

**Random Lake**  
**2018 Comprehensive Fishery Survey Report**  
**Sheboygan County, Wisconsin**  
**WBIC 30300**



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## Executive Summary

In 2018, a comprehensive fishery survey was conducted on Random Lake using a variety of sampling methods throughout the open water period in attempt to sample the major components of the fishery. The objectives of the survey were to 1) assess the status of the fishery, 2) attain population estimates for Northern Pike (*Esox lucius*), Muskellunge (*Esox masquinongy*) and Walleye (*Sander vitreus*), 3) evaluate stocking success of small fingerling Walleye, and 4) update management recommendations for the fishery of Random Lake. The results of the 2018 survey were compared to lakes with similar characteristics.

Eighty-eight Northern Pike were sampled during the 2018 spring netting (SNI) fyke net survey for a catch rate of 0.40/net night. The mean length was 25.2 inches, with a maximum length of 33.3 inches. Too few Northern Pike were sampled in 2018 to estimate the population abundance in Random Lake.

The Bailey modification of the Petersen Method adult population estimate for Muskellunge in Random Lake was 242 (95% CI [138-491]), equaling 1.2/acre. Muskellunge between ages three and six have higher growth rates than the statewide average, but growth rate from age seven and older is similar or lower than the statewide average. The average relative weight of Muskellunge sampled in 2018 was 78 with no fish at or above 100, indicating sub-optimal body condition. The slower growth rates for fish older than age six coupled with poor body condition may indicate a possible overabundance of Muskellunge in the lake.

Two hundred eighty-one Walleye were netted during the 2018 SNI fyke net survey for a catch rate of 2.50/net night. The fyke netting catch rate for Walleye is above average when compared to lakes across the state with similar characteristics (warm water temperatures and turbid water). The average length of Walleye sampled during the spring fyke netting survey was 20.4 inches, with a maximum length of 26.5 inches. The Schnabel population estimate for adult Walleye in 2018 was 417 (95% CI [368-481]), equaling 2.0/acre. The growth rate of Walleye in Random Lake is above the statewide average, with female Walleye reach legal harvestable size (18-inches) by age four and males by age six.

During the 2018 comprehensive fishery survey 172 Largemouth Bass (*Micropterus salmoides*) were captured, with the majority (n=112) sampled by spring electrofishing (SEII) with a catch rate of 25.5/mile. This catch rate is above average when compared to lakes with similar characteristics (warm water temperatures and turbid water) across the state. The average

length of Largemouth Bass sampled during the 2018 SEII survey was 11.5 inches, with a maximum length of 18.4 inches.

The growth rates of Bluegill (*Lepomis macrochirus*), Black Crappie (*Pomoxis nigromaculatus*) and Yellow Perch (*Perca flavescens*) in Random Lake were below the statewide average for all year classes. Panfish populations in Random Lake continue to be slow-growing and overabundant. Excessive, dense submerged aquatic vegetation may likely be influencing Bluegill growth rate and population size structure as it creates a refuge from Largemouth Bass predation.

Management of the fish community in Random Lake poses many challenges, including extensive aquatic vegetation, heavy fishing pressure and balancing the desires of anglers who target the different top-level predators. The extensive amount of aquatic vegetation is most likely the cause for the overpopulated, stunted panfish populations in Random Lake. Possible overstocking and the lack of protein rich forage could be the cause for the poor body condition of Muskellunge in Random Lake. Small fingerling Walleye stocking is a success and should continue, but natural reproduction of Walleye should be evaluated further.

Management recommendations include:

1. Consider targeted aquatic plant treatments in order to control non-native aquatic plants including Eurasian Watermilfoil (*Myriophyllum spicatum*) and Curly-Leaf Pondweed (*Potamogeton crispus*). Dense submerged aquatic vegetation may influence Bluegill growth rate and population size structure as it creates a refuge from predation.
2. Continue biennial stocking of small fingerling Walleye and continue to evaluate natural reproduction and recruitment to determine future stocking needs.
3. Evaluate the effectiveness of the county-wide 18-inch minimum length, three fish daily bag limit Walleye regulation change implemented in 2018. Assess changes to the Walleye population and adjust regulation if needed.
4. Continue stocking large fingerling Muskellunge but reduce the rate and frequency to every other year at a rate equivalent to 0.5/acre.
5. Consider changing the Largemouth Bass regulation from the current statewide regulation of a 14-inch minimum, five fish daily bag limit to a higher minimum

length limit. Given the sharp decline in Largemouth Bass above the harvestable size of 14 inches, and the above average catch rate, excellent body condition and decent growth rate observed in the 2018 survey, instituting a higher minimum length limit may improve size structure by increasing the number of larger fish in the population. A higher minimum length limit will also provide Largemouth Bass additional years to spawn by protecting mature adults from harvest.

6. Further assess Black Crappie and Yellow Perch populations if new sampling protocols are developed. The panfish populations in Random Lake offer important public fishing opportunities.
7. Move the Random Lake comprehensive survey from an eight-year rotation to a six-year rotation to better understand the effect of the 2018 Walleye regulation change and potential changes in Muskellunge stocking frequency.

## **Introduction**

Random Lake is a 212-acre drainage-headwater lake in southern Sheboygan County. It is located near the Sheboygan County and Ozaukee County line in the village of Random Lake and is considered a headwater lake because the lake's watershed is less than four square miles. Random Lake has 4.3 miles of shoreline, a maximum depth of 22 feet, and mean depth of six feet (Figure 1). The mean summer Trophic State Index (Secchi Tube) for Random Lake over the last five years was 58, indicating a eutrophic status. For a shallow headwater lake this is considered "good" rating. Water clarity is low and is impacted by resuspension of sediments because the lake does not thermally stratify in the summer months. Invasive species, especially non-native aquatic plants, are a continual problem including Curly-Leaf Pondweed, Eurasian Watermilfoil, Narrow-Leaf Cattail (*Typha angustifolia*), and Spiny Naiad (*Najas Marina*).

Most of the Random Lake shoreline is developed with either year-round or seasonal houses. The northeast corner of the lake and a small section on the east shore are the only undeveloped areas, which are primarily marsh land dominated by cattails. Random Lake receives heavy boating and fishing use, especially in summer. In addition, winter fishing pressure is high. Being one of two lakes in Sheboygan county that has a Muskellunge population, the Between the Lakes Chapter of Muskies Inc. is very active in Muskellunge management of Random Lake.

The Sheboygan Walleye Club and the Random Lake Rod and Gun Club are also active clubs with interest in the lake.

During 2013 and 2014, Random Lake was part of a statewide research project that assessed growth, condition and short-term survival of Muskellunge reared on different diets at Wild Rose State Fish Hatchery. Each year Random Lake received 105 large fingerling Muskellunge reared on natural prey (minnow only [MO]) and 105 reared intensively on pellets and finished extensively on minnows (minnow finished [MF]). Average condition at stocking was higher for MO fish compared to MF fish both years. Minnow-only fish were also significantly larger (both length and weight) at stocking than MF fish both years. Fall electrofishing catch rates were used to assess short-term (2–6 weeks) post-stocking survival. Statewide catch results from both years suggested that survival was higher for MO fish (Vaske et al 2017). Catch results both years at Random Lake suggested that short-term survival was nearly even. This study was important in assessing the viability of rearing Muskellunge on cost saving formulated feeds.

Random Lake supports populations of Muskellunge, Northern Pike, Walleye, Largemouth Bass and a variety of panfish species. Small fingerling Walleye have been stocked biennially in Random Lake since 1998 and large fingerling Muskellunge have been stocked frequently in Random Lake since 1990 (Table 1). Numerous fish surveys have been conducted on Random Lake with the earliest dating back to 1954; although a full comprehensive fishery survey had not been conducted on the lake since 1996. Most of the recent surveys were fall night electrofishing surveys to evaluate Walleye and Muskellunge stocking.

In 2018, a comprehensive fish survey was conducted on Random Lake using a variety of sampling methods throughout the open water period in attempt to sample the major components of the fishery. The objectives of the survey were to 1) assess the status of the fishery, 2) attain population estimates for Walleye and Muskellunge, 3) evaluate stocking success of small fingerling Walleye, and 4) update management recommendations for the fishery of Random Lake.

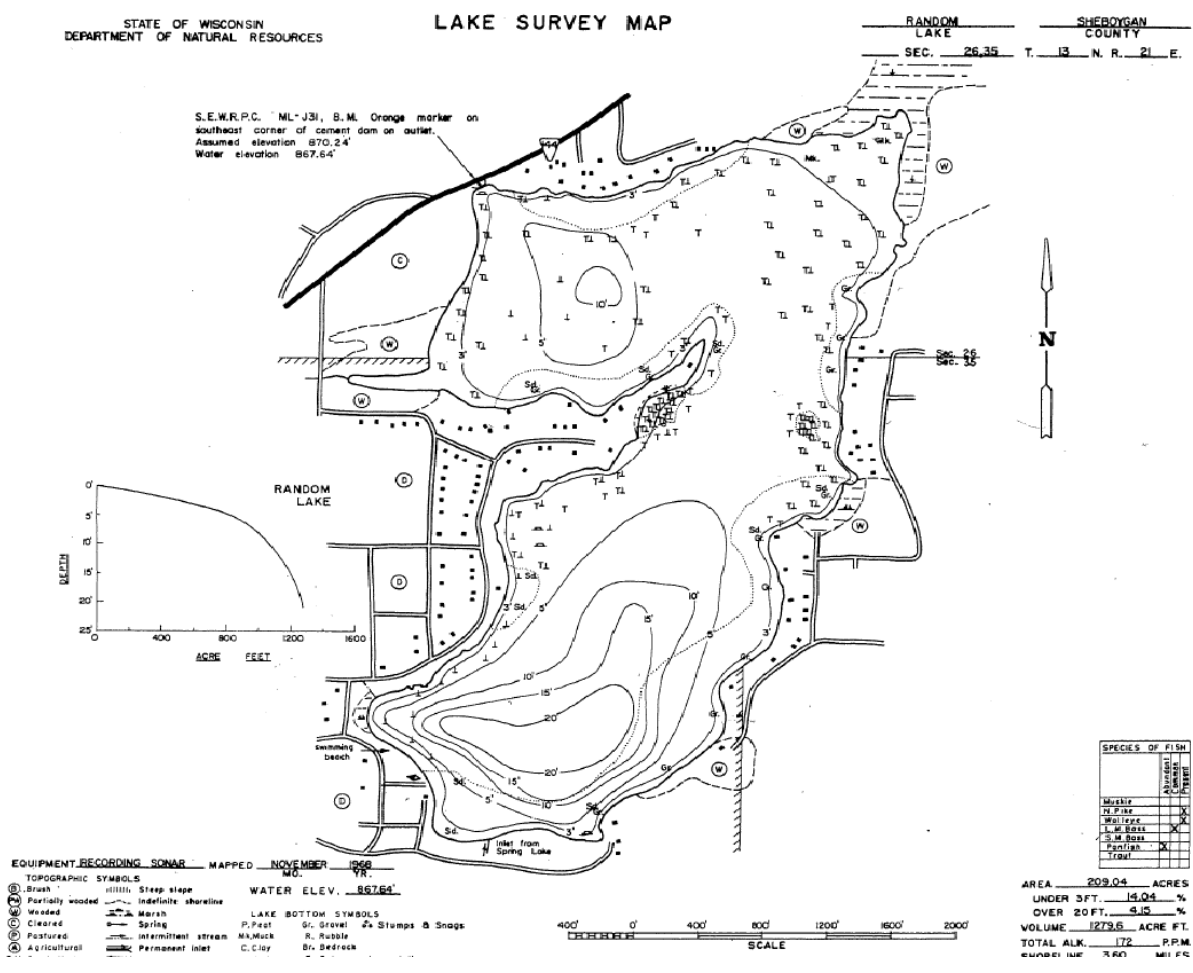


Figure 1. Lake survey map of Random Lake, Sheboygan County, Wisconsin.

Table 1. Number of fish stocked in Random Lake since 1991, by year, species, age class, and source type.

