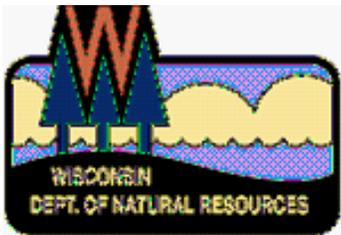


MAIDEN LAKE
Oconto County
2014/2015 Fish Management Report

Christopher C. Long – Senior Fisheries Biologist



Wisconsin Department of Natural Resources
101 N. Ogden Rd.
Suite A
Peshtigo, Wisconsin 54157



Maiden Lake - Oconto County, Wisconsin
2014/2015 Fish Management Report

Christopher C. Long, Fisheries Biologist, Date

Michael Donofrio, Fisheries Supervisor, Date

Steve Hewett, Bureau of Fisheries Management, Date

SUMMARY

Lake and location:

Maiden Lake, Oconto County, T33N R16E Sec 27

Physical / chemical attributes (Wisconsin DNR, 1977):

Surface acres: 278

Maximum depth (ft): 52

Average depth (ft): 20

Shoreline length (mi): 5.6

Lake type: Drainage

Basic water chemistry: Hard water, slightly alkaline, clear water with very high transparency, Secchi = 26 ft. (summer).

Littoral substrate: 30% gravel, 25% rubble, 25% muck and 20% sand.

Aquatic vegetation: Sparse

Other features: This lake is highly developed with homes along the shoreline and is located within the Ceded Territory.

Purpose of survey:

Determine the current status of fishery.

Surveys:

WDNR Survey ID: 494477312 – Early spring walleye (SEI) - 5/13/2014

WDNR Survey ID: 496447870 – Gamefish/Panfish electrofishing (SEII) - 6/11/2014

WDNR Survey ID: 515077226 – Fall juvenile walleye - 9/10/2014

WDNR Survey ID: 515077824 – Spring fyke netting - 4/15/2015 to 4/22/2015

WDNR Survey ID: 515077824 – Early spring walleye (SEI) - 4/22/2015

WDNR Survey ID: 515079149 – Fall juvenile walleye - 9/15/2015

Fishery:

The fishery of Maiden Lake is comprised of panfish species (bluegill, yellow perch and rock bass) and gamefish species (walleye, smallmouth bass, largemouth bass and northern pike).

EXECUTIVE SUMMARY

- Maiden Lake is located in northern Oconto County just southwest of Lakewood. At 278 acres, it is one of the larger lakes in the immediate area and offers a variety of recreational opportunities in addition to fishing.
- The last fisheries survey of Maiden Lake was conducted in 2005/2006 (Hasz, 2007). That survey indicated the walleye population in Maiden Lake declined from 2.4 adults/ acre in 1992 to 1.7 adults/acre by 2005. The 2005/2006 survey reported a shift in panfish populations (Hasz, 2007). In 1992, yellow perch were the most abundant panfish species collected but by 2005/2006, bluegill and rock bass were much more abundant than yellow perch.
- The goal of the 2014/2015 comprehensive fisheries survey was to assess the status of the fishery by characterizing gamefish populations based on relative abundance, proportional stock density (PSD), relative stock density (RSD), catch per unit effort (CPUE) and mean length at capture (age and growth). Comparisons to the 2005/2006 fisheries survey were made where applicable.
- Overall, 1,461 fish representing 11 species and 1 hybrid were collected during the 2014/2015 sampling season (Table 4). The five most abundant species collected by number were walleye (46%), rock bass (17%), smallmouth bass (14%), largemouth bass (9%) and bluegill (7%).
- A total of 671 walleye was collected; Seventy-four walleye were collected during the spring 2014 SEI survey, 112 during the 2015 SEI survey and 473 (including recaptures) during the 2015 fyke netting survey. Walleye ranged in length from 10.4 to 21.8 in (inches) and averaged 16.7 in across both the 2014 and 2015 SEI (April and May) surveys (Figure 1). A total of 473 walleye (97 recaptures) was collected during the spring fyke netting survey with a mean catch per net night (NN) for of 8.5/NN (Figure 2 & Table 6). The Schnabel multiple census fyke net population estimate for walleye 12 inches and larger was 792 or approximately 2.9 walleye/acre. Walleye were reaching legal size (18 in) by age 6 (Figure 3).
- Rock bass made up 17% of the fish collected totaling 250 fish (Table 4). Rock bass ranged in length from 3.9 to 12.4 in and averaged 10.7 in (Figure 4). Electrofishing CPUE was 87.3/h and fyke net CPUE was 3.6/NN (Tables 5 & 6). Overall, the length frequency (Figure 4) suggests that the rock bass population is well balanced in terms of age and size structure.
- During the survey, 201 smallmouth bass were collected (Table 4). Electrofishing yielded a CPUE of 62.5/h and fyke netting a CPUE of 1.4/NN (Tables 5 & 6). Smallmouth ranged in length from 4.5 to 19.4 in and averaged 10.9 in (Figure 5). Twenty-five percent of smallmouth bass measured were over the 14-in minimum length limit.
- One hundred thirty-six largemouth bass were collected during the 2014/2015 survey (Table 4). Electrofishing yielded a CPUE of 41.5/h and fyke netting a CPUE of 1.0/NN (Tables 5 & 6). Bass ranged in length from 5.5 to 19.8 in and averaged 12.5 in (Figure 7). Forty-four percent of largemouth bass measured were over the 14-in minimum length limit. Bass are reaching legal size (14 in) around age 7 or 8.
- Bluegill accounted for 7% of the fish collected and ranged in length from 2.2 to 7.3 in and averaged 4.6 in (Figure 9). Ten percent of the bluegill collected were 6.0 in or greater and considered harvestable. Bluegill PSD was 6 and RSD^P was 0. Neither PSD nor RSD^P were within the desirable range for a balanced population (Table 3). Age-4 bluegill averaged 4.8 in and age-5 fish averaged 6.1 in.
- A total of 28 northern pike was collected during the 2014/2015 fisheries survey and accounted for 2% of the fish collected (Table 4). Northern pike electrofishing and fyke netting CPUE was 0.5/h and 0.5/NN, respectively (Tables 5 & 6). Pike PSD was 63 and RSD^P was 17.

- Yellow perch made up just over 1% of the fish collected totaling 21 fish (Table 4). Perch ranged in length from 5.4 to 7.8 in. Electrofishing CPUE was 1.8/h and fyke net CPUE was 0.4/NN (Tables 5 & 6). No yellow perch were aged from this survey however, successful reproduction and recruitment of yellow perch was evident as several large schools of small perch were observed.
- Since the previous fisheries survey in 2005/2006, fish sampling protocols were evaluated and changed; specifically the timing of gamefish/panfish electrofishing (SEII). In 2005/2006, this sampling was conducted in the fall (i.e. September or October) where as in current survey, SEII electrofishing was conducted in June. Therefore, it's difficult to detect changes in bass and panfish populations between surveys.
- Maiden Lake was originally scheduled for SEI, SEII and fall electrofishing in 2014. Upon completion of the SEI electrofishing survey in May 2014 which revealed an abundant walleye population, we realized that a spring fyke netting survey was necessary in order to accurately characterize the walleye population. Therefore, spring fyke netting, in addition to SEI and fall electrofishing, was added to our sampling rotation in 2015.
- Walleye densities have fluctuated in Maiden Lake since the early 1990's. In 1992, it was estimated that the adult density of walleye was 2.4/ac but by 2005/2006, walleye density had declined to 1.7/ac. The current adult density (2.9/ac) is reassuring even though recreational walleye harvest is marginal. The total catch of walleye during the 1999/2000 creel survey period was 785 fish with a harvest of 259 walleye. Anglers fished a total of 7.5 hours to catch a walleye but 22.8 hours to harvest a walleye. Fishing pressure (hours/acre) on Maiden Lake was 45.8 hours/acre which was lower than the Oconto County average (70.6) but more than the Statewide average (33.6).
- While the overall abundance of panfish appears to be declining, catch rates were similar between years (Tables 5 & 6). However, summer panfish netting, including mini-fyke netting, is recommended before the next comprehensive survey in order to better evaluate panfish abundance and size structure.
- In 2005/2006, largemouth bass were more abundant than smallmouth bass but by 2014/2015, smallmouth were more abundant than largemouth (Tables 4, 5 & 6). The change in abundance, and increase in abundance of smallmouth bass, can be attributed to one or two good year classes of young smallmouth bass (5 to 8 inches) (Figure 5). Changes to the black bass regulations would likely be ineffective and are not recommended.
- In 2015, the minimum length limit for walleye was increased to 18 inches and the daily bag limit is 3 regardless of tribal harvest declarations. This regulation will allow a significant number of sexually mature adults between 15 and 18 inches an increased opportunity to spawn (Figure 2). This is especially significant since the walleye fishery has been maintained through natural reproduction. As a result, the stocking of large fingerling walleye should be closely monitored in the future. Therefore, alternate year stockings of large fingerlings walleye should continue at the rate of 5 fish/ acre but regular, routine monitoring should also continue to evaluate their contribution to the fishery.
- The next comprehensive fisheries survey (fyke netting, spring summer and fall electrofishing) of Maiden Lake is scheduled for 2023. Boat access to Maiden Lake is adequate. One public boat landing is available to anglers however, parking is extremely limited. Another private boat landing is operated at the Maiden Lake Resort. Shore fishing opportunities are extremely limited for the public. Boaters are reminded to remove all vegetation from their boat and trailer before leaving to limit the spread of invasive species.

