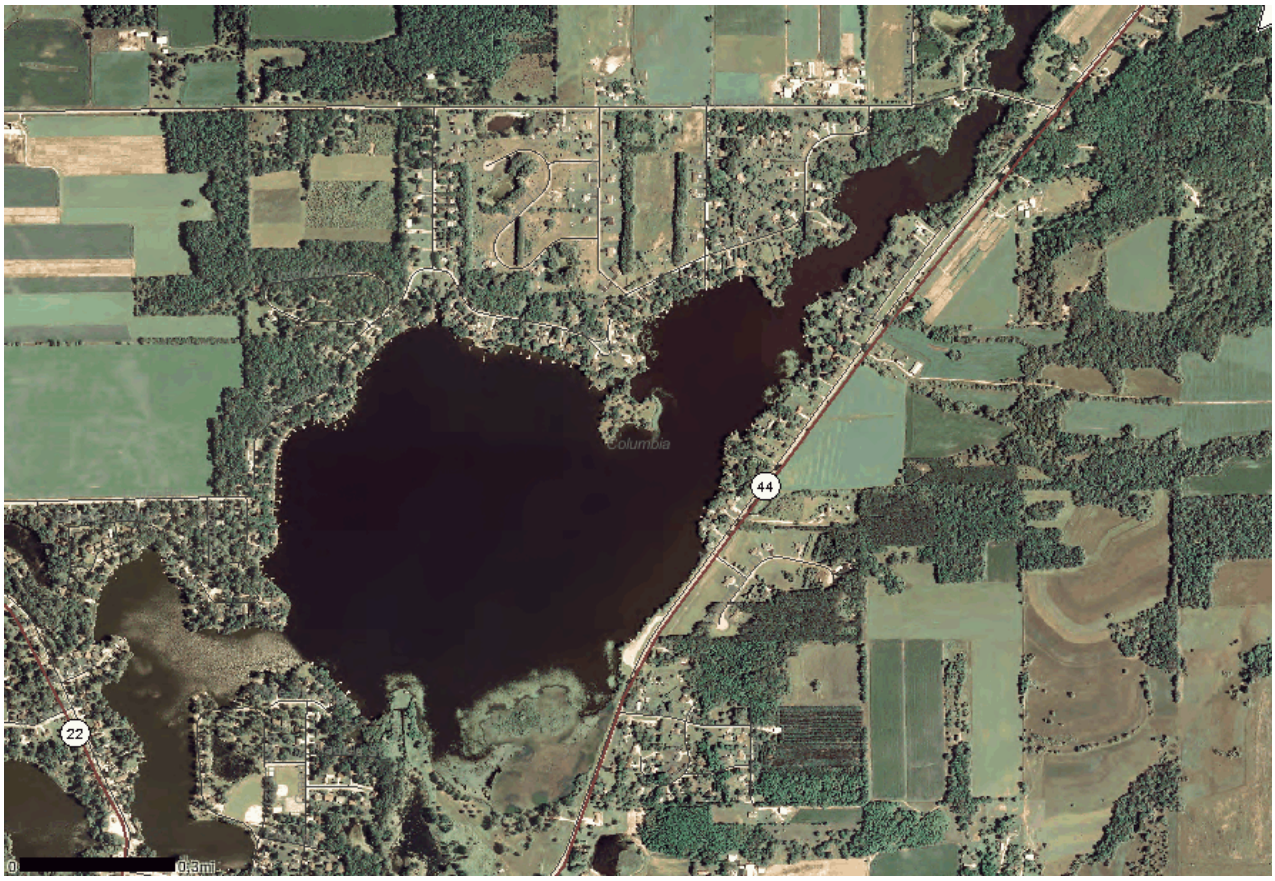
Comprehensive Fishery Survey of Park Lake
Columbia County, Wisconsin 2011.

Waterbody Identification Code: 180300

T12N10E Sections 2, 3



Nathan Nye
Fisheries Biologist
Wisconsin Department of Natural Resources
Poynette, Wisconsin
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EXECUTIVE SUMMARY

A comprehensive fishery survey was conducted on Park Lake during the spring and fall of 2011. The spring walleye population estimate (PE) of 1.1 adult walleyes ≥ 15 inches per acre indicated that the adult population was lower than the desired goal of 2 to 3 fish ≥ 15 inches per acre for a stocked walleye fishery in Wisconsin. The adult walleye population in Park Lake has declined since 2007 when the PE was 1.9 walleyes ≥ 15 inches per acre. This is partly attributable to the cessation of hyper-stocking of walleyes after 2006. Hyper stocking was part of an unsuccessful attempt to control nuisance gizzard shad via consumption by walleyes. The total walleye population in 2011 (all sizes) was 3.5 fish/acre. Most walleyes in Park Lake reach the legal harvest size of 15 inches by age 3, and all age 4 walleyes collected during the survey were larger than 15 inches. Walleyes in Park Lake grow relatively fast through age 4, before slowing down to grow between state and region averages.

Black crappies were the most abundant of all sport fish (panfish or gamefish) in Park Lake, and age 3 fish averaging 9.6 inches composed the majority of the fishery. Crappies grow fast in Park Lake from age 2 through 5 (oldest age sampled); growth meets or exceeds state and region averages for these age classes. Abundant gizzard shad ensure a massive forage base from spring through fall (YOY and juveniles), and the open-water nature of the lake (little submersed vegetation) favors black crappie foraging activity.

Other panfish of note include yellow perch and bluegills. Yellow perch are common in Park Lake, but the population is mostly composed of fish age 3 and younger which are not of an acceptable size for anglers to harvest. By the time they reach a length of 9 inches around age 4, few individuals remain; mortality is high after age 3. Bluegills are present in Park Lake, but growth and condition of age 1 and 2 bluegills are poor. This is most likely due to competition for zooplankton with YOY gizzard shad. Once bluegills reach 5 inches, growth and condition improve because bluegills are able to eat larger prey items (reduced zooplankton reliance), and can forage with less risk of being eaten by predators.

Largemouth bass are present in Park Lake, but abundance (SEII CPE8 = 8.3 fish/mile) is low relative to other lakes in Wisconsin. Growth and condition of largemouth bass are both average to good, however, and low bass densities are most likely a result of habitat limitations; there is very little submersed aquatic vegetation in Park Lake limiting suitable nesting sites. Also, competition for zooplankton with YOY gizzard shad may affect growth and survival of young largemouth bass. Forage is abundant for adult largemouth bass, mostly in the form of gizzard shad. Largemouth bass in Park Lake average over 14 inches by age 5, and all fish age 6 and older in the survey were larger than 14 inches.

Northern pike are present in Park Lake, but at abundances lower than historic levels. Northern pike in Park Lake appear to grow at or above state and region averages. Age 3 northern pike were the most common in the distribution and averaged 24.6 inches, with some individuals exceeding 32 inches.

Common carp and especially gizzard shad continue to contribute to the turbid state of Park Lake. A large year class of gizzard shad recruited to Park Lake in 2011, with a fall electrofishing catch rate of 603 fish/mile. The majority of these gizzard shad were YOY. The fall electrofishing catch rate of common carp was 21.5 per mile.

Lake & location
Park Lake, Columbia County, T12N10E Sections 2, 3

Physical/chemical attributes
Morphometry: 312 acres, maximum depth of 27 feet, average depth of 7 feet
Watershed: 53.8 square miles with 3% (1.6 square miles) draining directly into the lake and 97% (52.2 square miles) draining into the Fox River (Cunningham et al. 2007)
Lake type: Drainage (artificial impoundment of the Fox River)
Water Clarity: Turbid with summer algal blooms
Littoral substrate: 67% sand, 23% muck, 6% silt, 4% gravel
Trophic status: Eutrophic, the Fox River watershed above Park Lake is highly agricultural.
Aquatic vegetation: Diversity decreased from 15 species in 1978 to 6 species by 2003. Submersed aquatic vegetation is rare, and is dominated by Eurasian watermilfoil and curly leaf pondweed. Park Lake has shifted from a plant dominated to an algal dominated community.
Winterkill: Infrequent
Boat Landings: Three public boat access points exist on the lake; two are controlled by the Town of Wyocena, and one by Columbia County.
Other Features: There are two dams; one is located at the northwest end of the lake, and one is located at southwest end of the lake that has a top draw spillway. Hook and line fishing season dates, minimum harvest lengths, and bag limits can be found in Table 1.

Purpose of survey
Baseline lake survey Tier 1 assessment.

Dates of fieldwork
Fyke netting survey conducted April 10 through April 15, 2011 (SNI).
Spring electrofishing surveys conducted April 18, 2011 (SEI), and May 16, 2011 (SEII). Fall electrofishing survey conducted October 12, 2011.

Fishery
Black crappies are abundant. Yellow perch are common. Largemouth bass, bluegill, walleye, northern pike, and channel catfish are present

BACKGROUND

Lake History

Park Lake is a 312 acre, artificial impoundment of the Fox River in north central Columbia County. Water from the lake is released from a small hydroelectric dam on the southwest corner of the lake which drains into Spring Lake, eventually returning to the Fox River before it enters Swan Lake. Water also flows out of the lake through a second dam via the Fox River on the northwest corner of the lake. Park Lake has a maximum depth of 27 feet and a mean depth of seven feet. Three public boat access points exist on the lake; two are controlled by the Town of Wyocena, and one by Columbia County. The access site controlled by the county has a paved surface, launching dock, and parking spaces for up to 25 vehicle-trailer units.

Park Lake is highly eutrophic, receiving nutrient inputs from the Fox River watershed upstream of the lake; the land use in this watershed is dominated by small-scale dairy cattle operations and row crop agriculture. The lake formerly had an abundant and diverse aquatic plant community, but in recent times has converted to low abundance and diversity of submerged aquatic vegetation, and the plant community is dominated by algae. The number of species of aquatic vegetation decreased from 15 in 1978 to six by 2003, with Eurasian watermilfoil and sago pondweed the only submersed species remaining (Cunningham et al. 2007). Curly leaf pondweed appeared in the lake by 2006 (Cunningham et al. 2007).

The lake is in a nearly constant turbid state. Common carp and especially gizzard shad are two nuisance fish species that contribute to this turbid state. The Wisconsin Department of Natural Resources partnered with the Pardeeville Lakes Management District (PLMD) in 1998 on a program of high-density walleye stockings, which continued through 2006. The goal of the program was to perform a biomanipulation whereby gizzard shad would be controlled through predation by walleyes. Small fingerling walleyes were stocked at rates from 100 to 500 per acre every year (2 to 10 times the recommended every other year stocking rate, Cunningham et al. 2007). These stockings of small fingerlings were supplemented with occasional stockings of fry and large fingerlings. The program was abandoned following 2006; a walleye population estimate in the spring of 2007 placed the density of adult walleyes ≥ 15 inches at 1.9 per acre, and 3.8 total walleyes per acre. This was slightly below the 2 adults ≥ 15 inches per acre goal of a stocked walleye fishery in southern Wisconsin. The gizzard shad population did not appear to be affected, and the program was deemed unsuccessful in controlling the shad and was discontinued.

Extra protection for walleyes in the form of an increased minimum length limit and a decreased bag limit likely would have helped to increase numbers and population size structure of adult walleye had they been in place, but that was not the case. Walleye stocking levels have since returned to18 small fingerlings per acre every year, as outlined in the current Wisconsin walleye stocking guidance.

Stocking information for Park Lake can be found in Table 2. Largemouth bass were stocked on a few occasions in the 1970s, and again in 2005. Beyond that, largemouth bass have been sustained through natural reproduction. Muskellunge and tiger muskellunge were stocked on several occasions beginning in the late 1980s and running through the early 2000s. These were a mixture of fish produced by WDNR hatcheries, and WDNR co-op ponds (Portage Musky Club). Musky and tiger musky stockings ceased as the management philosophy moved away from stocking muskies on top of naturally reproducing native northern pike, and the Portage Musky Club ceased musky rearing operations at their facility.

Northern pike have been stocked periodically since the mid-1970s, and these stockings supplemented natural reproduction. A stocked walleye fishery is maintained primarily by stocking DNR-raised small fingerlings, although large fingerlings from the DNR and private hatcheries have been stocked periodically, and a single fry stocking using DNR hatchery-produced fry was done in 1999 (Table 2). Other stockings include channel catfish in 1996, 1999, 2000, and 2012 (after this survey occurred), both from a federal hatchery and a private hatchery. Bluegills stocked in 2005 were purchased from a private hatchery.

