

WISCONSIN DEPARTMENT OF NATURAL RESOURCES
Boulder Lake, Oconto County, Wisconsin

Fisheries Survey Report, 2021

Waterbody Identification Code: 491800

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Peshigo, Wisconsin

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SUMMARY

LAKE AND LOCATION

Boulder Lake, Oconto County, T31N R15E Sections 21 and 28, township of Doty. Also lies within Langlade County, T31N R14E Sections 20 and 29, township of Wolf River.

PHYSICAL/CHEMICAL ATTRIBUTES

Surface acres: 370 acres

Maximum depth: 11 feet

Mean depth: 7 feet

Lake type: spring lake, has an outlet

Lake class: complex, clear, cool; temperature transitional

Water chemistry: hard water

Littoral substrate: sand (35%), muck (20%), marl (10%), rubble (10%), boulders (5%)

Shoreline: 3.8 miles

Aquatic vegetation: Dominant vegetation from 2021 survey by Brenda Nordin (WDNR Water Resources) and Ryan Haney (UW-Stevens Point) includes muskgrasses (*Chara spp.*), Illinois pondweed (*Potamogeton illinoensis*), variable pondweed (*Potamogeton gramineus*), and slender naiad (*Najas flexilis*).

Aquatic invasives: Eurasian watermilfoil (*Myriophyllum spicatum*), verified in 2012

Banded mystery snail (*Viviparus georgianus*), verified in 2012

PURPOSE OF SURVEYS

Baseline lake survey Tier I assessment

DATES OF FIELDWORK

Fyke netting survey conducted March 29, 2021 through April 7, 2021. Electrofishing survey conducted May 24, 2021.

FISHERY

Largemouth Bass, Smallmouth Bass, Northern Pike, Bluegill, Black Crappie, Rock Bass, Yellow Perch, Pumpkinseed, White Sucker, Brook Trout, Brown Trout and Brown Bullhead are present.

ACKNOWLEDGEMENTS

Data collection for the 2021 survey was completed by Wisconsin Department of Natural Resources (DNR) fisheries staff Ronald Rhode, Tammie Paoli, and Ben Ewoldt. Fish aging and data entry was completed by Ronald Rhode.

BACKGROUND

Boulder Lake is a shallow, oligotrophic spring lake that borders Oconto and Langlade counties and lies within the Ceded Territory, which is 22,400 square miles of northern Wisconsin that were ceded to the United States by the Lake Superior Chippewa Tribes in 1837 and 1842. It has clear turquoise water with a marl bottom and is classified by the DNR as a complex, cool, clear temperature transitional lake. Approximately 80% of the shoreline is privately owned, with extensive development along the east, southwest, and north shores. The U.S. Forest Service owns the remaining 20% of shoreline, and they maintain a campground, swimming beach and boat ramp on the south shore. There is a private campground on the northeast shoreline. The lake receives heavy recreational use during the summer months. The existing 5 feet high by 4 feet wide dam at the northeast portion of the lake was constructed in 1951, has a head of 2 feet and is owned by Oconto County (Miles Winkler, pers. comm.). The outflow is Boulder Creek, which empties into the South Branch Oconto River approximately 1.25 miles downstream from the dam.

The Boulder Lake Private Homes Association is a non-governmental group on the lake.

The Oconto County Lakes Project is a county-wide grant-funded project being completed by Oconto County Land Conservation Department, University of Wisconsin – Stevens Point, UW-Extension, and the DNR. Over several years, 60 lakes with public access in Oconto County will have an individual Lake Management Plan developed. The County will have an Operational Strategy & Plan to help county staff members achieve an overall goal of “having the healthiest waters in Wisconsin.” At the time of writing this report, the Lake Management Plan is being drafted for Boulder Lake.

Current fishing regulations follow the general inland regulations. Stocking history from 1973 to present is listed in Table 1. Fisheries surveys conducted from 1995 to present are shown in Table 2.

METHODS

Eight standard 3' x 6' hoop fyke nets with ¾" bar, 1 ½" stretch mesh were set on March 29, 2021 (Figure 1). Nets were lifted daily from March 30 through April 7 for a total of 72 net nights.

All fish captured were identified by species. Gamefish were measured to the nearest 0.1 inch and given a top caudal fin clip (for a mark recapture population estimate). Pelvic fin rays (Northern Pike) or dorsal spines (Walleye, bass) were collected from five gamefish per 0.5-inch group per species. Scales or anal spines (Yellow Perch) were collected from five panfish per 0.5-inch group per species. Lengths on at least 250 of each panfish species were taken to the nearest 0.1 inch, with the remainder counted.

A DNR standard direct current double anode electrofishing boat was used to sample the entire 3.8 miles of shoreline on the evening of May 24, 2021. All fish were collected for two staggered 0.5 mile transects, and only gamefish were collected for the remaining 2.8 miles of shoreline that were sampled (Spring Electrofishing II) per protocol. Fish were measured to the nearest 0.1 inch, and gamefish were inspected for a top caudal fin clip. Additional aging structures were collected for length bins not filled during the netting survey. Fish collecting with both gear types (netting and electrofishing) were combined to increase sample sizes for length frequency and age/growth analysis.

RESULTS

Water temperature at the start of the spring netting survey was 43°F and rose to 54°F by the last day of netting.

A total of 1,562 fish (including recaptures) of twelve different species were collected throughout the survey period (Table 3). Catch per gear type is shown for each species sampled (Tables 4 and 5). Bluegill, Rock Bass, Largemouth Bass and Smallmouth Bass were common.

BLUEGILL

A total of 388 Bluegills were sampled. The catch rate was 5.3/net night and 5/mile for electrofishing (Tables 4 and 5). The CPE for spring electrofishing is below the 25th percentile compared to other Wisconsin lakes of the similar classification. The average length was 7.3 inches, ranging from 2.7 to 10.5 inches (Table 3). Size structure is excellent, with 78% being 6 inches or greater and 41% being at least 8 inches (Figure 2). The largest Bluegill was 10.5 inches and estimated at seven years old. The growth rate of Bluegills is noticeably higher than the northeast Wisconsin average (Figure 3).

BLACK CRAPPIE

A total of 28 Black Crappies were sampled. The catch rate was 0.4/net night (Table 4). The average length was 10.8 inches, ranging from 5.4 to 14.3 inches (Figure 4). Size structure is excellent, with 65% being 10 inches or greater. Age 6 (2015 year class) comprised the majority of the catch. Mean length at age is similar to northeast Wisconsin averages, although it should be noted that the sample size is low (Figure 5).

ROCK BASS

Rock Bass were the most abundant panfish species captured, with a total of 596 sampled. The catch rate was 8.3/net night and 2/mile for electrofishing (Tables 4 and 5). The average length was 5.8 inches with a range from 3.4 to 10.6 inches. Size structure is fair, with 17% being 7 inches or greater. Aging structures were not collected on Rock Bass.

YELLOW PERCH

A total of 47 Yellow Perch were captured. The catch rate was 0.5/net night and 12/mile for electrofishing (Tables 4 and 5). The average length was 7.6 inches, ranging from 4.7 to 12.8 inches (Figure 6). Size structure was fair, with 29% being 8 inches or larger, but with smaller (ages 2 and 3) Yellow Perch dominating the catches, which will provide future opportunities for perch fishing in the lake. The growth rate for Yellow Perch is above the northeast Wisconsin average (Figure 7).