TABLE OF CONTENTS

	Page
EXECUTIVE SUMMARY	i
INTRODUCTION	1
METHODS	2
DISCUSSION.....	5
CONCLUSIONS & RECOMMENDATIONS.....	8
ACKNOWLEDGEMENTS.....	9
LITERATURE CITED.....	10
APPENDIX I – TABLES	11
APPENDIX II – FIGURES	17
APPENDIX III – SAMPLING LOCATIONS.....	23

INTRODUCTION

Maiden Lake is located in northern Oconto County just southwest of Lakewood. At 278 acres it is one of the larger lakes in the immediate area and offers a variety of recreational opportunities in addition to fishing. There are two access points/boat landings on the lake; a public launch is maintained by the Town of Riverview off of Maiden Landing and the other is a private landing at the Maiden Lake Resort.

The Wisconsin Department of Natural Resources (WDNR) stocked small fingerling walleye in 2001 and large fingerling walleye, under the Wisconsin Walleye Initiative, in 2014 (Table 1). The Maiden Lake Association was responsible for all other recent walleye stockings (1995, 1998 and 2013) (Table 1). No walleye had been stocked between 1947 and 1995. For almost 50 years, the walleye fishery has been sustained through natural reproduction.

The last fisheries survey of Maiden Lake was conducted in 2005/2006 (Hasz, 2007). That survey indicated the walleye population in Maiden Lake declined from 2.4 adults/ acre in 1992 to 1.7 adults/acre by 2005. The 2005/2006 survey reported a shift in panfish populations (Hasz, 2007). In 1992, yellow perch were the most abundant panfish species collected but by 2005/2006, bluegill and rock bass were much more abundant than yellow perch. Hasz (2007) noted that the decline of yellow perch could possibly “be attributed to the lack of suitable habitat in the lake for successful reproduction, cover and/or overfishing”. However, after closer examination of the sampling data from 1992 and 2005/2006, it is more probable that spring netting efficacy was affected by water temperature at the time of collection (52°F in 1992 versus 48°F in 2006). Yellow perch spawning generally peaks around 50°F (Hinshaw, 2006). Largemouth bass and smallmouth bass populations exhibited good numbers and size structure while northern pike appeared to be the least abundant predator in the 2005/2006 survey. This survey also revealed that most species exhibited slower growth compared to other lakes in northeast Wisconsin.

A creel survey conducted during the 1999/2000 fishing season revealed a significant proportion of fishing effort was targeted at walleye. The total catch of walleye during the creel survey period was 785 fish with a harvest of 259 walleye. Anglers fished a total of 22.8 hours to harvest a walleye. Fishing pressure (hours/acre) on Maiden Lake was 45.8 hours/acre which was lower than the Oconto County average (70.6) but more than the Statewide average (33.6).

The goal of the 2014/2015 comprehensive fisheries survey was to assess the status of the fishery by characterizing gamefish populations based on relative abundance, proportional stock density (PSD), relative stock density (RSD), catch per unit effort (CPUE) and mean length at capture (age and growth). Comparisons to the 2005/2006 fisheries survey were made where applicable.

METHODS

Data collection:

Standard fyke nets (3-foot hoop, $\frac{3}{4}$ -bar, 1.5-inch stretch), mini-fyke nets ($\frac{1}{4}$ -inch stretch with turtle exclusion) and a standard WDNR electrofishing boat were used to collect fish on Maiden Lake. Sampling gear, effort, date, and target species for the survey are listed in Table 2. All fish collected were measured to the nearest 0.1 inch total length (TL) and separated into half-inch groups (X.0-X.4 for inch group and X.5-X.9 for half-inch group). A sub-sample of scales or dorsal spines was collected for age and growth analysis from all gamefish. Aging structures (scales or spines) were collected from 5 non young-of-the-year (YOY) fish per half inch group. If gender could be determined, structures from 5 fish per sex were collected per half inch group. Aging structures for panfish and nongame fish consisted of 5 samples per half inch group when gender could not be established. Ages were assigned to each fish using standard WDNR procedures.

Data analysis:

Relative abundance was calculated as the percentage each species represented from the total sample (i.e. 22 fish of a single species from a sample of 100 total fish = 22% relative abundance). Catch per unit effort (CPUE) was calculated as catch by gear divided by sampling effort for each species collected. Length frequency distributions were tabulated for dominant gamefish and consisted of combined April and May electrofishing samples as well as fyke net data. Proportional stock density (PSD) and relative stock density for preferred length fish (RSD^P) were calculated for dominant gamefish (Table 3; Anderson and Neumann 1996). Preferred lengths of various gamefish have a minimum length between 45 and 55% of the world record length for that species (Anderson and Neumann 1996). Stock, quality, and preferred lengths were used as proposed by Gabelhouse (1984). Mean length at capture data was calculated for dominant gamefish and compared to the average of mean length at age for northern Wisconsin.

A population estimate for walleye was obtained during the spring fyke net survey by giving each captured fish a top caudal fin clip. Marks (fin clips) were noted in subsequent collections until the survey was complete. The Schumacher-Eschmeyer and/or Schnabel formulas for multiple census were used to generate population estimates (Schneider, 1998; Schnabel, 1938).

RESULTS

Overall, 1,461 fish representing 11 species and 1 hybrid were collected during the 2014/2015 sampling season (Table 4). The five most abundant species collected by number were walleye (46%), rock bass (17%), smallmouth bass (14%), largemouth bass (9%) and bluegill (7%).

A total of 671 walleye was collected which accounted for 46% of the fish collected (Table 4). Seventy-four walleye were collected during the spring 2014 SEI survey, 112 during the 2015 SEI survey and 473 (including recaptures) during the 2015 fyke netting survey. This total also includes walleye collected during the 2014 and 2015 fall juvenile assessments and during the 2015 SEII gamefish/panfish electrofishing survey (Table 5).

In 2014, electrofishing for walleye was conducted in May and September with CPUE's of 29.6/h and 2.6/h, respectively (Table 5). Electrofishing in 2015 for walleye was conducted in April and September with CPUE's of 62.8/h and 1.9/h, respectively (Table 5). Walleye ranged in length from 10.4 to 21.8 in (inches) and averaged 16.7 in across both the 2014 and 2015 SEI (April and May) surveys (Figure 1). A total of 473 walleye (97 recaptures) was collected during the spring fyke netting survey with a mean catch per net night (NN) for of 8.5/NN (Figure 2 & Table 6). Walleye PSD and RSD^P from the spring fyke net sample was 87 and 13, respectively. Walleye PSD was well above the desirable range of 30 to 60 (Table 3). The Schnabel multiple census fyke net population estimate for walleye 12 inches and larger was 792 or approximately 2.9 walleye/acre. A subsample of 119 walleye from fyke nets was aged from 2 to 18 years old. Walleye were reaching legal size (18 in) by age 6 (Figure 3). Compared to the average length at age for northern Wisconsin, walleye growth was average until age 10 but below average at older ages (Figure 3).

Rock bass made up 17% of the fish collected totaling 250 fish (Table 4). Rock bass ranged in length from 3.9 to 12.4 in and averaged 10.7 in (Figure 4). Electrofishing CPUE was 87.3/h and fyke net CPUE was 3.6/NN (Tables 5 & 6). Overall, the length frequency (Figure 4) suggests that the rock bass population is well balanced in terms of age and size structure.

During the survey, 201 smallmouth bass were collected (Table 4). Electrofishing yielded a CPUE of 62.5/h and fyke netting a CPUE of 1.4/NN (Tables 5 & 6). Smallmouth ranged in length from 4.5 to 19.4 in and averaged 10.9 in (Figure 5). Smallmouth bass PSD was 36 and RSD^P was 12 (from electrofishing sample). Smallmouth bass PSD is within the desirable range for a balanced population (Table 3). Twenty-five percent of smallmouth bass measured were over the 14-in minimum length limit. A subsample of 76 smallmouth bass was aged from 1 to 11 years old. Smallmouth bass growth was above average until age 6 and below average at age 9 and older compared to the average mean length at age for smallmouth bass in northern Wisconsin (Figure 6). Smallmouth are reaching legal size (14 in) around age 6 or 7. Successful reproduction and recruitment of smallmouth bass was evident.

One hundred thirty-six largemouth bass were collected during the 2014/2015 survey (Table 4). Electrofishing yielded a CPUE of 41.5/h and fyke netting a CPUE of 1.0/NN (Tables 5 & 6). Bass ranged in length from 5.5 to 19.8 in and averaged 12.5 in (Figure 7). Largemouth bass PSD was 50 and RSD^P was 16 (from electrofishing sample). Bass PSD and RSD^P are within the desirable range for a balanced population (Table 3). Forty-four percent of largemouth bass measured were over the 14-in minimum length limit. A subsample of 71 largemouth bass was aged from 2 to 16 years old. Largemouth bass growth was average until age 6 and below average at older ages compared to the average mean length at age for bass in northern Wisconsin (Figure 8). Bass are reaching legal size (14 in) around age 7 or 8. Successful reproduction and recruitment of largemouth bass was evident.

