

WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Townsend Flowage

2023 Fish Management Report

WBIC 465000



Photo Credit: WDNR

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Table of Contents

	Page
Executive Summary	iii
Introduction	1
Methods	3
Data Collection	3
Data Analysis	3
Results and Discussion	4
Bluegill	4
Black crappie	7
Northern pike	9
Largemouth bass	10
Walleye	12
Muskellunge	14
Conclusions and Recommendations	15
Literature Cited	17

Executive Summary

- Townsend Flowage is 476 acres and supports a diverse fishery made up of northern pike, muskellunge, largemouth bass, and various panfish species.
- Over 40% of the fish collected were bluegill. Bluegill abundance was good but size structure was poor. Dense aquatic vegetation throughout the flowage is a contributing factor to increased abundance and poor size structure.
- Black crappie accounted for 10% of the fish collected. Abundance was influenced by fish that likely came downstream from the 2023 stocking in Reservoir Pond. Crappie averaged 5.9 inches. Growth was below average.
- Overall, 219 northern pike were collected and averaged 20 inches. The biggest pike collected was 37 inches long. Pike abundance increased between 2016 and 2023 and is above the median fyke netting CPUE for lakes within its class (simple, warm, dark).
- Largemouth bass growth and size structure has remained stable. Bass averaged 12 inches long and the biggest was 19 inches long. Compared to other lakes, bass abundance is slightly lower but hasn't changed between 2016 and 2023.
- Despite alternate year walleye stockings at 15 large fingerlings per acre, walleye abundance was low. Only 28 fish were collected. As a result, WDNR will no longer stock large fingerling walleye since stocking is not creating a fishable population.
- Muskellunge have been stocked since 2009. Fyke net CPUE was the same in both 2016 and 2023. However more netting effort occurred in 2023 and subsequently more muskies were collected compared to 2016. However, due to low abundance, WDNR will no longer stock muskellunge in Townsend Flowage.
- A combination of aquatic vegetation management strategies should be considered (e.g. implementing spot treatments/selective treatments using both chemical and mechanical removals) to reduce abundance.
- The current fishing regulations are adequate to provide quality fishing opportunities for a variety of species. The next fisheries survey is scheduled for 2031.

Introduction

Townsend Flowage, located in northern Oconto County (T33N R15E Sec 15), is 476 acres and consists of 2 distinct basins. Townsend Flowage is considered a simple, warm, dark-water lake by classification. The fishery of is comprised of panfish species (bluegill, black crappie, pumpkinseed, yellow perch and rock bass) and gamefish species (walleye, largemouth bass, northern pike and muskellunge). Two streams were dammed to form the flowage: McCaslin Brook and Mosquito Creek. As a result, the flowage exhibits unique physical and chemical attributes (Table 1).

Table 1: Physical and Chemical Attributes for Townsend Flowage (DNR, 1977).

Surface acres:	476
Maximum depth (ft):	30
Average depth (ft):	9
Shoreline length (mi):	10.5
Lake type:	Drainage
Basic water chemistry:	hard water, slightly alkaline, stained water of moderate transparency.
Littoral substrate:	70% muck, 20% sand, 8% gravel and 2% rubble.
Aquatic vegetation:	Moderate to dense submergent vegetation many areas.
Other features:	This lake is highly developed with homes along the shoreline and is located within the Ceded Territory.

A 6-foot drawdown was conducted over the winter of 2012-2013 with the objective of reducing the abundance of aquatic vegetation. Problems with overabundant aquatic vegetation have been reported from homeowners and anglers since the 1960's. In 2002, the Townsend Lake Association began removing aquatic vegetation with a mechanical harvester whereas chemical treatments had been used annually since the 1970's. The most abundant aquatic plant is Bushy pondweed which inhabits approximately 62% of the flowage. Common waterweed was found to inhabit approximately 57% of the flowage (Roost 2006). The following is a current list of known aquatic invasive species in Townsend Flowage: Aquatic forget-me-not banded mystery snail, Chinese mystery snail, curly-leaf pondweed, and Eurasian watermilfoil (EWM).

Stocking of both walleye and muskellunge have occurred on a regular basis since the 1970's (Table 2). From 1998 to 2012 the Wisconsin Department of Natural Resources (DNR) stocked approximately 80,000 small and large fingerling walleyes. From 2009 to 2021 over 4,600 large fingerling muskellunge have also been stocked by the DNR.

Beginning in 2014, large fingerling walleye were stocked at the rate of 15/acre under the Wisconsin Walleye Initiative (WWI; Table 2). Townsend Flowage was also selected as a study lake for the WWI whereby fall electrofishing is conducted

annually to assess natural reproduction. In stocking years, electrofishing was completed before stocking so stocked walleye were not misidentified as fish naturally reproduced.

Table 2. Townsend Flowage walleye and muskellunge stocking history.

Year	Species	Strain Stock	Number Stocked	Average Length	Source Type
1972	WALLEYE	UNSPECIFIED	14080	3.0	DNR HATCHERY
1974	WALLEYE	UNSPECIFIED	18000	3.7	DNR HATCHERY
1976	WALLEYE	UNSPECIFIED	34000	3.0	DNR HATCHERY
1994	WALLEYE	UNSPECIFIED	450	6.0	PRIVATE HATCHERY
1998	WALLEYE	UNSPECIFIED	10000	1.2	DNR HATCHERY
2000	WALLEYE	UNSPECIFIED	10000	1.7	DNR HATCHERY
2003	WALLEYE	UNSPECIFIED	1250	8.5	PRIVATE HATCHERY
2003	WALLEYE	MISSISSIPPI HEADWATERS	10000	2.1	DNR HATCHERY
2005	WALLEYE	LAKE MICHIGAN	4760	7.4	DNR HATCHERY
2008	WALLEYE	MISSISSIPPI HEADWATERS	10044	1.4	DNR HATCHERY
2010	WALLEYE	LAKE MICHIGAN	10000	1.4	DNR HATCHERY
2012	WALLEYE	LAKE MICHIGAN	10000	1.5	DNR HATCHERY
2014	WALLEYE	LAKE MICHIGAN	6667	6.8	DNR HATCHERY
2016	WALLEYE	Upper Mississippi River	6704	7.6	DNR HATCHERY
2018	WALLEYE	MISSISSIPPI HEADWATERS	6668	6.4	DNR HATCHERY
2020	WALLEYE	LAKE MICHIGAN	6759	8.3	DNR HATCHERY
1973	MUSKELLUNGE	UNSPECIFIED	1800	11.0	DNR HATCHERY
1975	MUSKELLUNGE	UNSPECIFIED	640	11.0	DNR HATCHERY
1977	MUSKELLUNGE	UNSPECIFIED	1200	9.0	DNR HATCHERY
2009	MUSKELLUNGE	UPPER WISCONSIN RIVER	200	10.5	DNR HATCHERY
2011	MUSKELLUNGE	UPPER WISCONSIN RIVER	400	9.3	DNR HATCHERY
2012	MUSKELLUNGE	UPPER WISCONSIN RIVER	400	10.2	DNR HATCHERY
2013	MUSKELLUNGE	UPPER WISCONSIN RIVER	476	9.7	DNR HATCHERY
2014	MUSKELLUNGE	UPPER WISCONSIN RIVER	400	9.8	DNR HATCHERY
2015	MUSKELLUNGE	UPPER WISCONSIN RIVER	400	11.4	DNR HATCHERY
2016	MUSKELLUNGE	UPPER WISCONSIN RIVER	399	10.9	DNR HATCHERY
2017	MUSKELLUNGE	UPPER WISCONSIN RIVER	251	10.7	DNR HATCHERY
2018	MUSKELLUNGE	UPPER WISCONSIN RIVER	400	11.8	DNR HATCHERY
2019	MUSKELLUNGE	UPPER WISCONSIN RIVER	440	12.0	DNR HATCHERY
2021	MUSKELLUNGE	GREAT LAKES SPOTTED	887	10.5	DNR HATCHERY

The last comprehensive fisheries survey of Townsend Flowage, completed in 2016, included spring fyke netting (SN1) for walleye/muskellunge/northern pike and late spring electrofishing (SE2) for gamefish and panfish.