Year	Species	Age Class	Number of Fish Stocked	Source Type
2018	Muskellunge	Large Fingerling	106	DNR
2018	Walleye	Small Fingerling	7,305	DNR
2017	Muskellunge	Large Fingerling	106	DNR
2017	Walleye	Large Fingerling	1,000	PRIVATE
2016	Muskellunge	Large Fingerling	209	DNR
2014	Walleye	Small Fingerling	7,499	DNR
2014	Walleye	Large Fingerling	1,000	PRIVATE
2014	Muskellunge	Large Fingerling	210	DNR
2013	Muskellunge	Large Fingerling	210	DNR
2012	Walleye	Small Fingerling	5,635	DNR
2011	Muskellunge	Large Fingerling	419	DNR
2010	Walleye	Small Fingerling	7,315	DNR
2009	Walleye	Large Fingerling	1,445	PRIVATE
2008	Walleye	Large Fingerling	1,010	PRIVATE
2008	Walleye	Small Fingerling	7,322	DNR
2007	Muskellunge	Large Fingerling	279	DNR
2006	Walleye	Small Fingerling	7,315	DNR
2004	Muskellunge	Large Fingerling	418	DNR
2004	Walleye	Small Fingerling	20,900	DNR
2003	Muskellunge	Large Fingerling	500	PRIVATE
2003	Muskellunge	Large Fingerling	419	DNR
2002	Walleye	Small Fingerling	17,710	DNR
2001	Muskellunge	Large Fingerling	419	DNR
2000	Walleye	Small Fingerling	20,900	DNR
1998	Walleye	Small Fingerling	21,230	DNR
1997	Muskellunge	Large Fingerling	1,045	DNR
1996	Northern Pike	Fingerling	902	DNR
1995	Walleye	Fingerling	14,950	DNR
1995	Northern Pike	Fingerling	1,045	DNR
1995	Muskellunge	Fingerling	236	DNR
1994	Northern Pike	Fingerling	1,045	DNR
1993	Muskellunge	Fingerling	375	DNR
1993	Northern Pike	Fingerling	2,182	DNR
1992	Northern Pike	Fingerling	1,045	DNR
1992	Muskellunge	Fingerling	410	DNR
1992	Walleye	Fingerling	10,450	DNR
1991	Muskellunge	Fingerling	300	DNR
1991	Walleye	Fingerling	5,225	DNR
1991	Northern Pike	Fingerling	1,077	DNR

## Methods

### Data Collection

Eight white nylon 0.75-inch bar mesh fyke nets were set on Random Lake to target spawning Northern Pike and Walleye (Spring Netting I, (SNI)) and Muskellunge (Spring Netting II, (SNII)). Nets were checked daily from March 27 to May 3, except for March 30 through April 4, April 13 through April 19, and April 24 when the nets were left open due to inclement weather. Water temperature on the first day of SNI was 38 degrees Fahrenheit and at the conclusion of SNI the water temperature was 55 degrees Fahrenheit. Average water temperature throughout SNI was 45 degrees Fahrenheit. All gamefish netted were measured to the nearest 0.1 inch. Additionally, weight was measured to the nearest 0.1 pound on all Northern Pike, Muskellunge, and Walleye netted. To estimate the population abundance of Northern Pike, Muskellunge, and Walleye in Random Lake, all male Northern Pike, Muskellunge, and Walleye netted were marked with a left ventral fin clip, all female Northern Pike, Muskellunge, and Walleye netted received a right ventral fin clip, and any unknown sex Northern Pike, Muskellunge, and Walleye netted received a top caudal fin clip. In addition, all Muskellunge were implanted with a Passive Integrated Transponder (PIT) tag in the dorsal musculature. Each PIT tag contained a unique identification number, to allow tracking of individual fish through time. All Northern Pike, Muskellunge, and Walleye netted were observed for fin clips from previous surveys and Muskellunge were scanned for previous PIT tags. Additionally, age structures were removed from Northern Pike, Muskellunge, and Walleye according to standard sampling protocols. These protocols include removing an anal fin ray from Northern Pike and Muskellunge and a dorsal spine from Walleye greater than 12 inches in length and a scale sample from Walleye less than 12 inches in length. Aging structures were collected until five structures were collected for each species and each sex for every half-inch increment. A subsample of Bluegill, Black Crappie, Yellow Perch, Pumpkinseed (*Lepomis gibbosus*) and Green Sunfish (*Lepomis cyanellus*) were measured to the nearest 0.1 inch and vouchered for collection of ageing structures (otoliths). Other fish species encountered were identified to species and counted.

Spring electrofishing (SEI) using a Wisconsin Department of Natural Resources (WDNR) standard pulsed direct current (PDC) boom shocker boat was conducted at night on April 17 and April 23. SEI sampling encompassed the entire shoreline (~4.3 miles) and



included 4.06 hours of sampling effort. On April 17, sampling began at 1949 and concluded at 2135. Pulsed direct current was used at 140 volts, 8.5 amps, at a pulse rate of 64 per second and 20 percent duty cycle. Water temperature was 37.5 degrees Fahrenheit. On April 23, sampling began at 2012 and concluded at 2230. Pulsed direct current was used at 145 volts and 11 amps, at a pulse rate of 64 per second and a 20 percent duty cycle. Water temperature was 49 degrees Fahrenheit. Both electrofishing sampling periods used two dippers, two probes with a total of 16 droppers, and a dip net bar mesh of 0.375 inches.

The objective of SEI was to count and measure adult Northern Pike and Walleye and record marks for adult Northern Pike and Walleye marked with fin clips during SNI to facilitate the calculation of a population estimates for both species. Largemouth Bass received top caudal fin clips as marks to facilitate the calculation of a population estimate using SEI as the marking sampling. All gamefish sampled were measured to the nearest 0.1 inch and Northern Pike, Muskellunge and Walleye were weighed to the nearest 0.1 pound. Aging structures were collected until five structures were collected for each species and each sex for every half-inch increment.

Spring Electrofishing (SEII) using a WDNR standard PDC boom shocker boat was conducted at night on May 15 targeting Largemouth Bass and panfish species. SEII sampling encompassed the entire shoreline (~4. miles), including four sampling stations totaling 2.2 hours of sampling effort. Pulsed direct current was used at 150 volts and 15 amps, with a pulse rate of 64 per second and 20 percent duty cycle at all stations.

The first sampling station targeting all fish began at 2047, concluded at 2102 (15 minutes of effort) and covered 0.5 miles of shoreline. All fish species were collected and gamefish and panfish were measured to the nearest 0.1 inch. Water temperature was 61 degrees Fahrenheit. The second sampling station targeting only gamefish began at 2145, concluded at 2230 (45 minutes of effort) and covered 1.5 miles of shoreline. The third sampling station targeting all species began at 2300, concluded at 2320 (20 minutes of effort) and covered 0.5 miles of shoreline. The fourth sampling station targeting only gamefish began at 2340, concluded at 0032 (52 minutes of effort) and covered 1.9 miles of shoreline. At stations targeting all species, all fish were collected and gamefish and panfish were measured to the nearest 0.1 inch. Other fish were identified to species and counted. At stations targeting only gamefish, all gamefish sampled were measured to the nearest 0.1 inch and Northern Pike, Muskellunge and Walleye

were weighed to the nearest 0.1 pound. All gamefish were examined for the presence of fin clip marks, or PIT tags from previous surveys. SEII sampling used two dippers, two probes (each with eight droppers), and a dip net bar mesh of 0.375 inches.

During SEII, Largemouth Bass were examined for top caudal fin clip marks to facilitate the calculation of a population estimate using SEII as the recapture sampling. Aging structures were collected from all gamefish until five structures were collected for each species and each sex for every half-inch increment. A subsample of Bluegill, Yellow Perch, Black Crappie, Pumpkinseed, Rock Bass (*Ambloplites rupestris*) and Green Sunfish were measured to the nearest 0.1 inch. Other fish species sampled were identified to species and counted.

Fall electrofishing (FE) using a WDNR standard PDC boom shocker boat was conducted at night on October 31 to assess the abundance and recruitment of young-of-the-year (YOY) and yearling Walleye, Northern Pike and Muskellunge. The FE survey encompassed the entire shoreline (~4.3 miles) and included 1.85 hours of sampling effort. Sampling began at 1807 and concluded at 2003. Pulsed direct current was used at 150 volts, 12 amps with a pulse rate of 64 per second and 20 percent duty cycle. FE sampling used two dippers, two probes with a total of 16 droppers, and a dip net bar mesh of 0.375 inches. Water temperature was 44 degrees Fahrenheit.

Prior to the 2018 comprehensive fish survey, fyke nets were set in 2017 to sample Muskellunge as part of the established two-year fyke netting protocol used to estimate Muskellunge population size. Six fyke nets were set and checked daily from April 18, 2017 to April 24, 2017. All Muskellunge netted were measured and weighed as described above. In addition, all Muskellunge netted received a PIT tag implanted between the pectoral fins and a corresponding pectoral fin clip based on sex: females-right pectoral fin, males-left pectoral fin, unknown sex-top caudal fin clip.

### Data Analysis

Fyke net total catch and catch-per-unit effort (CPUE, #/net night) were calculated for Northern Pike, Muskellunge, and Walleye to estimate relative abundance. The multiple recapture population estimator (Schnabel Method) was used to calculate a population estimate for Walleye with 95% confidence intervals. The Schnabel Method was used instead of the Lincoln-Peterson Method because the SEI night electrofishing recapture survey was ineffective on the lake and the

extended netting data allowed for multiple recaptures over time. Adult Muskellunge population abundance was estimated using the Bailey modification of the Peterson Method; where Muskellunge were marked during fyke netting in 2017 and then recaptured during fyke netting in 2018. Electrofishing total catch and CPUE (#/mile) were calculated for Largemouth Bass, Bluegill, Black Crappie, and Yellow Perch. Length frequency histograms were constructed for Northern Pike, Muskellunge, Walleye, Largemouth Bass, Bluegill, Black Crappie and Yellow Perch to assess size structure.

Relative weight, the ratio of a fish's weight to the weight of a standard fish of the same length based on a scale of 100 was used to assess body condition of Northern Pike, Muskellunge, Walleye and Largemouth Bass. Mean relative weight ( $W_r$ ) was calculated by length group as an index of Northern Pike and Walleye condition using a standard length-at-weight equation (Willis, 1998). Average relative weight was calculated for each species and for each sex separately when sex data were available. Relative weight values between 75 and 100 indicate normal weight for a given length. A relative weight value greater than 100 indicates that a fish is in excellent condition. A relative weight value less than 75 indicates that a fish is in poor condition.

Proportional size distribution (PSD) was also calculated for Northern Pike, Muskellunge, Walleye, and Largemouth Bass to assess population size structure. Stock lengths are based on standardized lengths for each species: Northern Pike (14 inches), Walleye (10 inches), Largemouth Bass (8 inches), Bluegill (3 inches) and Yellow Perch (5 inches) and quality lengths used were Northern Pike (21 inches), Walleye (15 inches), Largemouth Bass (12 inches), Bluegill (6 inches) and Yellow Perch (8 inches). Proportional size distribution-preferred (PSD-P) was also calculated for Northern Pike, Walleye, Largemouth Bass, Bluegill and Yellow Perch to assess the proportion of fish in the population that are a preferred length by anglers. These are based on standardized lengths for each species: Northern Pike (28 inches), Walleye (20 inches), Largemouth Bass (15 inches), Bluegill (8 inches) and Yellow Perch (10 inches) (Anderson and Neuman, 1996).

Relative size distribution-preferred (RSD-P) was also calculated for Northern Pike, Muskellunge, Walleye and Largemouth Bass to assess the proportion of fish in the population that are a preferred length by anglers. These are based on standardized lengths for each species:

Northern Pike (28 inches), Muskellunge (38 inches), Walleye (20 inches) and Largemouth Bass (15 inches) (Anderson and Neuman, 1996).

Growth information from Northern Pike, Muskellunge, Walleye, Largemouth Bass, Bluegill, Black Crappie, Yellow Perch and Pumpkinseed was obtained according to established protocols for each species and included fin rays, dorsal spines and scale samples collected throughout the comprehensive fishery survey. Growth data from Random Lake was compared to average statewide growth rates utilized in the WDNR Fisheries Management Database.

## **Results and Discussion**

### Northern Pike

Eighty-eight Northern Pike were sampled during 2018 SNI for a catch rate of 0.40/net night. The average length was 25.2 inches and the largest fish sampled was 33.3 inches (Figure 2). Four Northern Pike were sampled in 2018 SEI for a catch rate of 0.47/mile. The average length was 24.3 inches and the maximum length was 25.1 inches. One Northern Pike was found to have marks or fin clips from 2018 SNI. Six Northern Pike were sampled during 2018 FE with fish ranging from 7.8 inches to 25.5 inches and average length of 17 inches. None of the six Northern Pike sampled during FE were found to have marks or fin clips from prior surveys. Although the sample size was low, PSD was 96 and the RSD-28 was 21.

A Northern Pike population estimate was not feasible due to the small sample size obtained during SNI. The low capture rate was most likely attributed to the ice thawing from the northeast side of the lake prior to the entire lake becoming ice free, preventing access to sample known Northern Pike spawning habitat.

Northern Pike body condition was very good as suggested by relative weight ( $W_r$ ) values that ranged from 73 to 122, with a mean  $W_r$  of 92 ( $N = 86$ ). Sex specific relative weight for females was very good and ranged from 75 to 117 with a mean  $W_r$  of 93 ( $N = 25$ ). Male sex specific relative weight was excellent and ranged from 76 to 122 with a mean  $W_r$  of 90 ( $N = 41$ ). Relative weight values between 75 and 100 indicate normal weight for a given length and values greater than 100 indicate that a fish is in excellent condition.

Northern Pike in Random Lake had faster growth rate compared to the statewide growth rate (Figure 3). The majority of Northern Pike sampled were between age three and age five; however, this may be biased due to the low number of Northern Pike sampled. Prior to 1995, the Northern Pike regulation on Random Lake was no minimum length with a daily bag limit of five fish. From 1995 to present, the regulation was changed to a 26-inch minimum length limit with a daily bag limit of two fish. The Northern Pike sample size was too low to adequately assess the current regulation on Random Lake, however, 41% of the Northern Pike sampled were of legal size (26 inches).

