WISCONSIN DEPARTMENT OF NATURAL RESOURCES

2022-24 Pelican Lake Fisheries Survey Report

Waterbody Code: 1579900

Photo Credit: Lakeland Aerial

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Introduction

Pelican Lake was created by damming the Pelican River within the Upper Wisconsin River watershed in 1908 (Heath et al. 2013). Water levels in Pelican Lake are maintained by the Wisconsin Valley Improvement Company (WVIC) with a target of 6 feet of head and a maximum elevation of 1591.98 ft and a minimum elevation of 1589.98 as outlined in the Federal Energy Regulatory Commission (FERC) license (Kubisiak 2012). Water conditions support aquatic life, wildlife, recreation, public health and welfare. Pelican Lake's water quality has been classified as impaired with elevated levels of algal growth since 2016 (DNR 2021). Banded mystery snail (2004), Chinese mystery snail (2004), curly-leaf pondweed (1991), Eurasian water milfoil (2007), ornamental water lilies (2011), purple loosestrife (2010) and rusty crayfish (1983) are invasive species established in Pelican Lake. Additional information on Pelican Lake can be found at the Wisconsin Department of Natural Resources' (DNR) Lake Page.

Pelican Lake is classified as a complex-cool-dark lake (Rypel et al. 2019) with a shared fishery utilized by public and tribal members. Users can access the 3,585-acre system from one of the five public access points located around Pelican Lake (Figure 1). Anglers spent 22.1 hours per acre fishing on Pelican Lake in 2025 (Halverson et al. 2025) decreasing from the 46.2 hours per acre of the 2011 survey (Tobias and Blonski 2012). Panfish, northern pike and walleye were common targets for angling and harvest in 2024 as they were in 2011 (Halverson et al. 2025; Tobias and Blonski 2012). Tribal use includes spring harvest of an average of 823 ± 63 walleye and 13 ± 1 muskellunge per year (unpublished data; T. Cichosz Wisconsin DNR). An average of 3.1 angling tournaments and numerous angling leagues occur annually on Pelican Lake (unpublished data; N. Lederman Wisconsin DNR).

The DNR collaboratively monitors Pelican Lake with the Great Lakes Indian Fish and Wildlife Commission (GLIFWC), Sokaogon Chippewa Community Mole Lake Band of Lake Superior Chippewa, WVIC and the Pelican Lake Association. Fisheries assessments have focused on species of recreational value (Table 1). The aquatic plant community and lake characteristics have been monitored with support of the Lake Association (Heath et al. 2013). Concerns over perceived increases in bass abundance and decreases in panfish abundance have been expressed (personal communication; J. Kubisiak Wisconsin DNR) resulting in two citizen resolution submissions to the Wisconsin Conservation Congress (resolution 440322; resolution 441222).

The objectives of the 2022-2024 DNR fishery surveys on Pelican Lake were to

1. assess the status of the fish community
2. attain muskellunge, northern pike and walleye population estimates
3. evaluate the need for panfish and bass regulation changes
4. update fisheries management recommendations

Table 1. Fish surveys from 1955-2024 on Pelican Lake Oneida County, WI.

YEAR	TYPE	AGENCY	GEAR	TARGET SPECIES	SURVEY PURPOSE
1955	FN	DNR	seine	all species	relative abundance
1960	SE 2	DNR	boom	all species	relative abundance
1973	FN	DNR	fyke net	all species	relative abundance
1975	SN 1	DNR	fyke net	white sucker	relative abundance
1976	SN 1	DNR	fyke net	white sucker	relative abundance
1983	FE	DNR	boom	walleye	recruitment
1990	SN 1	DNR	fyke net	walleye	relative abundance
	FE	DNR	boom	juvenile gamefish	recruitment
1995	SE 1	GLIFWC	boom	walleye	mark-recapture
1996	SE 1	GLIFWC	boom	walleye	mark-recapture
1998	SE 1	GLIFWC	boom	walleye	mark-recapture
2001	SE 1	GLIFWC	boom	walleye	mark-recapture
2002	FE	DNR	boom	juvenile gamefish	recruitment
2003	FE	DNR/Mole	boom	juvenile gamefish	recruitment
2004	FN	DNR	mini fyke	all species	recruitment
2004	FE	DNR/Mole	boom	juvenile gamefish	recruitment
2005	SN 3	DNR	fyke net	panfish	relative abundance
	FE	DNR/Mole	boom	juvenile gamefish	recruitment
2006	FE	DNR/Mole	boom	juvenile gamefish	recruitment
2007	FE	DNR/Mole	boom	juvenile gamefish	recruitment
2008	FE	DNR/Mole	boom	juvenile gamefish	recruitment
2010	FE	DNR/Mole	boom	juvenile gamefish	recruitment
2011	SN 1	Mole Lake	fyke net	walleye/northern pike	mark-recapture
	SE 1	DNR/Mole	boom	walleye	mark-recapture
	SN 2	DNR	fyke net	muskellunge	relative abundance
	SE 2	DNR	boom	basses	relative abundance
	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
	SN 3	DNR	fyke net	panfish	relative abundance
2012	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
2013	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
2014	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
2015	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
2016	SE 2	DNR	boom	all species	relative abundance
	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
2017	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
2018	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
2019	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
2020	FE	DNR	boom	juvenile gamefish	relative abundance
2021	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
2022	SN 3	DNR	fyke net	panfish	relative abundance
	SE 2	DNR	boom	all species	relative abundance
2023	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
	SN 2	DNR/WVIC	fyke net	muskellunge/northern	mark-recapture
	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
	Angling	Pelican Lake	rod and	muskellunge	relative abundance
2024	SN 1	DNR	fyke net	walleye/northern pike	mark-recapture
	SE 1	DNR	boom	walleye	mark-recapture
	SN 2	DNR	fyke net	muskellunge	mark-recapture
	FE	DNR/Mole	boom	juvenile gamefish	relative abundance
	Angling	Pelican Lake	rod and	muskellunge	relative abundance

Table 2. Fish stockings from 1965-2024 in Pelican Lake, Oneida County, WI.

