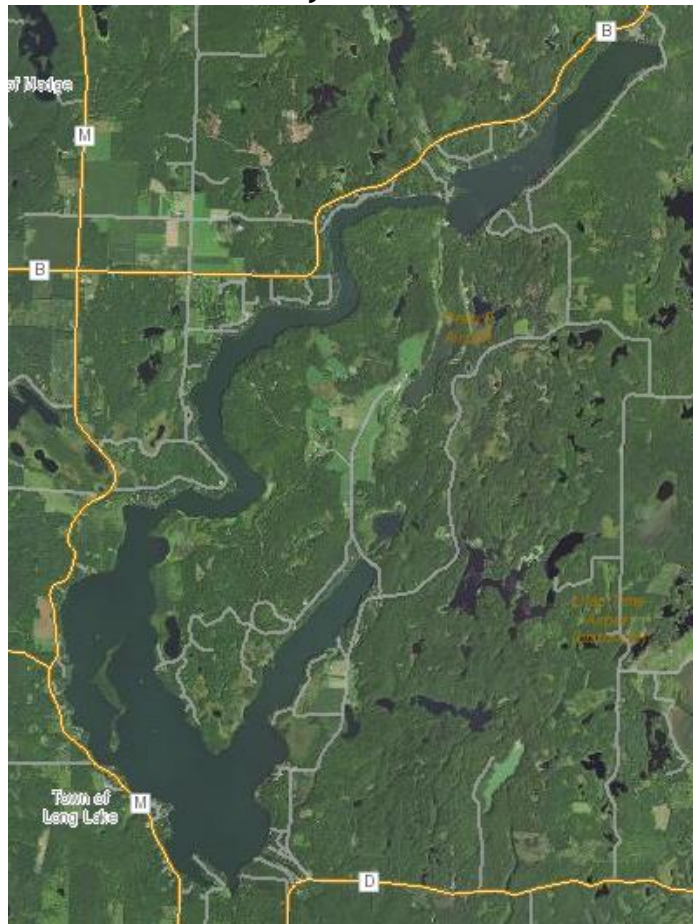


WISCONSIN DEPARTMENT OF NATURAL RESOURCES
Fisheries Survey Report for Long Lake,
Washburn County, WI 2022

Waterbody Code 2106800



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Executive Summary

Long Lake was surveyed in 2022 to assess the status of the fishery. We conducted a population estimate for walleye and indexed the catch rates for northern pike, largemouth bass and panfish species. We assessed general population characteristics, size structure and growth of all species.

The Long Lake walleye population is at its long-term average density since 1994 of 1.9 fish/acre. The adult walleye population has declined since 2015 but remains at a respectable density (above 1.5 fish/acre for a stocked fishery). The overall size structure of adults also increased since 2015 and over 52% of walleyes were available to angler harvest. No stocking or regulation changes are recommended.

The northern pike population has increased slightly in abundance and average size since the last survey. The population is stable in Long Lake. In addition, the catch rates are high when compared to other Wisconsin Complex-Two-Story lakes. No regulation changes are recommended.

The largemouth and smallmouth bass populations appear stable and healthy. The catch rates were slightly lower but not low enough to warrant concern. Average size and growth also improved for largemouth bass. This suggests anglers are continuing to harvest smaller bass, which helps improve the growth of the remaining fish in the lake. No management changes are recommended at this time.

The bluegill population was similar to 2015. Bluegill size structure was good when compared to other two-story lakes in Wisconsin. However, the 2015 creel survey also found good numbers of bluegill harvested at 7-8 inches, which may suggest our sampling was not as effective for bluegill in Long Lake. Continued monitoring is the best option to see if bluegill abundance continues to increase and size structure decreases. The black crappie population appears to be healthy in Long Lake, with a good catch rate and size structure, and was comparable to the last survey. Black crappies continue to provide a popular fishery with anglers. Overall, Long Lake provides a healthy fishery for walleye, northern pike, bass and panfish.

Introduction

Long Lake was surveyed in 2022 to assess the status of the fishery. We conducted a population estimate for walleye and indexed the catch rates for northern pike, largemouth bass and panfish species. We assessed general population characteristics, size structure and growth of all species. Recent management activities have been focused on stocking, regulation changes, public outreach and education.

LAKE CHARACTERISTICS

Long Lake is a moderately fertile and deep lake (Tables 1 & 2). More information on water quality and invasive species can be found at the Wisconsin Department of Natural Resources (DNR) Lake Page for [Long Lake](#). Long Lake is classified as a Complex-Two-Story lake due to the presence of cisco (Rypel et al. 2019).

Table 1. Lake and watershed characteristics for Long Lake, Washburn County, WI.

