WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Comprehensive Fishery Survey of Fish Lake, Dane County, Wisconsin 2021

Waterbody Identification Code: 985100

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Executive Summary

A comprehensive fishery survey of Fish Lake was conducted during the spring of 2021, including early fyke netting for Northern Pike (SN1) and late spring electrofishing for bass and panfish (SE2). One main purpose of the survey was to assess Northern Pike abundance, size structure and growth compared to the previous survey in 2015 and to determine the contribution of DNR hatchery-raised pike to the overall population of fish aged 1-4. The other main purpose was to assess the abundance, size structure and growth of bass and panfish populations compared to the previous survey in 2015. Fish Lake combined with Mud Lake in 2019 due to rising water levels, and this was the first attempt to assess any changes in the fishery that may have occurred since the lakes were combined.

Bluegill was the most abundant species collected, and abundance was high relative to other lakes in the management area, as well as the Simple Two-Story lake class. Growth was average, and the population size structure was poor in 2021, which was also the case in 2015. Black Crappie abundance was high relative to other area lakes and higher than any lake in the Simple Two-Story lake class based on the SN1 catch rate. Black Crappie recruitment was inconsistent, with large year classes produced every 2-4 years and weak year classes or complete recruitment failure in other years. Growth was poor relative to area and state averages, with large year classes exhibiting extremely poor growth and weak year classes showing average growth. Yellow Perch abundance appeared to increase from 2015 to 2021 based on the SN1 catch rate. Abundance was high compared to other Simple Two-Story lakes. Growth was at or below area and state averages, and the population size structure was poor.

Northern Pike abundance was high compared to other area lakes and high relative to other lakes in the Simple Two-Story lake class based on the SN1 catch rate. Abundance appeared to have increased significantly since 2015. The population of sexually mature Northern Pike was estimated at 614 fish or 1.5 fish/acre. Population size structure was good compared to other area lakes based on PSD values, and six Northern Pike were larger than 40 inches, the highest number of fish over 40 inches sampled in any area lake survey from 2010-present. Growth was good, outpacing area and state averages. Preliminary results of the genetic analysis found 46% (56/122) of sampled Northern Pike aged 1-4 could be traced to hatchery parents; stocked fish made up nearly half of the Northern Pike population in Fish Lake under age 5.

Largemouth Bass abundance based on the SE2 catch rate was relatively low compared to other area lakes and lakes within the Simple Two-Story lake class. Additionally, abundance was lower in 2021 than in 2015. The observed drop in bass abundance is attributed to reduced electrofishing catchability

arising from water level fluctuations at Fish Lake. The lake level has increased by nearly 10 feet since the last survey in 2015, and flooded timber in the littoral zone has forced electrofishing to occur at depths where it is not effective along much of the lake shoreline. Largemouth Bass size structure was good on the high end, with high PSD-18 and CPUE-18 values relative to other area lakes. Age 3 Largemouth Bass were the most common age in the distribution, far stronger than any other year class. A massive year class of Largemouth Bass was produced in Mud Lake in 2018, the first year after Mud Lake was separated from Fish Lake, treated with rotenone and re-stocked with fish transferred from Fish Lake. Some of the 2018 year class was removed and transferred to Indian Lake in 2019. However, the remaining fish became part of Fish Lake again when rising waters inundated Fish Lake Road in late 2019, and this strong year class was evident in 2021.

Common Carp abundance in Fish Lake appears to have decreased since 2015. The fyke net catch rate was slightly higher in 2021 in Fish Lake than in 2015 (4.2 vs. 3.8 fish/net night). However, the fyke net catch rate in Mud Lake in 2015 was 47.3 fish/net night, and if carp remained at 2015 abundance, the catch rate in Fish Lake in 2021 would have been much higher. The 2018 rotenone treatment of Mud Lake eradicated carp from that waterbody. Carp re-colonized Mud Lake from Fish Lake in 2018, but high bass abundance in Mud Lake reduced the abundance of juvenile carp significantly in 2018 and 2019, and reductions in abundance from the rotenone treatment and subsequent bass predations appear to have carried through to the present day. Little recent recruitment of carp was evident in 2021, and the abundance of centrarchids and Northern Pike appears to be sufficient to prevent mass recruitment of carp moving forward. Additionally, the former Mud Lake is no longer a shallow lake following the 10-foot increase in water level, and winter kill conditions that precipitated successful carp recruitment in the past are not likely to occur moving forward.

FUTURE MANAGEMENT RECOMMENDATIONS

1. Retain all current fishing regulations for Fish Lake, including the special regulation of an 18-inch minimum length limit with a one fish daily bag limit for Largemouth Bass.

2. Continue stocking large fingerling Northern Pike at the rate of two fish/acre utilizing fish with Mississippi River mainstem genetics. The surface area used in quota calculation should be the full 404 acres of the combined Fish Lake complex. Stocking will switch to an alternate-year approach to allow for the evaluation of natural recruitment from non-stocked years in future surveys.
3. Conduct annual Biobase sonar surveys to track submersed aquatic macrophyte density and assess changes that occur in the littoral zone through time.

4. Conduct the next comprehensive fishery survey in 2026. Additional late spring electrofishing surveys may be conducted prior to 2026 as the schedule and budget allow. Consider utilizing the mini-boom electrofishing boat to sample closer to the shore within the flooded timber.

GENERAL LAKE INFORMATION

LAKE & LOCATION

Fish Lake (including Mud Lake), Town of Roxbury, Dane County
T9N, R7E Sections 3, 4

PHYSICAL/CHEMICAL ATTRIBUTES

Morphometry
404 acres, maximum depth of 72 feet, average depth of 24.8 feet (DNR Data 2021).

Watershed
Approximately 1,680 acres, includes the entire Fish Lake watershed (680 hectares, Marshall et al. 1996). Krohelski et al. (2002) reported the Fish Lake watershed at 1,344 acres. The surrounding Roxbury Creek watershed (71.1 square miles) land use is 40.4% agriculture, 28.5% forested, 12.8% wetlands and 18.3% other uses. https://dnr.wi.gov/water/waterDetail.aspx?wbic=985100

Lake Type
Seepage with no flowing inlet or outlet except when Crystal Lake elevation exceeds 873.7 feet and water flows from Crystal Lake across neighboring lands and into Fish Lake.

Water Clarity
Turbid in summer, clear in spring, fall and winter.

Trophic Status
Eutrophic since 1986 (TSI > 50, Marshall et al. 1996). Moderately eutrophic in 2006 (TSI = 52; Marshall et al. 2007)

Aquatic Vegetation
Four native species and two exotic species (Jones et al. 2014). Eurasian watermilfoil and coontail most common.

WINTERKILL

Infrequent

BOAT LANDINGS

One boat access site as of 2021, a concrete landing at Dane County's Lussier County Park on the north side of the lake along Schoepp Road. The new Lussier Park landing opened in the summer of 2018 and includes a large parking area and pit toilet facilities. With the opening of the new landing, the old gravel boat landing on Fish Lake Road was converted to carry-in access only as of 2018 until rising water levels flooded the road and the access site in the fall of 2019. The old landing remains underwater as of early 2022.

OTHER ITEMS OF INTEREST

Adjacent 85-acre Mud Lake (Marx Pond) was a shallow bay of Fish Lake until Fish Lake Road was built in 1893, cutting Mud Lake off from Fish Lake (Marshall et al. 1996). Mud Lake became part of Fish Lake once again in the fall of 2019 when rising lake levels inundated Fish Lake Road.

PURPOSE OF SURVEY

Baseline lake survey Tier 1 assessment.

DATES OF FIELDWORK

Fyke netting survey conducted March 22 through April 5, 2021 (SN1).
Electrofishing survey conducted May 13, 2021 (SE2).

FISHERY

Bluegills and Black Crappies are abundant. Northern Pike and Largemouth Bass are common. Yellow Perch are present. Fishing seasons and bag limits are found in Table 1.

Introduction

Fish Lake is in the Town of Roxbury in northwestern Dane County. Adjacent Mud Lake was formerly a shallow bay of Fish Lake but was cut off from Fish Lake by the construction of a town road (Fish Lake Road) around 1893 (Marshall et al. 1996). Fish Lake is a seepage lake with no flowing inlet or outlet, but for much of its modern history, it was hydraulically connected to Mud Lake via culverts that ran under Fish Lake Road (Krohelski et al. 2002). The combined Fish Lake watershed is relatively small, draining a land area of between 2.1 and 2.7 square miles (Marshall et al. 1996, Krohelski et al. 2002). Rising water levels over several decades attributed to increased groundwater seepage caused the levels of Fish, Mud and Crystal lakes to rise significantly. Specifically, the surface elevation of Fish and Mud lakes rose by 9 feet between 1966 and 2000 from approximately 852 to 861 feet above sea level (Krohelski et al. 2002). Day et al. (1985) reported the surface area of Fish Lake at 216 acres with a maximum depth of 62 feet. Another report placed the surface area of

Fish Lake at approximately 231 acres in 1974, and by 1991, the area had increased to 251 acres with a maximum depth of 64 feet (Marshall et al. 1996). Water levels continued to fluctuate, and rising water levels periodically threatened homes around the lake as well as Fish Lake Road itself. Over the years, some homeowners elected to accept buyouts from Dane County and abandoned their homes. To prevent further threats to homes and infrastructure, the Crystal-Fish Lake Rehabilitation District held a permit that allowed the pumping of water from Fish Lake to nearby Roxbury Creek, which drains to the lower Wisconsin River. A stipulation of this permit called for separation of Fish and Mud lakes by placing crushed stone in the connecting culverts.

Despite anecdotal evidence that the culverts connecting Fish Lake to Mud Lake had been filled, it was determined in the fall of 2016 that one large culvert remained open, allowing passage of fish between Fish and Mud Lakes. The culvert was filled with crushed stone during the spring of 2017. In February 2018, a smaller unobstructed culvert was discovered, and the Mud Lake end of the smaller culvert was crushed and covered with stone, completely severing that connection between the lakes. In July 2018, the larger culvert had approximately 40 feet removed from the Mud Lake end. Additional rock was pushed inside the shortened culvert at the point of the Fish Lake Road embankment, and the end of the culvert was then crushed and covered with a large amount of rock, completely severing the final connection between the lakes.

The separation was short-lived when rising water levels, aided by a massive rainfall and snow melt event on March 13, 2019, and a wet year in general in 2019, inundated Fish Lake Road and joined Fish and Mud lakes together once again in October 2019. When the lakes were separated, they covered a total combined area of approximately 335 acres. In the year prior to re-connecting, Fish Lake covered around 250 acres and had a maximum depth of around 62 feet. Mud Lake covered 85 acres and had a mean depth of 9.5 feet and a maximum depth of 11.8 feet. By the summer of 2021, the combined Fish Lake covered an area of 404 acres, had a maximum depth of 72 feet, a mean depth of 24.8 feet and a volume of 10,031 acre-feet.

Mud Lake was historically eutrophic, largely devoid of aquatic vegetation and existed in an algal-dominated state. The lake was prone to winter kill, and as a result, Common Carp dominated the fishery and contributed greatly to the poor quality of the water and the fishery in Mud Lake. Mud Lake was successfully chemically treated with rotenone in January 2018, which eliminated the carp and allowed managers to start rebuilding the fishery in their absence. Field transfers of native fishes from Fish Lake to Mud Lake occurred in late April and early May 2018. However, the rehabilitation effort was compromised when carp were able to excavate through a weak point in

the stone barrier inside the large culvert in the spring of 2018 to re-invade Mud Lake from Fish Lake.

Following additional efforts to separate the lakes mentioned above, a second chemical treatment was tentatively planned for the winter of 2019-2020 but was canceled after the lakes reconnected in the fall of 2019. For the remainder of this report, the combined Fish and Mud Lake complex will be referred to simply as Fish Lake.

Expanded historical information for both Fish Lake and Mud Lake can be found in the 2015 comprehensive survey report for the two lakes, which is available on the DNR website by visiting https://dnr.wisconsin.gov/topic/Fishing/reports and clicking on the link for Dane County (Nye 2019).

There is one active stocking quota at Fish Lake for 808 large fingerling Northern Pike annually (two per acre), and the stocking history for Fish Lake from 1999-present can be found in Table 2.

SURVEY EFFORT

Two 2-foot rectangular frame fyke nets with rectangular hoops, two 3-foot rectangular frame fyke nets with circular hoops and one 4-foot rectangular frame fyke net with circular hoops (all 0.7-inch bar, 1.4-inch stretch mesh) were set on March 22, 2021, immediately after ice-out. These fyke nets targeted Northern Pike (SN1). Nets were run daily from March 23 through April 5, except for March 31. Net locations were adjusted as needed throughout the netting period. The total netting effort was 60 net nights, and the GPS coordinates of the fyke net locations can be found in Table 3.

Gamefish and panfish were measured to the nearest 0.1 inches, and a subsample of each species was weighed using electronic scales. Panfish and small gamefish were weighed on a scale with a capacity of two kilograms (kg) and a precision of 0.001 kg (1 gram). Larger gamefish were weighed on a scale with a capacity of 20 kg with a precision of 0.01 kg (10 grams). Both scales were manufactured by Yamato Corporation (model PPC-200W). Metric measurements were converted to pounds prior to data analysis. Aging structures were taken from a subsample of Bluegills, Black Crappies, Yellow Perch, Largemouth Bass and Northern Pike (Table 4). The goal was to take structures from five fish per half-inch group for Bluegills, Black Crappies and Largemouth Bass, and five structures per half-inch group from each sex for Northern Pike and Yellow Perch. Sex was recorded when evident based on the expression of eggs or milt. Mature Northern Pike captured during fyke netting were marked with a top caudal fin clip for calculating a population estimate, while immature fish were marked with a bottom caudal fin clip. All Northern

Pike captured after the first lift day were examined for marks. Small tissue samples (fin clips) were removed from 150 Northern Pike between 11 and 26 inches for the purpose of a genetic study. Genetic information collected from Northern Pike during the survey was compared to genetic information from parent fish used as broodstock by the state hatchery system from 2017-2020 to determine the relative contribution of stocking to the Northern Pike population (ages 1-4) in Fish Lake and 11 other lakes across southern Wisconsin in 2021.

A DNR standard direct current (DC) boom shocker boat was used to sample Fish Lake on the night of May 13. A total of two electrofishing stations were chosen, and the first station began at a randomly selected start point. The first station was 2 miles long, and panfish and gamefish were collected during the first 0.5 miles, while only gamefish were collected for the remaining 1.5 miles. The second station included a 0.5-mile panfish segment, and the gamefish-only segment covered the remainder of the shoreline of the lake (2.7 miles). Common Carp were observed and counted while sampling the 0.5-mile panfish segments but were not collected. Largemouth Bass were examined for marks from the netting survey earlier in the spring. All fish collected were measured to the nearest 0.1 inches. Aging structures were taken, and weights were recorded as necessary to fill out length bins. Starting and ending GPS coordinates for electrofishing stations can be found in Table 5.

Methods

A multiple census mark-recapture population estimate for Northern Pike was calculated using the Schnabel method. The formula for the Schnabel method is noted here:

$$N = \frac{\Sigma(C_t M_t)}{R+1}$$

Where *N* is the population size, C_t is the number captured on day *t*, M_t is the number marked on day *t*, and R is the total number of recaptures from the survey (Ricker 1975).

Various data analyses were completed using both Microsoft Excel and R (version 4.0.5) combined with R Studio (version 1.4.1106). For all sampling periods, total catch and catch-per-unit of effort (CPUE) was calculated by gear type for all species. Length frequency distributions were generated for gamefish species of interest. Length range, mean and median lengths were calculated for gamefish species as well. Proportional size distribution (PSD), proportional size distribution of fish sizes often acceptable for harvest (PSD-H, either socially acceptable or legally acceptable under current fishing regulations) and proportional size distribution of preferred length fish (PSD-P)

were calculated for all gamefish species of interest with more than 100 stock size individuals collected (Anderson and Neumann 1996, Guy et al. 2007). Length designations for stock, quality, harvestable, preferred, memorable and trophy sizes of the gamefish species collected from Fish Lake can be found in Table 6; these values were used for the calculation of PSD (Anderson and Neumann 1996, Guy et al. 2007). For Bluegills, PSD calculations were reported separately for fyke netting and electrofishing due to possible bias, with fyke nets being selective for larger Bluegills (Laarman and Ryckman 1982).

