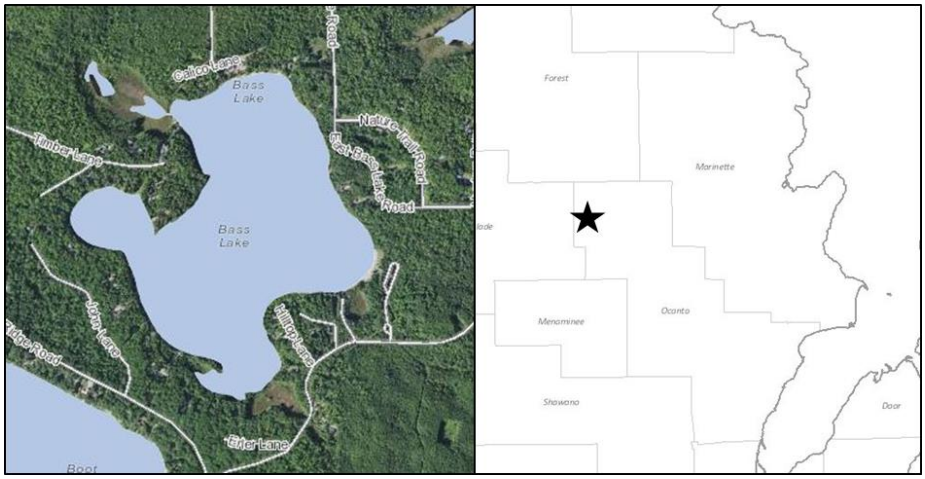
BASS LAKE

Oconto County

2016 Fish Management Report

Christopher C. Long
Fisheries Biologist



Wisconsin Department of Natural Resources
101 Ogden Road
Suite A
Peshtigo, Wisconsin 54157

2017

LAKE INFORMATION

Lake and Location:
Bass Lake, Oconto County, T32N R15E Section 4

Physical / Chemical attributes (Carlson et al. 1977):
Surface acres: 148
Maximum depth (ft): 50
Lake type: Seepage lake
Basic water chemistry: Medium hard, light brown water with moderate transparency.
Littoral substrate: 80% sand, 15% muck. 5% gravel
Other features: A U.S. Forest Service beach and picnic grounds are located on the east side of the lake as well as a boat landing with parking. The shoreline is primarily upland consisting of mixed hardwoods and conifers, and the remainder is shrub-bog wetland.

Purpose of Survey:
Determine current status of fishery.

Surveys:
WDNR Survey ID: 515081132 – Spring fyke netting; April 18 – April 25, 2016
WDNR Survey ID: 515081950 – Late spring bass/panfish; June 15, 2016
WDNR Survey ID: 515082050 – Summer panfish fyke netting; June 20 – June 23, 2016
WDNR Survey ID: 515082312 – Fall recruitment survey; August 23, 2016 & October 11, 2016

Fishery:
The fish population consists of largemouth bass, northern pike, walleye, black crappie, bluegill, pumpkinseed, rock bass, yellow perch, and white sucker.

EXECUTIVE SUMMARY

- Bass Lake is a 142-acre seepage lake located in northwestern Oconto County. The lake has a maximum depth of 40 feet but averages 19 feet deep. The United States Forest Service (USFS) owns and operates the only boat landing on the southeast side of the lake.
- The goal of the 2016 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).
- Overall, 1,537 fish representing 10 species and 1 hybrid were collected during the 2016 sampling season. The five most abundant species collected by number were rock bass (32%), walleye (29%), bluegill (18%), yellow perch (10%), and largemouth bass (7%).
- Walleye made up 29% of the fish collected totaling 447 fish. A total of 219 walleye (including 52 recaptured fish) was collected during the spring fyke netting survey with a mean catch per net night of 3.9/NN. The population estimate for all walleye was 212 fish or approximately 1.5 walleye/acre $\geq$ 15.0 inches. A subsample of 109 walleye was aged from 1 to 13 years old. Walleye were reaching legal size (18 in) by age 6. Compared to the average length at age for northern Wisconsin, walleye growth was above average until age 5.
- During the survey, 282 bluegill were collected. Bluegill ranged in length from 3.2 to 9.0 inches from the combined electrofishing and fyke netting samples. Overall, 47% of the bluegill measured were 6.0 in or greater and considered harvestable. Bluegill are reaching a harvestable size (6.0 inches) between ages 6 and 7 (Figure 7). Growth was below average at younger ages compared to the mean length at age of bluegill in northern Wisconsin.
- A total of 101 largemouth bass was collected during the 2016 fisheries survey and accounted for 7% of the fish collected. Bass ranged in length from 4.5 to 18.2 in and averaged 11.6 inches (Figures 9). Seventeen percent of largemouth bass collected during the SEII survey were over the 14-inch minimum length limit. Largemouth bass growth was average until age 6 but below average at older ages compared to the average mean length at age for bass in northern Wisconsin (Figure 10). Bass are reaching legal size (14 inches) around age 6.
- Reduced panfish harvest might benefit the fishery by creating a more robust forage base and potentially improve or maintain panfish size structure over time. On the other hand, limited food resources for panfish could result in even poorer growth and potentially lead to stunting.
- Alternate year stockings of large fingerlings walleye should continue at the rate of 10 fish/acre. Summer panfish netting should be completed to evaluate survival of stocked walleye and its contribution to the fishery while fall electofishing should be reserved to evaluate walleye natural reproduction. Fin clipping stocked walleye may be required in the future *if* natural reproduction improves. This would allow WDNR to determine the level of stocking (i.e. stocking rate) necessary to provide and sustain a quality fishing opportunity.
- The abundance of largemouth bass has declined but an alternative fishing regulation (i.e. no minimum length limit) would likely not have an impact on the population. Perhaps the loss of vegetation due to rusty crayfish and the removal of the early catch-and-release season for largemouth bass will be enough to curb their abundance in the future.
- The next comprehensive fisheries survey of Bass Lake is scheduled for 2024 and will focus on the age, growth, abundance, and recruitment of the dominant gamefish and panfish.

Commented [BDE1]: Since this is not protocol. Please explain you use of this method. Have you found it to work in general? Just this lake? What is your evidence? Maybe a brief statement here and then some additional discussion in the report.

TABLE OF CONTENTS

INTRODUCTION

Bass Lake is a 142-acre seepage lake located in northwestern Oconto County. The lake has a maximum depth of 40 feet but averages 19 feet deep. Bass Lake offers a variety of recreational opportunities in addition to fishing. The United States Forest Service (USFS) owns and operates the only boat landing on the southeast side of the lake. The USFS also maintains a beach and restroom facilities adjacent to the boat landing.

Bass Lake is in the Ceded Territory (22,400 square miles of northern Wisconsin that was ceded to the United States by the Lake Superior Chippewa Tribes in 1837 and 1842) and therefore eligible for tribal, off-reservation spearing harvest of gamefish but most notably, walleye. The Wisconsin Department of Natural Resources (WDNR) stocked small fingerling walleye in 2001, 2005 and 2009 with minimal success (Table 1). Beginning in 2013, and again in 2015, large fingerling walleye were stocked under the Wisconsin Walleye Initiative (Table 1).