Size (ac)	3,290
Max depth (ft)	74
Mean depth (ft)	26
Watershed Area (ac)	57,314
Lake class	Complex-Two Story

Table 2. June – August mean Trophic State Index (TSI) values for Long Lake, Washburn County, WI.

Secchi Disk Visibility	46
Total Phosphorus	51
Chlorophyll A	49

There are four public boat landings on Long Lake. These landings are located at: Blackhawk Road, Hanks Drive, Boat Landing Road and Sunset Bay Road. Long Lake is a popular multi-species fishery in Washburn County.

STOCKING HISTORY

Walleyes have been the only species stocked into Long Lake in the past 20 years (Appendix Table 1). Since 2014, Long Lake has exclusively received DNR large fingerling walleyes as part of the Wisconsin Walleye Initiative.

FISHING REGULATIONS

Walleyes are managed with an 18-inch minimum length limit and three fish daily bag limit. All other species either follow the statewide, regional or county fishing regulations.

Methods

Long Lake was sampled during 2022, following the DNR's Treaty assessment protocol ([Cichosz 2021](#)) to sample walleye and northern pike. After ice out, an early spring netting survey (SN1) was conducted from April 29 to May 5. Nets were removed from the North Basin on May 3, and the entire shoreline was sampled with night electrofishing (SE1). Nets were removed from the South Basin on May 5, and the entire shoreline was sampled with night electrofishing. These electrofishing runs served as recapture runs for the walleye population estimate. Black crappies were subsampled from fyke nets on May 3 and May 4.

A late spring electrofishing survey (SE2) was done on June 9 to assess largemouth bass, smallmouth bass and panfish populations. This survey consisted of five 0.5-mile stations where all bass and panfish were collected and five 1.5-mile stations where only bass were collected. In addition to these surveys, the DNR and Great Lakes Indian Fish and Wildlife Commission (GLIFWC) completed a fall electrofishing survey (FE) to assess the abundance of age-0 and age-1 walleye. Appendix Table 2 lists descriptions of standard DNR survey types, gear used and target water temperatures.

Lake Class Standards catch per unit effort (CPUE) were calculated by comparing Long Lake's CPUE of each species to CPUEs of the other Complex-Two-Story lakes in Wisconsin. When possible, CPUE was also compared to past surveys for Long Lake.

Walleye, largemouth bass and smallmouth bass were aged with scales and dorsal spines. Bluegills were aged with scales only. Spines were cross-sectioned and aged under a microscope. Mean length at age was compared to other Complex-Two-Story Wisconsin lakes and the northwest Wisconsin averages for walleye. Size structure was assessed using proportional size distribution (PSD) indices (Neumann et al. 2013). The PSD value of a species is the number of fish of a specified length or longer divided by the number of fish stock length or longer, the result multiplied by 100 (Appendix Table 3).

To better evaluate the levels of walleye stocking contribution and natural reproduction, fin clips were given to all walleye stocked in 2016 and 2018. All walleyes collected during the SN1 and SE1 surveys were checked for 2016 or 2018 fin clips. Walleyes were also checked during the 2017 and 2019 fall surveys. The contribution of stocking and natural reproduction for age-4 (2018) and age-6 (2016) walleye was estimated using an age length key and the proportions of clipped and unclipped age-4 and age-6 walleye from these surveys. These data were then applied to the adult population estimate to determine the number of age-4 and age-6 walleye that originated from stocking and natural reproduction. Survival was estimated by dividing the estimated number of stocked walleyes from each age class by the total number of fish stocked for that year and multiplying it by 100. The cost of each stocking event was calculated by multiplying the cost per stocked fingerling (\$1.06) by

the number of fish stocked. Cost per recruit was then calculated by dividing the total cost by the number of stocked adult fish recruited (Olson 2015).

Results

WALLEYE

The adult walleye population was estimated to be 1.9 fish/acre (Figure 1; CV=.05). This estimate was less than the 2015 estimate (2.6 fish/acre), but similar to the 2012 estimate (1.8 fish/acre). The 2022 estimate was slightly less than the 2019 Ceded Territory average for stocked lakes at 2.1 fish/acre (Cichosz 2021).

