WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Fishery Survey Report for Yellow Lake
Burnett County, Wisconsin 2021

WATERBODY IDENTIFICATION CODE: 2675200

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Introduction

Yellow Lake was surveyed in 2021 to assess the status of the fishery. We conducted a population estimate for Walleye and indexed the catch rates of Muskellunge, Northern Pike, Largemouth Bass, and panfish species. We assessed general population characteristics, size structure (when possible) and growth of all species. Recent management activities have focused on regulation changes, public outreach and education.

LAKE CHARACTERISTICS

Yellow Lake is a fertile and shallow 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 Yellow Lake. Yellow Lake is classified as a Complex-Two Story lake due to the presence of Cisco. However, it carries characteristics of a Complex-Warm Dark lake (Rypel et al. 2019).

Table 1. Lake and watershed characteristics for Yellow Lake, Burnett County, WI.

	Yellow Lake
Size (ac)	2,283
Max depth (ft)	31
Mean depth (ft)	19
Watershed Area (ac)	165,312
Lake class	Complex - Two Story

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

Trophic State Index	Yellow Lake
Secchi Disk Visibility	53
Total Phosphorus	56
Chlorophyll A	56

There are three public boat landings on Yellow Lake. These landings are located at: Jeffries Rd., Lake Ave. and Yellow Lake Rd. Yellow Lake is a popular multi-species fishery in Burnett County. It also supports one of the best Lake Sturgeon hook and line fisheries in Wisconsin (for more information on Yellow Lake sturgeon – please see the 2019 Yellow Lake Sturgeon Management Plan).

STOCKING HISTORY

Muskellunge have been the only species stocked into Yellow Lake since 2006 (Appendix Table 1). Prior to 2006, Walleye and Muskellunge were stocked. Muskellunge are currently stocked at a rate of 0.5 fish/acre on an alternate year basis.

FISHING REGULATIONS

There are currently no special regulations in Yellow Lake. All species either follow the statewide, regional or county fishing regulations.

Methods

Yellow Lake was sampled during 2021, following the DNR's assessment protocol (Cichosz 2021) to sample Walleye, Northern Pike and Muskellunge. DNR staff collected Walleye in the Yellow River (upstream of Yellow Lake) during the daytime with a pulsed direct current (DC) electrofishing boat. Sampling started once water temperatures were ≥45˚F. Staff collected Walleye between Conner's bridge and the Yellow River outlet into Yellow Lake from March 29 until April 6. Northern Pike and Muskellunge were indexed in Yellow Lake using fyke nets from April 9 to April 23.

A late spring electrofishing survey (SE2) was done on June 3 to assess bass and panfish populations. This survey consisted of 0.5-mile index stations where all gamefish and panfish were captured, and 1.5-mile stations where only gamefish were collected. There were three index stations and three gamefish stations completed on Yellow Lake. In addition to these surveys, the DNR conducted a fall electrofishing survey to assess the abundance of age-0 and age-1 Walleye. Table 2 in the Appendix lists descriptions of standard DNR survey type, gear used and target water temperatures.

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

Walleye, Largemouth Bass, Bluegill and Yellow Perch were aged with scales and dorsal spines. Muskellunge were aged with anal fin rays. Spines and fin rays were cross-sectioned and aged under a microscope. Mean length at age was compared to other Complex-Two Story Wisconsin lakes and northwest Wisconsin averages for Walleye. Size structure was assessed using the proportional size distribution (PSD) indices (Neumann et al. 2013). The PSD value of 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 (Appendix Table 3).

Results and Discussion

WALLEYE

The adult Walleye population was estimated to be 1.8 fish/acre (Figure 1). This estimate was less than the 2014 estimate (3.1 fish/acre) but similar to the 1997 population estimate. The 2021 estimate was less than the 2019 Ceded Territory average at 3.7 fish/acre for lakes with natural reproduction (Cichosz 2021).