YEAR	SPECIES	AGE CLASS	NUMBER OF FISH STOCKED	SOURCE TYPE
1965	walleye	fry	1,000,000	DNR Coop
	muskellunge	large fingerling	12,425	DNR Coop
1966	walleye	fry	1,530,000	DNR Coop
	walleye	small fingerling	30,000	DNR Coop
1967	muskellunge	large fingerling	3,245	DNR Coop
1968	walleye	fry	1,500,000	DNR Coop
1968	walleye	small fingerling	61,532	DNR Coop
1969	muskellunge	large fingerling	7,560	DNR Coop
1970	muskellunge	large fingerling	5,000	DNR Coop
1970	walleye	fry	1,800,000	DNR Coop
1970	walleye	small fingerling	16,240	DNR Coop
1971	muskellunge	large fingerling	7,700	DNR Coop
1972	walleye	small fingerling	46,600	DNR Coop
1974	muskellunge	large fingerling	2,850	DNR Coop
1975	walleye	small fingerling	20,000	DNR Coop
1976	muskellunge	large fingerling	1,395	DNR Coop
1976	walleye	small fingerling	20,000	DNR Coop
1977	muskellunge	large fingerling	2,369	DNR Coop
1980	muskellunge	large fingerling	2,500	DNR Coop
1981	muskellunge	large fingerling	890	DNR Coop
1982	muskellunge	large fingerling	2,500	DNR Coop
1984	muskellunge	large fingerling	1,186	DNR Coop
1984	walleye	fry	3,000,000	DNR
1985	muskellunge	large fingerling	2,500	DNR Coop
1986	muskellunge	large fingerling	1,176	DNR Coop
1988	muskellunge	large fingerling	2,500	DNR
1989	muskellunge	large fingerling	2,210	DNR Coop
1991	muskellunge	large fingerling	1,750	DNR
1992	muskellunge	large fingerling	2,500	DNR
1993	muskellunge	large fingerling	2,500	DNR
1996	muskellunge	large fingerling	2,500	DNR
1996	muskellunge	fry	100,000	DNR
1998	muskellunge	large fingerling	2,500	DNR
2003	yellow perch	large fingerling	33,250	Private
2004	bluegill	adult	34,671	Private
2012	muskellunge	large fingerling	3,611	DNR
2015	muskellunge	large fingerling	1,772	DNR
2018	muskellunge	large fingerling	1,793	DNR
2021	muskellunge	large fingerling	1,772	DNR
2024	muskellunge	large fingerling	819	DNR

Methods

A comprehensive fishery survey was conducted on Pelican Lake following the treaty assessment protocol (Cichosz 2021) from 2022 through 2024 (Figure 1). Early summer netting (SN 3) for panfish and late spring electrofishing (SE 2) for bass and panfish occurred in 2022. Late spring netting (SN 2) for muskellunge occurred in 2023 and 2024. Early spring netting (SN 1) for walleye and northern pike and early spring electrofishing (SE 1) for walleye occurred in 2024. Fall electrofishing (FE) targeting juvenile gamefish occurred each year. Effort provides a description of the overall status of the fishery, size structure of select fish species and population estimates of desirable gamefish.

SURVEY EFFORT

Spring fyke netting was conducted using standard 4-foot framed fyke nets. Six nets were set on May 17, 2022, fishing until May 20, 2022, targeting panfish resulting in 18 net-nights. Ten nets were set on May 8, 2023, fishing until May 15, 2023, targeting muskellunge resulting in 70 net-nights. Seven nets were set on April 1, 2024, with five nets additional nets set on April 4, 2024, totaling 12 nets fishing until April 13, 2024, targeting northern pike and walleye resulting in 128 net-nights. Four nets were removed on April 13, 2024, six additional nets removed on April 14, but five new nets were added on April 15, 2024, totaling 7 nets until April 19, 2024, targeting muskellunge resulting in another 25 net-nights. Nets were set in varying habitats (i.e., substrate and vegetation) and water depths targeting spawning adult fish of selected species (Figure 1). Nets were checked once every 24 hours.

Late spring electrofishing was conducted throughout Pelican Lake on the night of June 1, 2022 (Figure 1). Four half mile transects targeting all species were randomly selected and four 1.5-mile transects targeting gamefish stations were randomly selected. Early spring electrofishing targeting walleye around the entire shoreline of Pelican Lake was conducted on the night of April 14, 2024. Fall electrofishing surveys targeting gamefish of all sizes around the entire shoreline of Pelican Lake were completed on the nights of Sept. 19, 2022, Sept. 18, 2023, and Sept. 23, 2024. Boats sampling during spring electrofishing runs used AC power, two probes (each with 3 droppers), and two dippers with nets having 0.375-inch bar mesh netting. One boat used DC power during fall electrofishing while the remaining boats used AC. Each boat had two dippers with nets having 0.375-inch bar mesh netting.

Captured gamefish were measured to the nearest 0.1 inch and sex noted based on expression of eggs or milt during spring surveys. Lesions, tumors or malformities (e.g., bluespot and lymphosarcoma) were noted when found. During the spring 2024 sampling, largemouth bass, northern pike and walleye were marked with a right ventral fin clip. Muskellunge were checked for a passive integrated transponder (PIT) tag and if one was not found, a PIT tag was placed internally adjacent to the dorsal fin and released. Newly captured adult muskellunge had their first anal fin ray

removed for age estimation. Dorsal fin rays were collected from five walleye within every half-inch increment of each sex during SN 1 for age estimation. Scales were collected from five walleye per half inch group between 7-12 inches during FE surveys to determine age-0 and age-1 break points. Counts were recorded for other species.

Some recreational anglers targeting muskellunge provided additional data. The lake association purchased and provided select anglers fishing during leagues, tournaments or those who routinely fish on Pelican Lake with PIT tag readers during 2023 and 2024. Anglers recorded the length of caught muskellunge to nearest 0.25 inch. If a PIT tag was detected the PIT tag number was recorded. A single lake association member consolidated information by anglers and provided them to the DNR at the end of the angling season.

DATA ANALYSIS

Abundance was indexed with a population estimate converted to a density estimate (number per acre) by dividing the population estimate number by how many acres Pelican Lake is. The walleye and muskellunge populations were estimated using the Chapman's version of the Petersen method (Chapman 1951) as follows

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

Northern pike abundance was estimated using the Schnabel method (1938) as computed from Ricker (1975) as follows

$$\widehat{N} = \frac{\sum_{i=1}^{k} n_i M_i}{(\sum_{i=1}^{k} m_i) + 1}$$

Relative abundance was used as an index of population size for fish where a population estimate was not generated. Burbot relative abundance was indexed as number of individuals per net-night during SN 1 surveys. Bluegill, pumpkinseed and rock bass relative abundance were indexed as the number of individuals per shoreline mile during SE 2 runs collecting all fish. Largemouth bass and smallmouth bass were indexed as the number of individuals per shoreline mile during SE 2 runs collecting all fish or gamefish. Black crappie and yellow perch relative abundance were indexed as the number of individuals per net-night during SN 1 and 2 surveys.