Historically, Park Lake supported a good fishery for bluegills, crappies, largemouth bass, and northern pike. However, when comparing catch rates of bluegills, black crappies, and largemouth bass in 1996 vs. 2007, a severe decline in the fishery was apparent. Bluegill fyke net CPE declined from 458 per net night to 62 per net night, black crappie fyke net CPE declined from 340 per net night to 26 per net night, and largemouth bass electrofishing CPE declined from 23 per mile to 7 per mile (Cunningham et al. 2007). During fall electrofishing surveys from 1997 to 2005, largemouth bass CPE declined from nearly 60 per mile to less than 10 per mile (Cunningham et al. 2007). Walleye and northern pike CPE fluctuated during this time period, but remained within the normal range when compared to similar lakes in Wisconsin (Cunningham et al. 2007). One event of note was a mass die-off of northern pike in July 1995 where an estimated

500-600 northern pike perished; necropsy of deceased fish by WDNR fish health personnel determined the cause of death to be heat stress.

In 2007, PLMD, WDNR, and Columbia County finished the Park Lake Comprehensive Management Plan, and this plan was approved by the WDNR in 2009. This management plan was the result of a thorough study of the watershed surrounding Park Lake, along with the aquatic plant community and the fishery in the lake. Recommended actions outlined in the management plan included a drawdown of the lake level. This drawdown would facilitate natural compaction of the lake bottom sediments to allow re-establishment of native aquatic vegetation following the re-filling of the lake. It would also allow for an affordable chemical treatment of the lake with rotenone during the draw down to eradicate nuisance common carp and gizzard shad. This would provide for re-establishment of a desirable fishery through fish stocking. Fishing regulations would be changed to protect predator fish through increased minimum length limits and decreased daily bag limits. No wake zones would be also established to aid in the protection of recovering submerged aquatic vegetation. Once approved by the WDNR, a team was formed to implement the Comprehensive Management Plan. The team included representatives from the PLMD, the Village of Pardeeville, the Town of Wyocena, the Columbia County Land and Water Conservation Department, and the WDNR (Fisheries Management, Water Resources, and Environmental Analysis personnel). This team developed the implementation plan and early in 2012, the PLMD and the Town of Wyocena voted to approve the plan, but the vote by the Village of Pardeeville board ended in a tie, so no action was taken. A second vote by the Village board on a Saturday one month later saw the implementation plan defeated by a single vote and it was not implemented.

Fishing regulations on Park Lake in the past have followed the statewide general inland fishing regulations. A rule change proposal was made in 2013 by the WDNR to raise the minimum length limit on walleye from 15 to 18 inches, with the daily bag limit being lowered from five fish to three. The minimum length limit on largemouth and smallmouth bass would increase from 14 to 18 inches, and the daily bag limit would decrease from five fish to one. The minimum size limit for northern pike would be raised from 26 to 32 inches, with the daily bag limit being lowered from two fish per day to one. These changes in size and bag limits would offer more protection to these predator gamefish in an effort to increase their population levels and size structure to combat nuisance common carp and gizzard shad (biomanipulation). This was one recommended action from the management plan that had enough support to move forward, and

this could be accomplished by a DNR rule change rather than a vote by the PLMD, Town, and Village. At the 2013 Columbia County Conservation Congress spring hearings, the vote on this question deadlocked at 33 yes and 33 no, but WDNR Fisheries Management made the decision to move forward with the regulation change which will take effect in 2014.

METHODS

Data collection-spring and fall surveys

Following ice-out, 6 standard 3-foot hoop fyke nets with 0.7 inch bar, 1.4 inch stretch mesh were set on April 10, 2011; these fyke nets targeted northern pike and walleye (SNI). Fyke net locations (GPS coordinates) can be found in Table 3. All 6 nets were run on April 11, but gamefish only were counted and measured from one of the nets due to time constraints (spring Conservation Congress hearings). All 6 nets were run on April 12, but one of the nets was moved to a new location. All of the nets were run each day through April 15 when they were pulled. On April 15, the contents of two of the nets were dumped back into the lake without counting or measuring fish because high winds made work conditions unsafe.

Gamefish and panfish were measured to the nearest 0.1 inch and a subsample of each species was weighed to the nearest 0.01 pound. Aging structures were taken from a subsample of largemouth bass, northern pike, walleye, yellow perch, black crappie, and bluegill. The goal was to take structures from 5 fish per half-inch group for largemouth bass, black crappies, and bluegills, and 5 per half-inch group for each sex for northern pike, walleyes, and yellow perch. Sex was recorded when evident for northern pike, walleye, yellow perch, and black crappie. Walleyes that were 12 inches and larger received a top caudal fin clip, while walleyes smaller than 12 inches received a bottom caudal fin clip. Sexually mature northern pike (expressing gametes) were marked with a top caudal fin clip.

A WDNR standard direct current (DC) boom shocker boat was used to sample fish on Park Lake during the spring and fall of 2011. The first electrofishing survey occurred on the night of April 18 (SEI) to recapture walleyes that were marked during SNI. The entire shoreline was sampled and all gamefish were collected and measured to the nearest 0.1 inch. Walleye were examined for marks for calculation of a population estimate.

The second electrofishing survey occurred on May 16, 2011 (SEII). A total of two electrofishing stations were chosen at random, equally spaced around the lake. Each station was 2 miles of shoreline in length and within each station, panfish and gamefish were collected during the first 0.5 mile, while gamefish only were collected for the remaining 1.5 miles. Rough fish and other non-game fish were observed and counted while sampling the 0.5 mile panfish stations, but were not dip netted. All gamefish and panfish were measured to the nearest 0.1 inch. Largemouth bass were weighed to the nearest 0.01 pound (a sufficient number of weights had already been recorded for other gamefish and panfish), and aging structures were taken from gamefish and panfish where necessary to fulfill the minimum of 5 fish per half-inch group. Starting and ending GPS coordinates for electrofishing stations can be found in Table 4.

The final electrofishing survey occurred on October 12, 2011 to assess survival of stocked small fingerling walleye. This survey also served to determine CPUE of detrimental rough fish, specifically common carp and gizzard shad. A total of two electrofishing stations were chosen randomly, and were equally spaced around the lake. Each station was 2 miles of shoreline in length and within each station, panfish, gamefish, common carp, and gizzard shad were collected during the first 0.5 mile, while gamefish and common carp were collected for the remaining 1.5 miles. Gizzard shad were counted, and a subsample of these fish was measured to potentially identify distinct year classes from the length frequency distribution. All gamefish and panfish were measured to the nearest 0.1 inch. Starting and ending GPS coordinates for electrofishing stations can be found in Table 4.

Data Analysis

The walleye PE (number of adult fish ≥ 15 inches) was calculated using the Chapman modification of the Petersen single-census method where fish are marked during multiple fyke netting events (SNI), followed by a single recapture event (SEI). The formula is noted here:

$$N = \frac{(M+1)(C+1)}{R+1} - 1$$

Where N is the estimated population size, M is the number of fish that were marked, C is the number of fish captured on the recapture run and examined for marks, and R represents the number of fish captured on the recapture run that had marks. Once the estimate was calculated, it was divided by the surface area of the lake to determine adult walleye density (number of fish ≥ 15 inches / acre). This density was then compared to average densities for stocked and naturally reproducing walleye fisheries in Wisconsin. Using the same method and survey data, a

population estimate was also derived for the total number walleyes in Park Lake, regardless of size.

For SNI, SEI, SEII, and fall electrofishing, total catch and catch per unit of effort (CPUE) was calculated by gear type for all species. Data for both gear types was then combined, and length frequency distributions were generated for panfish and gamefish species with 50 or more individuals collected. Length range, mean length, median length, and mode length were calculated for all species. Proportional stock density (PSD) and relative stock density of preferred length fish (RSD-P) were calculated for all panfish and gamefish species with more than 100 individuals collected (Anderson and Neumann 1996). Length designations for stock, quality, preferred, memorable, and trophy sizes of the panfish and gamefish species collected from Park Lake can be found in Table 5; these values were used for calculation of stock density indices (Anderson and Neumann 1996). Aging structures (scales, dorsal spines, anal spines, and anal fin rays) were used to estimate ages of a subsample of each species, and age and size data from these fish were used to generate age-length keys to assign ages to the unaged fish in the sample.

Once age frequency distributions were completed for each species, inferences were made about year class strength and mortality when possible. Length-at-age data were also used to make inferences about growth of fish in Park Lake by comparing the lake to regional and statewide averages.

A von Bertalanffy growth curve was fitted to walleye length at age data for Park Lake to provide the predictive relationship of walleye length based on age. The von Bertalanffy growth equation is here:

$$l_t = L_\infty(1 - e^{-K(t-t_0)})$$

Where l_t is the length of the fish at a given age, L_∞, or L infinity, is the maximum theoretical length, K is the growth coefficient, and t_0 is the time in years when length would theoretically be equal to zero. Fishery Analysis and Modeling Simulator software (FAMS 1.0, Slipke and Maceina 2010) was used to estimate the model parameters. The growth curve was then plotted against observed values of mean length at age.

Relative weights were calculated to evaluate body condition of fish. Relative weight (W_r) is a tool biologists use to look at body condition of fish by comparing the length of the fish to an expected weight for that length. Standard weights were calculated for individuals of each species that had weights recorded (Murphy et al. 1991; Anderson and Neumann 1996). Standard weights were only calculated for individuals larger than the minimum recommended length for each species. Relative weights for each fish were calculated by dividing a fish's actual weight by the standard weight for a fish of that length. Average relative weight was then calculated for each species, and was done 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.

RESULTS AND DISCUSSION

General Fish Community

A total of 7,519 fish representing 20 different species from 10 families were sampled during spring netting and electrofishing, and fall electrofishing on Park Lake in 2011. Catch by gear type are shown for each species collected in Tables 6 and 7.

Black Crappie

In total, 3,094 black crappies were collected during the spring; the catch rates were 113.9 per net night during SNI and 18.0 per mile of shoreline during SEII (Table 6). The SEII catch rate ranked in the 73rd percentile statewide. Black crappies were the most abundant sport fish by number during spring netting and electrofishing (Table 6). In total, 1,271 black crappies were measured, and lengths ranged from 2.7 to 11.8 inches. The average, median, and mode lengths were 9.0, 9.4, and 9.7 inches, respectively (Table 8). The length frequency distribution for black crappie shows a bulk of the fish in the 9.0, 9.5, and 10.0 half-inch groups (Figure 1). Very few small or large fish were present in the sample. Black Crappie PSD and RSD-P values were 89 and 11, respectively. An additional 30 black crappies were sampled during the fall electrofishing survey; the catch rate was 30 per mile. Black crappies collected in the fall ranged from 2.7 to 5.9 inches in length, and averaged 5.2 inches (Table 9). Based on region and state average lengths, the crappies collected during the fall survey represented age 0 and age 1 fish.

Ages were estimated for a subsample of 65 black crappies collected during the spring, and 104 were weighed. Ages ranged from 1 to 5 years with age 3 fish being the most common, followed by age 2 (Figure 2). This indicates that a good year class was produced in 2008, and another solid year class was produced in 2009. Fish younger and older than this segment of the population are represented by few individuals per age group, and thus have limited value for state and regional growth comparisons. Age 2 and older black crappie grew as fast as or faster than the region and state averages. Black crappies in Park Lake reach an average length of 7.7 inches by age 2, 9.6 inches by age 3, and 10.8 inches by age 4 (Figure 3). By age 3, black crappies reach an acceptable size to be harvested by anglers, and numbers decline quickly through age 5, the oldest in the distribution. Black crappies in Park Lake were in good condition overall; the average relative weight was 102.5 (Figure 4).

Yellow Perch

In total, 1,117 yellow perch were collected; catch rates were 39.9 per net night during SNI and 41.0 per mile of shoreline during SEII (Table 6). The SEII catch rate ranked in the 88th percentile statewide. Yellow perch were the second most abundant sport fish by number collected during spring netting and electrofishing (Table 6). Lengths ranged from 3.0 to 10.5 inches, and the average, median, and mode lengths were 6.1, 5.7, and 5.4 inches, respectively (Table 9, Figure 5). Of the yellow perch greater than 5 inches in length (stock size), fish 8 inches and larger were present (PSD = 8), and fish 10 inches and larger were rare (RSD-P = 1). Sex was known for 620 fish and the sex ratio of these fish was 2.8:1, males to females. Male yellow perch averaged 6.0 inches, while female yellow perch averaged 6.7 inches.

Age 1 fish were not present in the sample, and this is most likely due to them not being vulnerable to the sampling gear. Nearly all of the yellow perch collected were caught in fyke nets, and age 1 perch are too small to be contained by the fyke net mesh used in the survey. Age 2 was the most common age class present in the catch, with numbers of fish declining to almost zero by age 5 (Figure 6). Growth was modest, with fish reaching an average length of 5.8 inches by age 2, and 7.5 inches by age 3, which is faster growth than the state average but slower growth than the regional average (Figure 7). Growth of age 4 fish was faster than state average and equal to the region average, but age 5 fish were poorly represented and thus have limited value for state and regional comparisons (Figure 7). Mortality after age 2 is high, and is probably due more to predation by walleye and northern pike, and less to angling because age 3 fish only averaged 7.5

inches and were not likely to be desired by anglers. Yellow perch were in average to good condition. Relative weights of females, males, and unknown sex fish were 110.1, 82.1, and 122.2, respectively. Relative weight for all fish averaged 94.9 (Figure 8). Five yellow perch were also collected during the fall survey ranging from 3.2 to 5.5 inches, with an average length of 4.6 inches.