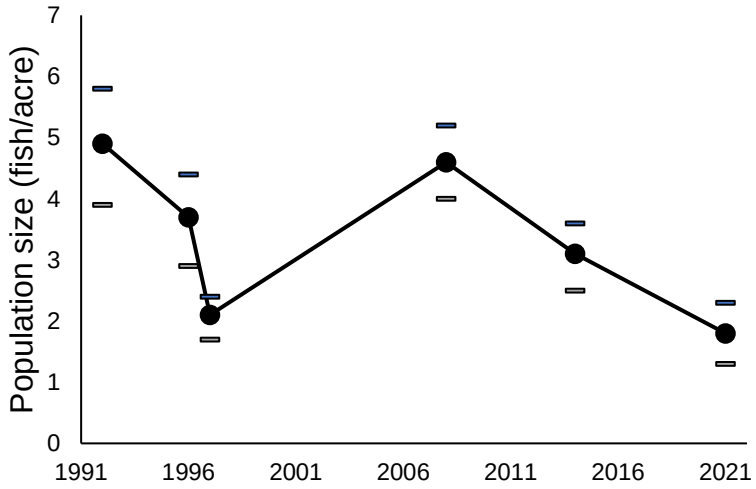

Figure 1. Walleye population estimates (with 95% confidence intervals) in Yellow Lake, Burnett County, WI. 1996 and 1997 were Great Lakes Indian Fish and Wildlife Commission estimates using different methods.

There were 869 Walleye collected with river electrofishing (Figure 2). The CPUE was 27.6 fish/mile for electrofishing. Walleye ranged in length from 12.7 to 28.2 inches. The mean lengths of male and female Walleye were 17.2 inches and 22.2 inches, respectively. The male to female ratio was 28:1. Walleye PSD was 94 and PSD-20 was 7. PSD in 2014 was lower at 76 and PSD-20 was 4.

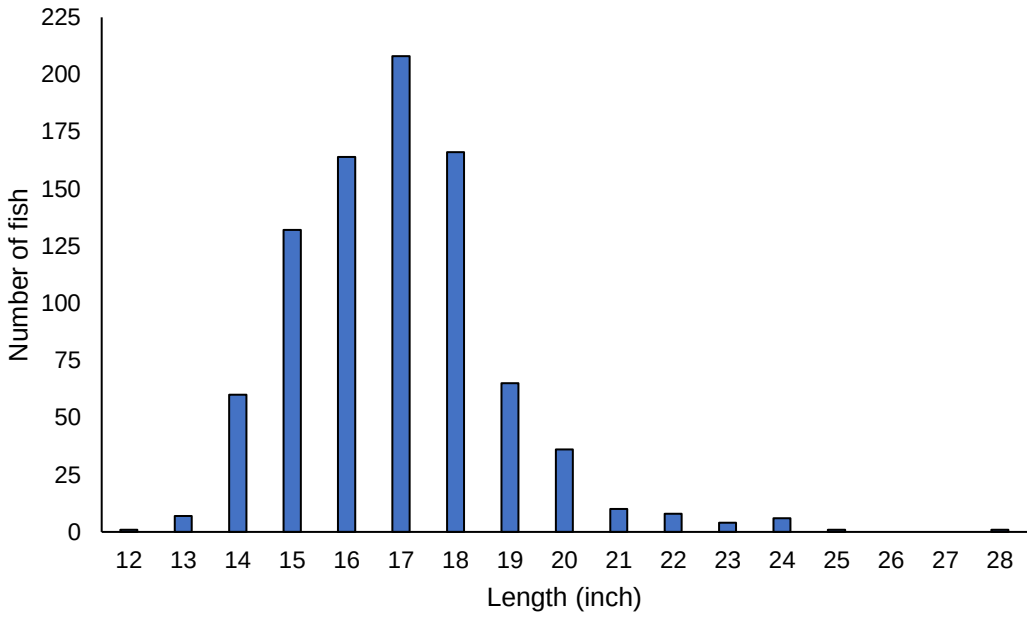

Figure 2. Length frequency of Walleye captured in the Yellow River during spring 2021 (n=869).

The overall growth of Walleye increased for male and female adult Walleye. The mean length-at-age was generally greater than those from 2008 and 2014 and was also above the northwest Wisconsin averages. Survival was estimated at 75%, similar to 2014 (73%).

The age-0 Walleye catch rate during the fall electrofishing survey was 7.3 fish/mile (Figure 3). This is above Yellow Lake's average of 5.9 fish/mile (1990-2021). Catch of age-0 Walleye has ranged from 0.0 to 20.0 fish/mile. When looking at comparable surveys, stocked year classes (Pre 2004 avg. = 4.9 fish/mile) were lower than catch rates from non-stocked year classes (Post 2004 avg. = 7.1 fish/mile).

