleye captured in a spring netting survey on Grindstone Lake in 2015.

However, there are drawbacks to the current slot limit. In the initial years of this regulation there was concern that walleye anglers may fish other waters masking the true effectiveness of this regulation. Creel survey data shows that while the estimate has fluctuated through time, specific effort for walleye in 2009 (12 years after regulation implementation) was 29% higher than in 1994 (pre-regulation) indicating that this concern is at least partially unwarranted. However, it is unknown if the current level of effort would be higher still under a different regulation. Second, hooking mortality is a frequent criticism anglers have of the slot limit. Some anglers feel that the slot limit forces the "release" of fish that are hooked deeply and will not survive, despite those fish being of a good size to eat. This criticism seems to be particularly common among ice anglers. We feel the best approach to managing that issue is to educate anglers about fishing practices that can minimize hooking mortality (circle hooks, quick response time to tip ups, etc.), as opposed to liberalizing regulations to allow more harvest in these instances. To create and maintain the kind of walleye fishery outlined in the objectives of this plan a sufficiently restrictive regulation is necessary. Results of the visioning session support such an approach and dictate a more balanced fishery with respect to size structure, abundance and harvest, as opposed to a "maximum sustainable yield" scenario.

YELLOW PERCH

GOAL 2: A yellow perch population of low to moderate density with a high proportion of preferred-size fish.

Objective 2.1: Currently we lack an effective method to assess the relative abundance of yellow perch. Such a method should be developed and may include catch rates from creel data.

Objective 2.2: Of all yellow perch harvested by anglers in the creel, 10-20% should be 10 inches or longer (RSD_{10} = 10-20%) and harvest rates should remain consistent (within 20%) or higher than historical averages.

Yellow Perch Status and Management Strategies (Local DNR Recommendations)

We did not actually set perch goals and objectives at the visioning session. This represents our best estimate of what is desired/possible based upon the preference data in Table A2. It is clear that initial management focus should be targeted at determining the best assessment methods and indices. The starting point will be determining if the early spring netting that is now being conducted is adequate and reasonable (particularly when nets are set to target walleye for purposes of conducting a population estimate). We will also be looking at past and future assessments with electro-fishing, gill netting, haul seine, angler-creel, late spring fyke-netting, and maybe even direct observation methods like SCUBA, or underwater video. Various gear types and survey timing continue to indicate that the percentage of the adult perch population over 10 inches is consistently between 5-15%. Some of our past perch survey data is shown below in Table 6.

Table 6. Size and abundance characteristics of Grindstone Lake yellow perch population as determined by netting, and hook and line creel census, 1976-2015.

Year	Gear	Effort	CPE*	RSD-10 (%)
August 1976	700' (diesel) haul seine	1.37 acres	510	7
April 2003	Fyke nets	32 set**	40	0
June 2003	Fyke nets	32 sets	3	14
2003 season	Creel/Hook and line	4,065 hours	3.2	13
2006 season	Creel/Hook and line	2,232 hours	2.0	9
April 2015	Fyke nets	75 sets	14	2
2015 season	Creel/Hook and line	3,163 hours	4.3	9

* CPE (Catch per effort) varies based on the gear type. Effort for fyke netting is one net-night, for seining is one seine haul, and for creel is an hour of angling effort.
** In April of 2003 during the early spring walleye-marking run, small perch were noted as abundant. However, they only measured fish out of one "representative" net, and only counted in 32 sets administered by fish management personnel. (See Photo 1). We include the 1976 haul seine data for comparison-because it is such a unique sampling method.

Early spring fyke netting likely offers the best survey data on yellow perch in Grindstone Lake. However, fyke netting efforts specifically targeting perch have been done inconsistently in the past since netting efforts and data collection typically focus on walleye and muskellunge. If fyke netting is to become a more reliable and consistent measure of the Grindstone Lake perch population, methods may need to be altered to include more sets in perch spawning areas (weedy bays) at times when perch are vulnerable to capture. Given the workload demanded by other species during survey efforts, we do not anticipate that dedicated efforts to monitor perch will be routine. As such, we recommend using creel data as a measure of yellow perch size. This metric has the added benefit of being directly related to angler catch, and presumably satisfaction. Using angler creel data as a measure of size structure does come with added caution. Many studies have shown that panfish anglers have a minimum length of fish they are willing to harvest. Unlike a fisheries survey that might capture the full spectrum of sizes in the lake, angler catch may not be responsive to changes in size structure if anglers continue to "high-grade" and keep only the largest fish they catch. For this reason, we recommend adding an additional component to Objective 2.2 to track overall harvest rates of perch anglers. If harvest rates remain consistent, or show a slight increase, we can be more confident that size structure trends are being represented in

creel data. If harvest rates decline it may be evidence that size is declining and anglers are only keeping the largest fish they are catching.