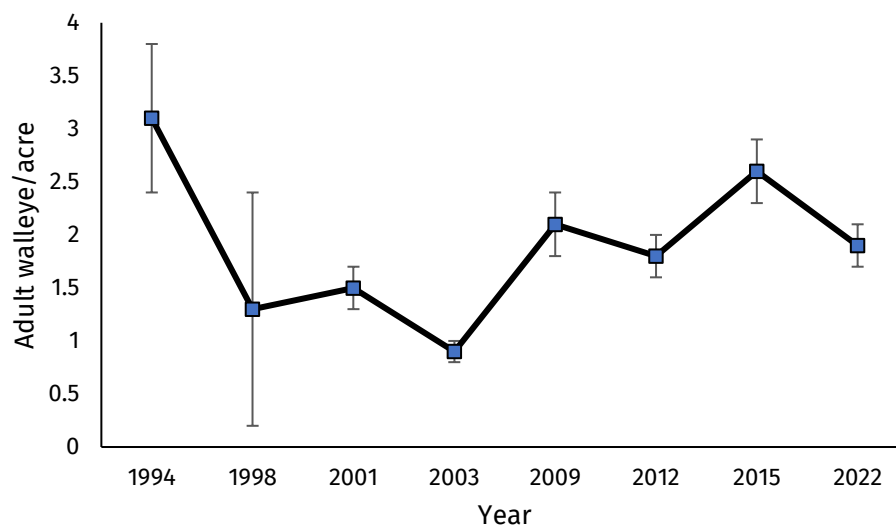


Figure 1. Walleye population estimates by year from 1994 – 2022 for Long Lake, Washburn County, WI.

There were 2,364 walleyes collected during the SN1 and SE1 surveys. The netting CPUE was 23.4 fish/net night, which was higher than 2015 (14.2 fish/net night). This catch rate was above the 90th percentile (17.8 fish/net night) for walleye in Complex-Two-Story lakes in Wisconsin. The electrofishing catch rate was 28.0 fish/mile and was similar to 2015 (27.1 fish/mile). The mean lengths of male and female walleye were 17.2 inches and 22.2 inches, respectively (Figure 2). These averages increased compared to 2015 (male = 16.6 inches, female = 20.0 inches). The male-to-female ratio was 2.6:1. The PSD-15 was 84 and PSD-20 was 28. The PSD-15 decreased compared to 2015 (91), while PSD-20 increased (6). Both male and female walleye generally grew at above-average rates for all ages when compared to northwestern Wisconsin averages.

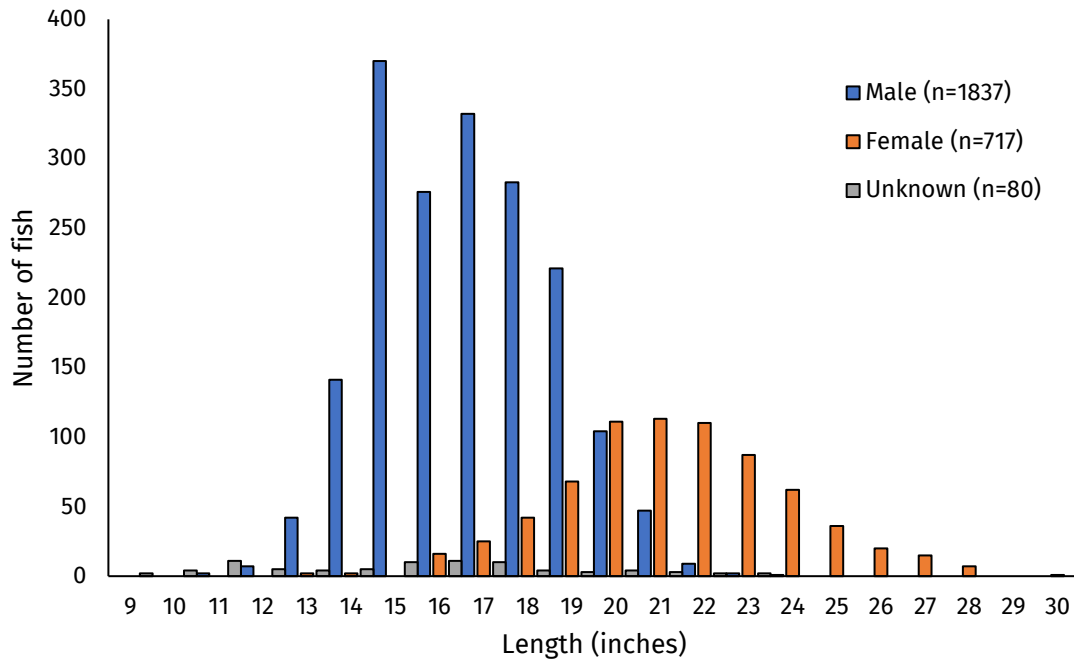


Figure 2. Length frequency of walleye by gender collected in Long Lake, Washburn County, WI during the 2022 SN1 and SE1 surveys.