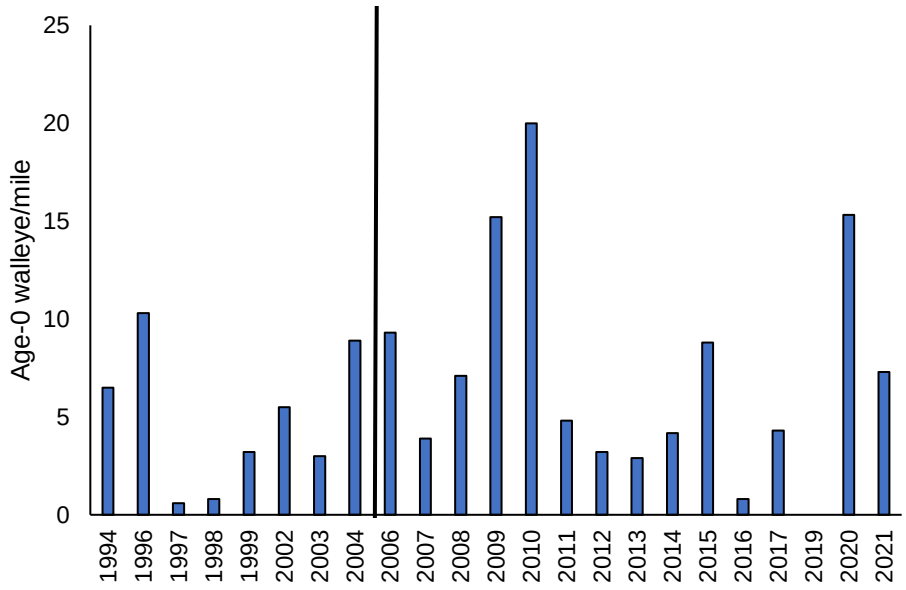

Figure 3. Catch of age-0 Walleye/mile of shoreline for Yellow Lake, Burnett County, WI. The black vertical line denotes time when Walleye stocking was discontinued.

The Walleye population had a lower density compared to prior surveys. The decrease is likely due to low levels of natural reproduction in 2016, 2017 and 2019. Although this was the lowest Walleye population estimate, the Yellow Lake Walleye population had another low population in 1997 (Figure 1), followed by the second highest estimate since 1992. Also, 2020 provided a strong year class, being the third highest since 2009. This suggests that the population should be on the upswing. Natural Walleye populations are known for going through boom-and-bust cycles. However, assessing Walleye natural recruitment through annual age-0 surveys and the adult population through population estimates should dictate any future management actions. If stakeholders are interested in bolstering the Walleye population, more restrictive regulations and habitat protection should be considered first.

MUSKELLUNGE

There were 32 Muskellunge collected in fyke nets for a catch rate of 0.60 fish/net night. The catch rate was twice the rate of 2008 (0.32 fish/net night). Also, this rate is near the 75th percentile (0.65 fish/net night) for Complex-Two Story Muskellunge lakes in Wisconsin. Compared to other Class A1 Muskellunge waters, Yellow Lake was above the median (0.42 fish/net night). Muskellunge collected ranged in length from 24.3 to 50.0 inches (Figure 4).

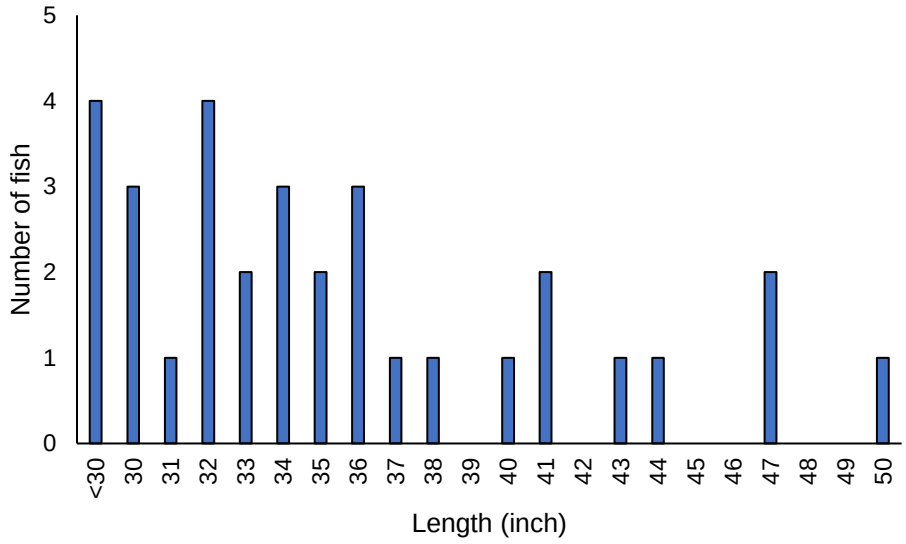

Figure 4. Length frequency of Muskellunge captured in Yellow Lake during spring 2021 (n=32).