Size structure of fishes was described using length frequencies, descriptive statistics and proportional size distribution (PSD; Gabelhouse 1984). Quality-sized fish are 36% of the world-record length and preferred-sized fish are 45% of the world-record length representing fish lengths anglers likely enjoy catching (Table 3). The PSD value for a species was calculated as the number of fish of a quality length and longer divided by the number of stock length fish or longer and multiplied by 100. The mean, minimum and maximum length of each fish species was calculated for the survey.

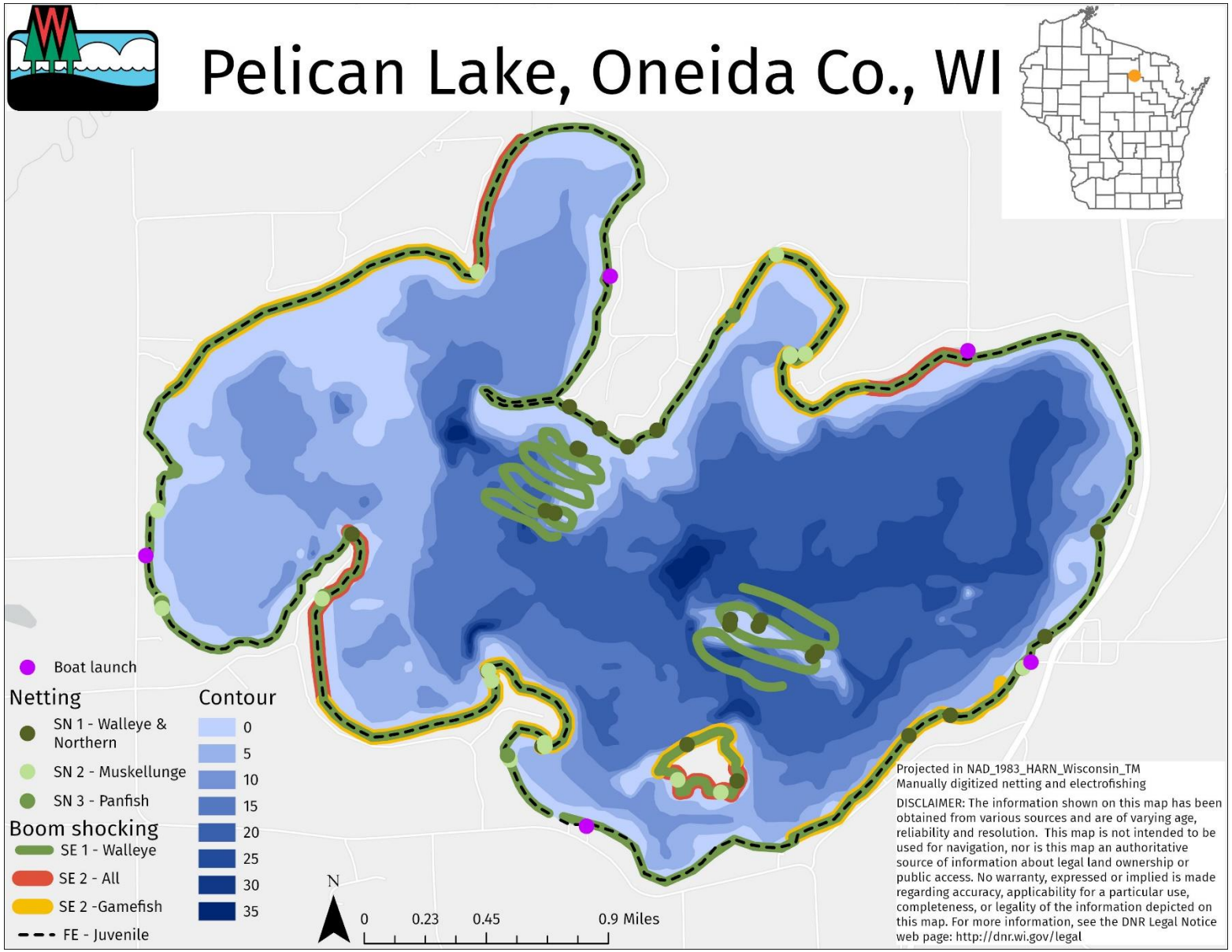

Figure 1. Sampling locations of the various capture gears used during the 2022-2024 surveys on Pelican in Oneida County, WI.

Table 3. Proportional size distribution lengths (inches) of select fish species in the Pelican, Oneida County, WI.

SPECIES	STOCK SIZE	QUALITY SIZE	PREFERRED SIZE
black crappie	5	8	10
bluegill	3	6	8
burbot	8	15	21
largemouth bass	8	12	15
muskellunge	20	30	38
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

Growth was quantified by assigning ages to muskellunge from anal rays or known age based off stocking date associated with individual PIT tag information and to walleye from dorsal spines. Ages were then assigned to each unaged fish that was measured using a species-specific age-length key. Age-length keys were created from the proportion of each age within each 1-inch length group for each species (Isermann and Knight 2005). Mean length at age was then calculated using the entire sample from assigned ages for each sex. Predicated mean maximum length was calculated by sex for muskellunge and walleye using Von Bertalanffy's growth equation of:

$$l_t = L_\infty(1 - e^{-K(t-t_0)})$$

Mortality was estimated using a catch curve. A weighted regression using the natural log of catch at age was determined (Miranda and Bettoli 2007) for muskellunge and walleye by sex and year. The point where descending ages occurred was manually adjusted for each year, sex and species for which data existed.

Relative abundance indices, mean length, growth rate, and mortality were compared to other complex-cool-dark lakes within the Wisconsin lake systems (Rypel et al. 2019), other Oneida county lakes and prior surveys completed within Pelican Lake when appropriate. Muskellunge population metrics were also compared among capture gears when appropriate.

Results

BLACK CRAPPIE

A total of 2,282 black crappie (eight electrofishing, 2,274 netting) were captured while surveying Pelican Lake. Black crappie catch rate was 10.2 per net-night during netting and 4.0 per mile during electrofishing in Pelican Lake. Black crappie catch per mile was in the 30th percentile statewide and around the 75th percentile per net-night for complex-cool-dark lakes (i.e., 25% of lakes have higher relative abundance). Black crappie catch rate has been variable through time during electrofishing and netting (Figure 2).

Measured black crappie lengths varied between 3.1 and 14.2 inches with a mean length of 8.8 inches (Figure 3). Mean length of black crappie was around 95th percentile for complex–cool–dark systems. Proportional size distribution of black crappie has been variable through time typically being comprised of mostly individuals larger than eight inches (Figure 4).