Bluegill accounted for 7% of the fish collected and ranged in length from 2.2 to 7.3 in and averaged 4.6 in (Figure 9). Ten percent of the bluegill collected were 6.0 in or greater and considered harvestable. Bluegill PSD was 6 and RSD^P was 0. Neither PSD nor RSD^P were within the desirable range for a balanced population (Table 3). Electrofishing CPUE was 170.9/h and fyke net CPUE was 0.2/NN (Tables 5 & 6). A subsample of 22 bluegill was aged from 4 to 5 years old. Most age groups were not represented. Age-4 bluegill averaged 4.8 in and age-5 fish averaged 6.1 in. Growth was slightly below average at all ages compared to the mean length at age of bluegill in northern Wisconsin (Figure 10). Successful reproduction and recruitment of bluegill was evident.

A total of 28 northern pike was collected during the 2014/2015 fisheries survey and accounted for 2% of the fish collected (Table 4). Northern pike electrofishing and fyke netting

CPUE was 0.5/h and 0.5/NN, respectively (Tables 5 & 6). Pike PSD was 63 and RSD^P was 17. No northern pike were aged from this survey. Due to the lack of recaptures during the fyke netting survey, a population estimate was not calculated.

Yellow perch made up just over 1% of the fish collected totaling 21 fish (Table 4). Perch ranged in length from 5.4 to 7.8 in. Electrofishing CPUE was 1.8/h and fyke net CPUE was 0.4/NN (Tables 5 & 6). No yellow perch were aged from this survey however, successful reproduction and recruitment of yellow perch was evident as several large schools of small perch were observed.

Additionally, white sucker, hybrid sunfish, green sunfish, black crappie and bullhead were also collected during the 2014/2015 survey and accounted for approximately 3.5% of all fish collected (Table 4).

DISCUSSION

Maiden Lake is relatively infertile because it is a deep, headwater drainage lake and it also has a small upland, forested watershed. Primary production, which forms the base of all aquatic food chains, is lacking which is evident from the summer Secchi disc reading of 26 ft. However, populations of panfish (bluegill, yellow perch and rock bass) and gamefish (walleye, largemouth bass and smallmouth bass) are present and offer anglers a respectable fishing opportunity.

Since the previous fisheries survey in 2005/2006, fish sampling protocols were evaluated and changed; specifically the timing of gamefish/panfish electrofishing (SEII). In 2005/2006 sampling was conducted in the fall (i.e. September or October) where as in current survey, SEII electrofishing was conducted in June. Therefore, it's difficult to detect changes in bass and panfish populations between surveys. Viable comparisons between years/surveys can still be made between spring (SEI) and fall electrofishing, as well as fyke netting surveys.

Maiden Lake was originally scheduled for SEI, SEII and fall electrofishing in 2014. Upon completion of the SEI electrofishing survey in May 2014, which revealed an abundant walleye population, we realized that a spring fyke netting survey was necessary in order to accurately characterize the walleye population. Therefore, spring fyke netting, in addition to SEI and fall electrofishing, was added to our sampling rotation in 2015.

Walleye densities have fluctuated in Maiden Lake since the early 1990's. In 1992, it was estimated that the adult density of walleye was 2.4/ac but by 2005/2006, walleye density had

declined to 1.7/ac. The current adult density (2.9/ac) is reassuring even though recreational walleye harvest is marginal. A creel survey conducted during the 1999/2000 fishing season revealed a significant proportion of fishing effort targeted walleye. The total catch of walleye during the creel survey period was 785 fish with a harvest of 259 walleye. Anglers fished a total of 7.5 hours to catch a walleye but 22.8 hours to harvest a walleye. Similarly, a creel survey conducted on Wheeler Lake, also located in northern Oconto County, during the 2008/2009 fishing season revealed a total catch of 193 walleye and harvest of 154 walleye. Anglers on Wheeler Lake fished a total of 28.6 hours to catch a walleye and 36.0 hours to harvest a walleye. Fishing pressure (hours/acre) on Maiden Lake was 45.8 hours/acre which was lower than the Oconto County average (70.6) but more than the Statewide average (33.6). Fishing pressure on Wheeler Lake was 43.0 hours/acre. The differences in the time it took to catch and/or harvest a walleye on each lake can be attributed somewhat to walleye density (fish/acre). The density of adult walleye in Maiden Lake (2.9/acre) is three times greater than the adult walleye density in Wheeler Lake (0.9/acre).

The walleye fishery in Maiden Lake has been maintained by natural reproduction for the last several decades and no significant stocking of walleye has occurred until recently (Table 1). Reproduction and recruitment of walleye can be highly variable between years however, natural reproduction of walleye was documented in 2014 with the collection of 5 YOY walleye between 3.9 and 5.0 in. No YOY walleye were collected in 2015 but walleye from the 2014 stocking were collected.

Between 2006 and 2014 the smallmouth bass population has experienced some changes in size structure and abundance. Smallmouth PSD declined from 49 to 36 between 2006 and 2014, respectively but RSD^P remained the same at 12. PSD and RSD^P estimates were derived from the April and June electrofishing samples in 2006 but only the June SEII electrofishing survey in 2014. The decline in PSD can be attributed to the large number of smallmouth between 5 and 8 inches that were collected in 2014 (Figure 5). The abundance of these smaller smallmouth bass indicates that reproduction and recruitment have been consistent. Overall though, more smallmouth bass over 14 inches were collected during the spring fyke netting survey in 2014 than 2006 (Table 5 & Figure 5). Population indices from SEII electrofishing are more reliable in terms of describing the population as a whole. SEII electrofishing is also more effective at collecting a representative sample of all sizes of smallmouth whereas fyke netting is more effective at

collecting larger bass. Nonetheless, smallmouth abundance appears to have increased and the size distribution is more equal across most length groups (Figure 5).

Smallmouth bass growth was slightly above average in 2014, compared to other lakes in northern Wisconsin, and similar to growth in 2006 (Figure 6). Smallmouth bass at older ages (> 9 years old) appeared to have below average growth but that could also be attributed to our ability to accurately assess ages of older fish using dorsal spines.

Largemouth bass abundance seems to have declined between 2006 and 2014 but size structure improved between years (Figure 7). Largemouth PSD increased from 45 to 50 between 2006 and 2014, respectively and RSD^P also increased from 3 to 16 between years. The increase in PSD is not as significant as the increase in RSD^P which essentially means more largemouth bass over 14 inches were present in 2014 than in 2006. PSD and RSD^P estimates for largemouth bass were derived from the April and June electrofishing samples in 2006 but only the June SEII electrofishing survey in 2014. Overall, largemouth bass growth was the nearly identical between 2006 and 2014 however, largemouth growth was average until age 6 and below average at age 7 and older compared to other lakes in northern Wisconsin (Figure 8). Again, the slower growth observed in larger/older largemouth bass could be attributed to our ability to accurately assess ages of older fish using dorsal spines.

Northern pike have never been overly abundant in Maiden Lake and the 2014/2015 survey did not prove otherwise. Only 28 pike were collected during the 2014/2015 (Table 4). Twenty-three pike were collected during the 2005/2006 survey.

Rock bass were the most abundant panfish species collected in both the 2005/2006 and 2014/2015 fisheries surveys (Tables 4, 5 & 6). More rock bass over 10 inches were collected in the recent survey with several fish over 12 inches in the sample (Figure 4).

Changes in the bluegill population are difficult to detect because survey methodologies were modified between surveys. The 2005/2006 survey collected bluegill in October whereas the 2014/2015 survey collected bluegill in June (Table 2). Bluegill size structure is poor (Figure 9) and remained relatively unchanged from the 2005/2006 survey. Bluegill PSD was 6 and RSD^P was 0 in both survey years (electrofishing samples). Bluegill growth was the same in both 2005/2006 and 2014/2015 and average compared to other lakes in northern Wisconsin (Figure 10).

CONCLUSIONS & RECOMMENDATIONS

The current fishing regulations (Table 7) are adequate and should continue to provide quality fishing opportunities. While the overall abundance of panfish appears to be declining, catch rates were similar between years (Tables 5 & 6). However, summer panfish netting, including mini-fyke netting, is recommended before the next comprehensive survey in order to better evaluate panfish abundance and size structure. Depending on the results of a panfish survey, Maiden Lake may be a good candidate for reducing the bag limit of panfish from 25/angler/day to 10/angler/day.