Ages were estimated from calcified structures for a subsample of each species. Age and size data from these fish were used to generate age-length keys, and ages were assigned to all fish sampled to estimate the age frequency of the population based on the aged subsample (Isermann and Knight 2005). Age frequency distributions were then generated for each species. Once age frequency distributions were completed for each species, inferences were made about year class strength and mortality when possible. Catch curves were generated for species exhibiting consistent recruitment for calculating total annual mortality rates. Mean length-at-age was used to make inferences about fish growth in Fish Lake by comparing the lake to area and statewide averages and lake class medians. Area averages are calculated from the mean length at age values from lakes managed out of the Poynette Fisheries office that were surveyed from 2010-2021. Area comparisons are helpful for anglers who are interested in knowing which of the lakes in the area offer the greatest fishing potential for a certain species. Statewide comparisons help give anglers a better idea of how a given lake compares on a broader scale. Lake class comparisons help anglers understand how a given lake shapes up against other lakes in the state that are the most like that lake.

Several states have developed lake classification systems, and newly developed lake classes and comparison tools offer an opportunity not previously available for Wisconsin lakes. After several years of study by a collective of DNR scientists, around 6,000 Wisconsin lakes were grouped into 15 classes based on the fish community in the lake (simple or complex), temperature (cool, warm, harsh), clarity (clear or dark) and hydrology (riverine, two-story, trout pond) (Rypel et al. 2019). Comparing a given lake's fishery performance to others within its lake class will help guide future management decisions and will inform the public by shaping more realistic expectations of how the fishery in that lake should perform. For instance, one should not expect a Simple-Warm-Dark lake to offer the same fishing experience as a Complex-Riverine lake.

Fish Lake (now including Mud Lake) is classified as a Simple Two-Story lake, a classification that includes 58 lakes across Wisconsin. The Simple Two-Story class has the fewest lakes of any lake class (Rypel et al. 2019). Lakes in this classification account for 1% of classified lakes by number and less than 1% of

the total surface area of all classified lakes. Simple Two-Story lakes have three or fewer sportfish species present, a small surface area, deep, cold, oxygenated habitats that support cold water fishes, may be managed differently for phosphorous water quality standards, and are found high in the landscape (Rypel et al. 2019).

Mean length-at-age was calculated using methods outlined in Bettoli and Miranda (2001), with the formula listed here:

$$\overline{Li} = (\sum N_{ij}\bar{l}_{ij})/N_i$$

Where $\overline{L}_i$ represents the mean length of the *i*th age group, $N_{ij} = N_j(\frac{n_{ij}}{n_j})$, N_j is the number of fish in the *j*th length group, n_{ij} = number of fish of the *i*th age group subsampled in the *j*th length group, n_j is the number of fish subsampled in the *j*th length group and $N_i = \sum N_{ij}$ over all *j* length groups. The inputs to this equation are derived from the length frequency distribution of the sample and the age-length key.

Relative weights were calculated to evaluate the body condition of fish. Relative weight (W_r) is a tool that compares 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, and standard weights were only calculated for individuals larger than the minimum recommended length for each species (Murphy et al. 1991, Anderson and Neumann 1996). 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

GENERAL FISH COMMUNITY

In total, 28,068 fish representing 13 different species or hybrids from five families were sampled during spring netting and electrofishing on Fish Lake in 2021; the listing is presented in Table 7. Catch and CPUE by gear type are shown for each species collected in Table 8. Length, age and relative weight data are summarized in Table 9.

BLUEGILL

In total, 23,382 Bluegills were collected during the survey; the catch rates were 386.6 fish/net night during SN1 and 189.0 fish/mile of shoreline during SE2. In terms of the total number of fish caught during spring netting and

electrofishing, Bluegill was the most abundant species collected. The 2021 SE2 catch rate was higher than the 2015 value (135 fish/mile) and ranked 4th out of 24 lakes in the Poynette management area surveyed since 2010 (Table 10). Compared to other lakes in its class across Wisconsin (Simple Two Story; 58 total lakes), the SE2 catch rate placed Fish Lake above the 75th percentile; Bluegills are more abundant in Fish Lake than in most other Simple Two-Story lakes (Figure 1). However, when looking at size-specific electrofishing catch rates of larger Bluegills (6, 7 and 8 inches), Fish Lake compares poorly with other area lakes.

In total, 1,443 Bluegills collected during SN1 and 189 collected during SE2 were measured. Bluegills captured during SN1 ranged from 2.6 to 8.9 inches in length, and the mean and median values were both 5.3 inches. The PSD, PSD-7 and PSD-P values calculated from SN1 were 18, 2 and zero, respectively. The SN1 PSD and PSD-7 values were much lower than in the previous survey in 2015, when PSD was 37 and PSD-7 was 9. Bluegills captured during SE2 ranged from 2.4 to 7.1 inches in length, and the mean and median lengths were 5.0 and 5.1 inches, respectively. The PSD, PSD-7 and PSD-P values calculated from SE2 were 7, 1 and zero, respectively. The SE2 PSD and PSD-7 values were much lower than in the previous survey in 2015 when PSD was 34 and PSD-7 was 6. Length frequency distributions of Bluegills caught during SN1 and SE2 are presented in Figure 2. Higher PSD values during SN1 compared to SE2 supports the hypothesis that fyke nets were selective for larger Bluegills. The PSD data, together with size specific electrofishing catch rates, indicated that the Bluegill size structure in Fish Lake was poor.

Bluegill ages ranged from 1 to 8 years in Fish Lake, with age 3 fish being the most common in the distribution (Figure 3). While recruitment appears to be relatively consistent overall, age 6 was a weak year class compared to ages 5 and 7. This prevented the application of a catch curve to the age frequency data for the purpose of calculating total annual mortality. In the general sense, however, mortality does appear to be relatively high after age 3, although this does not coincide with Bluegills reaching a size acceptable for anglers to harvest; age 4 fish averaged only 6.4 inches. Bluegill mean length-at-age values were at or above area and state averages and lake class median values across all ages in 2021 (Figure 4). Mean length at age values were slightly higher in 2021 compared to 2015 indicating better growth.

In general, Bluegills larger than 3 inches were in average condition (mean relative weight = 88.3. Ten Bluegills (18% of weighed fish) had relative weight values below 75, indicating poor condition, while eight Bluegills (15% of weighed fish) had relative weight values greater than 100, indicating excellent body condition.

BLACK CRAPPIE

In total, 3,189 Black Crappies were collected; the catch rates were 52.9 fish/net night during SN1 and 18.0 fish/mile during SE2 (Table 9). The SN1 catch rate was somewhat higher than the last survey in 2015 (36.9 fish/net night) and was well above the 75th percentile for the Simple Two-Story lake class (Figure 5). Lengths of 511 measured Black Crappies ranged from 4.9 to 12.5 inches, and mean and median lengths were 7.2 and 7.6 inches, respectively. The PSD, PSD-9, PSD-P and PSD-M values were 30, 3, 1 and zero, respectively. These values are indicative of poor size structure relative to other area lakes (Table 11). The PSD values in 2021 were similar to those observed in 2015 when PSD, PSD-9, PSD-P and PSD-M were 24, 4, zero and zero, respectively. The Black Crappie length frequency distribution from the 2021 survey is presented in Figure 6, with 2015 data included for reference.

Overall, ages ranged from 2 to 11 years with ages 1, 5, 8, 9 and 10 missing from the distribution (Figure 7). Recruitment was wildly inconsistent, and the peaks in the age frequency indicate boom and bust cycles, with large year classes produced every 2-4 years and weak year classes produced occasionally in the intervening years. Because recruitment is inconsistent with no discernible peak and subsequent decline in the age frequency, total annual mortality was not estimated. Age 2 fish were the most common in the distribution (38%). The 2014 year class was the dominant year class in the 2015 survey as age 1 fish and was still very strong in 2021 as age 7 fish (36%). The 2010 year class was very strong as age 5 fish in 2015 and was still relatively strong as age 11 fish in 2021.

Black Crappies showed the potential to be long-lived in Fish Lake, but their growth was poor, and the same was true in 2015. Black Crappie mean length at age in Fish Lake lagged behind area and state averages for ages 2, 4, 7 and 11; these represented the strongest year classes present in 2021 (Figure 8). Weaker year classes (ages 3 and 6) were represented by only a few fish in the sample and had mean length at age values at or above area and state averages.

The body condition of 49 weighed Black Crappies was good; the average relative weight was 100.1. Three fish (6%) had relative weights below 75, indicating poor body condition, while 31 fish (63%) had relative weights greater than 100, indicating excellent body condition. The mean relative weight in 2021 improved from 2015, when the relative weight averaged 88.0. The proportion of fish with a relative weight below 75 was lower in 2021 (6%) than in 2015 (14%). The proportion of fish with a relative weight greater than 100 was higher in 2021 (63%) than in 2015 (18%).

YELLOW PERCH

In total, 369 Yellow Perch were collected, all during SN1, and the catch rate was 6.2 fish/net night (Table 9). This was markedly higher than the 0.5 fish/net night observed in the 2015 survey of Fish Lake and slightly higher than the 4.1 fish/net night observed in Mud Lake in 2015. Yellow Perch were abundant in Fish Lake in 2021 relative to other lakes in the Simple Two-Story lake class; the SN1 catch rate was well above the 75th percentile (Figure 9). No perch were collected during SE2. In terms of the total number of fish caught during spring netting and electrofishing, Yellow Perch was the fourth most abundant species collected.

Measured Yellow Perch (n = 72) ranged from 4.6 to 8.8 inches, and the mean and median lengths were both 6.3 inches. Too few Yellow Perch were measured for meaningful PSD calculations, and the length frequency distribution is presented in Figure 10. In terms of mean length, median length and largest fish sampled, Fish Lake ranked near the bottom compared to other area Yellow Perch populations; size structure is poor (Table 12). Ages ranged from 2 to 6 years, with age 4 being the most common and numbers declining steadily thereafter (Figure 11). Growth of Yellow Perch was average to poor, with mean length at age values at or below area and state averages (Figure 12). Yellow Perch do not attain large sizes in Fish Lake, with age 5 fish averaging 6.4 inches. Mean length at age values in 2021 were comparable to what was observed in 2015, indicating nothing has changed regarding Yellow Perch growth. Past surveys indicated Yellow Perch were a very minor component of the fish community, and although the 2021 survey indicated a slight increase in abundance, the importance of the Yellow Perch to the recreational fishery remains low.

Relative weights of 57 Yellow Perch averaged 93.4, with females (95.4) in slightly better condition than males (88.9); Yellow Perch were generally in good condition. Four Yellow Perch (7% of weighed fish) had relative weights below 75, indicating poor condition. Fourteen Yellow Perch (25% of weighed fish) had relative weights above 100, indicating excellent condition.

NORTHERN PIKE

In total, 434 Northern Pike were sampled, including recaptures. The catch rate was 7.1 fish/net night during SN1 and 1.7 fish/mile during SE2 (Table 9). The 2021 catch rates were markedly higher than those observed in 2015 (2.0 fish/net night and 0 fish/mile), indicating an increase in abundance. The total catch excluding recaptures was 323 fish, and the Schnabel population estimate was 614 sexually mature Northern Pike, or 1.5 adult fish/acre (95% CI 506 - 780 total, or 1.2 - 1.9 fish/acre). Too few Northern Pike were sampled and recaptured in 2015 to provide a meaningful population estimate for comparison to 2021. Northern Pike were abundant in Fish Lake compared to

other lakes in the Simple Two-Story lake class; the SN1 catch rate was well above the 75th percentile (Figure 13).

Overall, 323 unique Northern Pike ranged from 10.9 to 43.7 inches, with mean and median lengths of 24.5 and 24.0 inches, respectively. Female Northern Pike (n = 135) ranged from 15.3 to 43.7 inches, averaging 27.8 inches. Male Northern Pike (n = 172) ranged from 10.9 to 28.0 inches, averaging 22.4 inches. The length frequency distributions of all Northern Pike sampled in both 2015 and 2021 are presented in Figure 14. Size structure in Fish Lake in 2021 compared favorably among area lakes, and the survey found the highest number of fish over 40 inches of any area lake surveyed since 2011 (Table 13). Too few fish were collected in the previous surveys of Fish and Mud lakes in 2015 for meaningful PSD calculations, and comparisons of size structure between the two surveys using PSD were not possible. However, examination of the length frequency distribution clearly indicates an increase in the number of Northern Pike larger than 28 inches from 2015 to 2021.

Overall, Northern Pike ages ranged from 1 to 9 years, with age 4 fish being the most common (28.1%) and age frequency declining steadily after age 4, as presented in Figure 15. Declines in number at age after age 4 coincide with the fish reaching legal harvest size. Fish Lake has historically been a popular lake for winter tip-up fishing, so some mortality due to harvest is not surprising. Harvest is not likely excessive considering that total annual mortality estimated from the catch curve was 40.3%, which was relatively low compared to other lakes in the Poynette management area with mortality estimates available (7 lakes, range 34.9-66.5%). The catch curve is presented in Figure 16.

Harvest may impact female Northern Pike to a greater degree than males because they reach legal harvest size sooner than males; females average over 26 inches by age 4, whereas males do not average over 26 inches until age 6. However, the ratio of males to females in the population only increased slightly for ages 5-9 (1.4:1) compared to ages 2-4 (1.3:1). The noticeable drop in number at age from age 4 to age 5 may also be reflective of the change in stocking that occurred after 2017. Prior to that, small fingerling Northern Pike were the primary product stocked in Fish Lake. From 2018-present, large fingerling Northern Pike were the primary product stocked. Fish that were age 4 and older in 2021 were reflective of the period of small fingerling stocking, while ages 1-3 were from the period of large fingerling stocking. Higher numbers of age 4 and younger Northern Pike in 2021 likely reflect increased recruitment due to better survival of stocked large fingerlings compared to small fingerlings.

Recruitment appears to occur annually based on the lack of missing year classes. Consistent recruitment observed in 2021 is not unexpected considering the history of annual fingerling stockings, but this differs from

what was observed previously. The 2015 survey found that the dominant year class at the time came from a year when large fingerling stocking occurred (2012), with years when small fingerlings were stocked contributing little to the fishery. Since then, small fingerlings were stocked from 2015-2018, and large fingerlings were stocked from 2019-present. Despite the variability in the hatchery product stocked, recruitment appears to have stabilized considerably, including years when small fingerlings were stocked.

Northern Pike mean length at age in Fish Lake was at or above the area and state averages for all observed ages (Figure 17). Northern Pike averaged over 26 inches by age 4, which is one or more years earlier than all other lakes in the Poynette management area. When looking at the sexes separately, it was evident that females grow faster, reach larger sizes and are vulnerable to harvest earlier than males. Some females reach 26 inches by age 3 and average over 29 inches by age 4. A few males reached 26 inches by age 4 but didn't average over 26 inches until age 6. Male Northern Pike in Fish Lake do not reach 30 inches prior to mortality.

Preliminary analysis results of 150 genetic samples collected from Northern Pike <26 inches during the survey found that 122 were age 4 or younger and 46% (n=56) came from hatchery parents. Of those, 17 were from 2017 (age 4), 14 were from 2018 (age 3), 22 were from 2019 (age 2) and 3 were from 2021 (age 1). Fish Lake had the second-highest contribution from stocked fish out of 12 total lakes in the study.

The condition of Northern Pike was good overall; relative weights of 268 Northern Pike averaged 98.7. Relative weights for Northern Pike were generally lower for males, who averaged 95.9, while females averaged 103.2 and unknown/immature fish averaged 87.7. The body condition of Northern Pike greatly improved from 2015, when relative weight average was 89. In 2021, six fish had relative weights below 75, indicating poor body condition, while 104 fish had relative weights above 100, indicating excellent condition.

LARGEMOUTH BASS

In total, 242 Largemouth Bass were collected during the spring, including recaptures; overall catch rates were 2.2 fish/net night during fyke netting and 20.8 fish/mile of shoreline during SE2 (Table 9). Largemouth Bass was the fifth most abundant sport fish species sampled during the survey. In 2021, the SN1 catch rate was 5.5 times higher than in 2015, while the SE2 catch rate was 41% lower compared to 2015. The SE2 catch rate placed just above the 25th percentile for the Simple Two-Story lake class (Figure 18). The lower SE2 catch rate can be explained by changes in the littoral zone of the lake. With the lake level up around 10 feet since the 2015 survey, the lake area has expanded, and a ring of flooded timber now exists in the littoral zone. This ring of timber makes it impossible to navigate an electrofishing boat close to the shore. Sampling occurred along the edge of the timber, most often in 8-10 feet of

water and occasionally deeper. Boat electrofishing is typically far less effective at catching fish in 8-10 feet of water than in 1-4 feet of water. The reduced sampling efficiency was reflected in the electrofishing catch rate for Largemouth Bass. The increased fyke net catch rate may be explained by decreased water clarity, as anecdotally higher Largemouth Bass fyke netting catch rates have been observed in past years in more turbid systems.