Brook trout, rainbow trout and brown trout were stocked in Bass Lake from the early 1970's until the mid 1980's. These stocking efforts were abandoned due to limited utilization and survival of these stocked fish.

The last comprehensive fisheries survey of Bass Lake was conducted in 2002. Gamefish and panfish sampling was conducted in 2008 and fall walleye assessments were completed intermittently from 2008 to 2015. The 2002 survey consisted of 42 net nights (NN) of spring fyke netting in mid-April and shoreline electrofishing in both the spring and fall. The survey documented the continued decline walleye natural reproduction and the need to improve walleye spawning habitat. Therefore, in 2008 a walleye spawning reef was constructed on USFS property in cooperation with WDNR and the Bass Lake Association. In 2014 this spawning reef was extended further out into the lake since receding water levels had left a considerable portion of the reef high and dry. Currently, lake levels have returned to normal pool elevation.

A creel survey was conducted during the 2016 – 2017 fishing season to sample the fishing activities of anglers and make projections of fishing effort, catch and harvest. A copy of the creel survey report can be found at the following link:
http://dnr.wi.gov/topic/fishing/documents/north/OcontoBass1617Creel.pdf

The goal of the 2016 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).

Commented [BDE2]: You also made a WAE PE

METHODS

Data collection:

Standard fyke nets (3-foot hoop, $^{3}/_{4}$-bar, 1.5-inch stretch), mini-fyke nets ($^{1}/_{4}$-inch stretch with turtle exclusion) and a standard WDNR electrofishing boat were used to collect fish on Boot Lake throughout the year. Sampling gear, effort, date, and target species for the survey are listed in Table 2. All gamefish fish collected were measured to the nearest 0.1-inch total length (TL). Not all panfish were measured; representative samples were taken to reduce handling mortality from a net or electrofishing run when the sample size was large. A sub-sample of scales or dorsal spines was collected for age and growth analysis from gamefish and panfish. Aging structures (scales or spines) were collected from 5 non young-of-the-year (YOY) fish per half inch group. If ~~gender~~ sex could be determined, structures from 5 fish per sex were collected per half inch group. 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 June electrofishing samples as well as fyke net data. Proportional stock density (PSD) and relative stock density for **p**referred 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). PSD and RSD^{P} ranges for balanced populations of gamefish and panfish are listed in Table 3. 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 is subsequent collections until the survey was complete. Bailey's modification (sampling during the recapture period is conducted with replacement) of the Peterson index was used to generate a population estimate since the number of fish sampled was low (Van Den Avyle & Hayward, 1999).

Commented [BDE3]: Look like you used the SE1 as a recapture run. This paragraph is currently written as if you use multiple-mark recapture.

RESULTS

Overall, 1,537 fish representing 10 species and 1 hybrid were collected during the 2016 sampling season (Table 5). The five most abundant species collected by number were rock bass (32%), walleye (29%), bluegill (18%), yellow perch (10%), and largemouth bass (7%).

A total of 488 rock bass was collected which accounted for 32% of our sample (Table 5). More than half of all rock bass were measured (377) and ranged in length from 3.8 to 11.1 inches and averaged 7.0 inches from the combined electrofishing and fyke netting samples (Figure 1). Two hundred seventy-five rock bass were collected during the spring fyke netting (CPUE = 4.9/NN) and 192 during the summer panfish netting (Tables 6 & 7). Twenty-one rock bass were collected during the summer, SEII electrofishing survey (Table 8). Scales were not collected for age and growth analysis of rock bass however, the length frequency (Figure 1) suggests that reproduction and recruitment is stable.

Walleye made up 29% of the fish collected totaling 447 fish (Table 5). In 2016 electrofishing for walleye was conducted in April and October with CPUE's of 20.9 and 3.0/mile, respectively (Table 8 & 9). Walleye ranged in length from 7.0 to 21.0 inches and averaged 13.6 inches during the April SEI survey (Figure 2). A total of 219 walleye (including 52 recaptured fish) was collected during the spring fyke netting survey with a mean catch per net night of 3.9/NN (Figure 3 & Table 6). Walleye ranged in length from 8.0 to 27.0 inches and averaged 18.2 inches during the spring fyke netting survey (Figure 3). Walleye PSD and RSD^{P} from the spring fyke net sample was 98 and 31. Walleye PSD was well above the desirable range of 30 to 60 (Table 3). The population estimate (Chapman's version of the Peterson Index) for all walleye was 212 fish (95% C.I. = 141 – 282) or approximately 1.5 walleye/acre $\geq$ 15.0

inches. A subsample of 109 walleye was aged from 1 to 13 years old. Walleye were reaching legal size (18 in) by age 6 (Figure 4). Compared to the average length at age for northern Wisconsin, walleye growth was above average until age 5 (Figure 4).

Commented [BDE4]: The table seems to be a little different. i.e., above until age 8.

During the survey, 282 bluegill were collected (Table 5). Electrofishing yielded a CPUE of 138.2.0/h, 1.0/NN during spring fyke netting and 8.3/NN during the summer panfish netting survey (Tables 6, 7, & 8). Bluegill ranged in length from 3.2 to 9.0 inches from the combined electrofishing and fyke netting samples. Bluegill averaged 5.7 inches during spring fyke netting; 5.5 inches from the summer electrofishing sample; and 6.1 inches during summer panfish netting (Figures 5 & 6; Tables 6, 7, & 8). Only 257 bluegill were measured of the 282 bluegill collected. Overall, 47% of the bluegill measured were 6.0 in or greater and considered harvestable (Figure 5). Bluegill PSD was 26 and RSD^P was 3; these values are from the June, SEII electrofishing sample. While PSD was within the desirable range for a balanced population, RSD^P was not (Table 3). A subsample of 55 bluegill was aged from 3 to 9 years old. Bluegill are reaching a harvestable size (6.0 inches) between ages 6 and 7 (Figure 7). Growth was below average at younger ages compared to the mean length at age of bluegill in northern Wisconsin (Figure 7). Successful reproduction and recruitment of bluegill was evident due to the number of YOY and age-1 bluegill (N = 317) collected during mini fyke netting (Table 7).

Commented [BDE5]: Is it good to include spring fyke net panfish in the mix with SNII and SEII survey data? Also Figure 5 is an SEII figure.

One hundred forty-eight yellow perch were collected during the 2016 survey (Table 5). More than half of all yellow perch were measured (76) and ranged in length from 3.8 to 8.3 inches and averaged 6.6 inches (Figure 8). One hundred thirty-eight perch were collected during the spring fyke netting (CPUE = 2.5/NN) and 2 during the summer panfish netting (Tables 6 & 7). Only 8 yellow perch were collected during the summer, SEII electrofishing survey (Table 8). Anal spines were not collected for age and growth analysis of yellow perch however, the length frequency (Figure 8) suggests that reproduction and recruitment is sustaining the population.

