WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Pine Lake, St. Croix County
2022 Fisheries Survey Report

WBIC 2489700

Photo Credit: Brian Spangler

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Introduction

Pine Lake is a eutrophic seepage lake located 5 miles north of the city of Baldwin in St. Croix County. It has a surface area of 118 acres and a mean depth of 8 feet with a maximum depth of 21 feet. Pine Lake has a naturally reproducing Largemouth Bass *Micropterus salmoides*, Northern Pike *Esox lucius* and pan fishery. Pine Lake is also stocked with large fingerling Walleye *Sander vitreus* on an alternate year basis. Northern Pike stocking occurred annually until 2019. A county park and boat landing are located on the northwest side of the lake. Pine Lake is dependent on runoff to maintain water levels and has a history of large water level fluctuations. Pine Lake has also experienced times of extreme dewatering through sinkholes in the lakebed. The last dewatering event occurred in 1988. At that time the sinkhole was patched and stocking resumed as water levels returned. In addition, Pine Lake had a history of winterkill which has been alleviated via the installation of two aeration systems in 1995. Chinese mystery snail (*Cipangopaludina chinensis*) is an invasive aquatic species first found in Pine Lake in 2013.

Pine Lake is classified as a Complex, Warm and Dark Lake in Wisconsin's lakes classification system in order to compare lakes within similar qualities in terms of trophic status, thermal regime and fish community.

Methods

SURVEY EFFORT

Pine Lake was surveyed in the spring of 2022 using fyke nets and electrofishing gear to assess the status of the current fish community. Immediately after ice out on April 13th, 12 fyke nets (3x6 ft, 0.75 inch mesh and 4x6 ft, 0.5 inch nylon mesh) were set targeting Northern Pike and Walleye (SNI survey). Nets were lifted daily for 10 days for a total of 75 net nights. All Walleye and Northern Pike were marked with fin clips during netting. Walleye were tagged with floy tags in an effort to estimate angler exploitation via tag returns. A sign was posted at the boat ramp to inform anglers of the exploitation study. Floy tags were labeled with a phone number for anglers to report tagged fish. An electrofishing run (SEI survey) was conducted during the netting survey to increase the number of marked Walleye in the sample due to low netting catch rates. A final recapture electrofishing run was conducted to after netting was completed to complete the population estimate of Walleye. Additionally, after water temperature reached 55° F, a night of electrofishing (SEII survey) was completed to target Largemouth Bass and panfish species. The shoreline was divided into 2-mile stations in which only gamefish were collected. Within each of these stations, a ½ mile substation was sampled for all fish species. All Common Carp *Cyprinus carpio* observed during these substations were counted to obtain relative abundance estimates. In the fall, after water temperature dropped below 70° F, one night of electrofishing was completed on the entire shoreline to sample young-of-

year Walleye. Spring and fall lake electrofishing was conducted with a pulsed DC maxiboom shocker with two booms and two dip netters.

All gamefish were counted and measured and a subsample of 5 per each ½ inch length group of both sexes (if possible) were 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 *Lepomis macrochirus*, Black Crappie *Pomoxis nigromaculatus* and Yellow Perch *Perca flavenscens*. Cleithra were removed from a subsample of Northern Pike in the 18-19 inch range.

ANALYSIS

Data analysis included calculation of catch rates for each species (CPE-Catch per unit effort) as a measure of relative abundance. Condition of individual fish was estimated by computing relative weight (Wr) for each fish based on length and weight where a value of 100 or higher indicates very good condition and values less than that resulting in poorer condition. Size structure of each species was evaluated by creating length frequency distributions and computing Proportional Size Distribution (PSD) which is a measure of 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 Preferred size (20 inches-Walleye, 28 inches-Northern Pike). Growth rates of Walleye were calculated by analyzing median length at age and compared to other lakes within the same lakes classification. 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.

Estimates of tag loss were adapted from Koenigs et al. 2013 and were estimated at 5% for the first 90 days post tagging. A non-reporting rate of 25% was used based on Quist et al. 2010.

Results

WALLEYE

Walleye were difficult to sample in fyke nets in Pine Lake leading to low fyke net catch rates. Electrofishing was essential in effectively surveying the population. A total of 322 Walleye were captured during spring surveys in 2022. The population is estimated at 2.1 adults/acre (95% C.L. 1.7 to 2.8/acre) or 246 individuals (Table 1). Walleye catch rates in fyke nets were low during the survey with relative abundance of Walleye resulting in 0.85/net night which is in the 25th percentile compared to similar lakes. CPE of Walleye collected during the spring electrofishing run was 23.3/mile. Walleye ranged in length from 5.0 to 27.0 inches with a mean length of 14.2

inches during the spring survey (Figure 1). PSD of adult Walleye collected during the SEI and SNI survey was 91. RSD-P of Walleye was 43. Relative weight of Walleye was 99. Growth rates of Walleye were average when compared to statewide median lengths at age of Walleye in Complex Warm Dark lakes (Figure 2). Walleye reached harvestable size (15 inches) at 3 years of age. All stocked year classes were present, with the exception of the 2017-year class (age-5) which was missing from the sample (Figure 3). The age-1 followed by the age-7 and age-3 year classes were strong. Seventeen and 15-year old fish were present in the sample.