When comparing electrofishing catch rates across area lakes, Fish Lake ranked just below the middle of the pack for total CPUE at 14th out of 23 lakes surveyed in the Poynette management area since 2010. The catch rate of fish ≥ 8 inches (CPUE-8; stock size) during SE2 was 18.5 fish/mile, again ranking 14th out of 23 area lakes. Catch rates of larger bass compared slightly more favorably on a local level, with Fish Lake ranking 11th out of 23 lakes for CPUE-14 (4.6 fish/mile) and 3rd out of 23 lakes for CPUE-18 (1.7 fish/mile). Rankings for local lakes based on various size-specific Largemouth Bass electrofishing catch rates can be found in Table 14.

Lengths of 233 unique Largemouth Bass ranged from 5.5 to 20.0 inches, and the mean and median lengths were 11.4 and 11.1 inches, respectively. The length frequency distribution is presented in Figure 19 and was dominated by fish in the 8–12-inch range. Of the Largemouth Bass ≥ 8 inches in length (stock size), fish ≥ 12 inches were present in good proportion (PSD = 35), as were fish ≥ 15 inches (PSD-P = 14) and fish ≥ 18 inches (legally harvestable, PSD-18 = 7). These values were lower than in 2015, when PSD, PSD-P and PSD-18 values were 90, 42 and 9, respectively. It should be noted that Largemouth Bass caught in fyke nets accounted for 54.5% of the total Largemouth Bass catch in 2021, compared to only 7% of the total catch in 2015. The fyke net catch in 2021 was dominated by fish in the 8–12-inch range and included few fish larger than 12 inches. This is typical in area lakes with higher Largemouth Bass fyke net catch rates. One hypothesis is that large bass are extremely net shy, accounting for their relatively low fyke net catch rates even in systems with higher fyke net catch rates overall. In any case, the influence of 8–12-inch bass caught during fyke netting is evident in the overall size distribution and accounts for the reduced PSD values in 2021 compared to 2015.

Age 3 was the most common in the distribution (57.3%), with age frequency variable but declining overall through age 11, and single age 14 and 15 fish present (Figure 20). It is common for Largemouth Bass to be fully recruited to the sampling gear by age 3, but this year class was especially strong in Fish Lake in 2021, comprising nearly 60% of the population. This is consistent with the size distribution being dominated by 8–12-inch fish and may reflect the massive year class of Largemouth Bass produced in Mud Lake in 2018. Variable year class strength from ages 7-11 and a couple of missing year classes after age 11 prevented the application of a catch curve to the data.

Largemouth Bass mean length-at-age in Fish Lake was slightly above area and state averages and lake class median values through age 9 (Figure 21). The mean length at age 6 was 15.8 inches, which was the second best in a comparison of area lakes (Table 15). This value was markedly better than the 2015 survey when the mean length at age 6 was 13.1 inches. Some improvement in Largemouth Bass growth should be expected due to changes in the density of aquatic macrophytes in the littoral zone, but such changes may not be measurable after less than two years of the altered condition.

The condition of Largemouth Bass in Fish Lake was excellent; the relative weights of 101 fish averaged 100.8. Three fish (2.9%) had a relative weight below 75, indicating poor condition, and 52 fish (51.4%) had relative weights greater than 100, indicating excellent condition. There was a weak positive correlation between fish length and relative weight.

DETRIMENTAL SPECIES

In total, 252 carp were collected in fyke nets during SN1 for a catch rate of 4.2 fish/net night, similar to the 3.8 fish/net night observed in 2015. During spring electrofishing, 12 Common Carp were counted while sampling panfish stations for an observation rate of 12.0 fish/mile which was lower than the 48.0 fish/mile observed in 2015. Admittedly, the electrofishing observation rate may have been reduced due to having to sample deeper water outside of the band of flooded timber ringing much of the lake's shoreline. In total, 189 Common Carp were measured, and lengths ranged from 7.2 to 21.9 inches, and the mean and median values were 16.9 and 16.4 inches, respectively. The length frequency is presented in Figure 22, and it indicated a bi-modal distribution with peaks at the 14 and 19-inch bins. Little recent recruitment was evident as only two yearling carp were collected, and they measured 7.2 and 7.3 inches. Few large carp were collected, with less than 10% of the catch measuring ≥ 20 inches. Measured carp collected during SN1 were also weighed; weights ranged from 0.9 to 5.0 pounds, with mean and median weights of 2.4 and 2.2 pounds, respectively.

Carp control efforts in Mud Lake began with attempts to separate Fish and Mud lakes by filling a large culvert connecting the lakes under Fish Lake Road with crushed stone in 2017. Mud Lake was treated with rotenone to eliminate the entire fishery in January 2018. A second smaller culvert connecting the lakes was discovered and permanently blocked by crushing the end and covering it with rock in February 2018, while Mud Lake still had rotenone levels that were lethal to carp. Adult carp re-invaded Mud Lake through gaps in the stone used to fill the larger culvert in the spring of 2018 and successfully spawned, creating a new year class of carp. The large culvert was permanently blocked in the summer of 2018, and planning began to re-treat Mud Lake to eradicate the carp a second time. Rising water levels in 2019 completely inundated Fish Lake Road in October 2019, combining Fish and Mud lakes into

one single waterbody and eliminating the possibility of treating Mud Lake a second time. Although young-of-year carp produced in Mud Lake in 2018 were greatly reduced in number through predation by Largemouth Bass in 2018 and early 2019, the remaining carp were left to populate the combined Fish Lake when the lakes joined together. Those fish account for some proportion of the carp population in the lake in 2021, although the exact proportion remains uncertain.

Discussion

Panfish were abundant in Fish Lake in 2021, and the abundance of all three species (Bluegill, Black Crappie, Yellow Perch) appeared to have increased noticeably since 2015. Despite increasing in abundance, Yellow Perch remained a minor component of the fishery and growth and size structure were poor. The Size structure of Bluegills and Black Crappies was also poor and appeared to decline from 2015 to 2021. However, Bluegill growth was average and slightly improved from 2015 to 2021. Bluegill recruitment is relatively steady, and harvest doesn't appear to be excessively impacting the population. In the past, the poor growth of Bluegills was attributed to poor foraging efficiency in the dense aquatic macrophyte beds that filled the littoral zone of Fish Lake. Bluegills could not efficiently forage for zooplankton, and Largemouth Bass could not efficiently forage for Bluegills leading to an overabundance of Bluegills and poor growth of both species as a result. Declines in the vast aquatic vegetation beds in the littoral zone of Fish Lake following the 10-foot increase in the lake level may, over time, lead to improved growth rates as foraging efficiency improves and panfish densities are reduced through predation by Largemouth Bass and Northern Pike. At their current abundance, Bluegills should be present in sufficient numbers to control Common Carp recruitment through predation on their eggs. There are no population-specific goals or objectives for Bluegill, and no regulation changes are recommended for panfish at this time.

Black Crappie growth was poor, and mean length at age values were essentially unchanged from 2015. Black Crappie recruitment was boom or bust, with massive year classes every few years and some years of complete recruitment failure. The strongest year classes present in 2015 remained strong in 2021. Mean length at age values for massive year classes were poor, with the weaker year classes showing slightly better growth. This may indicate that fish from the massive year classes are unable to overcome poor growth in their first year or two of life and will remain smaller than average throughout life.

Conversely, weak year classes likely do not face the same level of competition early in life and may grow faster as a result. The strongest year classes of crappies don't average over 8 inches in Fish Lake until age 7, while weak year classes averaged over 8 inches by age 3. If future surveys indicate a

continuation of this trend, back-calculated mean lengths at age could be compared for weak and strong year classes to assess the hypothesis that slow early growth impacts strong year classes of crappies throughout life. Black Crappies in Fish Lake are long-lived, but poor growth ensures that most will never reach a size acceptable to anglers for harvest. Case in point, age 11 crappies averaged 8.2 inches in 2021.

Northern Pike abundance increased from 2015 to 2021, and the population size structure improved over the same period. Fish Lake currently offers area anglers one of the best chances to catch a Northern Pike over 40 inches. The growth outpaces area and state averages throughout the range of observed ages. Genetic analysis indicated that a sizable portion of the Northern Pike population Fish Lake in 2021 came from stocked fish. Northern Pike should see their foraging efficiency increase with the decline of dense aquatic macrophyte beds, keeping growth rates strong and helping to reduce panfish densities through predation. The two-story nature of Fish Lake provides a cool water refuge for Northern Pike during hot summer weather and helps ensure the fish have access to optimal temperatures for growth. Northern Pike natural reproduction and recruitment may increase due to the spawning habitat provided by newly flooded grasses around the perimeter of Fish Lake. Additionally, Fish Lake is a closed system, and Northern Pike stocked there will not be lost to escapement, as generally occurs in stocked impoundments. This retention of stocked fish further helps to increase the success of Northern Pike stocking efforts at Fish Lake. In short, conditions are favorable for maintaining an excellent Northern Pike fishery moving forward. Currently, harvest does not appear to be excessive, and the current regulation is sufficient to provide a quality fishing opportunity for Northern Pike; no change is recommended. Moving forward, the goal is to provide anglers the opportunity to harvest Northern Pike and catch memorable size pike. The measurable objective is an adult Northern Pike population ≥ 1.5 fish/acre with a PSD-26 ≥ 30 and PSD-34 ≥ 5. Currently, these objectives are being met. The recommendation is to continue stocking large fingerling Northern Pike every other year at the rate of two fish per acre, utilizing fish with Mississippi River Mainstem genetics. The stocking quota should be based on the full 404 acres of the combined Fish Lake complex. Stocking in alternating years will allow future surveys to assess natural recruitment of Northern Pike from non-stocked years and help inform managers on fishery changes attributable to the changes in littoral habitat.

The Largemouth Bass electrofishing catch rate was markedly lower in 2021 compared to 2015, but this was due to the reduced effectiveness of the sampling gear (electrofishing) and did not reflect an actual decline in abundance. An exceptionally strong year class of age 3 Largemouth Bass was present in Fish Lake in 2021, comprising nearly 60% of the population. Age 3 fish would have been produced in 2018, the first year after the rotenone treatment of Mud Lake while it was still separated from Fish Lake. Adult

Largemouth Bass transferred to Mud Lake from Fish Lake after the treatment spawned successfully and, by early August, a massive class of young of year Largemouth Bass was evident in Mud Lake. Carp also re-invaded Mud Lake in 2018 and spawned successfully, producing a massive year class of their own. Initially, a re-treatment of Mud Lake was being planned for the winter of 2019-2020, which would eliminate the fishery a second time. As such, intensive sampling in late summer 2019 collected over 2,000 juvenile Largemouth Bass, which were transferred to nearby Indian Lake to aid in biomanipulation efforts there. In late fall 2019, water levels in Fish and Mud lakes rose further, and the two lakes reconnected when Fish Lake Road became inundated. As a result, the second rotenone treatment of Mud Lake never occurred, and the fish of Mud Lake became part of Fish Lake. The remnants of the massive 2018 bass year class in Mud Lake likely account for at least part of the unusually strong class of age 3 fish in Fish Lake in 2021. It is also possible that bass recruitment was excellent in Fish Lake in 2018.

Largemouth Bass growth was slightly above average and may improve in the future as the effects of reduced aquatic macrophyte density in the littoral zone manifest in improved foraging efficiency. Regulatory protection for Largemouth Bass offered by the 18-inch minimum length limit will serve to limit harvest and keep bass abundance high. Abundant bass foraging more efficiently should serve to reduce panfish abundance and improve their growth rates as well. Moving forward, the population goal for Largemouth Bass is to provide predation pressure on panfish to reduce their abundance and improve growth rates while also providing anglers a quality opportunity to catch larger bass. Measurable objectives for bass abundance in Fish Lake are hard to quantify due to the reduced effectiveness of electrofishing following the drastic rise in water levels. Under the old water level scenario, the recommendation would be an electrofishing catch rate above the lake class median of 36.2 fish/mile for Simple Two-Story lakes. The size structure objective would be an RSD-18 ≥ 5. Prior to the change in water level, Fish Lake (then separate from Mud Lake) was meeting the abundance objective and exceeding the size structure objective. Under the altered water level scenario, Fish Lake technically did not meet the abundance objective but continues to meet the size structure objective. The current regulation is sufficient to help the lake meet its abundance and size structure objectives, and no change is recommended. Fish Lake, in its current and former state, continually outperforms other area lakes with respect to the production of Largemouth Bass ≥ 18 inches.

It remains to be seen how the lake will respond to drastic changes in depth and resultant alterations to the littoral zone. Areas that once held dense aquatic macrophyte beds are now too deep to allow sufficient light penetration to support rooted aquatic vegetation. Areas that were dry land a few years ago have been flooded and have become the new littoral zone of the

lake. These areas may respond by becoming home to new aquatic plant beds once the plants have a chance to colonize those areas. In an effort to track changes in the density of aquatic vegetation in the littoral zone, annual sonar surveys using Biobase mapping software (www.biobasemaps.com) are recommended. While such surveys were not conducted on Fish Lake prior to the recent rise in water levels, such surveys have been conducted on Mud Lake since 2015. Future plant density surveys will allow comparisons to prior surveys on the Mud Lake side of the basin and will help managers track changes in the Fish Lake side of the basin as the lake adapts to the new water level over time. The first such survey occurred on July 20, 2021, and the bathymetric and plant density maps created from that survey are found in Figures 23 and 24. The DNR Fisheries program has both the equipment and the software license to continue these surveys moving forward. Data collected during these Biobase surveys will allow for calculation of the proportion of littoral zone relative to the whole lake area and to track that value over time. It will be interesting to see if changes in the littoral zone through flooding of new areas of land will contribute to changes in fish recruitment and growth, and how those changes will alter the fishery moving forward.

Extensive areas of flooded timber are a new habitat element in Fish Lake. Prior to the rise in the lake level, coarse woody habitat in the littoral zone of Fish and Mud lakes was limited. Dane County began planning for a project to add coarse woody habitat (fish sticks) along Lussier Park in 2018, but the change in water level halted those plans as areas of the park became flooded. Currently, coarse woody structure is abundant, but the habitat complexity of the wood is relatively low because only the trunks of standing trees are submerged. This is likely to change as the trees die and eventually fall into the lake. Submerged whole trees provide far better habitat complexity and will likely benefit fish and other aquatic organisms to a greater degree than standing trunks alone. The natural process of flooded trees falling into Fish Lake should be left unaltered to the extent possible, at least in areas where the riparian land is publicly owned, to maximize habitat benefits in the lake.

Fish Lake had only been in its current high-water state for two years at the time of the 2021 fishery survey, and the lakes had only been joined together for about 18 months. Population-level changes are likely to occur over a period of several years and may not have been detectable yet in 2021. For that reason, it is recommended to conduct a comprehensive fishery survey of Fish Lake in 2026, after five years instead of the scheduled 10-year rotation, which would have put the next survey in 2031. Additional late spring electrofishing surveys may be conducted before 2026 to track changes in Bluegill and Largemouth Bass populations. Mini-boom electrofishing may be more effective than using the maxi-boom boat because the smaller boat may prove more maneuverable in the flooded timber. Electrofishing efficacy may improve significantly if sampling can occur in shallower water closer to shore.

Recommendations

1. Retain all current fishing regulations for Fish Lake, including the special regulation of an 18-inch minimum length limit with a one fish daily bag limit for Largemouth Bass.
2. Continue stocking large fingerling Northern Pike at the rate of two fish/acre utilizing fish with Mississippi River mainstem genetics. Surface area used in quota calculation should be the full 404 acres of the combined Fish Lake complex. Stocking will switch to an alternate-year approach to allow for the evaluation of natural recruitment from non-stocked years in future surveys.
3. Conduct annual Biobase sonar surveys to track submersed aquatic macrophyte density and assess changes that occur in the littoral zone through time.
4. Conduct the next comprehensive fishery survey in 2026. Additional late spring electrofishing surveys may be conducted prior to 2026 as the schedule and budget allow. Consider utilizing the mini-boom electrofishing boat to sample closer to the shore within the flooded timber.