In 2015, angler catch rates were 4.3 perch/hour, 9% of the observed and measured angler catch exceeded 10 inches, and harvested perch averaged 9.1 inches. These figures are over-estimates of total population size structure because they are not adjusted for known size bias in the harvest. Population size structure indexed in netting surveys shows a considerably lower average size and a much smaller proportion over 10 inches (Table 6, Figure 4). Anglers release about 50% of their perch catch, presumably because they are smaller than acceptable size.

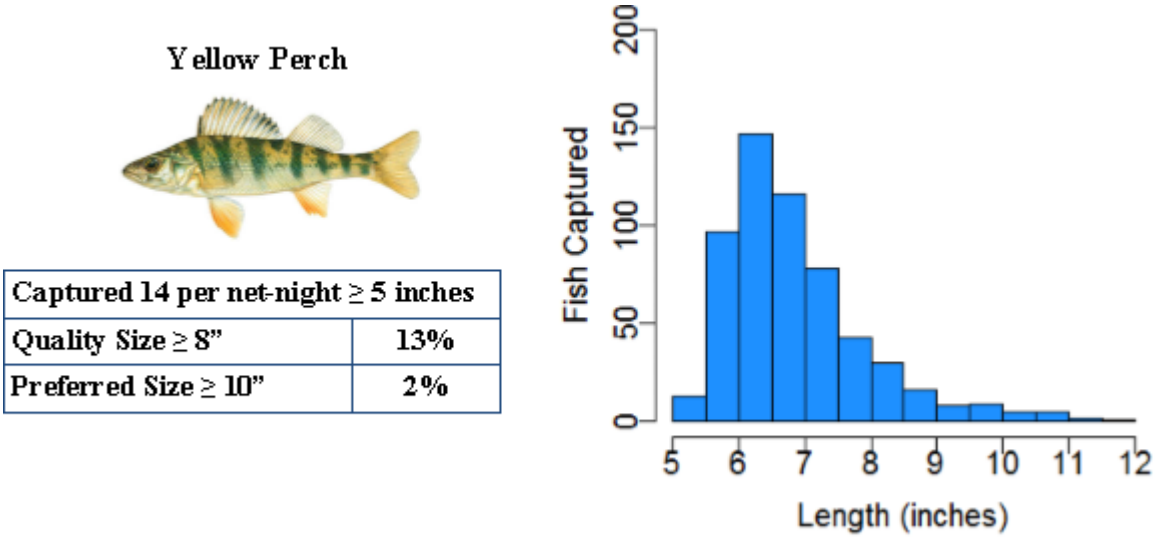

Figure 4. Catch rate and size structure of yellow perch captured in Grindstone Lake during a 2015 early spring fyke netting survey.

All parties should be cognizant of the dual role of yellow perch in the Grindstone fish community. The importance of larger adults in meeting the quality perch fishery objectives has already been acknowledged. However, their ecological role in this system will always be as a key forage species, especially for walleye. It will be important to safeguard good reproduction by protecting their spawning and nursery habitats in the long run. This system needs lots of small perch to serve as a food source for the rest of the fish community. The fishery provided by the adult perch should be considered a secondary purpose.

Yellow perch drape their eggs on shallow water structure and loss of this structure has been shown to decrease perch abundance (Sass et al. 2006). Increasing the amount of shallow woody habitat (in the form of "tree-drops") may be a viable action that stakeholders and agencies can partner in to increase perch production. Promoting healthy stands of native aquatic plants may also benefit yellow perch reproduction.

Photo 1: Yellow perch sampled in Grindstone Lake, via large fyke nets during the walleye marking run, April 2003. It has yet to be determined if this is a valid protocol for tracking abundance and size objectives. Perch serve a dual role in this ecosystem by providing a sought-after species for angler, and more importantly as a keystone forage species, especially for walleye.

Black Crappie

GOAL 3: A black crappie population of low density with a moderate to high proportion of preferred-size fish.

Objective 3.1: A late spring fyke net capture rate of 5-10 crappie per net-night.

Objective 3.2: Of all crappie 5 inches and longer captured by fyke netting in late spring, 40-60% should be 10 inches or longer (RSD_{10} = 40-60%).

Black Crappie Status and Management Strategies (Local DNR Recommendations)

This lake was once a trophy crappie lake and it may be that legacy that gives them greater importance than expected among those participating in the 2005 visioning session when compared to the current population. Crappie rank number 8 in the creel (% of targeted angling hours) but were number 3 species of interest in the Visioning Session, indicating that the public has not forgotten the lake's historical crappie potential. In the late 1970's, Grindstone produced several state record crappies. Then the population crashed, likely due to poor recruitment. There have been periods of increased recruitment, but overall recruitment is sporadic. Highly variable recruitment is a characteristic of many crappie populations, but Grindstone Lake may be an even more extreme case of this phenomenon as a result of its high predator population, limited crappie spawning and nursery habitat, and low productivity. Given those limitations, a "low density, but quality size

crappie fishery is the most reasonable expectation. Increasing crappie recruitment frequency or magnitude may not be possible in Grindstone Lake. Management of crappie will likely hinge on limiting mortality of year classes when they do appear and preserving or improving habitat.