In 2005/2006, largemouth bass were more abundant than smallmouth bass but by 2014/2015, smallmouth were more abundant than largemouth (Tables 4, 5 & 6). The change in abundance, and increase in abundance of smallmouth bass, can be attributed to one or two good year classes of young smallmouth bass (5 to 8 inches) (Figure 5). The exact reason for the increased success of smallmouth bass reproduction and recruitment is unknown. The change in black bass regulations in 2014 (whereby largemouth bass are no longer protected under the early catch-and-release season from the first Saturday in May to the second Saturday in June) did not affect smallmouth bass abundance. Additionally, harvest of both largemouth and smallmouth bass was negligible during the 1999/2000 creel survey. A total of 2,397 smallmouth and 778 largemouth were caught during the creel survey but only 125 smallmouth and 37 largemouth were harvested. Therefore, additional changes to the black bass regulations would likely be ineffective and are not recommended.

New walleye fishing regulations were implemented in 2015. The previous regulation consisted of a 15-inch minimum length limit and the daily bag limit fluctuated based on tribal harvest declarations. In 2015, the minimum length limit was increased to 18 inches and the daily bag limit is 3 regardless of tribal harvest declarations. This regulation will allow a significant number of sexually mature adults between 15 and 18 inches an increased opportunity to spawn (Figure 2). This is especially significant since the walleye fishery has been maintained through natural reproduction. As a result, the stocking of large fingerling walleye should be closely monitored in the future. Ultimately, stocking may not be necessary to sustain the walleye fishery. However, as more people and anglers realize that a quality walleye fishery is present in Maiden Lake, recreational and tribal harvest is likely to increase. Therefore, alternate year stockings of

large fingerlings walleye should continue at the rate of 5 fish/acre but regular, routine monitoring should also continue to evaluate their contribution to the fishery.

The next comprehensive fisheries survey (fyke netting, spring summer and fall electrofishing) of Maiden Lake is scheduled for 2022 and will focus on the age, growth, abundance, and recruitment of the dominant gamefish. Boat access to Maiden Lake is adequate. One public boat landing is available to anglers however, parking is extremely limited. Another private boat landing is operated at the Maiden Lake Resort. Shore fishing opportunities are extremely limited for the public. Boaters are reminded to remove all vegetation from their boat and trailer before leaving to limit the spread of invasive species. A map of Maiden Lake can be found at the following internet address; <http://dnr.wi.gov/lakes/maps/DNR/0487500a.pdf>

ACKNOWLEDGEMENTS

WDNR would like to thank the Maiden Lake Association for their assistance stocking walleye in 2014 and the opportunity to speak at their annual meeting in May 2015.

LITERATURE CITED

- Anderson, R. O. and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-481 *in* B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- Gabelhouse, D.W. Jr. 1984. A length-categorization system to assess fish stocks. *North American Journal of Fisheries Management* 4: 273-285.
- Hasz, J. 2007. Comprehensive Fisheries Survey of Maiden Lake, Oconto County Wisconsin during 2005 and 2006. Wisconsin Department of Natural Resources. Peshtigo, Wisconsin.
- Schnabel, Z.E. 1938. The estimation of the total fish population of a lake. *American Mathematical Monographs* 45: 348 – 368.
- Schneider, J.C. 1998. Lake fish population estimates by mark-and-recapture methods. Chapter 8 *in* Schneider, James C. (editor) 2000. *Manual of fisheries survey methods II: with periodic updates*. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.
- Willis, D.W., B.R. Murphy, and C.S. Guy. 1993. Stock density indices: development, use, and limitations. *Reviews in Fisheries Science* 1:203-222.

APPENDIX I – TABLES

Table 1. Stocking history of Maiden Lake; Oconto County, WI.

Year	Species	Strain Stock	Age Class	Number Stocked	Average Length	Source Type
1995	WALLEYE	UNSPECIFIED	FINGERLING	2100	6	PRIVATE HATCHERY
1998	WALLEYE	UNSPECIFIED	LARGE FINGERLING	2150		PRIVATE HATCHERY
2001	WALLEYE	UNSPECIFIED	SMALL FINGERLING	12000	2	DNR PONDS
2013	WALLEYE	UNSPECIFIED	LARGE FINGERLING	1496	7	PRIVATE HATCHERY
2014	WALLEYE	LAKE MICHIGAN	LARGE FINGERLING	2779	7	DNR HATCHERY

Table 2. Sampling gear, date, target species, sampling effort, and location (distance) for 2014/2015 fisheries survey on Maiden Lake; Oconto County, WI.

Gear	Date		Target Species	Sampling Effort hours (h) or net night (NN)	Shoreline Distance (mi)
	2014	2015			
Fyke net		Apr. 16 - 22	All fish	56 NN	
Electrofishing	13-May		Walleye	2.5 h	5.3
Electrofishing		22-Apr	Walleye	1.8 h	3.2
Electrofishing	11-Jun		All fish	1.0 h	0.6
			Gamefish	2.0 h	4.0
Electrofishing	10-Sep		YOY Walleye	1.9 h	4.0
Electrofishing		15-Sep	YOY Walleye	2.1 h	4.2

Table 3. Proposed length categories for various fish species. Measurements are total lengths for each category in inches. Updated from Anderson and Neumann (1996), Bister et al. (2000), Hyatt and Hubert (2001).

Species	PSD	RSD-P	Stock	Quality	Preferred	Memorable	Trophy
Black crappie			5	8	10	12	15
Bluegill	20 - 40	5 - 20*	3	6	8	10	12
Brown bullhead			5	8	11	14	17
Largemouth bass	40 - 70	10 - 40*	8	12	15	20	25
Muskellunge	30 - 60		20	30	38	42	50
Northern pike	30 - 60		14	21	28	34	44
Pumpkinseed	20 - 40		3	6	8	10	12
Rock bass	20 - 60		4	7	9	11	13
Smallmouth bass	30 - 60		7	11	14	17	20
Walleye	30 - 60		10	15	20	25	30
Yellow perch	30 - 50		5	8	10	12	15
Yellow bullhead			4	7	9	11	14

*Range based on management strategy for balanced populations.

Table 4. Number, relative abundance (%), and length range (in) of fishes collected in 2014/2015 from Maiden Lake; Oconto County, WI.

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER			
*Common Name of Fish	Number	Percent	Length Range (inches)
Walleye**	671	45.9%	3.9 - 28.0
Rock bass	250	17.1%	4.0 - 12.4
Smallmouth bass	201	13.8%	4.5 - 19.4
Largemouth bass	136	9.3%	5.5 - 19.8
Bluegill	104	7.1%	2.2 - 7.3
Northern pike	28	1.9%	13.7 - 30.9
White sucker	22	1.5%	8.1 - 22.9
Yellow perch	21	1.4%	5.4 - 7.8
Hybrid sunfish	13	0.9%	5.0 - 7.2
Green sunfish	9	0.6%	2.7 - 5.4
Black crappie	4	0.3%	10.3 - 12.7
Yellow bullhead	2	0.1%	9.9 - 10.9
TOTAL	1461		

* Common names of fishes recognized by the American Fisheries Society.

**Includes 2014 & 2015 SEI, 2015 spring fyke netting (+ recaptures) and 2014 & 2015 fall EF.

Table 5. Comparison of spring fyke netting data between 2006 and 2015 collected from Maiden Lake; Oconto County, WI.

2015 Fyke Netting (56*)			2006 Fyke Netting (76*)		
Species	Total Catch	Mean Catch per net night	Species	Total Catch	Mean Catch per net night
Walleye**	473	8.5	Rock Bass	291	3.8
Rock bass	202	3.6	Walleye**	168	2.2
Smallmouth bass**	76	1.4	White sucker	159	2.1
Largemouth bass**	53	1.0	Largemouth Bass**	69	0.9
Northern pike**	26	0.5	Bluegill	62	0.8
White sucker	21	0.4	Smallmouth Bass**	35	0.5
Yellow perch	20	0.4	Northern Pike**	11	0.1
Bluegill	10	0.2	Yellow perch	11	0.1
Hybrid sunfish	5	0.1	Green Sunfish	8	0.1
Black crappie	4	0.1	Black Crappie	4	0.1
Yellow bullhead	2	<0.1	Pumpkinseed	2	<0.1
TOTAL	892			820	

*Sampling effort in net nights for each corresponding year.

**Includes recaptured fish.

Table 6. Seasonal electrofishing summary between 2005/2006 and 2014/2015 surveys on Maiden Lake; Oconto County, WI.

Species	Spring electrofishing (SEI)									Gamefish/Panfish electrofishing (SEII)								
	2014 May			2015 April			2006 April			2014 June			2006 June			2005 October		
	Total	CPUE	CPUE	Total	CPUE	CPUE	Total	CPUE	CPUE	Total	CPUE	CPUE	Total	CPUE	CPUE	Total	CPUE	CPUE
Catch	/hour	/mile	Catch	/hour	/mile	Catch	/hour	/mile	Catch	/hour	/mile	Catch	/hour	/mile	Catch	/hour	/mile	
Bluegill										94	170.9	94.0				237	83.7	59.3
Yellow perch										1	1.8	1.0				2	0.7	0.5
Northern pike							2	1.3	0.4	1	0.5	0.3	3	0.8	0.7	18	5.7	4.0
Walleye	74	29.6	14.0	112	62.8	35.0	22	14.5	4.5	3	1.5	0.8						
Largemouth bass							42	27.7	8.5	83	41.5	20.8	119	33.2	26.4	113	35.7	25.1
Rock bass										48	87.3	48.0				139	49.1	34.8
Smallmouth bass							22	14.5	4.5	125	62.5	31.3	92	25.7	20.4	85	26.8	18.9

Fall electrofishing									
Species	2014 Sept.			2015 Sept.			2005 October		
	Total	CPUE	CPUE	Total	CPUE	CPUE	Total	CPUE	CPUE
	Catch	/hour	/mile	Catch	/hour	/mile	Catch	/hour	/mile
Walleye	5	2.6	1.3	4	1.9	1.0	5	3.6	1.1

Table 7. Current fishing regulations (2015 - 2016) for Maiden Lake; Oconto County, WI.