Juvenile Walleye surveyed in the fall were abundant with catch rates of age-1 fish at 9.8/mile. Lengths of age-1 Walleye ranged from 7.4 to 10 inches with an average length of 8.3 inches. No age-0 Walleye were captured during the fall survey.

At total of 168 adult Walleye were tagged with floy tags during 2022 surveys. A total of 7 tag returns were reported by anglers. Only 3 of those fish were reported harvested. Angler exploitation of Walleye was 5.4%. Approximately 43% of anglers that reported tagged Walleye were not targeting Walleye and were unaware of Walleye presence in the lake.

NORTHERN PIKE

A total of 557 Northern Pike were collected during the netting survey for a catch rate of 10.1/net night (90th percentile). The adult population size is estimated at 638 individuals or 5.4/acre (95% C.L. 4.8 to 6.2/acre). Pike ranged in length from 10.9 to 39.7 inches with a mean length of 23.3 inches for all surveys combined (Figure 4). PSD for Northern Pike was 74 and RSD-P was 39. Relative weight of Pike was 109. Northern Pike growth rates were slightly below average with mean age of males 18-18.9 inches at 3.7 years old (33rd percentile). The sample size of female Northern Pike within this length range was too small for analysis of female growth rates.

LARGEMOUTH BASS

Largemouth Bass were abundant with a total of 433 captured during electrofishing surveys. Electrofishing catch rates resulted in 63.7/mile of shoreline (75th percentile; Table 1). Lengths of Largemouth Bass ranged from 2.8 to 21.8 inches with an average length of 12.9 inches (Figure 5). Approximately 44% of Largemouth Bass were larger than 14 inches. PSD of Largemouth Bass was 68 and RSD-P was 39. Relative weights of Largemouth Bass ranged from 68 to 140 with an average of 108. Recruitment of Largemouth Bass was consistent and generally strong with the exception of the 2017-year class (Figure 6). Growth rates of Bass were average and comparable to similar lakes across Wisconsin (Figure 7). Bass reached harvestable size (14 inches) in 5 years on average.

BLUEGILL

Bluegill abundance was high during electrofishing surveys and resulted in a catch rate of 737/mile (95th percentile) for a total of 737 captured. Lengths of captured Bluegill ranged from 1.5 to 8.9 inches with an average length of 5.1 inches (Figure 8). PSD of Bluegill was 32. Only 1% of fish captured were larger than 8 inches. Condition of individual Bluegill ranged from poor to very good with Wr values ranging from 77 to 139 with an average of 106. Recruitment of Bluegill was strong and consistent with few fish present in the older age classes. Growth rates of Bluegill were average and comparable to Bluegill populations in similar lakes across the state (Figure 9). On average, Bluegill reach 7 inches in 5.4 years and reach 8 inches in 6.3 years.

BLACK CRAPPIE

Black Crappie were the least abundant panfish species with a catch rate of 157/mile during electrofishing runs and a total of 308 captured during the electrofishing and netting surveys combined. Lengths ranged from 2.7 to 10.1 inches with an average length of 6.3 inches (Figure 10). PSD of Black Crappie was 7. Relative weight ranged from 48 to 151 with an average of 107. Crappie exhibited inconsistent recruitment with a large year class in 2019 (age-3). Average length of age-3 fish was 6.5 inches. Growth rates of Black Crappie were poor with median length at age for all age classes substantially lower than the statewide median length at age for similar lakes (Figure 11). On average, Black Crappie reached 9 inches in 7 years in Pine Lake. The statewide average mean age at 9 inches is approximately 5 years old.

YELLOW PERCH

A total of 505 Yellow Perch were captured during spring surveys. Catch rates during the netting survey were 6.3/net night (75th percentile). The average length of Perch was 4.8 inches with lengths that ranged from 2.5 to 8.5 inches (Figure 12). Only 4% of Yellow Perch were larger than 8 inches and no Perch larger than 10 inches were collected. PSD of Yellow Perch was 50. Recruitment of Yellow Perch was strong and consistent for the age-1 through age-3 year classes. Older age classes were scarce (age-4-5). Growth rates of Yellow Perch in Pine Lake were average when compared to statewide growth rates in similar lakes (Figure 13). Perch reached 8 inches in 5 years, on average.

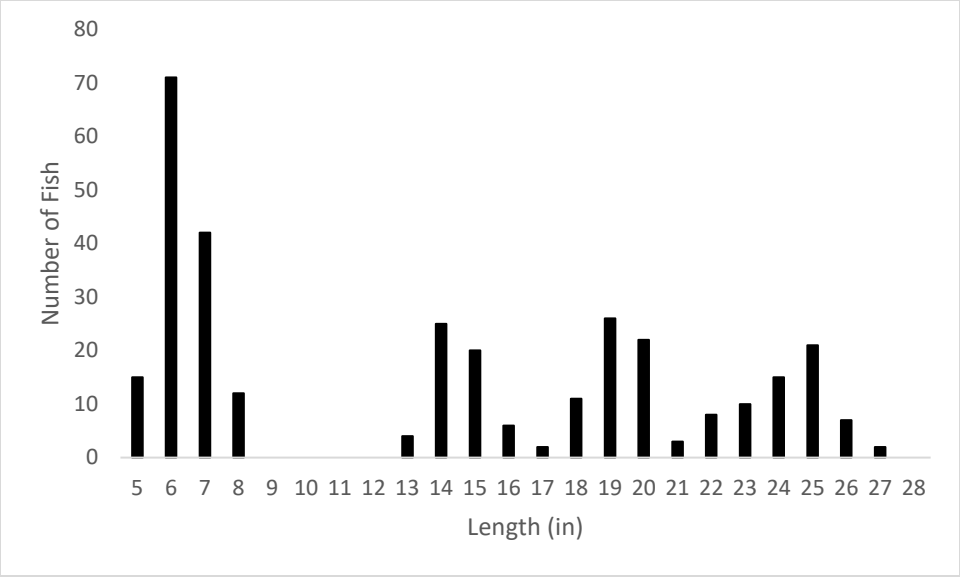

Figure 1. Length frequency distribution of Walleye in Pine Lake, St. Croix County, Wisconsin in 2022.