LARGEMOUTH BASS

Largemouth Bass were the dominant predator species captured, with a total of 255 sampled, including eight recaptured individuals. The catch rate for spring fyke netting was 2.2/net night and 26/mile for electrofishing (Tables 4 and 5). The spring electrofishing CPE for Largemouth Bass (26/mile) is above the 75th percentile compared to other lakes in Wisconsin of similar classification. Spring electrofishing CPE of Largemouth Bass has ranged from 22 to 57/mile from 1993 to 2021 (Table 6), which is above the 75th percentile for the entire time series when compared to other complex, cool, clear lakes in Wisconsin. The average length of Largemouth Bass was 12.4 inches ranging from 3.6 to 20.5 inches. Size structure was very good, with 47% over the 14-inch size minimum (Figure 8). It takes approximately seven years for a Largemouth Bass to reach 14 inches in Boulder Lake. Growth rates are below northeast Wisconsin averages (Figure 9) and could be a factor of higher density of both Largemouth and Smallmouth Bass competing for food resources. The oldest Largemouth Bass was 19.6 inches and estimated at age 17, while the longest Largemouth Bass was 20.5 and estimated at age 14. There is steady recruitment of Largemouth Bass, with fifteen age classes being represented. A population estimate was not generated due to the low number of recaptured fish.

SMALLMOUTH BASS

Smallmouth Bass were the second most abundant predator species captured, with a total of 201 sampled, including nine recaptured individuals. The catch rate for spring fyke netting was 2.4/net night and 7/mile for electrofishing (Tables 4 and 5). The average length of Smallmouth Bass was 11.2 inches, with a range from 5.4 to 17.4 inches. Size structure was poor, with only 10% over the 14-inch size minimum (Figure 10). It takes approximately seven years for a Smallmouth Bass to reach 14 inches in Boulder Lake. Growth rates are slower than other lakes in northeast Wisconsin (Figure 11) and could be a factor of higher density of both Largemouth and Smallmouth Bass competing for food resources. There is steady recruitment of smallmouth bass, with nine year classes being represented.

NORTHERN PIKE

Boulder Lake has a low abundance of Northern Pike with excellent size structure, with a total of 12 individuals sampled. The catch rate for spring fyke netting was 0.2/net night (Table 4). The average length was 27.4 inches, ranging from 18.8 to 36.8 inches (Table 3). Size structure was excellent, with 83% of the fish being greater than 21 inches and 42% being greater than 28 inches (Figure 12). The mean length at age is at or above northeast Wisconsin averages, although it should be noted that the sample size is low (Figure 13).

BROWN TROUT AND BROOK TROUT

A total of 15 Brown Trout and 13 Brook Trout were captured in the survey, mostly in the fyke nets. Brown Trout ranged from 7.2 to 9.2 inches, and Brook Trout ranged from 8.0 to 10.2 inches. There is no known stocking of trout into the lake. Previous surveys (2002, 1993 and 1978) also mentioned the presence of trout. Although the outlet has a dam with a head of 2 feet, it is possible that during high water, trout from the South Branch Oconto River move up the outlet (Boulder Creek) and are able to get into the lake. However, survival of trout in the lake during warm summer months is uncertain.

OTHER SPECIES

Other species captured are listed in Table 3 and include from most to least in abundance: Brown Bullhead, Pumpkinseed Sunfish, Pumpkinseed x Bluegill hybrid and White Sucker.

DISCUSSION AND RECOMMENDATIONS

Boulder Lake was surveyed every 2 to 4 years since the early 2000s as part of the DNR/U.S. Forest Service contract fisheries program. Upon Skip Sommerfeldt's retirement in December 2016, that position was eliminated. For the foreseeable future, Boulder Lake will be on a 10-year rotation for a comprehensive (netting and electrofishing) survey conducted by fish management out of Peshtigo DNR. The next survey for Boulder Lake is scheduled for 2031.

The overall status of the fishery in Boulder Lake continues to be diverse with good populations of Largemouth and Smallmouth Bass as the dominant predators. Mirroring the 1993 survey, the 2021 comprehensive survey revealed that the size structure of Largemouth Bass is good while the size structure of Smallmouth Bass is poor. Both species exhibit slower growth rates compared to other lakes in northeast Wisconsin. Although Largemouth Bass density is still considered high, abundance has declined from surveys completed from 2002 to 2011 and size structure has improved.

The most abundant panfish species in the lake are Rock Bass and Bluegill. Bluegill size structure improved from the 2002 summer panfish netting survey to the 2013 survey. Based on the 2021 survey, the size structure of Bluegill continues to be excellent, with above average growth rates.

Boulder Lake is within Wisconsin's Ceded Territory and has a history of Walleye management during the 1970s and 80s. Sommerfeldt (2004)¹ elaborated on the past focus of Walleye in the lake and provided possible reasons for the failure of Walleye to thrive related to lake characteristics and forage availability. Tribal harvest rights exist on the lake but are unlikely to be utilized since the most commonly speared species, Walleye and Muskellunge, are absent from the lake. I recommend continuing to manage the lake for bass and Bluegill. Boulder Lake provides quality fishing opportunities for anglers for those species. No changes to the general fishing regulations are recommended at this time.

Table 1—Stocking history of Boulder Lake from 1973 to 2021.

¹ https://p.widencdn.net/fmcbmn/Reports_ocontoboulderlake2002

Year	Species	Strain	Age Class	Number Stocked	Avg. Length (in.)	Source
1973	Walleye	Unspecified	Fingerling	18,000	5	DNR coop ponds
1985	Walleye	Unspecified	Fry	363,000	1	DNR hatchery
1986	Walleye	Unspecified	Fry	363,000	1	DNR hatchery
2001	Walleye	Unspecified	Sm. fingerling	15,000	1.6	DNR ponds

Table 2 – DNR fisheries surveys completed on Boulder Lake from 1984 to 2021.

Date	Survey Type	Effort	Primary survey purpose
May 24, 2021	Electrofishing	3.8 miles	Gamefish/panfish assessment (SEII)
March 29-April 7, 2021	Fyke net	72 net nights	Gamefish population estimate & panfish assessment (SNI)
May 26, 2016	Electrofishing	3.8 miles	Gamefish/panfish assessment (SEII)
September 25, 2013	Electrofishing	3.8 miles	Fall gamefish/panfish assessment
June 10-13, 2013	Fyke net	15 net nights	Panfish community assessment
May 23, 2013	Electrofishing	3.8 miles	Gamefish/panfish assessment (SEII)
June 1, 2011	Electrofishing	3.8 miles	Gamefish/panfish assessment (SEII)
May 14, 2009	Electrofishing	3.8 miles	Gamefish/panfish assessment (SEII)
May 16, 2006	Electrofishing	3.8 miles	Gamefish/panfish assessment (SEII)
September 26, 2002	Electrofishing	3.8 miles	Fall gamefish/panfish assessment
June 10-13, 2002	Fyke net	15 net nights	Panfish community assessment
May 22, 2002	Electrofishing	3.8 miles	Gamefish/panfish assessment (SEII)
September 22, 1993	Electrofishing	3.8 miles	Fall walleye recruitment evaluation
May-September, 1993	Creel	5 months	Angler effort, catch & harvest evaluation
May 27, 1993	Electrofishing	3.8 miles	Gamefish/panfish assessment (SEII)
April 22-30, 1993	Fyke net	86 net nights	Gamefish population estimate & panfish assessment (SNI)
October 15, 1986	Electrofishing	3.8 miles	Fall walleye recruitment evaluation
September 18, 1985	Electrofishing	3.8 miles	Fall walleye recruitment evaluation
May 23, 1984	Electrofishing	3.8 miles	Gamefish/panfish assessment (SEII)
April 14-18, 1984	Fyke net	46 net nights	Gamefish population estimate & panfish assessment (SNI)

Table 3. – Total number, percent of total, average length and length range of fish species captured with all gear types in 2021 in Boulder Lake. Numbers include recaptured individuals.