Yellow Lake Muskellunge grew quickly. The mean length-at-age was above the 75th percentile for Complex-Two Story Muskellunge lakes. On average, muskie reached 32.8 inches in five years and 43.9 inches in nine years. All Muskellunge collected had ages corresponding to DNR Muskellunge stockings. The age-5 year class was the most abundant year class in the fishery and made up 60% of the sample.

The Muskellunge population has rebounded since 2008 based on catch rates. Yellow Lake now appears to have a healthy population with trophy potential. DNR stocking accounted for all muskie observed and helped confirm that there is no natural reproduction occurring in Yellow Lake. Muskellunge growth appears to be well above average compared to other Complex-Two Story muskie lakes.

NORTHERN PIKE

There were 333 Northern Pike collected in spring fyke nets for a catch rate of 6.3 fish/net night. This catch rate was the same as in 2008 (6.3 fish/net night). This catch rate is above the 75th percentile for Complex-Two Story lakes in Wisconsin. The Northern Pike collected ranged in length from 11.0 to 33.5 inches (Figure 5). The average length was 21.4 inches and above the 95th percentile (21.0 inches) for Complex-Two Story pike lakes. PSD was 63 and PSD-28 was 3, similar to 2008 when PSD was 60 and PSD-28 was 0.

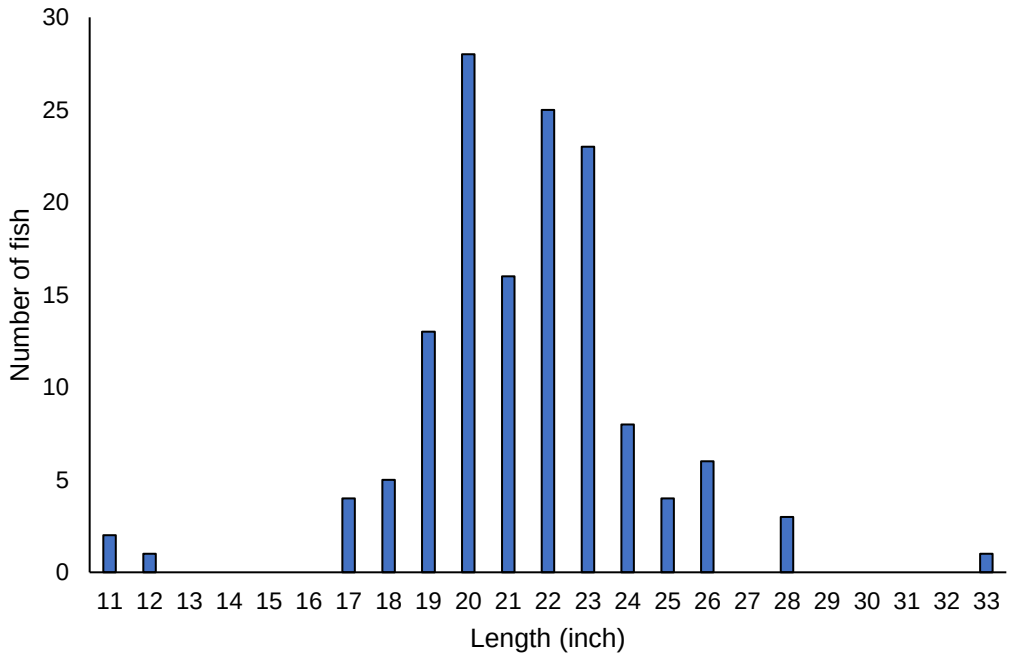

Figure 5. Length frequency of Northern Pike measured in Yellow Lake during spring 2021 (n=139).

The Northern Pike population remains healthy and abundant. The catch rate did not differ between 2014 and 2021. The size structure is also good, with an average size of 21.4 inches. The average length of Northern Pike in most lakes in Washburn/Burnett counties is typically 20 inches or less, so these data suggest pike are growing well in Yellow Lake.