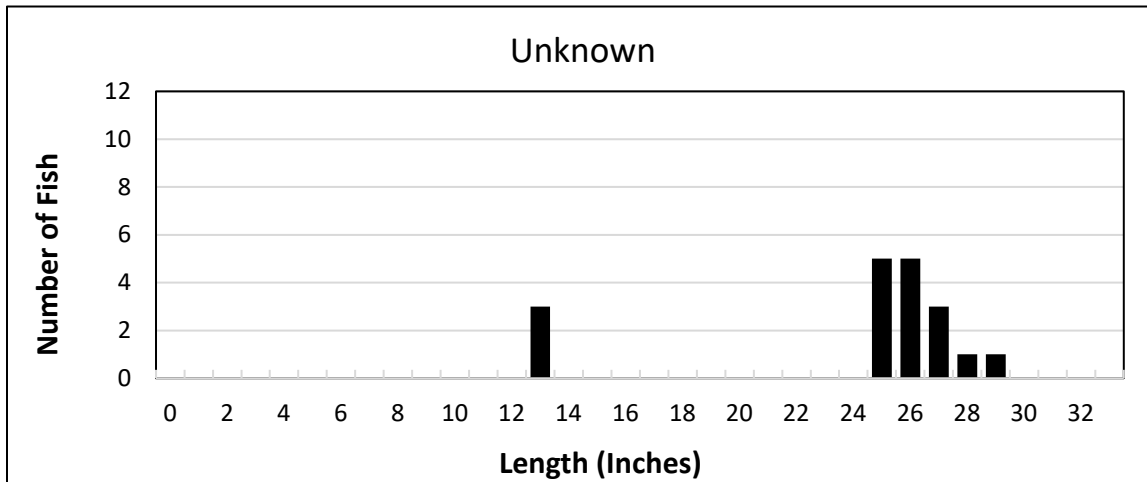
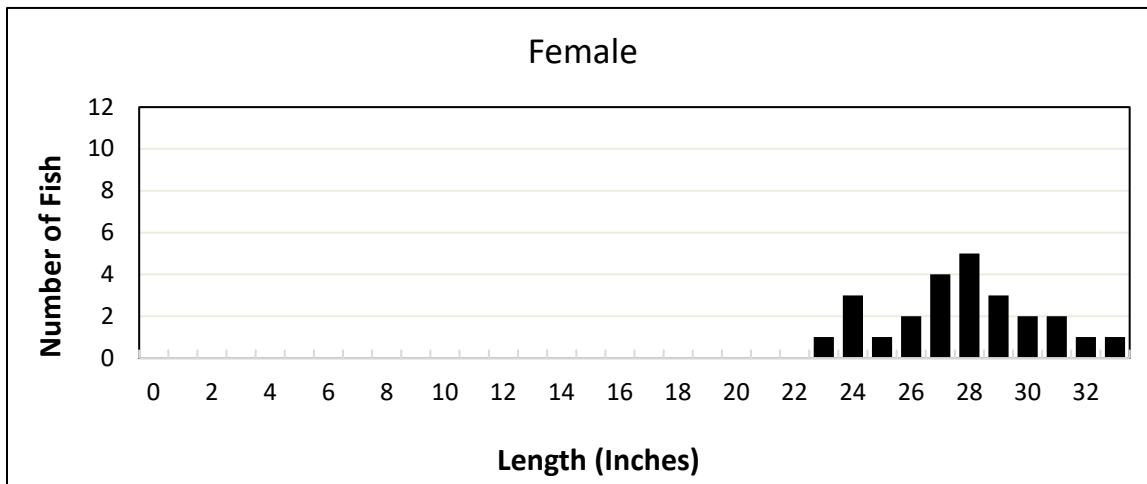
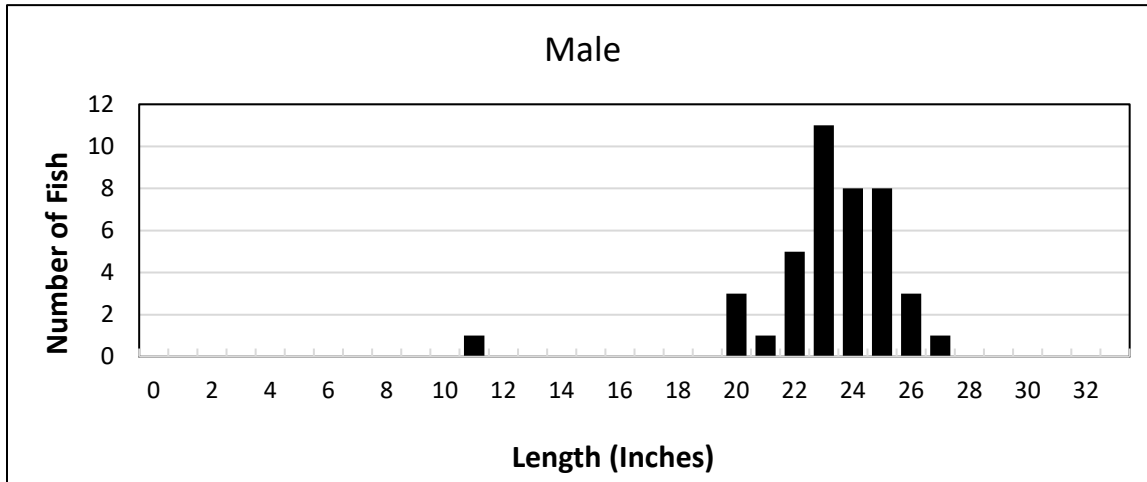


Figure 2. Length-frequency histogram of male, female and unknown sex Northern Pike sampled during the 2018 spring fyke netting survey (SNI) of Random Lake, Sheboygan County.

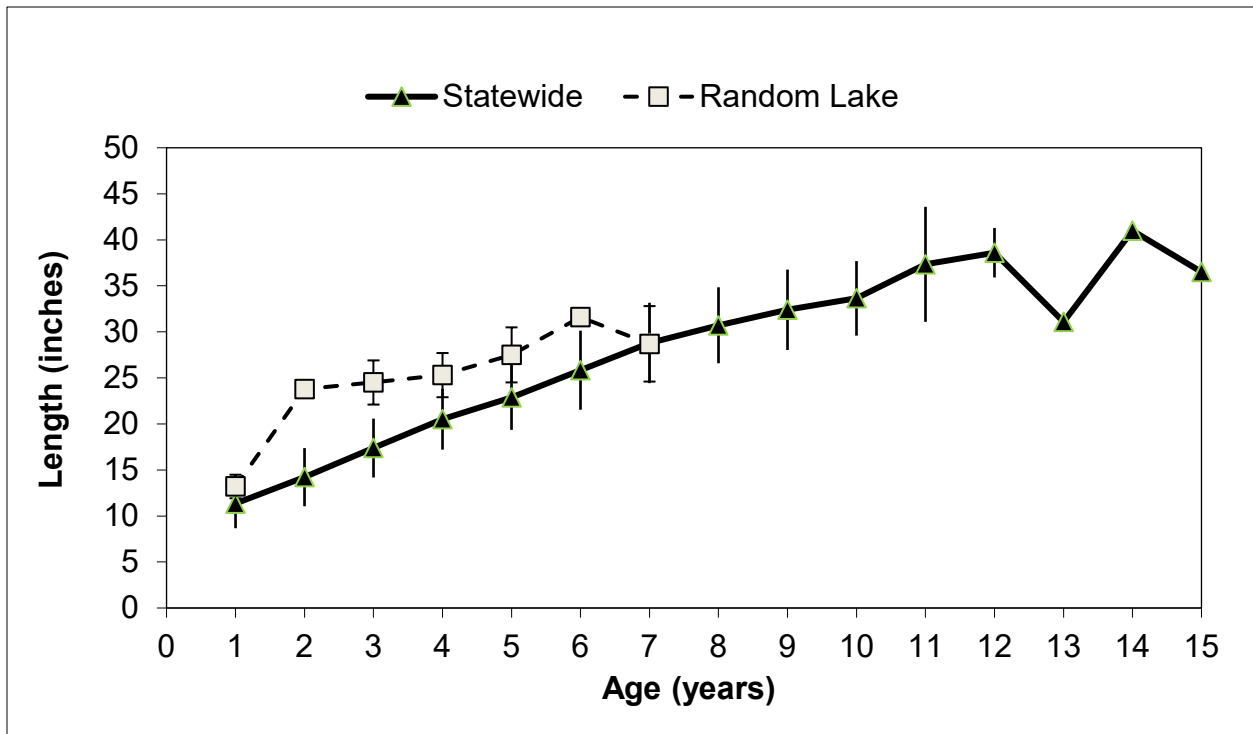


Figure 3. Northern Pike mean length at age determined using anal fin rays collected during the spring 2018 fyke netting survey (SNI) of Random Lake, Sheboygan County.

### Muskellunge

In 2017, fifty-one Muskellunge were sampled during SNI/SNII for a catch rate of 1.70/net night. The average length of Muskellunge sampled in 2017 was 34.5 inches with a maximum length of 44.0 inches (Figure 4). In 2018, forty-three Muskellunge were netted during SNI/SNII for a catch rate of 0.21/net night. The average length of Muskellunge sampled in 2018 was identical to 2017 (34.5 inches) and the maximum length was 41.0 inches (Figure 5). Between the two years, five Muskellunge were netted that were of legal harvestable size of 40 inches. Seven Muskellunge were sampled during 2018 FE with fish ranging from 11.1 inches to 35.8 inches and average length of 17.7 inches. Although the lake's Muskellunge population offers fish that can be legally harvested (40-inches), Random Lake is primarily managed as an action lake for Muskellunge and most anglers do not have a desire to harvest Muskellunge from the lake. Catch per unit effort of Muskellunge in 2018 (0.21/net night) was below average when compared to similar shallow, turbid lakes across the state, but was above average in 2017 (1.70/net night).

The Bailey modification of the Petersen Method adult population estimate for Muskellunge in Random Lake was 242 (95% CI [138-491]), equaling 1.2/acre. Although the sample size was low, the PSD for Muskellunge was 59 and the RSD-P was 9.

Muskellunge body condition was suboptimal as suggested by relative weight ( $W_r$ ) values that ranged from 53 to 98 with a mean  $W_r$  of 78 (N = 40). Sex specific relative weight for females was sub optimal and ranged from 61 to 71 with a mean  $W_r$  of 76 (N = 10). Male sex specific relative weight was suboptimal and ranged from 62 to 98 with a mean  $W_r$  of 79 (N = 17). Relative weight values between 75 and 100 indicate normal weight for a given length. A relative weight value greater than 100 indicates that a fish is in excellent condition. A relative weight value less than 75 indicates that a fish is in poor condition.

Muskellunge between ages 3 and 12 grow faster than or equal to the statewide average, except for ages eight and nine being slightly below the statewide average. Muskellunge over age 12 was limited to one age 15 fish in the 2018 survey. Given the limited statewide data of older age Muskellunge and the sample size of one fish, the age 15 fish measured 44.5 inches, indicating above-average growth rate (Figure 6).

The slow growth rates for fish older than six years old coupled with poor condition of Muskellunge may indicate a possible overabundance of Muskellunge in the lake. Large fingerling Muskellunge stocking should continue; however, the rate and frequency should be reduced given the number of Muskellunge per acre and the poor body condition of Muskellunge sampled. Stocking of large fingerling Muskellunge should occur every other year at a rate equivalent 0.5 Muskellunge/acre.



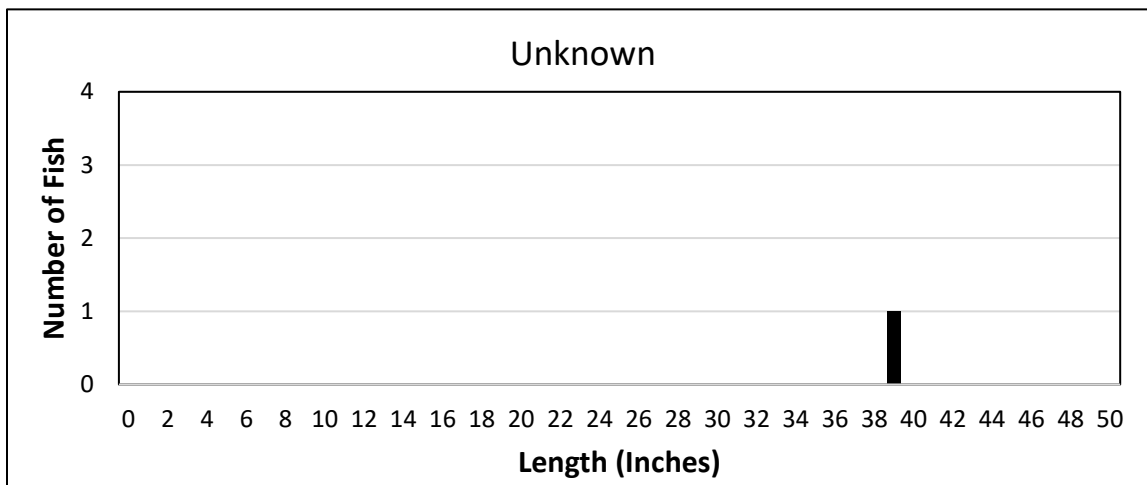
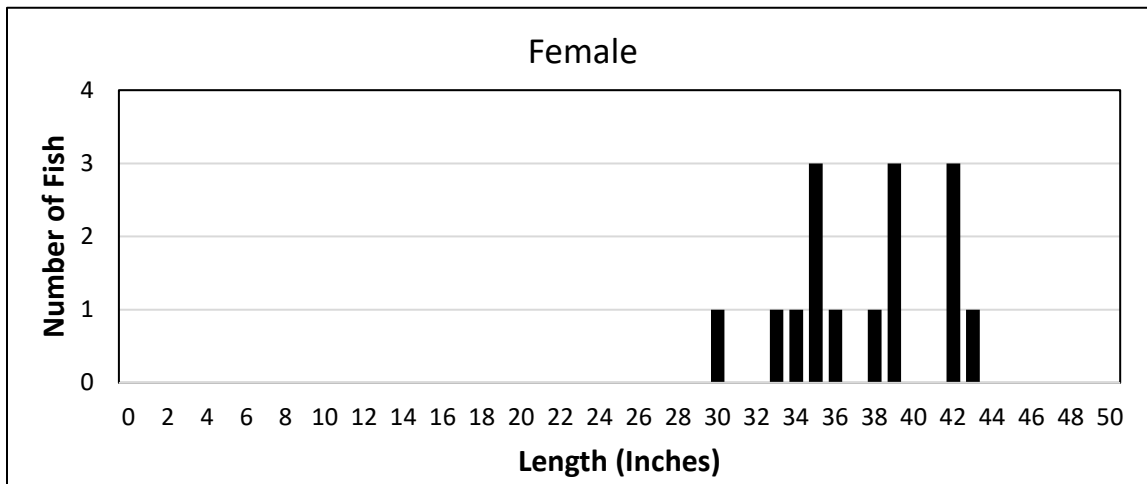
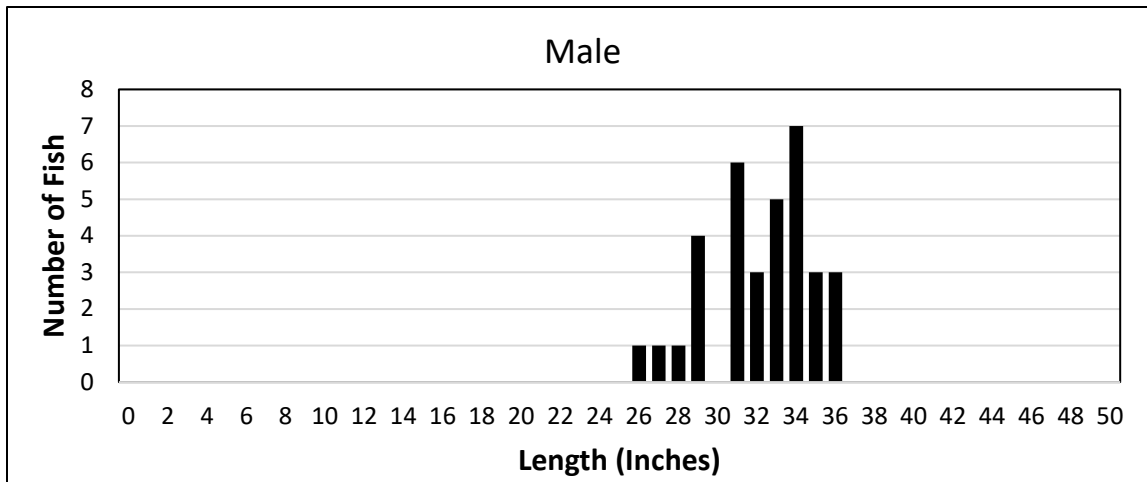


Figure 4. Length-frequency histogram of male, female, and unknown sex Muskellunge sampled during the 2017 spring fyke netting survey (SNI) on Random Lake.