Hatchery fin-clipped walleyes accounted for 44% of the age-4 year class and 64% of the age-6 year class. In total, clipped walleyes from the 2016 and 2018 stocked year classes made up 35% of the adult walleyes sampled. Estimated survival from stocking to age-4 was 3.1% and age-6 was 2.9%. The cost per recruit was estimated at \$31.47 per age-4 walleye and \$37.02 per age-6 walleye.

There were 21 age-0 walleyes collected in 2022 and the catch rate was 1.7 fish/mile, which was below the age-0 average catch rate for Long Lake (2.7 fish/mile). No age-1 walleyes were collected in 2022, but these fish would have been from natural reproduction as walleyes were not stocked in 2021. In general, age-1 walleyes have been considerably greater during FE surveys one year post stocking (odd years; averaged 9.3 fish/mile) compared to stocked years (even years; averaged 0.5 fish/mile; Figure 3). Prior to DNR large fingerling stocking, the age-1 catch rate averaged 0.7 fish/mile and after large fingerling stocking began, it averaged 5.0 fish/mile (all years combined). Hatchery fin-clipped age-1 walleyes made up 88% and 89% of the 2017 and 2019 age-1 walleyes collected in FE surveys (Figure 3). Based on the Shaw Index (Shaw and Sass 2020), Long Lake stocked walleyes had good survival to age-1 and ranged from 14.3% (2017) to 32.6% (2021) survival from stocking.

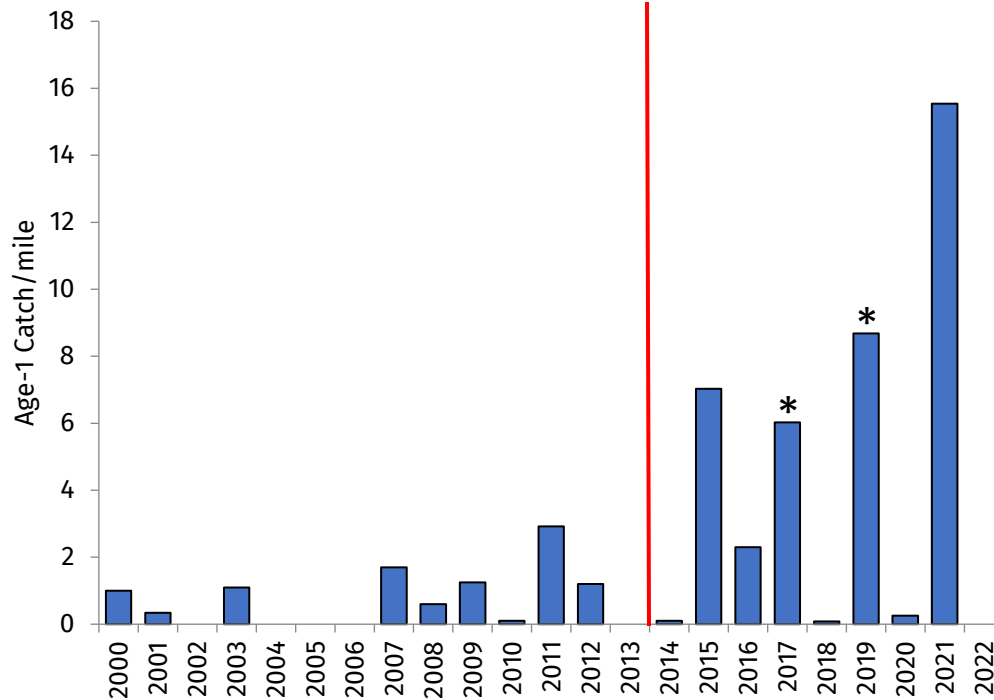


Figure 3. Catch of age-1 walleye/mile of shoreline for Long Lake, Washburn County, WI collected during FE surveys. The red vertical line denotes the year when DNR large fingerling walleye stocking started. * Denotes years where age-1 walleyes were examined for hatchery fin-clips.

NORTHERN PIKE

There were 161 northern pike collected during the SN1 survey for a catch rate of 2.0 fish/net night. This catch rate was higher than 2015 (1.4 fish/net night) and the same as the 75th percentile (2.0 fish/net night) for Complex-Two-Story lakes. The mean lengths of male and female northern pike were 19.5 inches and 22.2 inches, respectively. Northern pike averaged 21.0 inches and ranged from 13.0 to 37.0 inches, which is similar to 2015 (20.6 inches; Figure 4). This mean length was also above the 95th percentile for Complex-Two-Story lakes. The PSD-21 was 48 and PSD-26 was 6. Both values were slightly higher than in 2015 (PSD-21=44, PSD-26=5).