Emergent vegetation appears to be a major nursery habitat for this species and all existing beds, which are already scarce, should have high priority for conservancy. Increased big woody cover in the nearshore zone may provide benefits to crappie as well. Continuing to promote fish cribs as a management action may in fact work against crappie management objectives. Fish cribs are effective at concentrating crappie and making them vulnerable to harvest (where crappie might otherwise suspend over open water), while providing no known biological benefits in a lake like Grindstone.

Accomplishing size-based objectives (3.2) for crappie should not be difficult since population density will likely remain low, leading to adequate growth. However, these types of low density-high size fisheries are easily collapsed by pulse over-fishing (particularly when fish are strongly drawn to fish cribs). An impatient clientele puts a developing angling opportunity at risk. If public desire exists to improve crappie beyond their current status, some combination of reduced bag limit and possibly a size limit could aid in restoration of a quality crappie fishing opportunity in Grindstone Lake (a reduced bag for panfish may also help achieve perch objectives).

MUSKELLUNGE

GOAL 4: A muskellunge population of low to moderate density with a high proportion of memorable-size fish and a moderate proportion of trophy-size fish.

Objective 4.1: 0.1 to 0.2 adult muskellunge per acre in population estimates.

Objective 4.2: Of all muskellunge 20 inches and longer captured by fyke netting in early spring, 30-50% should be 42 inches or longer (RSD_{42} = 40-60%).

Muskellunge Status and Management Strategies (Local DNR Recommendations)

Unlike LCO, Grindstone has not been well-studied by muskellunge researchers. However, our most recent estimates (2003, 2006, 2009, 2015) put the adult muskellunge population at less than 400 adults with an alarmingly steep recent downward trend (Table 7). The Grindstone Lake muskellunge population is low-density by nature, but current population density is exceptionally low (1 adult for every 30 surface acres). Considerable work will need to be done to achieve even the lower end of the range established for Objective 4.1.

Table 7. Population estimates for muskellunge in Grindstone Lake. Estimates are generated through successive-year mark-recapture surveys.

Survey Year(s)	Estimated Number of Adult Muskellunge (CV)	Estimated Adults per acre
2003	403 (0.37)	0.13
2006	290 (0.18)	0.09
2009	135 (0.30)	0.04
2015	91 (0.35)	0.03

Grindstone Lake has always been known as a trophy potential lake and has the distinction of producing one of the early world record muskellunge from the Hayward area. Comparisons of historical data to the current muskellunge population show an improved size structure in 2016 compared to the 1960's (Figure 5). Increased musky size structure in Grindstone Lake mirrors trends in other Sawyer County lakes and throughout Wisconsin. Near-universal acceptance of catch-and-release over the last two decades by sport anglers is likely responsible for some improvements in size of muskellunge. A 50-inch minimum length limit was adopted for Grindstone Lake in 1998 and rules on using quick strike rigs for live bait fishing were adopted statewide in Wisconsin, both rules further reduce harvest and mortality of muskellunge which affords fish more time to attain larger sizes.