	NUMBER	PERCENT	AVERAGE LENGTH (inches)	LENGTH RANGE (inches)
Black Crappie	28	1.8%	10.8	5.4 - 14.3
Bluegill	388	24.8%	7.3	2.7 - 10.5
Largemouth Bass	255	16.3%	12.4	3.6 - 20.5
Smallmouth Bass	201	12.9%	11.2	5.4 - 17.4
Northern Pike	12	0.8%	27.4	18.8 - 36.8
Pumpkinseed	2	0.1%	5.0	4.2 - 5.8
Rock Bass	596	38.2%	5.8	3.4 - 10.6
Yellow Perch	47	3.0%	7.6	4.7 - 12.8
Brown Trout	15	1.0%	7.9	7.2 - 9.2
Brook Trout	13	0.8%	9.0	8.0 - 10.2
Pumpkinseed x Bluegill	1	0.1%	5.0	
Brown Bullhead	3	0.2%		
White Sucker	1	0.1%		
Total	1,562	100.0%		

Table 4. – Catch summary for spring fyke netting in 1993 and 2021 in Boulder Lake. Totals include recaptured individuals.

	2021 Spring Fyke Netting		1993 Spring Fyke Netting ¹	
	(72 net nights)		(86 net nights)	
	Total Catch	Catch per net night	Total Catch	Catch per net night
Black Crappie	28	0.4	0	0.0
Bluegill	383	5.3	527	52.7
Largemouth Bass	157	2.2	236	2.7
Smallmouth Bass	174	2.4	0	0.0
Northern Pike	12	0.2	19	0.2
Walleye	0	0.0	65	0.8
Pumpkinseed	1	0.0	2	0.2
Rock Bass	594	8.3	200	20.0
Yellow Perch	35	0.5	65	6.5
Brook Trout	12	0.2	1	0.0
Brown Trout	14	0.2		
Brown Bullhead	3	0.0		
White Sucker	1	0.0		

¹ 1993 panfish sample collected from only 10 net lifts.

Table 5. – Catch summary for electrofishing survey in Boulder Lake in 2021. Totals include recaptured individuals.

	2021 Spring

	Electrofishing ^a	
	24-May-2021	
	Total Catch	Catch per mile
Largemouth Bass	98	26
Smallmouth Bass	27	7
Bluegill	5	5
Pumpkinseed	1	1
Pumpkinseed x Bluegill	1	1
Rock Bass	2	2
Yellow Perch	12	12
Brook Trout	1	0.3
Brown Trout	1	0.3

^aGamefish collected for entire 3.8 miles shoreline. Panfish collected for two 1/2 mile stations.

Table 6. – Catch per mile for late spring electrofishing surveys in Boulder Lake, 1993 to 2021, Largemouth and Smallmouth Bass. 75th percentile for similar lake class for Largemouth Bass is 18/mile.

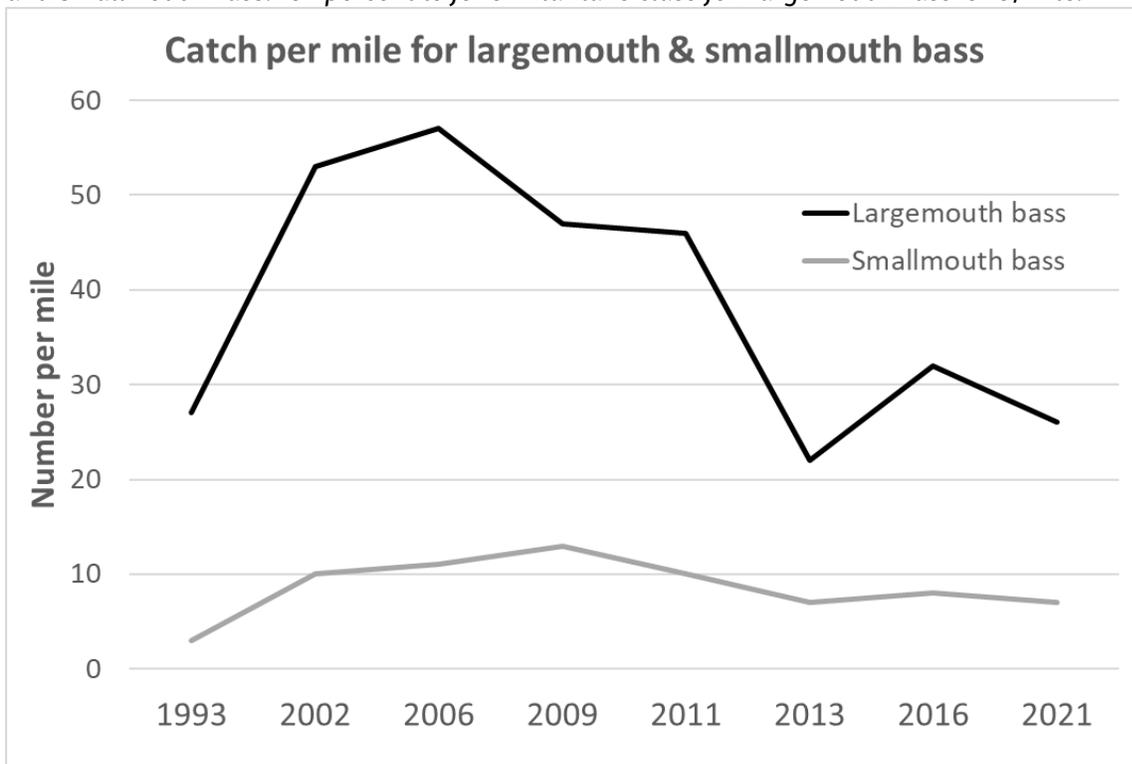
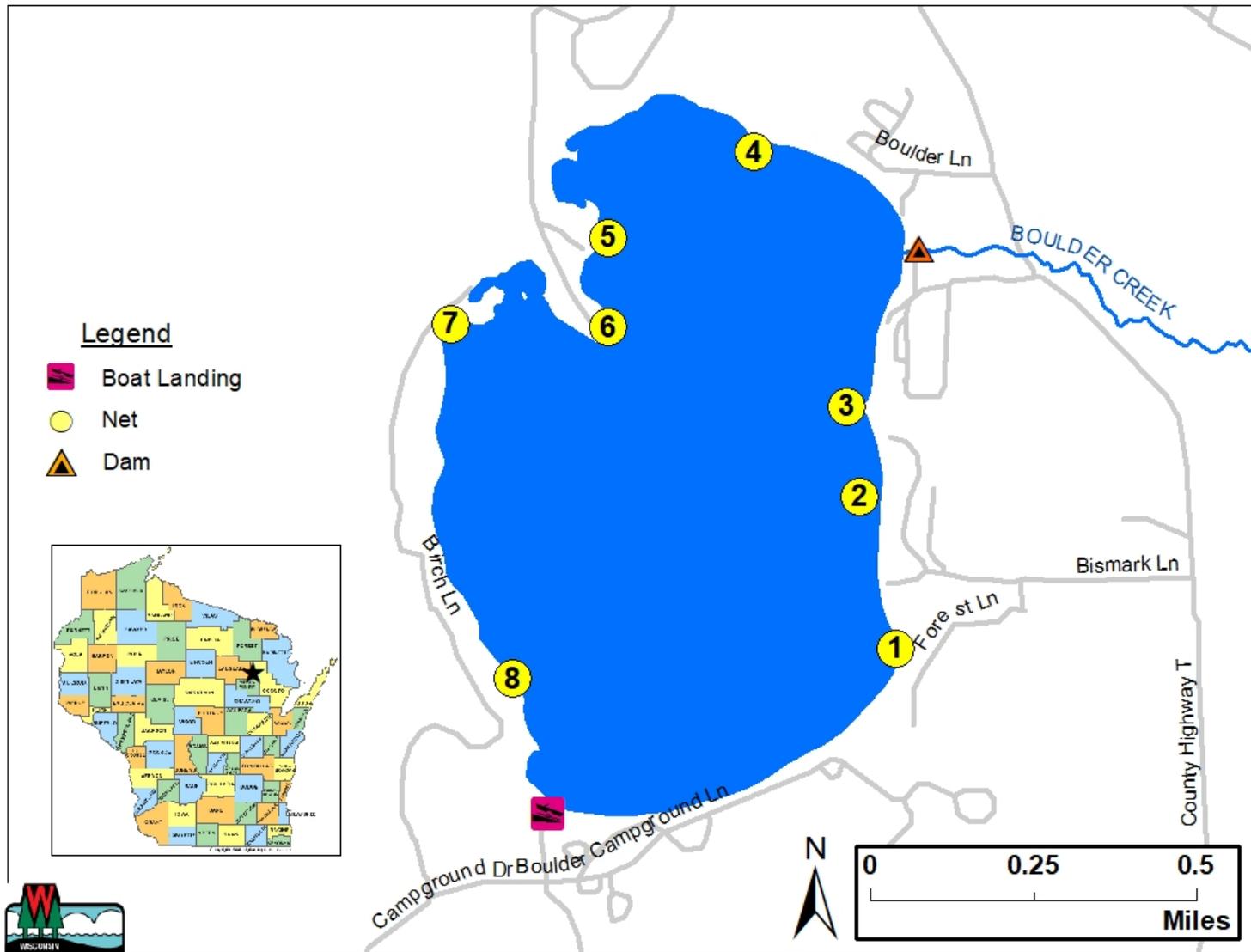


