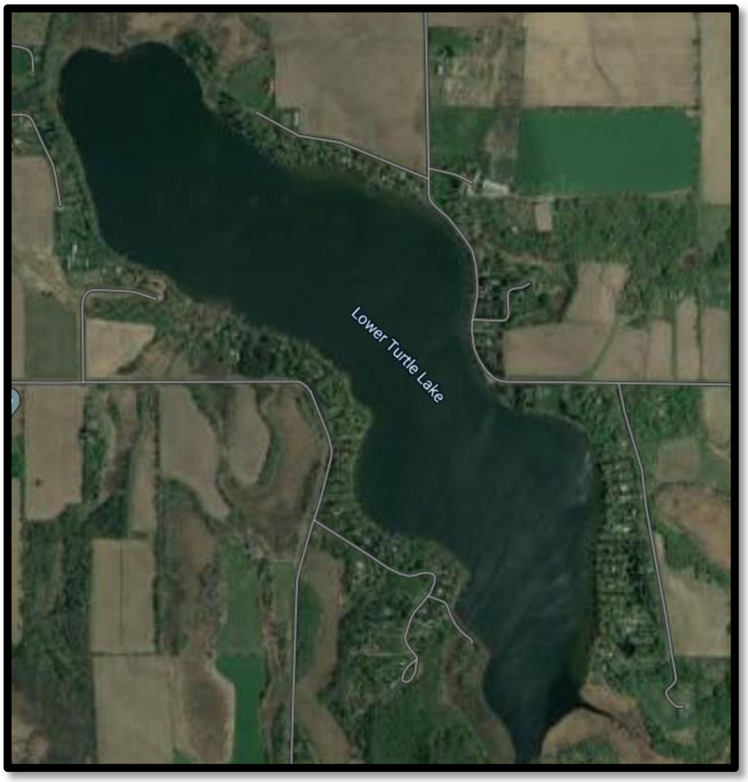
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Fishery Survey Report for Lower Turtle Lake, Barron County, Wisconsin 2021

WATERBODY IDENTIFICATION CODE: 2079700



Kyle J. Broadway
DNR Fisheries Biologist-Senior

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Introduction

Lower Turtle Lake is a 286-acre drainage lake located in Barron County, Wisconsin. The lake has a maximum depth of 24 feet and a mean depth of 14 feet, with approximately 10% less than 3 feet and 80% greater than 20 feet of water. The lake is best characterized by relatively steep sloping shorelines with greater littoral area and wetlands present in the northern and southern portions of the lake and bottom substrates roughly composed of 80% sand, 15% gravel and 5% muck. Lower Turtle Lake currently receives moderate recreational boating use and angling pressure and has quality and diverse fisheries. Lower Turtle Lake is a fertile, eutrophic system classified as a complex-warm-dark lake (Rypel et al. 2019). The July-August mean Trophic State Index (TSI) values for chlorophyll-a and total phosphorus were 68 and 60, respectively. Mean TSI has generally remained stable over the past decade. Moderate algal blooms occur on Lower Turtle Lake and submerged aquatic macrophytes are abundant in the nearshore littoral areas. Approximately 73% of the shoreline is developed, with 28.1 dwellings per shoreline mile. Shoreline development has substantially increased over the past half-century (9.3 dwellings per shoreline mile in 1976). Turtle Creek flows into Lower Turtle Lake from Upper Turtle Lake on the northern shoreline and out of Lower Turtle Lake along the southern shoreline. Currently, recognized invasive species include Chinese mystery snail and curly-leaf pondweed. There are two public boat launches located along the eastern shoreline off 12 ½ Ave (45.388, -92.072) and along the western shoreline of 3 ¾ 4th St (45.381, -92.072).

The sport fish community in Lower Turtle Lake consists of bluegill (*Lepomis macrochirus*), pumpkinseed (*L. gibbosus*), black crappie (*Pomoxis nigromaculatus*), largemouth bass (*Micropterus salmoides*), yellow perch (*Perca flavescens*), walleye (*Sander vitreus*), northern pike (*Esox Lucius*), bullheads (*Ameiurus spp.*), common carp (*Cyprinus carpio*), rockbass (*Ambloplites rupestris*), smallmouth bass (*Micropterus dolomieu*) and muskellunge (*E. masquinongy*).

Lower Turtle Lake has had a rich history of management actions directed toward improving and enhancing the fishery. The earliest fisheries surveys on record occurred during 1940 – 1942. The walleye population during this time was noted to be excellent, with high adult abundance and size structure, and was sustained by stocking (walleye stocking began in 1934). Few largemouth bass and northern pike were observed during the 1940's fisheries surveys. As early as 1951, concerns regarding nuisance common carp in Lower Turtle Lake spurred the initiation of rough fish removal contracts. Commercial seining operations occurred periodically during 1951 – 1980, but notable declines in the common carp population were never achieved.

Walleye stocking of fry, small fingerlings and adults continued annually until 1969, when stocking was discontinued after a quality adult walleye population was established. Evidence of walleye natural recruitment was observed during the early

1970s through the early 1990s, and the adult population remained good. Largemouth bass and northern pike populations increased notably during the 1980s and early 1990s. By the late 1990s, the adult walleye population had decreased significantly. Walleye stocking was reinitiated, and stocking efforts occurred every other year thereafter beginning in 2000 (Appendix Table 1). During 2000-2002, small fingerling walleye were stocked at a rate of 50 or 100 fish/acre. Walleye stocking shifted to large fingerlings in 2004 with the goal of improving adult abundance and natural reproduction. Since 2004, large fingerling walleye have been stocked every other year at a rate of 10 fish/acre. Additional efforts to improve walleye natural recruitment included the installation of artificial spawning reefs in 2004, 2006 and 2007. Harvest regulations were changed during 2011 to lower adult walleye exploitation rates and increase the harvest of largemouth bass with the intent to improve the survival of stocked walleye and increase natural reproduction. Natural recruitment of walleye has remained low since the early 1990s despite two decades of stocking and habitat improvement efforts.

Special fishing regulations in Lower Turtle Lake include an 18-inch minimum length limit (MLL) and three fish daily bag limit for walleye and a no MLL and five fish daily bag limit for largemouth bass. All other species follow statewide regulations.

The Wisconsin Department of Natural Resources (DNR) surveyed Lower Turtle Lake to assess the status of the fishery during 2021. A mark-recapture survey was performed to estimate the adult density of walleye. We assessed catch rates of largemouth bass, northern pike, bluegill, black crappie and yellow perch to estimate relative abundance. We assessed population characteristics, size structure and growth for all species when possible. Recent management efforts have focused on walleye stocking, public outreach and maintaining littoral zone habitat and water quality.

Methods

FIELD SAMPLING

Lower Turtle Lake was sampled during 2021 with early spring fyke netting (SN1), early spring (SE1) and late spring (SE2) night electrofishing, fall (FE) night electrofishing and open water and ice fishing creel surveys following the DNR comprehensive Treaty assessment protocol (Appendix Table 2; Cichosz 2021).

The population abundance of adult walleye was estimated using mark-recapture methodology during the SN1 and SE1 surveys. The population size of adult walleye was estimated with Chapman's modification of the Peterson model (Ricker 1975):

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

where N = population estimate; M = the number of fish marked in the first (marking) sample; C = the total number of fish (marked and unmarked) captured in the second (recapture) sample; and R is the number of marked fish captured in the second sample.

Walleyes were captured with fyke nets set at ice out. Fyke nets were set April 1, 2021 and checked every 24 hours for five days. Fyke nets had 4 x 6-foot frames, 0.5 to 0.75-inch bar measure mesh and lead lengths of 75 feet or less. All walleyes were measured (total length), weighed, sexed and given a specific mark indicating capture. Adult walleye ≥ 15 inches or sexable (extrusion of eggs or milt; Cichosz 2021) were marked with a fin clip, and juvenile walleye < 15 inches were marked with a different fin clip. Aging structures were collected from five walleye of each sex per 0.5-inch length group. Scales were taken from walleye < 12 inches, and dorsal spines were taken from fish > 12.0 inches. For the recapture period, walleye collected during the SE1 survey were measured, sexed, and checked for marks.

The SE2 survey was conducted on May 18, 2021 to assess largemouth bass and panfish populations. The SE2 survey consisted of 0.5-mile index stations where all gamefish and panfish were captured and 1.5-mile stations where all gamefish were collected. There were two index stations and two gamefish stations completed on Lower Turtle Lake. All fish were measured, but weights and aging structures were collected from five fish per 0.5-inch length group for age and growth analysis. Catch per unit effort (CPUE; index of relative abundance) was estimated as catch per mile.

