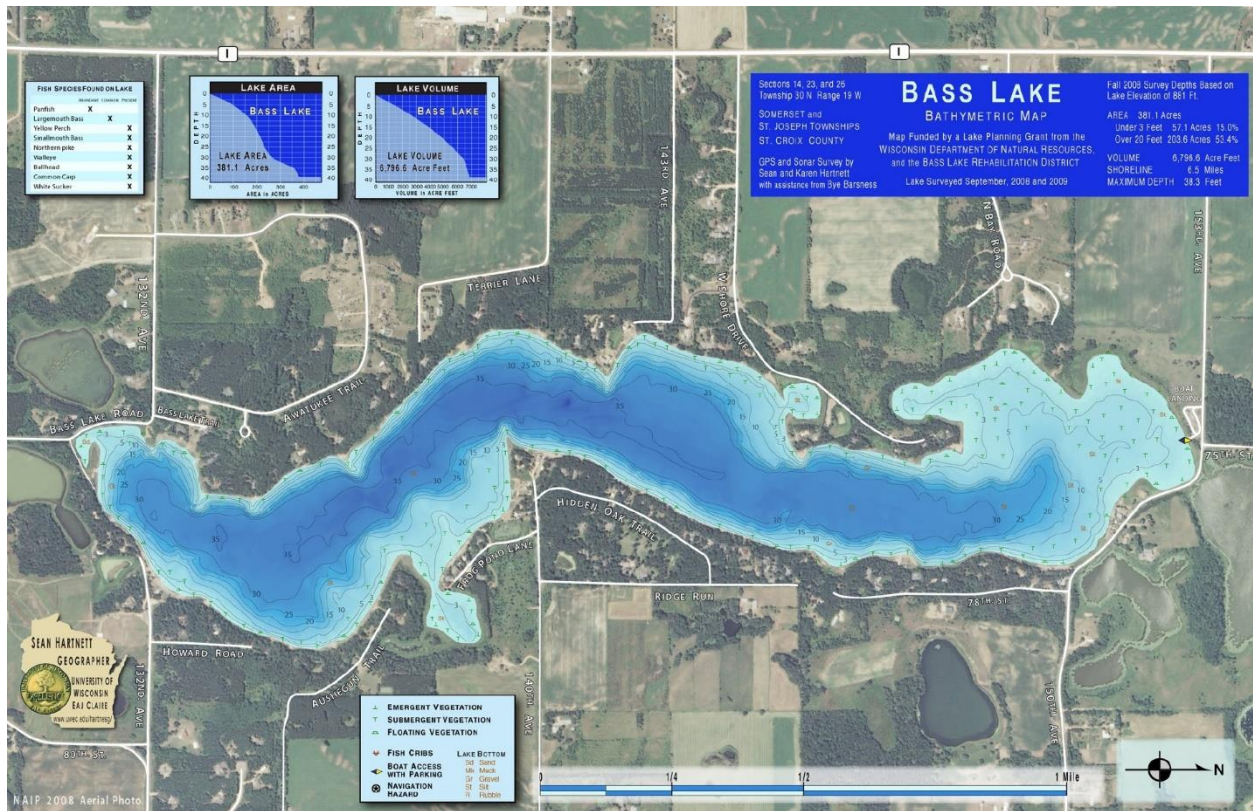


# WISCONSIN DEPARTMENT OF NATURAL RESOURCES

## Fisheries Survey Report for Bass Lake, St. Croix County, Wisconsin 2021

### WATERBODY IDENTIFICATION CODE 2450500



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## Introduction

Bass Lake is a 381-acre mesotrophic seepage lake located approximately 3 miles southeast of Somerset in west central St. Croix County. It has a maximum depth of 33 feet and approximately 5.65 miles of shoreline. Water levels are subject to extreme fluctuations throughout the years caused by the amount of precipitation and subsequent groundwater levels. Currently, the lake is at an average level compared to the past 60 years. Bass Lake has exceptional water quality and is considered an Outstanding Resource Water. However, development within the watershed is steadily increasing, and the majority of the shoreline is in development. A single public boat landing operated by St. Croix County is located at the north end of the lake. The lake receives heavy fishing pressure annually and is very popular with recreational boaters due to its proximity to New Richmond and the Twin Cities. Exotic species in Bass Lake include Common Carp, Eurasian Water Milfoil, Curly-leaf Pondweed, Phragmites, Zebra Mussels and Chinese Mystery Snails.

The lake is classified as a Complex Warm Clear lake in Wisconsin's lakes classification system, which compares lakes with similar lakes in terms of trophic status, thermal regime and fish community. Historically, the lake consisted of a bass and panfish fishery. These species remain the dominant species today. Largemouth Bass are common and have previously suffered from high abundance and poor growth rates during the time period of the statewide regulation of the 14-inch minimum length, five fish bag limit. To combat this, the protective slot regulation of 14-18 inches, with a bag limit of three and only one over 18 inches, was implemented in 2013. The bass daily bag limit was then increased to five in 2018.

Bluegill are also abundant in the lake, along with Black Crappie to a lesser extent. Because of the popularity of the fishery and concern of potential overharvest and reduction in quality sizes, the panfish bag limit was reduced from 25 to 10 in 2008.

Walleye have been stocked in the lake since the 1930s. Walleye rely on stocking to support a fishery because of limited to no natural reproduction. Bass Lake became part of the Walleye Stocking Initiative in 2014 and has since received large fingerling stockings on a biennial basis at a rate of 15/acre. Northern Pike were illegally introduced into the lake in the 1970s and densities have remained low. This survey will evaluate the effectiveness of the bass and panfish regulations and offer an initial evaluation of the Walleye stocking.

## Methods

### Sampling

Bass Lake was surveyed in the spring of 2021 using fyke nets and electrofishing gear to assess the status of the current fish community. Immediately after ice out on March 29, eight fyke nets (3x6 ft, 0.75-inch mesh and 4x6 ft, 0.5-inch nylon mesh) were set targeting Walleye and Northern Pike. The nets were lifted daily for five days for 39 net nights. All Walleye were marked with fin clips during netting. Immediately following the netting survey, one night of electrofishing (SEI) was conducted for the recapture survey for Walleye to obtain a population estimate.