Species	Fishing Season	Daily Limit	Minimum Length
Largemouth bass	May 2- March 6	5	14 inches
Smallmouth bass	May 2- June 19	Catch and release	
	June 20- March 6	5 in total with LMB	14 inches
Northern pike	May 2 - March 6	5	None
Walleye	May 2- March 6	3	18 inches
Panfish (bluegill, pumpkinseed, crappie, and yellow perch)	Open all year	25 in total	None
Bullheads	Open all year	None	None
Rock bass	Open all year	None	None

APPENDIX II – FIGURES

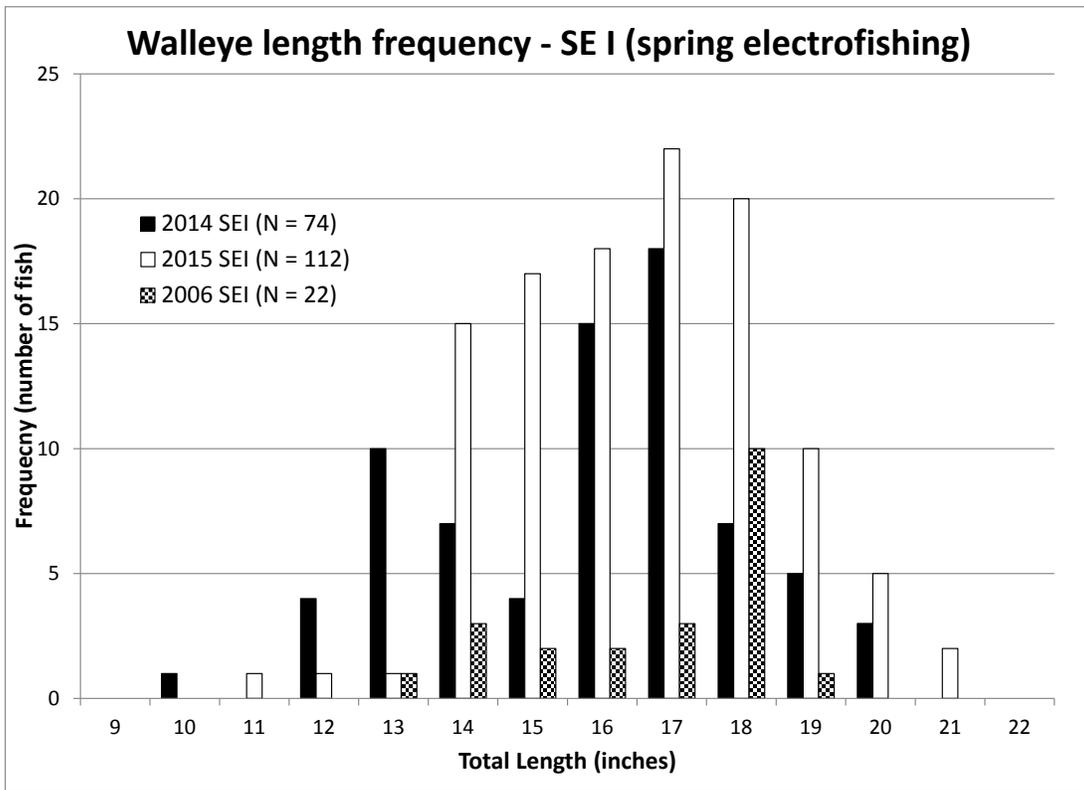


Figure 1. Walleye SEI electrofishing length frequency from 2006, 2014 and 2015 fisheries surveys at Maiden Lake; Oconto County, WI.

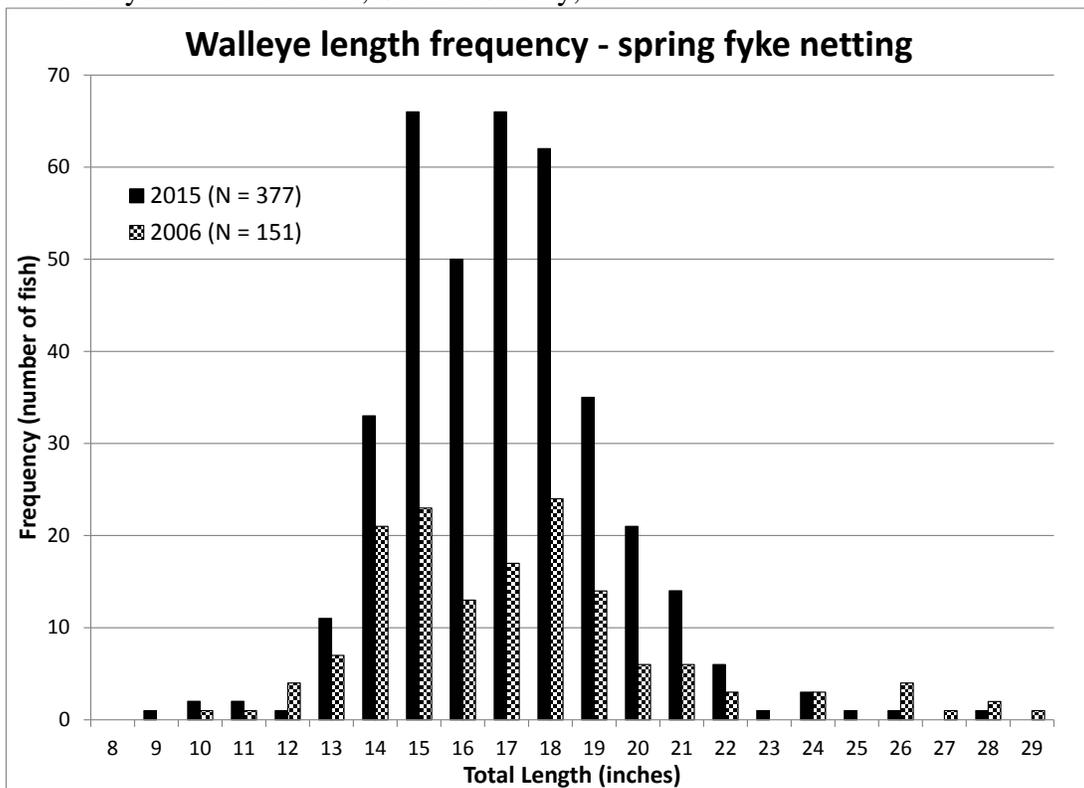


Figure 2. Walleye spring fyke netting length frequency from 2006 and 2015 fisheries surveys at Maiden Lake; Oconto County, WI.

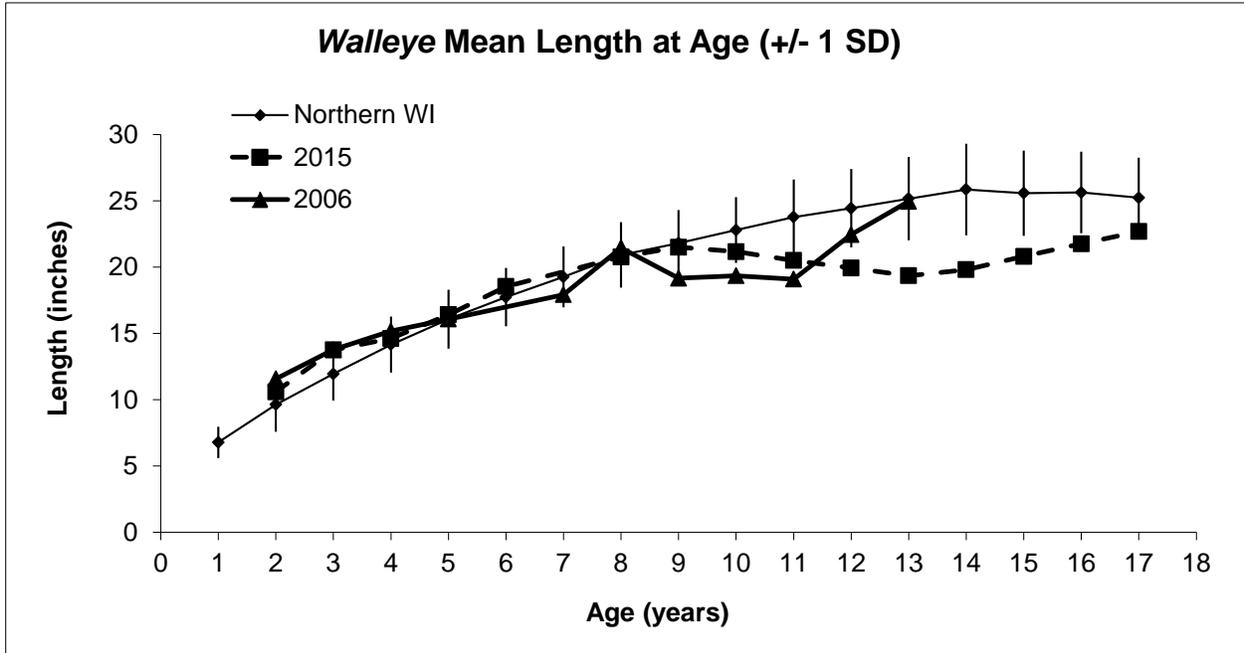


Figure 3. Walleye mean length at age comparison from Maiden Lake; Oconto County, WI.