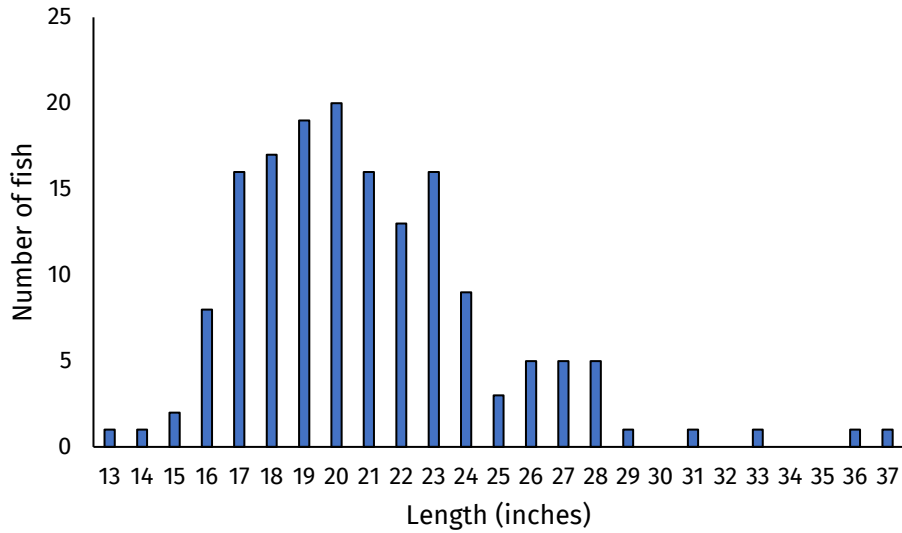


Figure 4. Length frequency of northern pike collected in Long Lake, Washburn County, WI (n=161) during the 2022 SN1 survey.

LARGEMOUTH AND SMALLMOUTH BASS

There were 106 largemouth bass collected during the SE2 survey for a catch rate of 11.8 fish/mile. This rate was lower than in 2015 (12.9 fish/mile) and above the 50th percentile for Complex-Two-Story lakes. The mean length of largemouth bass was 12.0 inches, greater than in 2015 (11.4 inches) and above the 90th percentile for Complex-Two-Story lakes (Figure 5). The PSD-12 was 53, a slight increase from 2015 (49). Largemouth bass grew above the Complex-Two-Story median for ages 2 to 6 and below for ages 8 to 11.

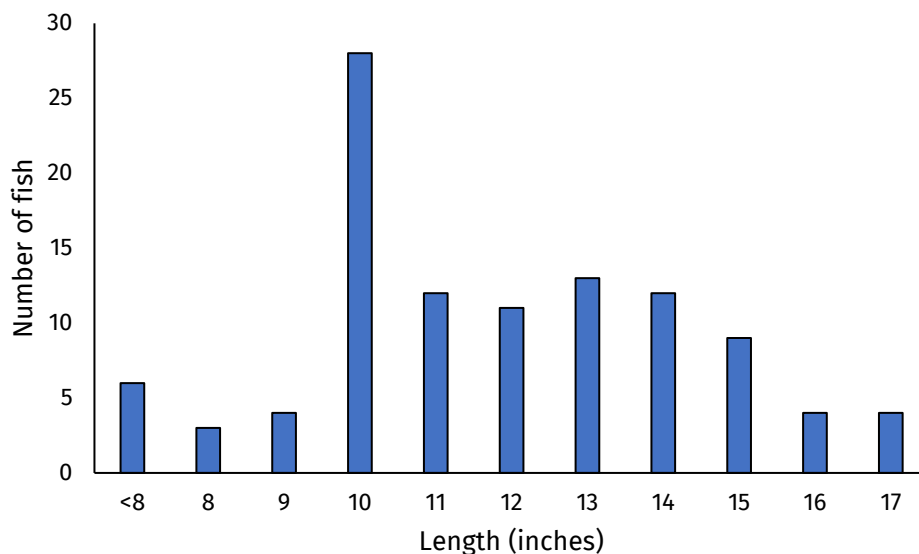


Figure 5. Length frequency of largemouth bass collected in Long Lake, Washburn County, WI (n=106) during the 2022 SE2 survey.

There were 20 smallmouth bass collected during the SE2 survey for a catch rate of 2.0 fish/mile. This rate was similar to in 2015 (1.8 fish/mile) and below the 50th percentile for Complex-Two-Story lakes. The mean length of smallmouth bass was 10.8 inches, which was greater than in 2015 (9.3 inches). Due to low sample size, PSD was not calculated, and a comparison was not made with Lakes Classification CPUE.