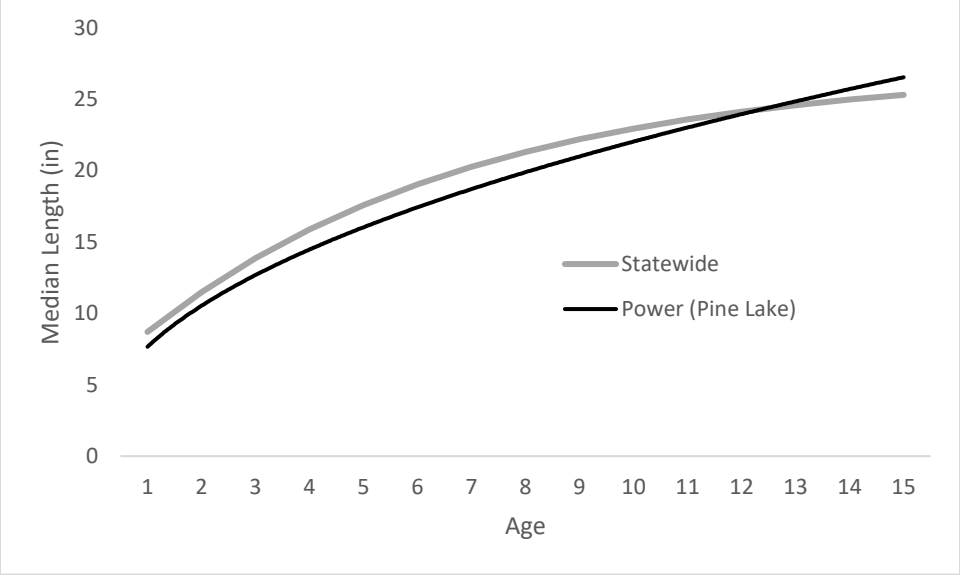

Figure 2. Median length at age of Walleye in Pine Lake, St. Croix County, Wisconsin in 2022 and statewide median length at age of Walleye in Complex Warm Dark Lakes in Wisconsin.

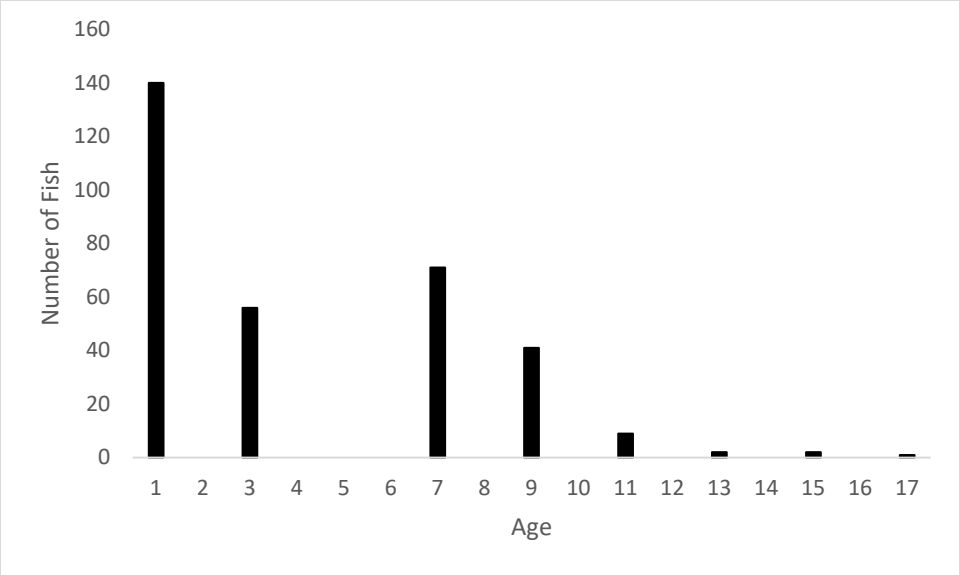

Figure 3. Age frequency distribution of Walleye in Pine Lake, St. Croix County, Wisconsin in 2022.