Additionally, after water temperatures reached 55°F, another night of electrofishing (SEII) was conducted to target bass and panfish species. The entire shoreline was divided into three stations that were approximately 2 miles in length each. Within each of these stations, a ½ mile substation was sampled for all fish species. All Common Carp observed during these substations were counted to obtain relative abundance estimates. Only gamefish species were captured within the remaining 1.5-mile stations. In the fall, after water temperatures dropped below 70°F, another night of electrofishing was conducted on the entire shoreline to sample the young-of-year Walleye population. Spring electrofishing was conducted with a pulsed DC miniboom shocker with two booms and one dip netter, while the fall electrofishing survey was conducted with a pulsed DC maxiboom shocker with two booms and one dip netter.

All gamefish were counted and measured. A subsample of five per each ½ inch length group of both sexes (if possible) was weighed, and aging structures were removed for age analysis in the lab. Gender was determined for each Walleye and Northern Pike. Dorsal spines were removed from Walleye for aging. Otoliths were removed from Largemouth Bass, Bluegill, Black Crappie and Yellow Perch. Cleithra were removed from a subsample of Northern Pike in the 18-19 inch range.

## Analysis

Data analysis included calculating catch rates for each species (CPE-Catch Per Effort) as a measure of relative abundance. A population estimate was conducted for the Walleye population. The condition of individual fish was estimated by computing relative weight ( $W_r$ ) for each fish based on length and weight, where a value of 100 or higher indicated very good condition and values less than that resulted in poorer condition. The size structure of each species was evaluated by creating length frequency distributions and computing Proportional Size Distribution (PSD), which measures the proportion of fish equal to or larger than stock size and equal to or larger than quality size fish in the population. Relative Stock Density (RSD-Preferred) was also calculated for Walleye and Northern Pike as a measure of the proportion of fish in the population larger than the preferred size (20 inches-Walleye, 28 inches-Northern Pike). Growth rates of Walleye were calculated using the von Bertalanffy growth coefficient and median length at age and were compared to other lakes within the same lakes classification. Walleye recruitment was evaluated through residual analysis, where the sign and magnitude of residuals from a catch-curve regression indicate relative year-class strength. Larger, positive residuals indicate years of higher recruitment and zero or negative residuals indicate years of poorer recruitment. Growth rates of Northern Pike were estimated by calculating the mean age at 18-18.9 inches for male and female Northern Pike and categorized into percentiles of statewide distributions of growth rates for both sexes.

## Results

### Gamefish

Walleye were more abundant than in previous surveys of the lake dating back to 1986. The adult population estimate resulted in 1.7/acre or approximately 642 adult Walleye (Figure 1). Catch rates of Walleye during the netting survey were in the 90<sup>th</sup> percentile for lakes within the Complex Warm Clear classification at 7.5 fish/net night. The average length of Walleye during the survey was 19.1 inches, ranging from 11 to 28.9 inches (Figure 2). Walleye exhibited

excellent size structure with a PSD of 88 and RSD-P of 33. The average condition of fish collected during the survey was good, with a mean Wr of 94. Recruitment of Walleye was high in the stocking years, indicating overall good survival of stocked fish (Figure 3). The age-5, or 2016 year class, was the strongest, followed by the age-7 and age-9 year classes. Evidence of some natural reproduction was evident by the presence of 4, 6 and 8 year old fish, which are the results of natural reproduction during the non-stocked years producing weak year classes (Figure 3). Most of the age-3 fish may not have reached sexual maturity by the time of the survey and were likely not fully recruited to our gear. The fall juvenile Walleye surveys have detected some evidence of natural reproduction with catch rates of 1.7 young-of-year/mile during non-stocked years as well as some survival and recruitment of age-1 fish following the non-stocked year (Figure 4). Growth rates of Walleye were comparable and slightly faster than the statewide median growth rates for lakes within the same classification (Figure 5). The von Bertalanffy growth coefficient resulted in growth in the 95<sup>th</sup> percentile for similar lakes across Wisconsin. Females exhibited faster growth rates than males. On average, fish reached 20 inches by the age of 7.

Largemouth Bass were very abundant during the electrofishing survey, with a catch rate of 80/mile, which is in the 90<sup>th</sup> percentile for similar lakes across Wisconsin. Lengths of Largemouth Bass ranged from 2 to 19 inches, with a mean length of 10.2 inches (Figure 6). The size structure improved from the 2011 survey and resulted in a PSD of 36 and an RSD-14 of 6. Approximately 5% of Largemouth Bass were larger than 14 inches, an improvement from the 2011 survey in which less than 1% of fish were larger than 14 inches. The condition of Largemouth Bass was good, with an average Wr value of 99. Growth of Largemouth Bass in Bass Lake was slightly below the statewide average for growth rates in similar lakes across the state, especially for larger individuals (Figure 7). On average, Largemouth Bass reached 14 inches in length in 8.4 years. Largemouth Bass exhibited strong and consistent recruitment and survival for younger age classes of fish (< age-7), with a steep drop in individuals present from the age-8 and older year classes, potentially indicating increased mortality when fish reach larger than 14 inches (Figure 8). A single Smallmouth Bass was captured during the electrofishing survey.

Northern Pike were present in low abundance, with a total of 43 individuals captured during the survey and a catch rate of 1.1 fish/net night. The length of Northern Pike ranged from 10.8 to 26.9 inches, with a mean length of 19.1 inches (Figure 9). The size structure of Northern Pike was slightly low but still in the acceptable range for a balanced fish population with a PSD of 34. Growth rates were also slightly low as measured by the mean age of males and females in the 18-19 inch range, which resulted in a mean age of 3.5 years old for males or the 33<sup>rd</sup> percentile. The sample size of females aged within this length range was too few to determine growth rates.

## Panfish

Bluegill were the most abundant panfish species and were in high densities during the survey. Catch rates were in the 90<sup>th</sup> percentile for similar lakes, and CPE was 476/mile. Lengths of Bluegill ranged from 2.3 to 9.7 inches, with a mean length of 5.1 inches (Figure 10). The size structure of Bluegill was good, with a PSD of 28 and an RSD-P of 12, which is within the range of balanced fish populations. The 2021 PSD slightly improved compared to the PSD estimates prior to the bag limit reduction, which was an average of 22. A total of 11% of the sample of Bluegills were larger than 8 inches. When compared to the sampling years prior to



the bag limit reduction from 25 to 10, the number of fish in the 7-7.9 inch range, as well as fish 8 inches and larger has improved substantially (Figure 11). Catch rates of 7-7.9 inch fish in 2021 was 13/mile, while pre-bag limit reduction surveys yielded an average of 4.4/mile. Catch rates of 8+ inch fish also improved from an average of 9.5/mile to 21/mile in 2021. The condition of fish was excellent, with a mean  $W_r$  value of 110. Growth rates of Bluegill were very comparable to statewide growth rates of lakes in the same lakes classification and were above average after Bluegill reached five years of age (Figure 12). On average, Bluegill reached 7 inches in length in 6.3 years. Growth rates were similar to surveys conducted prior to the bag limit reduction, however, indicating minimal improvement in growth resulting from the bag limit change. Bluegill recruitment was strong and consistent with likely high mortality of fish older than six years of age, which is generally the size and age at which they reach a harvestable size in Bass Lake (Figure 13).