References

Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D.W. Willis editors. Fisheries techniques, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Bettoli, P.W., and L.E. Miranda. 2001. Cautionary note about estimating mean length at age with subsampled data. North American Journal of Fisheries Management 21: 425-428.

Guy, C.S., R.M. Neumann, D.W. Willis, and R.O. Anderson. 2007. Proportional size distribution (PSD): a further refinement of population size structure index terminology. Fisheries 32(7): 348.

Isermann, D.A., and C.T. Knight. 2005. A computer program for age-length keys incorporating age assignment to individual fish. North American Journal of Fisheries Management, 25: 1153-1160.

Krohelski, J.T., Yu-Feng Lin, W. J. Rose, and R. J. Hunt. 2002. Simulation of Fish, Mud, and Crystal lakes and the shallow ground-water system, Dane

County, Wisconsin. U. S. Geological Survey Water-Resources Investigation Report 02-4014. USGS, Middleton, Wisconsin.

Laarman, P.W., and J. R. Ryckman. 1982. Relative size selectivity of trap nets for eight species of fish. North American Journal of Fisheries Management 2: 33-37.

Marshall, D. W., N. P. Nibbelink, P. J. Garrison, J. Panuska, and S. R. Stewart. 1996. A management plan to protect and improve the Fish Lake ecosystem. Wisconsin Department of Natural Resources, Madison, WI. 79pp.

Marshall, D.W., K. Connors, D. Flanders, T. Haynes, S. Jones, J. Leverance, D. Marsh, M. Richardson, and J. Yaeger. 2007. Aquatic plant management plan, Fish, Crystal, and Indian Lakes, Lower Wisconsin River Basin, Dane County, Wisconsin. Office of Lakes and Watersheds, Dane County Land and Water Resources Department, Madison, WI. 42pp.

Murphy, B. R., D. W. Willis, and T. A. Springer. 1991. The relative weight index in fisheries management: status and needs. Fisheries 16(2): 30-38.

Nye, N.J. 2019. Comprehensive Fishery Survey of Fish Lake, Dane County, Wisconsin 2015. Wisconsin Department of Natural Resources, Madison, Wisconsin. 74pp.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. Fisheries Research Board of Canada Bulletin 191.

Rypel, A.L., T.D. Simonson, D.L. Oele, Joanna D.T. Griffin, T.P. Parks, D. Seibel, C.M. Roberts, S. Toshner, L.S. Tate, and J. Lyons. 2019. Flexible classification of Wisconsin lakes for improved fisheries conservation and management. Fisheries 44(5) 225-238.

Tables

Table 1. Current fishing regulations for Fish Lake, Dane County, Wisconsin.

SPECIES[1]	SEASON DATES	LENGTH AND BAG LIMITS
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 18" and the daily bag limit is 1.
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.
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.

1. General regulations are listed for all categories of gamefish, however Channel and Flathead Catfish, Muskellunge, Walleye and Sauger are not found in Fish Lake.

Table 2. Stocking history for Fish Lake, Dane County, Wisconsin 1999-2021

YEAR	SPECIES	STRAIN	AGE CLASS[1]	NUMBER STOCKED	AVERAGE LENGTH (INCHES)	SOURCE TYPE
1999	NORTHERN PIKE	LAKE PUCKAWAY	LGF	432	7.3	DNR HATCHERY
2001	NORTHERN PIKE	UNSPECIFIED	LGF	432	7.5	DNR HATCHERY
2002	TIGER MUSKY	UNSPECIFIED	LGF	421	10.0	DNR CO-OP
2005	NORTHERN PIKE	UNSPECIFIED	SMF	7,200	1.9	DNR HATCHERY
2006	NORTHERN PIKE	PUCKAWAY	SMF	7,128	2.2	DNR HATCHERY
2008	NORTHERN PIKE	UNSPECIFIED	SMF	7,128	1.9	DNR HATCHERY
2009	NORTHERN PIKE	MUD LAKE - MADISON CHAIN	SMF	1,999	2.3	DNR HATCHERY
2012	NORTHERN PIKE	UNSPECIFIED	LGF	900	15.2	PRIVATE HATCHERY
2014	NORTHERN PIKE	MUD LAKE - MADISON CHAIN	LGF	400	9.3	DNR HATCHERY
2015	NORTHERN PIKE	MUD LAKE - MADISON CHAIN	SMF	2,500	3.7	DNR HATCHERY
2017	NORTHERN PIKE	MUD LAKE - MADISON CHAIN	SMF	1,986	2.4	DNR HATCHERY
2018	NORTHERN PIKE	MUD LAKE - MADISON CHAIN	SMF	1,986	2.4	DNR HATCHERY
2019	NORTHERN PIKE	MUD LAKE - MADISON CHAIN	LGF	552	7.9	DNR HATCHERY
2020	NORTHERN PIKE	MUD LAKE - MADISON CHAIN	LGF	502	10.0	DNR HATCHERY
2021	NORTHERN PIKE	MUD LAKE - MADISON CHAIN	LGF	502	8.1	DNR HATCHERY
2021	NORTHERN PIKE	UNSPECIFIED	LGF	500	13.5	PRIVATE HATCHERY

1. LGF = Large Fingerling, SMF = Small Fingerling.

Table 3. Dimensions, dates and locations (GPS coordinates) of fyke nets used during the spring 2021 survey of Fish Lake, Dane County, Wisconsin.

NET NUMBER	LEAD LENGTH (FEET)	FRAME HEIGHT (FEET)	SET DATE	FINAL LIFT DATE	LATITUDE	LONGITUDE
1	75	2	03/22/2021	03/24/2021	43.29224	-89.65894
2	75	2	03/22/2021	03/24/2021	43.29337	-89.66006
3	50	3	03/22/2021	04/05/2021	43.28795	-89.67020
4	50	3	03/22/2021	03/24/2021	43.28781	-89.66323
5	75	3	03/22/2021	04/05/2021	43.28880	-89.64402
1A	75	3	03/24/2021	03/25/2021	43.28202	-89.66157
2A	75	2	03/24/2021	03/25/2021	43.28526	-89.64660
4A	50	3	03/24/2021	04/05/2021	43.28404	-89.66265
1B	75	2	03/25/2021	03/26/2021	43.29031	-89.66854
2B	75	3	03/25/2021	04/05/2021	43.29216	-89.64847
6	50	3	03/26/2021	04/05/2021	43.28233	-89.65633

Table 4. Calcified structures used to estimate ages of fish collected during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

SPECIES	SIZE CATEGORY	AGING STRUCTURE
Black Crappie	ALL	otolith
Bluegill	ALL	otolith
Largemouth Bass	ALL	dorsal fin spine
Northern Pike	ALL	pelvic fin ray
Yellow Perch	ALL	anal fin spine

Table 5. Locations of electrofishing stations (GPS coordinates) sampled during SE2 on Fish Lake, Dane County, Wisconsin in 2021.

STATION NAME	DATE	START TIME	END TIME	DISTANCE SAMPLED (MILES)	WATER TEMPERATURE (F)	START LATITUDE	START LONGITUDE	END LATITUDE	END LONGITUDE
PANFISH 1	5/13/2021	2055	2130	0.5	62.3	43.29180	-89.65137	43.29145	-89.65942
GAMEFISH 1	5/13/2021	2145	2230	1.5	59.1	43.29145	-89.65942	43.28793	-89.66305
PANFISH 2	5/13/2021	2250	2315	0.5	59.3	43.28793	-89.66305	43.28793	-89.65945
GAMEFISH 2	5/13/2021	2345	0045	2.7	60.1	43.28793	-89.65945	43.29180	-89.65137

Table 6. The PSD length categories (inches) for selected fish species that were collected from Fish Lake in 2021 (Anderson and Neumann 1996, Guy et al. 2007).

SPECIES	STOCK	QUALITY (PSD)	HARVEST (PSD-H)[1]	PREFERRED (PSD-P)	MEMORABLE (PSD-M)	TROPHY (PSD-T)
Bluegill	3	6	7	8	10	12
Black Crappie	5	8	9	10	12	15
Yellow Perch	5	8	9	10	12	15
Largemouth Bass	8	12	18	15	20	25
Northern Pike	14	21	26	28	34	44

[1]Lengths of fish found socially (Bluegill, Black Crappie, Yellow Perch) or legally (Largemouth Bass, Northern Pike, Smallmouth Bass, Walleye) acceptable for harvest by anglers.

Table 7. Families and species of fish collected during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

FAMILY-SCIENTIFIC NAME	FAMILY-COMMON NAME	NUMBER OF SPECIES COLLECTED	SPECIES LIST (COMMON NAME)
Centrarchidae	Sunfishes	8	Black Crappie, Bluegill, Bluegill x Unknown hybrid, Green Sunfish, Green Sunfish x Pumpkinseed hybrid, Largemouth Bass, Pumpkinseed, Green Sunfish x Bluegill hybrid
Cyprinidae	Minnows	2	Common Carp, Golden Shiner
Esocidae	Pikes	1	Northern Pike
Ictaluridae	Catfishes	1	Yellow Bullhead
Percidae	Perches	1	Yellow Perch

Table 8. Summary of catch and catch-per-unit effort (CPUE) by sampling period during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

	CATCH			CPUE (FISH/NN)	(FISH/MILE)	(FISH/HOUR)
SPECIES	SN1	SE2	Total	SN1	SE2	SE2
Bluegill	23,193	189	23,382	386.6	189.0	189.0
Black Crappie	3,171	18	3,189	52.9	18.0	18.0
Northern Pike	425	9	434	7.1	1.7	3.3
Yellow Perch	369	0	369	6.2	0.0	0.0
Common Carp	251	12	263	4.2	12.0	12.0
Largemouth Bass	134	108	242	2.2	20.8	39.3
Pumpkinseed	98	0	98	1.6	0.0	0.0
Yellow Bullhead	54	0	54	0.9	0.0	0.0
Green Sunfish x Pumpkinseed	29	0	29	0.5	0.0	0.0
Bluegill x Unknown	11	0	11	0.2	0.0	0.0
Green Sunfish	7	0	7	0.1	0.0	0.0
Green Sunfish x Bluegill	3	0	3	0.1	0.0	0.0
Golden Shiner	1	2	3	0.0	2.0	2.0
	27,746	338	28,084			

Table 9. Summary of lengths (inches), PSD and ages of gamefish sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

SPECIES	PERIOD[1]	n COLLECTED	n MEASURED	LENGTH RANGE	MEAN LENGTH	MEDIAN LENGTH	PSD	PSD-H	PSD-P	PSD-M	AGE RANGE	MEAN RELATIVE WEIGHT
Bluegill	SN1	23,193	1,443	2.6-8.9	5.3	5.3	19	2	0	0		
Bluegill	SE2	189	189	2.4-7.1	5.0	5.0	7	1	0	0		
Bluegill	ALL	23,382	1,632	2.4-8.9	5.3	5.3	18	2	0	0	1-11	88.3
Black Crappie	SN1	3,171	477	4.9-12.5	7.2	7.6	29	2	1	0		
Black Crappie	SE2	18	18	5.6-9.6	7.9	7.9						
Black Crappie	All	3,189	495	4.9-12.5	7.2	7.6	29	3	1	0	2-11	100.1
Yellow Perch	All	369	72	4.6-8.8	6.3	6.3					2-6	93.4
Largemouth Bass	SN1	127	127	6.0-20.0	11.1	10.9	21	8	8	1		
Largemouth Bass	SE2	106	106	5.5-20.0	11.8	11.7						
Largemouth Bass	ALL	233	233	5.5-20.0	11.4	11.1	35	15	14	1	1-15	100.8
Northern Pike	ALL	323	323	10.9-43.7	24.5	24.0	77	35	24	5	1-9	98.7

1. All Yellow Perch were collected during SN1.
2. Five NOP were collected during SE2, and those data did not alter PSD values, so all periods were combined for this table.

Table 10. Bluegill size-specific electrofishing catch rates (CPUE; fish/mile) and area rankings from SE2 surveys of lakes in the Poynette management area, 2010-2021.

			CPUE (FISH/MILE)				CPUE RANK			
LAKE	COUNTY	YEAR	Total	6"+	7"+	8"+	Total	6"+	7"+	8"+
Silver	Columbia	2016	345.0	5.0	0.0	0.0	1	20	NA	NA
Tarrant	Columbia	2018	267.0	37.0	22.0	7.0	2	13	6	2
Blass	Sauk	2017	190.0	50.0	27.3	1.3	3	6	3	7
Fish	**Dane**	**2021**	**189.0**	**16.0**	**1.0**	**0.0**	**4**	**16**	**20**	**NA**
Mirror	Sauk	2014	143.3	62.0	14.7	0.0	5	3	9	NA
Dutch Hollow	Sauk	2016	141.3	69.3	30.7	6.0	6	2	1	3
Fish	Dane	2015	135.0	46.0	8.0	0.0	7	9	12	NA
Seeley	Sauk	2016	123.4	85.5	14.5	0.0	8	1	10	NA
Lazy	Columbia	2011	122.0	24.0	13.0	0.0	9	15	11	NA
Mud	Dane	2015	120.7	38.0	0.0	0.0	10	12	NA	NA
White Mound	Sauk	2019	102.0	48.0	22.0	7.0	11	8	5	1
George	Columbia	2013	101.0	53.5	19.2	0.0	12	5	7	NA
West	Columbia	2019	86.7	2.7	1.3	0.0	13	22	19	NA
Crystal	Dane/Col	2015	79.3	62.0	28.7	0.0	14	4	2	NA
Swan	Columbia	2018	74.0	38.7	6.7	0.7	15	11	13	10
Delton	Sauk	2021	68.0	50.0	3.0	0.0	16	7	15	NA
Wisconsin	Col/Sauk	2017	59.8	29.0	15.0	1.2	17	14	8	8
Virginia	Sauk	2016	53.9	38.8	26.7	4.2	18	10	4	4
Park	Columbia	2021	43.0	15.0	2.0	0.0	19	17	18	NA
Spring	Columbia	2018	32.0	2.0	0.0	0.0	20	23	NA	NA
La Valle Millpond	Sauk	2021	29.0	1.0	0.0	0.0	21	24	NA	NA
Crystal	Columbia	2014	20.0	2.9	2.9	2.9	22	21	17	6
Devils	Sauk	2013	12.0	6.0	3.0	3.0	23	19	16	5
Redstone	Sauk	2010	10.5	8.5	5.5	1.0	24	18	14	9

1. Mud Lake and Fish Lake are listed separately for 2015 and as one combined lake for 2021. In 2019 rising lake levels inundated Fish Lake Road, causing the two lakes to become one.
2. Crystal Lake in Columbia County is 28 acres and is located within the Peter Helland Wildlife Area near Pardeeville.

Table 11. Black Crappie size structure metrics for lakes in the Poynette management area, 2010-2021. Lengths are reported in inches.

LAKE[1]	COUNTY	YEAR	SURFACE AREA (ACRES)	n COLLECTED	n MEASURED	MEAN LENGTH	MEDIAN LENGTH	LARGEST FISH	PSD8	PSD9	PSD10	PSD12
Mud	Dane	2015	85	1,344	473	8.2	8.7	9.8	97	37	0	0
Park	Columbia	2021	312	512	351	10.4	10.4	13.5	92	88	77	27
Lazy	Columbia	2011	161	342	173	8.4	8.8	12.0	86	52	17	1
Crystal	Dane	2015	600	764	764	8.3	8.4	10.8	78	17	1	0
Swan	Columbia	2018	406	525	525	9.2	9.7	13.0	78	68	43	1
Wisconsin	Columbia	2017	7,200	501	501	8.8	8.4	14.2	70	34	26	16
Delton	Sauk	2014	267	1,661	635	8.1	8.3	9.4	68	4	0	0
Redstone	Sauk	2010	605	533	533	8.4	8.3	14.4	62	39	23	1
Spring	Columbia	2018	24	951	845	7.4	7.4	12.3	34	12	4	0
Fish	**Dane**	**2021**	**404**	**3,173**	**495**	**7.2**	**7.6**	**12.5**	**29**	**3**	**1**	**0**
Mirror	Sauk	2014	139	510	508	7.5	7.2	12.8	28	17	3	1
Fish	Dane	2015	258	1,627	877	5.3	4.3	9.8	24	4	0	0
Dutch Hollow	Sauk	2016	166	76	76	9.3	9.8	12.2				
White Mound	Sauk	2019	104	35	35	5.9	4.0	13.2				
Devils	Sauk	2013	375	17	17	4.9	4.1	11.5				

1. Mud Lake and Fish Lake are listed separately for 2015 and as one combined lake for 2021. In 2019 rising lake levels inundated Fish Lake Road, causing the two lakes to become one.