The primary goal of the 2023 comprehensive fisheries survey was to estimate walleye, musky, and northern pike abundance and evaluate size structure during spring fyke netting (SN1). We also assessed the status of other species by

characterizing relative abundance, proportional stock density (PSD), relative stock density (RSD), catch per unit effort (CPUE) and mean length at capture (age and growth) during late spring electrofishing (SE2).

Methods

Data Collection

Standard fyke nets (3-foot hoop, $3/4$ -bar, 1.5-inch stretch) were tended from April 18 to April 29, 2023 (SN1). The spring fyke netting survey (SN1) began before ice out in the channel downstream of the Reservoir Pond dam. Netting effort expanded into the flowage as the ice receded. The primary objective for this sampling period was to capture, measure, and mark adult walleye for use in estimating their abundance. The secondary objective is to measure and mark northern pike and musky.

A standard WDNR electrofishing boat was used on May 16, 2023 (SE2) to count and measure adult gamefish (e.g. bass) and panfish. Two, 2-mile shoreline segments were surveyed. Each 2-mile segment had 2 stations: a 1.5-mile gamefish station and a 0.5-mile gamefish/panfish station.

All fish collected were measured to the nearest 0.1-inch (in) total length (TL). A sub-sample of scales, dorsal spines, or anal fin rays was collected for age and growth analysis from all gamefish. Aging structures from target species were collected from 5 fish per half inch group in the stock, quality and preferred length groups. Ages were assigned to each fish using standard DNR procedures.

Data Analysis

Catch per unit effort (CPUE) was calculated as catch by gear divided by sampling effort for each species collected. Length frequency distributions were tabulated from fish measured during the electrofishing and fyke net samples; not all panfish were measured. Proportional stock density (PSD) and relative stock density for preferred length fish (RSD^P) were calculated for dominant gamefish (Anderson and Neumann 1996). Preferred lengths of various gamefish have a minimum length between 45 and 55% of the world record length for that species (Anderson and Neumann 1996). Stock, quality, and preferred lengths were used as proposed by Gabelhouse (1984). Mean length at capture data was calculated for dominant gamefish and compared to the average of mean length at age for northern Wisconsin, previous survey data from Townsend Flowage and statewide lake class data.

Results and Discussion

Overall, 2,117 fish representing 12 species and were collected during the 2023 sampling season (Table 3). The five most abundant species collected by number were bluegill *Lepomis macrochirus* (40%), black crappie *Pomoxis nigromaculatus* (23%), northern pike *Esox lucius* (10%), pumpkinseed *Lepomis gibbosus* (7%) and yellow bullhead *Ameiurus natalis* (6%).

Table 3. Species composition of fishes collected during the 2023 comprehensive survey of Townsend Flowage, Oconto County, WI.

2023						
SPECIES COMPOSITION OF FISHES COLLECTED						
*COMMON NAME	TOTAL NUMBER COLLECTED	PERCENT	NUMBER COLLECTED (FN)	AVERAGE LENGTH (inches)	NUMBER COLLECTED (SE2 - EF)	AVERAGE LENGTH (inches)
Bluegill	838	40%	586	4.9	252	4.4
Black crappie	478	23%	465	5.8	13	6.1
Northern pike**	219	10%	207	19.8	12	21.9
Pumpkinseed	154	7%	111	4.8	43	5.0
Yellow bullhead	118	6%	107	10.0	11	-
Largemouth bass	116	5%	10	13.6	106	11.5
Rock bass	65	3%	54	6.2	11	7.0
Hybrid sunfish	44	2%	38	5.5	6	6.3
Walleye**	37	2%	28	21.9	9	16.3
Yellow perch	33	2%	28	6.1	5	4.5
Muskellunge	10	0.5%	9	39.6	1	19.0
White sucker	3	0.1%	1	-	2	-
Golden shiner	2	0.1%			2	5.5
TOTALS	2,117		1,644		473	

* Common names of fishes recognized by the American Fisheries Society.

** Recaptures included

Bluegill

A total of 252 bluegill was collected electrofishing (Table 3 and Figure 1). Bluegill averaged 4.4 inches from the electrofishing sample. Eleven percent of the bluegill collected electrofishing were 6 inches or greater and considered harvestable (Figure 1). Electrofishing (EF) CPUE decreased from 345 to 252 bluegill/mile (mi) between 2016 and 2023 (Figure 2). However, bluegill CPUE is well above the 75th percentile for lakes within its classification (simple, warm, dark; Figure 2). Bluegill RSD^P from the electrofishing sample was 0 in both 2016 and 2023 and PSD decreased from 14 to 7 between surveys.

A total of 586 bluegill was collected fyke netting (Figure 3). Bluegill averaged 4.9 inches from the fyke netting sample. Fyke netting CPUE declined from 9.1 bluegill/net night (NN) in 2016 to 8.4/NN in 2023 however, more netting effort occurred in 2023 (70 NN) than in 2016 (50 NN).

A subsample of 16 bluegill was aged from 3 to 10 years old. Bluegill growth was average compared to the mean length at age in northern Wisconsin and for lakes within its class (Figure 4). Bluegill were reaching 6 inches in length by age 6 (Figure 4).

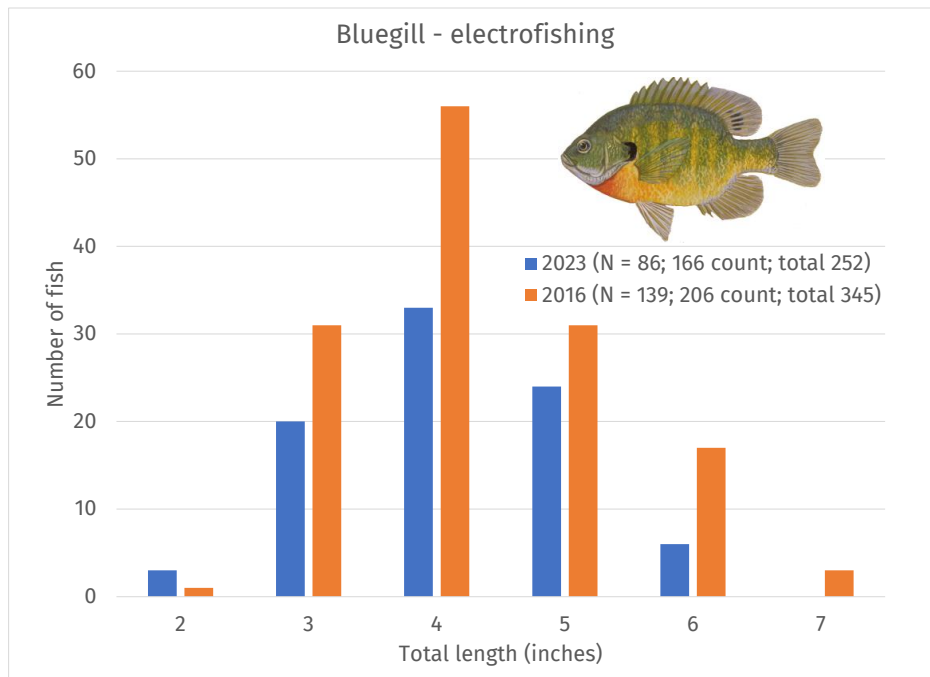


Figure 1. Length frequency of bluegill collected during SE2 electrofishing on Townsend Flowage, Oconto County, WI.