Black Crappie were the next most common panfish species present. However, catch rates were considerably lower than in the previous survey conducted in 2011. The catch rate during the netting survey was 1.1 fish/net night which is in the 25<sup>th</sup> percentile for similar lakes. Lengths ranged from 4.3 to 11.2 inches, with a mean length of 7.4 inches (Figure 14). The condition of Black Crappie was excellent, with a mean  $W_r$  value of 118. Growth rates were excellent and well above the statewide average for Black Crappie within the same lakes class (Figure 15). On average, Black Crappie reached 10 inches in approximately 5.8 years. Mortality appears high for fish older than five years or 10 inches in length, likely due to high angling pressure (Figure 16).

Yellow Perch were in very low abundance during both the netting and electrofishing surveys in which only two and nine fish were captured, respectively. Therefore, no further analysis was completed on Yellow Perch. A total of 50 pumpkinseed sunfish were captured during the electrofishing survey with lengths ranging from 3.9 to 7.7 inches.

## Discussion

The current Walleye population (1.7 adults/acre) was higher than in the previous surveys since 1986, which averaged 0.6 adults/acre. Walleye were, and for the most part still are, largely the result of stocking. Large fingerling stocking occurred from 2008 to 2012 and mainly originated from a private hatchery. In 2014, Bass Lake was included in the Wisconsin Walleye Stocking Initiative (WSI) and received extended growth large fingerlings from DNR hatcheries every other year. This survey allows for evaluating the population after four years of WSI stocking. The intent of this stocking is to determine if naturally reproducing populations can be established in lakes with Walleye populations that have had a history of natural reproduction. An additional goal of this stocking is to determine if a fishable population of at least 1.5 adults per acre can be established. To date, this stocking has resulted in 1.7 adults/acre, which is higher than in all previous population estimates of Bass Lake. Some natural reproduction is evident by the presence of small year classes from the non-stocked years and the presence of young-of-year in the fall juvenile surveys during non-stocked years and prior to stocking in stocked years. Since 2019, fall juvenile surveys have captured an average of 1.7 young-of-year per mile. These fish are the result of natural reproduction and, while this is not a significant contribution to the population, it does result in weak year classes of fish according to aging results from the 2021 survey.

Catch rates of Largemouth Bass were lower than in the 2011 survey (80/mile in 2021; 137/mile in 2011), and the size structure was slightly improved. The percentage of bass larger than 14 inches improved from the 2011 survey of less than 1% to 5%, respectively. PSD was also improved from the previous survey and is within the range for a balanced fish population (40-70), but further improvement in size structure is warranted in order to increase the trophy potential. The 2021 growth rates were similar to the growth rates during the 2011 survey, which occurred during the period of the 14-inch minimum length limit. The 2013 implementation of the 14-18 inch protected slot regulation has, therefore, likely resulted in the reduction in abundance and improvement in size structure. The protected slot has increased survival and allowed more fish to reach larger sizes, but growth rates have not improved, likely indicating persistent overabundance or a lack of forage. However, with the catch-and-release mentality of the majority of bass anglers, regulations may have a limited effect. Harvest is encouraged for bass less than 14 inches to further improve the population. An overabundance of aquatic macrophytes can also result in reductions in Largemouth Bass foraging success (Diehl 1988; Dionne and Folt 1991; Dibble and Harrel 1997; Valley and Bremigan 2002). The high abundance of macrophytes in Bass Lake during the late spring and summer months may impact foraging success and subsequent growth rates. The improvement of water levels in recent years to more average levels may have also aided in providing increased littoral habitat for Bass and other littoral-oriented species.

Northern Pike remain in low abundance with similar catch rates in the previous and current surveys. The size structure was also similar, with no fish larger than 30 inches captured. Growth rates were similar to the 2011 survey and slightly below the statewide average. The fluctuation in water levels throughout the years likely has a large impact on Northern Pike populations. With water levels improving to a more normal level recently, Northern Pike reproduction and growth may improve with the improved littoral habitat. Many species, including Northern Pike, Largemouth Bass, Walleye and panfish, require and prefer nearshore woody habitat for spawning, foraging or refuge. With the increase and prevalence in shoreline development, this type of habitat is extremely limited within Bass Lake. Efforts to restore this type of habitat in the form of tree drops or fish sticks would aid in the improvement of littoral habitat for fish and other aquatic species, reduce shoreline erosion and enhance fish populations.

Bluegills were much more abundant than in the 2011 survey. However, the size structure of the population was very similar. The ten panfish bag limit was implemented in 2008 and could not be fully evaluated in the 2011 survey. With 13 years since the reduction in bag limits, the regulation can be fully evaluated. The size structure, in terms of the number of Bluegill in the 7- 7.9 inch range and larger than 8 inches, was much improved relative to the pre-bag limit surveys prior to 2010. The average number of fish in the 7-7.9 inch range pre-bag limit change was 4.4/mile, while the 2021 survey resulted in 13.0 per mile. The average number of fish larger than 8 inches pre-bag limit change was 9.5/mile, while the 2021 survey resulted in 21.0/mile. Bluegill exhibited good growth rates similar to pre-bag limit reduction growth rates in terms of mean length at age. The current size structure is much improved from the previous surveys prior to the reduction in bag limit and is well within the range for a balanced fish population and is better than most of the lakes within the county. Black Crappie have experienced a sharp decline in densities relative to the previous survey. No fish were present in the age-1 year class, and mortality is likely high for mature fish. Crappie recruitment can be variable, highly erratic and largely influenced by environmental factors

including water levels. Strong year classes are generally only formed every 3-5 years (Hooe 1991; Allen and Miranda 1998; Maceina and Stimpert 1998).