Table 12. Yellow Perch size structure metrics for lakes in the Poynette management area, 2010-2021. Lengths are reported in inches.

LAKE[1]	COUNTY	YEAR	GEAR TYPE	n COLLECTED	n MEASURED	PSD	PSD9	PSDP	PSDM	MEAN LENGTH	MEDIAN LENGTH	LARGEST FISH
White Mound	Sauk	2019	Fyke, EF	131	130	71	42	16	0	8.6	8.7	11.9
Devils	Sauk	2013	Fyke	106	106	63	51	37	10	9.0	9.1	13.5
Swan	Columbia	2018	Fyke	887	887	26	8	2	0	7.3	7.2	12.0
Crystal	Dane	2015	Fyke	590	590	23	3	0	0	7.4	7.5	9.8
Wisconsin	Col/Sauk	2017	Fyke	281	281	13	3	1	0	7.0	6.9	11.3
Redstone	Sauk	2010	Fyke, EF	129	129	9	1	0	0	6.3	6.2	9.0
Park	Columbia	2011	Fyke	1,122	675	8	3	1	0	6.1	5.7	10.5
Park	Columbia	2021	Fyke, EF	4,718	1,197	3	1	0	0	6.1	6.0	11.3
Mirror	Sauk	2014	Fyke	267	267	6	2	0	0	6.2	6.0	9.9
Fish	**Dane**	**2021**	**Fyke**	**369**	**72**					**6.3**	**6.3**	**8.8**
Fish	**Dane**	**2015**	**Fyke, EF**	**58**	**58**					**4.2**	**3.6**	**9.5**
Mud	**Dane**	**2015**	**Fyke, EF**	**100**	**100**					**5.4**	**5.5**	**7.5**

1. Mud Lake and Fish Lake are listed separately for 2015 and as one combined lake for 2021. In 2019 rising lake levels inundated Fish Lake Road, causing the two lakes to become one.

Table 13. Northern Pike abundance and size structure metrics for lakes in the Poynette management area, 2011-2021. Lengths are reported in inches.

LAKE[1]	COUNTY	SURFACE AREA (ACRES)	YEAR	n UNIQUE FISH SAMPLED	PE[2] (n/ac)	MEAN LENGTH	LARGEST FISH	n>40"	PSD	PSD26	PSDP	PSD32	PSDM	PSD40
Delton	Sauk	267	2014	250	1.3	27.7	41.4	2	92	59	45	19	14	1
Devils	Sauk	375	2013	119	0.5	30.2	40.0	1	87	73	65	49	41	1
Park	Columbia	312	2021	151	0.9	23.9	37.9	0	79	40	24	3	1	0
Fish	**Dane**	**404**	**2021**	**323**	**1.5**	**24.5**	**43.7**	**6**	**77**	**35**	**24**	**9**	**5**	**2**
Swan	Columbia	406	2018	268	1.7	21.9	33.5	0	66	27	19	1	0	0
Lazy	Columbia	161	2011	384	7.4	22.4	37.5	0	64	31	16	7	3	0
Mirror	Sauk	139	2014	302	6.6	21.0	42.0	3	56	10	3	2	2	1
Dutch Hollow	Sauk	166	2016	469	4.2	19.1	35.9	0	22	4	2	1	0	0
Fish	Dane	258	2015	86		22.8	38.2	0						
Wisconsin	Col/Sauk	7,200	2017	58		21.6	39.3	0						
Spring	Columbia	24	2018	46		22.8	29.7	0						
White Mound	Sauk	104	2019	45		24.0	38.1	0						
Crystal	Dane	600	2015	18		26.0	34.3	0						
Mud	Dane	85	2015	1		26.4	26.4	0						

1. Mud Lake and Fish Lake are listed separately for 2015 and as one combined lake for 2021. In 2019 rising lake levels inundated Fish Lake Road, causing the two lakes to become one.
2. PE = Population Estimate; an estimate of the number of sexually mature Northern Pike per surface acre of water calculated by the Schnabel mark-recapture method.

Table 14. Largemouth Bass size-specific electrofishing catch rates and area rankings from SE2 surveys of lakes in the Poynette management area, 2010-2021.

			CPUE (FISH/MILE)						CPUE RANK					
LAKE[1,2]	COUNTY	YEAR	Total	8"+	12"+	14"+	18"+	20"+	Total	8"+	12"+	14"+	18"+	20"+
White Mound	Sauk	2019	273.2	243.2	102.4	5.2	1.6	0.8	1	1	2	10	4	1
Virginia	Sauk	2016	207.9	201.2	172.7	2.4	0.0	0.0	2	2	1	17	NA	NA
Crystal	Columbia	2014	190.5	184.8	23.8	0.0	0.0	0.0	3	3	7	NA	NA	NA
Tarrant	Columbia	2018	81.0	76.0	44.0	31.0	0.0	0.0	4	5	3	1	NA	NA
Dutch Hollow	Sauk	2016	79.2	76.2	43.3	11.3	0.7	0.0	5	4	4	3	7	NA
Silver	Columbia	2016	72.4	59.6	23.2	10.4	0.0	0.0	6	6	8	4	NA	NA
Devils	Sauk	2013	55.8	51.9	32.2	0.6	0.3	0.0	7	7	5	21	10	NA
George	Columbia	2013	49.5	45.5	13.1	1.0	0.0	0.0	8	8	10	18	NA	NA
Fish	Dane	2015	35.3	26.5	23.9	15.6	2.1	0.3	9	10	6	2	1	5
Blass	Sauk	2017	32.7	28.7	12.0	6.7	0.0	0.0	10	9	11	9	NA	NA
Lazy	Columbia	2011	32.5	26.0	11.5	3.8	0.3	0.3	11	11	12	14	11	6
Seeley	Sauk	2016	25.8	21.0	13.7	8.1	0.0	0.0	12	13	9	6	NA	NA
Crystal	Dane/Col.	2015	23.7	22.1	11.3	7.6	2.1	0.5	13	12	13	7	2	2
Fish	**Dane**	**2021**	**20.8**	**18.5**	**9.6**	**4.6**	**1.7**	**0.4**	**14**	**14**	**15**	**11**	**3**	**4**
Mud	Dane	2015	18.7	4.7	1.3	0.7	0.0	0.0	15	22	22	20	NA	NA
Mirror	Sauk	2014	18.2	17.0	11.2	9.0	0.3	0.0	16	15	14	5	9	NA
Delton	Sauk	2021	10.6	10.3	9.4	7.1	0.5	0.0	17	16	16	8	8	NA
Wisconsin	Col/Sauk	2017	7.8	6.5	5.2	3.7	0.0	0.0	18	18	17	15	NA	NA
Swan	Columbia	2018	7.4	7.0	5.0	3.9	0.9	0.4	19	17	18	13	6	3
Spring	Columbia	2018	7.0	6.0	4.0	4.0	0.0	0.0	20	19	19	12	NA	NA
Park	Columbia	2021	6.3	5.4	3.7	2.9	1.0	0.0	21	20	20	16	5	NA
Redstone	Sauk	2010	4.7	4.7	3.3	0.9	0.1	0.0	22	21	21	19	12	NA
West	Columbia	2019	2.7	0.0	0.0	0.0	0.0	0.0	23	NA	NA	NA	NA	NA
Mean			45.0	40.9	21.7	6.1	0.4	0.1						
Median			24.7	21.6	11.4	3.9	0.1	0.0						

1. Crystal Lake in Columbia County is 28 acres and is located within the Peter Helland Wildlife Area near Pardeeville.
2. Mud Lake and Fish Lake are listed separately for 2015 and as one combined lake for 2021. In 2019 rising lake levels inundated Fish Lake Road, causing the two lakes to become one.

Table 15. Mean length at age 6 (MLA-6) of Largemouth Bass in lakes in the Poynette Management Area, 2010-2021.

LAKE	COUNTY	YEAR	MLA-6
Park	Columbia	2021	16.6
Fish	**Dane**	**2021**	**15.8**
Spring	Columbia	2018	15.6
Wisconsin	Col/Sauk	2017	15.5
Delton	Sauk	2014	15.4
Swan	Columbia	2018	15.3
Redstone	Sauk	2010	14.5
Lazy	Columbia	2011	14.4
Mirror	Sauk	2014	14.2
Fish	Dane	2015	13.1
Crystal	Dane/Col.	2015	13.1
White Mound	Sauk	2019	12.8
Virginia	Sauk	2016	12.5
Dutch Hollow	Sauk	2016	12.2
Devils	Sauk	2013	10.8
Average			14.1
Median			14.4

FIGURES

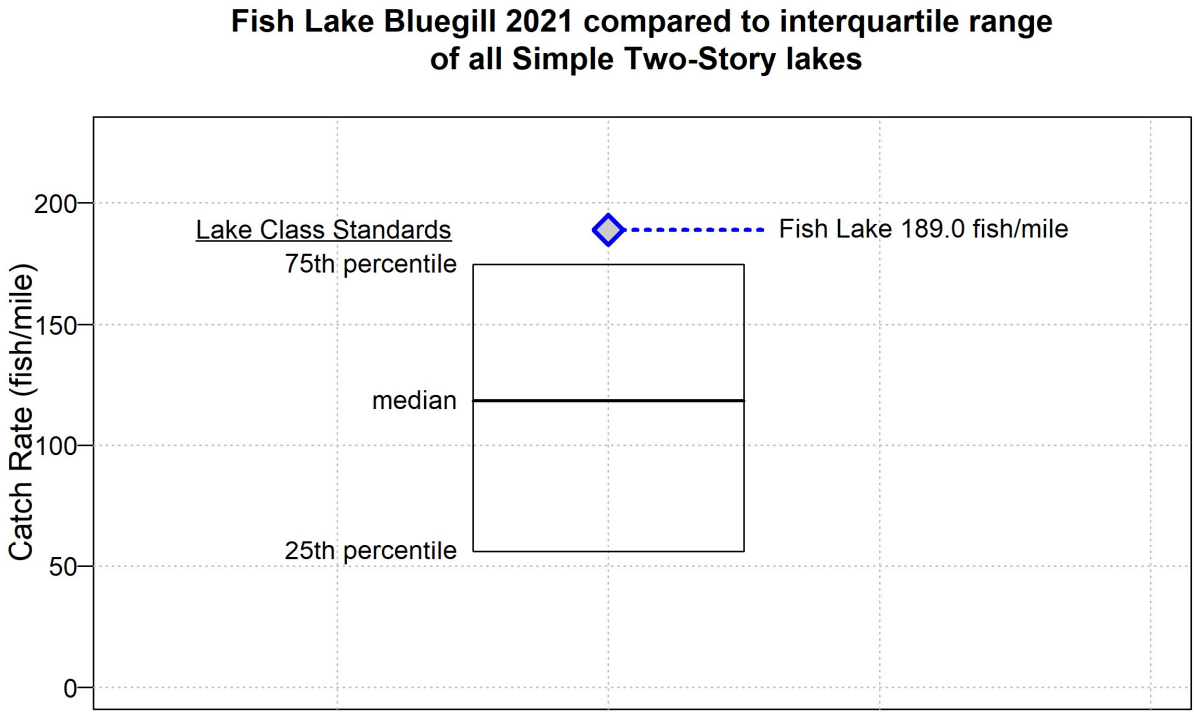

Figure 1. Bluegill electrofishing catch rate lake class comparison for Fish Lake, Dane County, Wisconsin. Lake class is Simple Two-Story.

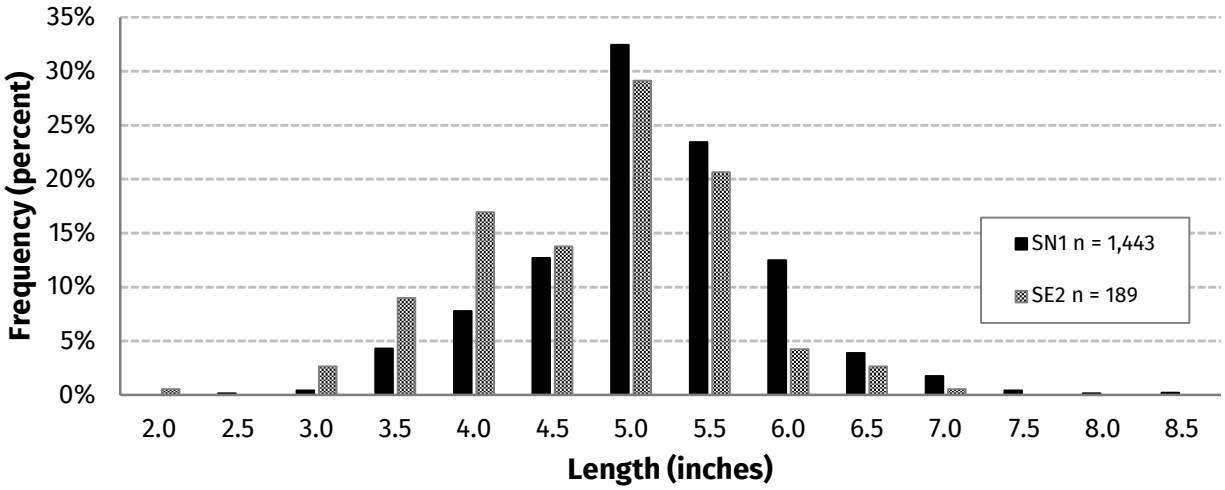

Figure 2. Length frequency distribution of Bluegills sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

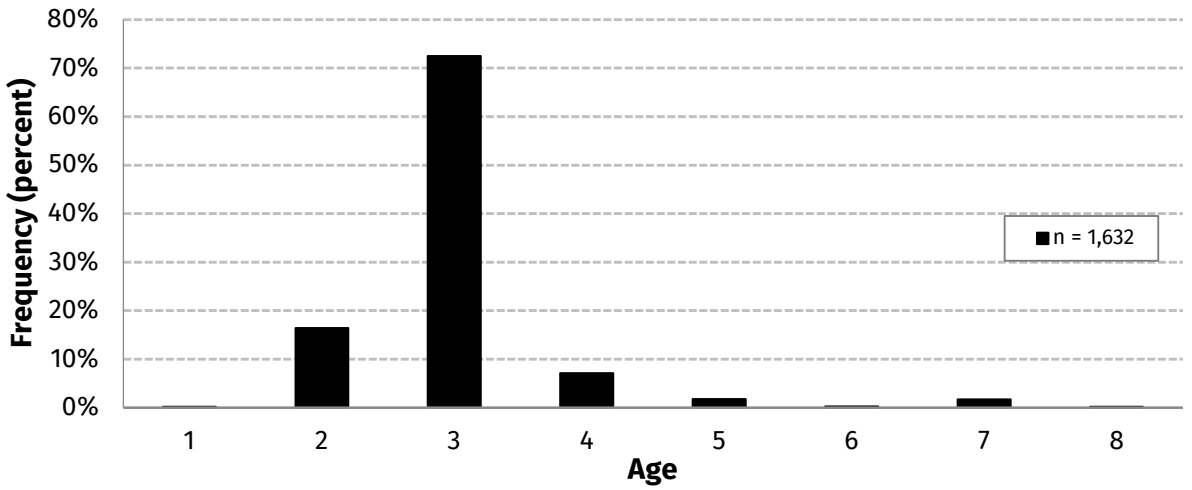

Figure 3. Age frequency distribution of Bluegills sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

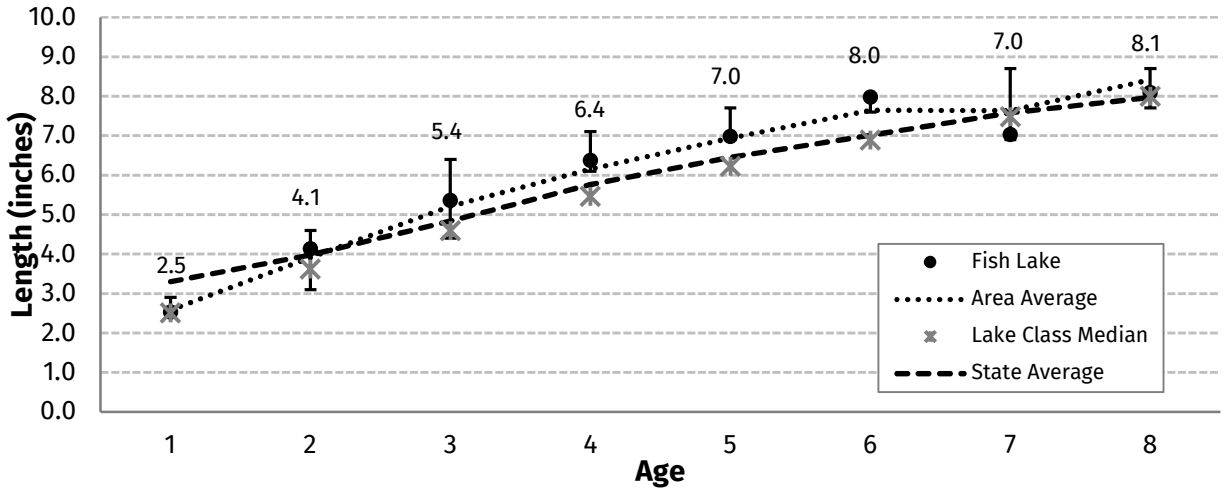

Figure 4. Mean length at age of Bluegills sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin. Error bars represent the range of observed lengths for a given age.