LARGEMOUTH AND SMALLMOUTH BASS

Forty-three Largemouth Bass were collected with electrofishing for a catch rate of 7.1 fish/mile. This catch rate is similar to 2014 (6.8 fish/mile). This catch rate is above the 50th percentile for Complex-Two Story lakes in Wisconsin. Largemouth Bass averaged 11.8 inches, a decrease from 2014 (14.2 inches), and ranged from 2.5 to 18.5 inches (Figure 6). This average was above the 90th percentile for Complex-Two Story lakes in Wisconsin. CPUE and growth were not calculated for Smallmouth Bass due to a low sample size. Three Smallmouth Bass were collected, with an average length of 8.5 inches. PSD was not calculated for either species due to low sample sizes. Largemouth Bass grew above lake class average until age-8, when growth slowed to near and below average. This growth was similar to 2014.

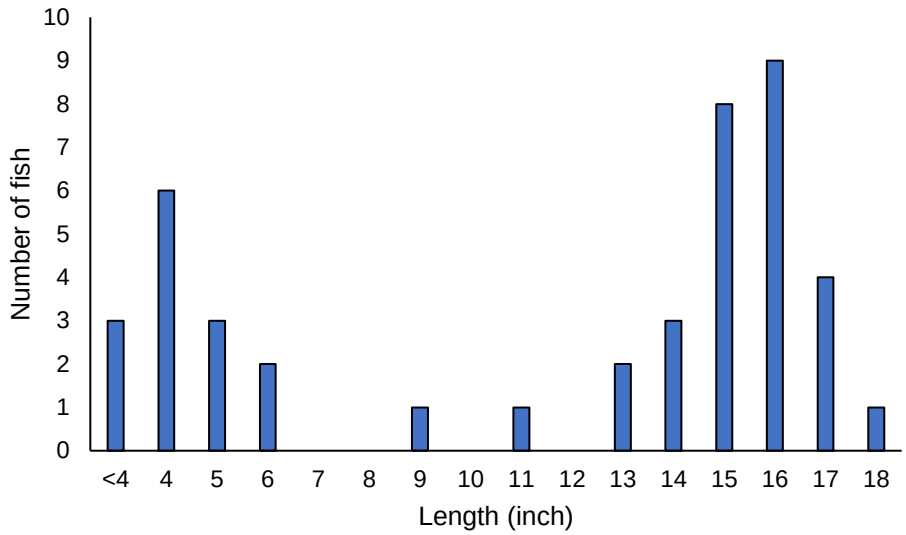

Figure 6. Length frequency of Largemouth Bass collected in Yellow Lake during spring 2021 (n=43).

Largemouth Bass have a low-density population in Yellow Lake. Their population remains lower because of the turbid water of Yellow Lake. Largemouth Bass in northwest Wisconsin tend to be more abundant in clear vegetated lakes. Growth was above average for most sizes.

PANFISH

One hundred thirty-one Bluegill were collected with electrofishing for a catch rate of 87.3 fish/mile. This catch rate was greater than in 2014 (52.0 fish/mile) and greater than the 50th percentile (51.7 fish/mile) for Complex-Two Story lakes in Wisconsin. Bluegill averaged 5.1 inches, with 18% being greater than 7.0 inches (Figure 7). This was a large decrease in size since 2014 (7.1 inches). This average length was above the 90th percentile for Complex-Two Story lakes in Wisconsin (5.0 inches). Bluegill PSD was 34.

The catch rate of Black Crappie was 36 fish/mile. Black Crappie averaged 8.1 inches, which was above the 95th percentile for Complex-Two Story lakes in Wisconsin.

Yellow Perch were collected at a rate of 13 fish/mile, a decrease from 2014 (44.6 fish/mile). The average size of Yellow Perch was 5.1 inches, similar to 2014, and above the 75th percentile for Complex-Two Story lakes in Wisconsin. Pumpkinseed and Rock Bass were also present in low numbers.