Bluegill

In total, 810 bluegills were collected during the spring; the catch rates were 27.4 per net night during SNI and 71.0 per mile of shoreline during SEII (Table 6). The SEII catch rate ranked in the 42nd percentile statewide. In terms of the total number of fish caught during spring netting and electrofishing, bluegill was the third most abundant species (Table 6). Nearly all bluegills collected during SNI and SEII (N = 733) were measured, and the remainder were counted and released (SNI). Aging structures were taken from a subsample of 62 fish, and weights were recorded from a total of 99 fish. Lengths ranged from 2.2 to 8.6 inches, and the average, median, and mode lengths were 5.3, 5.0, and 4.7 inches, respectively (Table 8, Figure 9). Bluegill PSD and RSD-P values were 34 and 1, respectively (Table 8). The RSD-P is lower than the desired range of 5 to 20 for a balanced bluegill population; size structure is poor (Willis et al. 1993). Ages ranged from 1 to 7, with age 2 fish being the most common in the distribution (Figure 10). Bluegill growth in Park Lake appears to be moderate, as they grow faster than the state average, but not quite as fast as the regional average until age 6 when length at age surpasses both the state and region averages (Figure 11). The size distribution is bi-modal with a peak at the 4.5 half-inch group, and a second peak at the 6.0 half-inch group. Bluegills reach an average length of 6.3 inches by age 3, 7.4 inches by age 4, and 7.6 inches by age 5. Overall, bluegills larger than 3 inches were in average condition (mean relative weight = 80.5), but bluegills from 3 to 5 inches were in poor condition; mean relative weight for these fish was 63.8 (Figure 12). Forty-three bluegills were collected during the fall survey (CPE = 43 per mile), ranging from 1.9 to 7.8 inches in length, with an average length of 5.7 inches (Table 7, Table 9).

Walleye

In total, 493 walleyes were collected from Park Lake during the spring (including recaptures); catch rates were 12.0 per net night during SNI, 24.8 per mile of shoreline sampled during SEI, and 7.0 per mile during SEII (Table 6). Walleyes were the fourth most abundant sport fish by number during spring netting and electrofishing (Table 6). For the population estimate, a total of

125 adult walleyes ≥ 15 inches were marked during fyke netting. Fifty-six adult walleyes were captured during SEI, and marks were found on 20 of these fish. The Chapman population estimate was calculated at 341 adult walleyes ≥ 15 inches (95% CI 248 – 509), for a density of 1.1 adults ≥ 15 inches per surface acre (95% CI = 0.8 – 1.6 per acre). This represents a decrease in adult density from 2007, when the population was calculated at 1.9 adults ≥ 15 inches per surface acre.

For all walleyes, regardless of size, a total of 288 fish were marked during fyke netting. During SEI, 128 total walleyes were captured, and marks were found on 33 of those fish. The Chapman population estimate for all walleyes in Park Lake, regardless of size, was calculated at 1,096 (95% CI 830 – 1,513) for a total walleye density of 3.5 fish per surface acre (95% CI 2.7 – 4.8). This represents only a slight decrease from the estimate of 3.8 total walleyes per acre in 2007.

The SEII catch rate of fish ≥ 10 inches (CPE10) was 3.8 per mile, ranking in the 38th percentile for Wisconsin lakes ≥ 190.5 acres. In total, 411 walleyes were measured during spring sampling (total catch excluding recaptures) and lengths ranged from 7.2 to 25.8 inches (Figure 13). The average length was 14.3 inches, and the median and mode lengths were 14.5 and 14.6 inches, respectively (Table 8). The PSD and RSD-P values calculated from spring netting and electrofishing were 49 and 6, respectively (Table 8).

Ages were estimated for a subsample of 139 walleyes using dorsal spine sections. Age 1 fish were the most common age in the distribution, with numbers declining steadily thereafter through age 9, the oldest fish in the distribution (Figure 14). Walleye growth in Park Lake is moderate to fast; walleyes in Park Lake grow faster than the regional and state averages for ages 1 through 3, but slower than the regional average for ages 4 through 7 (Figure 15). Walleyes grow faster than state and regional averages for age 8 and faster than the state average for age 9; no regional average was available for age 9. Walleyes begin to reach legal harvest size (15 inches) as early as age 2, and age 3 fish averaged 15.6 inches. All age 4 and older walleyes that were sampled exceeded 15 inches.

The von Bertalanffy growth equation does an excellent job of describing growth of walleyes in Park Lake through age 9, the oldest age represented in the survey (Figure 16). When solving for the model parameters, allowing the software to solve for L_∞ rather than holding it constant at a specific value while solving for K and t_0 was preferable because it provided the best fit of the

growth function to the data. The estimates of the three model parameters (L_∞, K, and t_0) were 32.4 inches (882.8 millimeters), 0.108, and -2.856, respectively.

Good growth of walleye, particularly at ages 1 through 3, can be attributed to an abundance of prey in the lake, including gizzard shad and yellow perch. Walleye growth slows somewhat at age 4, and this can be attributed to the fish reaching sexual maturation and shifting energy allocation from somatic growth to reproduction. Overall, walleyes larger than 6 inches were in good condition (mean relative weight = 98.2), with females (mean relative weight = 99.8) in slightly better condition than males (mean relative weight = 94.2). Walleye relative weights are represented in Figure 17.

Survival of stocked small fingerling walleyes through their first growing season in Park Lake was assessed through the fall electrofishing survey. In total, 103 walleyes were collected during the fall survey, and 28 were young of the year (YOY). The overall catch rate was 25.8 walleyes per mile, and the YOY walleye catch rate was 7.0 per mile. The YOY catch rate places Park Lake in the 65th percentile of Wisconsin lakes smaller than 546 acres. Young of the year walleyes ranged from 4.7 to 9.2 inches in length, averaging 8.0 inches. Only one of the YOY walleyes was smaller than 6.5 inches. Age 1 and older walleyes in the fall survey ranged from 12.5 to 26.8 inches in length, averaging 15.2 inches while the median and mode lengths were 14.3 and 14.6 inches, respectively (Table 9).

Largemouth Bass

In total, 118 largemouth bass were collected during the spring; overall catch rates were 0.9 per net night during fyke netting, 7.6 per mile of shoreline sampled during SEI, and 13.5 per mile during SEII (Table 6). The catch rate of fish ≥ 8 inches (stock size) during SEII was 8.3 per mile, and this ranked in the 61st percentile in a comparison of 11 Wisconsin drainage basins. This indicates that based on SEII CPE8, largemouth bass densities in Park Lake compare favorably with other drainage basins in the state. Largemouth bass was the sixth most abundant sport fish species sampled during the spring survey.

Largemouth bass lengths ranged from 4.6 to 20.3 inches, and the average, median, and mode lengths were 11.2 inches, 11.3, and 5.2 inches, respectively (Table 8). The length frequency distribution is represented in Figure 18. Of the largemouth bass ≥ 8 inches in length (stock size), fish ≥ 12 inches were present in good numbers (PSD = 62), as were fish 15 inches and larger

(RSD-P = 28). A total of 30% (N = 35) of all largemouth bass sampled were larger than the 14 inch minimum size limit.

Altogether, 63 largemouth bass were included in the age analysis. Age 1 was the most common age in the sample, with numbers declining steadily thereafter through age 8, along with a single age 12 fish, the oldest fish in the distribution (Figure 19). Largemouth bass growth in Park Lake is moderate; bass generally grow faster than the state average but slower than the regional average through age 7. Largemouth bass begin to reach legal harvest size (14 inches) as early as age 5 when they average 14.2 inches, while age 6 fish average 15.2 inches. All fish age 6 and older that were sampled exceeded 14 inches. Growth of age 8 fish appears to be slower than the state and regional averages (Figure 20). This is at least partly an artifact of only one age 8 fish being present in the sample. Better growth of older largemouth bass might be expected due to abundant forage in the form of gizzard shad. However, foraging success of largemouth bass may be limited due to constant turbid state of the lake, and by dense algal blooms during the summer which can further reduce visibility for sight feeding predators. Largemouth bass larger than 6 inches were generally in excellent condition; the average relative weight was 111.8 (Figure 21).

In total, 111 largemouth bass were collected during the fall survey; the catch rate was 27.8 per mile (Table 7). Largemouth bass were the most abundant gamefish collected in the fall sample. Lengths ranged from 7.0 to 17.6 inches, averaging 11.0 inches (Table 9). The median and mode lengths during the fall survey were 10.2 and 8.8 inches, respectively (Table 9). Largemouth bass PSD and RSD-P values for the fall survey were 38 and 7, respectively.

Northern Pike

In total, 51 northern pike were sampled during the spring; the catch rates were 1.4 fish per net night (SNI), 1.7 fish per mile during SEI, and 0.5 fish per mile during SEII. Lengths ranged from 13.2 to 32.3 inches and the length frequency distribution is represented in Figure 22. The average length was 23.7 inches, the median length was 23.3 inches, and the mode was 21.1 inches (Table 8). Ages ranged from 1 to 5 years, with age 3 fish being the most common, as represented in Figure 23. Northern pike in Park Lake show faster growth than the regional and state averages for ages 2, 3, and 5, and almost identical growth to the regional average for age 4 (Figure 24). There was only one age 1 fish in the sample; it was a female that was between the regional and state averages. Relative weights for northern pike were generally within the normal range, and

averaged 92.0, 93.5, and 113.6 for females, males, and unknown sex fish, respectively (Figure 25). Fast growth of northern pike in Park Lake can be attributed to an abundance of prey, including gizzard shad, common carp, and yellow perch. Five northern pike were collected during the fall survey (CPE = 1.3 per mile) ranging from 19.8 to 29.4 inches, with an average length of 22.2 inches (Table 7, Table 9).

Other Desirable Fish Species

Channel catfish and pumpkinseed provide additional fishing opportunities in Park Lake. In total, 51 channel catfish were collected during the spring and fall surveys. Lengths ranged from 7.9 to 24.1 inches, averaging 18.1 inches in the spring and 11.8 inches in the fall (Table 8, Table 9). The presence of small catfish (7 to 10 inches, approximately age 2) indicates that stocked catfish are now successfully reproducing in the lake. Prior to the 2011 survey, channel catfish had not been stocked into Park Lake since 2000. A more thorough survey of the catfish population in Park Lake could be accomplished using baited hoop nets if desired in the future.

Pumpkinseed catch rates were 3.9 per net night during SNI, and 9.0 per mile during SEII. Lengths ranged from 3.0 to 7.1 inches, averaging 5.0 inches. The median and mode lengths were 4.8 and 4.3 inches, respectively.

Detrimental Rough Fish

Gizzard shad and common carp have been identified as being detrimental fish species in Park Lake. Specifically, the feeding behavior of the two species stirs up bottom sediments and aids in re-suspension of phosphorous. Gizzard shad further contribute to the problem through the copious amounts of feces they produce. This re-suspension of phosphorous contributes to the turbid state of the lake and corresponding algal blooms. Gizzard shad were collected during SNI (CPE = 1.8 per net night), but not during SEII (Table 6). Common carp were collected during SNI (CPE = 1.3 per net night), and were counted during SEII, averaging 8.0 fish per mile (Table 6).

During the fall survey, gizzard shad were the most abundant species collected by a wide margin; the electrofishing catch rate was 603 per mile (Table 7). The gizzard shad sample was largely composed of YOY fish ranging from 2.9 to 4.5 inches in length. Common carp were observed

and counted during the fall survey; the observation rate was 21.5 per mile. While common carp are present and probably having some detrimental effects on the lake, gizzard shad are significantly more abundant and are probably having more of an impact on the water quality of the lake. Gizzard shad are negatively impacting fish populations in the lake, specifically bluegills, by reducing their growth through competition for food resources, and by contributing to the turbid state of the lake which reduces feeding success of sight-feeding fish. Predator densities must be increased to help combat detrimental rough fish, especially gizzard shad.

CONCLUSIONS

Park Lake is turbid and has little submersed aquatic vegetation. As such, it has a fish community characteristic of shallow, turbid systems. Black crappie is the dominant panfish species and the most abundant species likely to be pursued by anglers in Park Lake. The black crappie generally prefers clearer water than does the white crappie, however it seems to be quite successful in this shallow turbid system, as it has been in other such systems in Wisconsin (Becker 1983). Crappies have also been known to be abundant in areas populated by carp (which Park Lake is), as the carp convert habitat from weedy to more open, thus benefitting black crappie feeding abilities (Schneberger 1972, Becker 1983). Age 2 and older black crappies grow relatively fast in Park Lake, likely due to a dietary shift from relying on zooplankton to larger prey such as insects and fish after early life stages. Larval and juvenile gizzard shad represent a plentiful food source for black crappies in Park Lake from spring through fall.