A total of 101 largemouth bass was collected during the 2016 fisheries survey and accounted for 7% of the fish collected (Table 5). SEII electrofishing yielded a CPUE of 57.7/h and fyke netting a CPUE of 0.3/NN (Tables 6 & 8). Bass ranged in length from 4.5 to 18.2 in and averaged 11.6 inches (Figures 9). Largemouth bass PSD was 57 and RSD^P was 8 (from the SEII electrofishing sample). Bass PSD was within the desirable range for a balanced population however, RSD^P was not (Table 3). Seventeen percent of largemouth bass collected during the SEII survey were over the 14-inch minimum length limit (Figure 9). A subsample of 76 largemouth bass was aged from 1 to 12 years old. Largemouth bass growth was average until

age 6 but below average at older ages compared to the average mean length at age for bass in northern Wisconsin (Figure 10). Bass are reaching legal size (14 inches) around age 6. Successful reproduction and recruitment of largemouth bass were evident judging from the length frequency and age at length (Figures 9 & 10).

Additionally, pumpkinseed sunfish, northern pike, white sucker, black crappie, and golden shiners were also collected during the 2016 survey and accounted for approximately 5% of the remaining fish collected (Table 5).

DISCUSSION

Bass Lake is relatively infertile because it is a seepage lake and it has a small upland, forested watershed. Populations of panfish (yellow perch, bluegill and rock bass) and gamefish (walleye and largemouth bass) are present and offer anglers a respectable fishing opportunity.

Since the previous fisheries surveys in 2002 and 2008, fish sampling protocols were evaluated and changed; specifically, the timing of gamefish/panfish electrofishing (SEII). In 2008, SEII sampling was conducted in both the spring and fall (June & October). ~~Only~~ eElectrofishing data comparisons were made between the June samples in 2008 and 2016 but the 2008 October date were not used in these comparisons. Viable comparisons between years/surveys can still be made between spring (SEI) and fall electrofishing samples in all years. No spring fyke netting was conducted in 2008 therefore, spring fyke netting data comparisons were limited to the surveys conducted in 2002 and 2016. Additionally, comparison of relative abundance between the 2016 survey and previous surveys is not possible since the sampling was not consistent between years or surveys.

Commented [BDE6]: October is fall. Should this maybe be "fall YOY electrofishing samples"?

Rock bass was the most abundant species collected during spring fyke netting in both 2002 and 2016 (Table 6). Abundance was similar between years however, size structure improved between years (Figure 1). The collection of rock bass $\leq$ 5.0 inches in 2002 was much greater than in 2016 resulting in a higher fyke net CPUE (Figure 1; Table 6). The average length of rock bass collected during the 2016 summer fyke netting was smaller than rock bass collected during spring fyke netting in 2016 (Figure 1). Rock bass were the 3rd most harvested species during the 2016 creel survey.

Walleye were the most abundant gamefish collected during the 2016 fisheries survey (Table 5). Adult walleye density increased in Bass Lake from 1.1 walleye/acre to 1.5

walleye/acre between 2002 and 2016~~, respectively.~~. A creel survey conducted in 2016 on Bass Lake estimated the total catch of walleye to be 110 fish but harvest totaled only 13 walleye. The 2002 creel survey revealed a total catch of 22 walleye and total harvest was 16 walleye. Even though more walleye were caught in 2016, the difference in the number of fish harvested between creel surveys could be attributed to the change in the minimum length limit (MLL) between creel surveys. The MLL in 2002 was 15 inches whereas in 2016, the MLL was 18 inches. The change in fishing regulation likely caused the specific walleye harvest rate to more than double from 20.4 hours/fish to 45.0 hours/fish between 2002 and 2016. The new fishing regulation will hopefully increase the number of sexually mature adults between 15 and 18 inches, improving natural reproduction.

Commented [BDE7]: The harvest rate was cut in half not doubled. Unless you have the hours/fish mixed around with fish/hour

Commented [BDE8]: I would be careful about throwing these numbers around they are based on a total harvest of 13 and 22 walleye. What is the S.E..? They just seem out of wack with what is going on in the fishery. i.e., a lot more 18-20" fish and more fish in general.

Bass Lake is also in the Ceded Territory (22,400 square miles of northern Wisconsin that was ceded to the United States by the Lake Superior Chippewa Tribes in 1837 and 1842) and therefore eligible for tribal, off-reservation spearing harvest. Between 2005 and 2016, 28 walleye have been harvested by tribal members over 4 different years. Therefore, recreational and tribal harvest are not impacting the total number of adult walleye in the population.

Natural reproduction sustained the walleye population for many years. However, the population has been steadily declining since 1978 (Kornely, 2004). Even though some natural reproduction may have been observed in 2002, reproduction and recruitment were insufficient to sustain a quality walleye fishing opportunity. Therefore, WDNR and the Bass Lake Association began stocking walleye in 2001 (Table 1). In 2013, the Wisconsin Legislature appropriated funds to WDNR to begin the Wisconsin Walleye Initiative (WWI). This program has increased the production and distribution of large fingerling walleye throughout Wisconsin, including Bass Lake. As a result, WDNR stocked large fingerling walleye in 2013 and 2015 (Table 1).

Spring electrofishing CPUE for walleye improved from 12.5/mile in 2008 to 20.9/mile in 2016 (Table 8) but spring fyke netting CPUE declined from 4.3/NN in 2002 to 3.9/NN in 2016 (Table 6). The decline in fyke netting CPUE could have been a result of increased netting effort between years (56NN in 2016 vs. 42NN in 2002) (Table 6). Walleye growth from the 2016 sample was exceptionally good and above average through age 5 (Figure 4). Strong year classes of age-1 and age-3 walleye were observed. These year classes coincide with the large fingerling stockings that occurred in 2013 and 2015 (Table 1; Figures 2, 3, & 4). The good survival that was documented likely also contributed to the increased total catch rate of walleye between the 2002 and 2016 creel surveys.

Previous surveys documented the suspected decline of yellow perch in Bass Lake (Kornely, 2004). The 2016 fisheries survey produced a yellow perch fyke net CPUE of 2.5/NN which was an increase from the 1.6 perch/NN observed in 2002 (Table 6). The abundance and size structure of yellow perch appears to have improved slightly between 2002 and 2016 (Figure 8). The shift in average size of perch from around 4.0 inches in 2002 to 6.6 inches in 2016 could be a result of increased predation on small perch because of increased walleye stocking and adult density (Figure 8). This seems likely because walleye growth was above average and perch are preferred forage for walleye (Figure 4).

Commented [BDE9]: If the abundance also increased the increase in size structure is not likely due to increases in predation. There is likely another factor fueling the perch production. Maybe lower bass; maybe other factors.