A fall night electrofishing survey was conducted on September 23, 2021 to assess the year class strength of age-0 and age-1 walleye. The entire shoreline was sampled and walleyes <12 inches were collected. The CPUE of age-0 and age-1 walleye was compared to previous fall evaluations.

POPULATION DEMOGRAPHICS

Population estimates and CPUE were compared to previous surveys and lake class standards when possible.

Walleyes and largemouth bass were aged with dorsal spines, and bluegills and black crappies were aged with scales. Dorsal spines were cut with a Dremel saw and aged with a dissecting microscope by a single interpreter. Scale samples were pressed on acetate slides and aged on a microfiche reader by a single interpreter. When data were available, mean length at age was compared to previous surveys, county (Barron and Polk counties) averages, northern region averages (18 counties in the DNR northern region) and the median length at age for similar complex-cool-dark lakes (Rypel 2019).

The von Bertalanffy (1938) growth model was determined using mean length at age data to assess growth using the following equation:

$$Lt = L_{inf}\ (1 - e^{-k(t-t_0)})$$

Where L_t is length at time t, L_{inf} is the maximum theoretical length (length infinity), e is the exponent for natural logarithms, k is the growth coefficient, t is age in years, and t_0 is the age when L_t is zero.

Growth equations for largemouth bass and walleye were completed by pooling sexes, despite sex-specific growth differences.

Size structure was assessed using the proportional size distribution (PSD) indices and compared to previous surveys (Neumann et al. 2013). The PSD value for a species is the number of fish of a specified length and longer divided by the number of fish of stock length or longer, the result multiplied by 100. Relative weight (W_r) was used to describe fish condition. Relative weight is the ratio of a fish's weight at capture to the weight of a "standard" fish of the same length determined by a standard weight equation. The mean W_r was determined.

The instantaneous mortality (Z) and annual mortality ($A = 1\text{-}e^{-Z}$) rates of largemouth bass were determined using a catch curve regression fitted to those ages fully recruited to the gear (Miranda and Bettoli 2007).

To assess walleye stocking survival, an age-length key was used to estimate the abundances of walleye in each year class, assuming no natural reproduction and all fish were from stocked origin. Survival was estimated by dividing the population estimate for 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 number of large fingerlings stocked by the average cost per large fingerling ($1.06). The cost per recruit to age-3, age-5 and age-7 were estimated by dividing the cost of each stocking event by the estimated abundance of that year class. The survival rate of stocked large fingerlings to age-1 was estimated by dividing the density of age-1 walleye (fish/acre; Shaw and Sass 2020) by the density (fish/acre) of stocked large fingerlings the previous fall. Cost per recruit to age-1 was estimated by dividing the cost of each stocking event by the estimated abundance of that year class.

RECREATIONAL CREEL AND TRIBAL HARVEST

Open water and ice fishing creel surveys were completed on Lower Turtle Lake to assess the pressure and harvest from recreational anglers. The creel survey began the first Saturday in May and went through the first Saturday in March the following year. However, no creel data were collected during November because of unsafe ice conditions. Creel survey methods followed a stratified random design as described by Rasmussen et al. (1998). The directed effort, catch, harvest, specific harvest rate and mean length of harvested fish were evaluated for each species during the open water and ice fishing creel surveys. Directed angling effort for each species was compared to other lakes creel surveys in Barron and Polk counties using 19 creel surveys during 2003 – 2021 and only included the most recent creel survey for each lake. Harvest trends for each species were determined by calculating the relative harvest level each month. The angling exploitation rate for adult walleye was calculated by dividing the estimated number of marked adult walleye harvested by the total number of adult walleye marked (R/M; Ricker 1975). Tribal exploitation was calculated as the total number of adult walleyes harvested divided by the adult population estimate (C/N; Ricker 1975). The total adult walleye exploitation rate was calculated by summing angling and tribal exploitation.

Results

EARLY SPRING FYKE NETTING AND ELECTROFISHING

WALLEYE

There were seven fyke nets fished for five nights, which totaled 28 net nights. The adult walleye population during 2021 was estimated to be 604 fish (95% CI = 466 – 742 fish) or 2.2 fish/acre (95% CI = 1.7 – 2.7 fish/acre; Figure 1). The population estimate was less than the 2011 estimate but was considered similar (given the wide confidence interval in 2011). Adult walleye density was greater than other stocking-dependent lakes in Barron and Polk counties (1.4 ± 0.2 fish/acre; mean PE ± mean error; estimated using data from 55 PE surveys across 26 lakes ranging from 1995 - 2021). Walleye fyke netting CPUE was 9.9 fish/net night, which was above the 75th percentile (5.8 fish/net night) for similar complex-warm-dark Wisconsin lakes. There were 277 walleyes collected fyke netting (Figure 2).

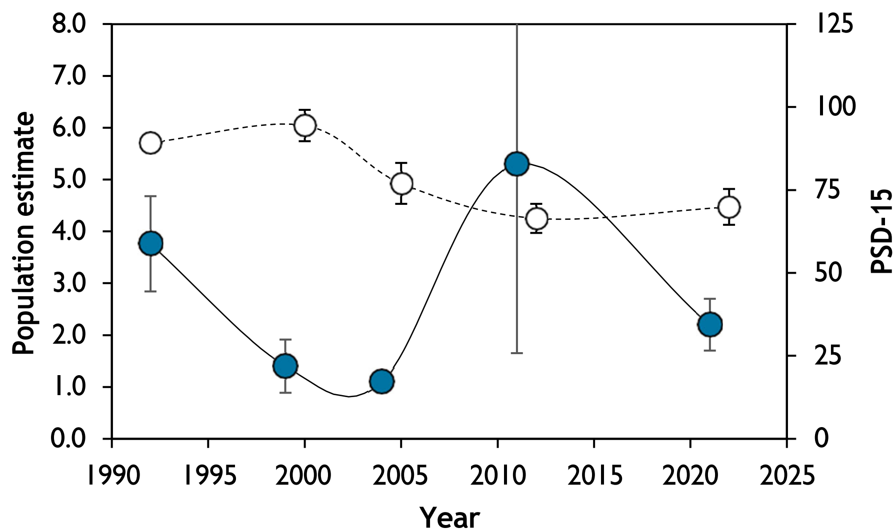

Figure 1. Adult walleye population estimates (number of fish per acre ± 95% CI; blue circles) and PSD-15 (± 95% CI; hollow circles) from 1992 - 2021 fishery surveys.

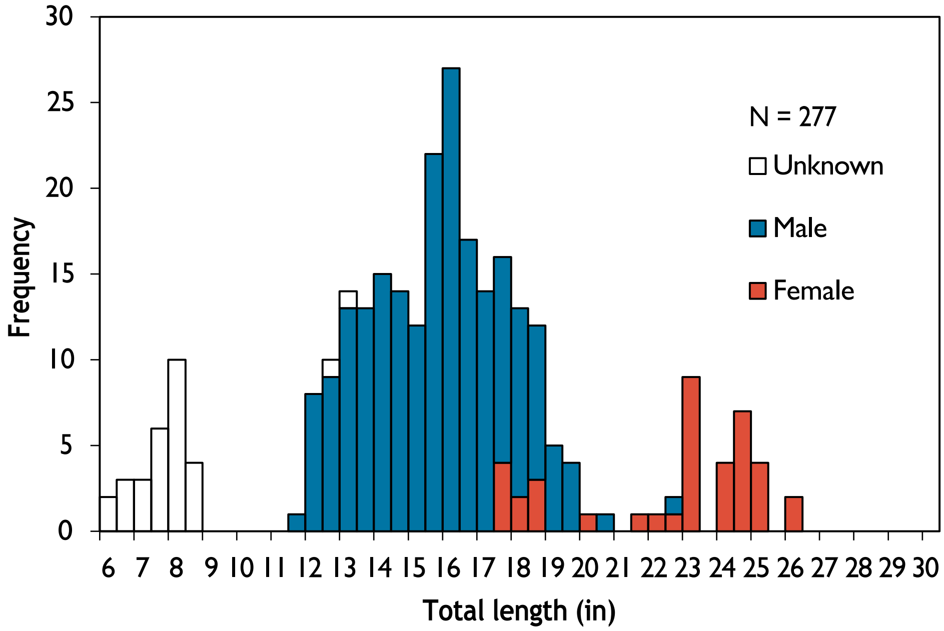

Figure 2. Length frequency histogram for walleyes collected during the SN1 survey in Lower Turtle Lake, Barron County, WI, 2021.