PANFISH

There were 540 bluegills collected during the SE2 survey for a catch rate of 216 fish/mile. This rate was an increase from 2015 (154 fish/mile) and above the 75th percentile for Complex-Two-Story lakes. The mean length of bluegill was 4.9 inches, which was similar to 2015 (5.0 inches) and above the 90th percentile for Complex-Two-Story lakes (Figure 6). The PSD-6 was 19, which was similar to 2015 (18). Bluegills grew below the Complex-Two-Story average for all ages collected.

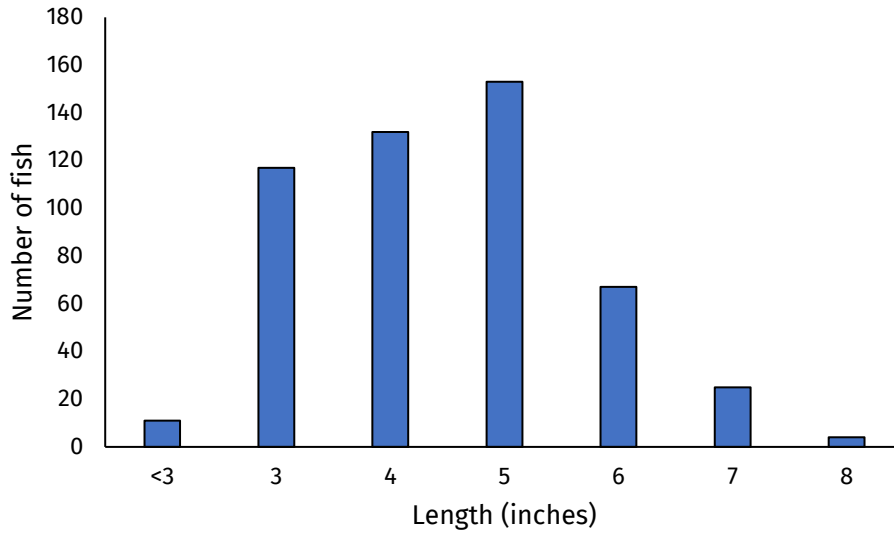


Figure 6. Length frequency of bluegill measured in Long Lake, Washburn County, WI (n=509) during the 2022 SE2 survey.

There were 188 black crappies collected between the SN1 and SE2 surveys (Figure 7). The netting catch rate was 10.3 fish/net night, a slight decrease from 2015 (13 fish/net night) and above the 90th percentile for Complex-Two-Story Lakes. The mean length of black crappies was 7.8 inches, similar to 2015 (8.0 inches) and above the 95th percentile for Complex-Two-Story lakes. The PSD-8 was 53, a decrease from 2015 (82).

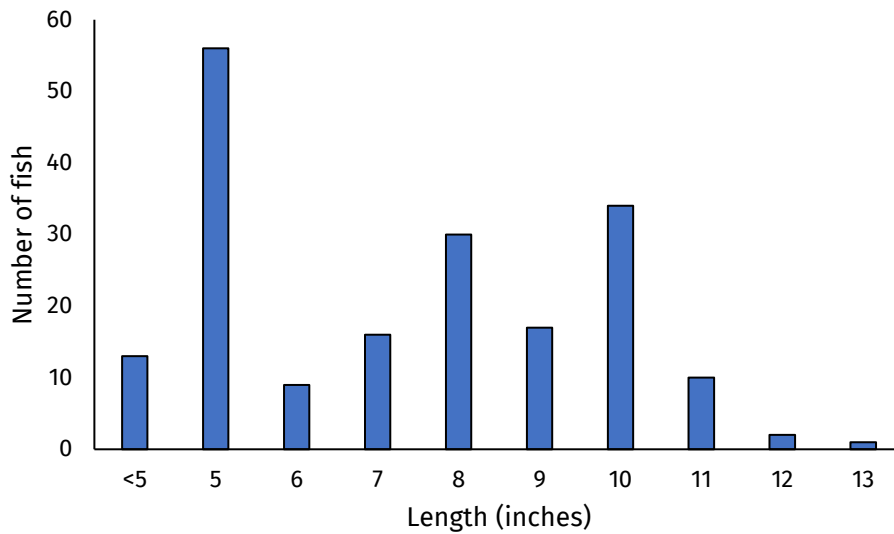


Figure 7. Length frequency of black crappies collected in Long Lake, Washburn County, WI (n=188) during the 2022 SN1 and SE2 surveys.

Rock bass were the third most abundant panfish species with 187 collected. Rock bass averaged 7.0 inches and ranged from 3.0 to 9.6 inches. Other panfish collected at lower numbers included pumpkinseed, yellow perch, hybrid sunfish, green sunfish and warmouth.