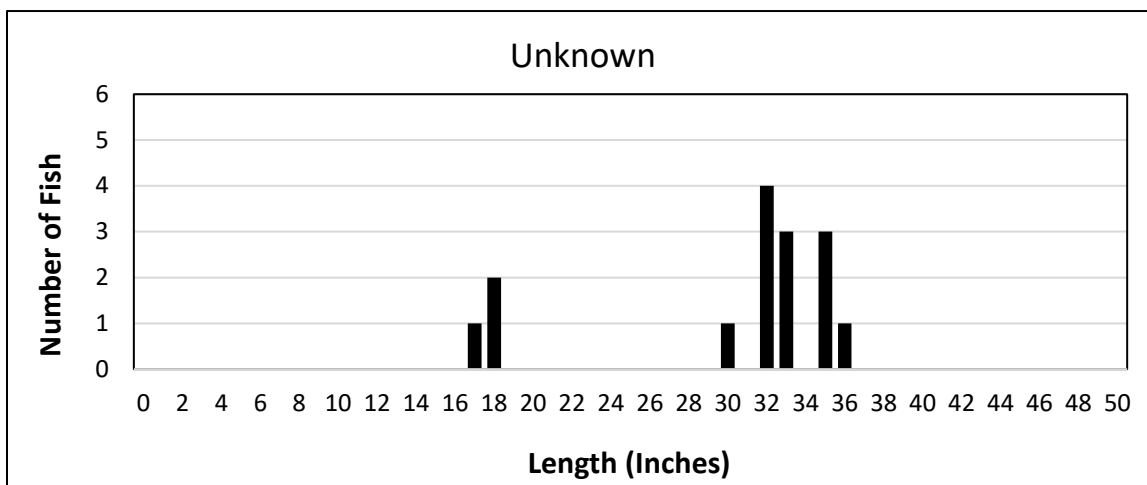
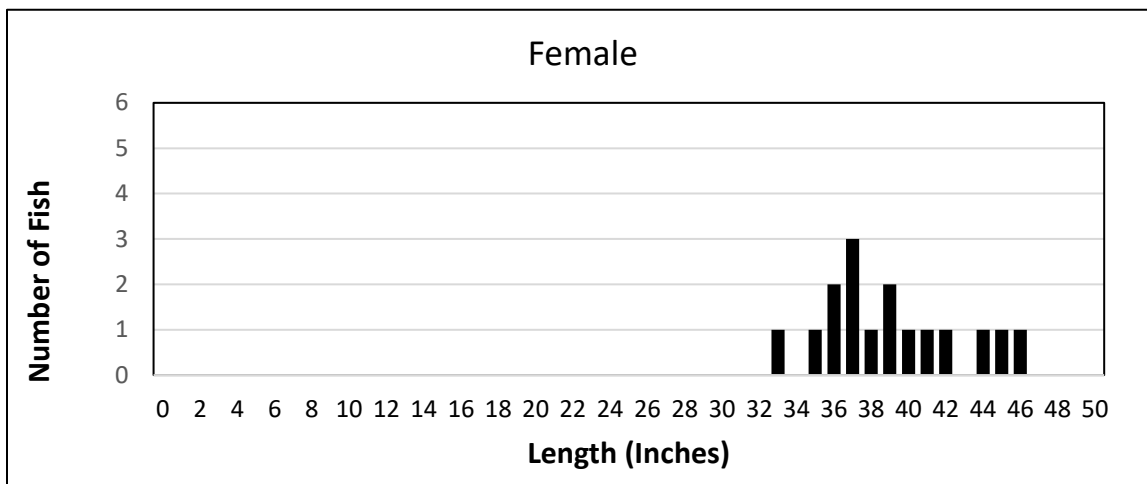
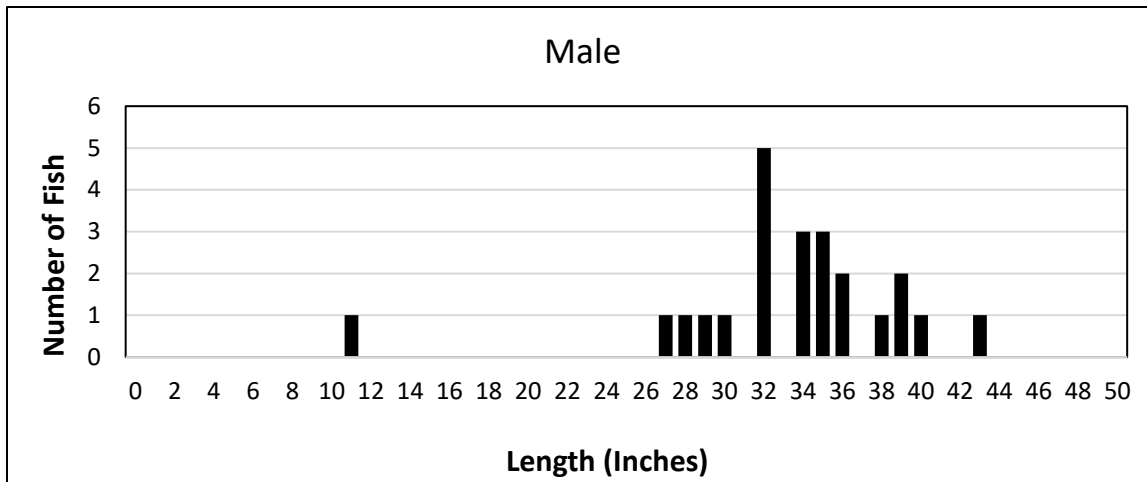


Figure 5. Length-frequency histogram of male, female, and unknown sex Muskellunge sampled during the 2018 spring fyke netting survey (SNI and SNII) on Random Lake.

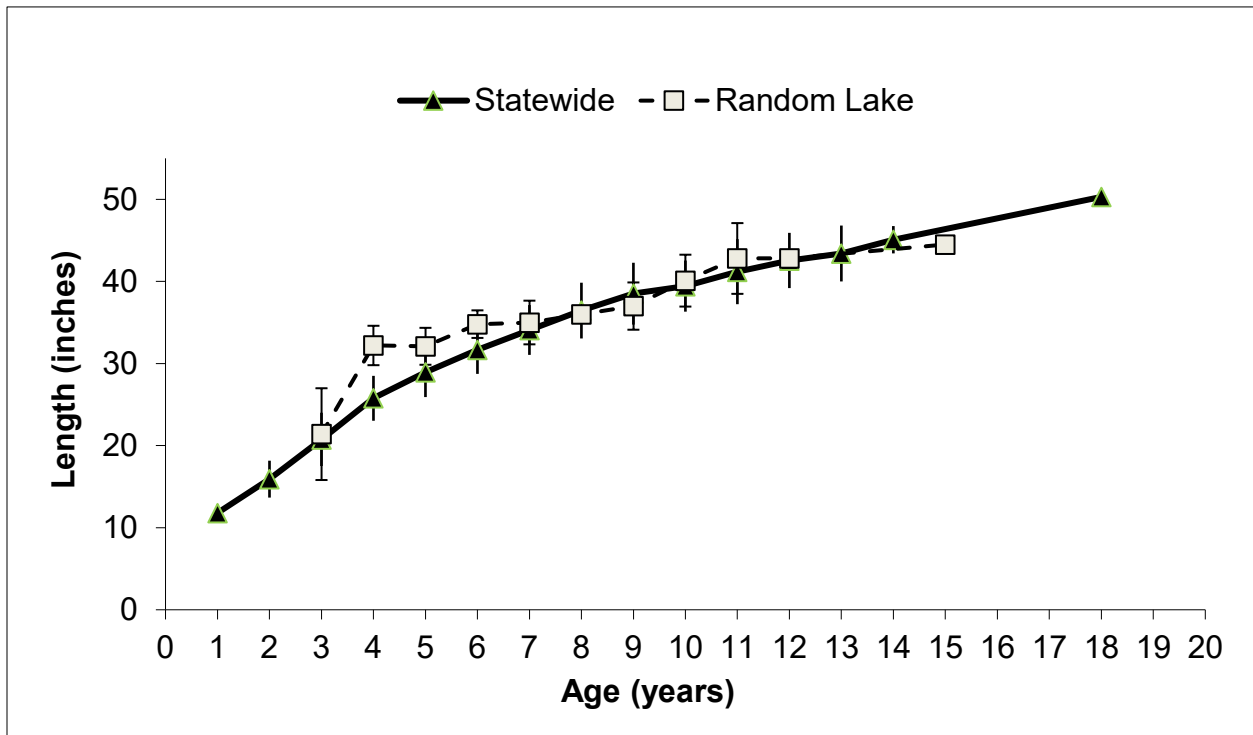


Figure 6. Muskellunge mean length at age determined using anal fin rays collected during the spring 2018 fyke netting survey (SNI) of Random Lake, Sheboygan County.

### Walleye

Two hundred eighty-one Walleye were netted during 2018 SNI for a catch rate of 2.5/net night. The average length of Walleye sampled was 20.4 inches, with a maximum length of 26.5 inches (Figure 7). The largest female sampled was 26.5 inches in length and weighed 7.1 pounds. In addition, 95 Walleye were captured during SEI for a catch rate of 11.1 Walleye/mile. The average length was 19.7 inches with fish ranging from 13.4 inches to 25.6 inches. Thirteen Walleye were sampled in SEII with fish ranging from 13.4 inches to 25.6 inches and average length of 18 inches. Seven of the thirteen Walleye sampled in SEII were found to have marks or fin clips from prior surveys, including five females and two males. Nine Walleye were sampled during FE with fish ranging in length from 10.6 inches to 25.6 inches and average length of 17.3 inches. None of the nine Walleye sampled during FE were found to have marks or fin clips from prior surveys. The SNI catch rate for Walleye is above average when compared to lakes across the state with similar characteristics (warm water temperatures and turbid water). The PSD for Walleye was 100 and the RSD-20 was 55.

In 2018, the adult walleye population size (including sexually mature fish and fish over 15-inches) was estimated at t 417 (95% CI [368-481]), equaling 2.0/acre using the Schnabel population estimate formula.

Walleye body condition as suggested by relative weight ( $W_r$ ) values were very good and ranged from 56 to 134 with a mean  $W_r$  of 93 (N = 335). Sex specific relative weight for females was excellent and ranged from 56 to 134 with a mean  $W_r$  of 98 (N = 160). Male sex specific relative weight was good and ranged from 72 to 134 with a mean  $W_r$  of 89 (N = 168). Relative weight for male Walleye was generally lower than females given the females' spawning condition and presence of eggs at the time of capture.

Walleye in Random Lake grow faster than the statewide average and as expected, female Walleye grow faster and larger than males. On average, female Walleye reach legal harvestable size (18-inches) by age four and males by age six. Random Lake has been stocked biennially with small fingerling Walleye by the DNR and large fingerling Walleye in alternate years by private groups. Correlating aging data from fish collected in 2018 with stocking data, it appears that the strongest year classes of Walleye are from small fingerling stocking events occurring in even years (Table 1; Figure 8). In addition, there appears to be some natural reproduction in the lake, with the presence of all year classes from age 4 to 14 years. (Figure 8).

Biennial stocking of small fingerling Walleye should continue in Random Lake, but more evaluation is needed to determine the amount of natural reproduction and recruitment in the lake. Furthermore, the lack of smaller Walleye in the population is concerning for future years and additional evaluation is needed. The newly implemented county-wide regulation of 18-inch minimum length and 3 fish daily bag limit established in 2018 is advantageous to anglers fishing Random Lake since 77% of the Walleye sampled during the 2018 survey were legal for harvest.