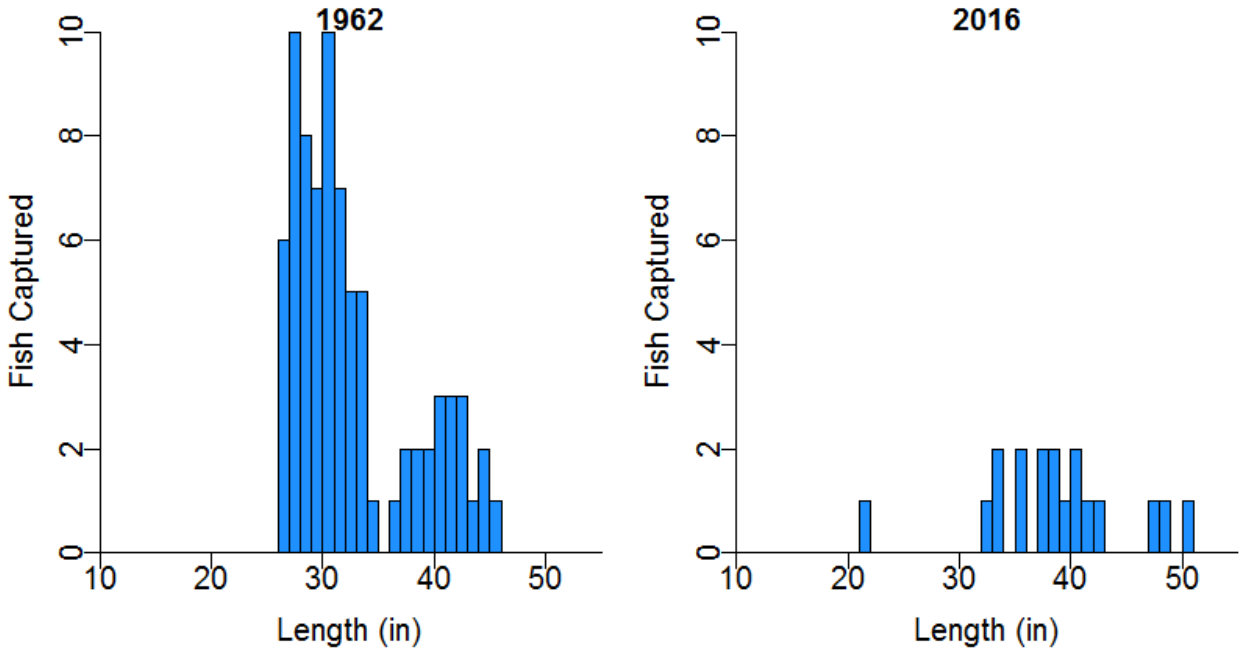

Figure 5. Size structure of muskellunge from fyke netting surveys in 1962 and 2016. While a population estimate is not available for 1962, it can be assumed that the population was larger at that time than it was in 2016.

In the absence of any clear indication to the contrary, we believe that stocking is needed to meet goals and sustain the current muskellunge population in Grindstone Lake. The spawning and nursery habitat is not severely compromised and there have been instances where we may have detected natural reproduction. In a 2003-04 netting effort, we sampled small yearling muskellunge which likely were naturally reproduced. There have been other instances where juveniles were captured that might have been wild progeny. However, it is clear from the declining population abundance between 2003-2015 that natural reproduction alone cannot maintain muskellunge at the levels established in Objective 4.1, and even current stocking amounts, sizes, or strategies may be insufficient. Stocking quotas were reduced in 2001 from annual to alternate year, 2500 large fingerlings. This reduction was in response to the 50" minimum size, and to accommodate the ten-year (2002-2012) statewide stocking evaluation. Despite reductions in stocking rate over time, the current adult population in Grindstone Lake should be considerably higher. A regression analysis (Tim Simonson, unpublished data) comparing stocking rates (#/acre/year) to resulting adult density would predict that the Grindstone Lake adult muskellunge population should be around 10x more abundant than the 2015 estimate based on stocking rates between 2000-2009. The reason that stocking has not resulted in a more abundant adult population in Grindstone Lake is not clear. Developing a better understanding of the factors limiting stocking success may be needed. On

means to gather that information would be radio tagging fingerlings and tracking their movement and survival post-stocking. Information on factors limiting stocking success may lead to the recommendation of alternate stocking strategies, including private stocking if genetically appropriate fingerlings become available, “super-size” fall fingerling stockings similar to what was done on the Chippewa Flowage in 2016, or other programs that are deemed to have promise. New genetic tools will allow for easier determination of natural born fish in Grindstone Lake. Juvenile muskellunge that do not appear to be a part of a stocked year class should have a fin clip taken for genetic analysis to determine if the juvenile is the product of stocking or is natural born. All adult muskellunge captured in DNR surveys should be given PIT (Passive Integrated Transponder) tags for determination of growth rates, emigration, and population size estimates. Maximizing stocking survival and long-term survival of the resulting adults will be key to reversing population declines in Grindstone Lake.

Muskellunge from LCO are the most appropriate brood source for stocking in Grindstone Lake. Studies have shown that the LCO muskellunge stock has remained genetically intact, has not changed over time, and is significantly different from several other regional study lakes, including Butternut and Bone Lakes. LCO is currently being used as a muskellunge broodstock source for northwestern Wisconsin based on these considerations (Jennings et al. 2010). The LCO genetics study and broodstock plan directly impact Grindstone Lake because of the physical connection of the two waters. Until it has been shown to be otherwise, we will operate under the hypothesis that the Grindstone stock should be genetically identical to LCO and progeny from LCO are the most appropriate fish to stock in Grindstone Lake. We will continue to stock at rates and sizes that provide the best possibility of achieving the objectives established in this plan. However, these stockings will be contingent on the availability of appropriate source fish and other hatchery production limitations.

Musky Bay in LCO may end up being dredged to restore its muskellunge spawning habitat. If that does occur and is found to be a success (restored muskellunge reproduction), there might be potential applications in Grindstone Lake. There are deposits of organic sediments in spawning areas behind the islands. Those sediments could be dredged to enhance spawning. On the other hand, habitat protection and conservancy probably trumps heroic restoration in Grindstone Lake. Encouraging lakeshore property owners to practice shoreline conservancy, protect and restore buffer zones, and any other watershed strategy designed to minimize run-off, erosion, and safe-guard water quality, should work in favor of muskellunge spawning. Adding littoral woody habitat may also provide benefits to muskellunge spawning and stocking success (Rust et al. 2002, Wagner et al. 2015)

Given the current low numbers of northern pike in Grindstone it is unlikely that their presence severely limits muskellunge reproduction in this lake. Unlike LCO, in Grindstone we are not proposing any change in the northern pike fishery or any type of active mechanical control using angling, nets, or any other kind of intensive effort.