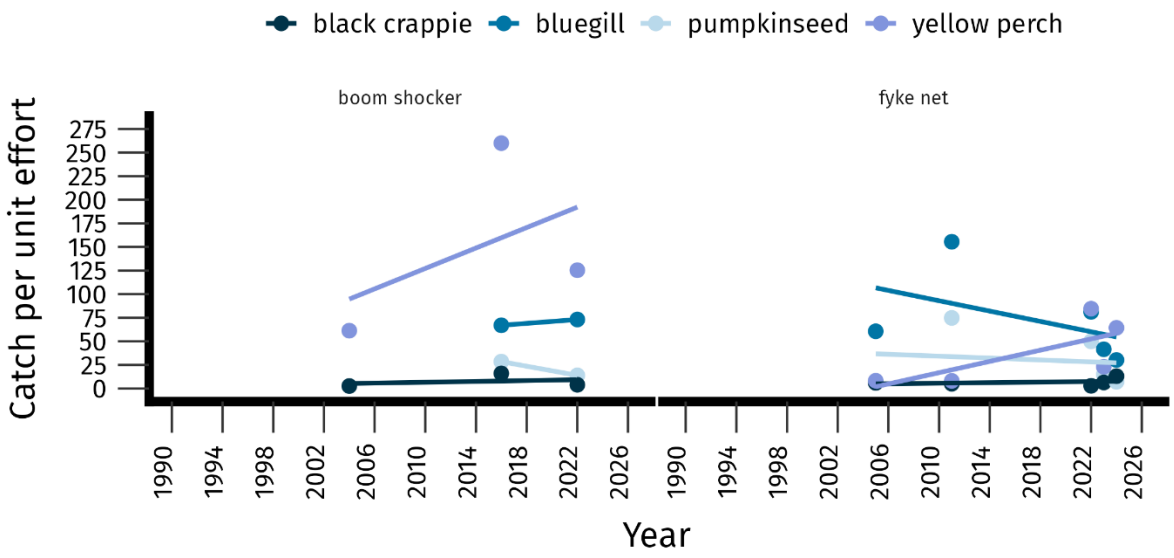

Figure 2. Catch rate of black crappie, bluegill, pumpkinseed and yellow perch among surveys in Pelican Lake targeting panfish during electrofishing (left; catch per mile) and netting (right; catch per net-night). Each species is a unique color.

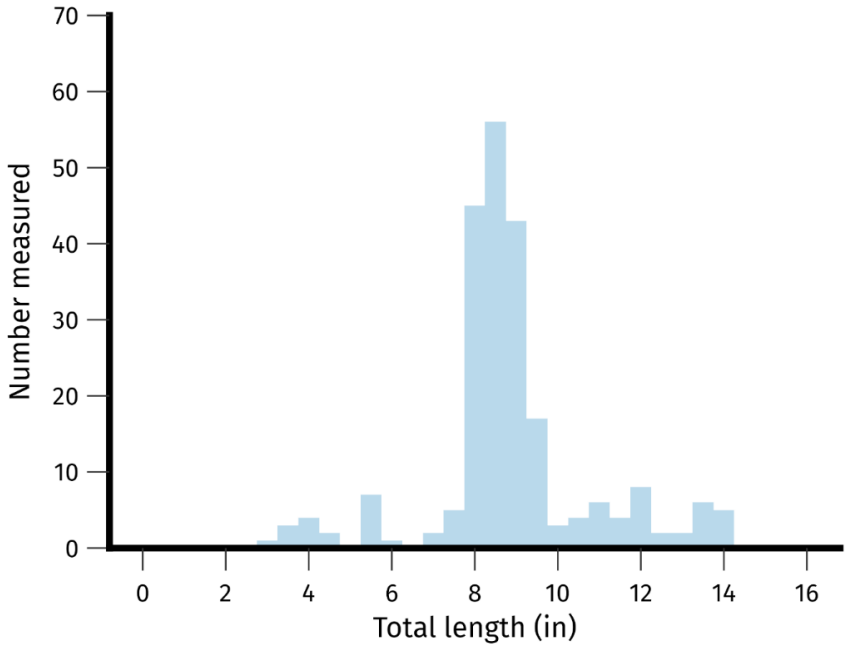

Figure 3. Length frequency of measured black crappie in Pelican Lake Oneida County, WI during the 2022-2024 survey. Length bins are every 0.5 inch.

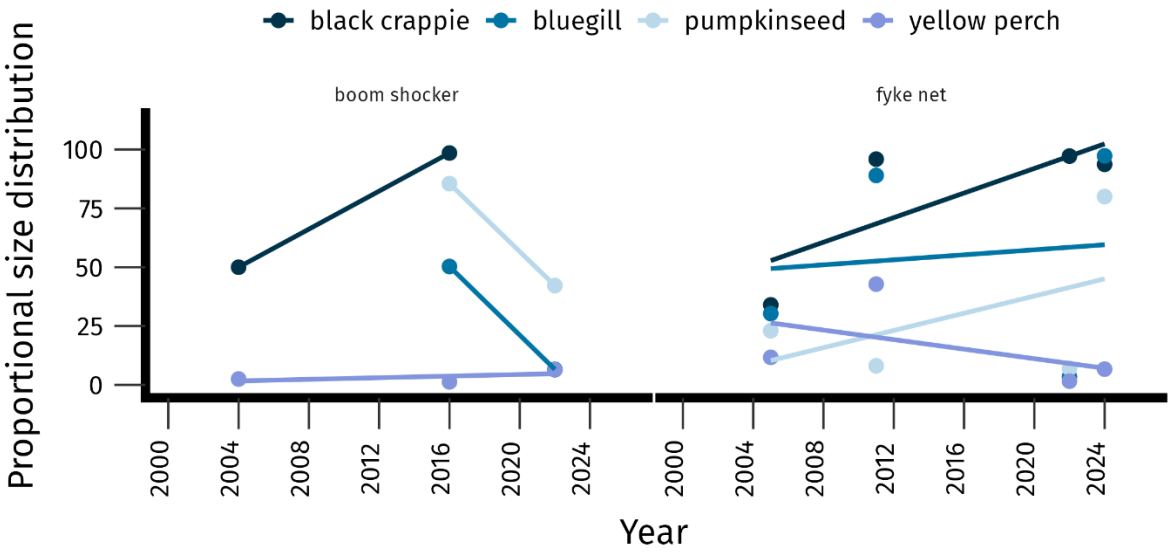

Figure 4. Proportional size distribution of quality length fish from select panfish species captured during electrofishing (left) and netting (right) surveys within Pelican Lake Oneida County, WI.