Overall, the Walleye population has improved from the WSI large fingerling stocking and has resulted in a fishable population with a population estimate higher than in years prior to the stocking initiative. Some evidence of natural reproduction is evident, however, only enough to produce a weak year class at this time. The protected slot limit on Largemouth Bass appears to have resulted in some improvement in densities and overall size structure, however, more harvest is encouraged for Bass less than 14 inches to further improve the population. Additionally, the reduction in the panfish bag limit from 25 to 10 in 2008 also appears to have resulted in improvements in the Bluegill population in terms of size structure. It is difficult to determine the extent of the impact of low lake levels during the evaluation and prior to the change in the bag limit. Fish sticks and tree drop projects are highly recommended to continue enhancing and improving near-shore habitats that are essential to many fish species life histories.

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# Figures and Tables

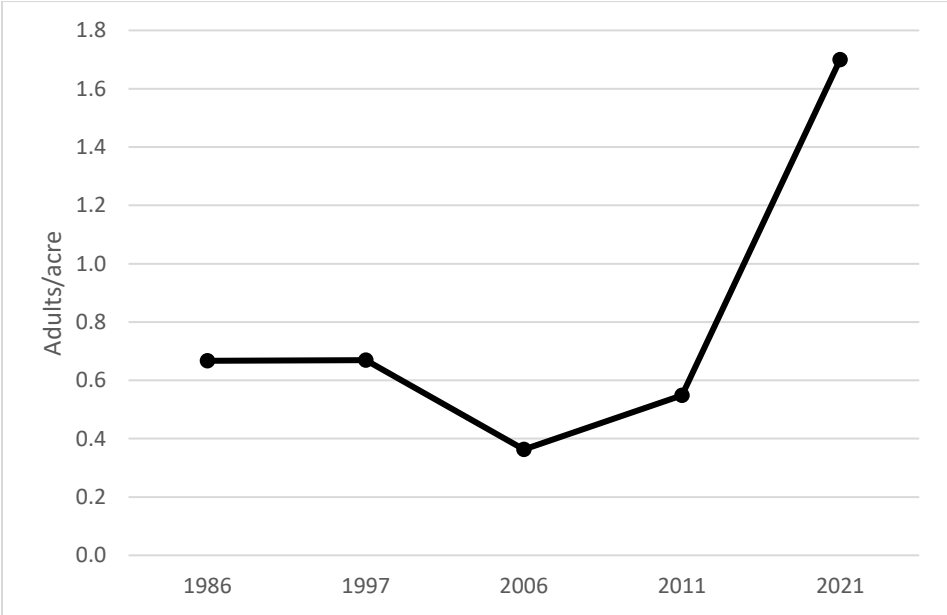


Figure 1. Adult Walleye population estimates in Bass Lake, St. Croix County from 1986 to 2021.



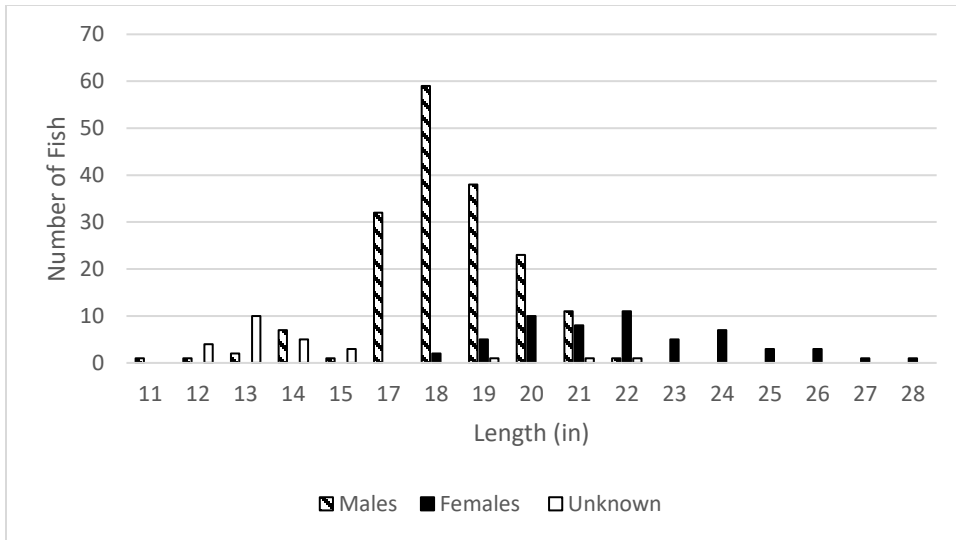


Figure 2. Length frequency distribution of Walleye collected from Bass Lake, St. Croix County, spring 2021.

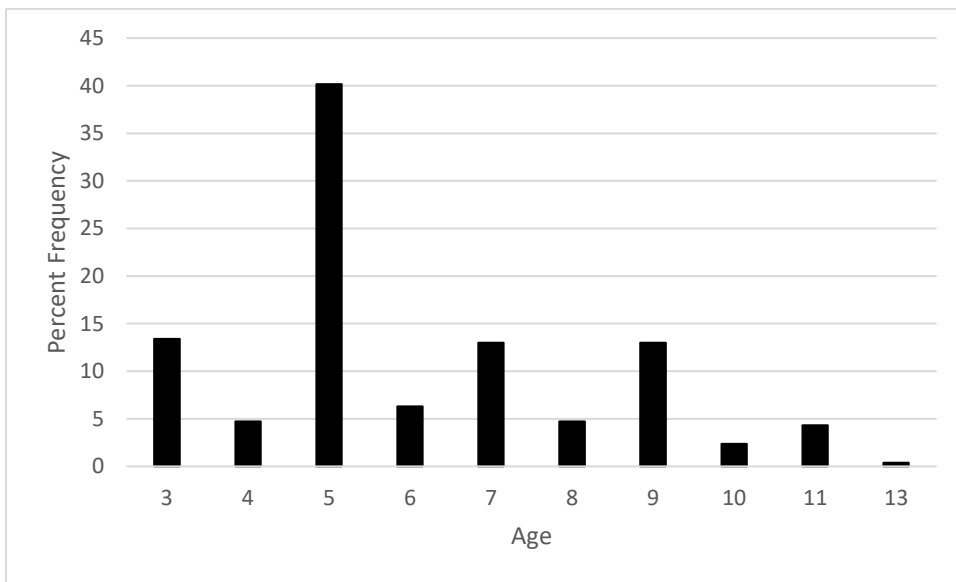


Figure 3. Age frequency distribution of Walleye collected from Bass Lake, St. Croix County, spring 2021.