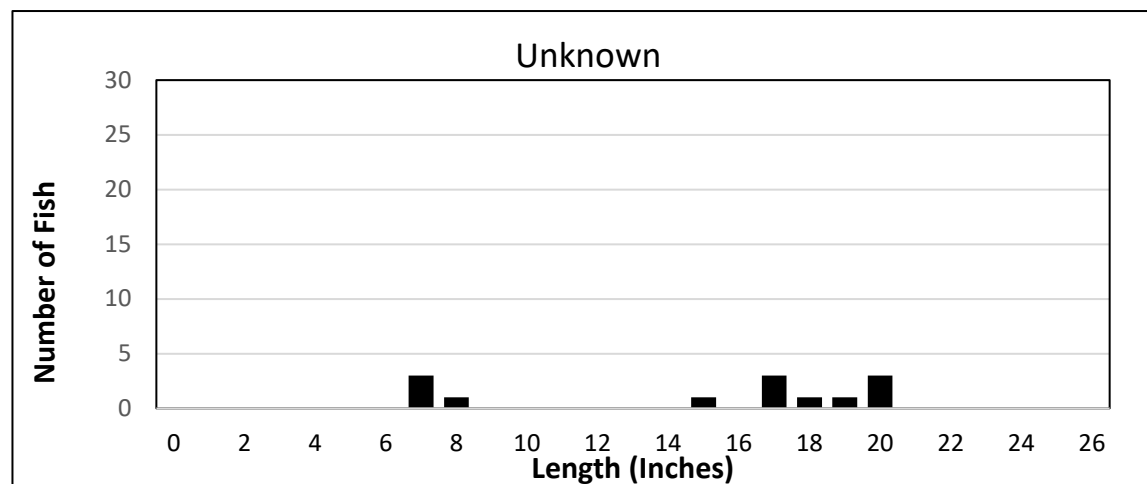
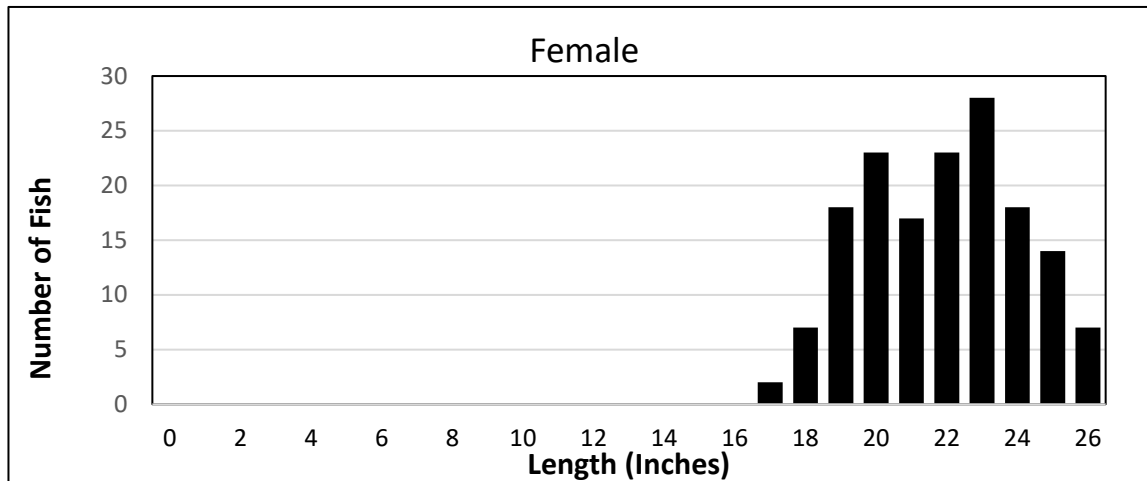
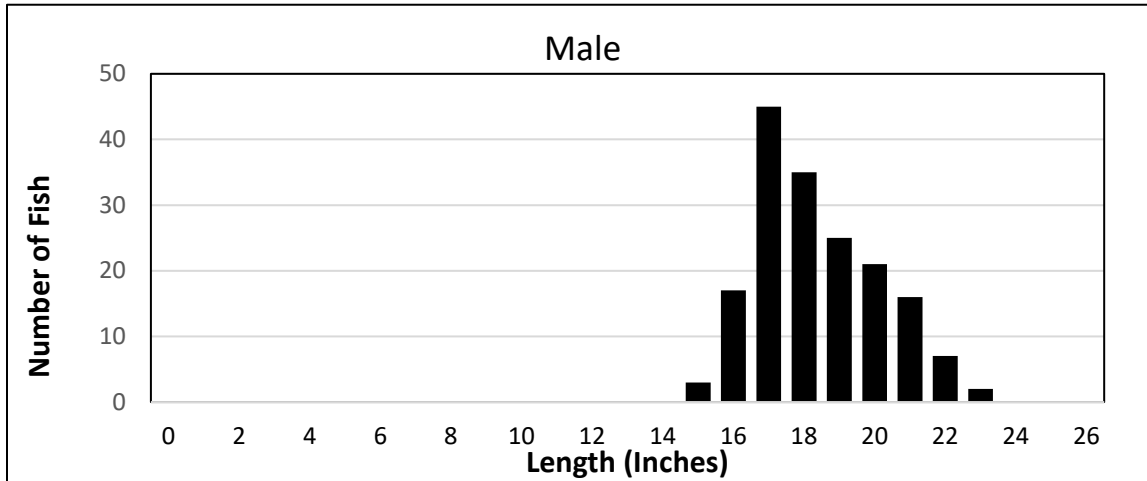


Figure 7. Length-frequency histogram of male, female and unknown sex Walleye sampled during the 2018 spring fyke netting survey (SNI) of Random Lake, Sheboygan County.

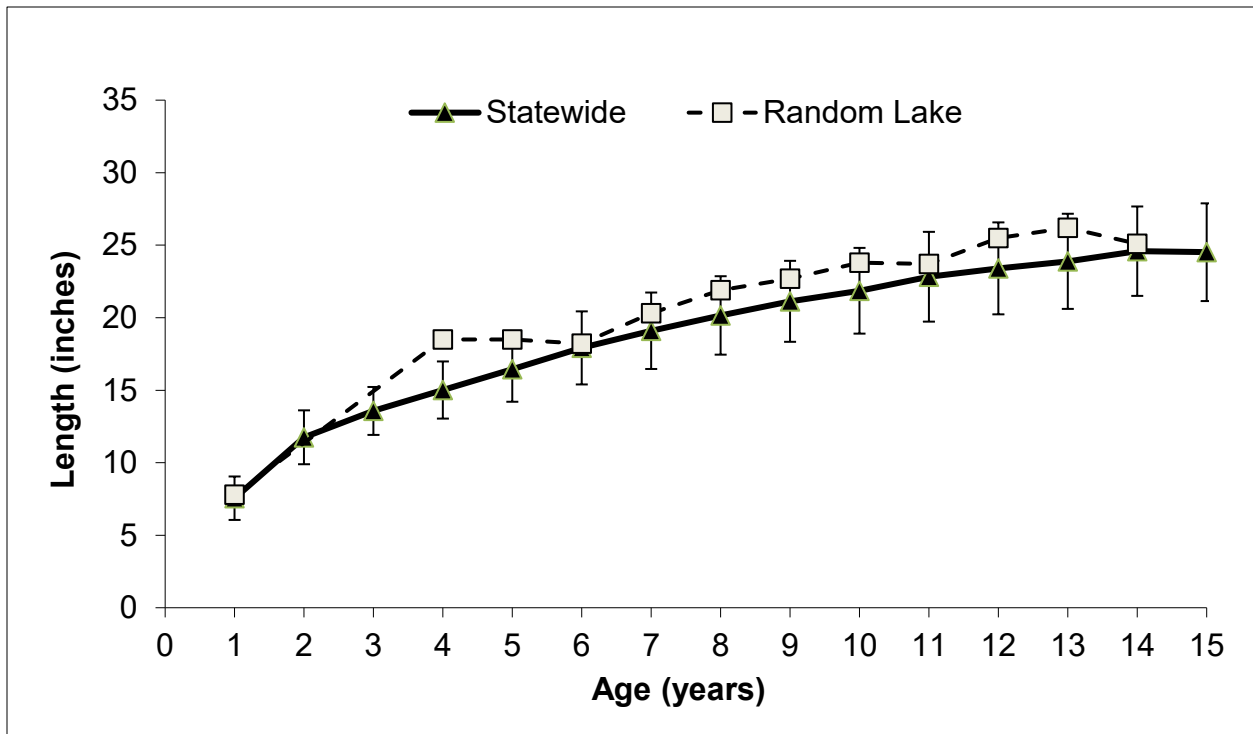


Figure 8. Walleye mean length at age determined using dorsal spines collected during the spring 2018 fyke netting survey (SN1) of Random Lake, Sheboygan County.

### Largemouth Bass

During the 2018 comprehensive fisheries survey 172 Largemouth Bass were captured, with the majority (n=113) sampled in SEII with a catch rate of 25.5/mile. This catch rate is above average when compared to lakes with similar characteristics (warm water temperatures and turbid water) across the state. The average length of Largemouth Bass sampled during SEII was 11.5 inches, with a maximum length of 18.4 inches (Figure 9).

A balanced Largemouth Bass population typically displays PSD values between 40-60. The PSD of Largemouth Bass in Random Lake in 2018 was 53 and the RSD-15 was 11.

Largemouth bass body condition as suggested by relative weight ( $W_r$ ) values from SEII data was excellent and ranged from 71 to 171 with a mean  $W_r$  of 107 (N = 111).

The Largemouth Bass growth rate equals the statewide average for ages two through seven and drops below the state average at age eight and nine, although sample size of older fish was limited to two fish at age eight and one fish at age nine (Figure 10). The current Largemouth Bass regulation for Random Lake is a 14-inch minimum, five fish daily bag limit. Given the sharp decline in Largemouth Bass above the harvestable size of 14 inches, and the

above average catch rate, excellent body condition and decent growth rate observed in the 2018 survey, instituting a higher minimum length limit may improve size structure by increasing the number of larger fish in the population. A higher minimum length limit will also provide Largemouth Bass additional years to spawn by protecting mature adults from harvest.

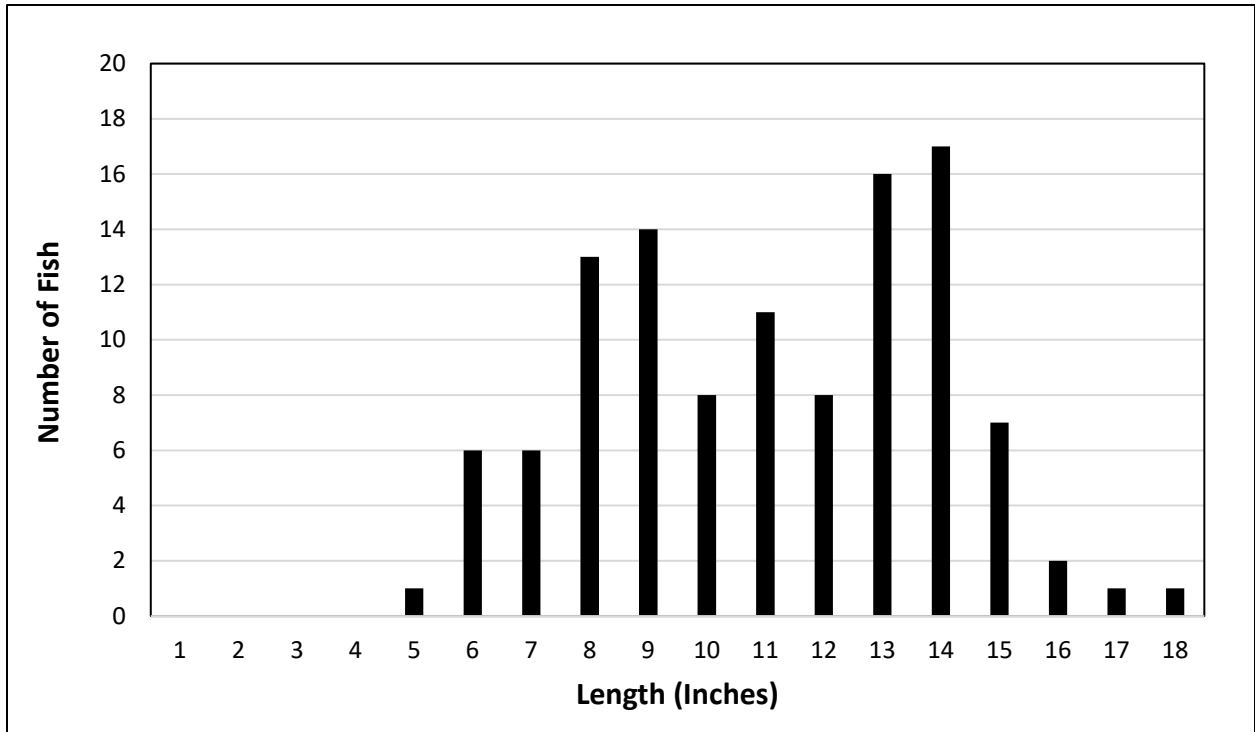


Figure 9. Length-frequency histogram of Largemouth Bass sampled during the 2018 spring electrofishing survey (SEII) of Random Lake, Sheboygan County.

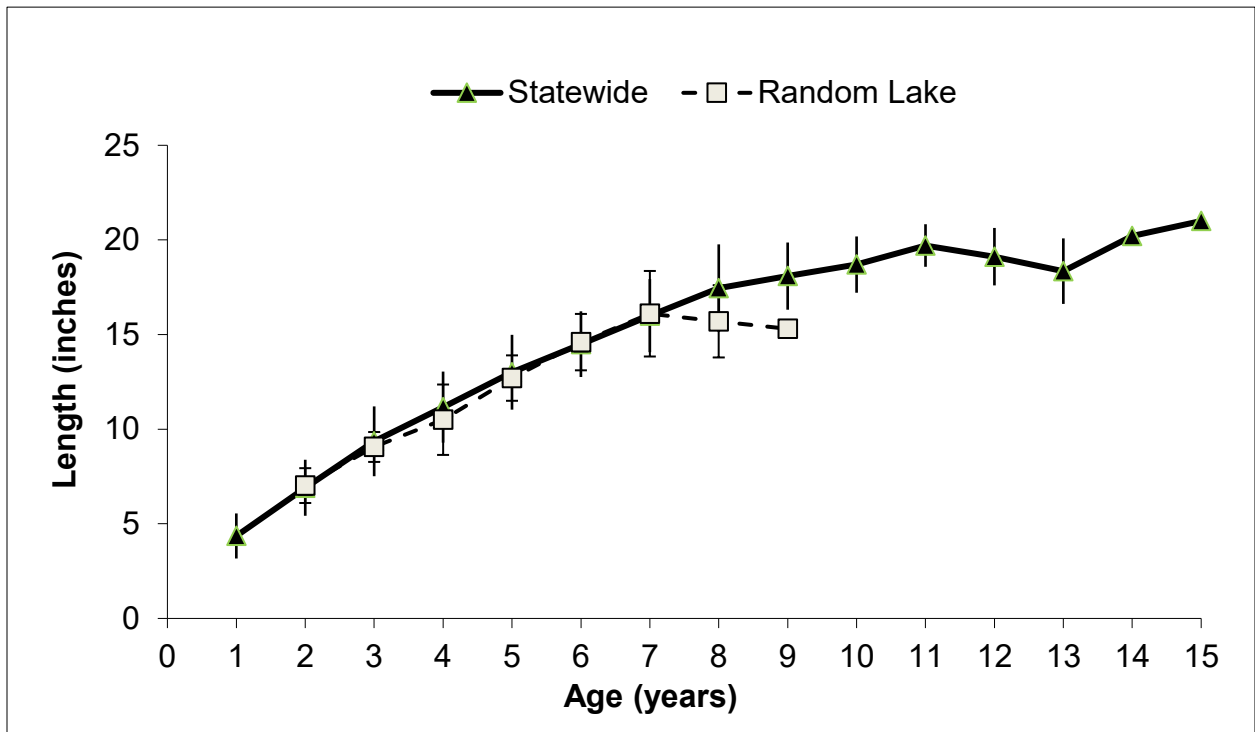


Figure 10. Largemouth Bass mean length at age determined using scales collected during the spring 2018 fyke netting survey (SNI) of Random Lake, Sheboygan County.