BLUEGILL

A total of 8,603 bluegill (148 electrofishing, 8,455 netting) were captured while surveying Pelican Lake. Bluegill catch rate was 38.0 per net-night during netting and 73.1 per mile during electrofishing. Bluegill catch per mile was in the 42nd percentile statewide and near the 50th percentile per mile for complex-cool-dark lakes. Bluegill catch rate has been variable through time during electrofishing and netting (Figure 2).

Lengths of measured bluegill varied between 2.4 and 9.7 inches with a mean length of 5.2 inches (Figure 5). Bluegill mean length was in the 90th percentile for complex-cool-dark systems. Proportional size distribution of bluegill has been variable through time (Figure 4).

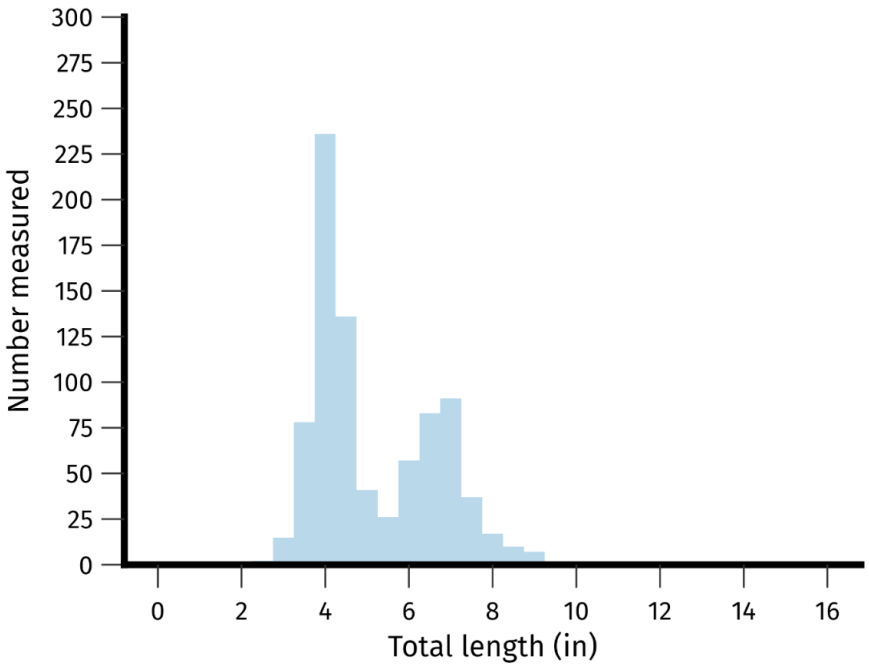

Figure 5. Length frequency of measured bluegills in Pelican Lake Oneida County, WI during the 2022-2024 survey. Length bins are every 0.5 inch.

BURBOT

A total of 33 burbot (five electrofishing, 28 netting) were captured while surveying Pelican Lake. Burbot catch rate was 0.11 per net-night during netting and 0.5 per mile during electrofishing. Lengths of measured burbot varied between 6.3 and 16.7 inches with a mean length of 12.5 inches (Figure 6). Further size structure comparisons should be avoided due to limited sample size (< 75 individuals; Miranda 2007) and data limitation for comparison to other complex-cool-dark lakes.

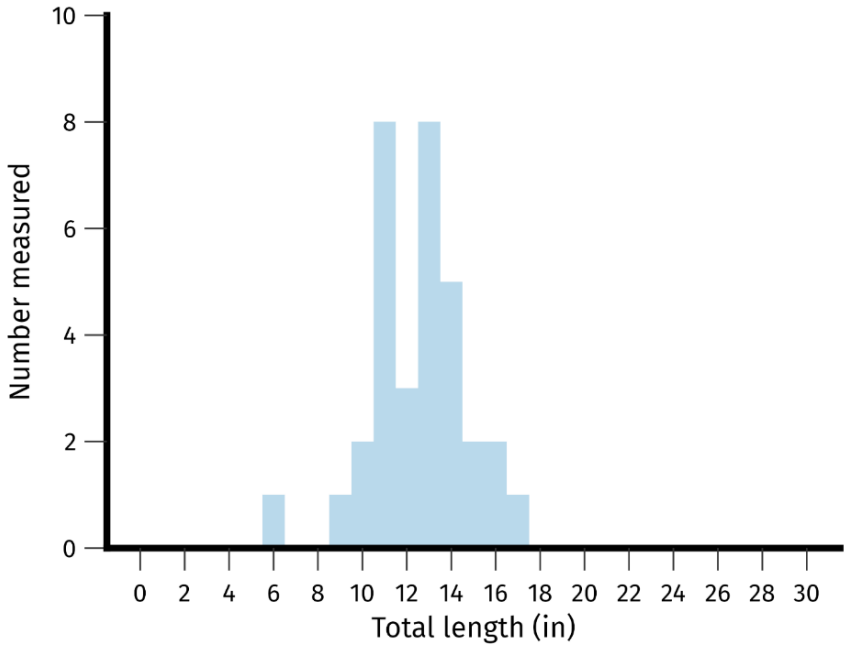

Figure 6. Length frequency of measured burbot in the Pelican Flowage Oneida County, WI during the 2022-2024 survey. Length bins are every 1.0 inch.

LARGEMOUTH BASS

A total of 445 largemouth bass (384 electrofishing, 61 netting) were captured while surveying Pelican Lake. Catch rate for largemouth bass was 0.1 per net-night during netting and 4.5 per mile during electrofishing. Largemouth bass catch per mile was in the 44th percentile statewide and around the 50th percentile for complex-cool-dark lakes. Spring largemouth bass relative abundance decreased from what was found in 2011 during the 2022 survey while fall relative abundance has been increasing over the years (Figure 7).

Measured largemouth bass lengths varied between 2.3 and 20.4 inches with a mean length of 12.0 inches (Figure 8), which is in the 95th percentile for complex-cool-dark lakes. Largemouth bass size structure has been variable through time (Figure 9). Largemouth bass PSD-12 has typically met the range of those managed for big bass (PSD-12 = 50–80; Willis et al. 1993) despite being variable though time and trending downward (Figure 9).