There were 122 walleyes collected during the SE1 survey (recapture period) with a CPUE of 32.1 fish/mile. There were 39 recaptured males, 69 unmarked males, two recaptured females, eight unmarked females and four unmarked walleye of unknown sex.

Walleyes ranged in length from 6.0 – 26.2 inches, and the mean lengths of females and males were 22.1 inches and 15.6 inches, respectively (SN1 and SE1 surveys). Walleye size structure was good in Lower Turtle Lake. PSD-15 was 70 and PSD-20 was 13. Walleye size structure remained similar to the 2011 survey (PSD-15 = 66 and PSD-20 = 14) but lower than that of the historic self-sustaining population in 1992 (Figure 1). The sex ratio was male-biased with a male-to-female ratio of approximately 5:1.

Walleye in Lower Turtle Lake had good growth rates. Walleye ages ranged from 1 to 13, while females ranged from 5 to 11 and males 3 to 13. Mean lengths at age during the 2021 survey were lower than those observed during the 2011 survey (average difference in mean length at age: -1.4 inches) but similar to complex-warm-dark Wisconsin lakes (average difference in mean length at age: -0.5 inches) and the Barron/Polk counties average (average difference in mean length at age: -0.6 inches). All comparisons used ages 3, 5, 7 and 9 fish. The predicted theoretical maximum length for walleye using von Bertalanffy growth models was 31.1 inches with k (growth coefficient) and t_0 (time at which length equals zero) estimated to be 0.12 and -1.0, respectively (Figure 3).

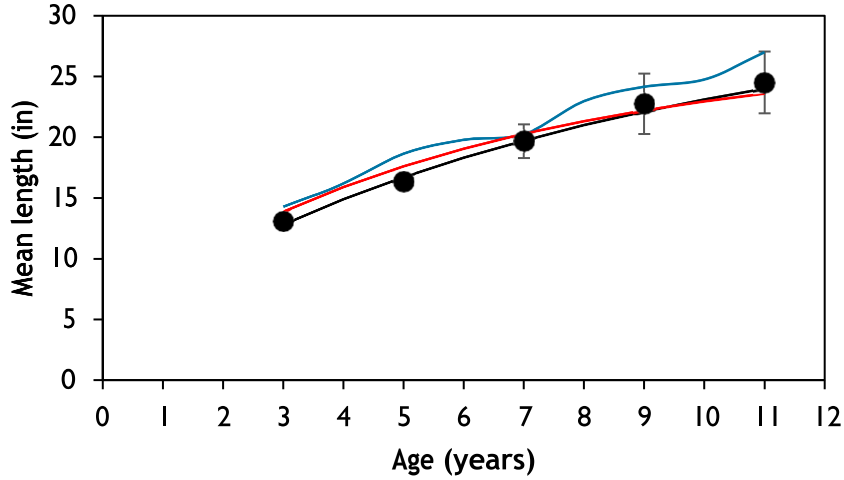

Figure 3. Mean length at age ± standard deviation of walleye (black circles) in Lower Turtle Lake and the von Bertalanffy growth curve (black line). Mean length at age estimates during the 2011 survey are represented by the blue line. The median length at age for similar complex-warm-dark Wisconsin lakes is represented by the red line. Mean length at age estimates for Barron and Polk counties were similar to the Lake Class estimates and not represented in the plot.

Large fingerling walleye have been stocked into Lower Turtle Lake every other year since 2004 at a rate of approximately 9-10 fish/acre. Survival to age-3 was 3.9%, and the cost per age-3 fish was estimated at $26.90. Age-3 walleyes were slightly below harvestable size on average and not fully mature; therefore, they may have been underrepresented in this survey. The survival rate was likely higher and the cost per recruit lower than estimated for age-3 fish. Survival to age-5 was 8.6%, with the cost per age-5 fish estimated at $12.50. Large fingerling survival to age-5 in Lower Turtle Lake was similar to the Barron and Polk counties' average survival to age-5 for stocking-dependent systems (8.4%; estimated using data from 10 PE surveys, including the most recent for each lake). Age-5 fish were fully mature and susceptible to survey methods, with a mean length of 16.4 inches. However, age-5 fish were not yet susceptible to harvest by the recreational fishery (18-inch MLL). Walleye are susceptible to recreational harvest at age-7. Survival to age-7 was 3.6%, and the cost per age-7 fish was estimated at $29.80. The contribution of natural recruits to the adult population remains low, evidenced by weak age-0 year classes and missing year classes of even-year-aged fish (2 – 10; Figure 3). Recruitment of stocked fish to the adult population appears good with satisfactory survival of all stocked year classes, and stocking remains necessary to maintain a quality fishery.

NORTHERN PIKE

The northern pike population had low abundance but a good size structure. There were 24 northern pike collected during the SN1 survey. The CPUE was 0.9 fish/net night, which was below the 50th percentile (1.8 fish/net night) for similar complex-warm-dark Wisconsin lakes. Northern pike ranged in length from 15.9 to 31.1 inches, with an average length of 20.7 inches, which was above the 75th percentile (18.3 in) for similar complex-warm-dark Wisconsin lakes. The northern pike population has declined since 2011 (2.3 fish/net night), but fish remain in above-average condition (mean W_r = 96). Fish ranged from age-3 to age-12.

MUSKELLUNGE

There were three muskellunge (two juveniles and one adult male) captured in Lower Turtle Lake during the SN1 survey. These fish are likely migrants from downstream Big Moon Lake.

LATE SPRING ELECTROFISHING

LARGEMOUTH BASS

There were 35 largemouth bass collected during the 2021 SE2 survey with a CPUE of 9.2 fish/mile, which declined since the 2011 survey (30.3 fish/mile). The CPUE was slightly above the 25th percentile (8.5 fish/mile) for similar complex-warm-dark Wisconsin lakes and suggests a low-density population. The CPUE of largemouth bass ≥ 14 inches was similarly low with 4.7 fish/mile and has also declined since the 2011 survey (7.6 fish/mile).

With the low abundance, largemouth bass had a good size structure. Largemouth bass ranged in length from 8.8 - 19.1 inches, and the mean length was 14.8 inches, which was above the 99th percentile (14.3 inches) for similar complex-warm-dark Wisconsin lakes. The PSD-12 was 94 and PSD-14 was 51, which indicated a good size structure (Figure 4), and both indices improved since the 2011 fishery survey (PSD-12 = 80 and PSD-14 = 26).

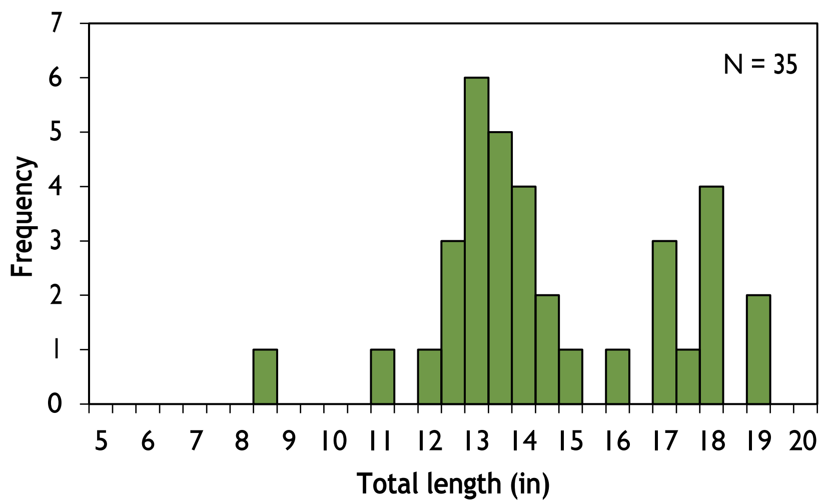

Figure 4. Length frequency of largemouth bass in Lower Turtle Lake during the 2021 SE2 survey.

Largemouth bass in Lower Turtle Lake had above-average growth rates. The mean length at age was greater than the median length at age standard for similar complex-warm-dark Wisconsin lakes (average difference in length at age estimates:

+1.4 inches; ages 2 – 6; Figure 5). Similarly, mean length at age estimates were greater than the 2011 survey estimates (average difference in mean length at age estimates: +1.5 inches; ages 2 – 6) and the northern region estimates (average difference in mean length at age estimates: +2.0 inches; ages 2 – 6). Too few age-7 and older largemouth bass were sampled to include in mean length at age comparisons. The von Bertalanffy growth model could not be fit to the observed age-length data. The mean W_r of largemouth bass was 113 and indicated fish were in excellent overall condition (Bennett 1970).