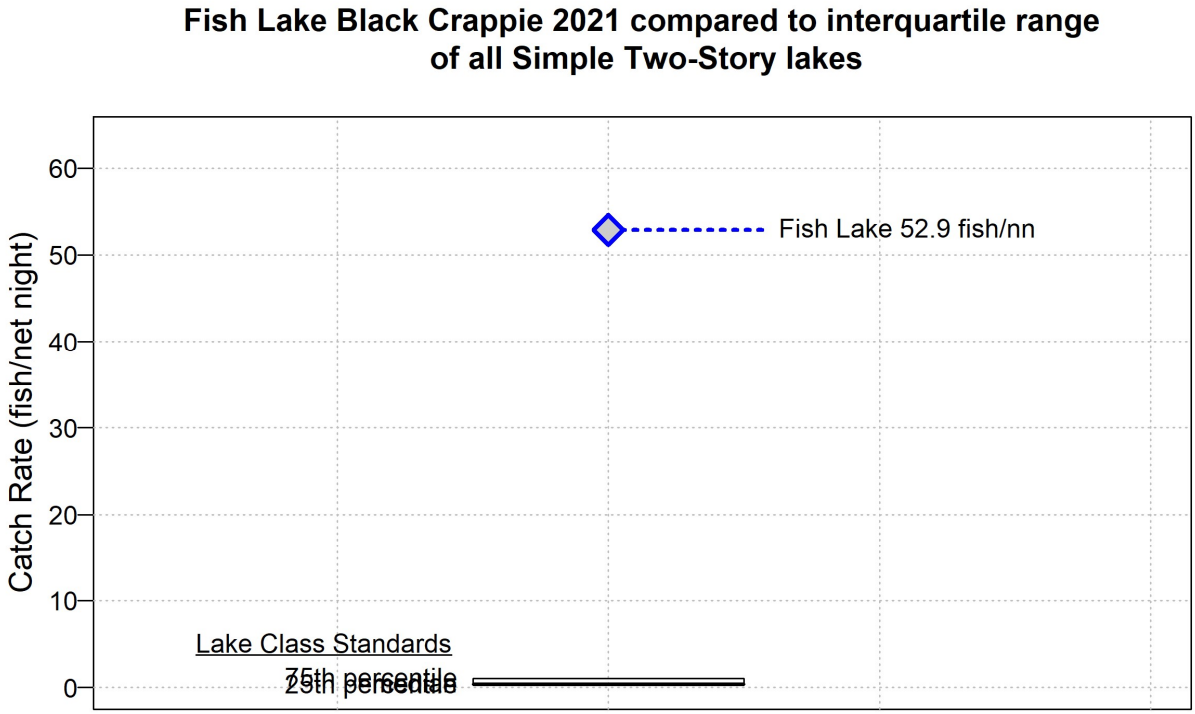

Figure 5. Black Crappie fyke net catch rate lake class comparison for Fish Lake, Dane County, Wisconsin. Lake class is Simple Two-Story.

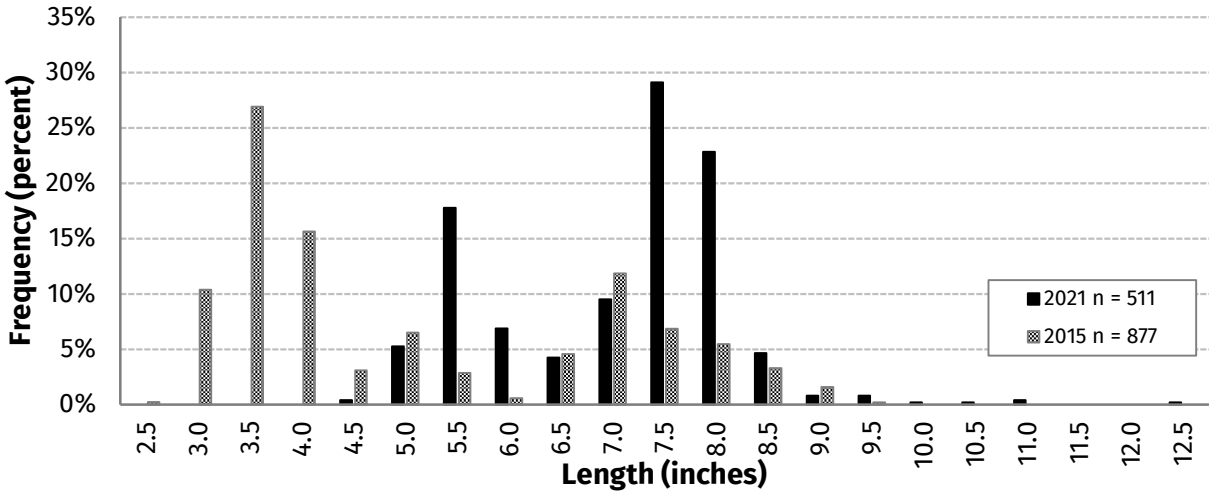

Figure 6. Length frequency distribution of Black Crappies sampled during the 2015 and 2021 comprehensive fishery surveys of Fish Lake, Dane County, Wisconsin.

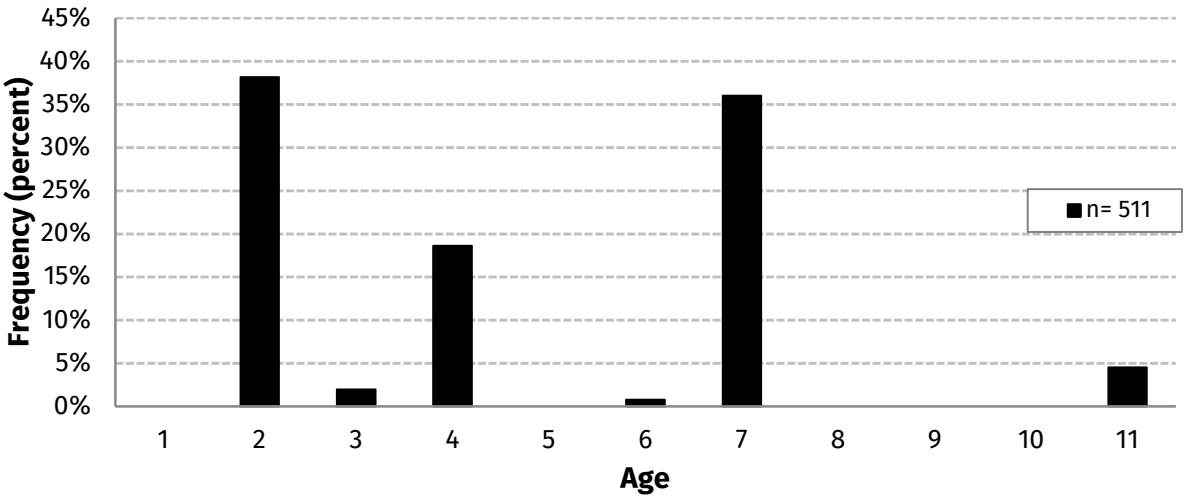

Figure 7. Age frequency distribution of Black Crappies sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

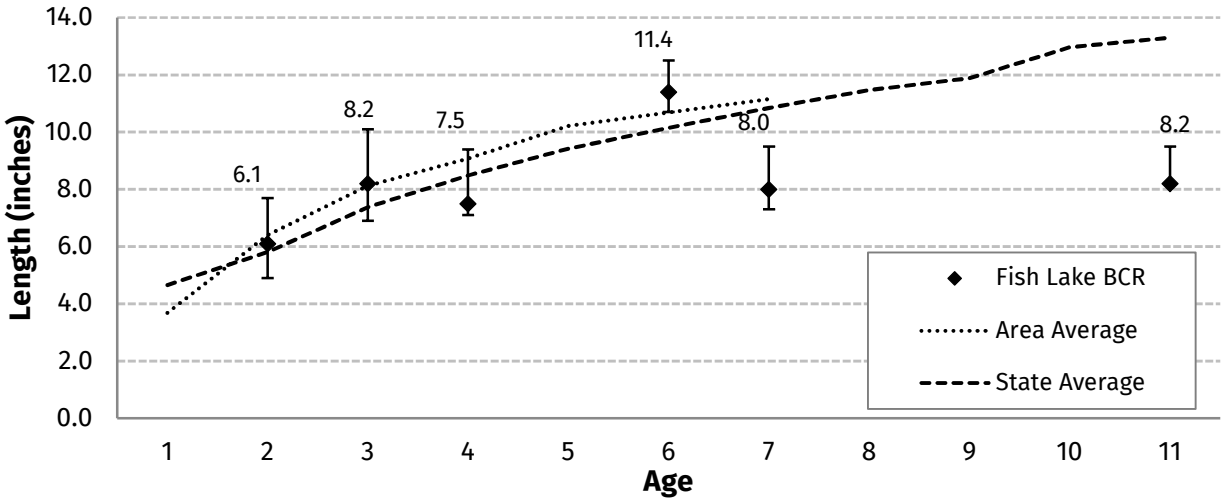

Figure 8. Mean length at age of Black Crappies sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin. Error bars represent the range of observed lengths for a given age.

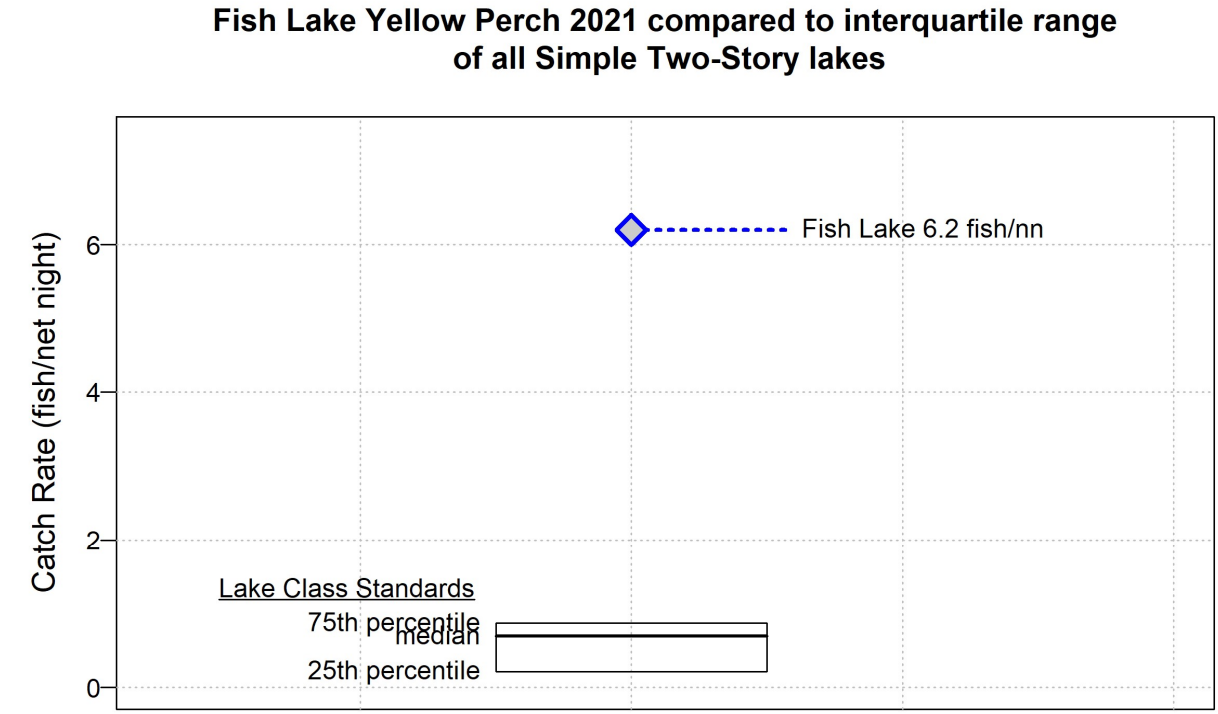

Figure 9. Yellow Perch fyke net catch rate lake class comparison for Fish Lake, Dane County, Wisconsin. Lake class is Simple Two-Story.

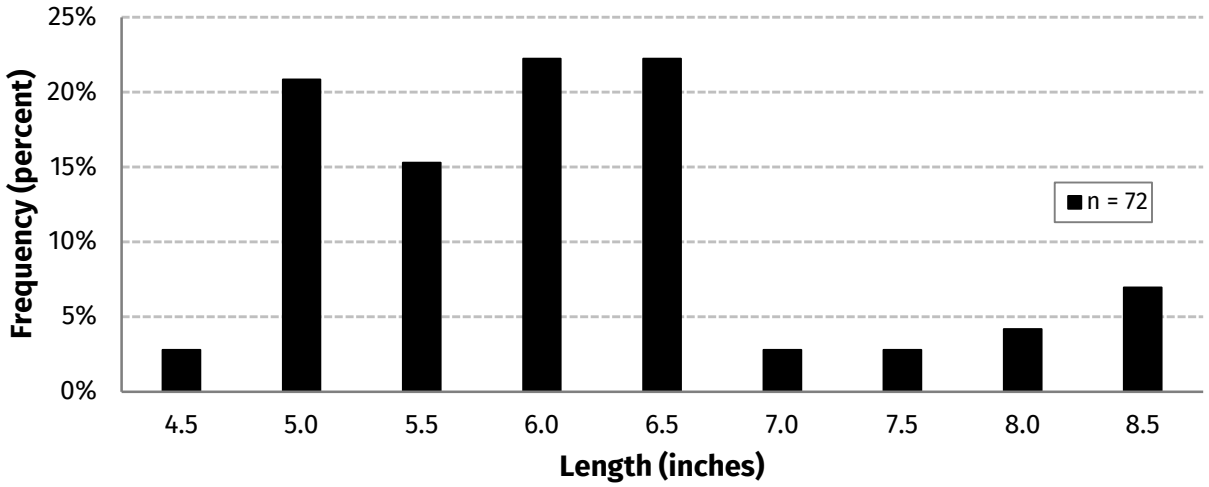

Figure 10. Length frequency distribution of Yellow Perch sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

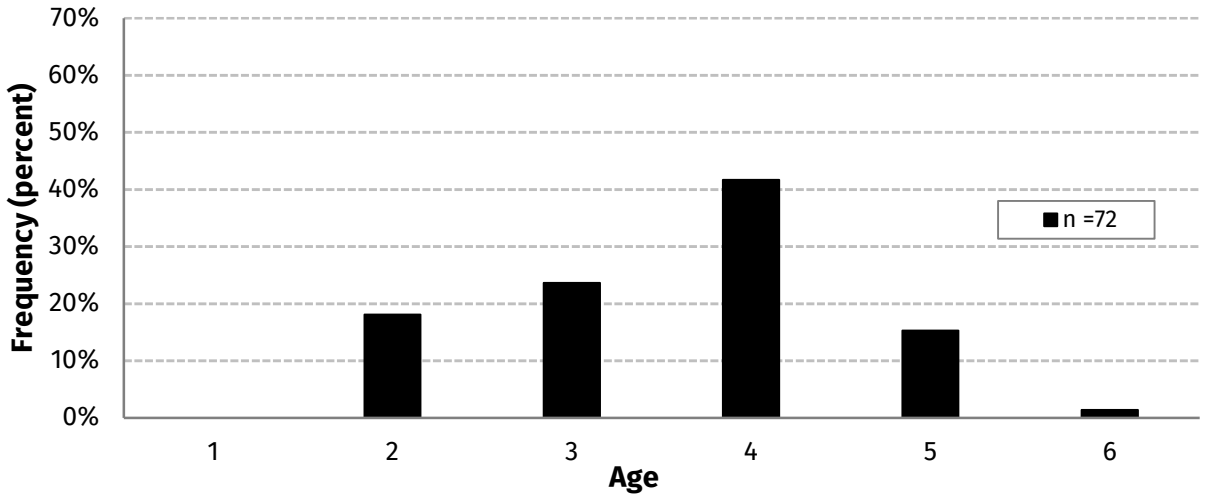

Figure 11. Age frequency distribution of Yellow Perch sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