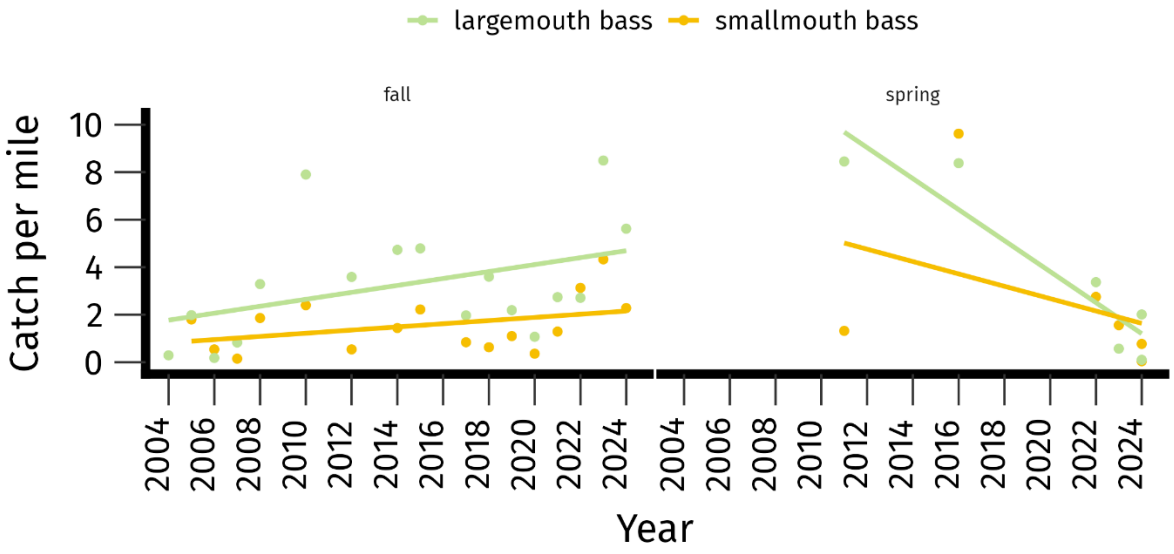

Figure 7. Catch per mile of largemouth bass (green) and smallmouth bass (orange) among electrofishing surveys in Pelican Lake targeting bass during fall sampling (left; after July) and spring (right; before July).

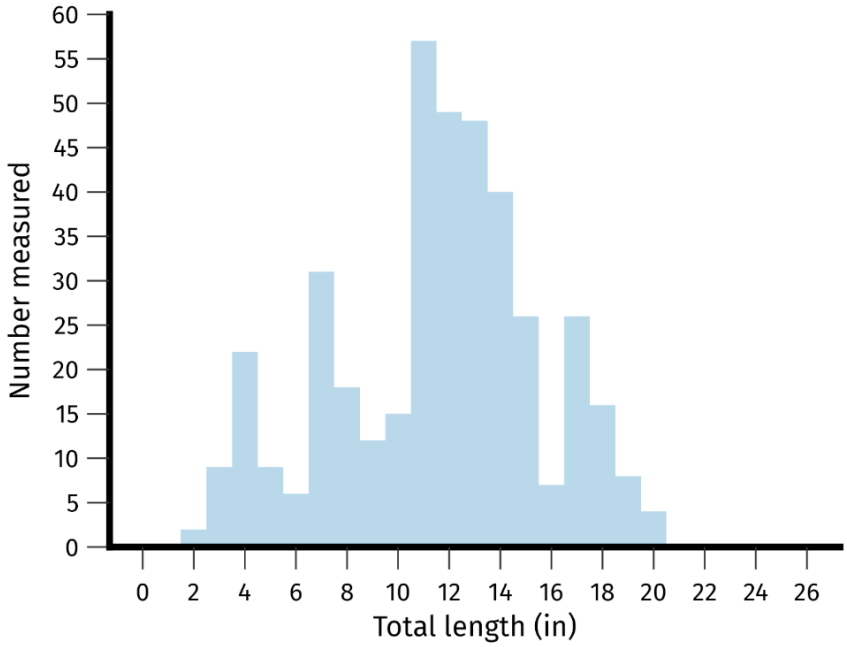

Figure 8. Length frequency of largemouth bass captured in Pelican Lake, Oneida County, WI during the 2022-2024 comprehensive survey. Lengths bins are every 1.0 inch.

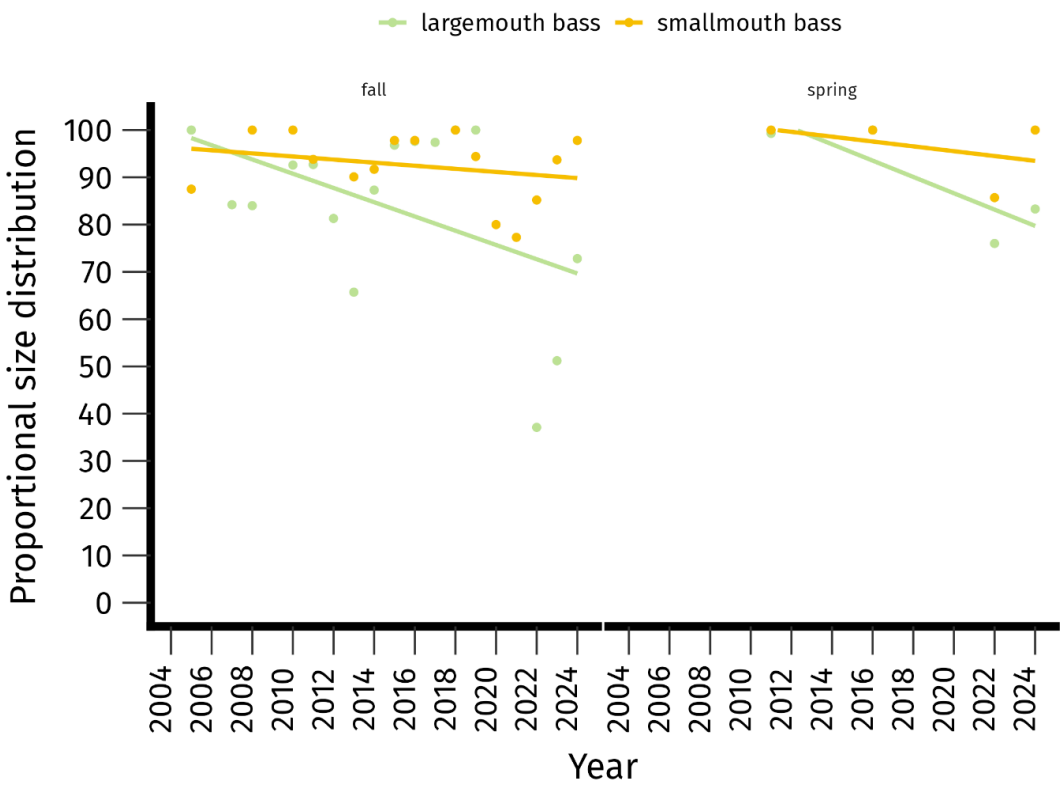

Figure 9. Population size structure using proportional size distribution (PSD) for largemouth and smallmouth bass during the fall (left) and spring (right) surveys.