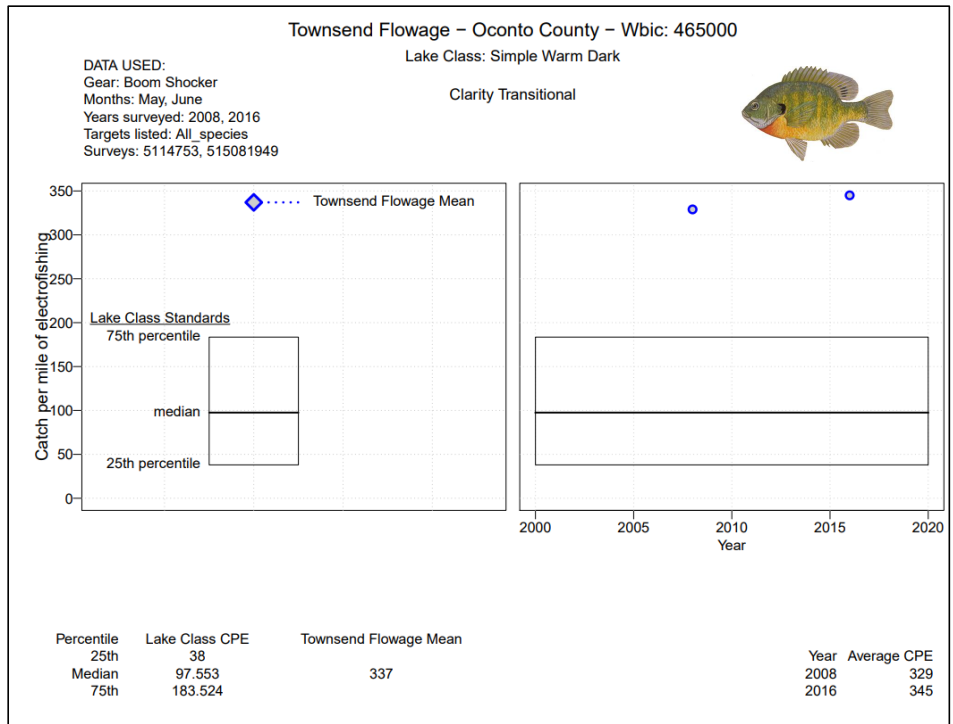


Figure 2. Lake classification bluegill electrofishing CPUE for Townsend Flowage, Oconto County, WI.

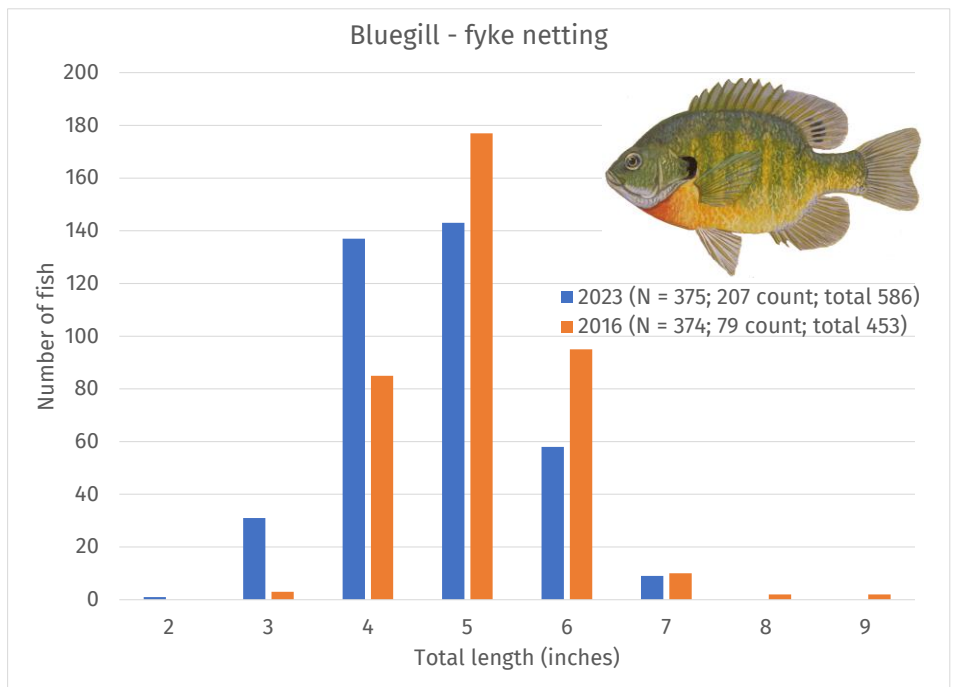


Figure 3. Length frequency of bluegill collected during spring fyke netting on Townsend Flowage, Oconto County, WI.

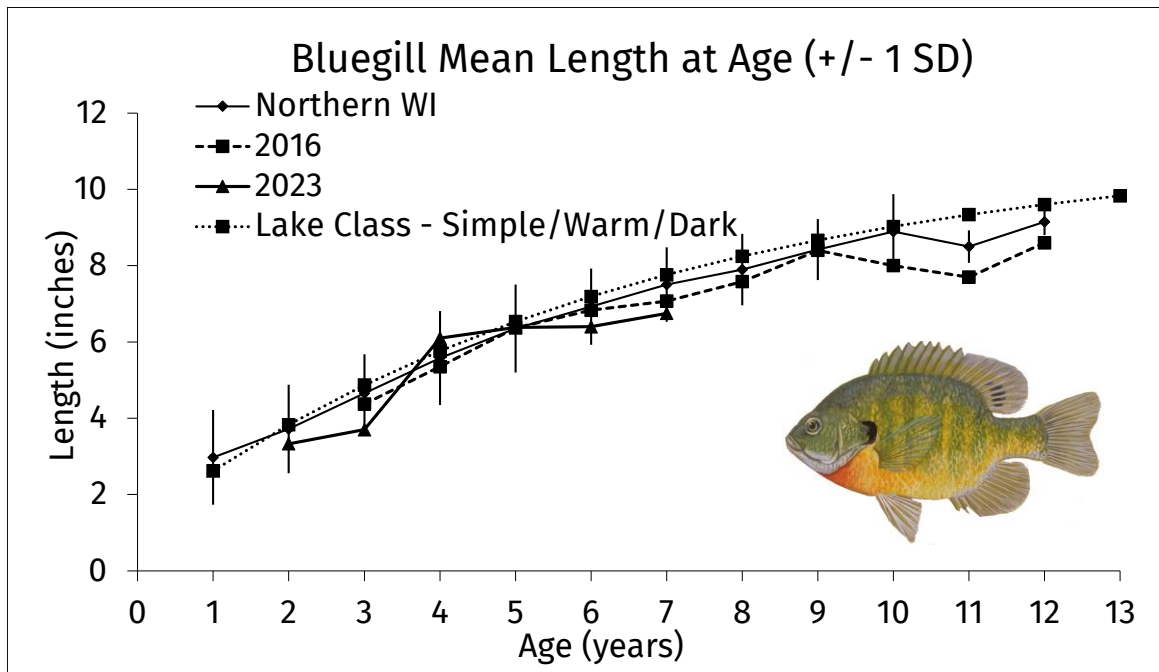


Figure 4. Mean length at age of bluegill from Townsend Flowage, Oconto County, WI.