Discussion

WALLEYE

Natural reproduction of walleye occurs in Long Lake, but stocking remains an important source of recruitment. This is evident by the higher catch rates of age-1 walleyes following large fingerling stockings since 2014. In addition, hatchery fin clips allowed us to learn that stocked age-1 walleyes made up a majority of our age-1 walleye catch in 2017 and 2019. Based on our analysis, these fish also make up about 35% of the adult walleyes currently in Long Lake. This analysis only accounts for two of the four large fingerling stockings. At the same time, the natural reproduction of walleyes based on fall age-0 surveys has been poor, and we haven't observed a larger year class since 2010 (10 fish/mile). Despite the low age-0 catch rates of naturally reproduced walleye in fall surveys, they have a relatively high contribution to the Long Lake adult walleye population. This higher level of natural contribution may be for a few reasons: 1) natural juvenile walleyes survive better into adulthood than stocked fish, 2) natural juvenile walleyes are not as susceptible to fall sampling or 3) possible fin generation has altered our results. Also, these stocking contribution estimates may be altered once we have the results of a genetic parentage analysis being completed by the University of Wisconsin – Stevens Point in the future. Stocking will continue to help bolster the population, but walleye natural reproduction (even at low levels) remains a key component for the walleye fishery.

The Long Lake walleye population is at its long-term average density since 1994 of 1.9 fish/acre. The adult walleye population has declined since 2015 but remains at a respectable density (above 1.5 fish/acre for a stocked fishery). The overall size structure of adults also increased since 2015, and over 52% of walleye were available to angler harvest. One reason the population appears lower is the larger stocked year classes are not sexually mature. This scenario would be the case for some females from the 2018 stocking and most males and females from the 2020 stocking. As these immature fish enter the adult population, the population density may increase to a higher level. Walleye grow quickly in Long Lake and reach 18 inches in four to six years. The 18-inch minimum length limit and a daily bag limit of three walleye regulation protects mature fish and increases the chances for successful natural reproduction. For these reasons, no changes are recommended for the minimum length limit for Long Lake.

NORTHERN PIKE

The northern pike population has increased slightly in abundance and average size since the last survey. The population is stable in Long Lake. In addition, the catch rates are high when compared to other Wisconsin Complex-Two Story lakes. The abundance of northern pike may be slightly underestimated due to nets being set mostly in the main lake at sites that favored walleye spawning habitat. If timing allows, focused netting should occur for northern pike in future surveys.

LARGEMOUTH AND SMALLMOUTH BASS

The largemouth and smallmouth bass populations appear stable and healthy. The catch rates were slightly lower but not low enough to warrant concern. Average size and growth also improved for largemouth bass. This suggests anglers are continuing to harvest smaller bass, which helps improve the growth of the remaining fish in the lake. In response to concern regarding an unknown fish disease in 2021, all bass were observed for disease during this survey. No bass were observed with signs of active disease (lesions or dead) that impacted both largemouth and smallmouth bass in 2021. Only two of the 126 largemouth and smallmouth bass collected electrofishing had healed lesions (1.6%). These results suggested the disease had run its course, and these fish were likely surviving after the infection.

PANFISH

The bluegill population was similar to 2015. Bluegill size structure was good when compared to other Complex-Two-Story lakes in Wisconsin. However, the 2015 creel survey also found good numbers of bluegills harvested at 7-8 inches, which may suggest our sampling was not as effective for bluegills in Long Lake. Continued monitoring is the best option to see if bluegill abundance continues to increase and size structure decreases. The black crappie population appears to healthy in Long Lake with a good catch rate and size structure and was comparable to the last survey. Black crappies continue to provide a popular fishery with anglers.

Recommendations

1. Long Lake has a healthy stocked walleye population. Large fingerling walleyes have good stocking survival and contribution to the adult fishery. Alternate year large fingerling walleye stocking should continue at the current rate (10 fish/acre).
2. The current walleye regulation (18-inch minimum length limit, three fish daily bag limit) likely keeps harvest low and the walleye population high. Good growth allows for quick replacement of 18-inch fish, so no regulation changes are recommended. This regulation also protects mature fish and increases the chances for successful natural reproduction.

3. The northern pike population seems stable and healthy. If possible, a subset of nets should be set for northern pike in the next survey. No management changes are recommended.
4. The largemouth and smallmouth bass populations changed little since 2015. The largemouth bass catch rate was slightly lower than 2015, but growth and size structure improved. There was little evidence of impacts from an unknown bass disease, which was reported in largemouth bass and smallmouth bass in 2021. No management changes are recommended.
5. The panfish populations have remained similar to the last survey in 2015. Bluegill numbers are healthy and had a lower average size. Bluegill growth remains below average. This suggests lowered bag limits may not benefit bluegill. No management changes are recommended.
6. Black crappies are present at a higher density with multiple age classes present. Long Lake continues to have a strong fishery for black crappies. No management changes are recommended.
7. Efforts to increase habitat complexity in Long Lake should continue, where applicable. More inputs of coarse woody habitat, protection/promotion of aquatic vegetation and maintenance/restoration of vegetative buffers are needed habitat work in Long Lake. This website <https://healthylakeswi.com/> is a great resource to learn more.
8. Invasive species monitoring and control programs should continue. Efforts to keep aquatic invasive species out of a waterbody are much more effective than controlling invasive species once they are established.