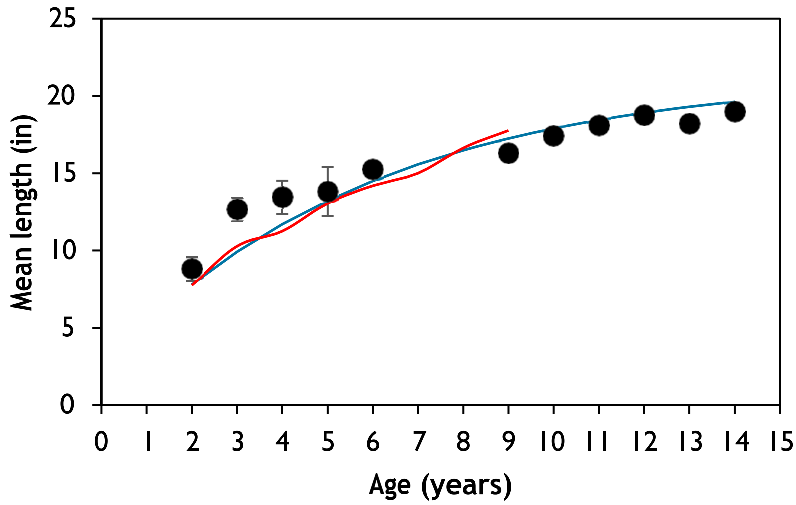

Figure 5. Mean length at age ± standard deviation for largemouth bass during 2021 SE2 survey on Lower Turtle Lake. Blue line represents the median length at age estimates for complex-warm-dark Wisconsin lakes and the red line represents the 2011 survey mean length at age estimates. Mean length at age estimates for the northern region were similar to the Lake Class estimates and not represented in the plot.

Total annual mortality was not estimated from a catch curve regression model due to limited age data.

BLUEGILL

A low-density bluegill population with good size structure was present in Lower Turtle Lake. A total of 144 bluegills were collected during the SE2 survey. Bluegill CPUE was 37.9 fish/mile, which was near the 25th percentile (38.0 fish/mile) for similar complex-warm-dark Wisconsin lakes. Bluegill CPUE in Lower Turtle Lake was less than the mean bluegill CPUE for lakes in Barron and Polk counties (54.0 ± 4.7 fish/mile; ± SE) but remained similar to 2011 (38.4 fish/mile). The CPUE of quality-size (≥ 6 inches) and preferred-size (≥ 8 inches) fish was 35.3 fish/mile and 0.5 fish/mile, respectively (Gabelhouse 1984). The CPUE of quality-size fish doubled since 2011 (16.6 fish/mile) and was above the mean bluegill ≥ 6 inches CPUE for lakes in Barron and Polk counties (23.7 ± 2.1 fish/mile; ± SE).

Bluegill lengths ranged from 3.5 – 8.1 inches, with an average length of 6.6 inches (Figure 7). The mean length of bluegill was above the 99th percentile (6.5 inches) for similar complex-warm-dark Wisconsin lakes. PSD-6 was 93 and the PSD-8 was 1. The PSD-6 index value was well above the generally accepted range for a balanced bluegill population (PSD-6 = 20-60); however, PSD-8 was 1 and below the recommendation (PSD-8 = 5 - 20) by Anderson (1985). The PSD-6 index value has nearly doubled since 2011 (PSD-6 = 51) and was well above the mean PSD-6 index value for lakes in Barron and Polk counties (PSD-6 = 47 ± 3; SE). In general, the bluegill population had a good size structure, but fewer large individuals were present (Figure 7).

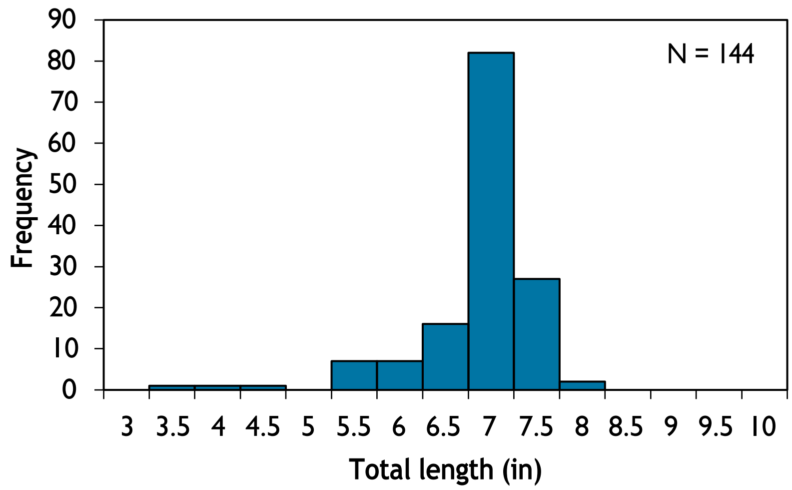

Figure 7. Length frequency of bluegill in Lower Turtle Lake during the 2021 SE2 survey.

Bluegills in Lower Turtle Lake had average growth rates. Mean length at age was similar to median length at age standards for similar complex-warm-dark Wisconsin lakes (average difference in length at age estimates: -0.3 inches; ages 3 – 8). Mean length at age estimates were also similar to the mean Barron and Polk counties estimates (average difference in mean length at age estimates: +0.1 inches; ages 3 – 8) and the northern region estimates (average difference in mean length at age estimates: +0.1 inches; ages 3 – 8).

BLACK CRAPPIE

Lower Turtle Lake supports an abundant black crappie population with a moderate size structure. A total of 129 black crappies were collected during the 2021 SE2 survey with a CPUE of 34.0 fish/mile, which increased since 2011 (7.1 fish/mile) and was well above the mean black crappie CPUE for lakes in Barron and Polk counties (9.6 ± 1.9 fish/mile; ± SE). The CPUE of quality-size fish (≥ 8 inches) was 33.2 fish/mile and well above average for lakes in Barron and Polk counties (5.8 ± 1.3 fish/mi; ± SE; Gabelhouse 1984).

Lengths of black crappies ranged from 7.5 – 9.8 inches, with an average length of 8.9 inches (Figure 8). The mean length of black crappie matched the 99th percentile (8.9 inches) for similar complex-warm-dark Wisconsin lakes. PSD-8 was 99 and PSD-10 was 0. PSD index values were similar to 2011 (PSD-8 was 92) and well above the mean PSD-8 index value for lakes in Barron and Polk counties (PSD-8 = 65 ± 4; SE). These PSD index values indicate a good overall size structure with few large individuals present.

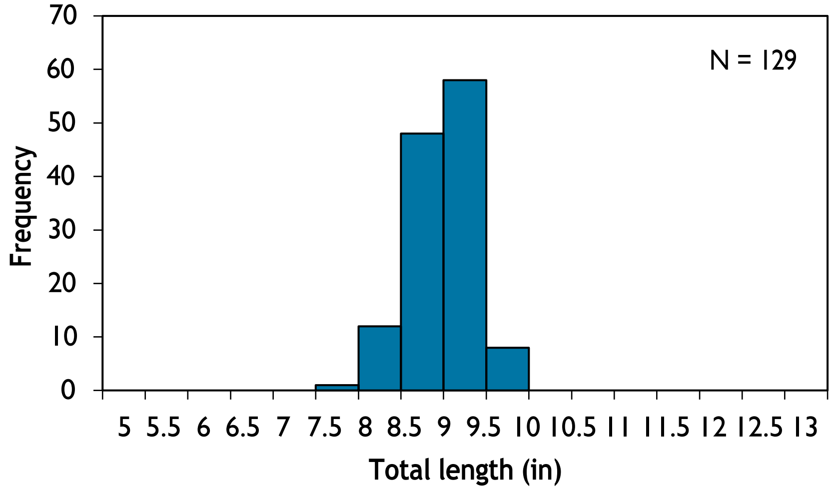

Figure 8. Length frequency of black crappies in Lower Turtle Lake during the 2021 SE2 survey.