Black crappie

A total of 13 black crappie was collected electrofishing (Table 3). Crappie averaged 6.1 inches from the electrofishing sample. Electrofishing (EF) CPUE increased from 4 to 13 crappie/mile (mi) between 2016 and 2023.

A total of 465 black crappie was collected fyke netting (Figure 5). Crappie ranged in length from 4 to 13 inches and averaged 5.8 inches from the fyke netting sample. Fyke netting CPUE increased from 2.8 crappie/net night (NN) in 2016 to 6.6/NN in 2023 however, more netting effort occurred in 2023 (70 NN) than in 2016 (50 NN).

The collection of numerous 4 and 5-inch black crappie suggest that the 2022 fall stocking of 1,750 fish Reservoir Pond (upstream flowage) could have influenced the 2023 fyke netting CPUE (Figure 5). It will be several years before these fish are considered harvestable (8 inches) by anglers.

A subsample of 19 black crappie was aged and ranged from 3 to 12 years old (Figure 4). Crappie were reaching 8 inches by age 7 and growth was below average at all ages compared to the mean length at age of crappie in northern Wisconsin and for lakes within its class (Figure 6).

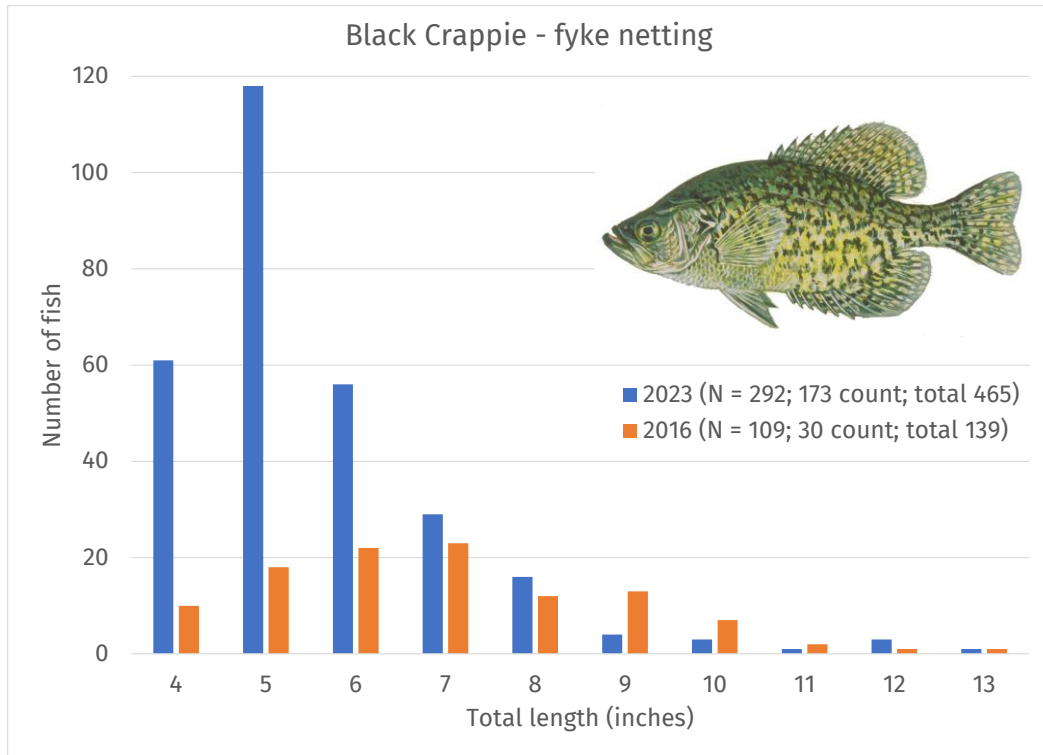


Figure 5. Length frequency of black crappie collected during spring fyke netting on Townsend Flowage, Oconto County, WI.

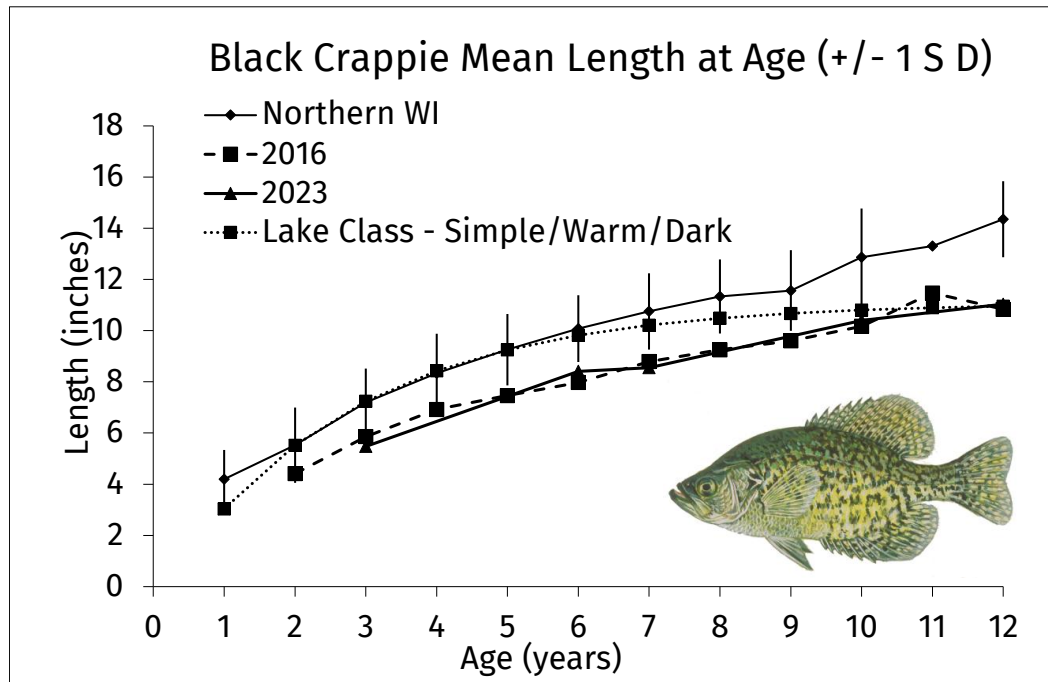


Figure 6. Mean length at age of black crappie from Townsend Flowage, Oconto County, WI.

Northern pike

Northern pike accounted for 10% of the fish collected (219 total). Pike ranged in length from 8 to 37 inches (Figure 7). The average length of pike decreased between 2016 and 2023 from 21.6 inches to 19.8 inches. Fyke netting CPUE increased from 2.4/NN in 2016 to 3.0/NN in 2023 despite increased netting effort and was greater than the median CPUE for lakes within its class (Figure 8). The collection of more small pike (< 20 inches) in 2023 decreased the average length of pike between surveys. Overall, northern pike relative abundance has increased, size structure has remained stable, and reproduction is adequate to sustain the population. No pike were aged from this survey and due to the lack of recaptures during fyke netting, it was not possible to generate a population estimate.