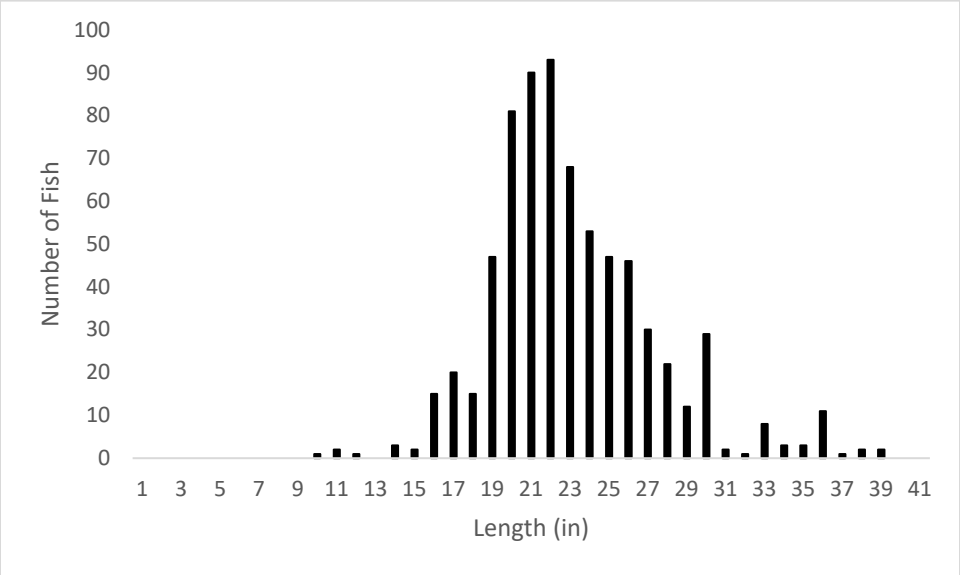

Figure 4. Length frequency distribution of Northern Pike in Pine Lake, St. Croix County, Wisconsin in 2022.

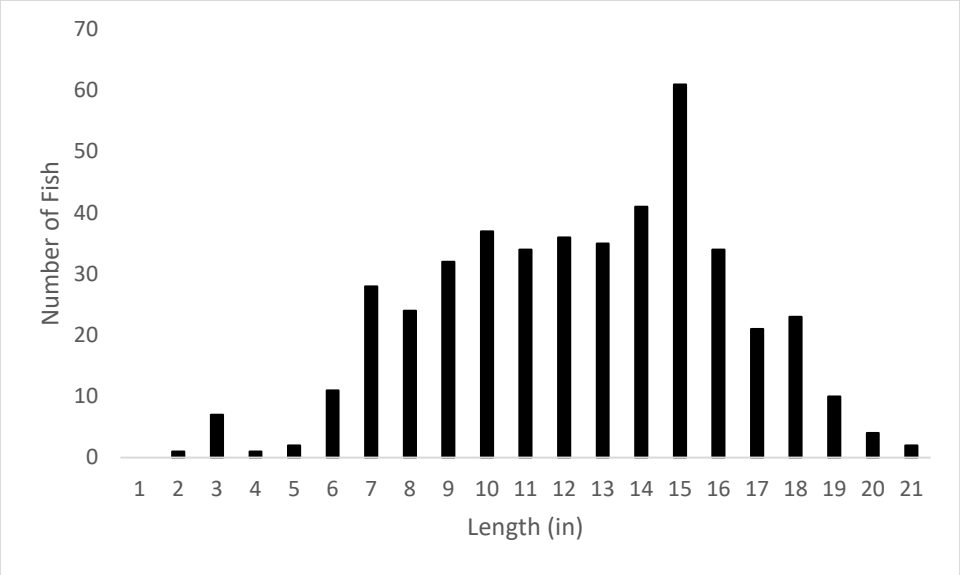

Figure 5. Length frequency distribution of Largemouth Bass in Pine Lake, St. Croix County, Wisconsin in 2022.

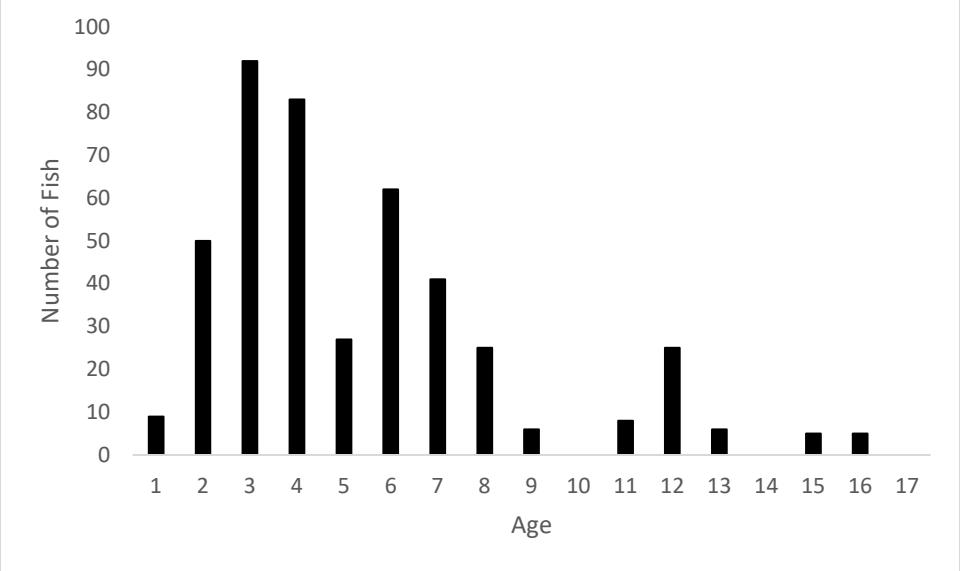

Figure 6. Age frequency distribution of Largemouth Bass in Pine Lake, St. Croix County, Wisconsin in 2022.