Largemouth bass abundance has declined and size structure diminished between 2008 and 2016 (Table 8 and Figure 9). Electrofishing CPUE declined from 68.5/mile in 2008 to 29.4/mile in 2016 (Table 8). In 2016, 17% of largemouth bass collected were greater than the 14-inch MLL but in 2008, 46% of the largemouth bass collected were greater than 14 inches. PSD declined from 60 in 2008 to 57 in 2016 and RSD^{P} declined from 34 to 8 between 2002 and 2016~~, respectively.~~. Angler harvest is not impacting the population even though they were the most targeted species in both the 2002 and 2016 creel surveys. The 2016 creel survey indicated that only 17 largemouth bass were harvested of the 427 that were caught and no bass were harvested during the 2002 creel survey. One plausible explanation for the decline in largemouth bass could be the presence of rusty crayfish (*Orconectes rusticus*) in Bass Lake which was verified in 2015. Rusty crayfish were collected during fyke netting surveys (spring and summer) in 2016 and are notorious for eating and decimating aquatic vegetation. Additionally, rusty crayfish can be especially damaging in relatively unproductive northern lakes, where beds of aquatic plants are not abundant. Loss of vegetative habitat could be part of the reason the abundance of largemouth bass has declined in recent years.

Bluegill electrofishing CPUE & PSD decreased between 2008 and 2016 (Table 8). However, fyke netting CPUE was nearly identical between 2002 and 2016 (Table 6). Low catches of bluegill during spring fyke netting prompted the initiation of summer panfish fyke netting in 2016 (Table 7 and Figure 5). By targeting bluegill in late-spring/early-summer during spawning, we collected 149 fish, almost 3 times the number collected during spring fyke netting and twice as many as electrofishing (Tables 6 & 7). The results from the summer panfish fyke netting were encouraging since more 7 and 8-inch bluegill were collected (Figure 6). Bluegill were the second most targeted species during the 2016 creel survey and total harvest was 466

fish. The average size of bluegill harvested from Bass Lake in 2016 was 7.3 inches. Bluegill growth was well below average at younger ages. The reduction in aquatic vegetation (presumably by rusty crayfish), which supports many food items (i.e. invertebrates) that juvenile panfish consume, may be the reason bluegill growth was poor. It's difficult to determine how bluegill growth has changed since age and growth information is not available from previous surveys.

CONCLUSIONS & RECOMMENDATIONS

The current fishing regulations (Table 4) should continue to provide quality fishing opportunities. However, due to the infertile nature of Bass Lake, the increase in fishing pressure (9.7 hours/acre in 2002 vs. 12.6 hours/acre in 2016), and subsequent harvest, consideration should be given to reducing the panfish bag limit to 10/angler/day. Even though bluegill abundance appears to be stable and yellow perch size structure has improved, bluegill growth was poor. Reduced panfish harvest might benefit the fishery by creating a more robust forage base for predator species (i.e. bass and walleye) and potentially improve or maintain panfish size structure over time. On the other hand, limited food resources for panfish could result in even poorer growth and potentially lead to stunting. Future fisheries surveys should continue to utilize summer panfish netting to monitor panfish abundance, growth and size structure if feasible.

Commented [BDE10]: The size of fish harvested by anglers are too big to be forage items for bass and walleye, so reducing bag limits will likely not have impacts on forage availability.

The 2013 and 2015 walleye stockings were successful and fish from the 2013-yearclass should be of harvestable size by 2018. Walleye stocking will be necessary in the future to sustain this fishery since natural reproduction is minimal. As the walleye fishery recovers in Bass Lake, recreational harvest will likely increase. The MLL increase from 15 to 18 inches, and continued stocking of large fingerling walleye, will likely increase the adult density of walleye and potentially lead to improved natural reproduction however, spawning habitat is limited. Alternative spawning sites should be located and a plan developed to improve spawning habitat in another part of Bass Lake. In the meantime, alternate year stockings of large fingerlings walleye should continue at the rate of 10 fish/acre until another population estimate is generated. Instead of utilizing fall electrofishing to evaluate survival of stocked walleye and its contribution to the fishery, summer panfish netting should be completed and produced better results for age-1 walleye in 2016 on Bass Lake (Table 9 & Figure 3). Fall electofishing should be reserved to evaluate walleye natural reproduction. Fin clipping stocked walleye may be

Commented [BDE11]: Again, need to justify this technique.

required in the future *if* natural reproduction improves. This would allow WDNR to determine the level of stocking (i.e. stocking rate) necessary to provide and sustain a quality fishing opportunity.

Commented [BDE12]: Again, why can't you just sample prior to stocking?

The abundance of largemouth bass has declined but an alternative fishing regulation (i.e. no minimum length limit) would likely not have an impact on the population. Anglers are targeting largemouth bass but harvest is minimal, which was confirmed by the 2002 and 2016 creel surveys. Fishing regulations for black bass were changed in the northern bass zone 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). Perhaps the loss of vegetation due to rusty crayfish and the removal of the early catch-and-release season for largemouth bass will be enough to curb their abundance in the future.

The next comprehensive fisheries survey (spring fyke netting, SEI electrofishing, summer panfish fyke netting, mini fyke netting, SEII electrofishing, and fall electrofishing) of Bass Lake is scheduled for 2024 and will focus on the age, growth, abundance, and recruitment of the dominant gamefish. Access to Bass Lake is available to anglers from the National Forest boat landing and offers ample parking. The National Forest also owns and operates a beach and restroom facilities adjacent to the boat landing. Shore fishing opportunities are limited at both locations. Boaters are reminded to remove all vegetation from their boat and trailer before leaving to limit the spread of invasive species. A map of Bass Lake can be found at the following internet address; http://dnr.wi.gov/lakes/maps/DNR/0417900a.pdf

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.

Bister, T. J., D. W. Willis, M. L. Brown, S. M. Jordan, R. M. Neumann, M. C. Quist, and C. S. Guy. 2000. Proposed standard weight (Ws) equations and standard length categories for 18 warmwater nongame and riverine species. North American Journal of Fisheries Management 20:570-574.

Carlson, H. L., L. M. Andrews, and C. W. Threinen. 1977. Surface water resources of Oconto County. Wisconsin Department of Natural Resources, Madison, WI.

Gabelhouse, D. W. Jr. 1984. A length-categorization system to assess fish stocks. North American Journal of Fisheries Management. 4:273-285.

Kornely, G.W. 2004. Fishery report: Bass Lake, Oconto County, WI. Wisconsin Department of Natural Resources, Peshtigo, WI.

Van Den Avyle, M.J., and R.S. Hayward. 1999. Dynamics of exploited fish populations. Pages 127-163 *in* C.C. Kohler and W.A. Hubert, editors. Inland fisheries management in North America. 2nd edition. American Fisheries Society, Bethesda, Maryland.

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 since 1972 for Bass Lake, Oconto County, Wisconsin.