Grindstone is about half on- and half off-Reservation. The magnitude and size distribution of off- Reservation tribal spring spearing is well documented under the terms of the Voigt Decision. Off-reservation spring spear harvest is small, on the order of 0-15 muskellunge per year, with a mean of 5 and zero fish harvested several times in recent years. But while there is a considerable amount of data supporting the minimal effect of spring off-Reservation spearing harvest, on-Reservation spearing, both in spring and winter is largely unknown. Managing a shared muskellunge fishery for trophy sports-angling objectives, without knowing the magnitude and impact of the total Tribal fishery will likely prove to be very difficult. The WDNR needs to make a concerted effort to communicate with the LCO Tribal Conservation Department and the LCO

Tribal Council on the need for a complete Tribal harvest dataset. Angling harvest is monitored every three years and has been estimated to be 0 fish in each of the last 5 creel surveys.

SMALLMOUTH BASS

GOAL 5: A smallmouth bass population of moderate to high density with a high proportion of memorable-size fish and a moderate proportion of trophy-size fish.

Objective 5.1: Electrofishing capture rates for 7-inch and longer smallmouth bass of 25-40 per mile.

Objective 5.2: Of all smallmouth bass 7 inches and longer captured by electrofishing during the bass spawning season, 10-20% should be 17 inches or longer (RSD_{17} = 10-20%) and 3-7% should be 20 inches or longer (RSD_{20} = 3-7%).

Smallmouth Bass Status and Management Strategies (Local DNR Recommendations)

A better job needs to be done incorporating survey techniques (late-spring electrofishing) into the comprehensive sampling regime currently performed by the WDNR Treaty Unit. This may require a cooperative effort between the Treaty Unit and DNR Fisheries Management crews. Late-spring electrofishing sampling will provide needed data on smallmouth (and largemouth) bass which will help us determine whether Objectives 5.1 and, 5.2 are being met.

The current smallmouth bass population in Grindstone Lake does not meet either abundance (5.1) or size (5.2) objectives established in this Plan, despite habitat indicating that these objectives should be attainable. A modeling study that classified lakes based on their potential to support bass populations put Grindstone Lake into a “large, deep, cool” classification (Hansen and Hansen 2016). However, in comparison to other lakes in that classification, Grindstone Lake has considerably lower smallmouth bass size structure (RSD14-26, Figure 6) than average. For comparison, Round Lake, Sawyer County falls into the same classification and supports a smallmouth bass population with an RSD-14 of 74 (Wolter 2013).

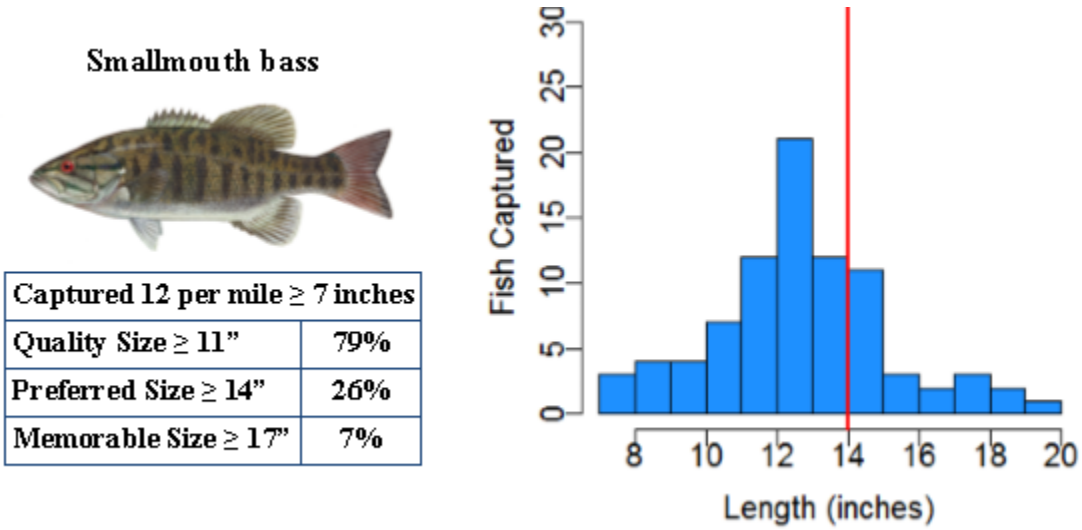

Figure 6. Catch rate, size structure, and size histogram of smallmouth bass captured in a 2015 late-spring electrofishing survey in Grindstone Lake.

Harvest may be a factor impacting smallmouth bass size on Grindstone Lake. In 2006, an estimate of the total number of adult smallmouth in Grindstone Lake was generated and a creel survey estimated total angler harvest. The creel survey estimated that anglers harvested 171 adult

smallmouth. This figure may seem insignificant in a 3,000-acre lake until put into context with the estimated total numbers of smallmouth present, particularly the estimated number of smallmouth over legal size (Table 8). Based on the available data from 2006, the estimated exploitation rate of legal-sized smallmouth (14 inches or greater) was over 40%. This level of exploitation is concerning and has the potential to impact both size structure and abundance of smallmouth. If we assume that the population size of smallmouth is currently similar to the 2006 estimate, and that fish over 14 inches make up only a small percentage of the population (Figure 6), even small amounts of harvest will make it difficult to achieve smallmouth bass objectives established in this plan. Therefore, we believe that reducing angler harvest will make it easier to achieve objectives 5.1 and 5.2.