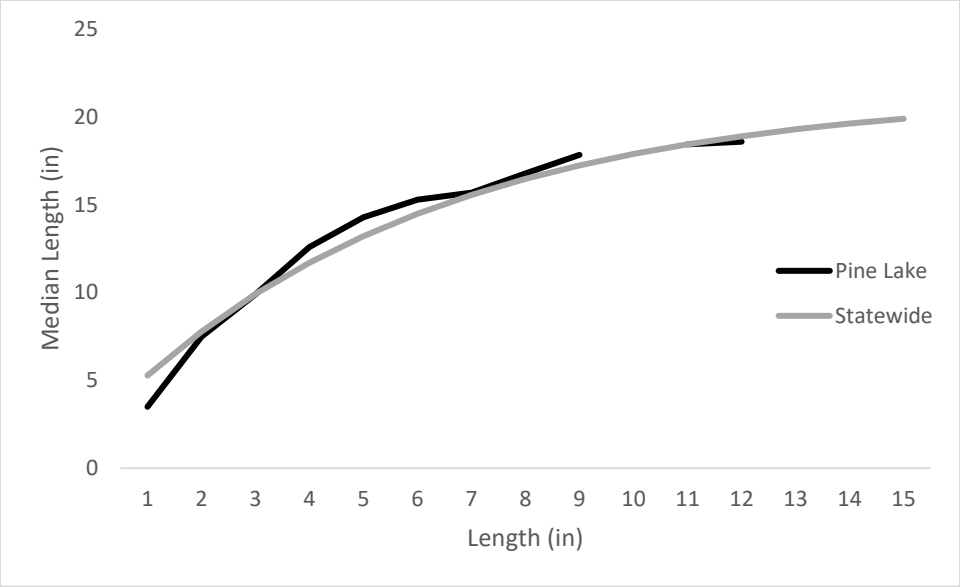

Figure 7. Median length at age of Largemouth Bass in Pine Lake, St. Croix County, Wisconsin in 2022 and statewide median length at age of Largemouth Bass in Complex Warm Dark Lakes in Wisconsin.

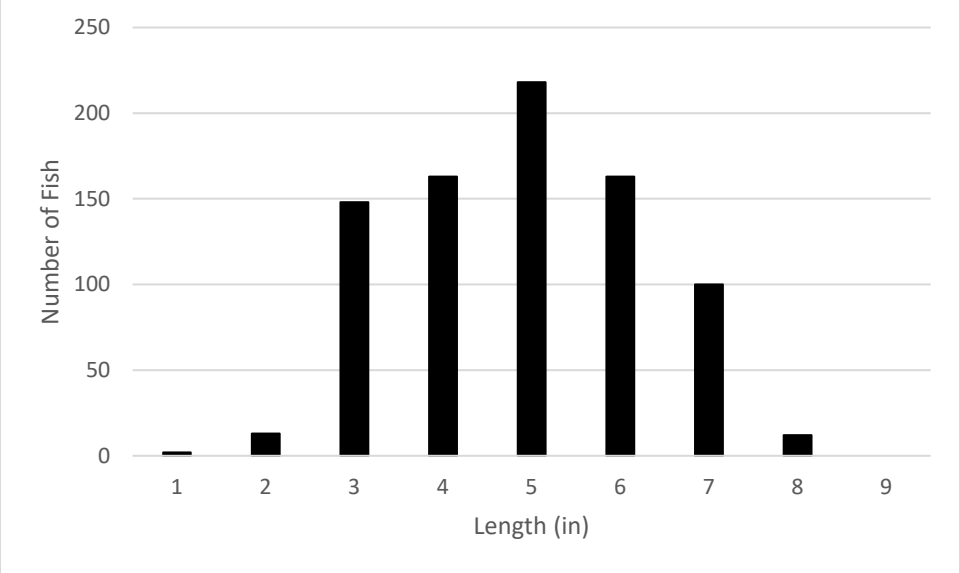

Figure 8. Length frequency distribution of Bluegill in Pine Lake, St. Croix County, Wisconsin in 2022.

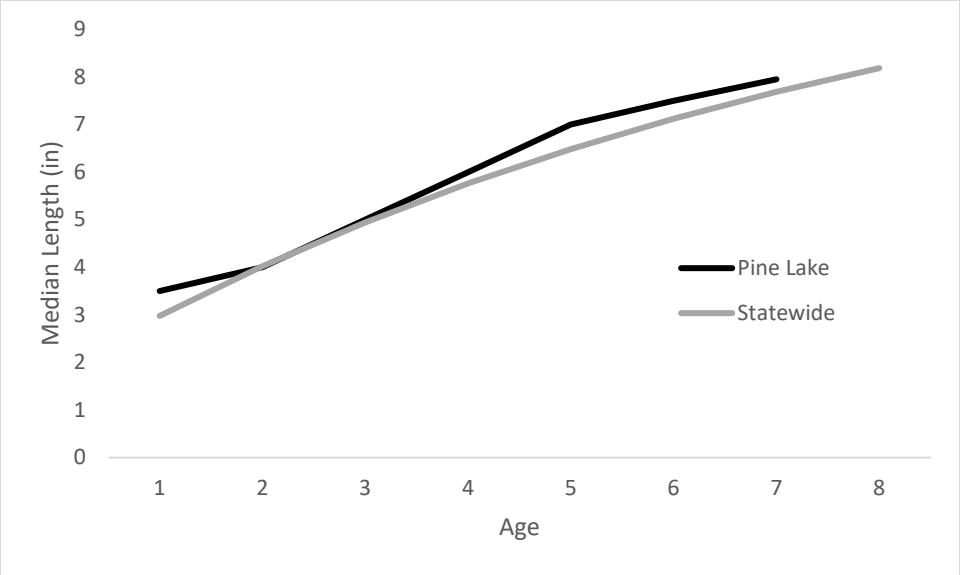

Figure 9. Median length at age of Bluegill in Pine Lake, St. Croix County, Wisconsin in 2022 and statewide median length at age of Bluegill in Complex Warm Dark Lakes in Wisconsin.