Year	Species	Age Class	Number Stocked	Average Length (inches)	Source
1972	BROOK TROUT	YEARLING	500	9.0	WDNR
1972	RAINBOW TROUT	YEARLING	3000	9.0	WDNR
1973	BROOK TROUT	YEARLING	500	9.0	WDNR
1973	RAINBOW TROUT	YEARLING	3000	9.0	WDNR
1974	BROOK TROUT	YEARLING	400	9.0	WDNR
1974	RAINBOW TROUT	YEARLING	3000	7.0	WDNR
1975	BROOK TROUT	YEARLING	400	-	WDNR
1975	RAINBOW TROUT	YEARLING	3000	-	WDNR
1976	BROOK TROUT	YEARLING	400	-	WDNR
1976	RAINBOW TROUT	YEARLING	3000	-	WDNR
1977	BROOK TROUT	YEARLING	400	-	WDNR
1977	RAINBOW TROUT	YEARLING	3000	-	WDNR
1978	RAINBOW TROUT	YEARLING	5000	-	WDNR
1979	RAINBOW TROUT	YEARLING	3000	-	WDNR
1980	RAINBOW TROUT	YEARLING	3000	-	WDNR
1981	BROWN TROUT	YEARLING	3000	-	WDNR
1982	RAINBOW TROUT	YEARLING	3000	-	WDNR
1983	RAINBOW TROUT	YEARLING	3000	9.0	WDNR
1999	YELLOW PERCH	LARGE FINGERLING	500	10.0	Private
2001	WALLEYE	SMALL FINGERLING	7000	1.6	WDNR
2005	WALLEYE	LARGE FINGERLING	1080	8.5	Private
2005	WALLEYE	SMALL FINGERLING	7405	1.4	WDNR
2006	WALLEYE	LARGE FINGERLING	988	7.0	Private
2008	WALLEYE	LARGE FINGERLING	995	7.5	Private
2009	WALLEYE	LARGE FINGERLING	998	7.0	Private
2009	WALLEYE	SMALL FINGERLING	4963	1.7	WDNR
2013	WALLEYE	LARGE FINGERLING	1420	7.8	WDNR
2015	WALLEYE	LARGE FINGERLING	1444	7.7	WDNR

Table 2. Sampling gear, date, target species, sampling effort, and location (distance) for 2016 fisheries survey on Bass Lake; Oconto County, WI.

Gear	Date	Target Species	Sampling Effort hours (h) or net night (NN)	Shoreline Distance (mi)
Fyke net	April 18, 2016 to April 25, 2016	All fish	48 NN	
Electrofishing	April 27, 2016	Gamefish	1.3 h	2.7
Electrofishing	June 15, 2016	Gamefish	0.5 h	1.0
		& Panfish	1.3 h	2.6
Fyke net	June 20, 2016 to June 23, 2016	Panfish	18 NN	
Mini fyke net	August 23, 2016	YOY Panfish	8 NN	
Electrofishing	October 11, 2016	YOY WAE & MUE	1.3 h	3.7

Table 3. Accepted stock density index ranges for balanced fish populations and length categories proposed for various fish species. Measurements are minimum total lengths for each category in inches. Updated from Anderson and Neumann (1996) and Bister et al. (2000).

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

Table 4. Fishing regulations for Bass Lake, Oconto County, Wisconsin for the 2016-2017 season.

Species	Fishing Season	Daily Limit	Minimum Length
Largemouth bass	May 7- March 5	5	14 inches
Smallmouth bass	May 7- June 17 June 18- March 5	Catch and release 5 in total with LMB	14 inches
Northern pike	May 7- March 5	5	None
Walleye	May 7- March 5	3	18 inches
Panfish (bluegill, pumpkinseed, crappie, and	Open all year	25 in total	None
Bullheads	Open all year	None	None
Rock bass	Open all year	None	None

Table 5. Number, relative abundance (%), and length range (in) of fishes collected during 2016 in Bass Lake; Oconto County, WI.

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER			
*Common Name of Fish	Number	Percent	Length Range (inches)
Rock bass	488	32%	3.8 - 11.1
Walleye**	447	29%	7.0 - 27.0
Bluegill	282	18%	3.2 - 9.0
Yellow perch	148	10%	3.8 - 8.3
Largemouth bass**	101	7%	4.5 - 18.2
Pumpkinseed	35	2%	4.1 - 7.9
Northern pike**	13	1%	15.4 - 33.4
White sucker	10	1%	
Hybrid sunfish	8	1%	3.6 - 7.0
Black crappie	4	< 1%	9.8 - 12.4
Golden shiner	1	< 1%	
TOTAL***	**1,537**		
* Common names of fishes recognized by the American Fisheries Society.			
** Includes recaptured fish during spring fyke netting.			
*** Does NOT include mini-fyke net data.			

Table 6. Comparison of spring fyke netting data from Bass Lake between 2016 and 2002 surveys; Oconto County, WI

2016 Fyke Netting (56*)			**2002 Fyke Netting (42*)**		
	Total	Mean Catch		Total	Mean Catch
Species	Catch	per net night	Species	Catch	per net night
Rock bass	275	4.9	Rock bass	238	5.7
Walleye**	219	3.9	Walleye**	184	4.3
Yellow perch	138	2.5	Yellow perch	68	1.6
Bluegill	57	1.0	Bluegill	56	1.3
Largemouth bass	15	0.3	Black crappie	31	0.7
Pumpkinseed	10	0.2	Largemouth bass	7	0.2
White sucker	10	0.2	Northern pike	4	0.1
Northern pike	4	0.1	Smallmouth bass	1	< 0.1
Black crappie	3	0.1			
TOTAL	**731**		TOTAL	**589**	
*Sampling effort in net nights for each corresponding year.					
**Includes recaptured fish.					

Table 7. Summary of summer panfish fyke netting and summer mini fyke netting from Bass Lake; Oconto County, WI.

2016 Fyke Netting (18*)			**2016 Mini Fyke Netting (8*)**		
	Total	Mean Catch		Total	Mean Catch
Species	Catch	per net night	Species	Catch	per net night
Rock bass	192	10.7	Bluntnose minnow	361	51.6
Walleye	154	8.6	Bluegill	317	45.3
Bluegill	149	8.3	Largemouth bass	24	3.4
Pumpkinseed	23	1.3	Rock bass	22	3.1
Largemouth bass	11	0.6	Yellow perch	4	0.6
Northern pike	8	0.4	Pumpkinseed	2	0.3
Hybrid sunfish	8	0.4	Iowa darter	1	0.1
Yellow perch	2	0.1	Johnny darter	1	0.1
Black crappie	1	0.1			
Golden shiner	1	0.1			
TOTAL	**549**		TOTAL	**732**	
*Sampling effort in net nights for each corresponding year.					

Table 8. Seasonal electrofishing summary from 2008 and 2016 at Bass Lake; Oconto County, WI.

	Spring electrofishing (SEI)						Gamefish/Panfish electrofishing (SEII)					
	2016 April			2008 April			**2016 June**			2008 June		
	Total	**CPUE**	**CPUE**	Total	CPUE	CPUE	**Total**	**CPUE**	**CPUE**	Total	CPUE	CPUE
Species	**Catch**	**/hour**	**/mile**	Catch	/hour	/mile	**Catch**	**/hour**	**/mile**	Catch	/hour	/mile
Bluegill							**76**	**138.2**	**76.0**	57	171.0	114.0
Yellow perch							**8**	**14.6**	**8.0**	32	96.0	64.0
Northern pike							**1**	**0.8**	**0.4**	2	1.7	1.0
Walleye	**56**	**42.0**	**20.9**	25	13.9	12.5	**10**	**7.7**	**3.9**	7	6.0	3.5
Largemouth bass							**75**	**57.7**	**29.4**	137	117.4	68.5
Rock bass							**21**	**38.2**	**21.0**	37	111.0	74.0
Pumpkinseed							**2**	**3.6**	**2.0**			

Table 9. Fall electrofishing catch per unit effort (CPUE) for Bass Lake surveys from 2001 - 2016.