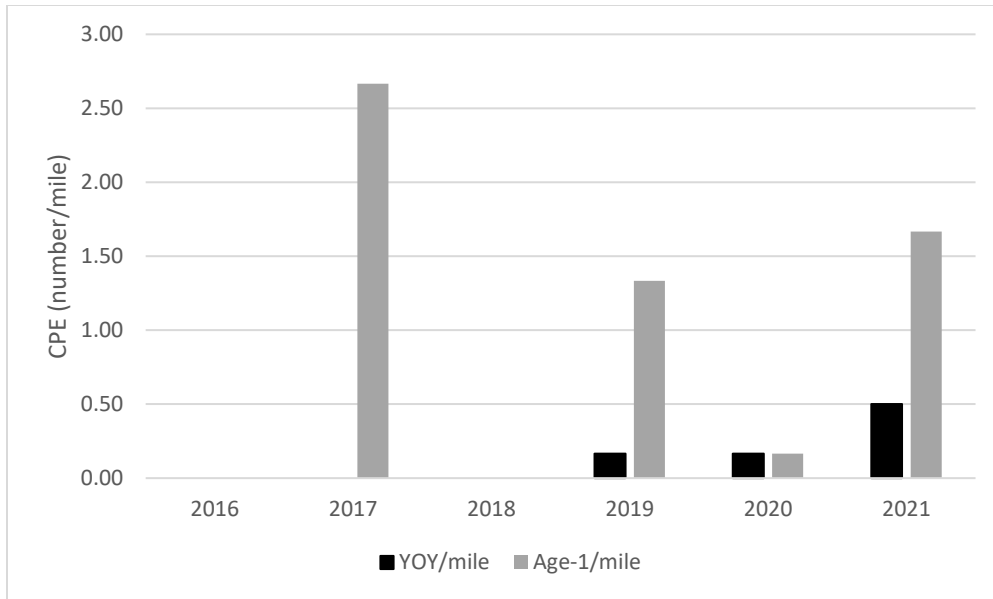


Figure 4. Catch rates (CPE) of young-of-year (YOY) Walleye and Age-1 Walleye collected during fall juvenile Walleye survey in Bass Lake, St. Croix County.

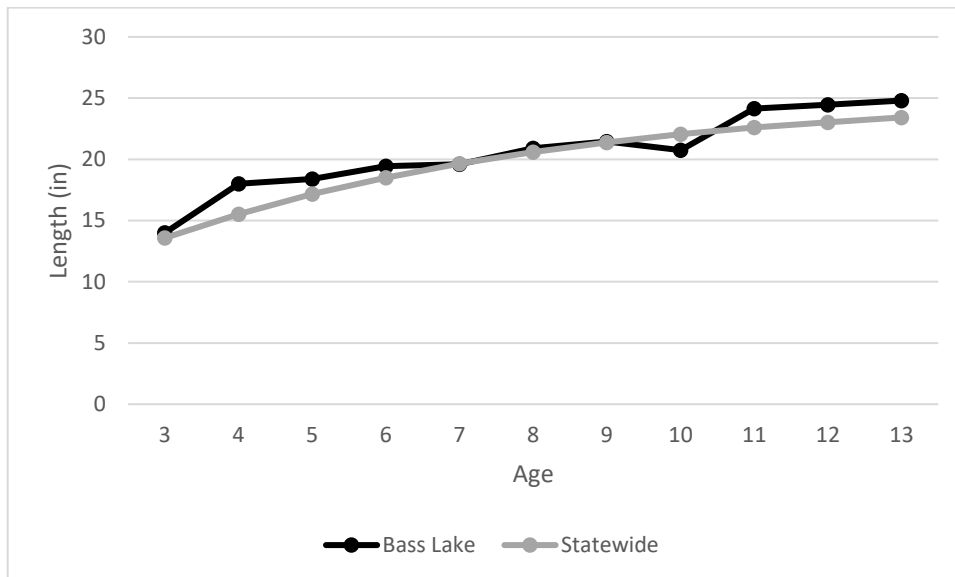


Figure 5. Median length at age of Walleye collected from Bass Lake, St. Croix County in spring 2021 compared to statewide median length at age of Walleye within Complex Warm and Clear classified lakes.

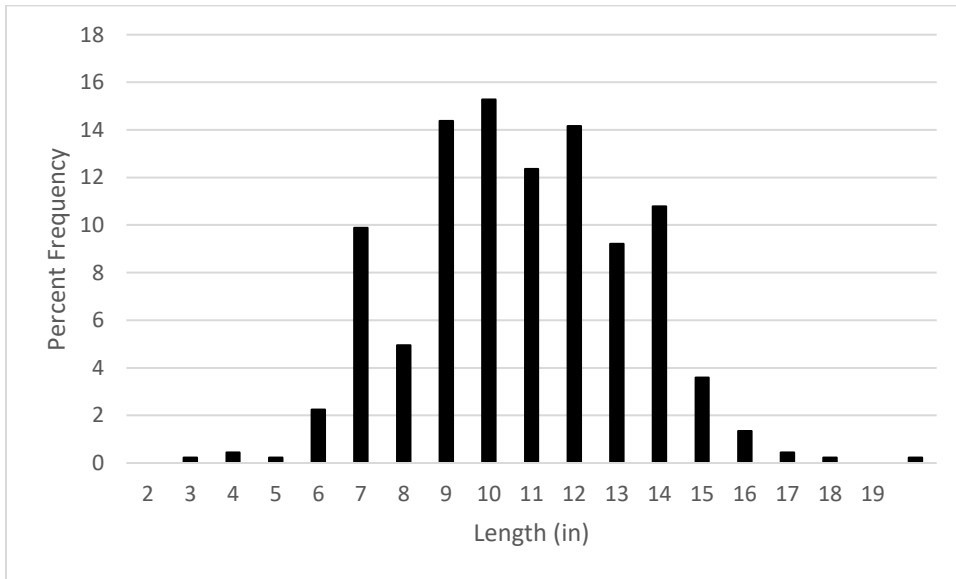


Figure 6. Length frequency distribution of Largemouth Bass collected from Bass Lake, St. Croix County, spring 2021.