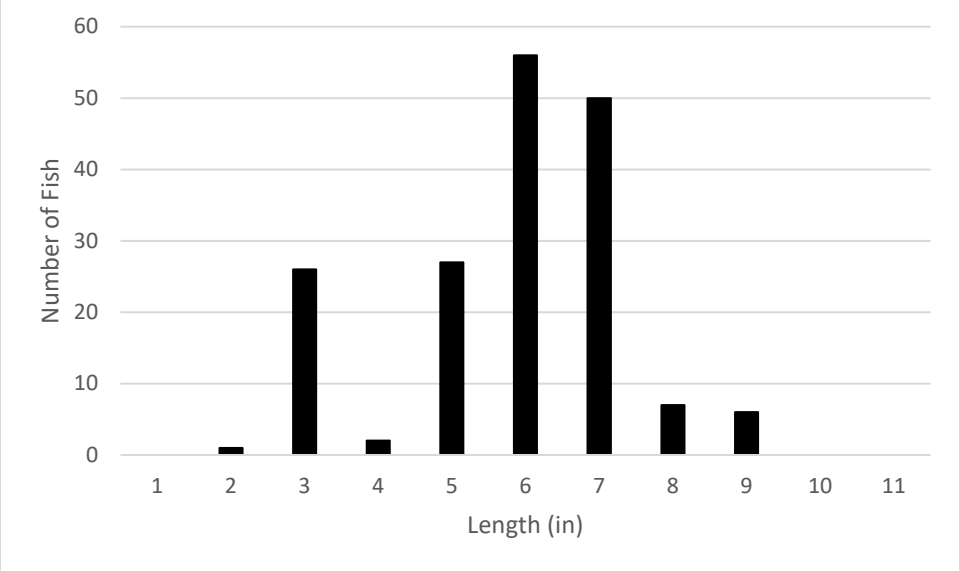

Figure 10. Length frequency distribution of Black Crappie in Pine Lake, St. Croix County, Wisconsin in 2022.

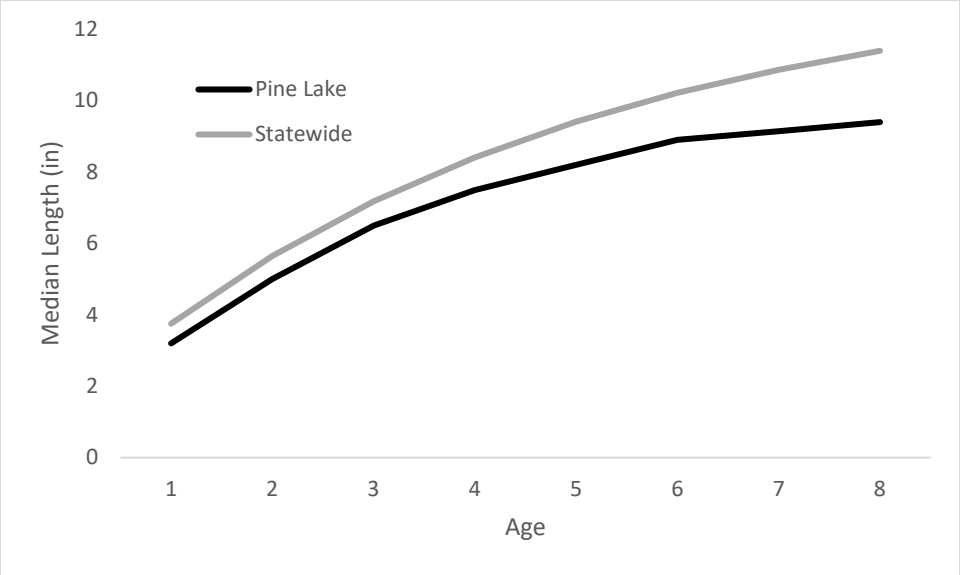

Figure 11. Median length at age of Black Crappie in Pine Lake, St. Croix County, Wisconsin in 2022 and statewide median length at age of Black Crappie in Complex Warm Dark Lakes in Wisconsin.