Figure 1. Locations of eight fyke nets on Boulder Lake, Oconto & Langlade County, 2021.



Date: 11/9/2021

Figure 2. – Bluegill length frequency distribution from Boulder Lake, 2021.

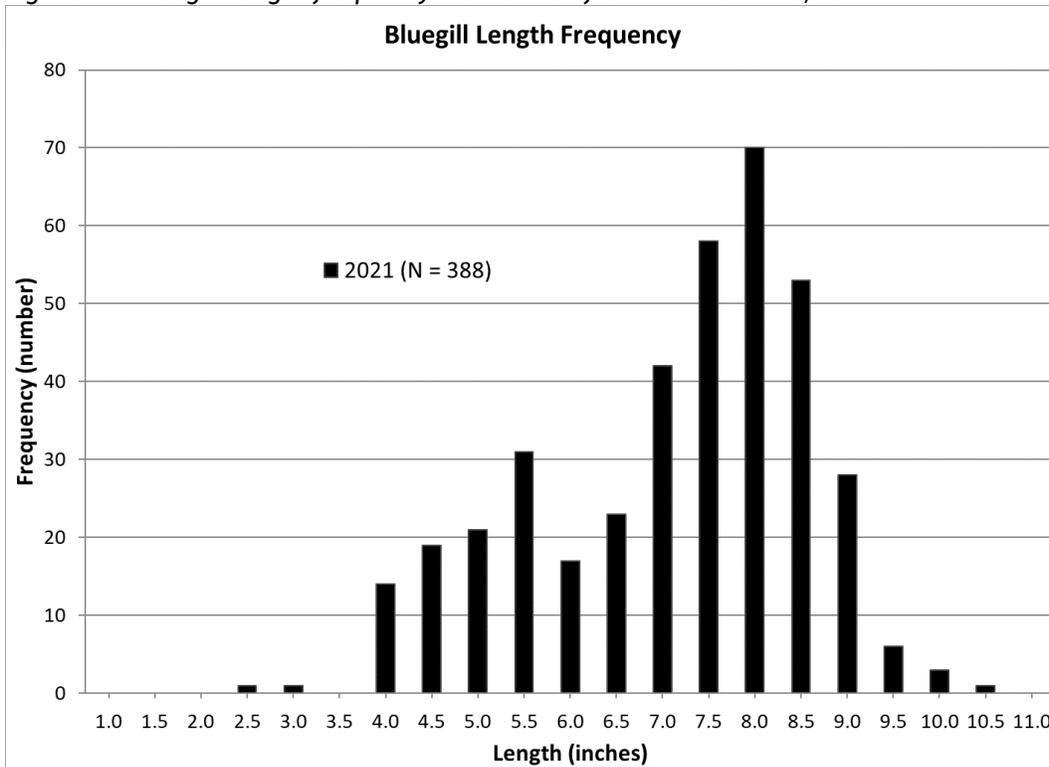


Figure 3. – Bluegill mean length at age from Boulder Lake in 2021, compared to northeast Wisconsin averages.