YELLOW PERCH

A total of 36 yellow perch were collected during the SE2 survey (Figure 9). Yellow perch CPUE was 9.5 fish/mile and the CPUE of quality-size fish (≥ 8 inches) was 1.6 fish/mile (Gabelhouse 1984). The 2021 survey CPUE estimates were greater than the mean estimates of yellow perch CPUE (5.6 ± 0.8 fish/mile; ± SE) and yellow perch ≥ 8 inches CPUE (0.7 ± 0.3 fish/mile; ± SE) for lakes in Barron and Polk counties, indicating an above-average fishery for the area.

Lengths ranged from 3.0 – 9.0 inches with an average length of 6.1 inches, which was above the 95th percentile (5.3 inches) for similar complex-warm-dark Wisconsin lakes. PSD-8 was 21 and PSD-10 was 0. The PSD-8 index value has increased since 2011 (PSD-8 was 0) and now resembles the mean PSD-8 index value for lakes in Barron and Polk counties (PSD-8 = 21 ± 3; SE). This is suggestive of a below average size structure.

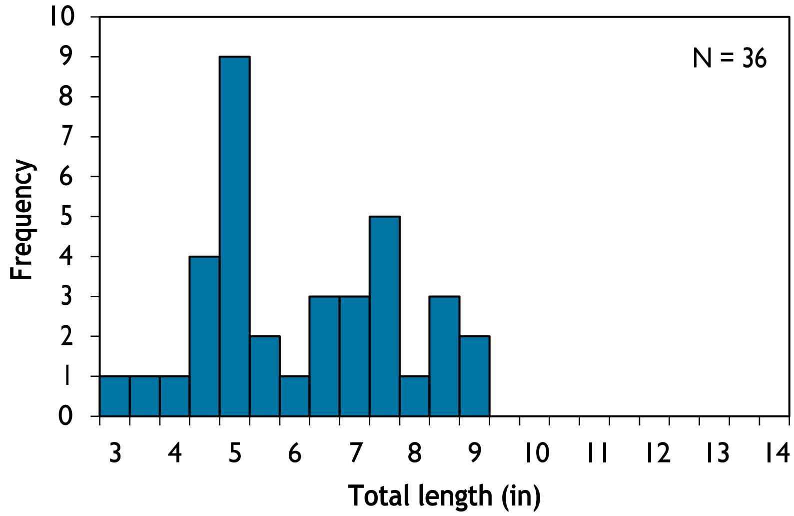

Figure 9. Length frequency of yellow perch in Lower Turtle Lake during the 2021 SE2 survey.

FALL ELECTROFISHING

AGE-0 WALLEYE

Two age-0 walleyes (9.4 – 9.5 inches) were collected during the fall electrofishing survey with a CPUE of 0.53 fish/mile. Age-0 fish likely represent natural recruits, and age-0 walleye catch rates have been low since the initiation of extended growth stocking (0.5 ± 0.3 fish/mile; mean ± SE; 2013 - 2021). In total, 31 age-1 walleyes were collected with a CPUE of 8.2 fish/mile. Age-1 walleye ranged from 10.5 – 12.9 inches and would have corresponded with the fall 2020 stocking. Catch rates of age-1 walleye were consistently greater the year following stocking (7.6 ± 1.2 fish/mile, mean ± SE; 2013 - 2021) than stocked years (2.0 ± 0.8 fish/mile; SE; 2013 – 2021; Figure 10). Survival to age-1 of large fingerlings stocked during 2020 was 24.1%, and the cost per age-1 fish was $4.40. Large fingerling survival to age-1 indexed during the 2017, 2019 and 2021 surveys (25.5% ± 2.0%; mean ± SD) were higher than the 2013 and 2015 surveys (20.7% ± 1.3%; mean ± SD). The mean survival of stocked large fingerling year classes since 2013 (five stocked years classes) was 23.5% (± 1.4%; SE) and higher than the mean survival rates observed for stocking-dependent systems in Barron and Polk counties (17.5% ± 2.5%; mean survival ± mean error; estimated using data from 64 FE surveys that corresponded with a large fingerling stocking the previous year, across 19 lakes). Lower Turtle Lake is classified as a combination natural recruitment-stocking lake with limited natural recruitment and stocking necessary to support a desirable fishery. Large fingerling stockings began in 2004 and have had high survival and successfully created a quality walleye fishery with a good adult density and quality size structure. However, natural recruitment remains low relative to the self-sustaining populations prior to 1992 (Figure 10).

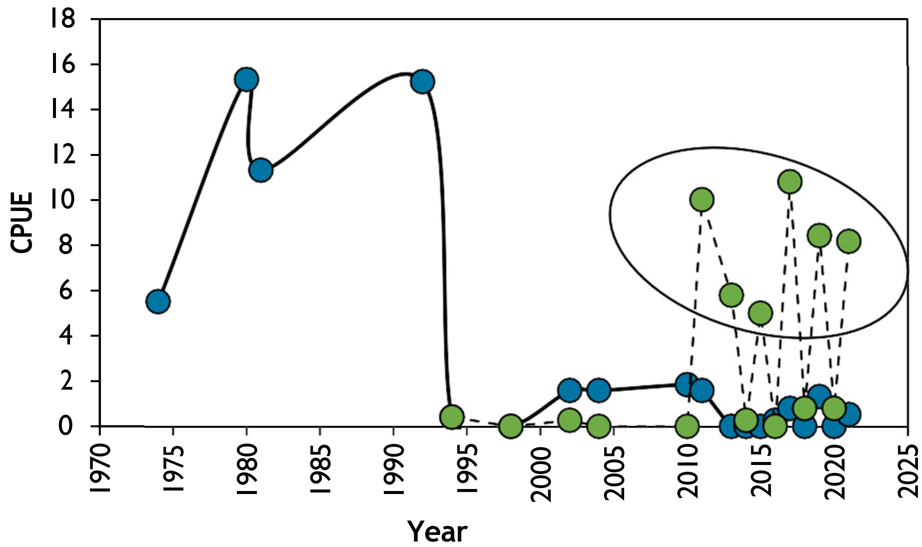

Figure 10. Age-0 (blue circles, solid line) and age-1 (green circles, dashed line) walleye CPUE (fish/mile) indexed from fall electrofishing surveys during 1974 - 2021. Circled points represent catch rates of age-1 walleye the year following a large fingerling stocking event.

LARGEMOUTH BASS

The 2021 fall electrofishing CPUE of largemouth bass (≥ 8 inches) was 3.4 fish/mile (Figure 11). The fall electrofishing CPUE of adult largemouth bass declined since 2010 ($P < 0.01$; adjusted $R^2 = 0.74$; simple linear regression) but has remained relatively static from 2014 – 2021 with a mean CPUE of 6.0 fish/mile. This corresponded with an increase in PSD-15 since 2010, which also remained static since 2014 (Figure 11). The PSD-12 remained similar through time. The decline in largemouth bass abundance has resulted in a greater proportion of large individuals within the population.

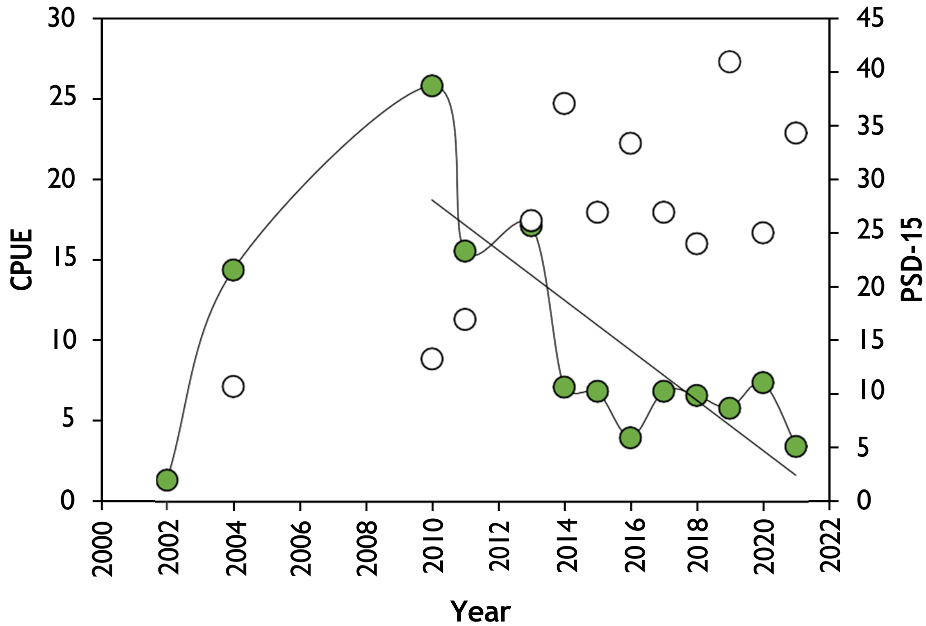

Figure 11. Fall electrofishing CPUE (fish/mile; green circles) and PSD-15 (white circles) of adult (≥ 8 inches) largemouth bass in Lower Turtle Lake during 2002 - 2021. Solid line represents a significant decline in CPUE during 2010 - 2021 ($P < 0.01$; adjusted $R^2 = 0.74$; simple linear regression).