## Bluegill

A total of 7,156 Bluegill were sampled in SNI, however fish were not individually identified with a mark; therefore, individual Bluegill may have been netted multiple times. Bluegill varied in size from 2.5 inches to 6.5 inches with a mean length of 4.3 inches (Figure 10). A total of 365 Bluegill were sampled in SEII for a catch rate of 365 Bluegill/mile. Bluegill varied in size from 1.5 inches to 5.5 inches with a mean length of 3.7 inches (Figure 11). This catch rate is above average compared to lakes across the state with similar characteristics (warm water temperatures and turbid water). Of the 722 Bluegills measured, less than 1% of the fish were six inches in length or greater. Historically, Random Lake has had an overabundance of small panfish of various species. Prior to 2007 when wild fish transfer restrictions were implemented across the state, panfish were netted from Random Lake and transferred to area lakes after winter kills, drawdowns, or chemical treatments. In addition, in 1959 Random Lake was chemically treated with toxaphene to try to resolve the overabundant panfish problem and improve size structure. Neither of these methods improved the panfish population long term and the issue is still ongoing.

Ideally a balanced Bluegill population displays a PSD of quality-size fish (6 inches) of 40-60 and a RSD-P of preferred-size fish (8 inches) of a minimum of 5. Bluegill PSD using SEI data was zero given no Bluegill over 6 inches were sampled. The PSD using SNI data was 1 with eight Bluegill over 6 inches in length sampled. The low PSD values indicate a lack of quality-size Bluegill in Random Lake. Bluegill RSD-8 was zero in both SEII and SNI sampling. The low RSD-8 values indicate a lack of preferred-size Bluegill in Random Lake.

The growth rate of Bluegill in Random Lake is below the statewide average for all year classes (Table 3; Figure 12). Due to slow growth, the bluegill population may not be able to withstand high intensity of exploitation without significantly reducing the percentage of quality and preferred-size fish in the population, hence the low PSD and RSD-P. Bluegill in Random Lake may be food limited possibly due to intraspecific and interspecific competition among panfish species, leading to slow growth. Therefore, minimum length limit regulations would likely be unsuccessful in improving the number of quality-size bluegill. Use of a minimum length limit may further reduce growth rates among sub-minimum size Bluegill. Efforts should be made to evaluate alternative solutions to regulating exploitation. Excessive, dense submerged

aquatic vegetation may likely be influencing Bluegill growth rate and population size structure as it creates a refuge from predation.

Table 3. Panfish aging data from Random Lake in 2018 compared to statewide aging data.

	Age	1	2	3	4	5	6	7	8	9	10	11
Black Crappie	Mean Length (in)	-	4.2	5.2	6.2	6.8	7.7	8.9	9.9	-	11.0	11.0
	Number Aged	-	2	16	9	10	5	1	1	-	1	1
	State Average (in)	4.7	5.8	7.4	8.5	9.4	10.2	10.8	11.5	11.9	13	13.3
Bluegill	Mean Length (in)	-	3.0	3.9	4.7	4.9	5.8	5.9	-	-	-	-
	Number Aged	-	5	6	14	5	6	2	-	-	-	-
	State Average (in)	3.3	4.0	4.8	5.8	6.4	7.0	7.6	8.0	8.5	8.9	8.7
Yellow Perch	Mean Length (in)	-	-	4.5	6.1	7.2	8.1	7.5	9.0	9.1	-	9.6
	Number Aged	-	-	3	17	13	3	8	2	2	-	1
	State Average (in)	4.1	5.0	6.1	6.9	7.8	8.6	9.6	10.2	10.7	12.1	11.8

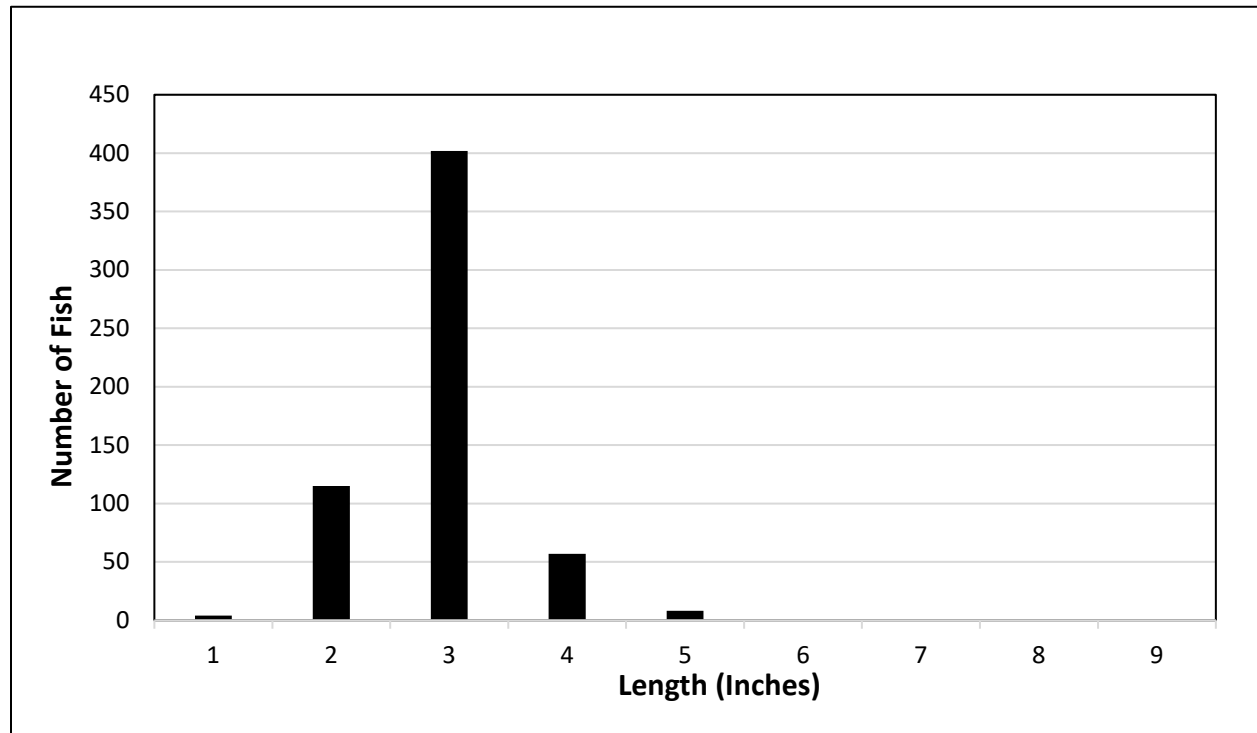


Figure 10. Length-frequency histogram of Bluegill sampled in spring fyke netting survey (SNI) of Random Lake, Sheboygan County.

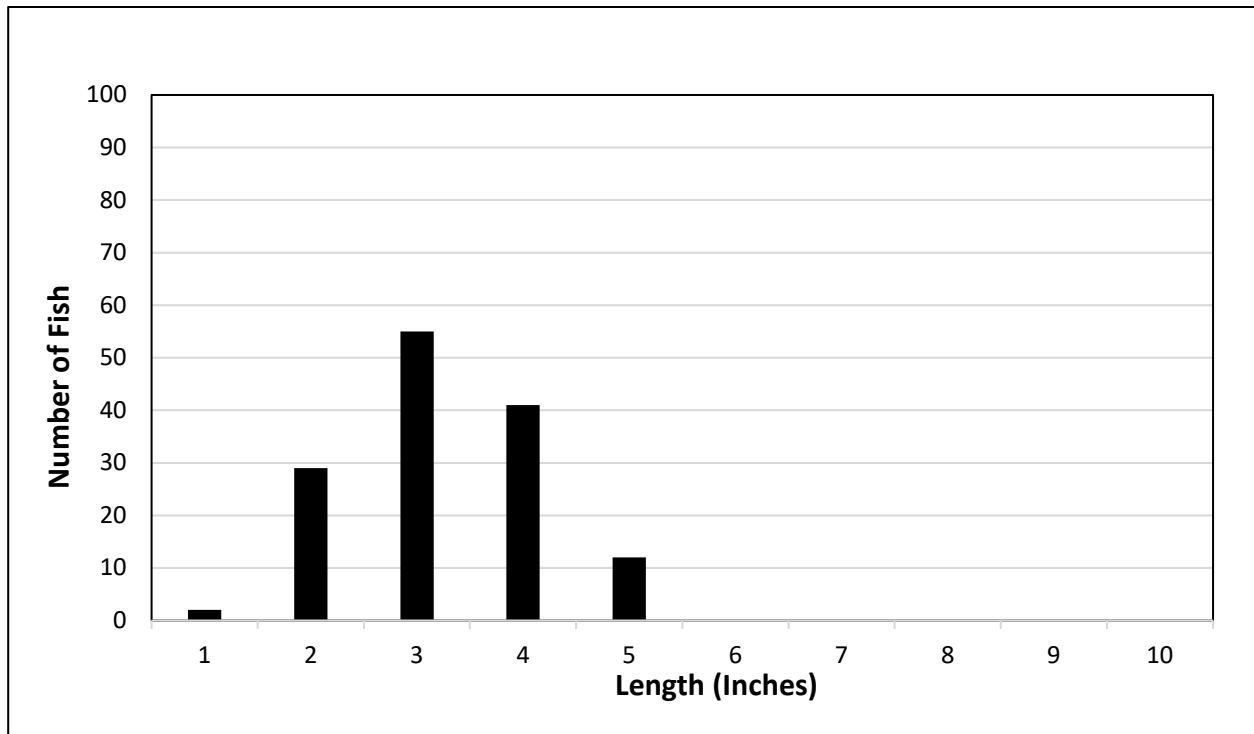


Figure 11. Length-frequency histogram of Bluegill sampled during the 2018 spring electrofishing survey (SEII) of Random Lake, Sheboygan County.

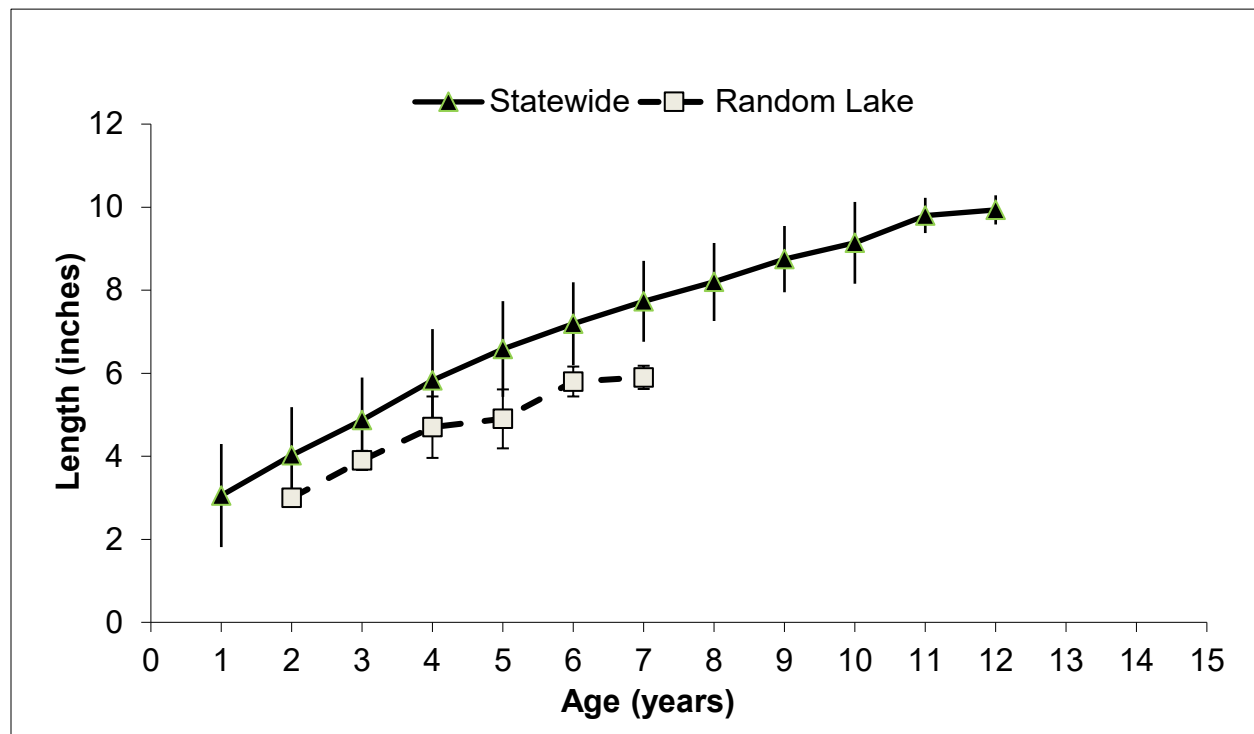


Figure 12. Bluegill mean length at age determined using otoliths collected during the spring 2018 fyke netting survey of Random Lake, Sheboygan County.