Fall electrofishing												
	2001*		**2002***		**2009***		**2014**		**2015**		**2016**	
	Total	**CPUE**	**Total**	**CPUE**	**Total**	**CPUE**	**Total**	**CPUE**	**Total**	**CPUE**	**Total**	**CPUE**
Species	**Catch**	**/mile**	**Catch**	**/mile**	**Catch**	**/mile**	**Catch**	**/mile**	**Catch**	**/mile**	**Catch**	**/mile**
Walleye	**8**	**3.0**	**10**	**4.0**	**6**	**2.1**	**2**	**0.8**	**4**	**1.6**	**8**	**3.0**
* Total catch included all walleye; future surveys only targeted YOY, age-1, and age-2 walleye.												

APPENDIX II – FIGURES

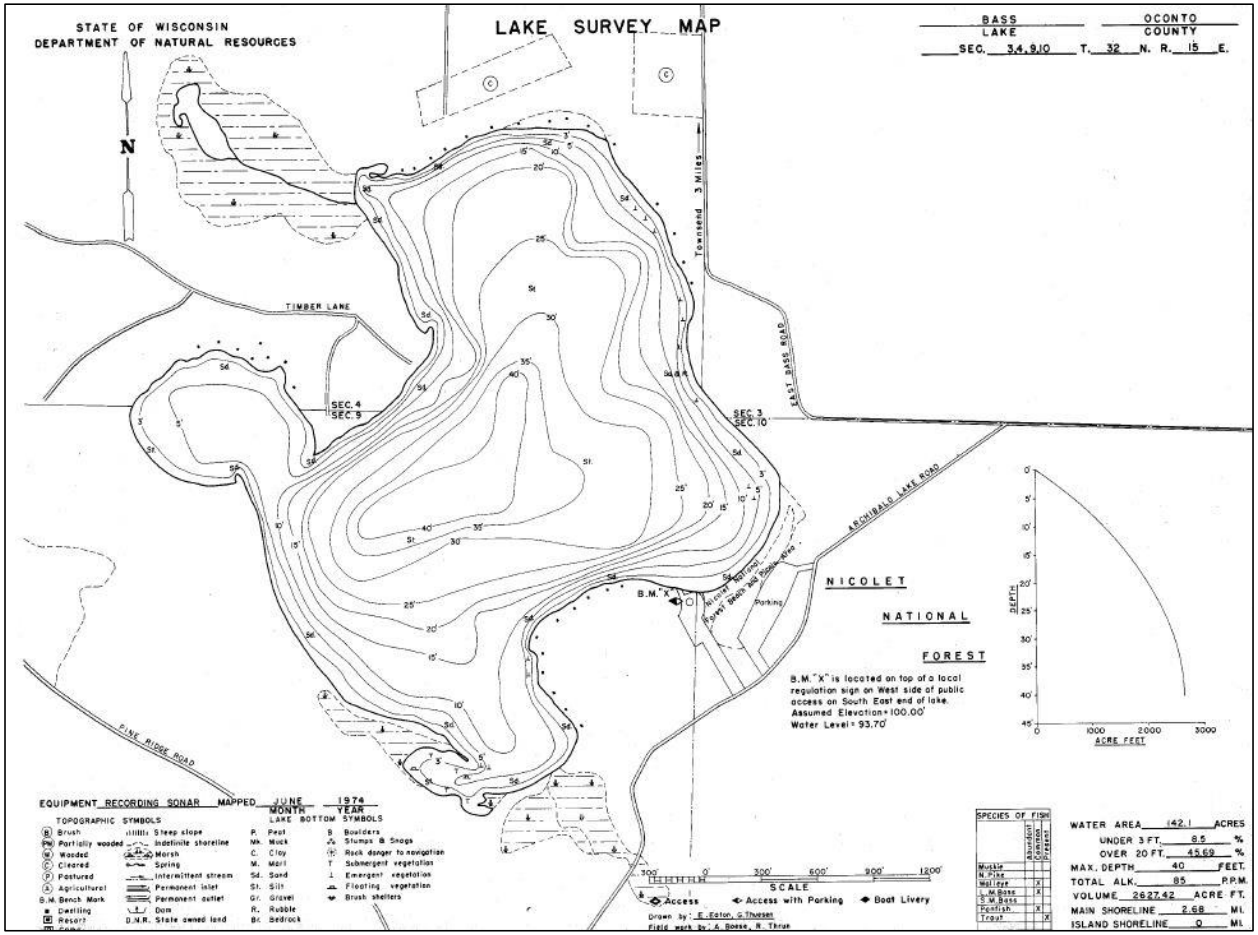


Figure 1. Contour map of Bass Lake, Oconto County, Wisconsin

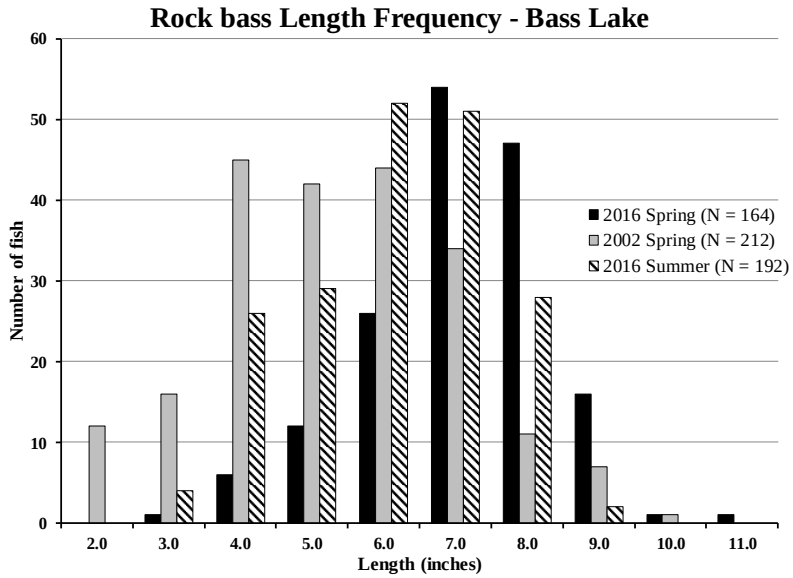


Figure 1. Length frequency of rock bass collected during fyke netting surveys in 2002 and 2016 on Bass Lake, Oconto County, Wisconsin.