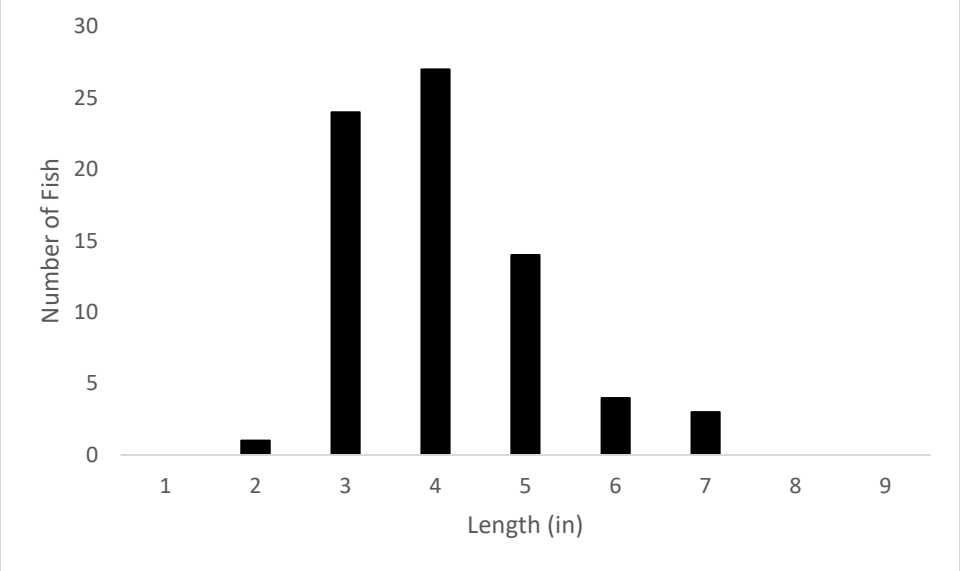

Figure 12. Length frequency distribution of Yellow Perch in Pine Lake, St. Croix County, Wisconsin in 2022.

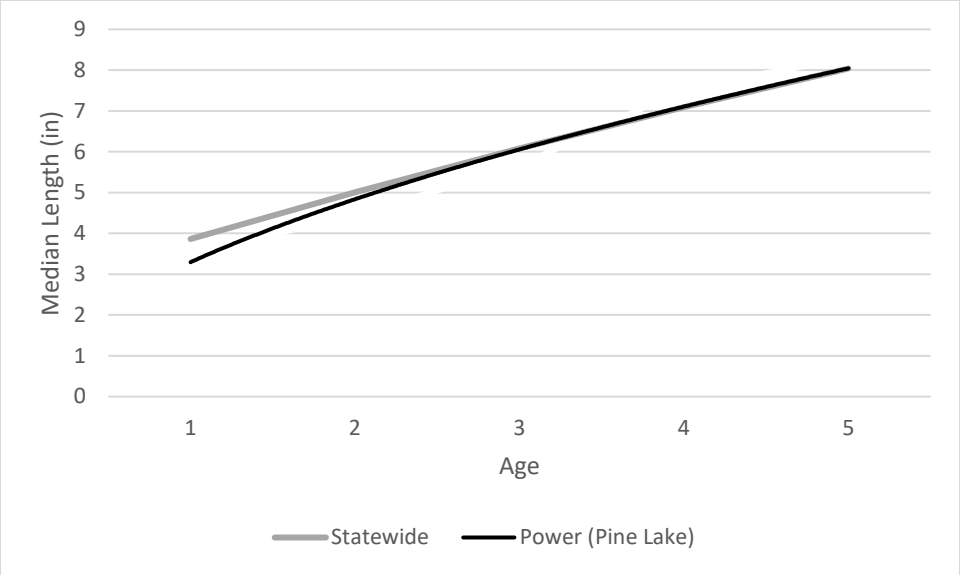

Figure 13. Median length at age of Yellow Perch in Pine Lake, St. Croix County, Wisconsin in 2022 and statewide median length at age of Yellow Perch in Complex Warm Dark Lakes in Wisconsin.

Table 1. Abundance, number collected and length characteristics of fish species in Pine Lake (Baldwin), St. Croix County in 2022. Number in parentheses in Catch Rate column is the percentile for Complex Warm Dark Lakes in Wisconsin.

SPECIES	MEAN LENGTH (IN)	MAX LENGTH (IN)	N	CATCH RATE OR POPULATION ESTIMATE
Walleye	14.2	27	322	2.1/acre
Northern Pike	23.3	39.7	557	5.4/acre; 10.1/net night (90)
Largemouth Bass	12.9	21.8	433	63.7/mile (75)
Bluegill	5.1	8.9	737	737/mile (95)
Black Crappie	6.3	10.1	308	157/mile
Yellow Perch	4.8	8.5	505	6.3/net night (75)
Black Bullhead			18	
Creek Chub			1	
Golden Shiner			4	
Pumpkinseed			6	
White Sucker			7	

Discussion

The Walleye population has greatly expanded since the 2014 survey. During 2014, catch rates were very low with only 20 fish captured in the entire survey. The likely cause of the now abundant population is the extended growth fingerling stocking that has resulted in increased survival and recruitment of Walleye in Pine Lake. Pine Lake was initially stocked with extended growth walleye fingerlings in 2013 as part of the Wisconsin Walleye Stocking Initiative study (WSI). The study is currently ongoing with conclusive results expected in 2026. The foremost goals of this study were to first, determine if natural reproduction could be established or re-established in once naturally reproducing Walleye populations and secondly, to determine if

fishable populations (> 1.5 adults/acre) of Walleye could be established. Additionally, effects of stocking rates and lake characteristics would be evaluated. While Pine Lake does not contain attributes that allow for a naturally reproducing Walleye population, a moderately abundant Walleye population has been established as a result of the extended growth fingerling stocking. Initial results of the WSI study have indicated that Walleye stocking success increases with decreasing water clarity and high nutrient loads. Poor water quality and turbidity in Pine Lake has likely influenced the success of this stocking.