Largemouth bass and bluegills are present, but numbers have declined from what they were when the lake was a clear water system with abundant aquatic vegetation. Bluegill numbers are low, and size structure is poor. While growth falls between state and region averages, condition of small bluegills from three to five inches in length is poor. This is most likely a reflection of competition for food (zooplankton) between larval and juvenile bluegills and YOY gizzard shad (DeVries and Stein 1992, Dettmers and Stein 1992, Aday 2003). This competition can lead to reduced growth rates and condition of bluegill throughout life (Aday 2003). Older gizzard shad are less likely to compete for zooplankton because by age 1, they have undergone a diet shift to detritus and phytoplankton (Becker 1983).

The decline in largemouth bass abundance since the mid-1990s is probably due to a variety of factors acting in concert, rather than any single factor. The CPUE of largemouth bass $\geq$ 8 inches during SEII (8.3 fish/mile) is low relative to other lakes in Wisconsin. Declines in submersed

aquatic vegetation may have led to fewer suitable nesting areas for largemouth bass, which prefer protected areas with abundant vegetation (Becker 1983). Young of year gizzard shad compete with largemouth bass for zooplankton, and have a head start because they are hatched earlier in the spring than the bass (Becker 1983, Dettmers and Stein 1992, Aday et al. 2005). The transition from a clear water lake to a turbid lake may have negatively impacted largemouth bass, a sight-feeding predator, by reducing visibility and thus foraging success. This may be offset, however, by high abundances of prey such as gizzard shad, which older largemouth bass will readily utilize. Condition of largemouth bass in Park Lake remains good based on observed relative weight values. Largemouth bass growth falls between state and regional averages through age 7, and stock density indices such as PSD and RSD-P (62 and 28) still fall within the ranges recommended by Willis et al. (1993) of 40 to 70 and 10 to 40, respectively for a balanced largemouth bass population. Abundance of stock size and larger fish is where largemouth bass fall short in Park Lake.

Yellow perch are abundant in Park Lake, but probably serve more as prey for walleye and northern pike, rather than to provide a fishery for anglers. Age 2 yellow perch were the most common (average length 5.8 inches), but by the time they begin to reach acceptable harvest size for anglers at age 4 (average length 9.1 inches) abundance is reduced to low levels. Nonetheless, yellow perch are a vital component of the fish community in Park Lake.

Walleyes add a bonus fishery component to the bass, panfish, and northern pike fisheries in Park Lake. Abundance of adult walleyes ≥ 15 inches is 1.1 fish/acre, and this is well below the normal desired goal of 2 to 3 fish/acre for a stocked walleye fishery in Wisconsin. Hyper stocking of walleyes in the past did build the fishery up to near the desired population goal, but lack of regulatory protection of adult walleyes offset population gains. As walleyes became more abundant, they were increasingly sought by anglers and harvested at a size that did not allow the population to reach its full potential. New walleye size and bag limits that go into effect in 2014 should afford the walleye population the protection it has lacked in the past. Numbers and size structure should improve as a result.

Stockings of small fingerling walleyes into Park Lake have been successful in maintaining the low-level fishery that exists there. This success is most likely attributable to the turbid state of the lake and the low densities of a portion of the centrarchid population. The turbid water provides cover that is not otherwise offered by aquatic vegetation, and predators (some already at

reduced levels anyway) have a harder time preying on the small fingerlings. Once the walleyes are large enough to consume other fish, prey is readily available in the form of yellow perch and gizzard shad, and growth of walleyes is relatively fast through age 4. Positive effects on the walleye population that are attributable to the regulation changes should be evident by the next comprehensive survey which is scheduled for 2019.

Northern pike are present in Park Lake, and actually grow faster than the state and region averages, reaching legal harvest size around age 5. Prey for northern pike is not lacking in Swan Lake as yellow perch, gizzard shad, and common carp all serve to feed this predator. Successful natural reproduction of northern pike in Park Lake and the Fox River system appears to still occur, at least periodically, as evidenced by good numbers of YOY northern pike captured in the Fox River upstream of Park Lake during a stream survey in September 2013. Poor water quality and the lack of a thermal refuge during the height of severe summer drought events serve as the biggest challenges to northern pike in Park Lake, as well as other shallow impoundments in south central and southeastern Wisconsin. This was made particularly evident in mid-July 2012 when elevated water temperatures caused northern pike die-offs in several Columbia County lakes including Lake Wisconsin, Lazy Lake, and Wyona Lake (Wyocena Millpond). A northern pike die-off was not reported on Park Lake during this period, but could very well occur during similar temperature-related events in the future. This is supported by the past documented major northern pike die-off in Park Lake (1995) which was attributed to heat stress.

The more restrictive length and bag limits going into effect in 2014 will afford the northern pike population extra protection from harvest and hopefully allow northern pike to help control nuisance carp and gizzard shad through increased consumption. Too few northern pike were collected in the 2011 survey to provide a meaningful population estimate and meaningful PSD and RSD calculations. Only four percent of the northern pike collected in the entire 2011 survey were 30 inches or larger.

Carp and gizzard shad catch rates in the 2011 fall survey were 21.5/mile and 603.0/mile, respectively. Until a chemical treatment of Park Lake can be completed, environmental conditions (long cold winters) and consumption by predator fish will be the only means of control of these species.

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TABLES AND FIGURES

Table1. Current fishing regulations (2013) for Park Lake, Columbia County, Wisconsin.

Species	Season Dates	*Length and Bag Limits Through 2013
Catfish	Open All Year	No minimum length limit and the daily bag limit is 10.
Panfish (bluegill, pumpkinseed, sunfish, crappie, and yellow perch)	Open All Year	No minimum length limit and the daily bag limit is 25.
Largemouth bass and smallmouth bass	First Saturday in May through the first Sunday in March	The minimum length limit is 14" and the daily bag limit is 5.
Northern pike	First Saturday in May through the first Sunday in March	The minimum length limit is 26" and the daily bag limit is 2.
Walleye, sauger, and hybrids	First Saturday in May through the first Sunday in March	The minimum length limit is 15" and the daily bag limit is 5.
Bullheads	Open All Year	No minimum length limit and the daily bag limit is unlimited.
Rough fish	Open All Year	No minimum length limit and the daily bag limit is unlimited.

*Minimum length and daily bag limits for largemouth bass, northern pike, and walleye will change to 18/1, 32/1, and 18/3 for the 2014-2015 fishing season.

Table 2. Stocking history of Park Lake, 1972-2012.

Year	Waterbody Name	Species	Strain (Stock)	Age Class	Number Fish Stocked	Avg. Fish Length (inches)
1972	PARK LAKE	LARGEMOUTH BASS	UNSPECIFIED	FRY	2,000	2.0
1976	PARK LAKE	LARGEMOUTH BASS	UNSPECIFIED	FINGERLING	15,000	3.0
1976	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	FINGERLING	3,031	11.0
1979	PARK LAKE	LARGEMOUTH BASS	UNSPECIFIED	FRY	10,000	
1987	PARK LAKE	MUSKELLUNGE	UNSPECIFIED	FINGERLING	75	10.0
1987	PARK LAKE	NOP X MUE	UNSPECIFIED	FINGERLING	885	10.0
1987	PARK LAKE	WALLEYE	UNSPECIFIED	FINGERLING	150	4.0
1988	PARK LAKE	NOP X MUE	UNSPECIFIED	FINGERLING	1,100	9.0
1989	PARK LAKE	NOP X MUE	UNSPECIFIED	FINGERLING	831	8.0
1990	PARK LAKE	NOP X MUE	UNSPECIFIED	FINGERLING	150	8.0
1991	PARK LAKE	MUSKELLUNGE	UNSPECIFIED	FINGERLING	400	9.0
1991	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	FINGERLING	1,086	8.0
1991	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	FRY	600,000	0.6
1991	PARK LAKE	WALLEYE	UNSPECIFIED	FINGERLING	1,238	5.0
1992	PARK LAKE	MUSKELLUNGE	UNSPECIFIED	FINGERLING	196	9.0
1992	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	FINGERLING	600	9.0
1992	PARK LAKE	WALLEYE	UNSPECIFIED	FINGERLING	2,170	4.7
1993	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	FINGERLING	600	7.8
1993	PARK LAKE	WALLEYE	UNSPECIFIED	FINGERLING	1,000	3.0
1994	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	FINGERLING	500	7.5
1995	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	FINGERLING	100	13.0
1995	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	FINGERLING	2,236	5.7
1995	PARK LAKE	WALLEYE	UNSPECIFIED	FINGERLING	480	6.0
1996	PARK LAKE	CHANNEL CATFISH	UNSPECIFIED	FINGERLING	3,000	5.0
1996	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	FINGERLING	1,200	8.0
1996	PARK LAKE	WALLEYE	UNSPECIFIED	FINGERLING	2,000	5.0
1997	PARK LAKE	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	75	10.0
1997	PARK LAKE	WALLEYE	UNSPECIFIED	LARGE FINGERLING	1,140	4.5

Year	Waterbody	Species	Strain (Stock)	Age Class	Number Fish Stocked	Avg. Fish Length (inches)
1998	PARK LAKE	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	130	11.9
1998	PARK LAKE	WALLEYE	DELAVAN LAKE	SMALL FINGERLING	43,900	1.3
1999	PARK LAKE	CHANNEL CATFISH	UNSPECIFIED	ADULT (BROODSTOCK)	428	13.5
1999	PARK LAKE	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	150	11.8
1999	PARK LAKE	MUSKELLUNGE	UNSPECIFIED	YEARLING	148	14.7
1999	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	LARGE FINGERLING	200	12.5
1999	PARK LAKE	NOP X MUE	UNSPECIFIED	YEARLING	253	14.6
1999	PARK LAKE	WALLEYE	UNSPECIFIED	FRY	561,600	0.4
2000	PARK LAKE	CHANNEL CATFISH	UNSPECIFIED	ADULT	4,713	7.0
2000	PARK LAKE	CHANNEL CATFISH	UNSPECIFIED	LARGE FINGERLING	1,700	6.0
2000	PARK LAKE	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	228	11.0
2000	PARK LAKE	MUSKELLUNGE	UNSPECIFIED	YEARLING	120	14.3
2000	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	LARGE FINGERLING	400	14.0
2000	PARK LAKE	NOP X MUE	UNSPECIFIED	LARGE FINGERLING	301	8.1
2000	PARK LAKE	NOP X MUE	UNSPECIFIED	YEARLING	101	12.0
2000	PARK LAKE	WALLEYE	UNSPECIFIED	SMALL FINGERLING	31,260	1.4
2001	PARK LAKE	MUSKELLUNGE	UNSPECIFIED	LARGE FINGERLING	300	9.0
2001	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	LARGE FINGERLING	500	12.0
2001	PARK LAKE	NOP X MUE	UNSPECIFIED	LARGE FINGERLING	300	9.3
2001	PARK LAKE	WALLEYE	UNSPECIFIED	LARGE FINGERLING	375	7.0
2002	PARK LAKE	NORTHERN PIKE	PUCKAWAY	SMALL FINGERLING	1,787	4.4
2002	PARK LAKE	NORTHERN PIKE	PUCKAWAY	SMALL FINGERLING	5,232	2.2
2002	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	LARGE FINGERLING	3,231	11.3
2002	PARK LAKE	WALLEYE	ROCK-FOX	SMALL FINGERLING	15,600	1.4
2003	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	LARGE FINGERLING	1,200	12.5
2003	PARK LAKE	WALLEYE	LAKE MICHIGAN	SMALL FINGERLING	156,780	2.1
2003	PARK LAKE	WALLEYE	LAKE MICHIGAN	SMALL FINGERLING	15,000	1.4
2003	PARK LAKE	WALLEYE	UNSPECIFIED	LARGE FINGERLING	2,000	9.3