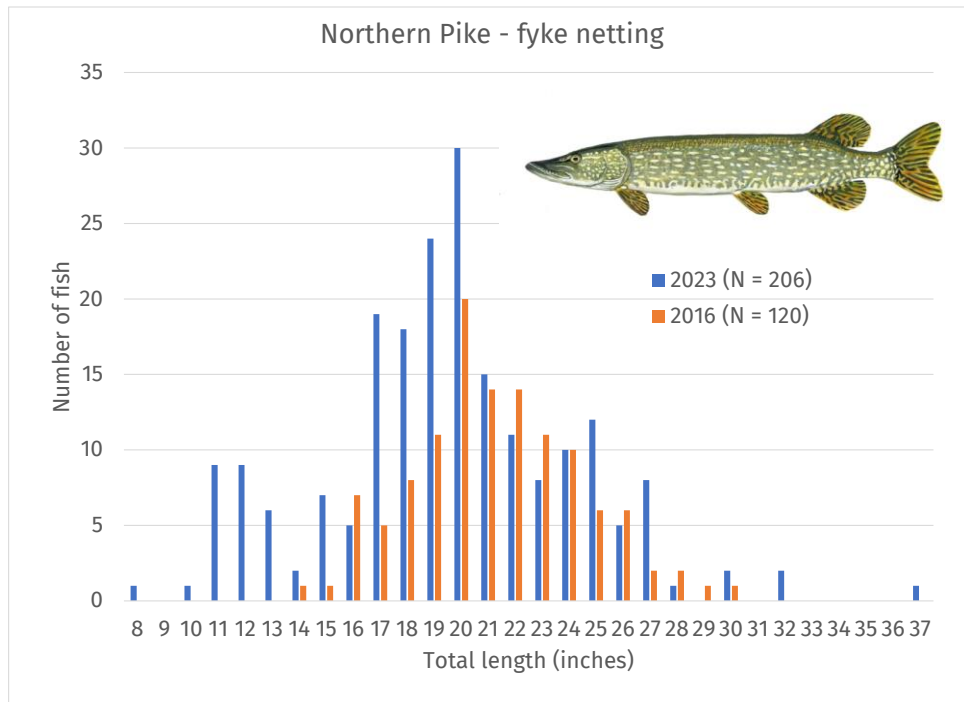


Figure 7. Length frequency of Northern Pike collected during spring fyke netting in 2016 and 2023 from Townsend Flowage, Oconto County, WI.

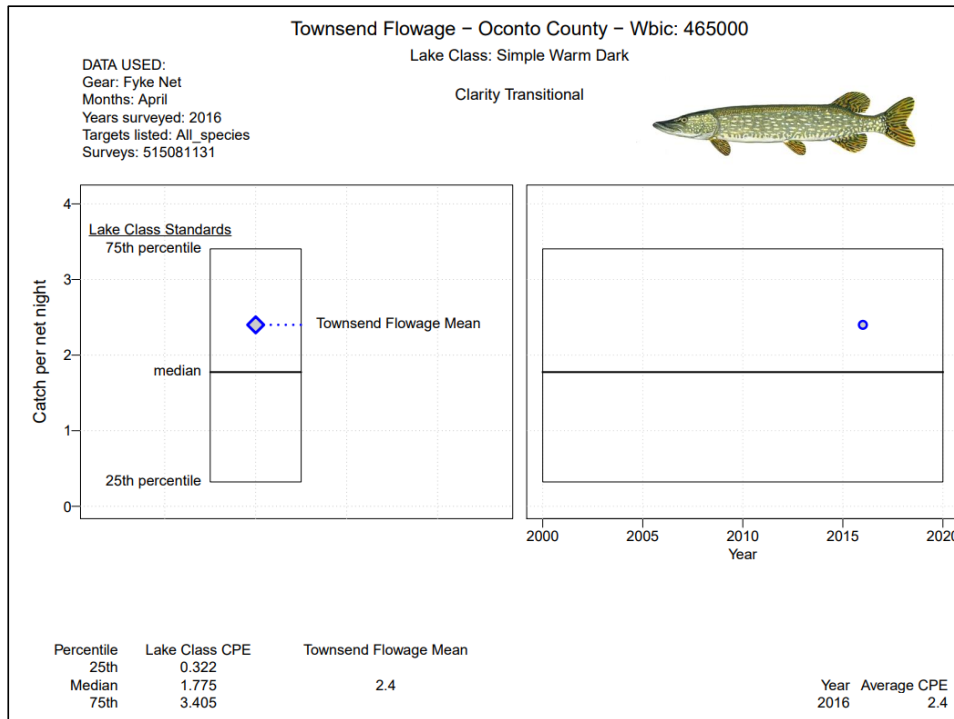


Figure 8. Lake classification northern pike fyke netting CPUE for Townsend Flowage, Oconto County, WI.

Largemouth bass

Largemouth bass *Micropterus salmoides* were the second most abundant predator species collected during the 2023 survey (Table 2). Overall, 106 largemouth bass were collected during the electrofishing survey and ranged in length from 5 to 19 inches and averaged 11.5 inches (Figure 9). PSD declined from 60 to 54 between 2016 and 2023. However, RSD^P increased slightly from 18 to 25 between surveys. The increase in RSD^P in 2023 can be attributed to more largemouth bass collected that were 15 inches and larger (Figure 9). Electrofishing CPUE was essentially the same between 2016 (25 bass/mile) and 2023 (27 Bass/mile) which is slightly below the median CPUE for lakes within its class (Figure 10).

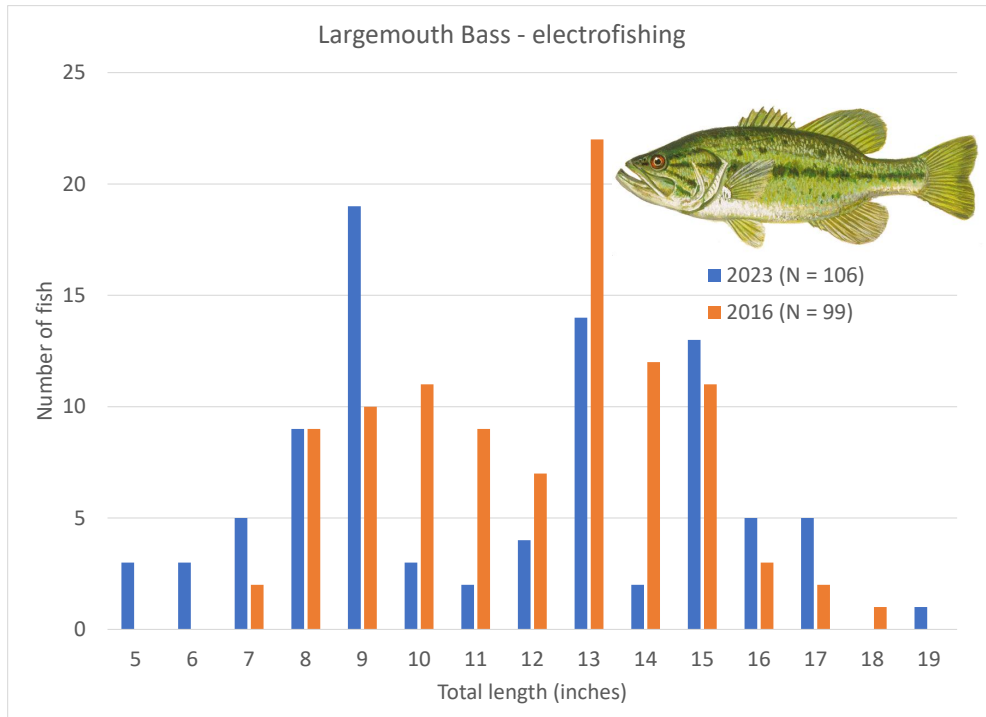


Figure 9. Length frequency of largemouth bass collected during 2016 and 2023 SE2 electrofishing surveys from Townsend Flowage, Oconto County, WI.