WALLEYE

The 2021 fall electrofishing CPUE of walleye (≥ age-2) was 10.5 fish/mile (Figure 12). Adult walleye CPUE has increased since 2002 ($P < 0.01$; adjusted $R^2 = 0.43$; simple linear regression). Harvest regulation changes occurred during 2011 to liberalize largemouth bass harvest and restrict walleye harvest. Since that time, abundances of largemouth bass and walleye appeared inversely related (Figure 13).

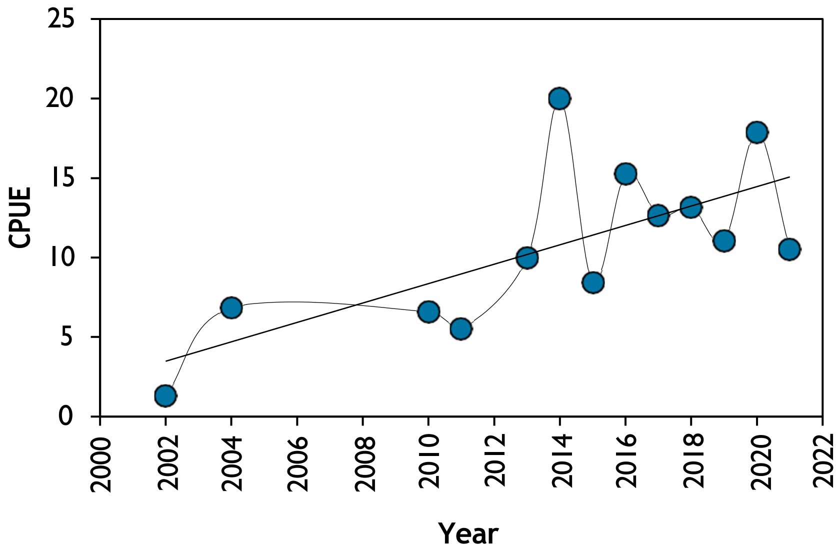

Figure 12. Fall electrofishing CPUE (fish/mile; blue circles) of adult walleye in Lower Turtle Lake during 2002 - 2021. Solid line represents modeled catch rates during 2002 - 2021 ($P < 0.01$; adjusted $R^2 = 0.43$; simple linear regression).

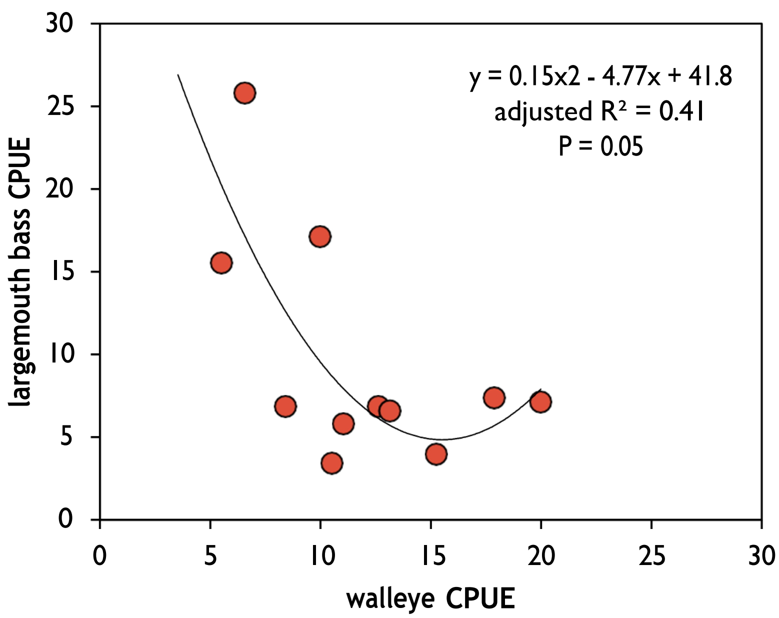

Figure 13. Fall electrofishing CPUE (fish/mile) of walleye (≥ age-2) and largemouth bass (≥ 8 inches) during 2010 - 2021. Solid line represents the best model fit ($P = 0.05$; adjusted $R^2 = 0.41$; second order polynomial).

RECREATIONAL CREEL AND TRIBAL SPEARING

Projected angling effort amounted to 14,299 hours (51.8 hours/acre) on Lower Turtle Lake, where 8,366 hours (29.3 hours/acre) occurred during open water and 5,933 hours (20.8 hours/acre) occurred during the ice fishing seasons. Angling effort on

Lower Turtle Lake during 2021 was greater than the mean projected angling pressure (42.5 ± 18.5 hours/acre; ± SD) for lakes in Barron and Polk counties (indexed using 16 creel surveys during 2004 – 2021, including most recent creel survey for each lake). Angling effort was highest during January (10.6 hours/acre) and May (7.0 hours/acre). Angling effort during the open water season ranged from 1.0 hour/acre during October to 7.0 hours/acre during May. Angling effort during the ice fishing season ranged from 3.8 hours/acre during February to 10.6 hours/acre during January. Directed fishing effort was greatest for black crappies (36.1 hours/acre), bluegills (33.2 hours/acre), yellow perch (21.2 hours/acre) and walleyes (15.1 hours/acre).

WALLEYE

Walleye was the fourth most targeted species by anglers with 4,313 hours of directed effort (13.0% of total angling effort). Fishing effort for walleye (15.6 hours/acre) was above average for lakes in Barron and Polk counties (7.0 hours/acre). There were 1,416 walleyes estimated to be caught (specific catch rate of 0.28 fish/hour), and 47 were estimated to be harvested (specific harvest rate of < 0.01 fish/hour). Directed fishing effort was greatest during early spring (May – June; 1,013 hours) and winter (December – February; 2,185 hours). Specific catch rates of walleye were highest during the open water season, with September and October having the greatest catch rates.

Few walleyes were harvested by anglers, and the angling exploitation rate was 1.5%. Tribal exploitation of walleye was 6.1% by off-reservation tribal spearers. The total adult walleye exploitation rate was 7.6%.

LARGEMOUTH AND SMALLMOUTH BASS

Directed fishing effort for largemouth bass accounted for 1,354 hours (4.1% of total angling effort). Fishing effort for largemouth bass (4.5 hours/acre) was below average for lakes in Barron and Polk counties (12.3 hours/acre). There were 784 largemouth bass estimated to be caught (specific catch rate of 0.3 fish/hour), and 98 were estimated to be harvested (8.0% harvest rate). The mean length of harvested fish was 13.9 inches and ranged from 10.0 – 16.8 inches. Directed fishing effort and catch was highest during the open water season (May – August), with the greatest specific catch rates observed during the spring spawning period (May – June).

Smallmouth bass were the least targeted species, with 47 hours of directed fishing effort. There were 30 smallmouth bass estimated to be caught (specific catch rate of 0.08 fish/hour). Fishing effort occurred primarily during September and October, and no fish were harvested. No smallmouth bass were observed during the 2021 fishery survey, but they are present at a low density.

NORTHERN PIKE

Directed fishing effort for northern pike accounted for 1,534 hours (4.6% of total angling effort). Fishing effort for northern pike (5.6 hours/acre) was near average for lakes in Barron and Polk counties (7.4 hours/acre). Targeted effort was greatest during the ice fishing season (December – January accounted for 80% of targeted effort). Despite this, the total catch was greater during the open water season (May – August), but the total harvest was similar, indicating differential harvest rates between open water and ice fishing seasons. The mean length of harvested fish was 25.4 inches and ranged from 18.2 – 31.7 inches.