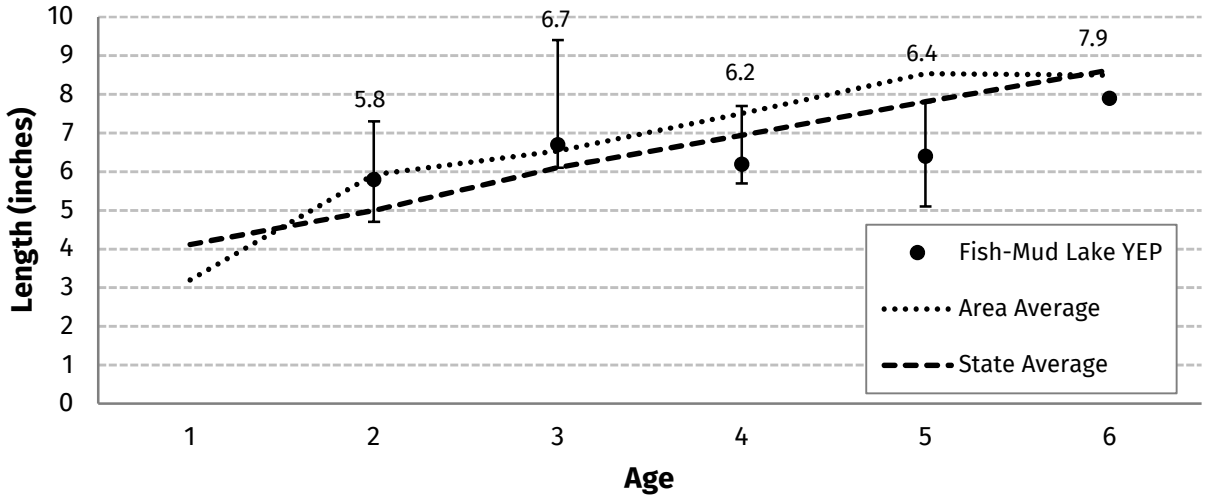

Figure 12. Mean length at age of Yellow Perch sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin. Error bars represent the range of observed lengths for a given age.

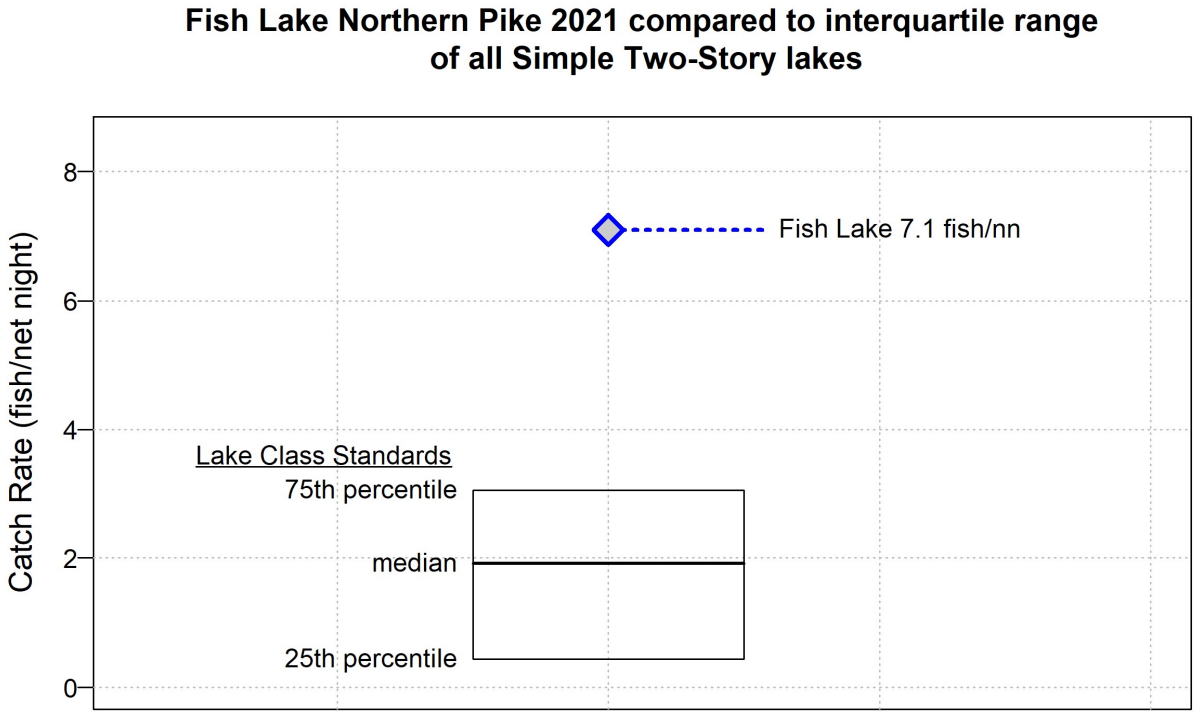

Figure 13. Northern Pike fyke net catch rate lake class comparison for Fish Lake, Dane County, Wisconsin. Lake class is Simple Two-Story.

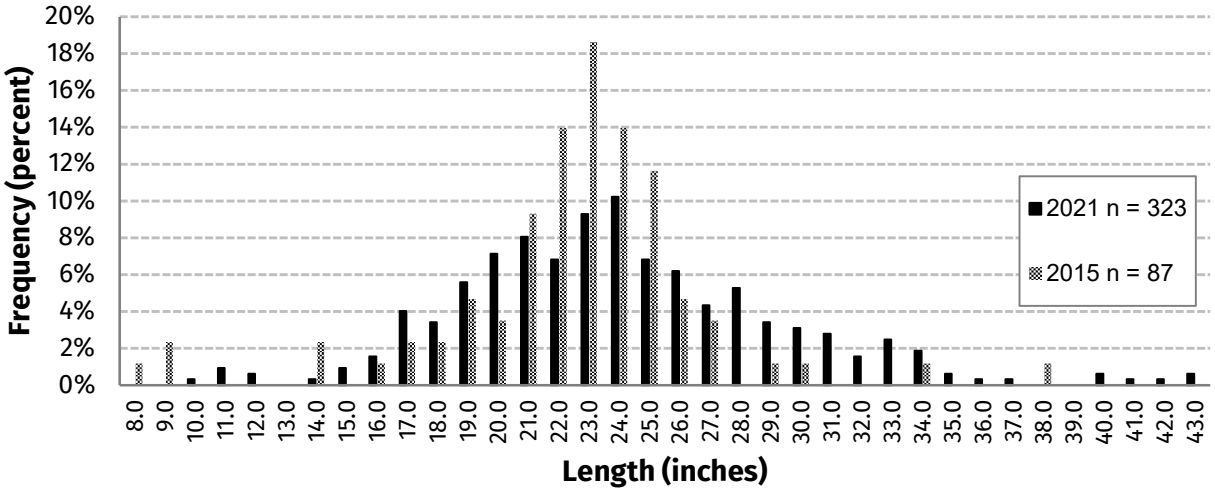

Figure 14. Length frequency distribution of Northern Pike sampled during the 2015 and 2021 comprehensive fishery surveys of Fish Lake, Dane County, Wisconsin.

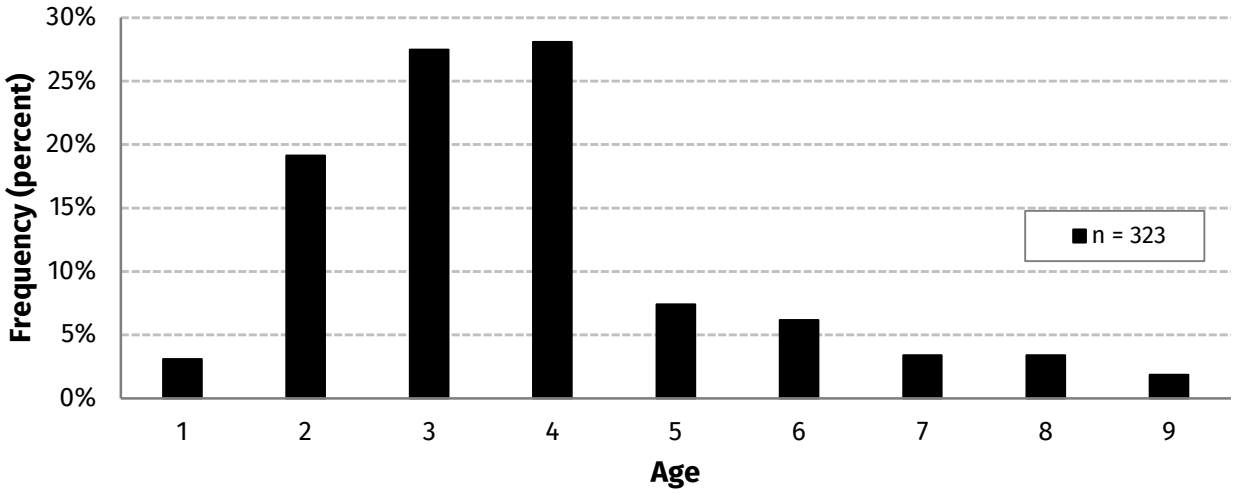

Figure 15. Age frequency distribution of Northern Pike sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

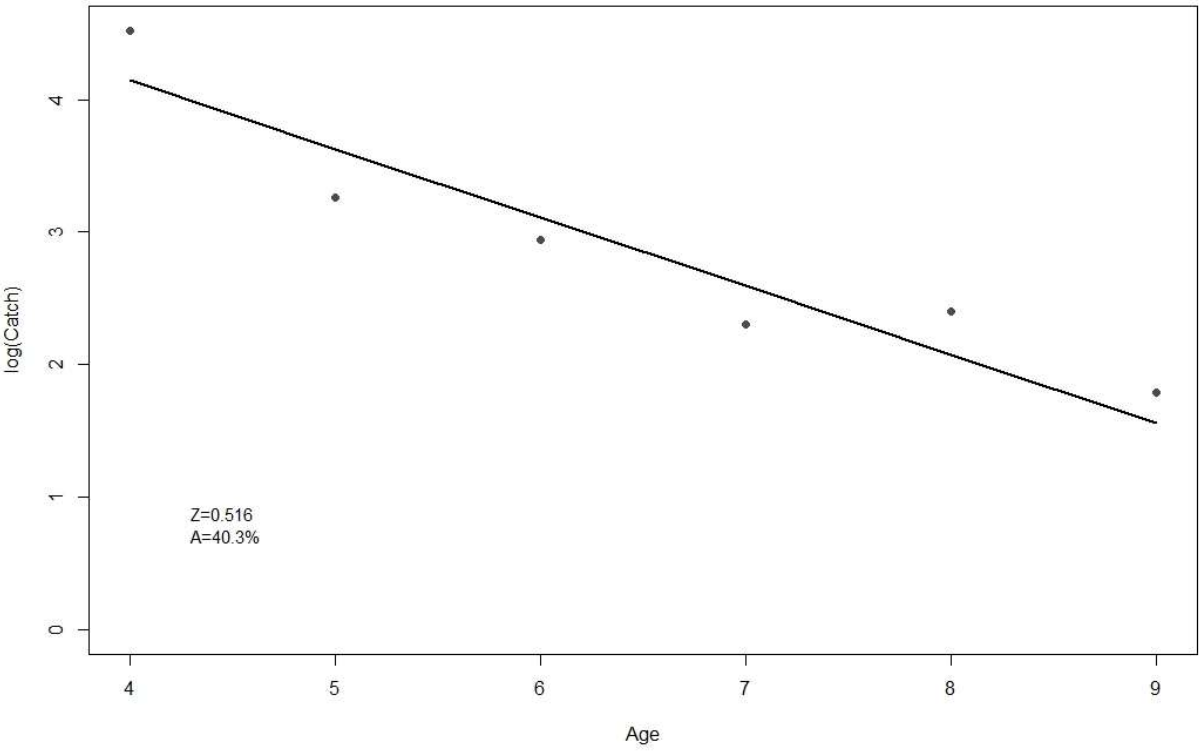

Figure 16. Catch curve for Northern Pike sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

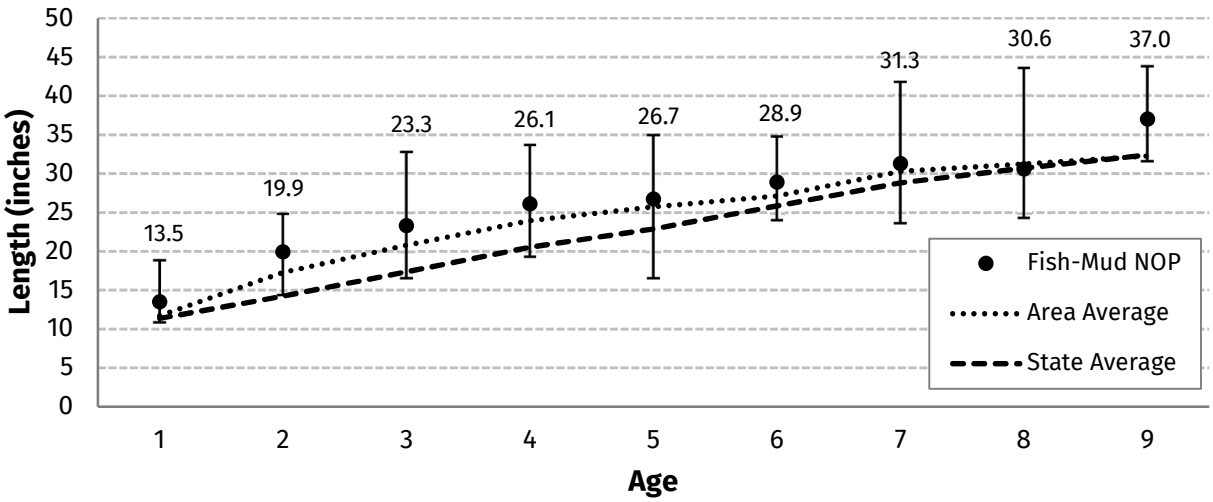

Figure 17. Mean length at age of Northern Pike sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin. Error bars represent the range of observed lengths for a given age.