MUSKELLUNGE

A total of 358 muskellunge were captured while surveying Pelican Lake (77 angling, 32 electrofishing, 249 netting). Of the muskellunge captured during the population estimate sampling, 200 new individuals were handled and 23 individuals of them had been previously caught indicated by a PIT tag. An additional 135 muskellunge were captured outside of the population estimate period or less than 30 inches and not included in the population estimate. Muskellunge catch rate was 1.0 per net-night during netting and 0.4 per mile during electrofishing. Catch per net-night of muskellunge was around the 71st percentile statewide and around the 75th percentile for complex-cool-dark lakes. Adult muskellunge were estimated at 389 ± 75 fish (0.11/acre; CV = 0.18) in 2024 increasing from the 2012 estimate of 212 ± 30 individuals (0.06/acre; CV = 0.19).

Lengths of muskellunge varied between 12.8 and 48.5 inches with a mean length of 35.7 inches (Figure 10) which is around the 100th percentile for complex-cool-dark lakes. A lower proportion of individuals were in the quality and preferred size categories in 2023 & 2024 compared to that of the 2010 & 2011 survey. Muskellunge PSD-38 was 38 and PSD-42 was 24 in 2024 while PSD-38 was 73 and PSD-42 was 40 during the 2011 survey.

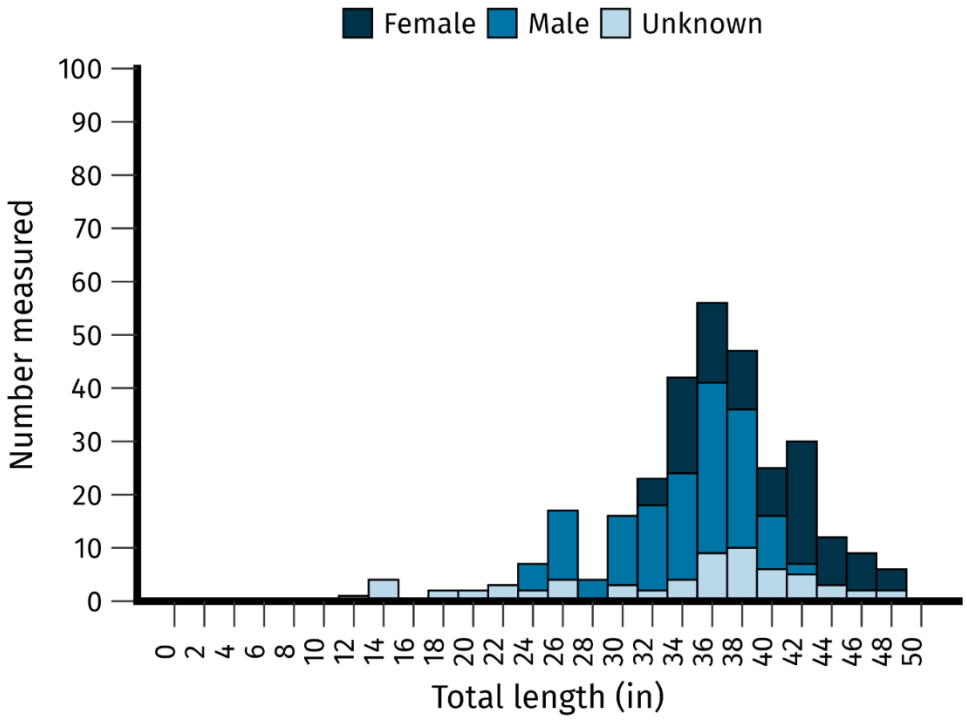

Figure 10. Length frequency of muskellunge captured in Pelican Lake, Oneida County, WI during the 2022-2024 comprehensive survey. Length bins are every 2 inches.

Muskellunge were represented by 15 age classes varying from age-1 to age-16 in 2023-2024. Muskellunge were found to grow quicker up to age-9 in Pelican Lake compared to other complex-cool-dark lakes. Male growth slowed after age-9, but females remained quicker than other complex-cool-dark lakes (Figure 11). Females grew quicker than males (multiple regression: $r^2 = 0.25$, $p < 0.05$). Mean length at age did not differ among gears (multiple regression: $r^2 = 0.002$, $p = 0.2$) or age assignment method (fin ray vs known age, multiple regression: $r^2 = -0.005$, $p = 0.9$). The predicated theoretical mean maximum length from the von Bertalanffy growth model for males was 40.0 (95% confidence interval; 38.0 – 40.3 inches) and 49.7 (95% confidence interval; 46.1-60.0) inches for females. Two individuals caught in 2023 by anglers were caught again in 2024 by anglers and had grown ~1 inch. Inconsistent recruitment across years made it impossible to apply a catch curve to quantify total mortality of muskellunge within Pelican Lake.