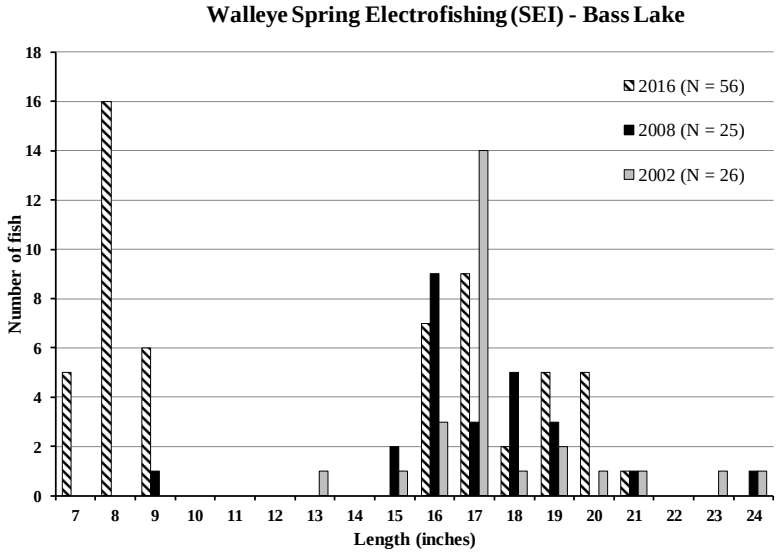


Figure 2. Length frequency of walleye collected during spring electrofishing surveys in 2002, 2008 & 2016 on Bass Lake, Oconto County, Wisconsin.

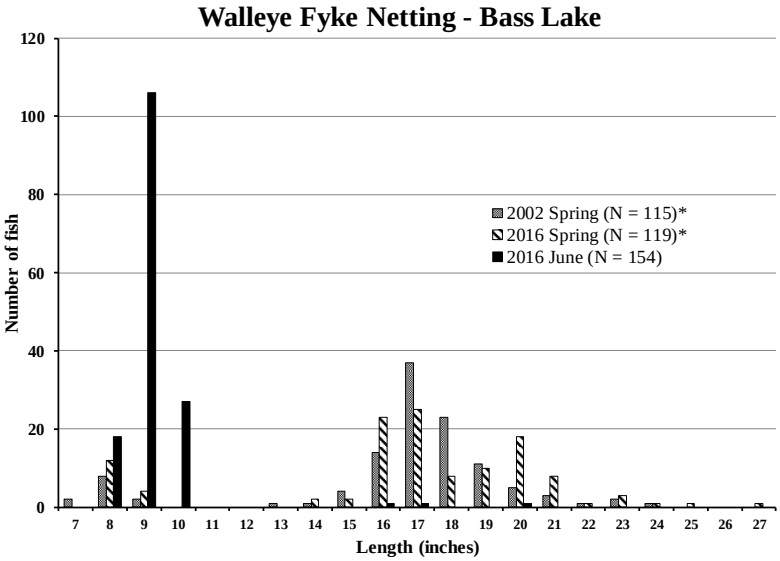


Figure 3. Length frequency of walleye collected during fyke netting surveys in 2002 & 2016 on Bass Lake, Oconto County, Wisconsin. **** = recaptures not included in length frequency***

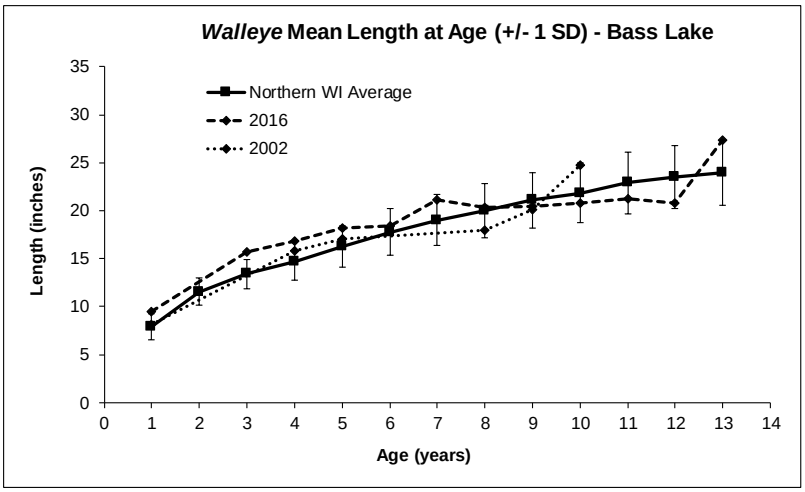


Figure 4. Mean length at age of walleye from spring fyke netting surveys in 2002 and 2016 on Bass Lake, Marinette County, Wisconsin.

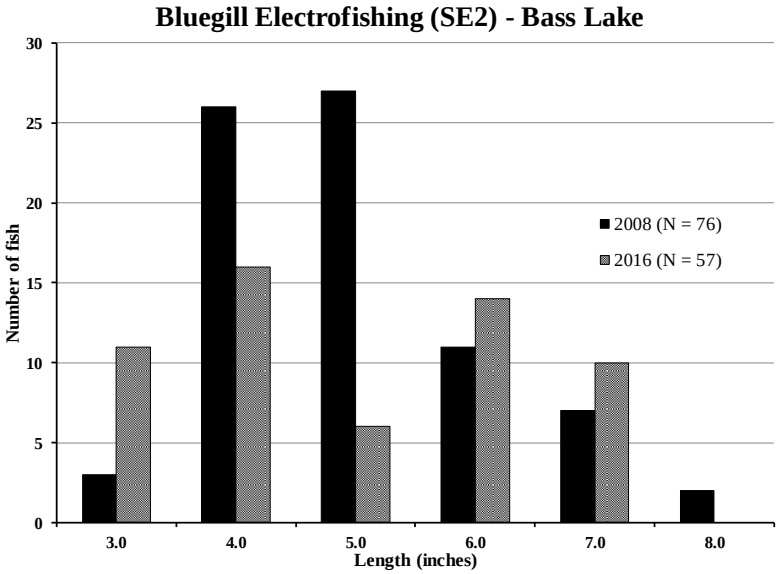


Figure 5. Length frequency of bluegill collected during summer electrofishing surveys in 2008 and 2016 on Bass Lake, Oconto County, Wisconsin.

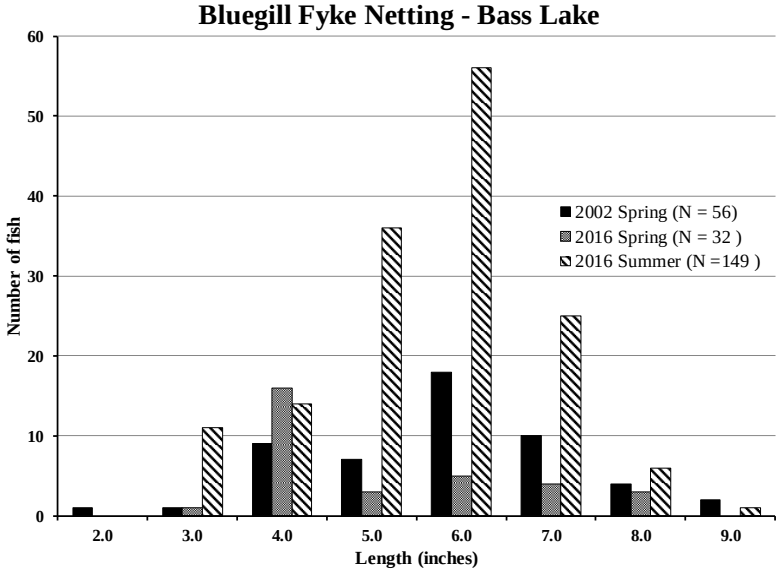


Figure 6. Length frequency of bluegill collected during fyke netting surveys in 2002 and 2016 on Bass Lake, Oconto County, Wisconsin.