Acknowledgements

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Appendix Table 1. Fish stocking records for Long Lake, Washburn County, WI, 1998-2022. * = Walleye Wagon values are approximate amounts.

Year	Species	Age Class	Number Stocked	Avg. Length (in)	Source
1998	WALLEYE	LARGE FINGERLING	3,191	8.0	PRIVATE
1999	WALLEYE	SMALL FINGERLING	164,500	1.7	DNR
1999	WALLEYE	LARGE FINGERLING	1,500	5.0	PRIVATE
1999	WALLEYE	LARGE FINGERLING	20,618	3.5	TRIBAL
2000	WALLEYE	LARGE FINGERLING	10,000	3.0	PRIVATE
2001	WALLEYE	SMALL FINGERLING	164,500	1.5	DNR
2001	WALLEYE	LARGE FINGERLING	1,000	8.0	PRIVATE
2001	WALLEYE	SMALL FINGERLING	149,635	2.2	TRIBAL
2003	WALLEYE	SMALL FINGERLING	172,879	1.9	DNR
2003	WALLEYE	SMALL FINGERLING	104,281	2.0	TRIBAL
2004	WALLEYE	FRY	2,600,000	0.3	WALLEYE WAGON*
2004	WALLEYE	LARGE FINGERLING	5,000	4.0	PRIVATE
2005	WALLEYE	FRY	2,600,000	0.3	WALLEYE WAGON*
2005	WALLEYE	SMALL FINGERLING	97,739	2.0	TRIBAL
2005	WALLEYE	LARGE FINGERLING	5,500	5.5	PRIVATE
2006	WALLEYE	FRY	2,600,000	0.3	WALLEYE WAGON*
2007	WALLEYE	FRY	2,600,000	0.3	WALLEYE WAGON*
2007	WALLEYE	SMALL FINGERLING	21,406	1.6	DNR
2007	WALLEYE	LARGE FINGERLING	3,003	8.0	PRIVATE
2008	WALLEYE	LARGE FINGERLING	1,082	7.0	DNR
2008	WALLEYE	SMALL FINGERLING	50,430	2.5	TRIBAL
2009	WALLEYE	SMALL FINGERLING	115,150	1.7	DNR
2009	WALLEYE	FRY	2,592,989	0.3	WALLEYE WAGON*
2009	WALLEYE	LARGE FINGERLING	2,227	7.5	PRIVATE
2010	WALLEYE	FRY	2,600,000	0.5	WALLEYE WAGON*
2011	WALLEYE	SMALL FINGERLING	115,443	1.7	DNR
2014	WALLEYE	LARGE FINGERLING	34,779	6.4	DNR
2016	WALLEYE	LARGE FINGERLING	34,121	7.5	DNR
2018	WALLEYE	LARGE FINGERLING	34,683	6.4	DNR
2020	WALLEYE	LARGE FINGERLING	35,677	6.9	DNR
2022	WALLEYE	LARGE FINGERLING	34,758	7.1	DNR

Appendix Table 2. Survey types, gear used, target water temperature and target species.

Survey Type	Gear Used	Target Water Temperature (°F)	Target Species
Spring Netting 1 (SN1)	Fyke Net	~45	Walleye, northern pike
Spring Electrofishing 1 (SE1)	Boat Electrofishing	45-50	Walleye
Spring Netting 2 (SN2)	Fyke Net	50-55	Muskellunge, black crappie, yellow perch
Spring Electrofishing 2 (SE2)	Boat Electrofishing	55-70	Largemouth bass, smallmouth bass, bluegill and other panfish, non-game species
Spring Netting 3 (SN3)	Fyke Net	65-80	Bluegill, black crappie
Fall Electrofishing (FE)	Boat Electrofishing	50-60	Juvenile walleye and muskellunge

Appendix Table 3. Proportional size distribution values.

Species	Stock Size (in)	Quality Size (in)	Preferred Size (in)
Black crappie	5	8	10
Bluegill	3	6	8
Largemouth bass	8	12	15
Northern pike	14	21	28
Pumpkinseed	3	6	8
Rock bass	4	7	9
Smallmouth bass	7	11	14
Walleye	10	15	20
Yellow perch	5	8	10