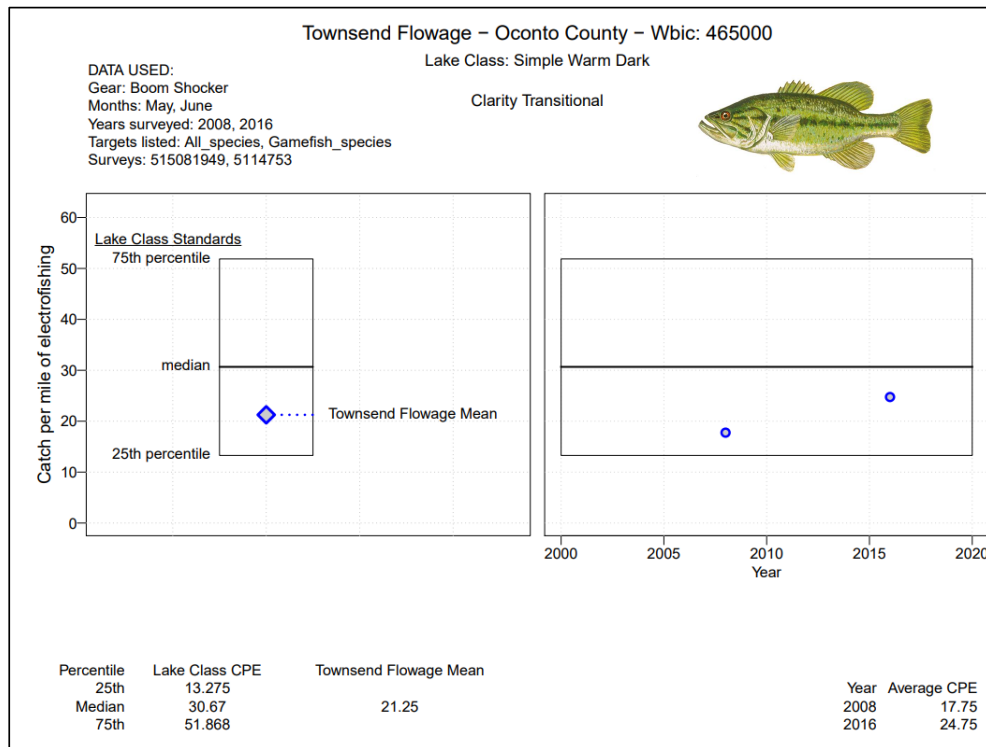


Figure 10. Lake classification largemouth bass electrofishing CPUE for Townsend Flowage, Oconto County, WI.

A subsample of 26 largemouth bass was aged using scales (<12”) and dorsal spines (>12”). Ages ranged from 2 to 11 years old. Largemouth bass growth was average until age 7 but below average at older ages compared to the mean length at age of largemouth bass in northern Wisconsin and for lakes within its class (Figure 11). Largemouth bass were reaching 14 inches at age 7. Good year classes of largemouth bass were present indicating successful reproduction and recruitment.

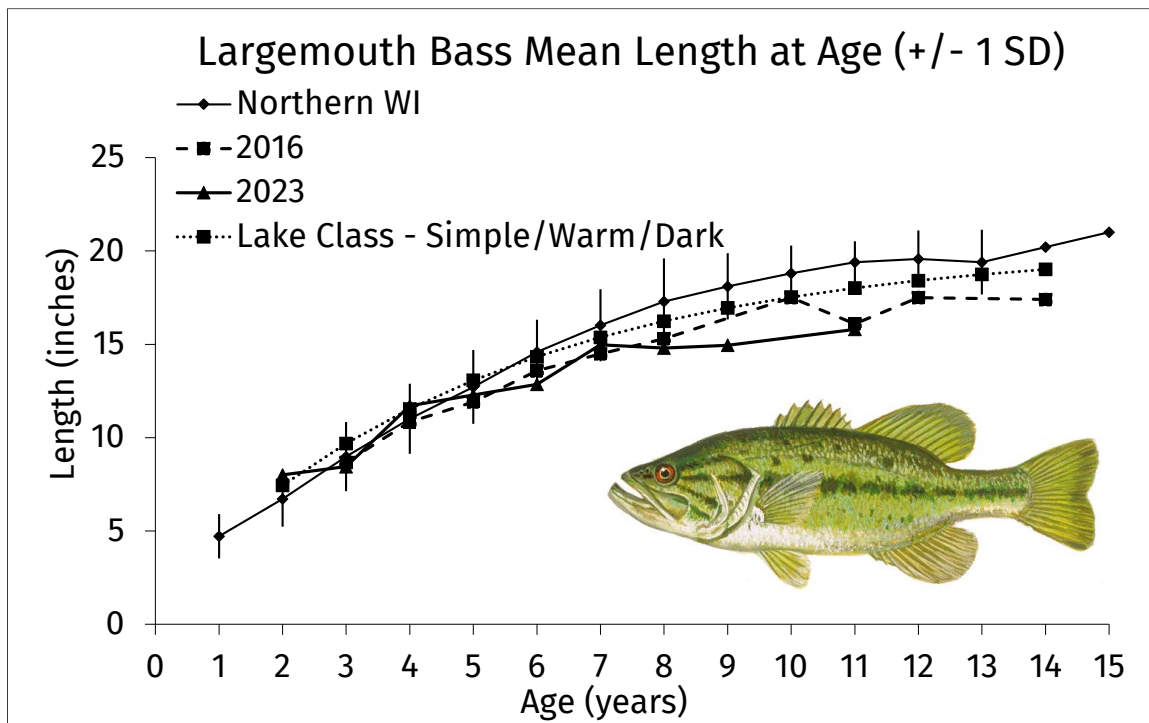


Figure 11. Mean length at age of Largemouth Bass from 2016 and 2023 surveys from Townsend Flowage, Oconto County, WI.

Walleye

Twenty-eight walleye *Sander vitreus* were collected during the spring fyke netting survey (Table 2). Walleye collected in fyke nets ranged in length from 14 to 25 inches and averaged 21.9 inches (Figure 12). Spring fyke netting CPUE increased from 0.2/NN in 2016 to 0.4/NN in 2023. The median fyke netting CPUE for walleye in simple, warm, dark lakes is 0.4 (Figure 13). Despite walleye stocking and sampling efforts, an adult walleye population estimate was not possible due to the small sample size and lack of recaptures. The fall walleye recruitment electrofishing survey was canceled since adult density could not be established. Only 2 Walleye were aged. Both fish were 5 years old and averaged 19.8 inches in length.