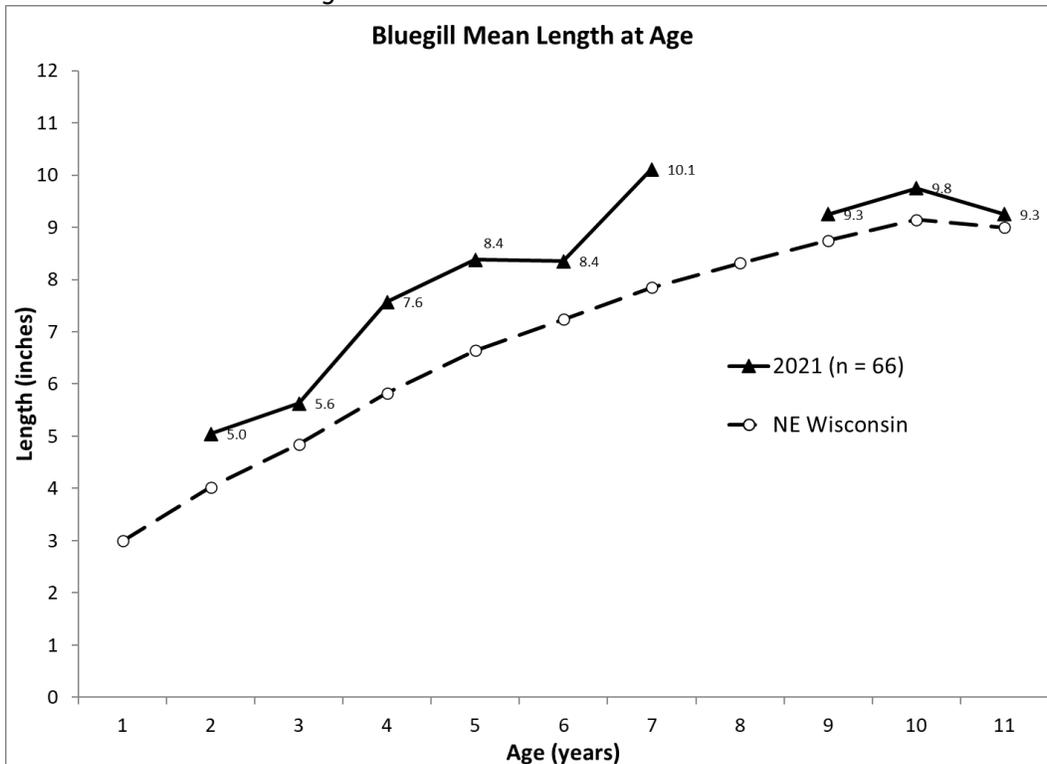


Figure 4. – Black Crappie length frequency distribution from Boulder Lake, 2021.

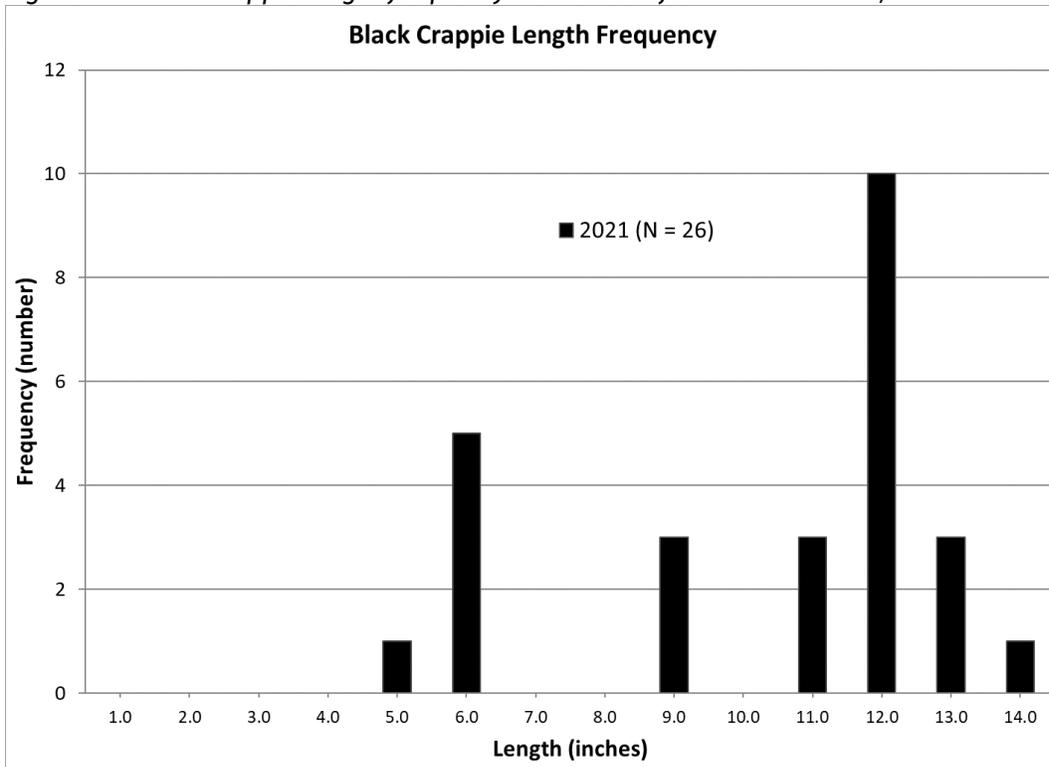


Figure 5. – Black Crappie mean length at age from Boulder Lake in 2021, compared to northeast Wisconsin averages.

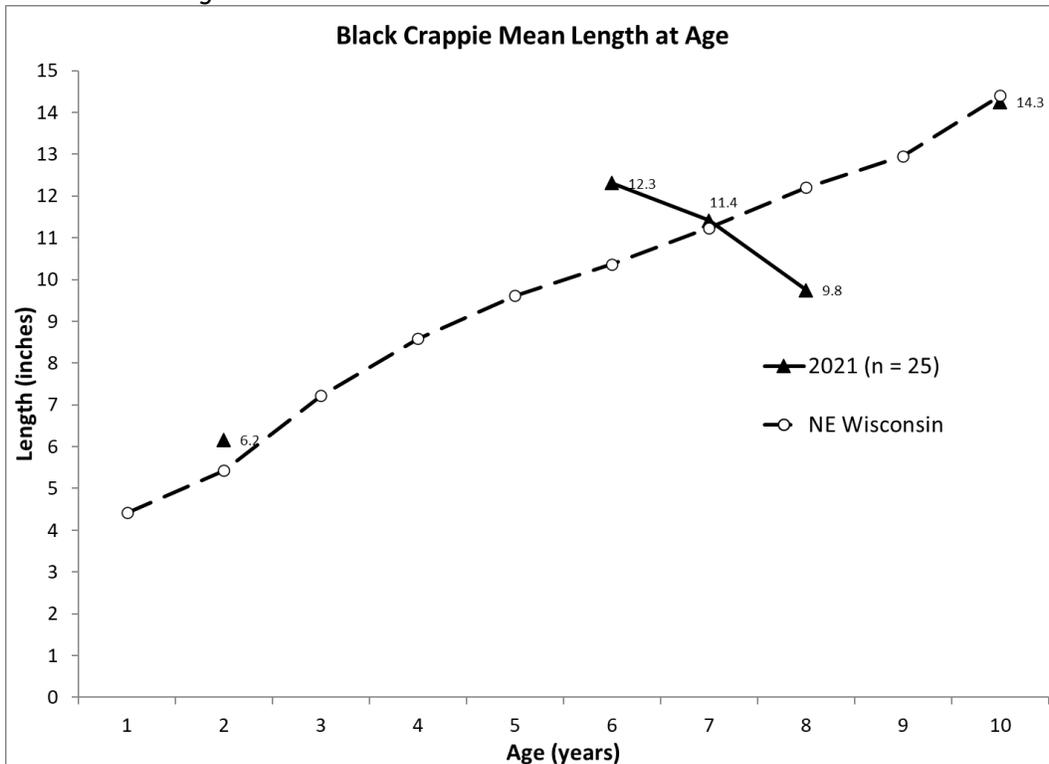


Figure 6. – Yellow Perch length frequency distribution from Boulder Lake, 2021.