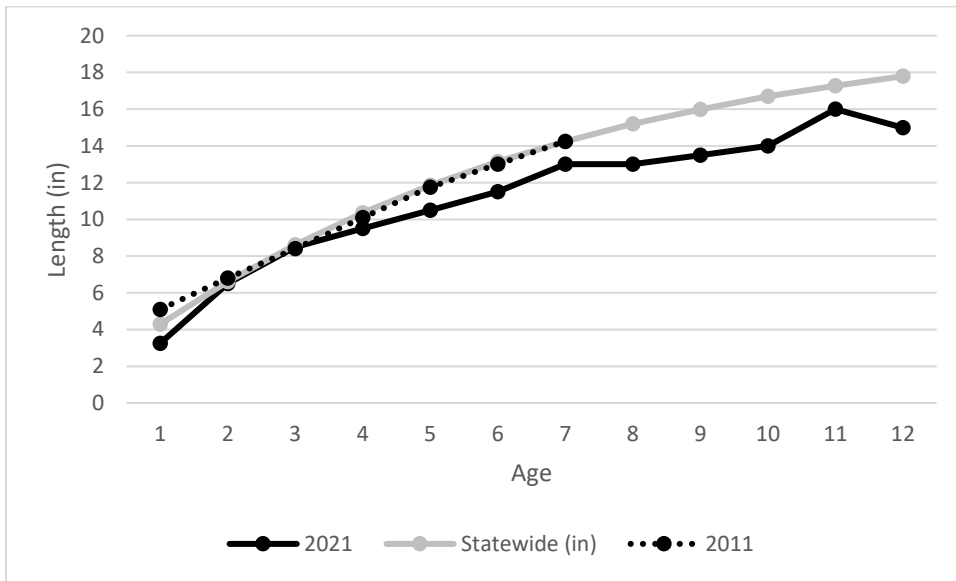


Figure 7. Median length at age of Largemouth Bass collected from Bass Lake, St. Croix County in spring 2011 and 2021 compared to statewide median length at age of Largemouth Bass within Complex Warm and Clear classified lakes.

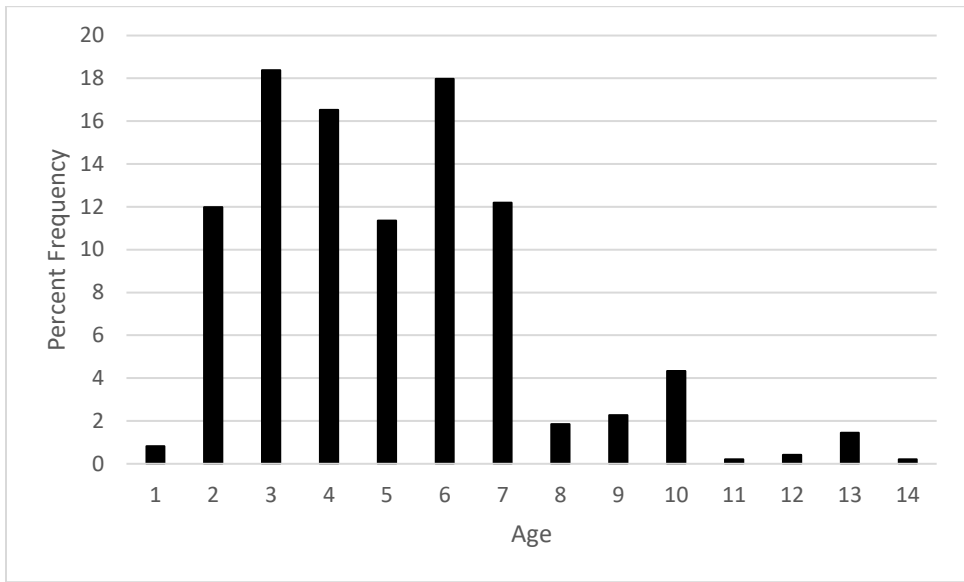


Figure 8. Age frequency distribution of Largemouth Bass collected from Bass Lake, St. Croix County, spring 2021.

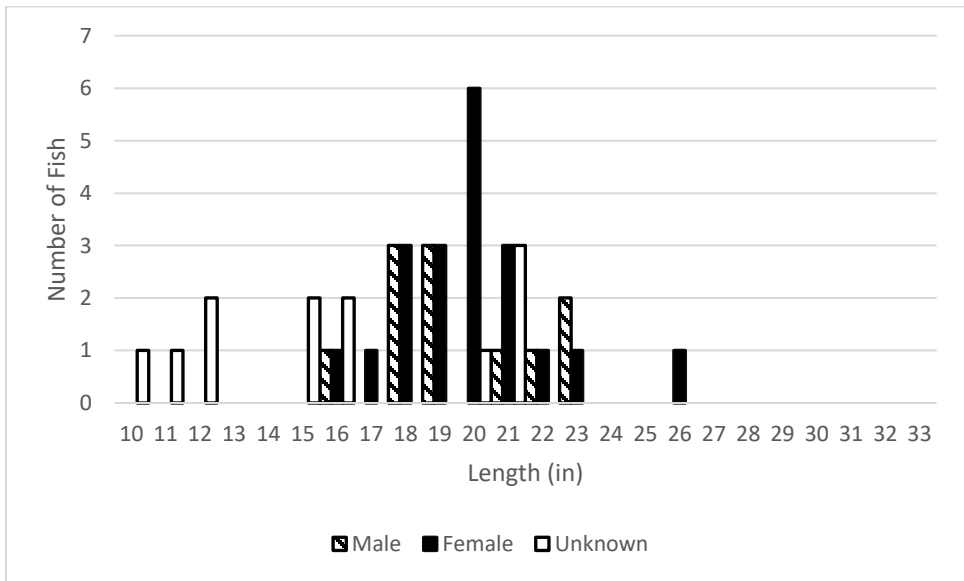


Figure 9. Length frequency distribution of Northern Pike collected from Bass Lake, St. Croix County, spring 2021.