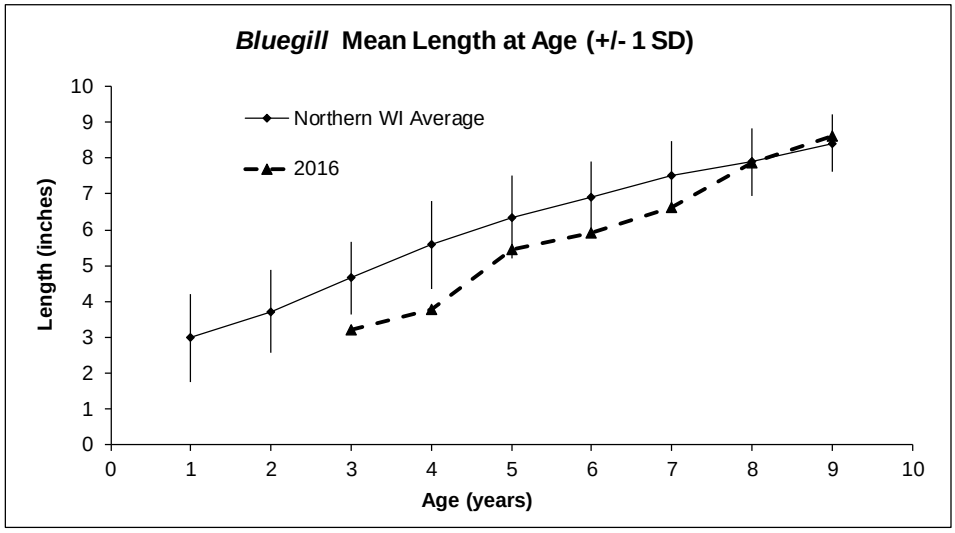


Figure 7. Mean length at age of bluegill sampled during the 2016 surveys of Bass Lake, Marinette County, Wisconsin.

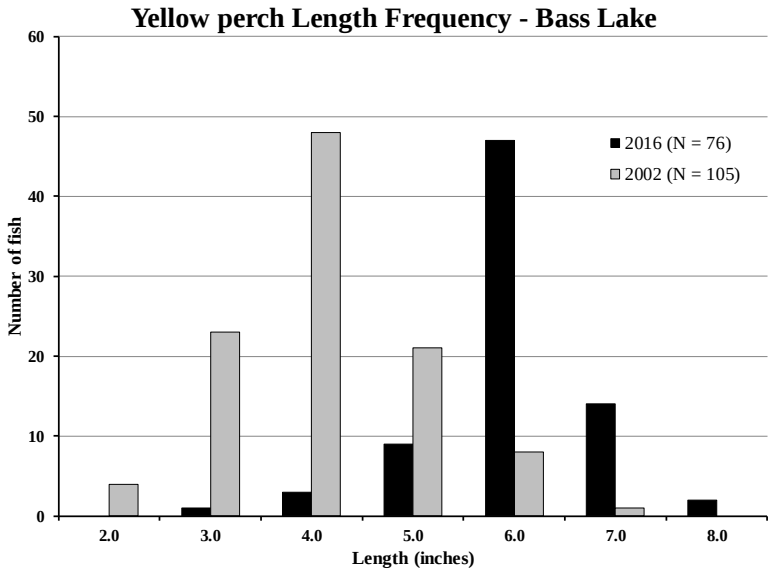


Figure 8. Length frequency of yellow perch collected in the 2002 and 2016 surveys on Bass Lake, Oconto County, Wisconsin.

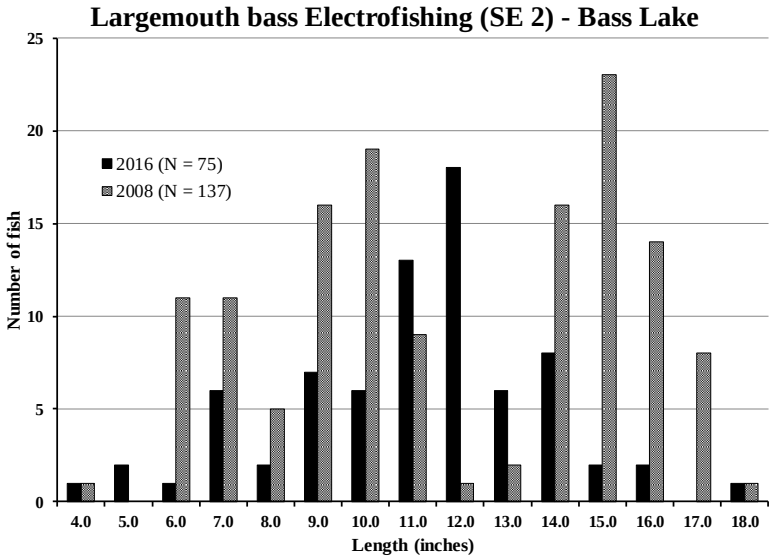


Figure 9. Length frequency of largemouth bass collected during electrofishing surveys (SE 2) in 2008 and 2016 on Bass Lake, Oconto County, Wisconsin.

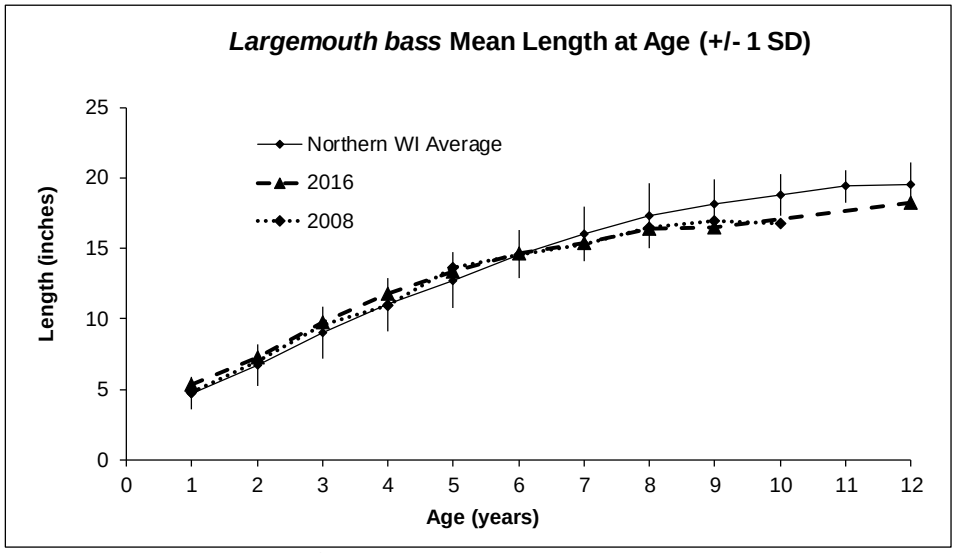


Figure 10. Mean length at age of largemouth bass collected in 2008 and 2016 on Bass Lake, Oconto County, Wisconsin.