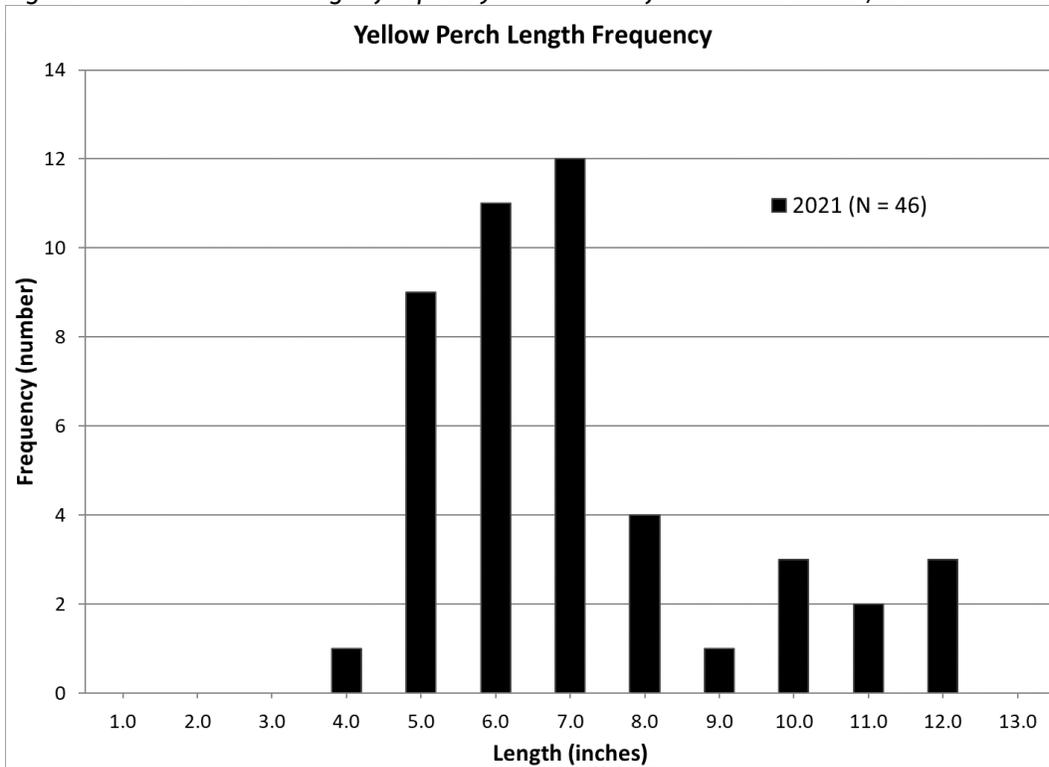


Figure 7. – Yellow Perch mean length at age from Boulder Lake in 2021, compared to northeast Wisconsin averages.

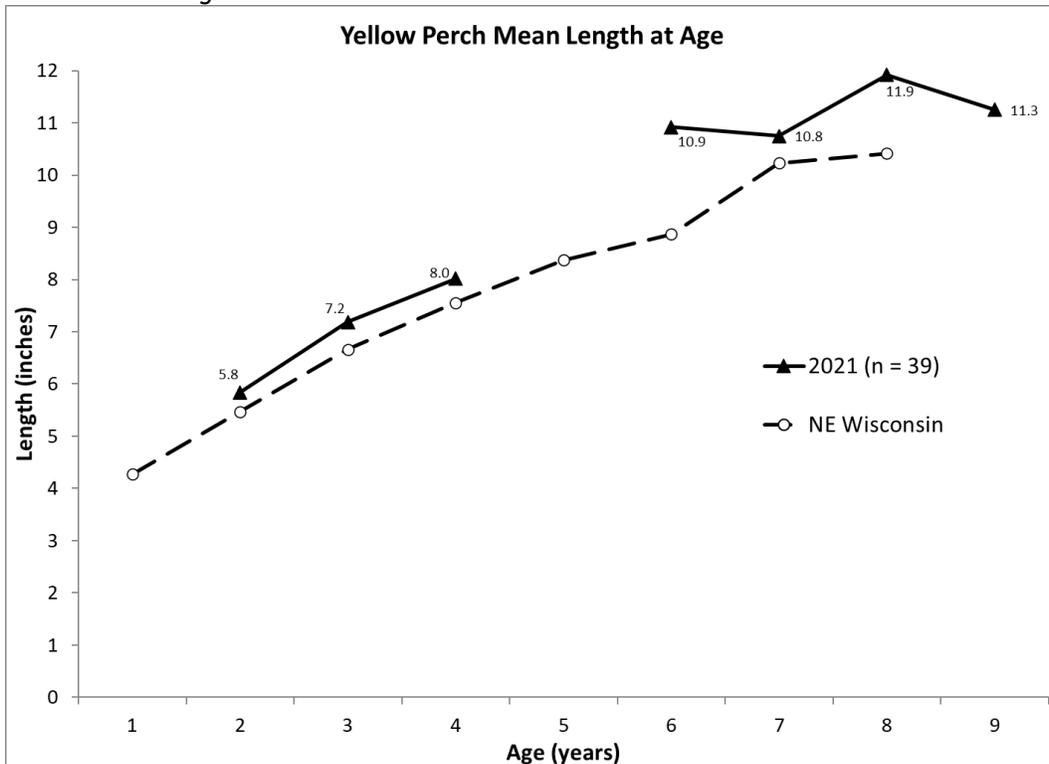


Figure 8. – Largemouth Bass length frequency distribution from Boulder Lake, 2021.

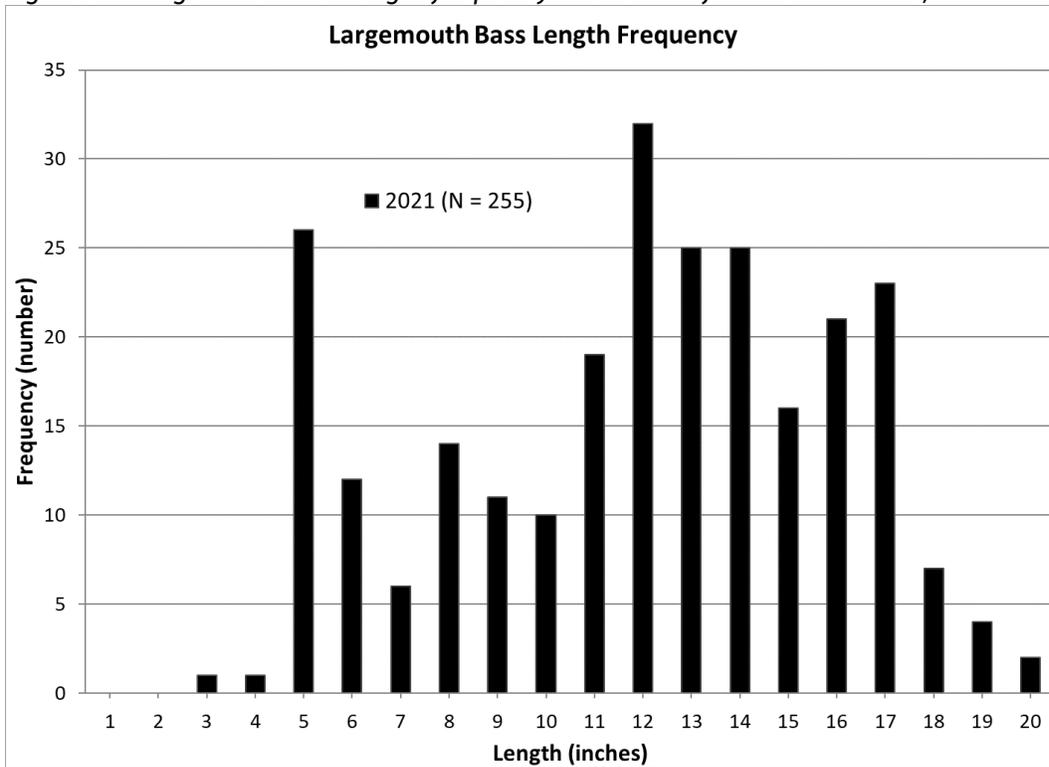


Figure 9. – Largemouth Bass mean length at age from Boulder Lake in 2021, compared to northeast Wisconsin averages.