Year	Waterbody	Species	Strain (Stock)	Age Class	Number Fish Stocked	Avg. Fish Length (inches)
2004	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	LARGE FINGERLING	875	14.0
2004	PARK LAKE	WALLEYE	LAKE MICHIGAN	SMALL FINGERLING	114,547	1.4
2004	PARK LAKE	WALLEYE	UNSPECIFIED	LARGE FINGERLING	7,000	6.0
2005	PARK LAKE	BLUEGILL	UNSPECIFIED	ADULT	2,300	4.0
2005	PARK LAKE	BLUEGILL	UNSPECIFIED	YEARLING	2,000	3.5
2005	PARK LAKE	LARGEMOUTH BASS	UNSPECIFIED	LARGE FINGERLING	2,000	4.0
2005	PARK LAKE	NORTHERN PIKE	PUCKAWAY	SMALL FINGERLING	10,059	2.1
2005	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	FRY	60,000	0.8
2005	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	SMALL FINGERLING	5,000	2.0
2005	PARK LAKE	WALLEYE	LAKE MICHIGAN	SMALL FINGERLING	156,016	1.5
2005	PARK LAKE	WALLEYE	UNSPECIFIED	LARGE FINGERLING	3,000	6.0
2006	PARK LAKE	NORTHERN PIKE	PUCKAWAY	SMALL FINGERLING	14,532	2.7
2006	PARK LAKE	WALLEYE	LAKE MICHIGAN	SMALL FINGERLING	124,445	1.1
2006	PARK LAKE	WALLEYE	ROCK-FOX	SMALL FINGERLING	45,055	1.1
2008	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	SMALL FINGERLING	7,250	1.9
2008	PARK LAKE	WALLEYE	ROCK-FOX	SMALL FINGERLING	5,616	1.3
2009	PARK LAKE	NORTHERN PIKE	MUD LAKE - MADISON CHAIN	SMALL FINGERLING	15,843	2.6
2009	PARK LAKE	WALLEYE	ROCK-FOX	SMALL FINGERLING	5,616	1.4
2010	PARK LAKE	WALLEYE	ROCK-FOX	SMALL FINGERLING	5,616	1.7
2011	PARK LAKE	WALLEYE	ROCK-FOX	SMALL FINGERLING	5,616	1.5
2012	PARK LAKE	CHANNEL CATFISH	UNSPECIFIED	LARGE FINGERLING	300	5.0
2012	PARK LAKE	NORTHERN PIKE	MUD LAKE - MADISON CHAIN	SMALL FINGERLING	3,000	2.1
2012	PARK LAKE	NORTHERN PIKE	UNSPECIFIED	YEARLING	300	11.0
2012	PARK LAKE	WALLEYE	ROCK-FOX	SMALL FINGERLING	5,616	1.2

Table 3. Locations of fyke nets (GPS coordinates) used during SNI on Park Lake in 2011.

Net Number	Date First Set	Date Last Lifted	Latitude	Longitude
1	04/10/2011	04/15/2011	43.54482	-89.28238
2	04/10/2011	04/15/2011	43.54830	-89.28268
3	04/10/2011	04/15/2011	43.54361	-89.29511
4	04/10/2011	04/15/2011	43.53877	-89.29891
5	04/10/2011	04/12/2011	43.54259	-89.29729
6	04/10/2011	04/15/2011	43.54325	-89.29422
7	04/12/2011	04/15/2011	43.545	-89.29477

Table 4. Locations of electrofishing stations (GPS coordinates) sampled during SEII and fall electrofishing on Park Lake in 2011.

Date	Station	Distance (miles)	Start Latitude	Start Longitude	End Latitude	End Longitude
05/16/2011	Panfish #1	0.5	43.54355	-89.28363	43.55109	-89.27899
05/16/2011	Gamefish #1	1.5	43.55109	-89.27899	43.54841	-89.29420
05/16/2011	Panfish #2	0.5	43.54841	-89.29657	43.54374	-89.29716
05/16/2011	Gamefish #2	1.5	43.54374	-89.29716	43.54239	-89.29657
10/12/2011	Panfish #1	0.5	43.54841	-89.2942	43.55109	-89.27899
10/12/2011	Gamefish #1	1.5	43.55109	-89.27899	43.54355	-89.28363
10/12/2011	Panfish #2	0.5	43.54355	-89.28363	43.54374	-89.29716
10/12/2011	Gamefish #2	1.5	43.54374	-89.29716	NA	NA

Table 5. Length categories (inches) that have been proposed for the sport fish species that were collected from Park Lake in 2011 (Anderson and Neumann 1996).

Species	Stock	Quality	Preferred	Memorable	Trophy
Black crappie	5	8	10	12	15
Bluegill	3	6	8	10	12
Channel catfish	11	16	24	28	36
Largemouth bass	8	12	15	20	25
Northern pike	14	21	28	34	44
Walleye	10	15	20	25	30
Yellow perch	5	8	10	12	15

Table 6. Summary of catch by gear type for SNI, SNII, and SEII on Park Lake, spring 2011. Catch per unit of effort is abbreviated CPE.

	CATCH				CPE				
Species	SNI	SEI	SEII	Total	Fish/net night (SNI)	Fish/hour (SEI)	Fish/hour (SEII)	Fish/mile (SEI)	Fish/mile (SEII)
Black Crappie	3,076	0	18	3,094	113.9	0.0	0.0	36.0	18.0
Yellow Perch	1,076	0	41	1,117	39.9	0.0	0.0	82.0	41.0
Bluegill	739	0	71	810	27.4	0.0	0.0	142.0	71.0
Walleye	337	128	28	493	12.0	54.9	24.8	12.9	7.0
Yellow Bullhead	284	0	0	284	10.5	0.0	0.0	0.0	0.0
White Sucker	102	0	92	194	3.8	0.0	0.0	184.0	92.0
Largemouth Bass	25	39	54	118	0.9	16.7	7.6	24.9	13.5
Pumpkinseed	105	0	9	114	3.9	0.0	0.0	18.0	9.0
Northern Pike	40	9	2	51	1.4	3.9	1.7	0.9	0.5
Gizzard Shad	49	0	0	49	1.8	0.0	0.0	0.0	0.0
Channel Catfish	44	1	1	46	1.6	0.4	0.2	0.5	0.3
Common Carp	34	0	8	42	1.3	0.0	0.0	16.0	8.0
Green Sunfish	22	0	9	31	0.8	0.0	0.0	18.0	9.0
Yellow Bass	7	0	6	13	0.3	0.0	0.0	12.0	6.0
Golden Shiner	5	0	0	5	0.2	0.0	0.0	0.0	0.0
Black Bullhead	4	0	0	4	0.1	0.0	0.0	0.0	0.0
Bowfin	3	0	0	3	0.1	0.0	0.0	0.0	0.0
Hornyhead Chub	1	0	0	1	0.0	0.0	0.0	0.0	0.0
Quillback Carpsucker	1	0	0	1	0.0	0.0	0.0	0.0	0.0
Total	5,954	177	339	6,470					

Table 7. Summary of electrofishing CPUE during fall sampling on Park Lake in 2011.

*Species	Total Catch	Fish/hour	Fish/mile
Gizzard Shad	603	1,033.7	603.0
LMB	111	53.3	27.8
WAE	103	49.4	25.8
Common Carp	86	41.3	21.5
Yellow Bass	44	75.4	44.0
BLG	43	73.7	43.0
BLC	30	51.4	30.0
CCF	7	3.4	1.8
Green Sunfish	6	10.3	6.0
NOP	5	2.4	1.3
YEP	5	8.6	5.0
Pumpkinseed	4	6.9	4.0
Yellow Bullhead	1	1.7	1.0
Brook Silverside	1	1.7	1.0
	1,049		

*Majority of gizzard shad were YOY, 2.9 to 4.5 inches, most around 4.0 inches

Table 8. Summary of lengths (inches), stock density indices, and ages of gamefish and panfish sampled during spring 2011 on Park Lake.

Species	N	N Measured	Minimum Length	Maximum Length	Mean Length	Median Length	Mode	PSD	RSD-P	Minimum Age	Maximum Age
Black Crappie	3,094	1,271	2.5	11.8	9.0	9.4	9.7	89	11	1	5
Yellow Perch	1,117	675	3.0	10.5	6.1	5.7	5.4	8	1	2	5
Bluegill	810	733	2.2	8.6	5.3	5.0	4.7	34	1	1	7
Walleye	493	411	7.2	25.8	14.3	14.5	14.6	49	6	1	9
Pumpkinseed	123	114	3.0	7.1	5.0	4.8	4.3	21	0		
Largemouth Bass	118	117	4.6	20.3	11.2	11.3	5.2	62	28	1	12
Northern Pike	51	51	13.2	32.3	23.7	23.3	21.1			1	5
Channel Catfish	44	44	8.8	24.1	18.1	19.8	21.1				

Table 9. Summary of lengths (inches) and stock density indices of gamefish and panfish sampled during fall 2011 on Park Lake.

Species	N	Minimum Length	Maximum Length	Mean Length	Median Length	Mode	PSD	RSD-P
Largemouth Bass	111	7.0	17.6	11.0	10.2	8.8	38	7
Walleye	103	4.7	26.8	13.3	14.3	14.6	39	3
Bluegill	43	1.9	7.8	5.7	5.7	5.0		
Black Crappie	30	2.7	5.9	5.2	5.4	5.2		
Channel Catfish	7	7.9	19.6	11.8	8.8	8.8		
Northern Pike	5	19.8	29.4	22.2	20.4			

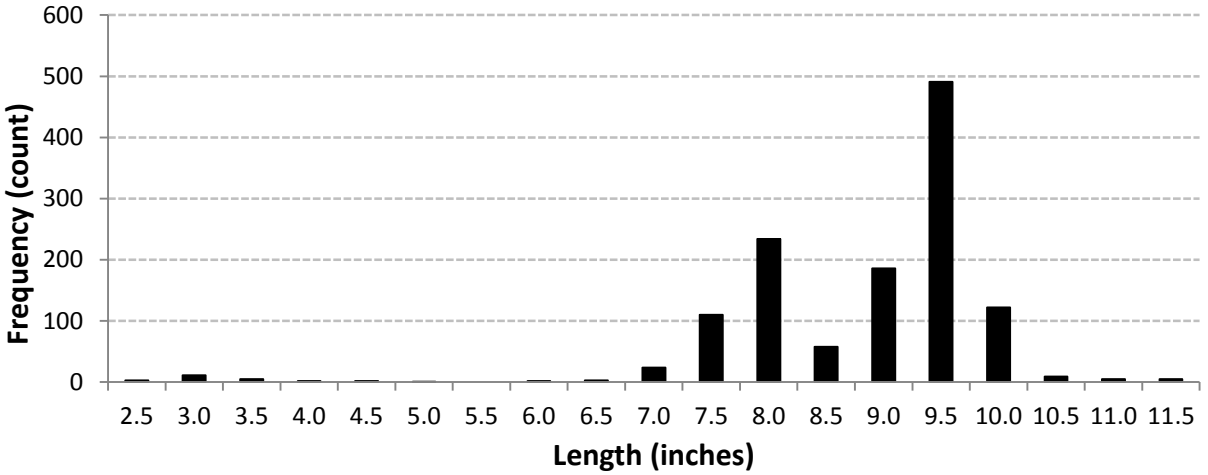

Figure 1. Length frequency distribution of black crappies collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

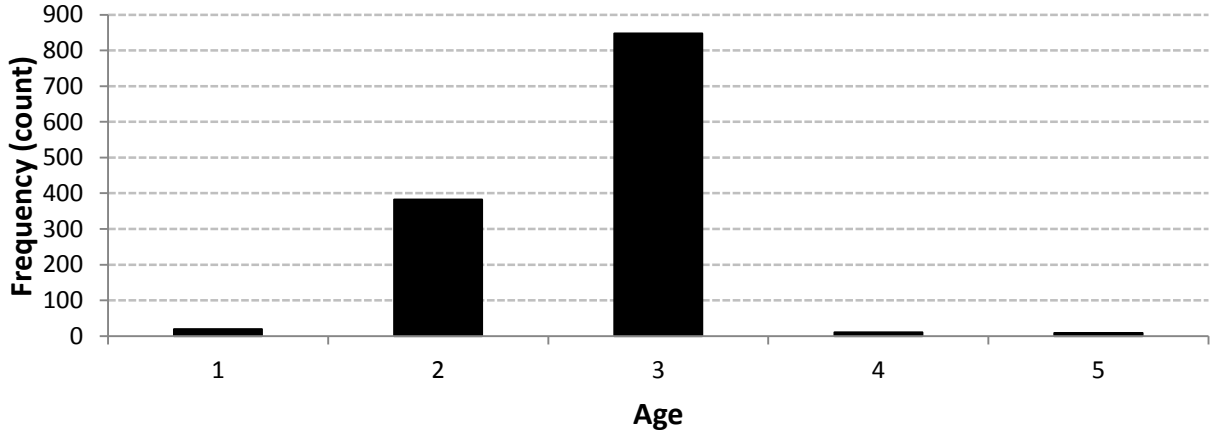

Figure 2. Age frequency distribution of black crappies collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

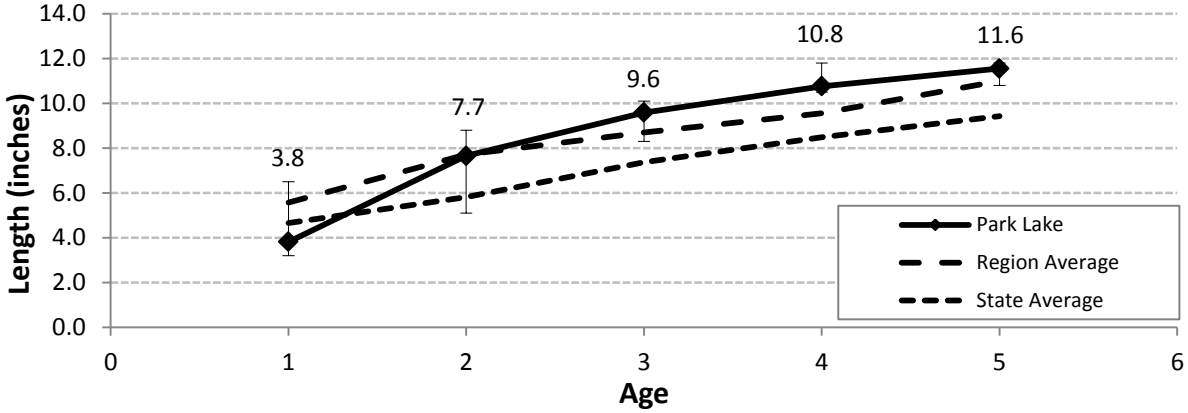

Figure 3. Mean length at age of black crappies collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin. Error bars represent minimum and maximum length values for a given age.