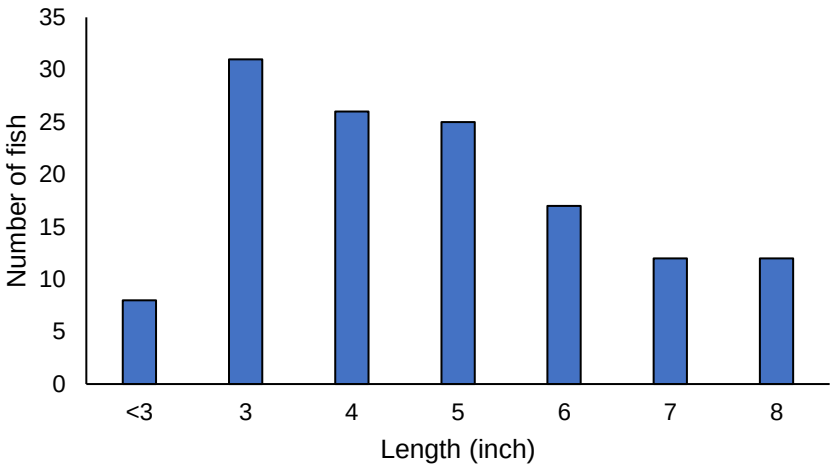

Figure 7. Length frequency of bluegill collected in Yellow Lake during spring 2021 (n=43).

The relative abundance of Bluegill and Black Crappie have increased since 2014, while Yellow Perch have decreased in the same timeframe. This trend will be important to watch since Walleye, Muskellunge and Northern Pike all prefer to prey on Yellow Perch when available. If perch continue to decline in abundance and Bluegill decrease in size structure, a lower panfish bag limit should be considered.

COMMON CARP

Nine Common Carp were observed netting and electrofishing. Common carp are not at nuisance levels, but continued monitoring will be important with this species in Yellow Lake.

Local Biologist Recommendations

1) The Walleye population had the lowest recorded estimate on Yellow Lake. However, the population should increase following a strong year class in 2020. Natural reproduction remains the best option for Walleye recruitment, and no stocking should occur at this time. If stakeholders are interested in bolstering the Walleye population, more restrictive regulations and habitat protection should be considered first.
2) The Muskellunge population appears to have increased since the last survey in 2008. No management changes are needed for Muskellunge at this time.
3) Northern Pike are abundant and provide another angling opportunity. No management changes are needed for this species.
4) Largemouth and Smallmouth Bass are at lower densities. Yellow Lake's habitat is likely leading to a lower bass population. No management changes are recommended for bass.

5) If perch continue to decline in abundance and bluegill continue to decrease in size structure, consideration of a lower bag limit should occur for panfish.
6) Efforts to preserve habitat in the Yellow River are very important. The Yellow River serves as important spawning habitat for Yellow Lake Walleye, Lake Sturgeon and other species. Lake groups, community members and anglers are encouraged to work with the DNR to promote a way to provide more protection to the river upstream of Yellow Lake.
7) Efforts to increase habitat complexity in the Yellow Lake system should also be encouraged, where applicable. Inputs of coarse woody debris, protection/promotion of aquatic vegetation and maintenance/restoration of vegetative buffers are needed habitat work in Yellow 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. Common Carp should be monitored by the DNR during fishery surveys.

Acknowledgements

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Appendix Table 1. Fish stocking records for Yellow Lake, Burnett County, WI. 1998 – 2021.

Year	Species	Age Class	Number Stocked	Avg. Length (in)	Source
1998	WALLEYE	SMALL FINGERLING	100,000	1.4	DNR
1999	MUSKELLUNGE	LARGE FINGERLING	1,500	11.2	DNR
2000	WALLEYE	SMALL FINGERLING	100,000	1.5	DNR
2000	WALLEYE	SMALL FINGERLING	24,345	2.6	TRIBAL
2002	MUSKELLUNGE	LARGE FINGERLING	1,444	10.6	DNR
2002	WALLEYE	SMALL FINGERLING	114,330	1.5	DNR
2004	MUSKELLUNGE	LARGE FINGERLING	1,445	10.7	DNR
2004	WALLEYE	SMALL FINGERLING	114,565	1.2	DNR
2004	WALLEYE	SMALL FINGERLING	67,987	2.9	TRIBAL
2006	MUSKELLUNGE	LARGE FINGERLING	801	11.6	DNR
2008	MUSKELLUNGE	LARGE FINGERLING	1,444	9.5	DNR
2010	MUSKELLUNGE	LARGE FINGERLING	1,392	12.2	DNR
2012	MUSKELLUNGE	LARGE FINGERLING	2,287	12.8	DNR
2014	MUSKELLUNGE	LARGE FINGERLING	1,143	11.2	DNR
2016	MUSKELLUNGE	LARGE FINGERLING	739	11.9	DNR
2018	MUSKELLUNGE	LARGE FINGERLING	1,256	12.1	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

A DNR Technician lifting a fyke net

A DNR electrofishing boat

Appendix Table 3. Proportional and relative stock density 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