BLUEGILL

Bluegill was the second most targeted species, with 9,494 hours of directed effort (28.6% of total angling effort). Fishing effort for bluegill (33 hours/acre) was above average for lakes in Barron and Polk counties (22.3 hours/acre). There were 15,091 bluegills estimated to be caught (specific catch rate of 1.42 fish/hour), and 6,600 were estimated to be harvested (specific harvest rate of 0.65 fish/hour; Figure 13). Directed angler effort was approximately equal between the open water (4,495 hours) and ice fishing seasons (4,999 hours). Open water fishing effort was concentrated during May – August (86.7%), and ice fishing effort was concentrated during December – January (77.8%). Estimated angler catch and harvest rates were higher during May – August (mean specific catch/hour = 2.80 fish; mean specific harvest/hour = 1.30 fish) compared to December – January (mean specific catch/hour = 0.34 fish; mean specific harvest/hour = 0.09 fish; Figure 14). The mean length of harvested bluegill was 7.7 inches, with fish ≥ 7 inches composing 96% and fish ≥ 8 inches composing 35% of harvested fish. Fish ≥ 9 inches composed 3.9% of the harvested fish.

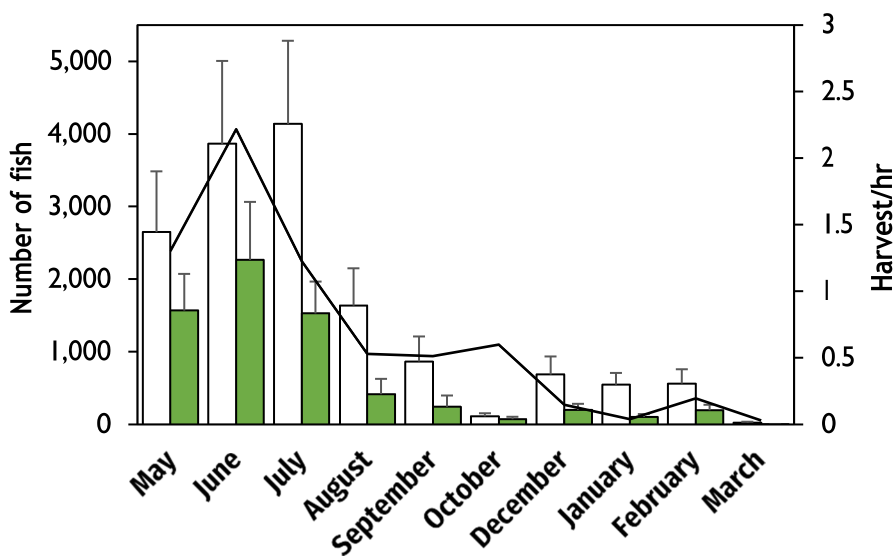

Figure 14. Estimated number of bluegills caught (white bars ± standard deviation) and harvested (green bars ± standard deviation) during May - March. The specific rate of harvest (fish/hour) is represented by the solid line.

BLACK CRAPPIE

Black crappie was the most targeted species with 10,338 hours of directed effort (31.2% of total angling effort). Fishing effort for black crappie (38.0 hours/acre) was well above average for lakes in Barron and Polk counties (16.0 hours/acre). There were 30,343 black crappies estimated to be caught (specific catch rate of 2.86 fish/hour), and 9,859 were estimated to be harvested (specific harvest rate of 0.94 fish/hour; Figure 14). Angler effort was approximately equal between the open water (5,158 hours) and ice fishing seasons (5,181 hours). Fishing effort was relatively equally distributed within the open water (May – August) and ice fishing (December – February) seasons. The lowest amount of fishing effort occurred during September, October and March. Estimated angler catch and harvest rates were higher during May – August (mean catch/hour = 4.1 fish; mean harvest/hour = 1.20 fish) compared to December – February (mean catch/hour = 1.34 fish; mean harvest/hour = 0.57 fish; Figure 15). The highest estimated catch and harvest rates occurred during July (Figure 15). Despite the lower angling effort, September and October had relatively high estimated catch and harvest rates. The mean length of harvested black crappie was 9.4 inches, with fish ≥ 9 inches composing 79% and fish ≥ 10 inches composing 15% of harvested fish. Fish ≥ 11 inches composed 1.8% of the harvested fish.

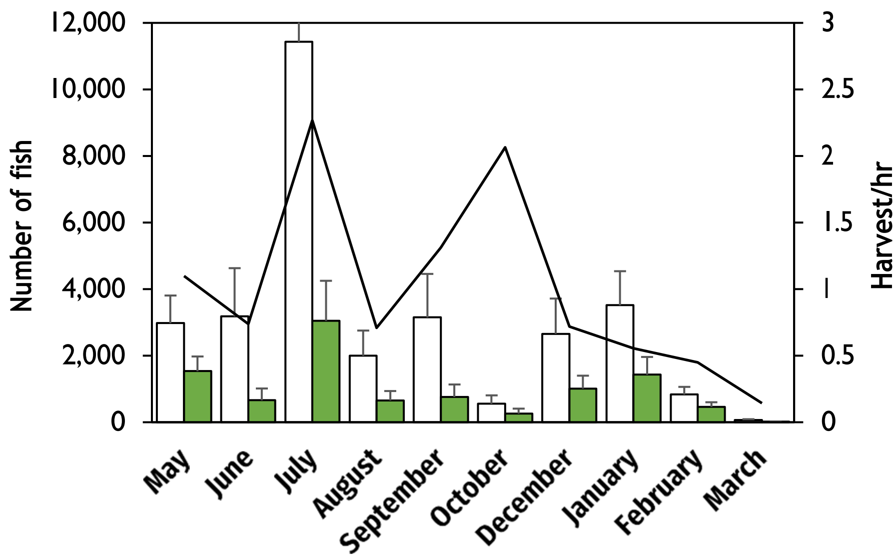

Figure 15. Estimated number of black crappies caught (white bars ± standard deviation) and harvested (green bars ± standard deviation) during May - March. The specific rate of harvest (fish/hour) is represented by the solid line.

YELLOW PERCH

Yellow perch was the third most targeted species with 6,069 hours of directed effort (18.3% of total angling effort). Fishing effort for yellow perch (22.0 hours/acre) was higher than average for lakes in Barron and Polk counties (4.9 hours/acre). There were 7,177 yellow perch estimated to be caught (specific catch rate of 0.85 fish/hour), and 1,898 were estimated to be harvested (specific harvest rate of 0.23 fish/hour; Figure 15). Directed angler effort for yellow perch was greater during the ice fishing season (4,968 hours; 82% of directed angling effort) compared to the open water fishing season (1,101 hours; 18% of directed angling effort). Angling effort was highest during December (1,309 hours; 4.7 hours/acre), January (2,550 hours; 9.2 hours/acre) and February (994 hours; 3.6 hours/acre) and relatively low during all other months (1,216 hours combined). The mean estimated angler catch and harvest rates during December – February were 0.53 fish/hour and 0.17 fish/hour, respectively. Anglers caught and harvested more yellow perch in total during July than any other month (Figure 16). Less angling effort was expended during the open water months, but anglers were most efficient at catching yellow perch during July and August with specific catch rates of 3.1 fish/hour and 2.4 fish/hour, respectively. Additionally, the rate at which anglers caught harvestable-sized fish was highest during July and August (Figure 15). The mean length of harvested yellow perch was 9.2 inches with fish ≥ 9 inches composing 70.0% and fish ≥ 10 inches composing 18.6% of harvested fish.

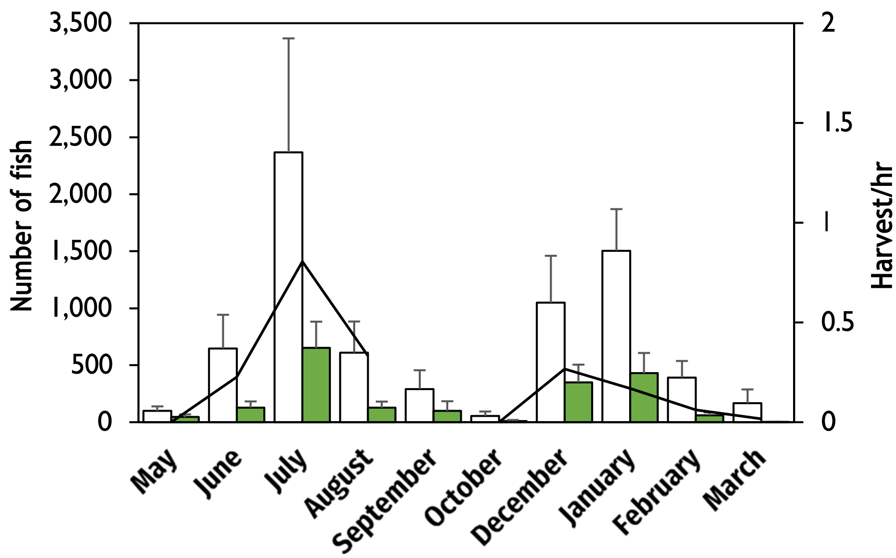

Figure 16. Estimated number of yellow perch caught (white bars ± standard deviation) and harvested (green bars ± standard deviation) during May - March. The specific rate of harvest (fish/hour) is represented by the solid line.