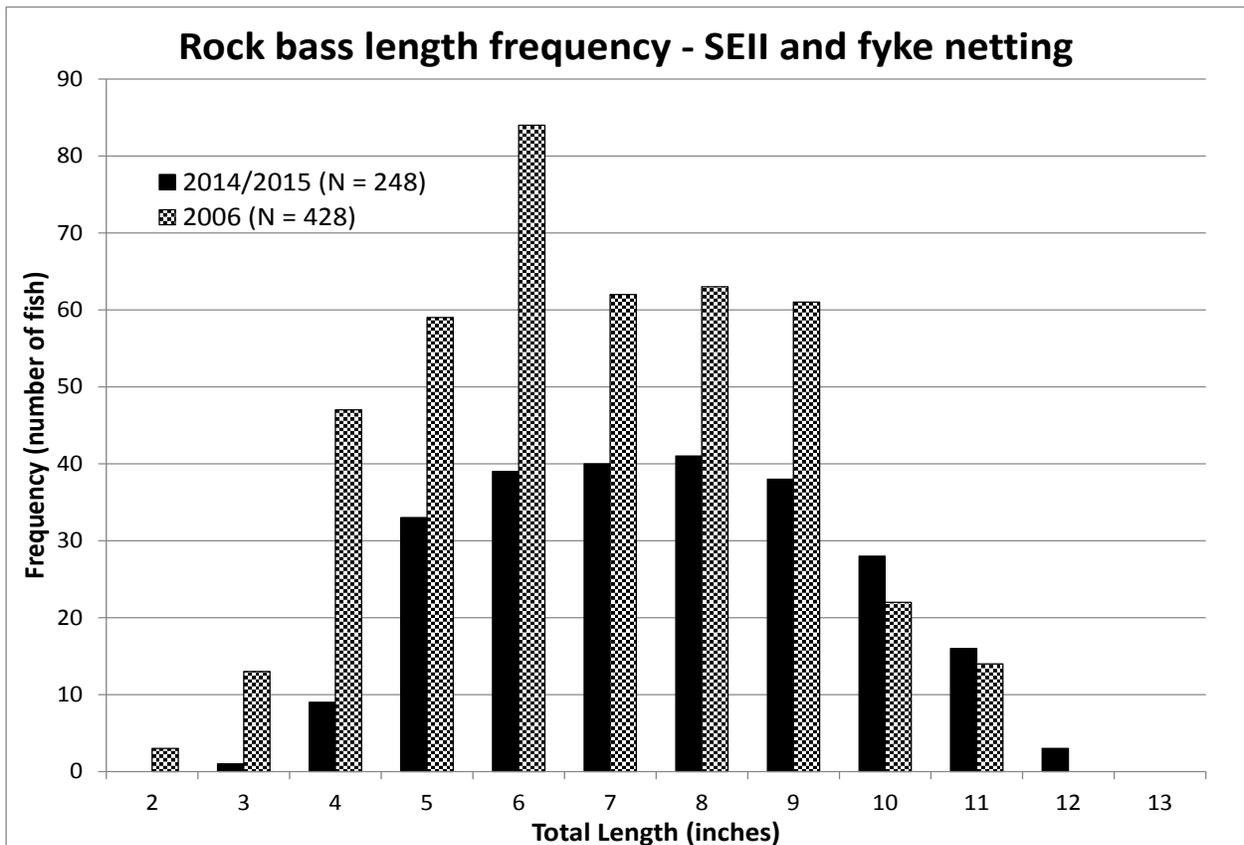


Figure 4. Rock bass length frequency from 2006 and 2014/2015 fisheries surveys at Maiden Lake Oconto County, WI.

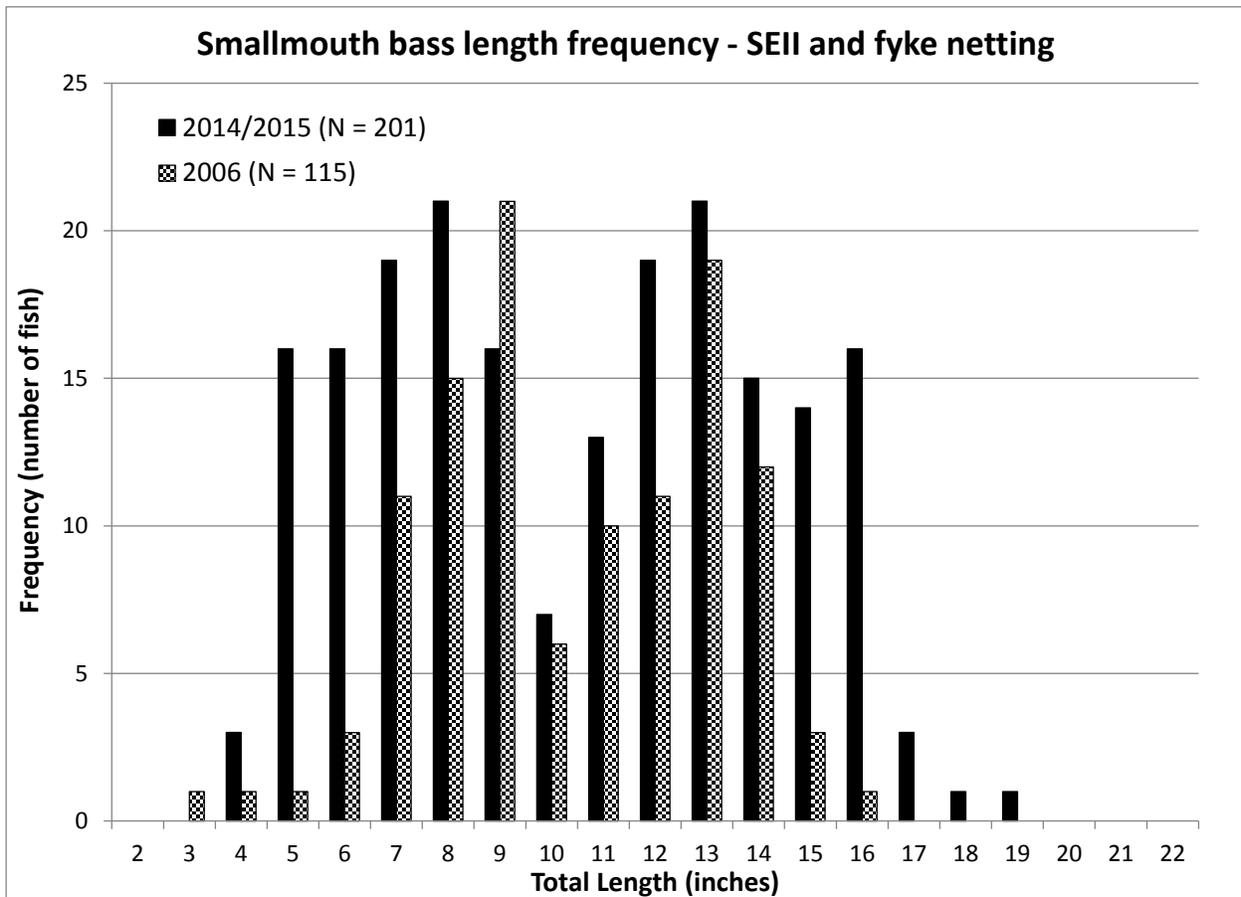


Figure 5. Smallmouth bass length frequency from 2006 and 2014/2015 fisheries surveys at Maiden Lake; Oconto County, WI.