Prior to 2013, Walleye were inconsistently stocked as small and large fingerlings. Some evidence of survival from those years classes is still apparent in 2022. Maximum age of Walleye in Pine Lake in 2022 was age-17. Age analysis revealed a missing 2017-year class of Walleye. This may have been due to a significantly smaller average length of stocked fish in 2017 (4 inches at time of stocking). Average length of extended growth fingerlings generally averages 7-8 inches. With the increase in the Largemouth Bass and Northern Pike populations, small fingerlings or small extended growth fingerlings may no longer be effective in Pine Lake. Walleye exhibited average growth rates and excellent size structure and fish were in good condition. Harvest of Walleye is extremely low based on tag return data (5% exploitation). Many anglers that reported tags were not aware that Walleye were present in Pine Lake. Because natural reproduction of Walleye is unlikely, the Walleye fishery should be managed as a put-grow-take fishery.

Similar to Walleye, the Northern Pike population has continued to grow in Pine Lake and the species is now abundant. Northern pike population was estimated at 4.4/acre in 2014 and is currently at 5.4/acre. Despite increases in abundance, condition of fish was good and size structure was similar to the previous survey with RSD-P of 32 in 2014 and RSD-P of 39 in 2022. Average length of Pike has slightly declined from 2014 (26.4 in) to 2022 (23.3 in). However, growth rates of Northern Pike were below average. This likely indicates density dependent factors beginning to take effect resulting from high stocking rates. Some natural reproduction was documented, indicating natural reproduction is possible and present during some years but is likely inconsistent and at rates too low to sustain the population. Therefore, stocking is needed to maintain the fishery. The stocking rate should be reduced to reduce overall abundance of Northern Pike which will aid in improving size structure and growth rates.

The Largemouth Bass population appears to have made a rebound since the 2014 survey in which abundance had been on a declining trend from surveys in 2003 and 2007. In 2022, Largemouth Bass were in high abundance and exhibited excellent size structure and average growth rates. Largemouth Bass experienced a dramatic increase in relative abundance from 8.2/mile (25^{th} percentile) in 2014 to 63.7/mile (75^{th} percentile) in 2022. With the increase in densities of Bass, the average length of fish has declined from 13.8 inches in 2014 to 12.9 inches in 2022. Size structure appears to be declining with fewer fish larger than 14 inches and lower PSD values relative to the 2014 survey. Only 9% of fish were larger than 18 inches in 2022 while 15% were larger than 18 inches in 2014. Fish are still in excellent condition with average

growth rates. Similar to Walleye, the 2017-year class was missing as documented by age analysis.

Bluegill and Yellow Perch exhibited similar population demographics relative to the 2014 survey with good growth, good condition, consistent recruitment coupled with relatively poor size structure and few large individuals. While Bluegill were highly abundant, growth rates were good and evidence of density dependence was not apparent. The poor size structure of panfish is very likely due to high angler harvest rates. Only 1% of Bluegills were larger than 8 inches and there were no Yellow Perch larger than 10 inches. Contrastingly, Black Crappie were in low abundance and exhibited poor growth, similar to results from the 2014 survey. In 2022, Black Crappie were documented to require 7 years to reach 9 inches in length and 12 years to reach 10 inches with very few fish from older year classes present in the sample. Overall, Black Crappie in Pine Lake require approximately 2 additional years to reach 9 inches than Black Crappie statewide. Slow growth rates indicate that fish are not reaching harvestable size and are dying of old age or natural mortality before they reach harvestable size. Despite the presence of winter aeration to provide adequate dissolved oxygen levels, dissolved oxygen may still be an issue in winters with longer than average periods of ice cover coupled with snow cover. Centrarchid species, including Black Crappie are particularly sensitive to low levels of dissolved oxygen (Moore 1942) and stress during winter months resulting from low dissolved oxygen may negatively influence growth rates. Fluctuating water levels in Pine Lake may have a larger impacts on Black Crappie than other species. Black Crappie are sensitive to fluctuating water levels and low water levels in winter may negatively impact year class strength in reservoirs (Maceina and Stimpert 1998; Maceina 2003). While Pine Lake is a seepage lake and water levels are not artificially controlled, water levels tend to drastically fluctuate based on runoff and the lake was previously impacted by sinkholes in the lakebed. Fluctuating water levels and low water during winter months may explain the variations in recruitment of Black Crappie in Pine Lake.

The reduction in panfish bag limits in 2008 from 25 to 10/day has not resulted in an improvement in size structure for panfish in Pine Lake. With a poor Black Crappie fishery and Yellow Perch in low abundance, improvement of the Bluegill fishery is recommended based on the habitat potential of the lake. Overharvest of larger individuals is likely resulting in low abundance of larger panfish. Pine Lake may be a candidate for experimental panfish regulations to aid in improvement of size structure for Bluegills.

Recommendations

1. Northern Pike stocking should continue on an alternate year basis at a reduced rate of 1/acre.
2. Largemouth Bass harvest is encouraged to aid in improvements in size structure and growth rates.
3. Walleye harvest is encouraged, and the fishery should be managed as a put-grow-take fishery.

4. Maintaining the winter aeration system is recommended to aid in sustaining the fishery in winter.

References

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