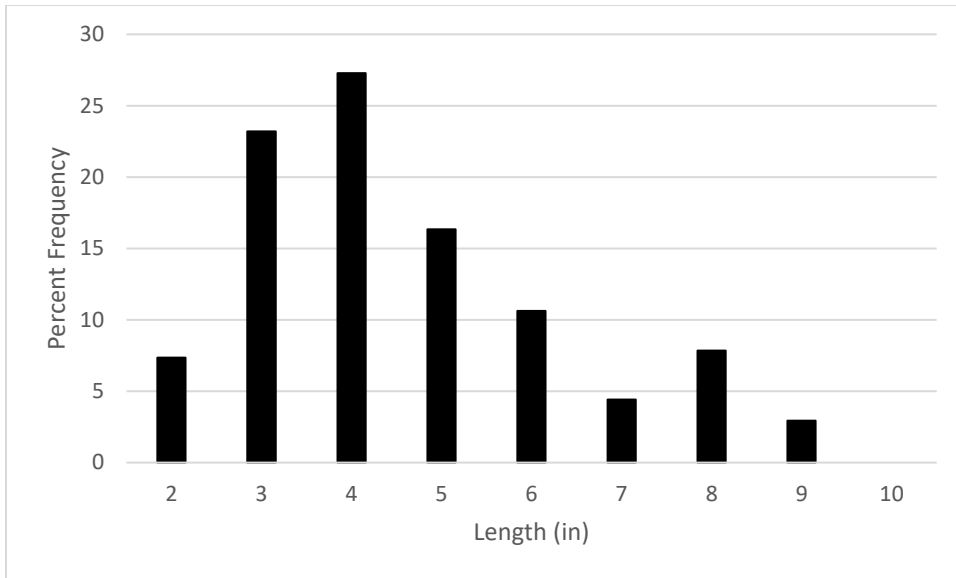


Figure 10. Length frequency distribution of Bluegill collected from Bass Lake, St. Croix County, spring 2021.

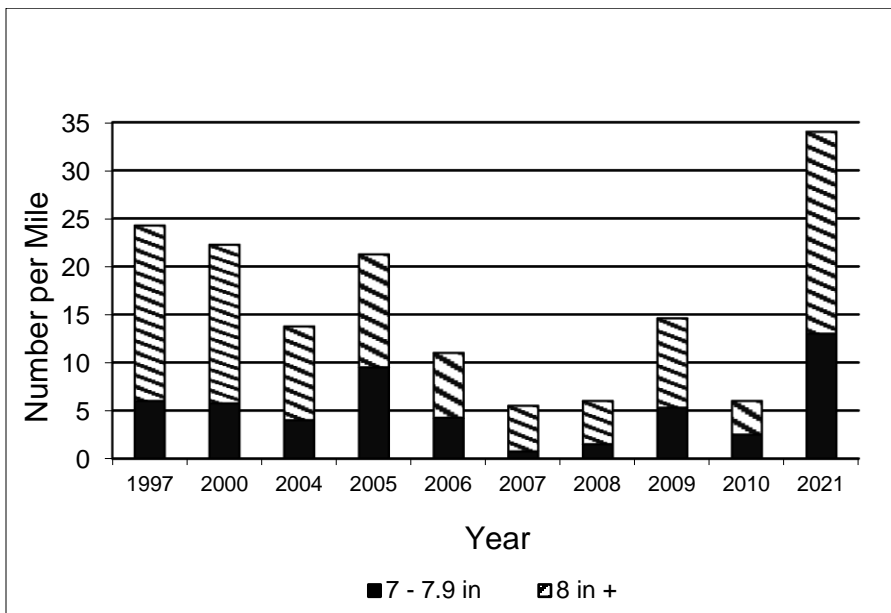


Figure 11. Catch rates of Bluegill in the 7-7.9 inch range and larger than 8 inches (8 in+) in Bass Lake, St. Croix County. The years of 1997-2008 represents years with a 25 panfish bag limit, and 2009-2021 represents years with a 10 panfish bag limit.

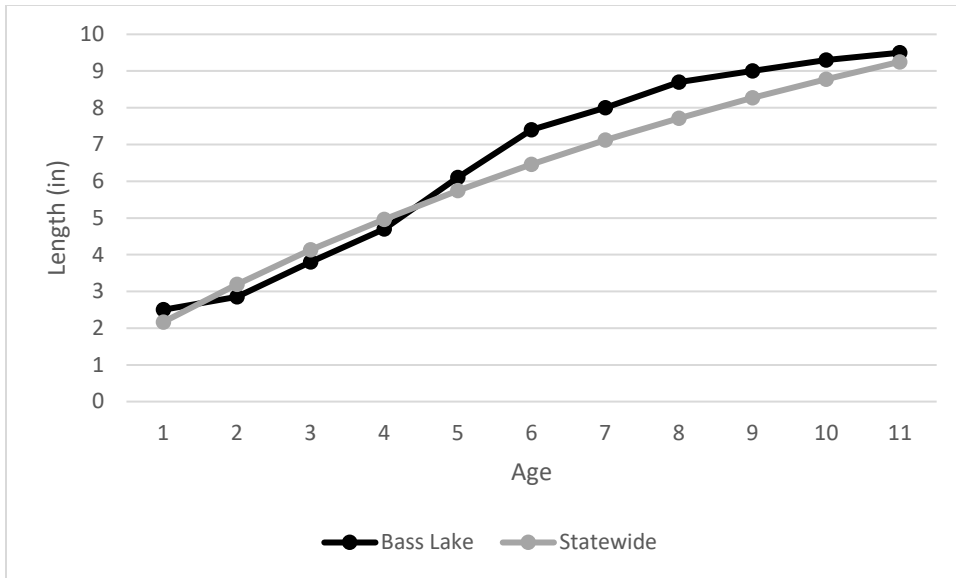


Figure 12. Median length at age of Bluegill collected from Bass Lake, St. Croix County in spring 2021 compared to statewide median length at age of Bluegill within Complex Warm and Clear classified lakes.

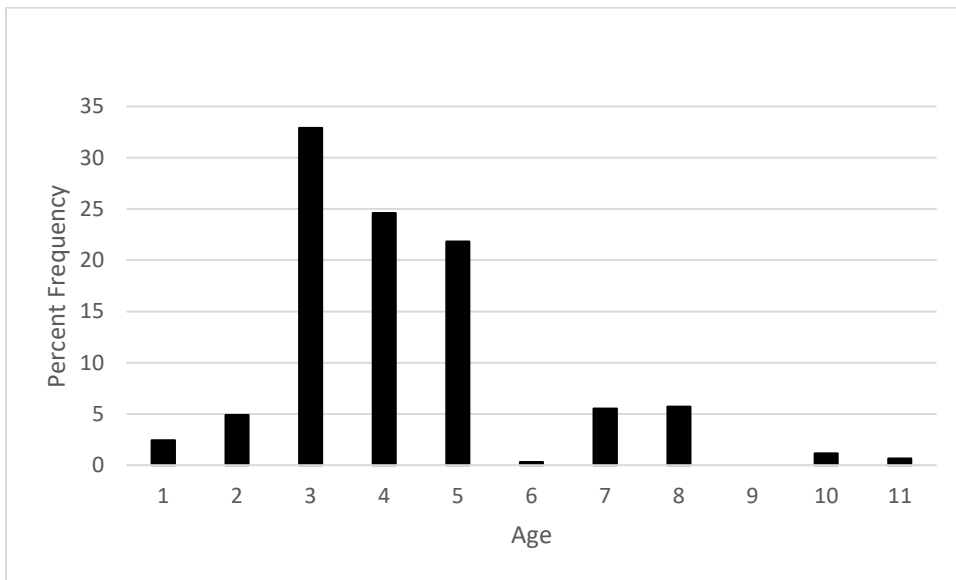


Figure 13. Age frequency distribution of Bluegill collected from Bass Lake, St. Croix County, spring 2021.