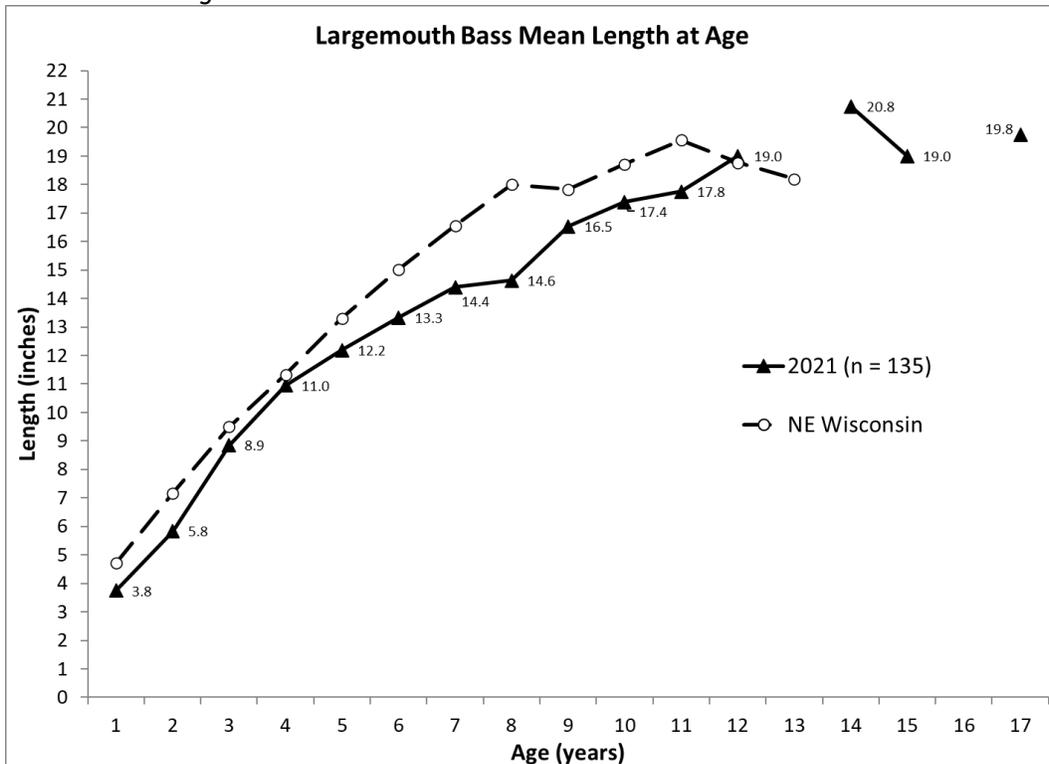


Figure 10. – Smallmouth Bass length frequency distribution from Boulder Lake, 2021.

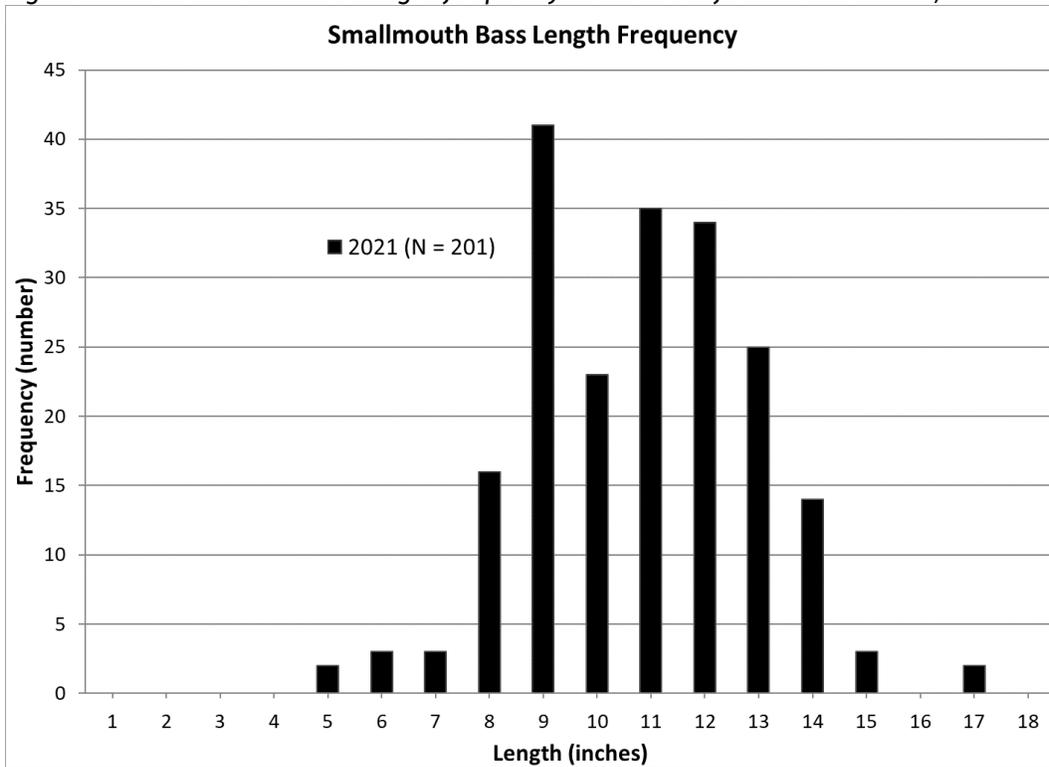


Figure 11. – Smallmouth Bass mean length at age from Boulder Lake in 2021, compared to northeast Wisconsin averages.