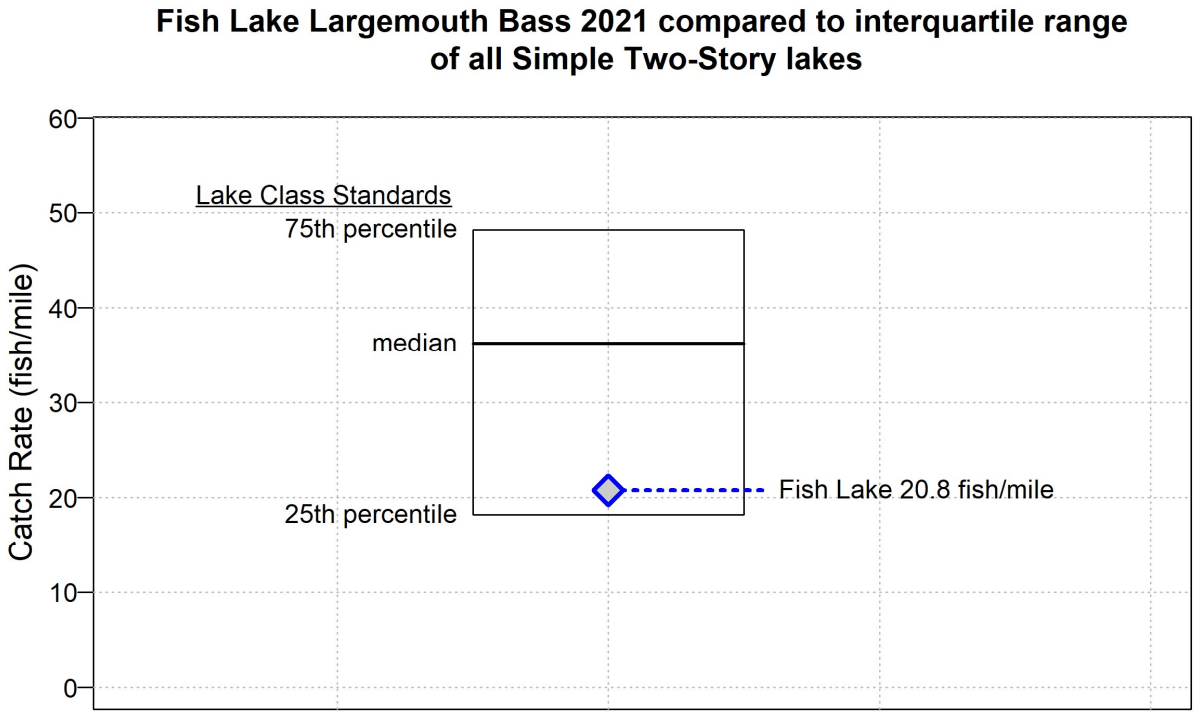

Figure 18. Largemouth Bass electrofishing catch rate lake class comparison for Fish Lake, Dane County, Wisconsin. Lake class is Simple Two-Story.

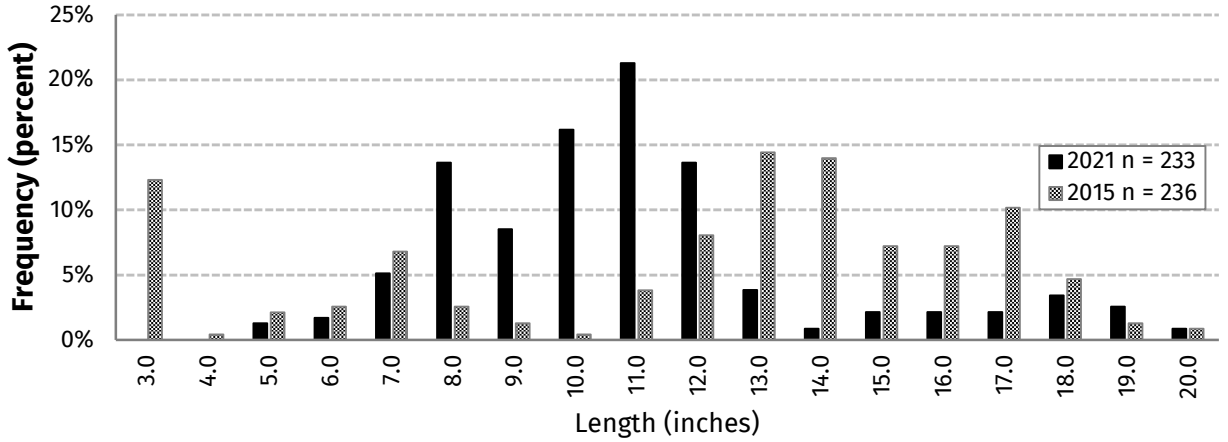

Figure 19. Length frequency distribution of Largemouth Bass sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

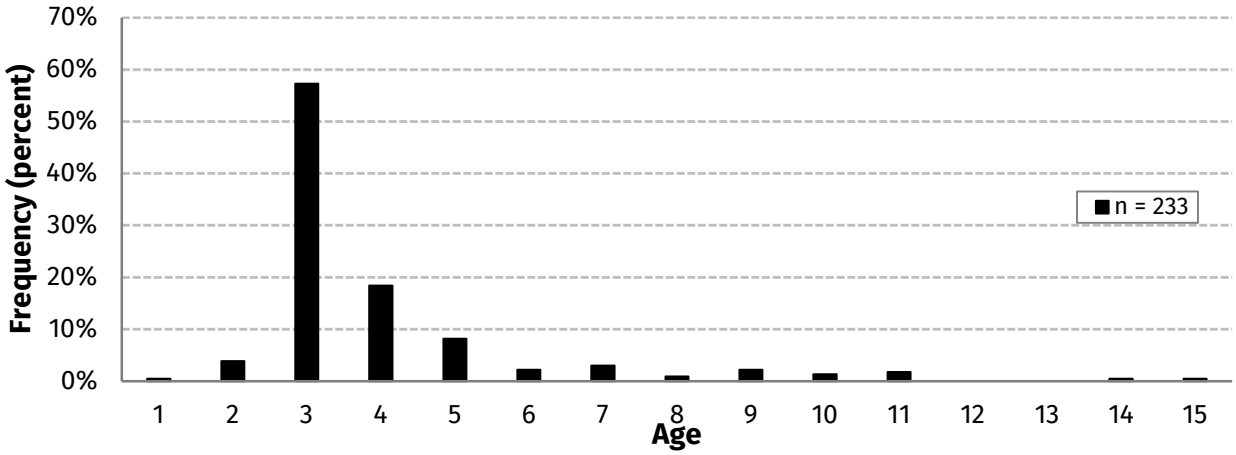

Figure 20. Age frequency distribution of Largemouth Bass sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

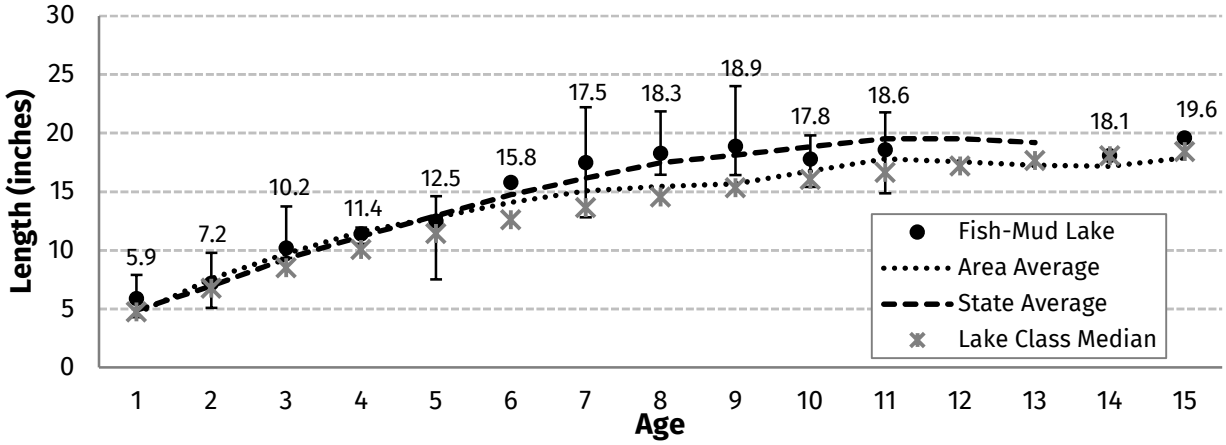

Figure 21. Mean length at age of Largemouth Bass sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin. Error bars represent the range of observed lengths for a given age.

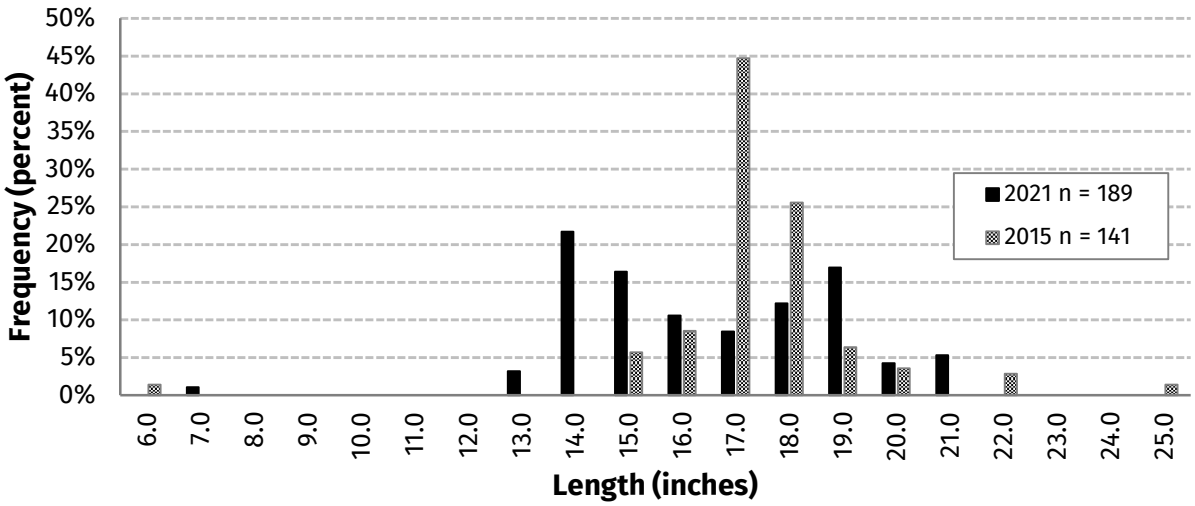

Figure 22. Length frequency distribution of Common Carp sampled during the 2021 comprehensive fishery survey of Fish Lake, Dane County, Wisconsin.

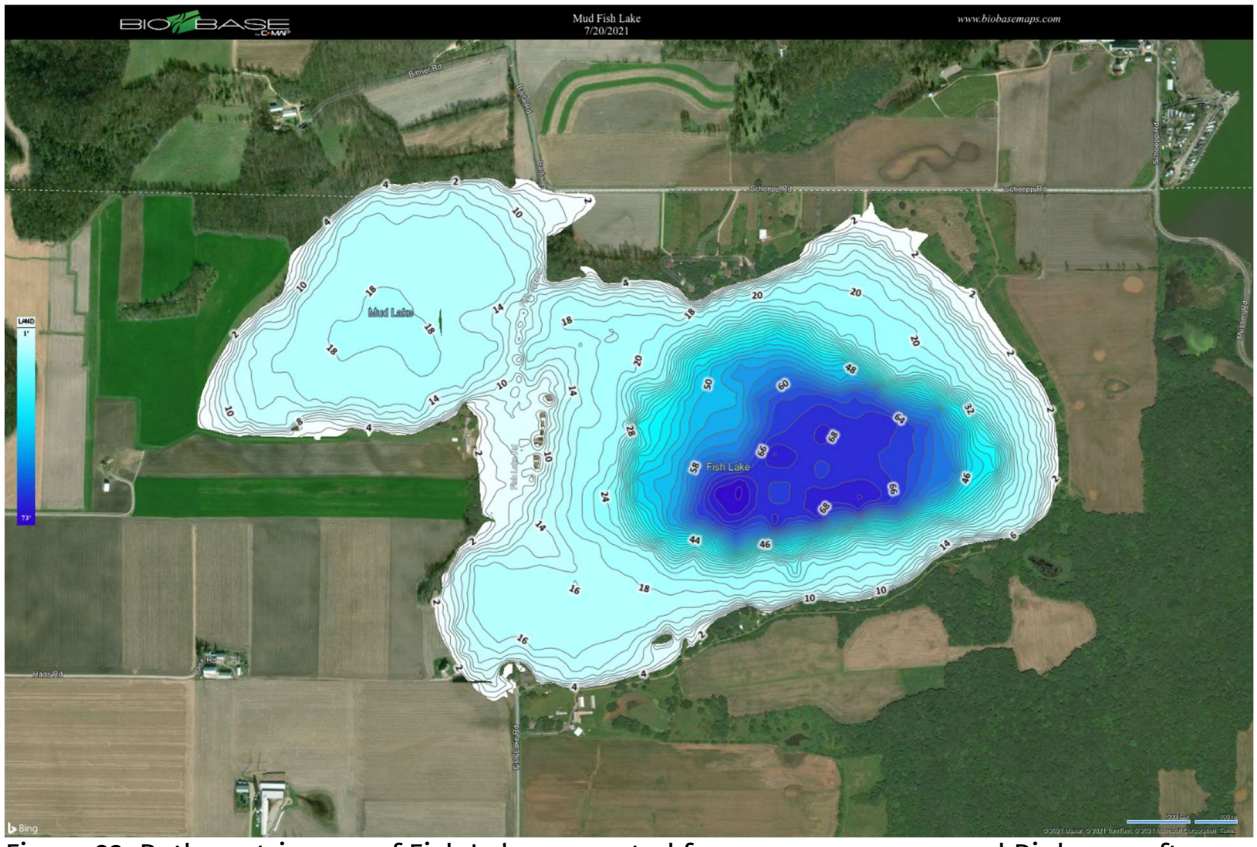

Figure 23. Bathymetric map of Fish Lake generated from a sonar survey and Biobase software on July 20, 2021.

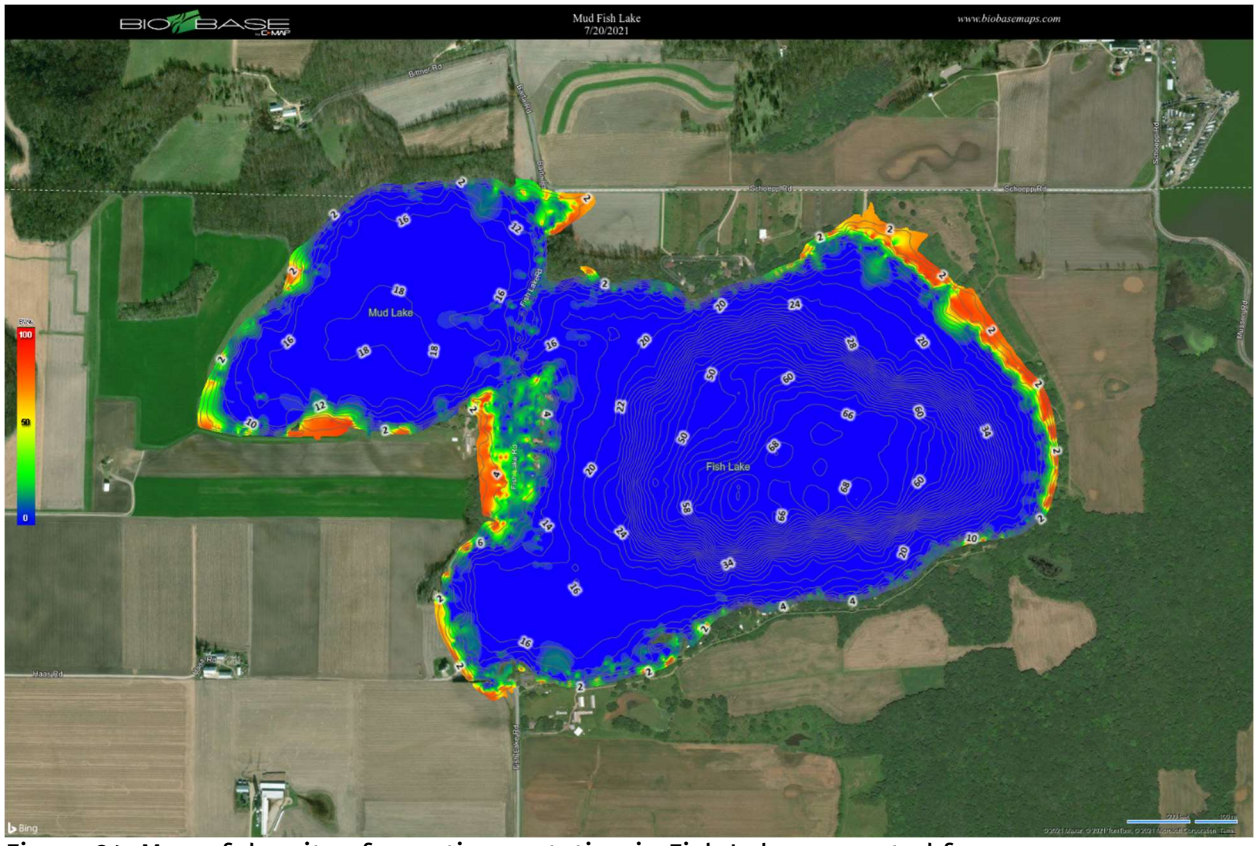

Figure 24. Map of density of aquatic vegetation in Fish Lake generated from a sonar survey and Biobase software on July 20, 2021. Aquatic plant density ranges from none (blue) to little, moderate and high (green, yellow, red).