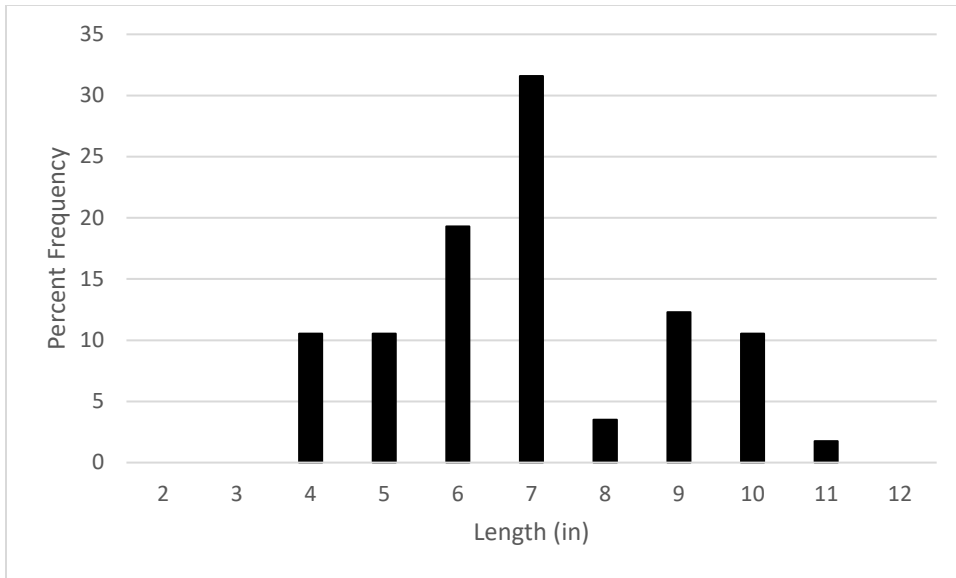


Figure 14. Length frequency distribution of Black Crappie collected from Bass Lake, St. Croix County, spring 2021.

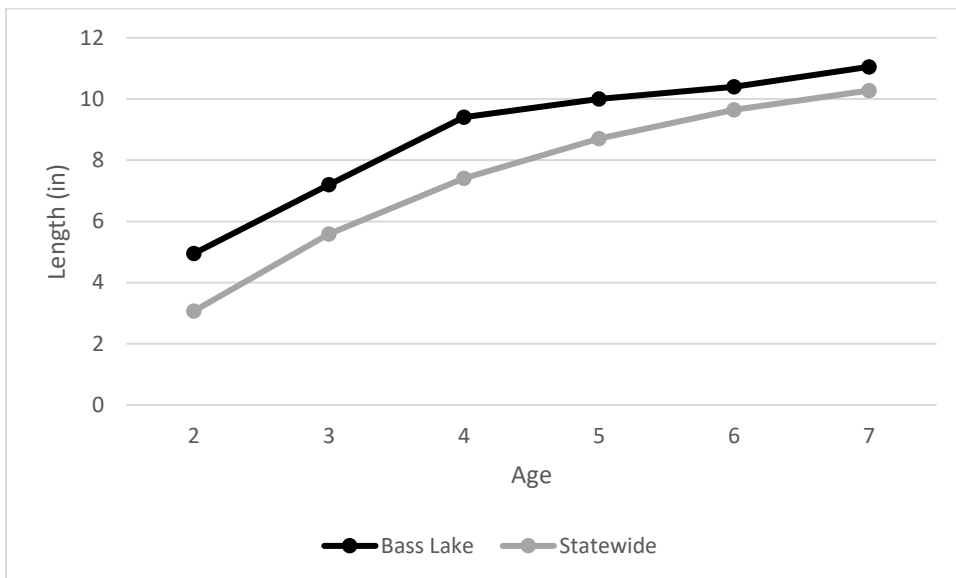


Figure 15. Median length at age of Black Crappie collected from Bass Lake, St. Croix County in spring 2021 compared to statewide median length at age of Black Crappie within Complex Warm and Clear classified lakes.

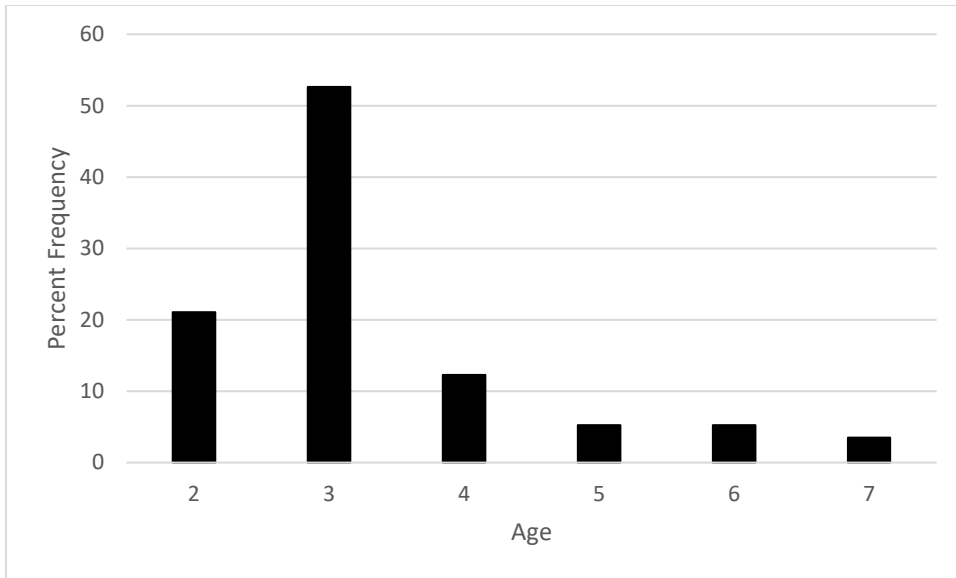


Figure 16. Age frequency distribution of Black Crappie collected from Bass Lake, St. Croix County, spring 2021.