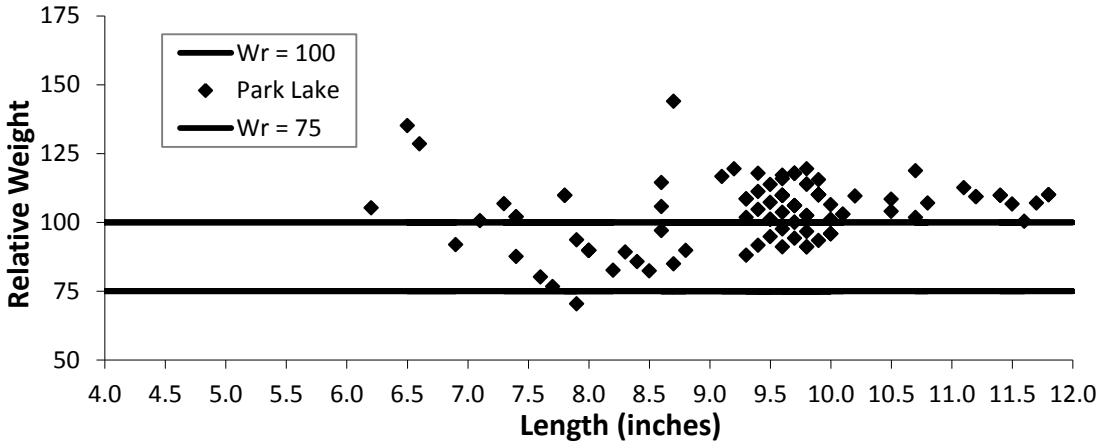

Figure 4. Relative weights of black crappies collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

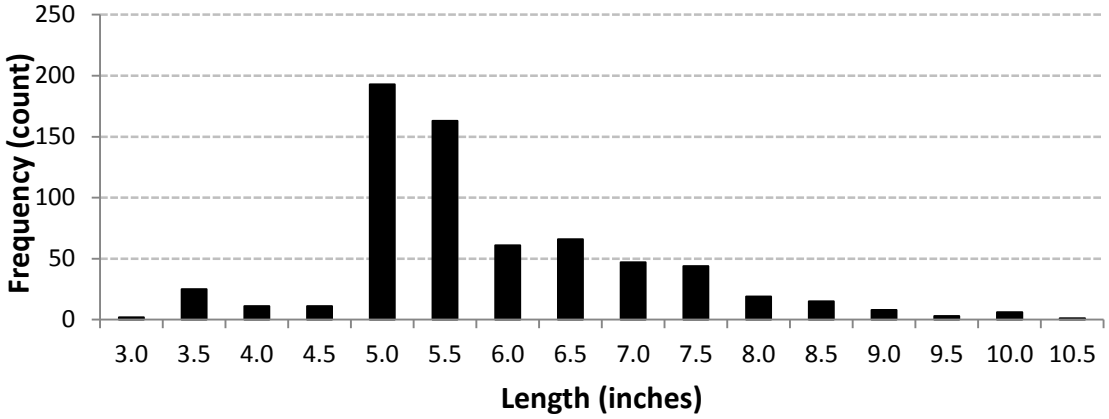

Figure 5. Length frequency distribution of yellow perch collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

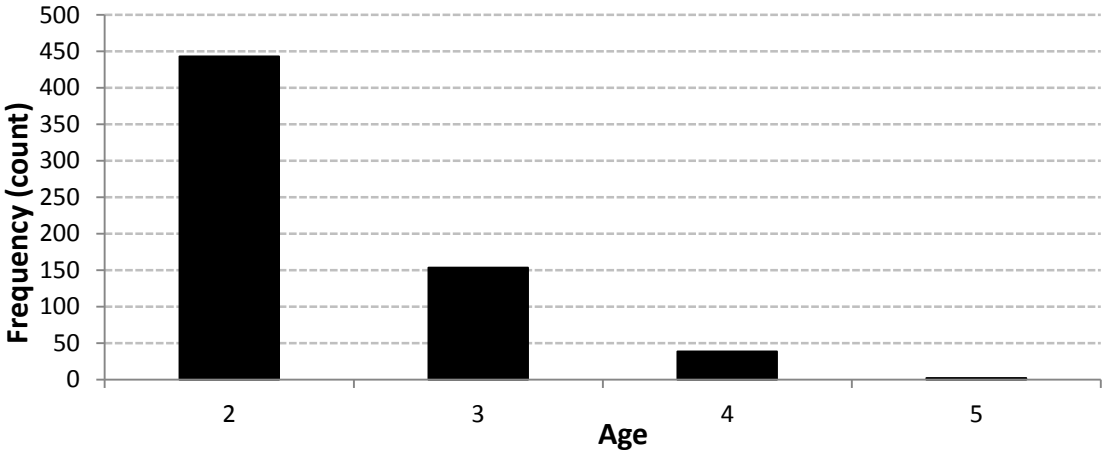

Figure 6. Age frequency distribution of yellow perch collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

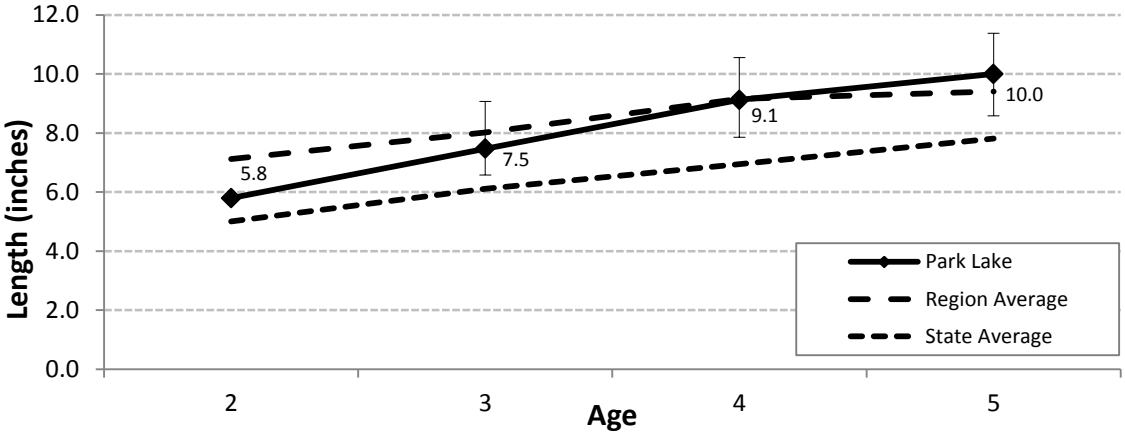

Figure 7. Mean length at age of yellow perch collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin. Error bars represent minimum and maximum length values for a given age.

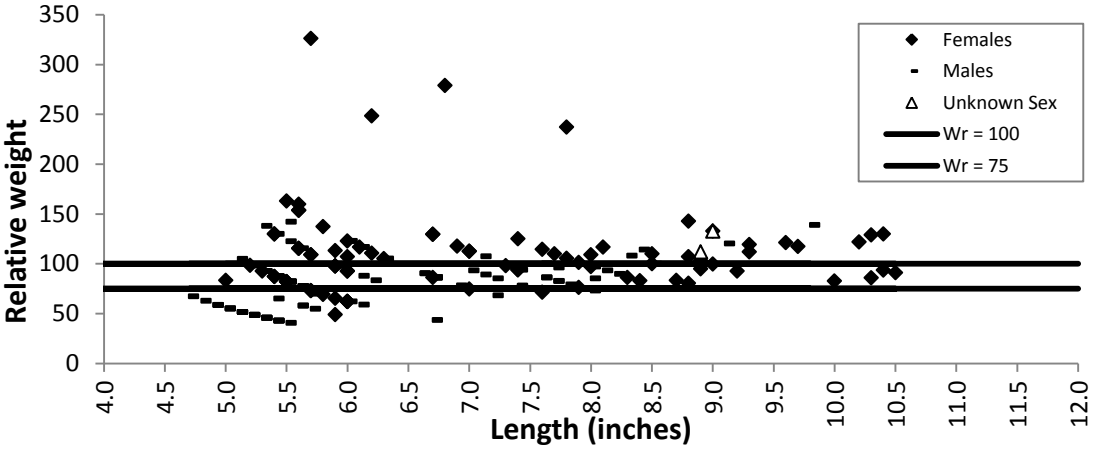

Figure 8. Relative weights of yellow perch collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

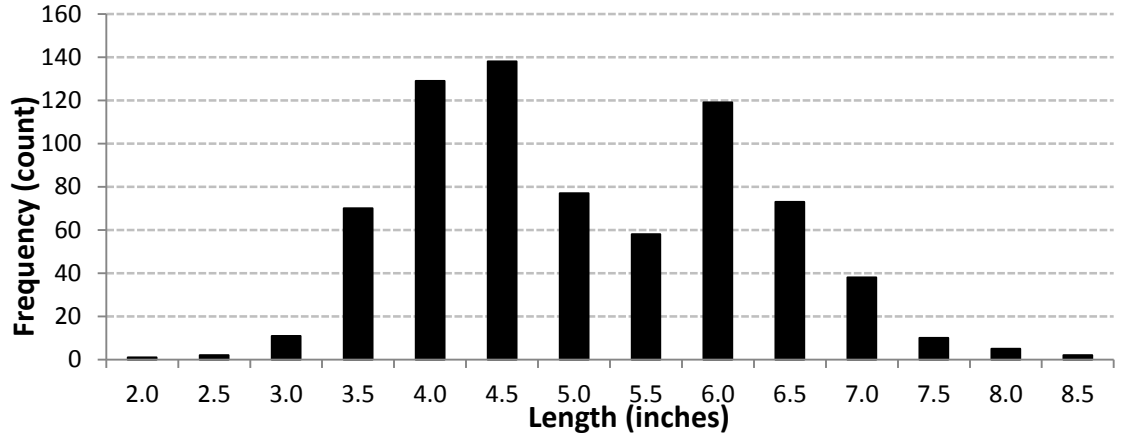

Figure 9. Length frequency distribution of bluegills collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

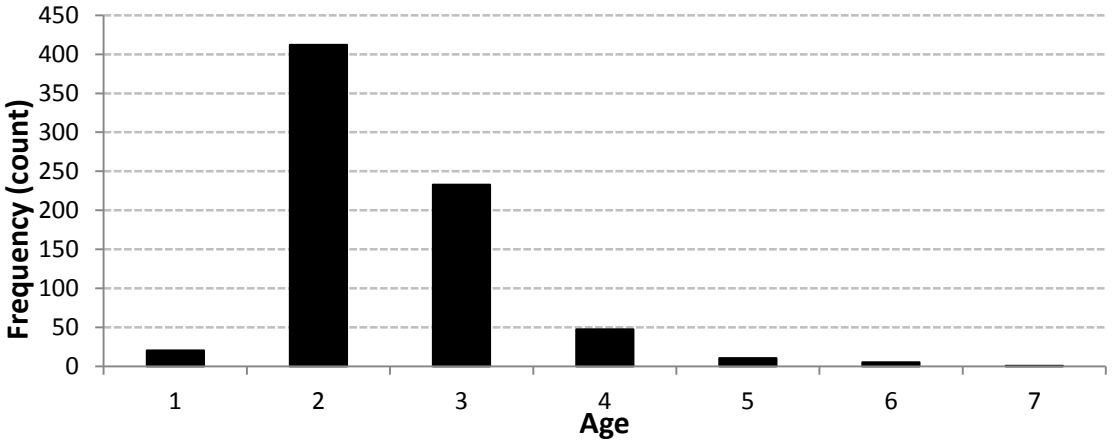

Figure 10. Age frequency distribution of bluegills collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

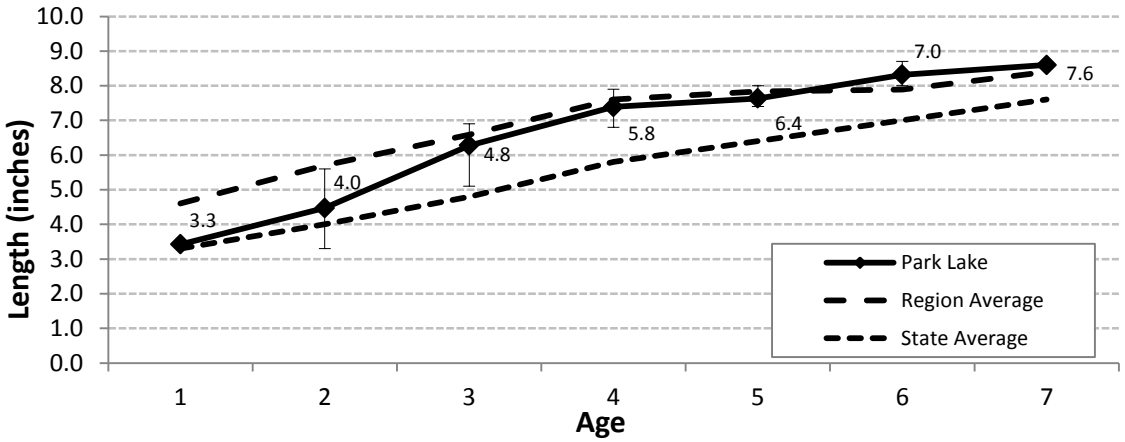

Figure 11. Mean length at age of bluegills collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin. Error bars represent minimum and maximum length values for a given age.