Summary & Discussion

The fishery on Lower Turtle Lake is diverse and healthy, with desirable sportfish populations and popular recreational fisheries. Angling effort was moderate overall and higher than average compared to other popular fishing lakes in the area. Panfish are the main attraction in Lower Turtle Lake, with relatively high directed angler effort, high catch rates and high harvest pressure. Abundant populations of bluegill, black crappie and yellow perch with good size structure provided above-average recreational fisheries for the area. Large fingerling walleye stockings have established a quality adult population and a popular fishery among anglers.

Large fingerling walleye stockings have had good survival and successfully established a moderate density population. Walleye stocking success is good for a stocking-dependent system and greater than other stocking-dependent lakes in Barron and Polk counties. Adult walleye density in 2021 remained similar to 2011 and both were greater than in 2004, when adult density was at its lowest. Walleye stocking began in 2000 to mitigate declining adult densities, with large fingerling stockings beginning in 2004. Although, recent adult densities remain lower than in 1992 when a naturally reproducing, self-sustaining walleye population was present. Natural recruitment has remained limited, and Lower Turtle Lake has not had a significant naturally recruited year class since 1992. Age-0 walleye have been observed at low abundances during some years but the contribution of natural recruitment to the current adult population is near zero based on missing year classes during non-stocked years. Lower Turtle Lake is classified as a combination natural recruitment-stocking lake with limited natural recruitment, and stocking remains necessary to sustain an adult population. Large fingerling stocking will be maintained at approximately 10 fish/acre to support this population. The goal of large fingerling stocking will be to maintain an adult density of 1.5 – 2.5 fish/acre. Higher adult densities could be achieved if natural reproduction were to be re-established. Catch rates of age-1 stocked walleye and age-0 natural recruits will continue to be assessed every other year during off-stocking years.

The management goal in Lower Turtle Lake was to increase adult densities and eventually restore walleye natural recruitment. Adult densities have increased over the previous two decades, which could be due to large fingerling stockings, liberalizing largemouth bass harvest and restricting adult walleye harvest. Largemouth bass harvest regulations were liberalized during 2011, from a 14-inch MLL, five fish daily bag limit to a no MLL, five fish daily bag limit. At the same time, adult walleye harvest was restricted with an 18-inch MLL, three fish daily bag limit with the intent to reduce adult exploitation rates and increase population size. As a result, angler exploitation of adult walleye during 2021 was low compared to other walleye fisheries in Barron and Polk counties despite a moderate amount of directed effort. The 18-inch MLL, three fish daily bag limit may have contributed to a higher male-to-female sex ratio (5:1) favorable for natural reproduction. Naturally reproducing walleye populations typically have sex ratios skewed toward males, but stocking-dependent fisheries that receive extended growth walleye are commonly observed to be female-biased (Sass et al. 2022). The current 18-inch MLL, three fish daily bag limit will be maintained with the intent to sustain or increase adult densities, keep adult exploitation low and restore natural reproduction. If natural reproduction remains limited and stocking success remains good in the future, then perhaps alternate harvest regulations could be considered to increase harvest opportunities for anglers.

There is currently a low-density northern pike population in Lower Turtle Lake with good size structure. The northern pike population has declined since 2011, but fish remain in above-average condition. The recreational fishery for northern pike is popular, and anglers mainly targeted northern pike during the ice fishing season, with directed fishing effort (5.6 hours/acre) near the average for Barron and Polk counties (7.4 hours/acre) despite declining population abundance. Declining population abundance of northern pike should improve size structure with time.

Lower Turtle Lake supports a low-density largemouth bass population with excellent size structure. Fish growth was above average, and fish were in excellent condition. The largemouth bass fishery was relatively limited compared to other popular fisheries in Barron and Polk counties. Few bass were harvested during 2021, despite liberal harvest regulations, and the population's total annual mortality rate was presumably low (catch curve analysis was not performed due to limited age data). However, adult largemouth bass declined when harvest regulations were liberalized in 2011, and this corresponded with greater proportions of large individuals within the population (PSD-15 increased but PSD-12 remained similar temporally). The liberal harvest regulation (no MLL, five fish daily bag limit) will be maintained, and anglers are encouraged to harvest small (< 14 inches) largemouth bass. Overall, the largemouth bass population remains healthy, supports a good recreational fishery, and no management actions are recommended at this time. Otoliths should be collected during the next survey and transverse thin-sections are used to assess age to improve growth and mortality estimates.

Panfish species support a popular fishery in Lower Turtle Lake and receive a high directed angler effort and provide high catch rates and harvest. Black crappie, bluegill and yellow perch populations have all increased in abundance and size structure since 2011. Lower Turtle Lake supports abundant and above-average populations of black crappie and yellow perch with above-average recreational fisheries for the area. The bluegill population remained in the low-density category similar to 2011, but size structure was good and improved greatly since 2011. Directed fishing effort for bluegill was high despite a low-density population, likely due to an excellent size structure, and contributed significantly to the overall recreational fishery. Size structure indexed from the SE2 survey greatly underrepresented the largest size classes present and those targeted by the recreational fishery for each of the panfish species. These panfish populations are also likely important contributors to the fish community as the primary forage base for predatory fishes. Future fishery surveys should closely monitor the population demographics of each species due to the popularity and intensity of the current panfish recreational fishery and their importance to the overall fish community. Lower Turtle Lake could be a candidate for a reduced bag limit if recreational fishing pressure and harvest remains high. No specific management actions for black crappie, yellow perch and bluegill are recommended at this time.

Management Recommendations

1. Maintain walleye density between 1.5 to 2.5 fish/acre through stocking large fingerlings. Continue to stock large fingerling (6-8 inches) walleyes in alternate years at a rate of 10 fish/acre. Walleye stocking efforts should continue to focus solely on large fingerling stockings. The relative contribution of large fingerlings to the adult population should be reassessed during the next comprehensive survey in 2030. Additionally, the survival of age-1 stocked walleye and natural recruitment of age-0 walleye will be assessed every other year during off-stocking years.
2. Largemouth bass will continue to be managed with a no minimum length limit and daily bag limit of five fish. Otoliths should be collected during the next survey to improve age and growth estimation.
3. No specific management actions regarding northern pike, bluegill, black crappie and yellow perch are recommended at this time. Otoliths should be collected from bluegills and black crappies during the next survey to improve age and growth estimation.
4. The next comprehensive fisheries survey is scheduled for 2030. The abundance, size structure, age structure and growth of panfish should be closely monitored as these species support popular recreational fisheries and receive high harvest pressure. Efforts should also be directed at reassessing the stocking efficiency and survival of large fingerling walleye and evaluating natural recruitment.
5. Public input regarding the fishery and angler preference information should be assessed before the next comprehensive fisheries survey. Engaging resource constituents via public meetings or questionnaires will provide indications of public preferences and will help guide future management directions, goals and objectives.
6. Efforts to increase habitat complexity in Lower Turtle Lake should also be encouraged where applicable. Inputs of coarse woody habitat, protection/promotion of aquatic vegetation and maintenance/restoration of vegetative buffers would be beneficial. This website healthylakeswi.com is a great resource to learn about this recommendation.
7. Invasive species monitoring and control programs should continue.

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Appendices

Appendix Table 1. Walleye stocking records for Lower Turtle Lake, 2000 - 2021.

YEAR	SPECIES	AGE CLASS	NUMBER STOCKED	AVG. LENGTH (IN.)
2000	Walleye	Small Fingerling	13,800	1.5
2002	Walleye	Small Fingerling	27,450	1.4
2004	Walleye	Large Fingerling	5,506	6.8
2006	Walleye	Large Fingerling	2,759	6.8
2008	Walleye	Large Fingerling	2,755	7.0
2010	Walleye	Large Fingerling	2,760	7.3
2012	Walleye	Large Fingerling	2,760	7.4
2014	Walleye	Large Fingerling	2,859	6.2
2016	Walleye	Large Fingerling	2,859	7.0
2018	Walleye	Large Fingerling	2,857	6.2
2020	Walleye	Large Fingerling	2,859	6.9

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