Table 8. Estimated number of adult smallmouth by size class in Grindstone Lake in 2006, estimated harvest of smallmouth from creel surveys, and the resulting estimated exploitation rate.

Size Class (inches)	Population Estimate	Estimated Number Harvested	Exploitation (% harvested)
8-13.9	1,505	38*	2
14-17.9	265	121	46
>18	30	12	40
Total	1,800	171	9

*Grindstone Lake smallmouth were protected by a 14-inch size limit at the time of this survey, bass shorter than 14 inches showing up in the creel are the result of anglers violating, not being aware of limits, or measurement error.

New harvest regulations for smallmouth bass were enacted in 2018 to improve smallmouth bass size. The new regulation consists of an 18-inch minimum length limit and 1 daily bag limit for smallmouth bass, while establishing no minimum length limit for largemouth bass. The combined daily bag limit for both bass species is 5 (meaning an angler could harvest 5 largemouth bass OR 4 largemouth bass and 1 smallmouth bass over 18 inches). This regulation was put in place on LCO and Round lake in 2016, so enacting the same regulation on Grindstone (and Whitefish) creates consistency throughout LCO and it's connected waters which all have similar smallmouth bass potential. The success of this regulation will be evaluated through DNR electrofishing surveys and potentially through other means as well, including creel data and data from bass tournaments. The regulations will be considered a success if they improve smallmouth bass abundance and/or size to objective levels established in this plan (Sand Lake, Sawyer County and Nebagamon Lake, Douglas County would serve as appropriate controls for such an evaluation).

It is noted that more restrictive regulations will cause a disruption in how catch-hold-release bass tournaments conduct themselves on Grindstone Lake and other lakes in the area with similarly restrictive regulations. However, no bass tournament permits are typically issued for Grindstone Lake. The regulation change may still impact smaller, "club tournaments" that do not meet the minimum requirement for obtaining a DNR issued tournament permit. Club tournaments can still choose to operate catch-hold-release events if they work around the existing limit (no more than 1 smallmouth bass in possession per angler and a minimum length of 18 inches). That has been done for tournament events on Round Lake, Sawyer County with mixed success. Another option would be for bass events on Grindstone (and other lakes in the LCO chain) to operate like muskellunge fishing tournaments and switch to a no-weigh-in, or "paper tournament" format. While we recognize that this format changes some aspects of competitive fishing enjoyment, they would continue to allow participants to target all sizes and species of bass. Additionally, while impacts of catch-hold-release tournaments are generally minimal on bass populations, their effects

cannot be completely ignored. Even under ideal tournament conditions and best handling practices, some amount of initial and delayed mortality are near certainties. Competitive bass fishing events switching to a paper-only format may help achieve bass objectives established in this plan. Additional reductions in unintentional angling mortality may be gained by encouraging anglers to use circle hooks when targeting smallmouth with live bait.

Smallmouth bass life history is highly dependent on big woody cover in the near-shore zone. Shoreline conservancy and restoration of buffers zones, and especially tree-drops to restore big woody cover will favor smallmouth.

NORTHERN PIKE

GOAL 6: A northern pike population of low density with a high proportion of preferred-size fish and a moderate proportion of memorable-size fish.

Objective 6.1: Adult CPE of 0.5-3 fish per net night of early spring fyke net sampling.

Objective 6.2: Of all northern pike 14 inches and longer captured by fyke netting in early spring, 20-35% should be 28 inches or longer (RSD-28 = 20-35%).

Northern Pike Status and Management Strategies (Local DNR Recommendations)

Unlike LCO, where northern pike abundance exploded and they might out-number muskellunge by a ratio of 50 to 1, both species are low in abundance in Grindstone Lake. So, it is unlikely that northern pike have any significant negative predatory or competitive interactions with muskellunge in Grindstone Lake. Northern pike currently provide a bonus gamefish opportunity.

The objectives and the suggested methodologies in objectives 6.1 and 6.2 are reflective of the amount of focus typically given to northern pike in spring netting surveys in Grindstone Lake that target walleye and muskellunge. We do not expect that population estimates for northern pike will be completed in Grindstone Lake considering the management (and angler) focus on other species. As such, catch-per-effort (CPE) from spring netting appears to be the best available metric of pike abundance and size. The mean net CPE for northern pike during the entire walleye marking run typically only falls in the 1-3 fish/net range. If abundance remains within that range, we feel confident that pike will not have negative interactions with other species of interest (muskellunge) and pike size objectives (6.2) can also be met. Creel data does not indicate a large amount of angler focus (<2% of total fishing effort) or harvest, suggesting that more restrictive regulations are not necessary for pike.