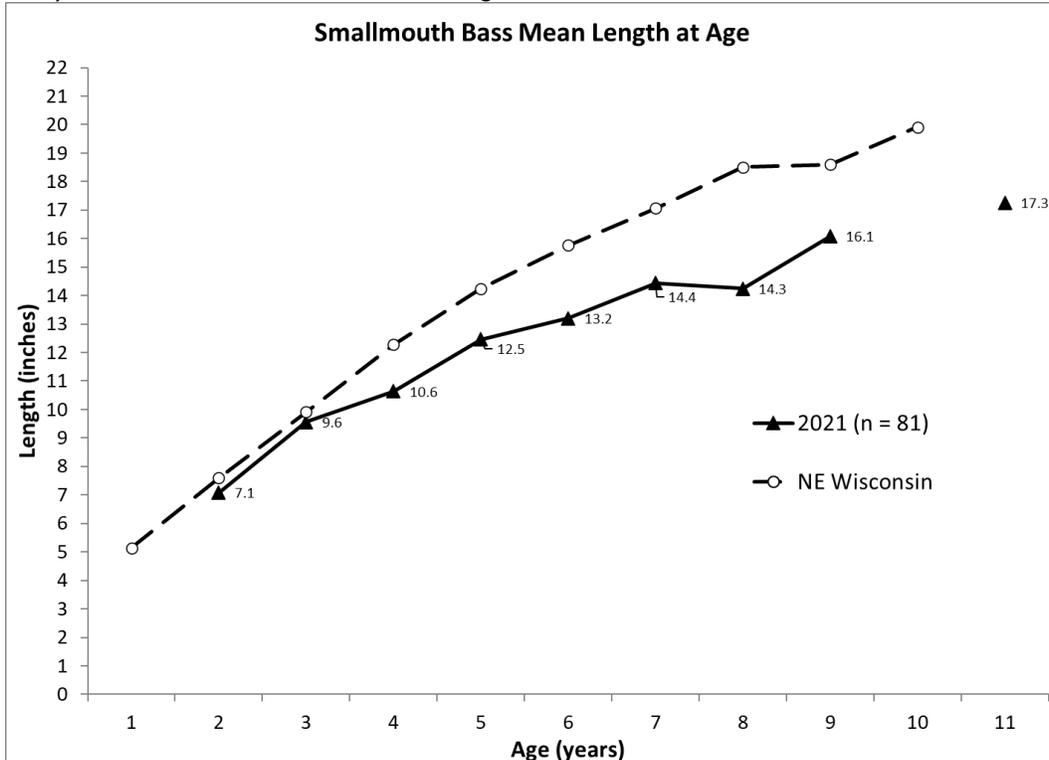


Figure 12. – Northern Pike length frequency distribution from Boulder Lake, 2021.

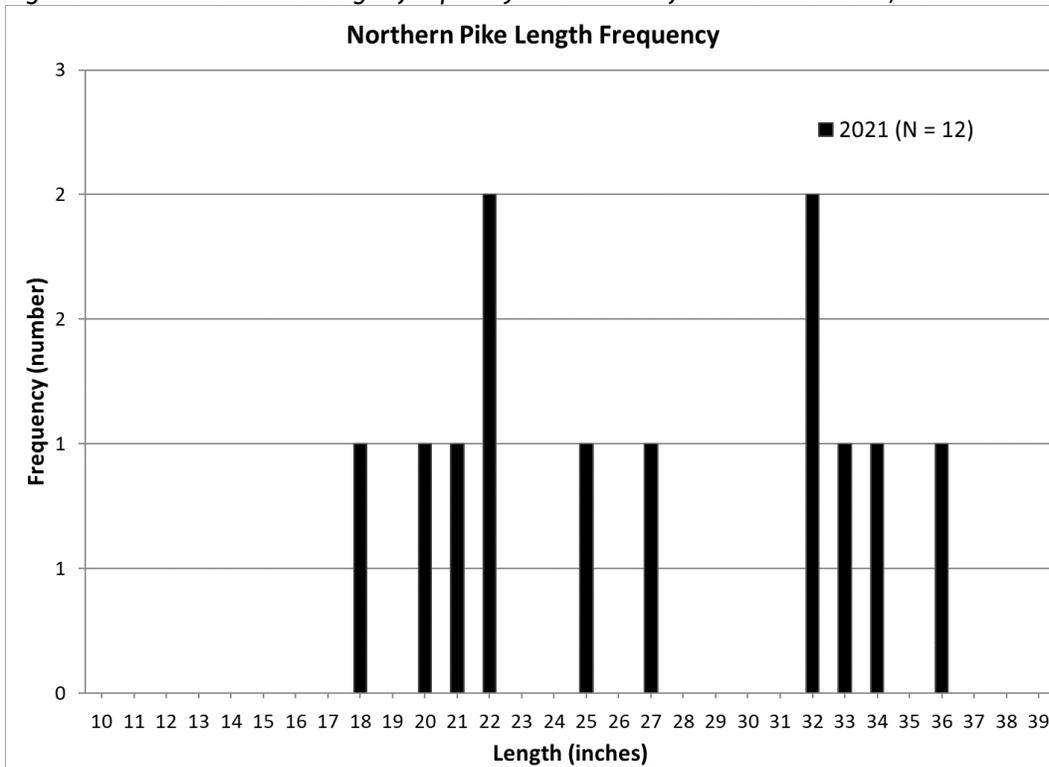
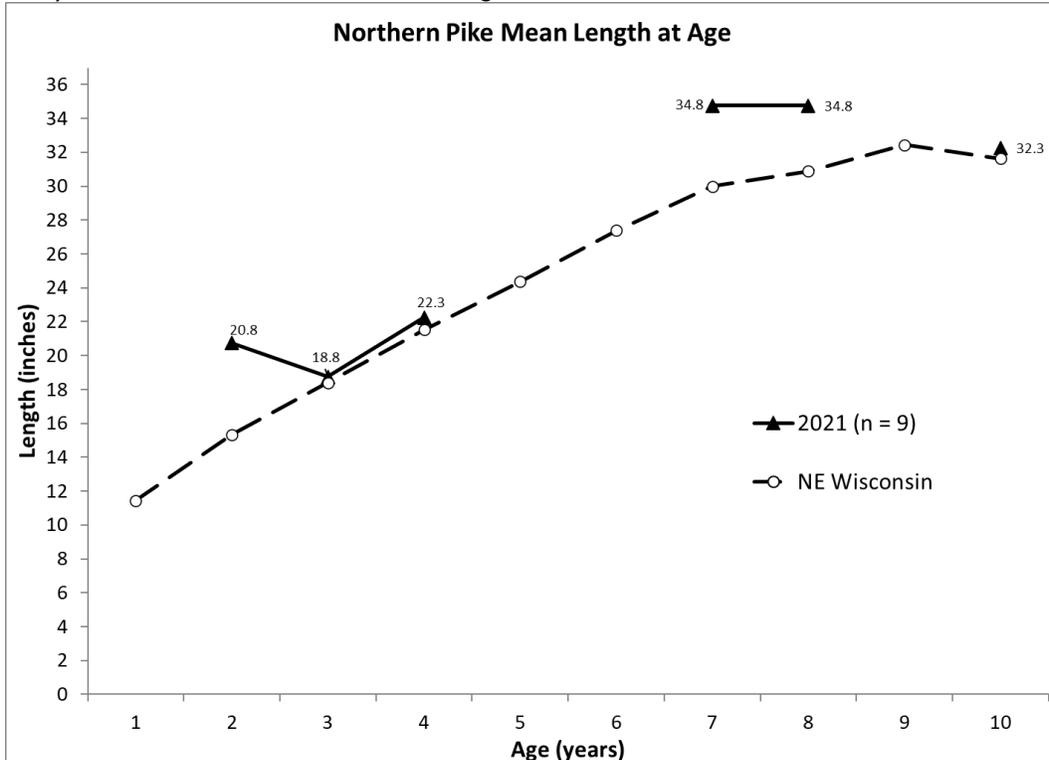


Figure 13. – Northern Pike length mean length at age from Boulder Lake in 2021, compared to northeast Wisconsin averages.



Appendix - Photos (photo credit: DNR staff)



The U.S. Forest Service operates the Boulder Lake campground on the south end of the lake next to the boat landing.



Boulder Lake shoreline with a fyke net set in the water.



Brook Trout captured in the nets.



The outlet dam flowing into Boulder Creek.



Old fish cribs on the bottom of Boulder Lake.



A net of large Bluegill.