## Black Crappie

A total of 3,296 Black Crappie were captured during SNI, however, fish were not individually identified with a mark; therefore, individual Black Crappie may have been netted multiple times. Black Crappie lengths varied from 3.5 inches to 11.0 inches with an average length of 5.3 inches (Figure 13). A total of 23 Black Crappie were sampled during SEII, at a catch rate of 23/mile. Black Crappie lengths varied from 4.0 inches to 9.5 inches with an average length of 6.1 inches (Figure 14). It should be noted that spring electrofishing does not always effectively sample Black Crappie populations in inland lakes. The DNR is currently exploring other possible options to better sample Black Crappie populations. Like Bluegill, Black Crappie growth rates were well below state averages across all age classes (Table 3; Figure 15). Competition among panfish is most likely slowing growth of all panfish species.

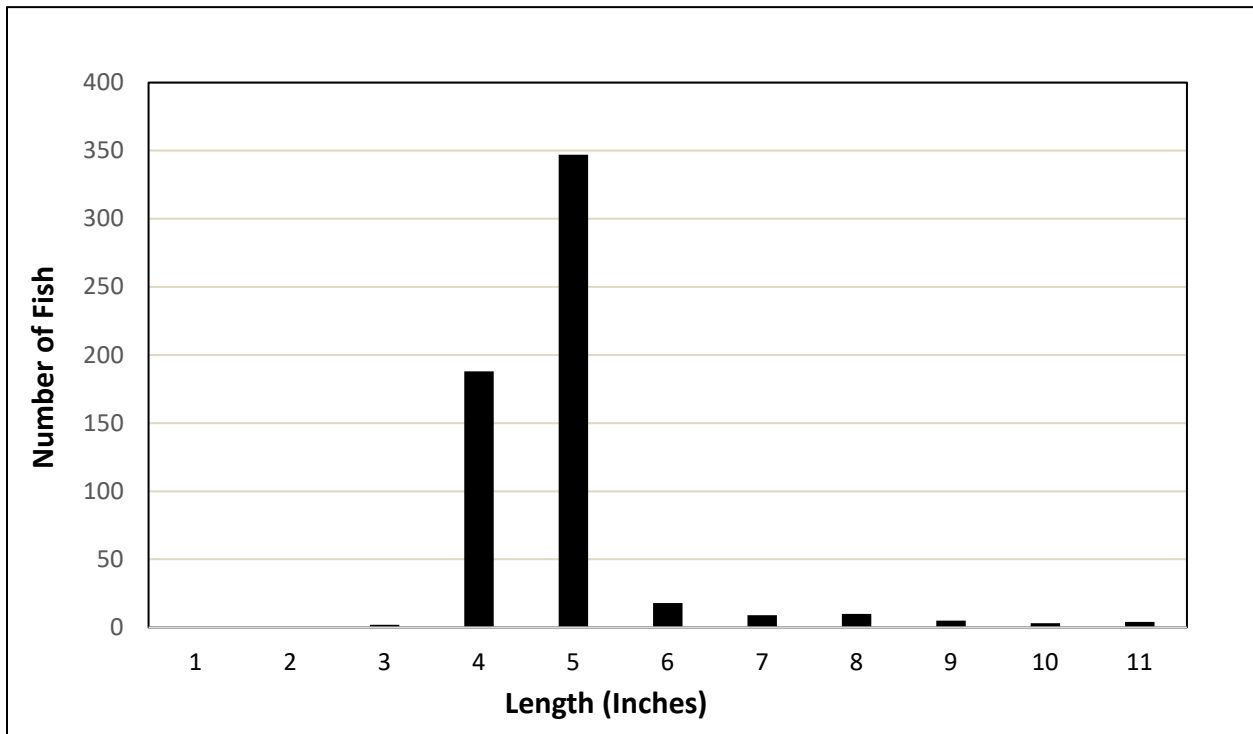


Figure 13. Length-frequency histogram of Black Crappie sampled during the 2018 fyke netting survey (SNI) of Random Lake, Sheboygan County.

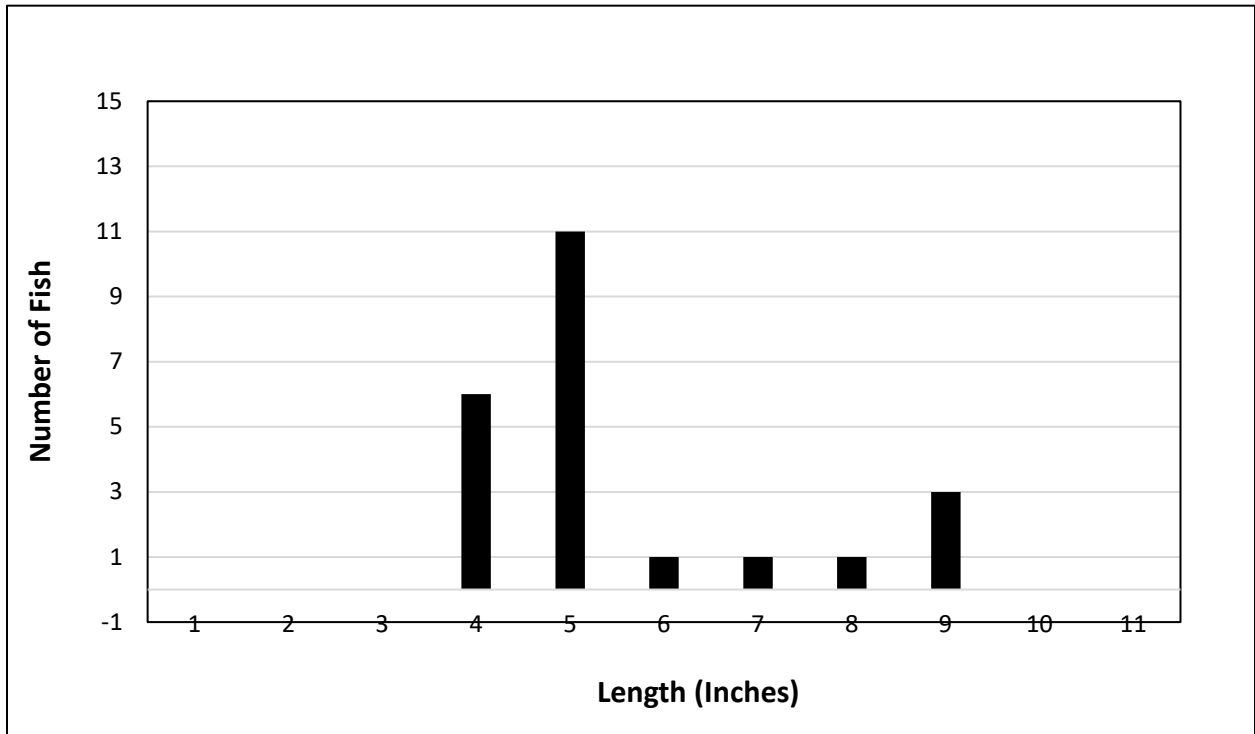


Figure 14. Length-frequency histogram of Black Crappie sampled during the 2018 spring electrofishing survey (SEII) of Random Lake, Sheboygan County.

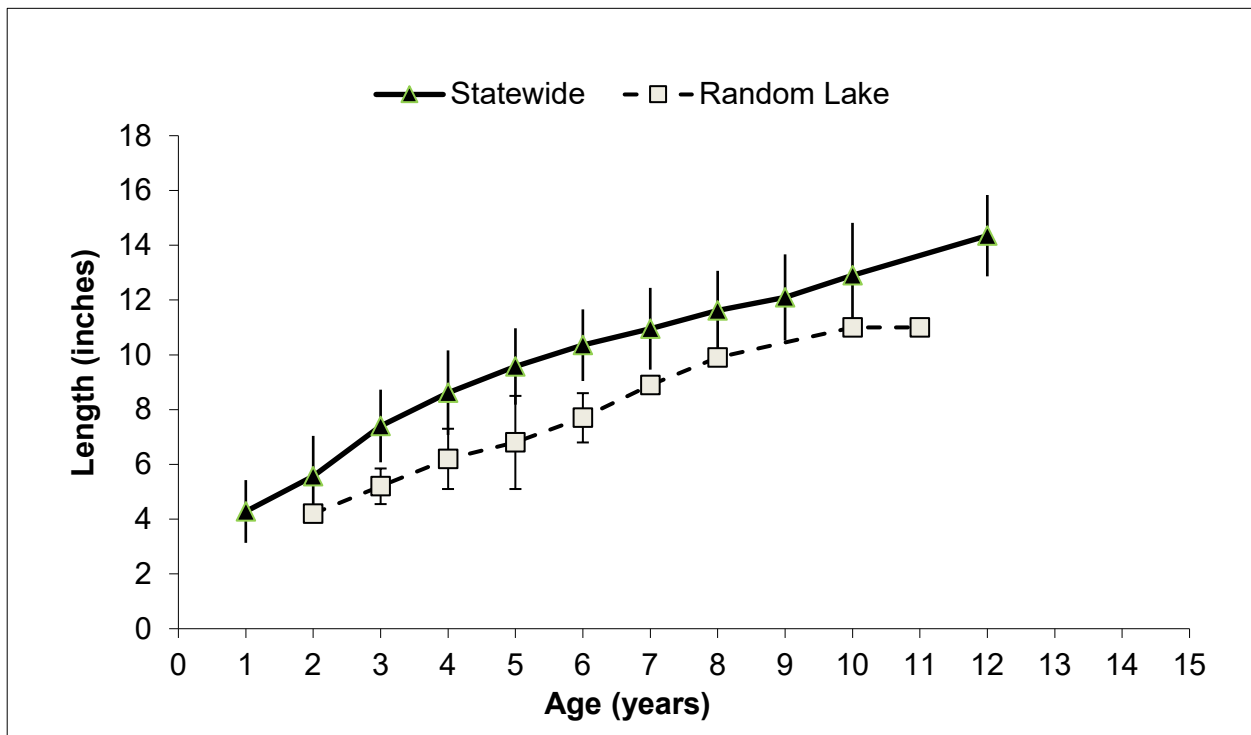


Figure 15. Black Crappie mean length at age determined using otoliths collected during the spring 2018 fyke netting survey of Random Lake, Sheboygan County

## Yellow Perch

A total of 372 Yellow Perch were sampled in SNI, however fish were not individually identified with a mark; therefore, individual Yellow Perch may have been netted multiple times. Yellow Perch lengths varied from 3.5 inches to 10.5 inches with an average length of 6.5 inches (Figure 16). A total of 44 Yellow Perch were sampled in SEII for a catch rate of 44/mile. Yellow Perch lengths varied from 2.0 inches to 9.0 inches with an average length of 4.7 inches (Figure 17). It should be noted that spring electrofishing does not effectively sample Yellow Perch populations in inland lakes. The DNR is currently exploring other possible options to better sample Yellow Perch populations. Like Bluegill and Black Crappie, Yellow Perch also had slower growth rates at all ages compared to other lakes statewide (Table 3; Figure 18).

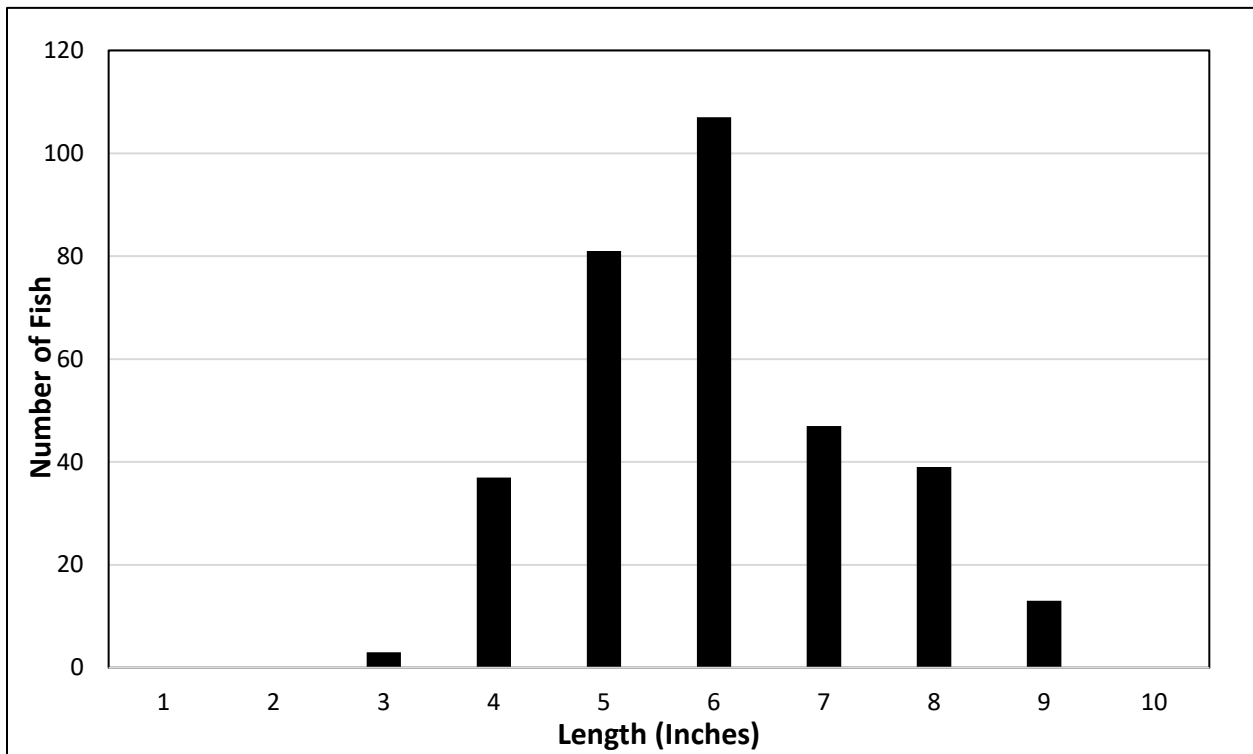


Figure 16. Length-frequency histogram of Yellow Perch sampled during the 2018 fyke netting survey (SNI) of Random Lake, Sheboygan County