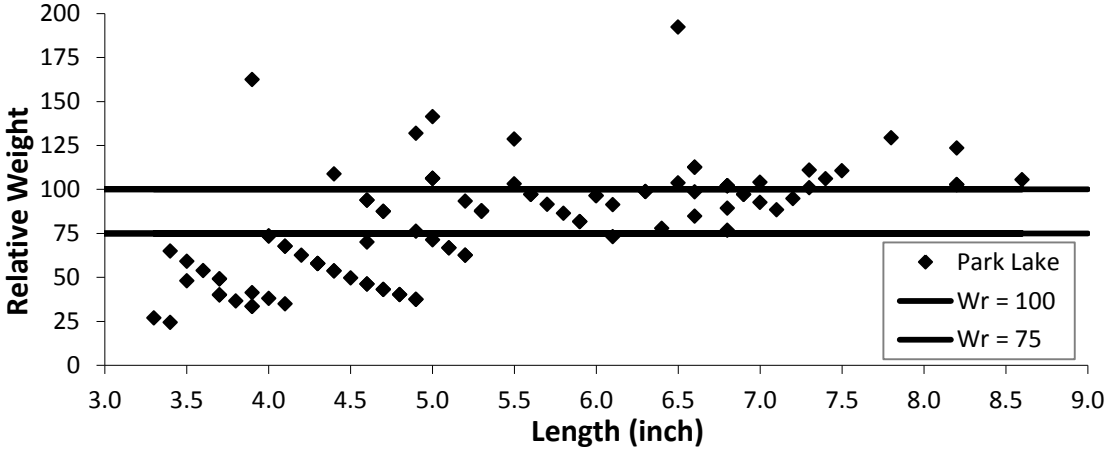

Figure 12. Relative weights of bluegills collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

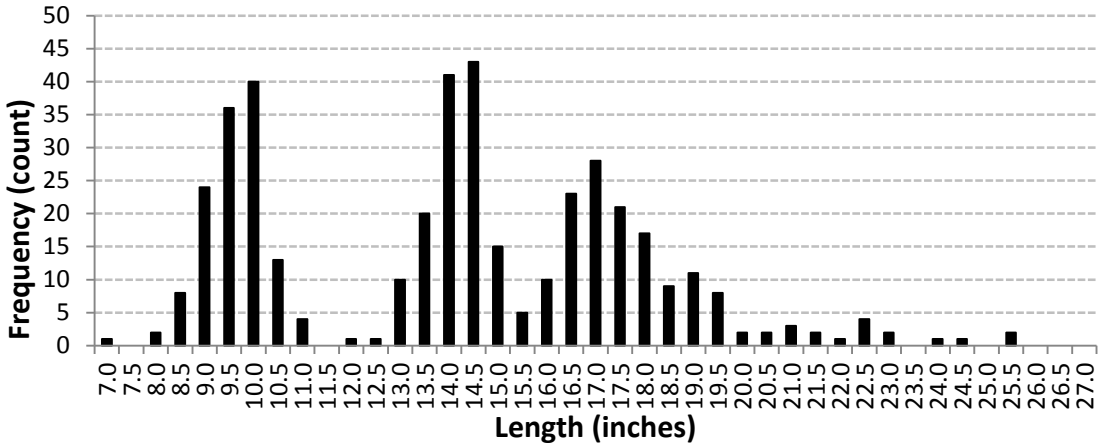

Figure 13. Length frequency distribution of walleyes collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

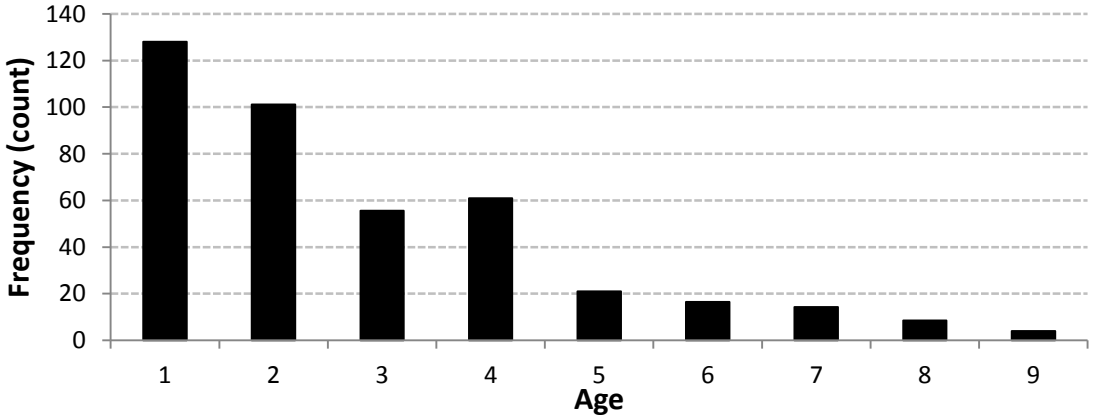

Figure 14. Age frequency distribution of walleyes collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

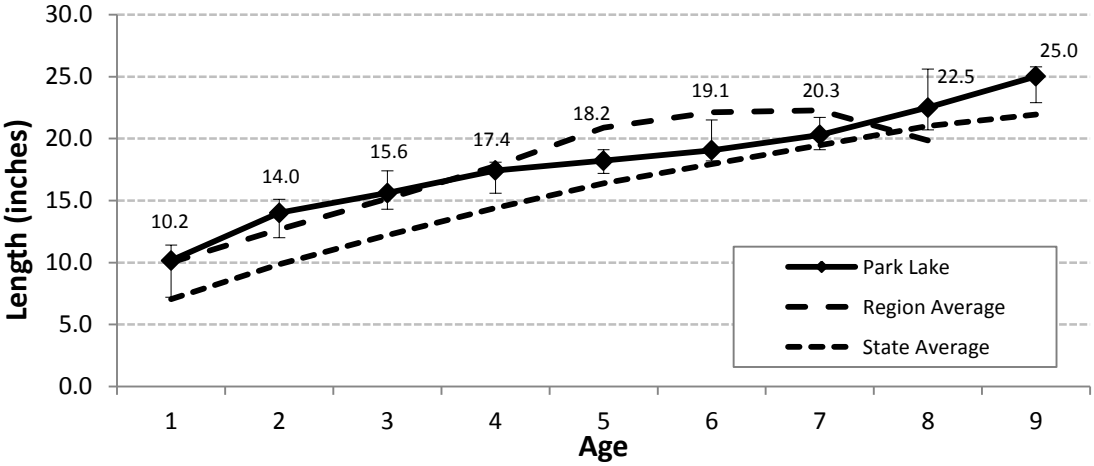

Figure 15. Mean length at age of walleyes collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin. Error bars represent minimum and maximum length values for a given age.

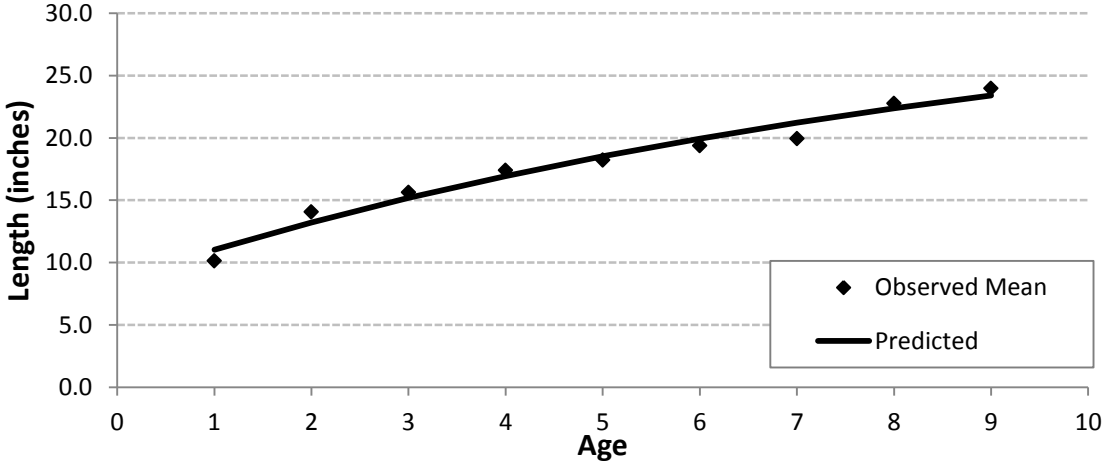

Figure 16. Observed values for mean length at age of Park Lake walleyes with predicted von Bertalanffy growth curve fitted to the data.

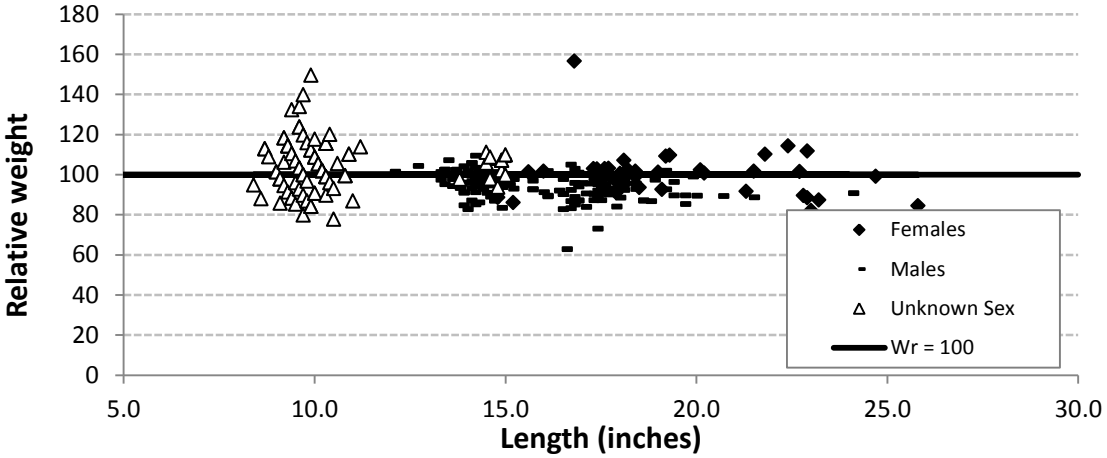

Figure 17. Relative weights of walleyes collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