OTHER SPECIES

GOAL 7: A healthy aquatic ecosystem.

Objective 7.1: No net loss of native fish or other aquatic species, as documented by periodic baseline monitoring surveys; and no ingress of non-native species or strains.

Objective 7.2: 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. Cisco should be given particular importance within objective 7.1 given their specific habitat requirements (cold, well-oxygenated water) and perceived importance in the food web as a forage species for muskellunge, walleye, and northern pike. Cisco monitoring should be done periodically with vertical gill nets following the protocol of Lyons et al. 2015.

Introduction of invasive exotic species should be discouraged by the Grindstone Lake Association via direct communications with their membership and appropriate signing at local businesses and public access areas.

Support for good shore-land management along privately-owned shorelines would help to prevent excessive input of nutrients. 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, particularly for walleye, which require very clean gravel or rubble substrate for successful spawning. Minimizing the input of phosphorus and nitrogen from lawns or faulty septic systems will minimize nuisance plant growth and the ultimate decay of those plants that depletes oxygen and kills fish. Addition of woody cover (shoreline tree-drops) and allowance of trees naturally falling in the water to stay there will be key to restoring a near-shore habitat type that is severely lacking in Grindstone Lake but is important to many species that anglers are interested in. Wild shorelines can exist on well-managed private properties as well as public lands.

APPENDIX A

Results of Visioning Session for Stakeholders in the Fishery of Grindstone Lake in Sawyer County, Wisconsin

Date: July 23, 2005
Time: 1:00 p.m. to 5:00 p.m.
Place: Senior Center in Hayward, WI
Facilitator: Dave Neuswanger, Fisheries Supervisor, Upper Chippewa Basin, WDNR
Technical Advisor: Frank Pratt, Senior Fisheries Biologist, Hayward, WDNR
Profile of 16 Participants:

Lakeside Landowners – 13
Area Anglers – 2
Fishing Guides – 1
Business Owners – 0
Others – 0

Table A1. Levels of sport fishing interest among visioning session participants in fish species nominated for consideration at Grindstone Lake.

Fish Species Nominated	Level of Participant Fishing Interest			
	High	Medium	Low	None
Walleye	10	4	2	0
Yellow Perch	7	5	3	0
Black Crappie	7	4	3	1
Muskellunge	6	3	7	0
Smallmouth Bass	4	6	6	0
Bluegill	4	6	5	1
Trout	3	4	3	6
Northern Pike	1	4	8	3
Rock Bass	0	7	2	5

Table A2. Preferences for numbers versus size and catch versus harvest among visioning session participants for fish species perceived to be most important at Grindstone Lake.

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
Walleye	3	9	2	2	13	1
Yellow Perch	0	1	12	0	7	9
Black Crappie	0	13	1	0	15	0
Muskellunge	0	7	7	15	0	0
Smallmouth Bass	0	9	6	11	3	1

APPENDIX B

Table B1. Creel survey history (by year) detailing catch and harvest for popular sportfish species in Grindstone Lake, Wisconsin.

2012 Creel Results

Species	Estimated Total Angler Catch	Estimated Total Angler Harvest
Walleye	2,670	389
Yellow perch	17,447	2,034
Black crappie	23	4
Muskellunge	82	0
Smallmouth	11,072	271
Bluegill	5,788	1,119
N. pike	268	67
Rock bass	2,131	1,050
Largemouth	440	21

2009 Creel Results

Species	Estimated Total Angler Catch	Estimated Total Angler Harvest
Walleye	7,917	1,948
Yellow perch	20,633	6,265
Black crappie	613	251
Muskellunge	176	0
Smallmouth	10,849	411
Bluegill	4,405	1,189
N. pike	416	214
Rock bass	2,868	533
Largemouth	207	22

2006 Creel Results

Species	Estimated Total Angler Catch	Estimated Total Angler Harvest
Walleye	3,315	873
Yellow perch	13,522	3,359
Black crappie	229	149
Muskellunge	210	0
Smallmouth	6,106	170
Bluegill	2,517	1,312
N. pike	291	96
Rock bass	2,637	267
Largemouth	123	0

2003 Creel Results

Species	Estimated Total Angler Catch	Estimated Total Angler Harvest
Walleye	2,151	779
Yellow perch	14,278	2,632
Black crappie	269	252
Muskellunge	314	0
Smallmouth	5,006	332
Bluegill	4,209	903
N. pike	283	71
Rock bass	3,553	1,272
Largemouth	127	0

2000 Creel Results

Species	Estimated Total Angler Catch	Estimated Total Angler Harvest
Walleye	1,507	552
Yellow perch	9,958	3,055
Black crappie	14	7
Muskellunge	191	0
Smallmouth	2,805	220
Bluegill	5,951	1,245
N. pike	306	70
Rock bass	2,103	783
Largemouth	92	0