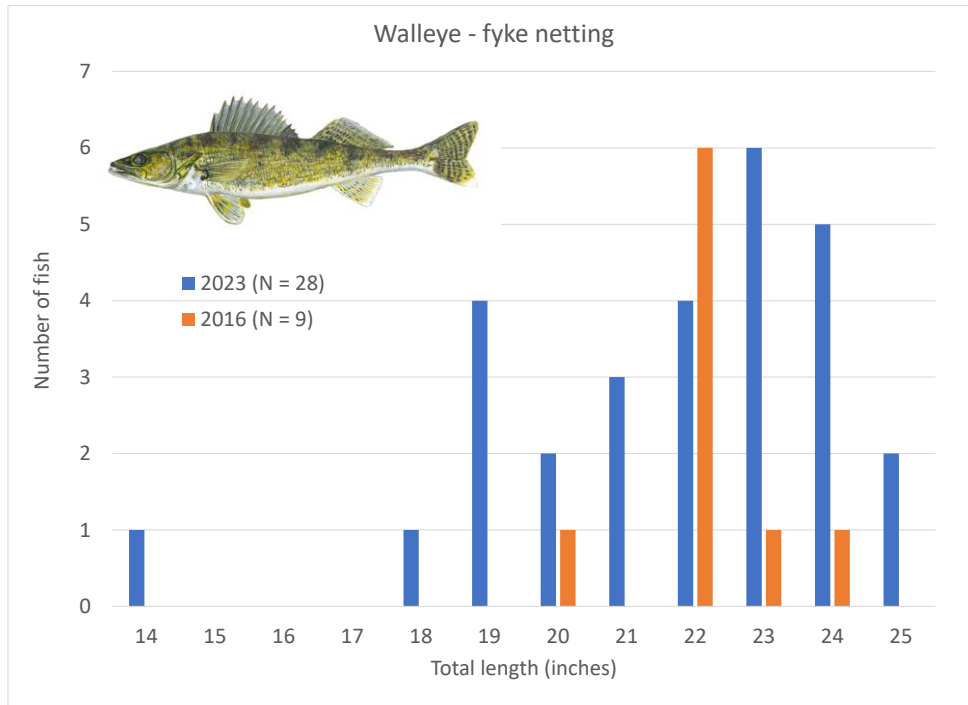


Figure 12. Length frequency of walleye collected during 2016 and 2023 surveys from Townsend Flowage, Oconto County, WI.

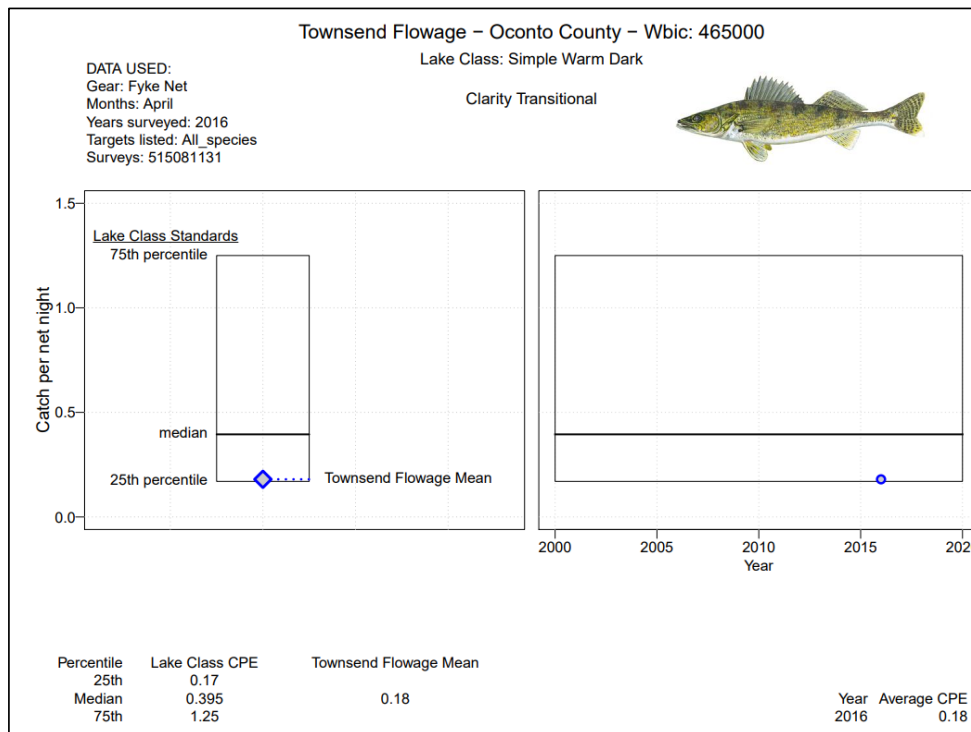


Figure 13. Lake classification walleye fyke netting CPUE for Townsend Flowage, Oconto County, WI.

Muskellunge

Muskellunge *Esox masquinongy* have been stocked in Townsend Flowage on a regular basis since 2009 (Table 2). In 2023, 10 muskies were collected and ranged in length from 35 to 44 inches (Figure 10). Fyke netting CPUE was 0.1 musky/NN in both 2016 and 2023 which is the same as other lakes in its classification (simple, warm, dark; Figure 15).

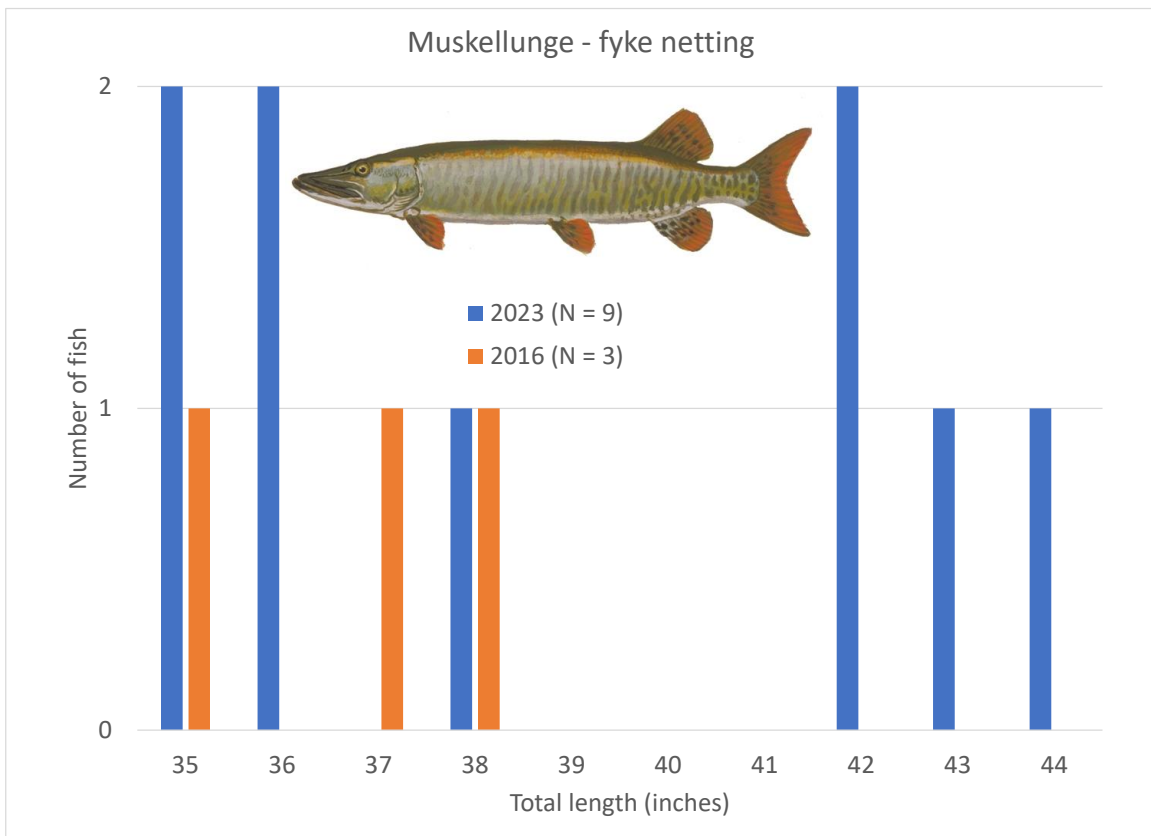


Figure 14. Length frequency of Muskellunge collected during 2016 and 2023 surveys from Townsend Flowage, Oconto County, WI.