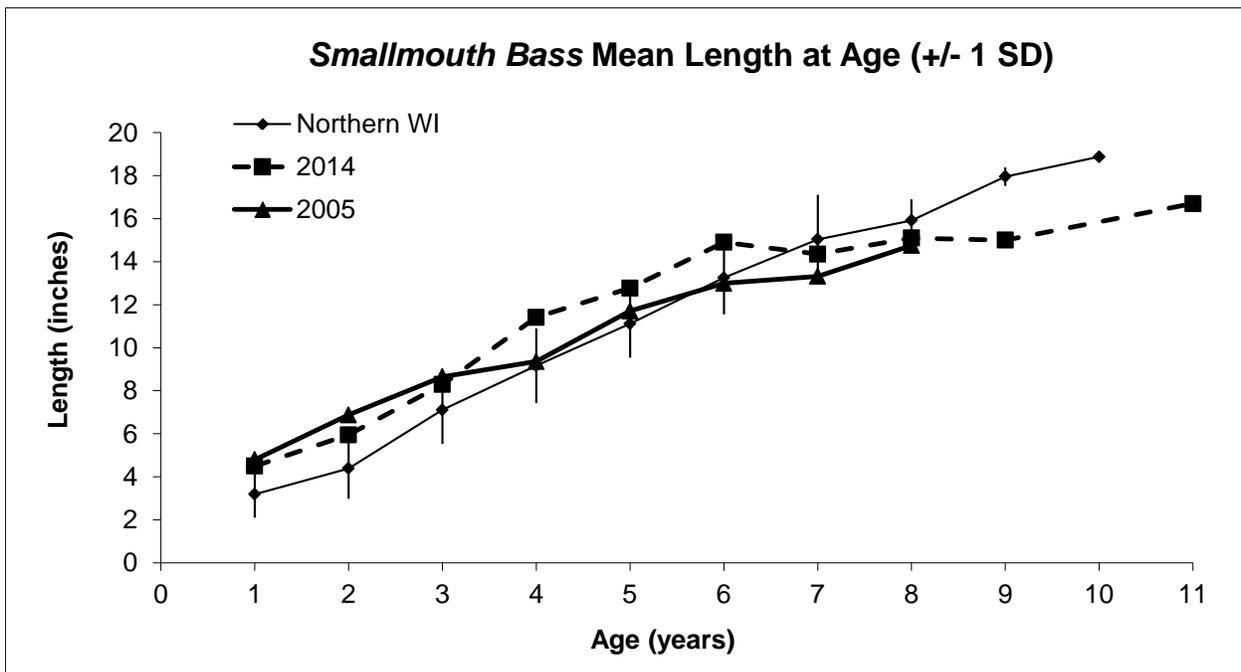


Figure 6. Smallmouth bass mean length at age comparison from Maiden Lake; Oconto County, WI.

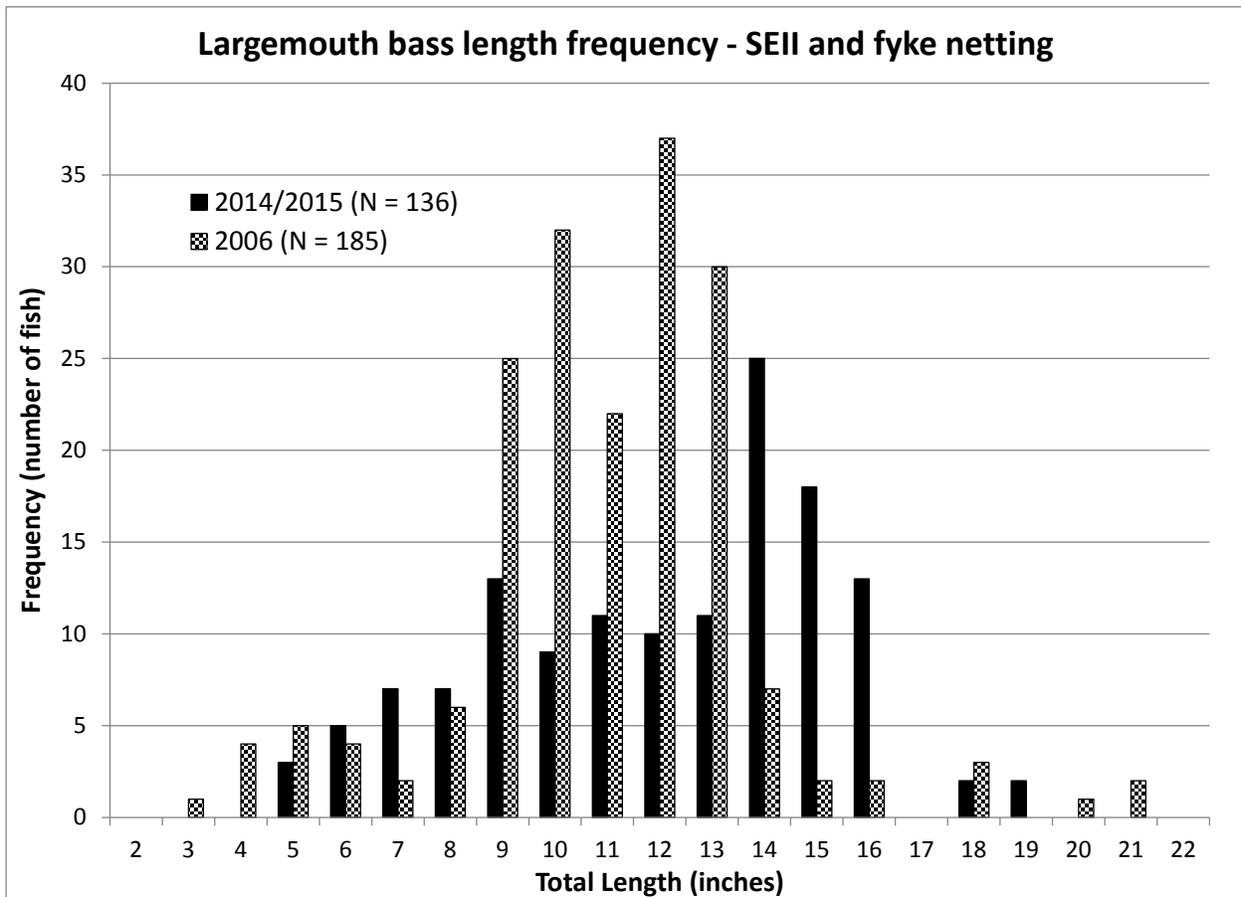


Figure 7. Largemouth bass length frequency from 2006 and 2014/2015 fisheries surveys at Maiden Lake; Oconto County, WI.

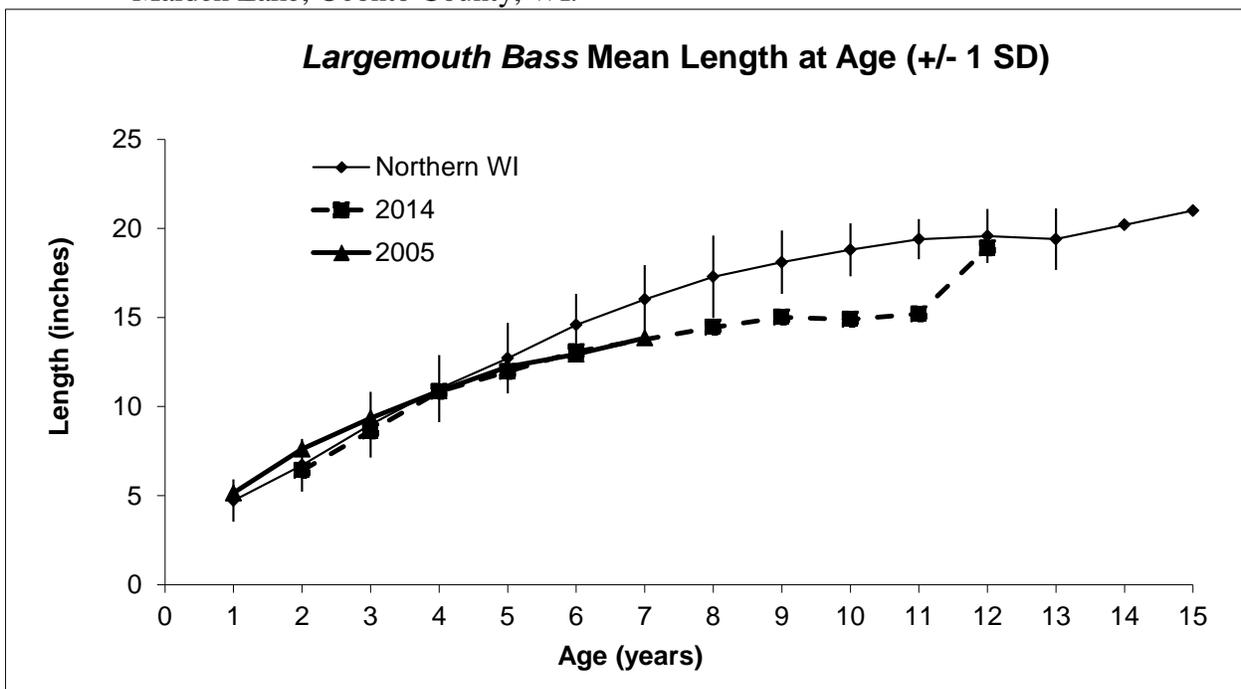


Figure 8. Largemouth bass mean length at age comparison from Maiden Lake; Oconto County, WI.