1994 Creel Results

Species	Estimated Total Angler Catch	Estimated Total Angler Harvest
Walleye	2,433	1,277
Yellow perch	5,038	3,460
Black crappie	44	29
Muskellunge	55	7
Smallmouth	331	110
Bluegill	508	571
N. pike	221	126
Rock bass	1,026	824
Largemouth	21	3

APPENDIX C

An online survey that mirrored the questions asked to elicit the feedback shown in Appendix A was crafted on response to criticism that the stakeholder feedback used to develop this plan was outdated or had insufficient sample size. The survey was administered online through Survey Monkey and was distributed through various email lists that would capture a range stakeholders, including property owners, guides, resorts, and both local and nonlocal anglers. The survey was specifically targeted at stakeholders interested in at least one of seven lakes where visioning sessions had been completed between 2004-2006 and where management plans were complete or were in draft form. Those lakes included the Chippewa Flowage, Lac Courte Oreilles, Nelson Lake, **Grindstone Lake**, Round Lake, Moose Lake, and the Quiet Lakes (Lost Land and Teal).

A total of 497 responses were received. Results from the online survey are shown below with comparisons to the results from in-person visioning sessions. Species preferences (Table C1) were nearly identical in rank with only black crappie-muskellunge and smallmouth bass-bluegill swapping adjacent spots. Both bass species scored higher in the online format than the in-person sessions. This may be the result of the online surveys capturing a relatively high proportion of "casual anglers" (self-identified through the survey). The higher response rate of casual anglers to an online survey with an average response time of 4 minutes in comparison to the visioning sessions which often took several hours is not surprising. Preference for how each species should be managed (Table C2) was also largely similar, with the only major difference being more interest in trophy management for northern pike among in-person respondents. The online survey actually filled in a few gaps in the results from the in-person sessions where there was not enough time to get specific feedback for all species.

Table C1. Species preferences based on a weighted score of angling interest for both in-person visioning sessions (2004-2006) and a similar online survey (2018). Score determined for each species using: ((N=high interest x 3) + (N=medium interest x 2) + (N=low interest x 1)) / total respondents.

Visioning Session	Score	Online Survey	Score
Walleye	2.67	Walleye	2.45
Muskellunge*	2.22	Black crappie	2.07
Black crappie	2.07	Muskellunge*	1.93
Bluegill	2.00	Smallmouth bass*	1.83
Smallmouth bass*	1.42	Bluegill	1.75
Yellow perch	1.37	Yellow Perch	1.44
Northern pike*	1.25	Northern pike*	1.43
Largemouth bass	1.00	Largemouth bass	1.36
Average	1.75	Average	1.78
Total respondents	166		497

*indicates species not present in all lakes where survey was administered.

Table C2. Summary of responses to two questions about preferred management style (size vs. numbers and harvest vs. catch and release) for the most popular species in several Sawyer County lakes between in-person visioning sessions (2004-2006) and a similar online survey (2018). Most common result in each category is shown in bold.

	Visioning Session			Online Survey		
	Trophy	Balance	Action	Trophy	Balance	Action
Walleye	3.36%	**76.51%**	20.13%	5.87%	**69.60%**	24.53%
Black crappie	16.41%	**82.81%**	0.78%	7.49%	**74.52%**	17.99%
Muskellunge	48.54%	**50.49%**	0.97%	**49.47%**	43.35%	7.18%
Bluegill	18.45%	**74.76%**	6.80%	10.31%	**66.23%**	23.46%
Yellow perch	NA	NA	NA	11.29%	**58.29%**	30.41%
Smallmouth bass	40.54%	**48.65%**	10.81%	32.08%	**55.27%**	12.65%
Largemouth bass	NA	NA	NA	30.25%	**53.81%**	15.94%
Northern pike	**71.43%**	28.57%	0.00%	39.86%	**50.12%**	10.02%
	C+R	Balance	Harvest	C+R	Balance	Harvest
Walleye	6.67%	**72.00%**	21.33%	8.96%	**59.28%**	31.77%
Black crappie	0.80%	**92.00%**	7.20%	8.92%	**53.72%**	37.37%
Muskellunge	**92.04%**	6.19%	1.77%	**83.93%**	10.71%	5.36%
Bluegill	3.88%	**76.70%**	19.42%	8.47%	**46.19%**	45.34%
Yellow perch	NA	NA	NA	8.91%	**45.21%**	45.88%
Smallmouth bass	**78.07%**	20.18%	1.75%	**46.33%**	41.87%	11.80%
Largemouth bass	NA	NA	NA	30.32%	**36.20%**	33.48%
Northern pike	31.82%	**54.55%**	13.64%	19.41%	**47.63%**	32.96%

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** This plan heavily relies on our professional interpretation of numerous uncited, hard-copy, survey reports, summary sheets, individual sampling reports, and other raw data contained in the Hayward fishery file and Spooner Treaty files, as well as files from the computerized, statewide data base. Additional thanks to Dan Tyrolt (LCO Conservation Department) and Jan Eck (Sawyer County Land Conservation Department), for their personal communications regarding land types and development history.