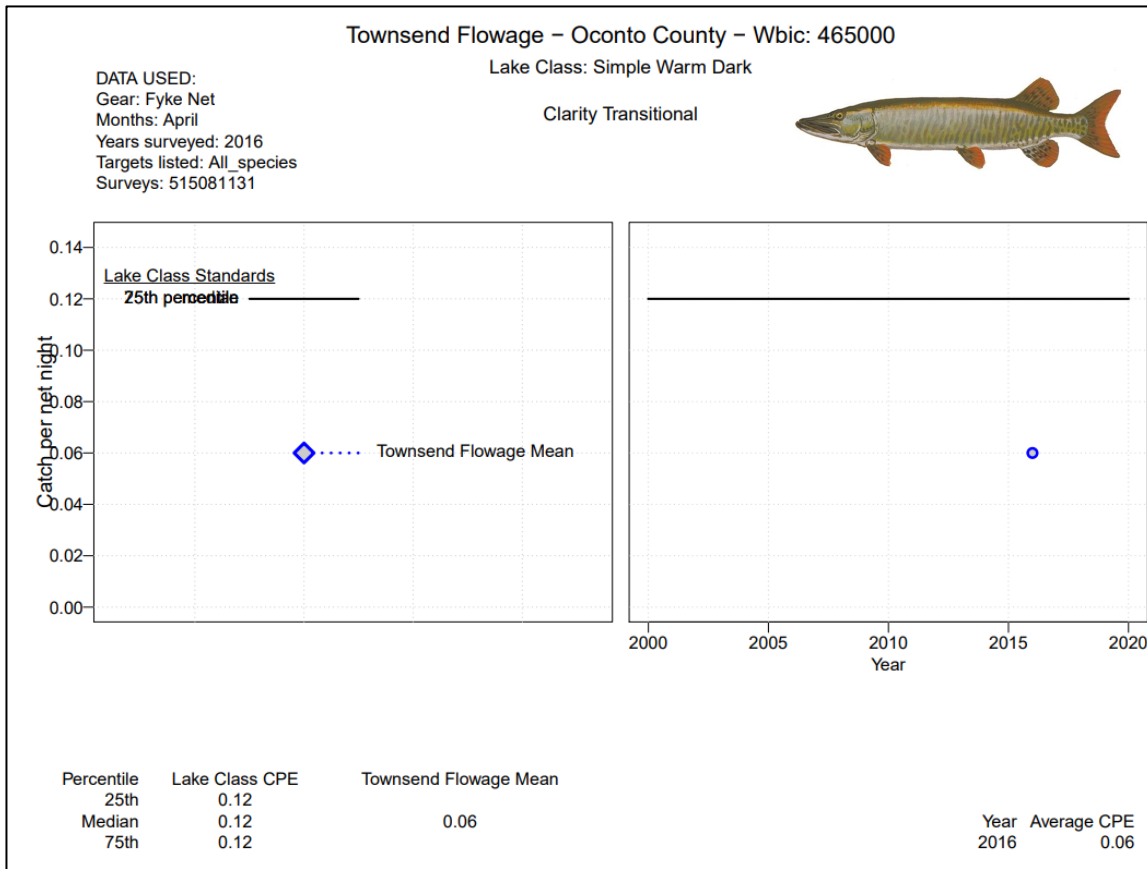


Figure 15. Lake classification muskellunge fyke netting CPUE for Townsend Flowage, Oconto County, WI.

Additionally, pumpkinseed, rock bass *Ambloplites rupestris*, yellow perch *Perca flavescens*, golden shiner *Notemigonus crysoleucas* and yellow bullhead *Ameiurus natalis* were collected and accounted for about 18% of the total number of fish collected during the 2023 fish survey in Townsend Flowage (Table 2).

Conclusions and Recommendations

Townsend Flowage provides a good fishing opportunity for a variety of species. Bluegill abundance declined but is still above the 75th percentile for this lake class however, size structure is poor. The amount of aquatic vegetation present in Townsend Flowage provides dense cover for panfish and forage fish species to hide which can potentially lead to increased abundance and stunting due to slower than optimal growth. Dense vegetation also prevents sight predators including largemouth bass and northern pike, from being effective at ambushing their prey which may also contribute to poor growth and overabundance of

panfish. Additionally, collecting fish in dense vegetation is difficult and often samples may not be representative of the entire population.

Large fingerling walleye stocking was initiated in 2014. The stocking rate of large fingerling walleye has been 15/acre in alternate years (Table 1). However, there has been only a slight improvement in adult walleye density between 2016 and 2023. Therefore, WDNR will no longer stock large fingerling walleye in Townsend Flowage since survival appears to be low and adult density is less than the threshold of 1.5 adults/acre for establishing a fishable population.

Largemouth bass electrofishing CPUE remained consistent between 2016 and 2023 but remains below the median for this lake classification. Size structure improved slightly. Townsend Flowage contains ideal largemouth bass habitat and there may be room for additional population growth. An expanded or more abundant largemouth bass population would provide additional predation on panfish populations and may improve panfish size structure.

Northern pike fyke netting CPUE increased but the average size decreased slightly. Northern pike reproduction and recruitment were good. Anglers can expect to readily catch northern pike but most will be on the small side.

Muskellunge stockings have provided a modest fishing opportunity in Townsend Flowage even though fyke netting CPUE has remained relatively low. At the time of the 2023 survey, there were likely five or six year classes that were sexually mature and vulnerable to collection during spring netting. Based on estimated annual mortality rates of muskellunge, these fisheries take time to develop. Since Townsend Flowage provides musky with an ample forage base, suitable habitat, and has shown some improvement, a follow up targeted musky fyke netting survey (SN2) should be conducted to further evaluate the population and the more recent stocking events.

The current fishing regulations are adequate to provide quality fishing opportunities for a variety of species. The next comprehensive fisheries survey (spring fyke netting targeting walleye, pike, and musky; electrofishing {spring, fall}) of Townsend Flowage is scheduled for 2031 and will focus on the age, growth, abundance, and recruitment of the dominant gamefish.

Access to Townsend Flowage is adequate. Boaters are reminded to remove all vegetation from their boat and trailer before leaving to limit the spread of this and other invasive species. A map of Townsend Flowage can be found at the following internet address;

https://apps.dnr.wi.gov/doclink/lakes_maps/0465000a.pdf

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