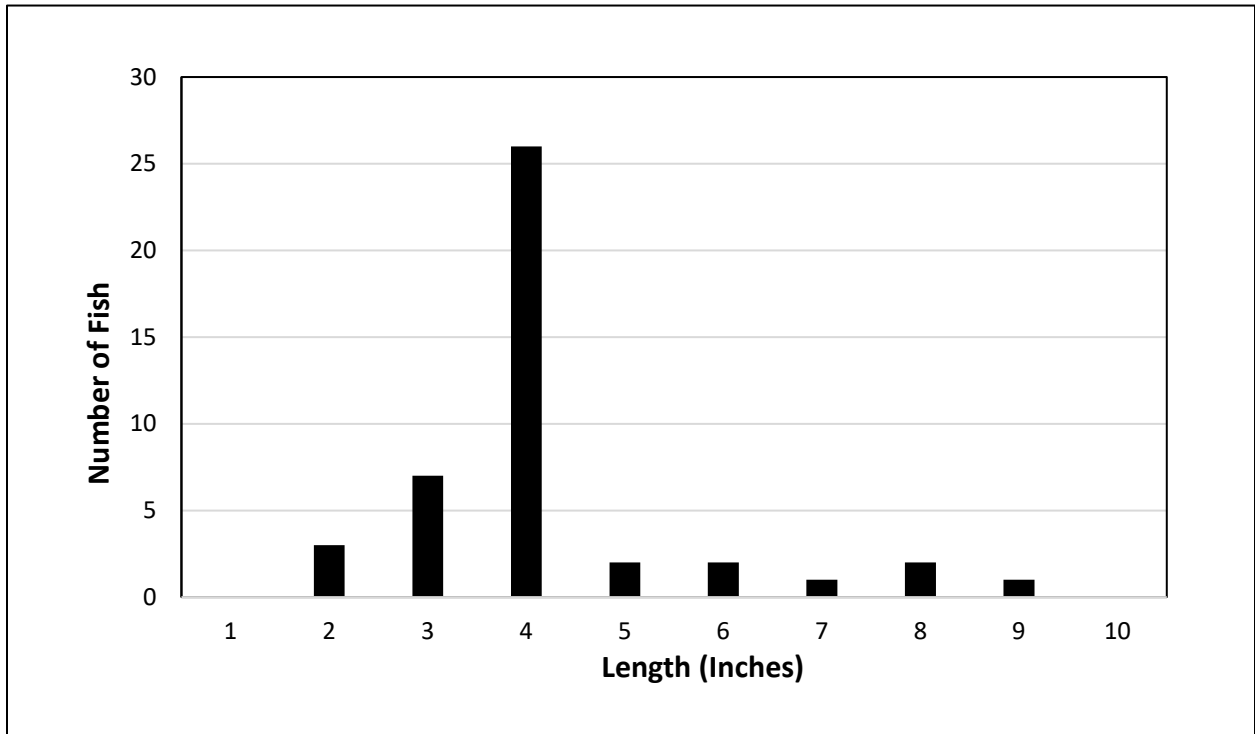


Figure 17. Length-frequency histogram of Yellow Perch sampled during the 2018 spring electrofishing survey (SEII) of Random Lake, Sheboygan County.

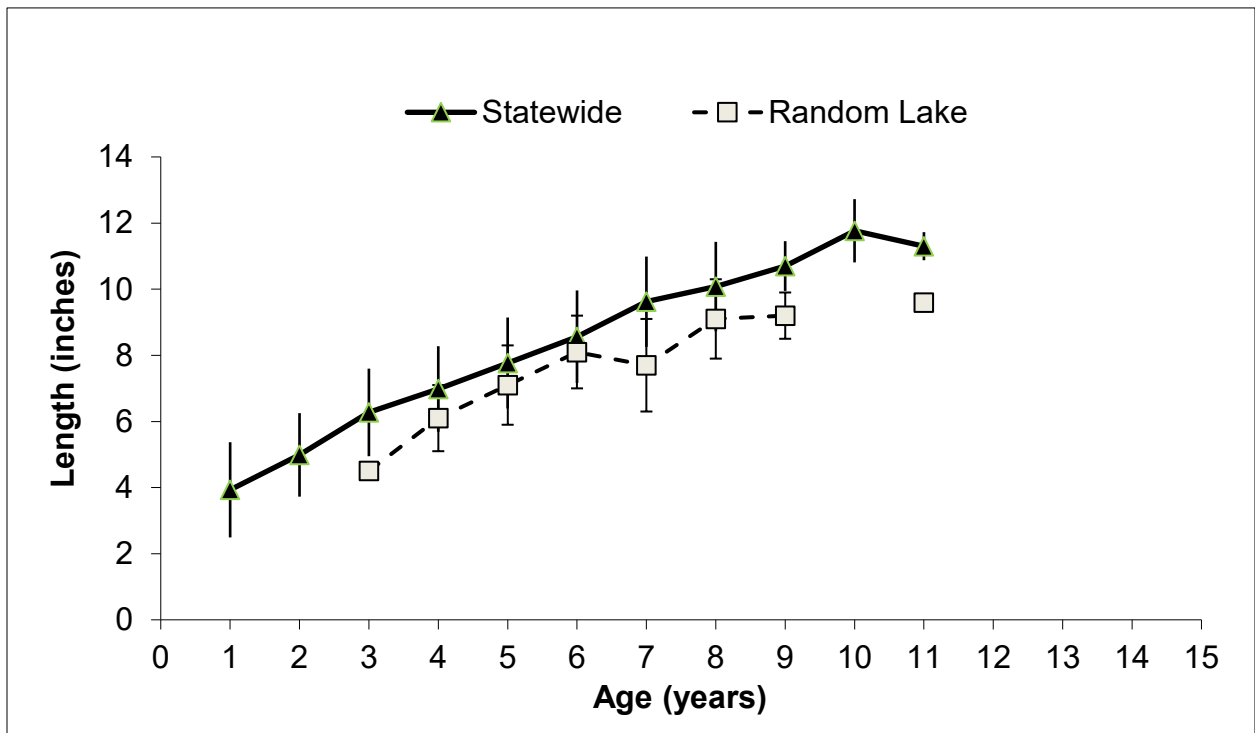


Figure 18. Yellow Perch mean length at age determined using otoliths collected during the spring 2018 fyke netting survey of Random Lake, Sheboygan County.

### Pumpkinseed

A total of 1,428 Pumpkinseed were sampled in SNI, however fish were not individually identified with a mark; therefore, individual Pumpkinseed may have been netted multiple times. Pumpkinseed lengths varied from 2.8 inches to 7 inches with an average length of 4.3 inches (Figure 19). A total of 26 Pumpkinseed were sampled in SEII for a catch rate of 26/mile. Pumpkinseed lengths varied from 2.5 inches to 5.6 inches with an average length of 4 inches.

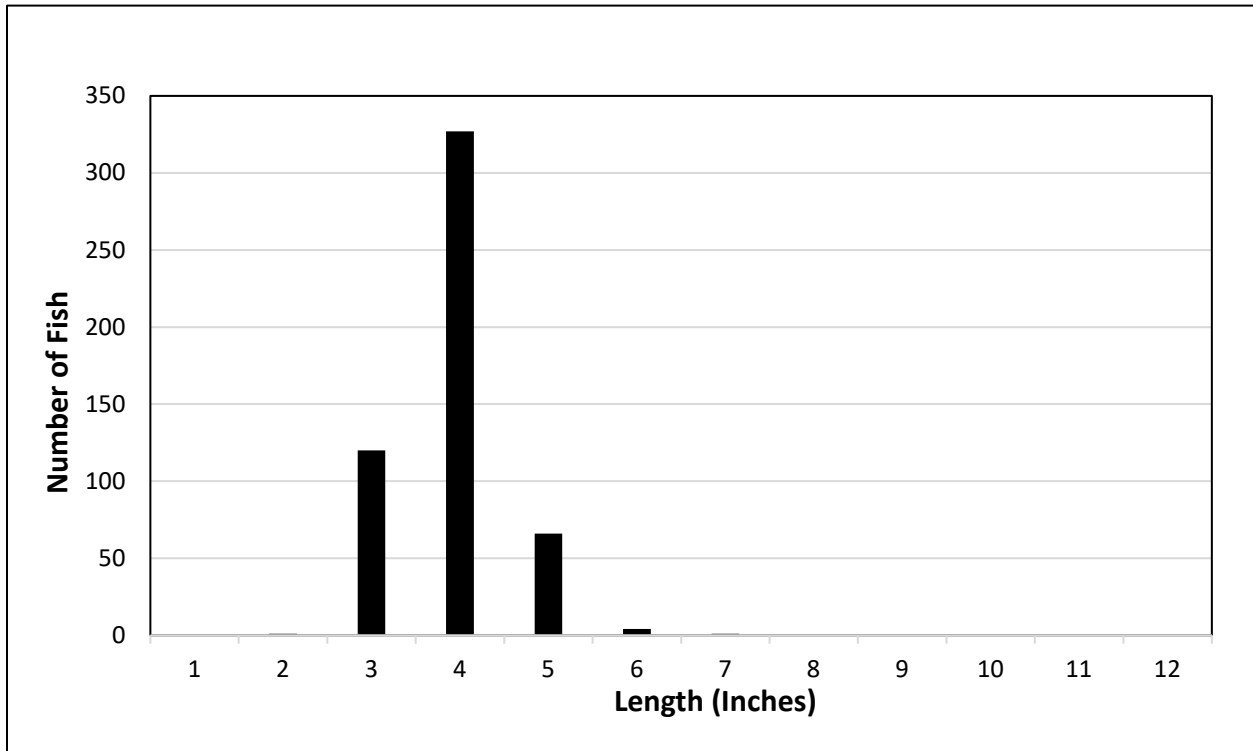


Figure 19. Length-frequency histogram of Pumpkinseed sampled during the 2018 spring electrofishing survey (SEII) of Random Lake, Sheboygan County.

### Other Species

Other fish species sampled in Random Lake during the 2018 comprehensive survey included: Rock Bass, Green Sunfish, Green Sunfish x Bluegill Hybrid, Golden Shiner, White Sucker, Common Carp, and Yellow Bullhead. None of these species were dominant in the system; however, the panfish species could provide an added recreational opportunity to anglers.



## **Management Recommendations**

The Muskellunge population in Random Lake appears to be overabundant and overall body condition is poor. Large fingerling Muskellunge stocking should continue, but the rate and frequency should be reduced to decrease abundance and improve body condition. Possible overstocking and the lack of protein-rich forage could be the cause for the poor body condition of Muskellunge in Random Lake.

The Walleye population in Random Lake currently provides an excellent fishery with 77% of the population available for legal harvest (18 inches) by anglers. Small fingerling stocking appears to be effective for establishing year classes and should continue, but more evaluation of the presence and level of natural reproduction and recruitment of Walleye in the lake is necessary. The newly implemented county-wide regulation of 18-inch minimum length and 3 fish daily bag limit established in 2018 should be evaluated for effectiveness as part of the next comprehensive fish survey conducted on Random Lake.

The Largemouth Bass population in Random Lake self-sustained by natural reproduction and does not require supplemental stocking. Harvest of Largemouth Bass appears to be high once fish reach legal size (14 inches). To address potential overharvest, a Largemouth Bass regulation change should be considered to increase size structure and provide Largemouth Bass additional years to spawn by protecting mature adults from harvest.

Panfish populations in Random Lake are slow-growing and continue to be overabundant. Low PSD and RSD-8 indicates a lack of quality-size and preferred-size Bluegill. The growth rate of Bluegill in Random Lake is below the statewide average for all year classes. Due to slow growth, the bluegill population may not be able to withstand high intensity of exploitation without significantly reducing the percentage of quality and preferred-size fish in the population, hence the low PSD and RSD-8. Bluegill in Random Lake may be food limited possibly due to intraspecific and interspecific competition among panfish species, leading to slow growth. Therefore, minimum length limit regulations would likely be unsuccessful in improving the number of quality-size Bluegill. Use of a minimum length limit may further reduce growth rates among sub-minimum size Bluegill. Efforts should be made to evaluate alternative solutions to regulating exploitation. Excessive, dense submerged aquatic vegetation may likely be

influencing Bluegill growth rate and population size structure as it creates a refuge from predation.

Management of the fish community in Random Lake poses many challenges, including extensive aquatic vegetation, heavy fishing pressure, and balancing the desires of anglers of two top level predators, Muskellunge and Walleye.

Management recommendations include:

1. Consider targeted aquatic plant treatments in order to control non-native aquatic plants including Eurasian Watermilfoil and Curly-Leaf Pondweed. Excessive, dense submerged aquatic vegetation may likely be influencing Bluegill growth rate and population size structure as it creates a refuge from predation.
2. Continue stocking small fingerling Walleye and continue to evaluate natural reproduction and recruitment to determine future stocking needs.
3. Evaluate the effectiveness of the county-wide 18-inch, three fish daily bag limit Walleye regulation implemented in 2018. Assess changes to the Walleye population and make recommendations for adjustment if needed.
4. Continue stocking large fingerling Muskellunge but reduce the rate and frequency to every other year at a rate equivalent to 0.5/acre.
5. Consider changing the Largemouth Bass regulation from the current statewide regulation of a 14-inch minimum, five fish daily bag limit to a higher minimum length limit. Given the sharp decline in Largemouth Bass above the harvestable size of 14 inches, and the above average catch rate, excellent body condition and decent growth rate observed in the 2018 survey, instituting a higher minimum length limit may improve size structure by increasing the number of larger fish in the population. A higher minimum length limit will also provide Largemouth Bass additional years to spawn by protecting mature adults from harvest.
6. Further assess Black Crappie and Yellow Perch populations if new sampling protocols are developed. The panfish populations in Random Lake offer important public fishing opportunities.

7. Move the Random Lake comprehensive survey from an eight-year rotation to a six-year rotation to better understand the effect of the 2018 Walleye regulation change and potential changes in Muskellunge stocking frequency.

### **Acknowledgments**

The field work, data collection, scale, spine, fin ray and otolith ageing and data entry required for this survey was conducted by WDNR Fisheries Technicians Tanya Meives and Danyelle Deboer. Report review and editing was provided by WDNR Fisheries Management staff including Tanya Meives, Christine Larson, Travis Motl and Tim Simonson.

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