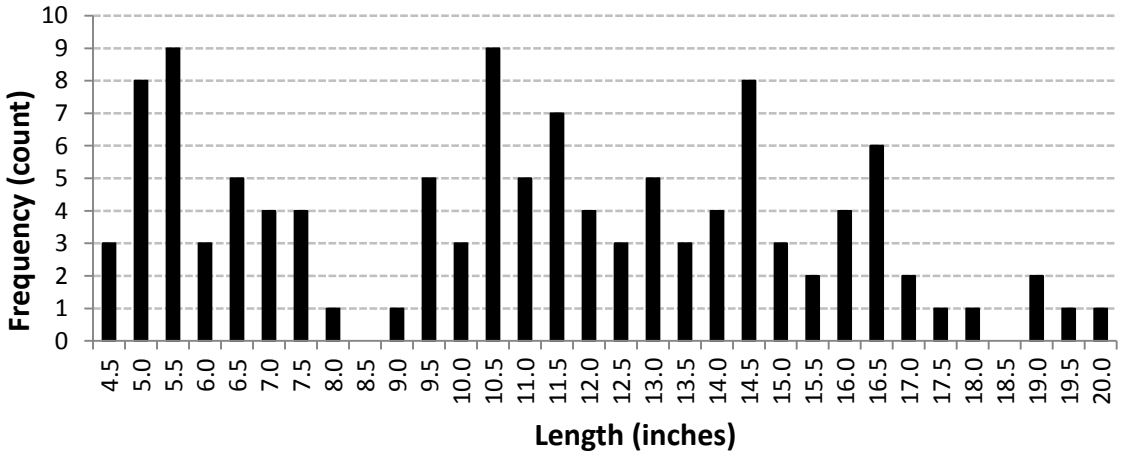

Figure 18. Length frequency distribution of largemouth bass collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

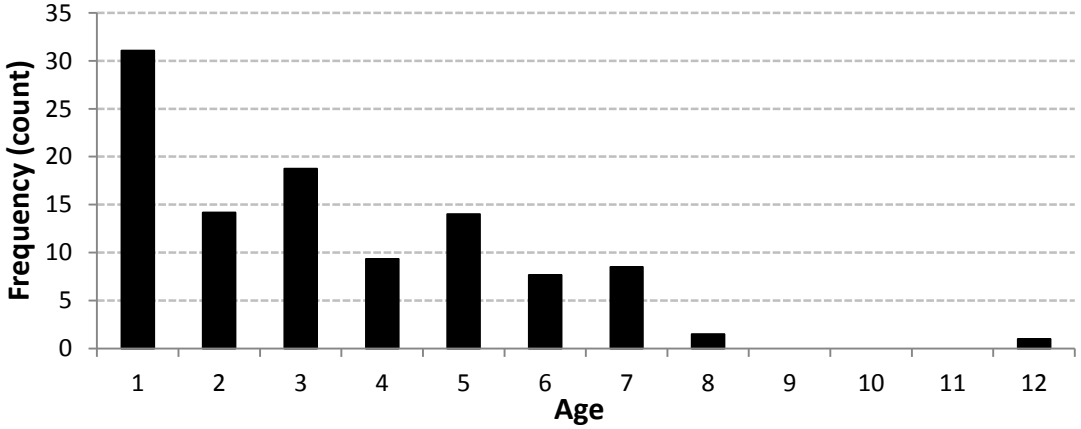

Figure 19. Age frequency distribution of largemouth bass collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

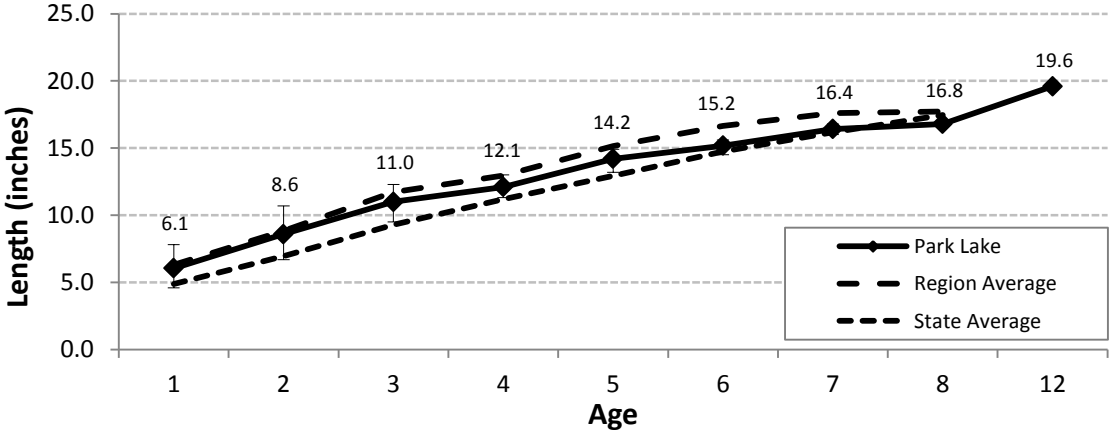

Figure 20. Mean length at age of largemouth bass collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin. Error bars represent minimum and maximum length values for a given age.

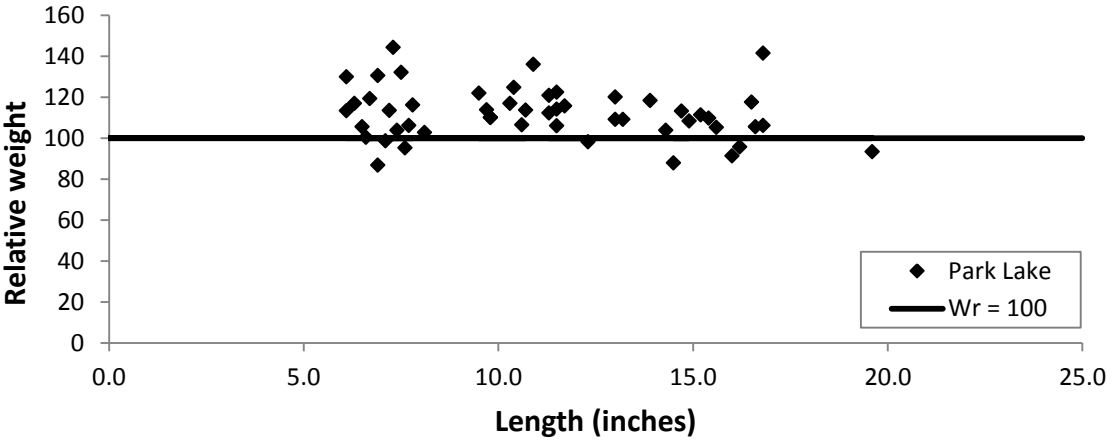

Figure 21. Relative weights of largemouth bass collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

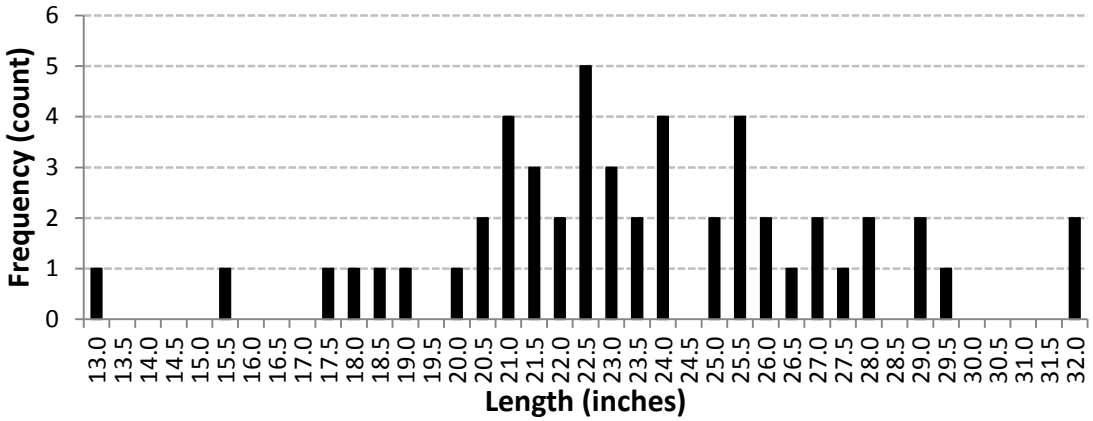

Figure 22. Length frequency distribution of northern pike collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

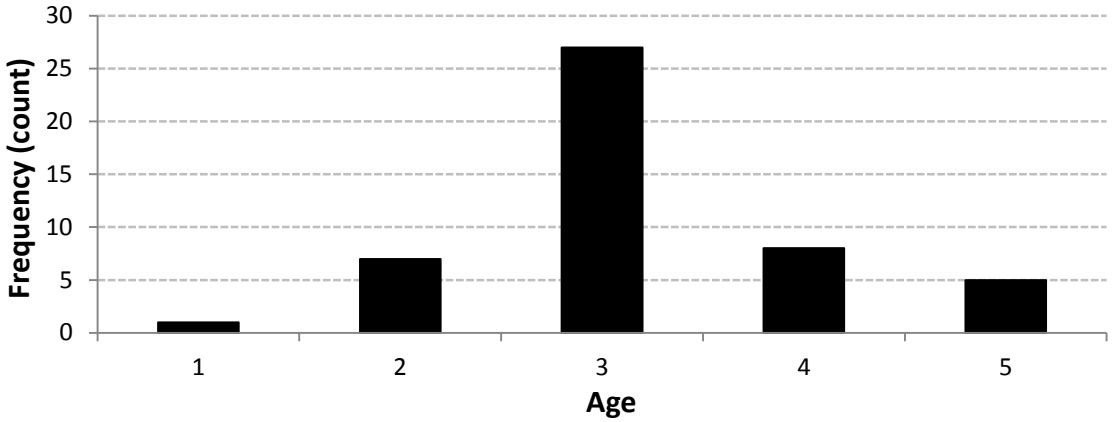

Figure 23. Age frequency distribution of northern pike collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.

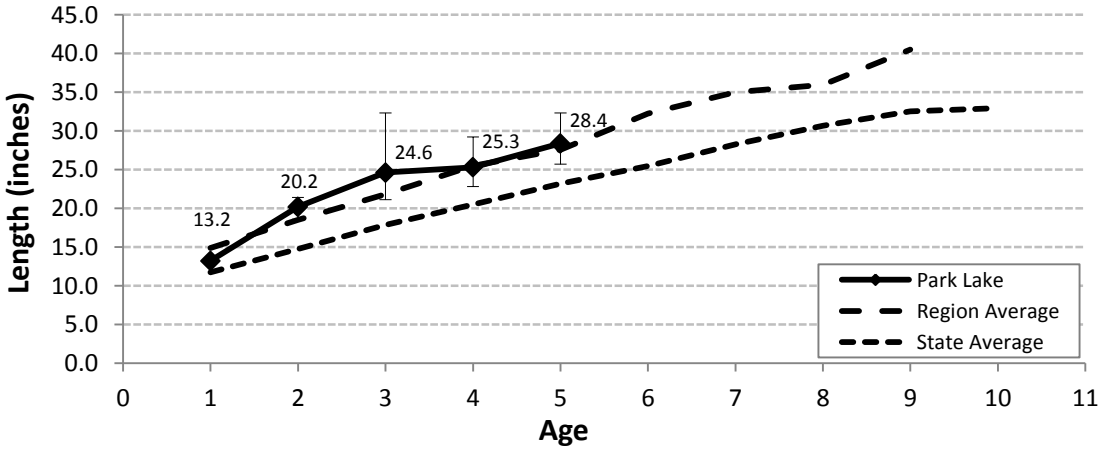

Figure 24. Mean length at age of northern pike collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin. Error bars represent minimum and maximum length values for a given age.

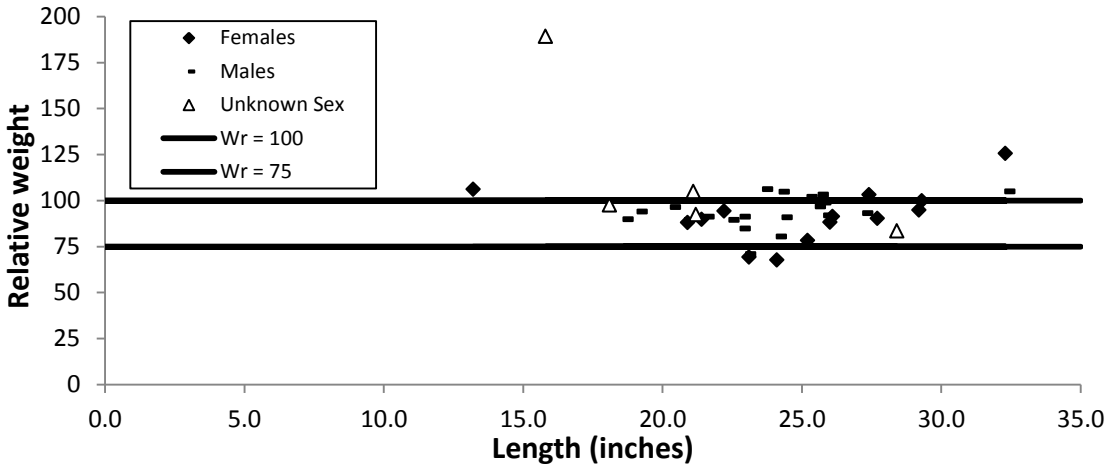

Figure 25. Relative weights of northern pike collected during the spring 2011 survey of Park Lake, Columbia County, Wisconsin.