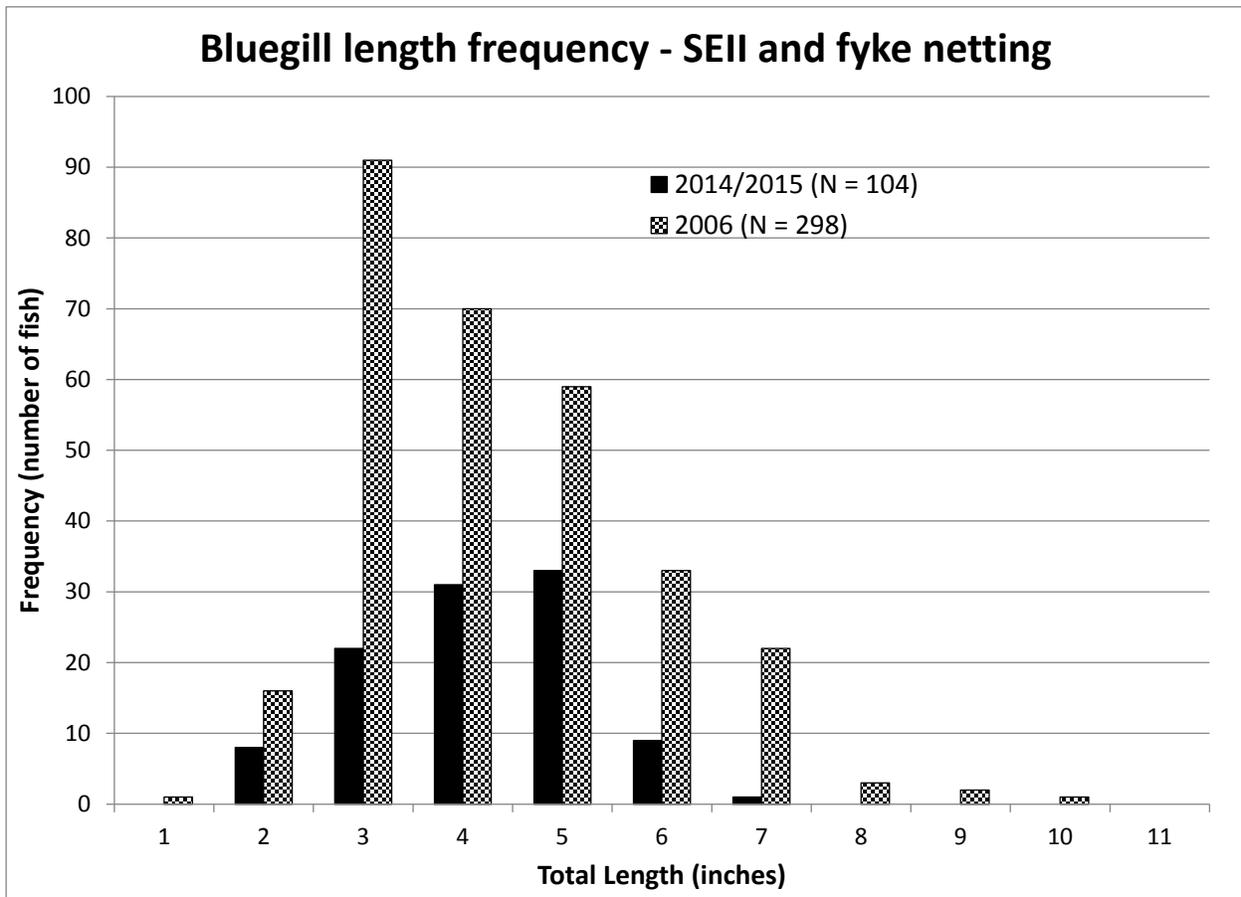


Figure 9. Bluegill length frequency from 2006 and 2014/2015 fisheries surveys at Maiden Lake Oconto County, WI.

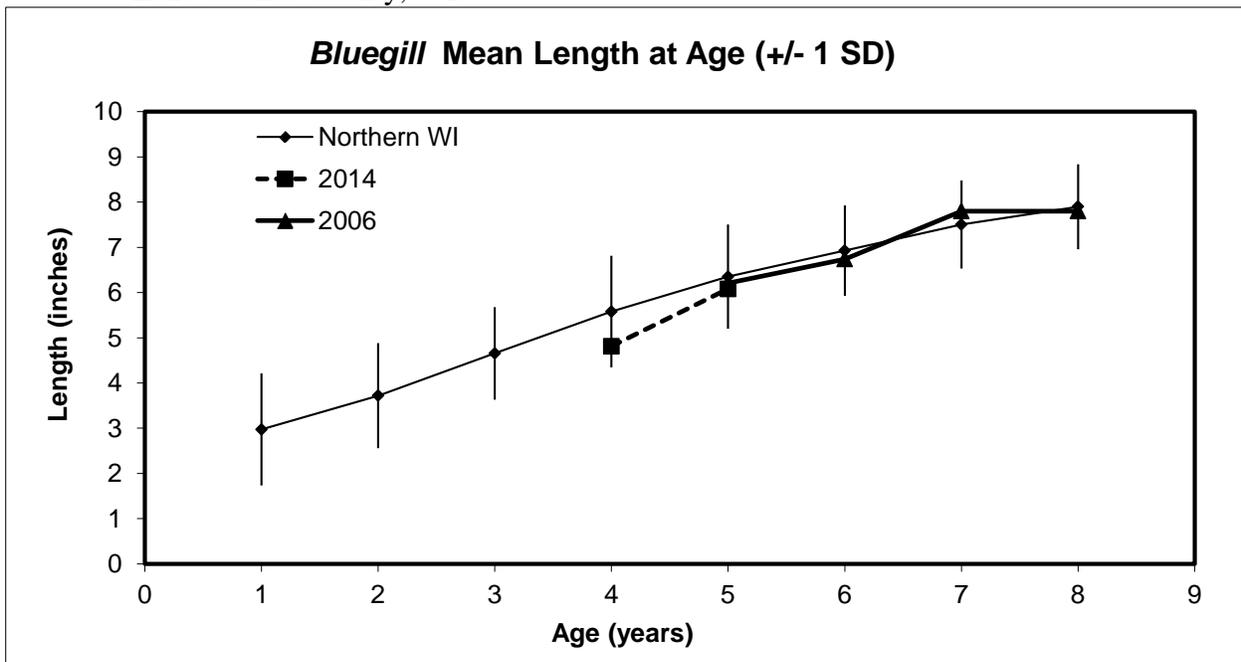


Figure 10. Bluegill mean length at age comparison from Maiden Lake; Oconto County, WI.

APPENDIX III – SAMPLING LOCATIONS

Maiden Lake
2015 – 8 nets

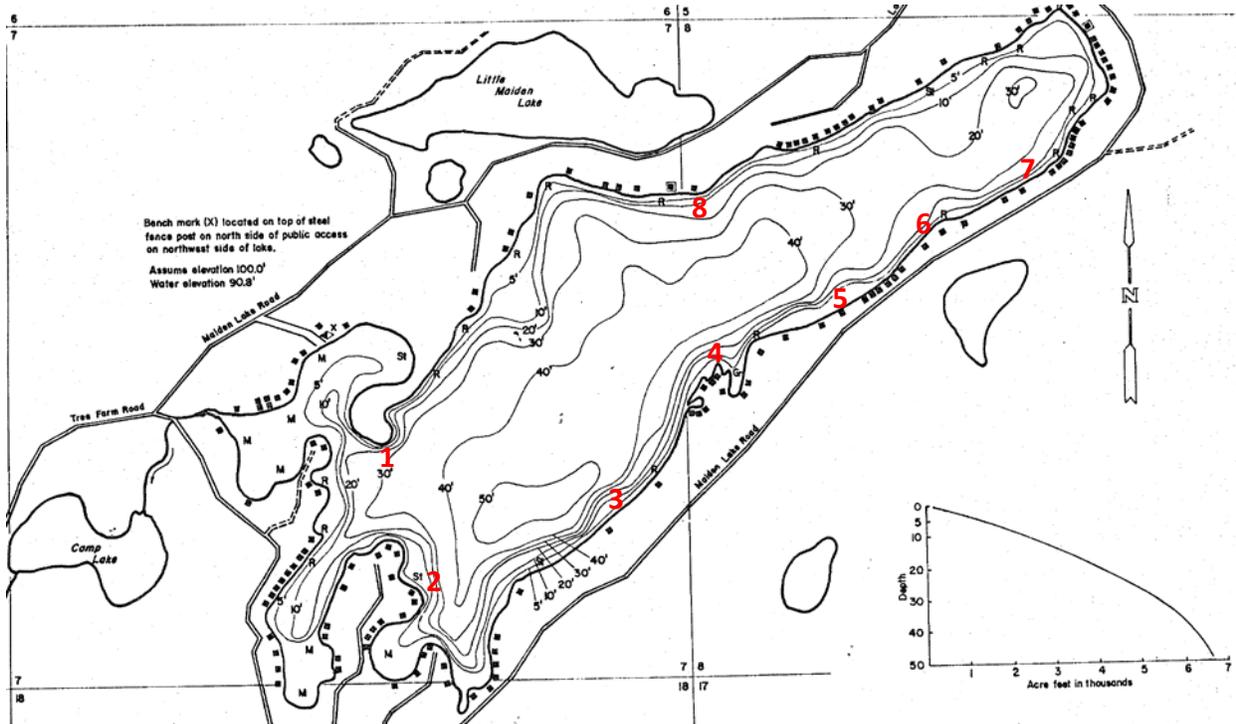


Figure 11. Fyke net locations during 2014/2015 comprehensive survey of Maiden Lake; Oconto County, WI.