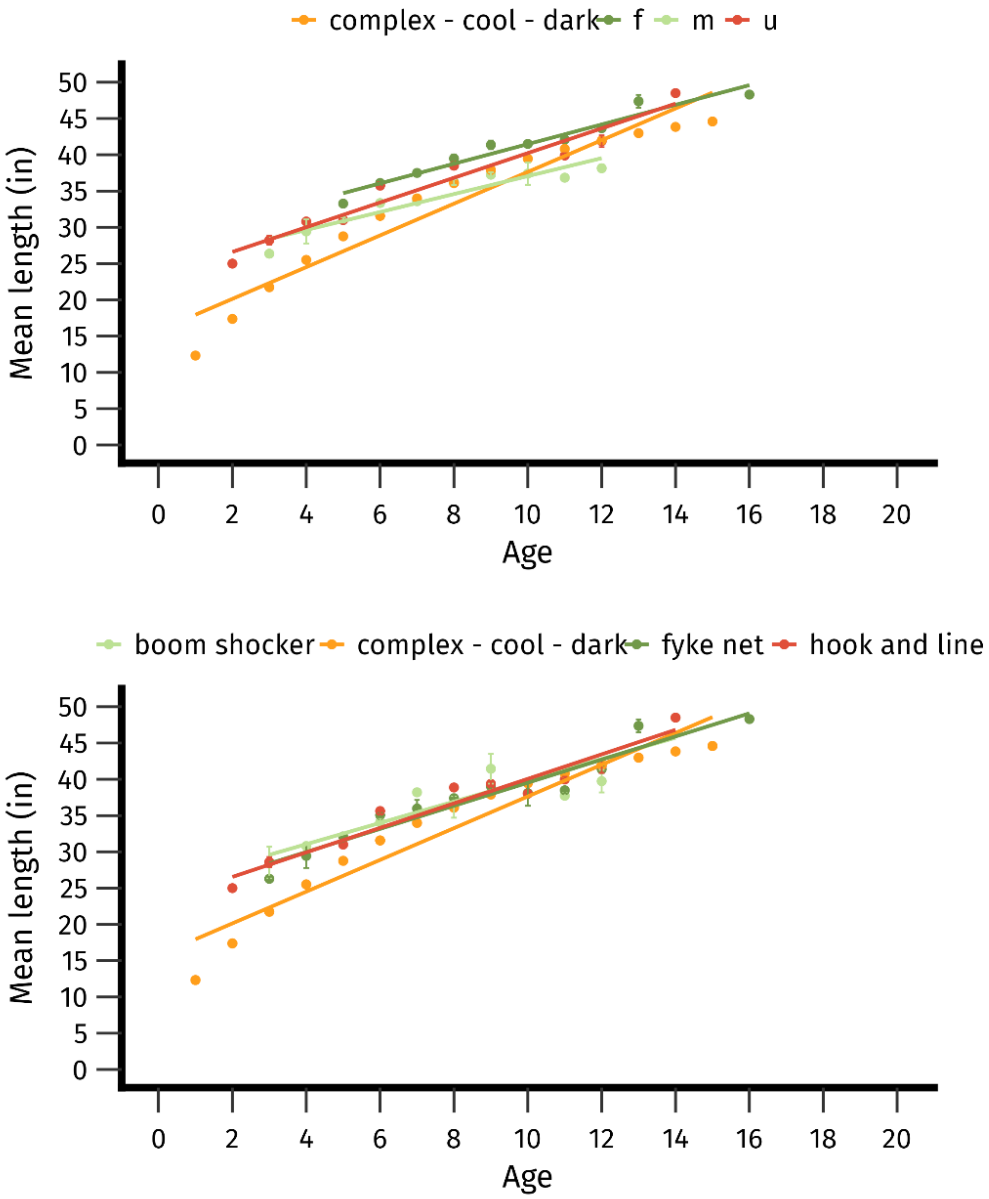

Figure 11. Mean total length (±1 standard error) at estimated and known age of muskellunge within Pelican Lake for each sex (top) and capture method (bottom). Muskellunge ages were assigned using anal fin rays or had known ages based off being stocked with PIT tags. Length of individuals with an unknown age were assigned an age with a sex specific age-length key. The median length at age for similar complex-cool-dark Wisconsin lakes is included for comparison.

Fifty-eight muskellunge were able to be classified as likely reproduced within Pelican Lake and 171 from stocking using PIT tag histories. An average of 2% of each stocking class was handled with 59, 31, 49 and 32 muskellunge being handled from the 2012, 2015, 2018 and 2021 stocking classes respectfully. Those stocked individuals represented 72% (minimum of 66%, maximum of 77%) of the muskellunge handled each year.

NORTHERN PIKE

A total of 669 northern pike were captured while surveying Pelican Lake. Northern pike catch rate was 2.52 per net-night during netting and 1.65 per mile during electrofishing. Northern pike catch per net-night was around the 75th percentile for complex-cool-dark lakes. Spring northern pike net relative abundance in 2024 (3.1 per net-night) and 2023 (1.5 per net-night) was lower than what was found in 2011 (4.3 per net-night). Spring and fall northern pike electrofishing catch per mile has been variable through time but decreasing generally (Figure 12). A decreasing trend is also seen in the population estimate of northern pike being 1,247 ± 247 fish (0.34/acre; CV = 0.20) in 2024 compared to the 5,240 ± 940 individuals (1.5/acre; CV = 0.18) estimate of 2011. Angler creel survey found 27 northern pike harvested during the 2024-25 fishing season had fin clips out of the 384 that were marked during the spring survey for an estimated exploitation rate of 7% (unpublished data; L. Eslinger Wisconsin Department of Natural Resources).

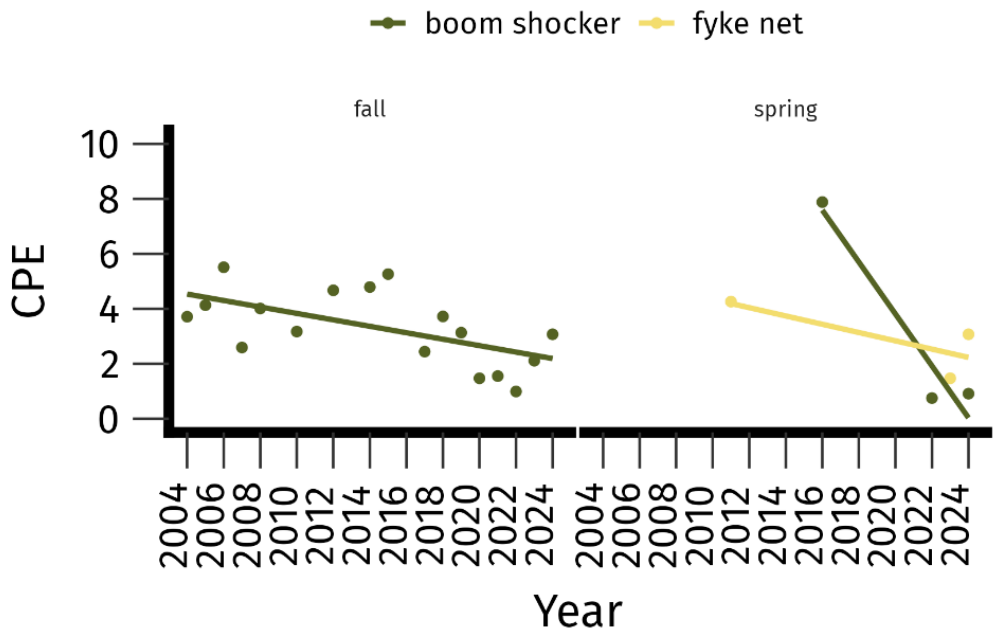

Figure 12. Catch per effort of northern pike during boom shocking (green) and fyke netting (yellow) during fall (left; after July) and spring (right; before July) surveys in Pelican Lake.

Lengths of northern pike varied between 7.5 and 34.8 inches with a mean length of 21.3 inches (Figure 13), which is in the 90th percentile for complex-cool-dark lakes. Northern pike size structure has been variable through time but increasing generally (Figure 14). Northern pike PSD-28 was 3 and PSD-34 was <1 in 2024 similar to the PSD-28 of <1 and PSD-34 of <1 observed during the 2011 survey. Northern pike PSD-21 index of 45 ± 3 in 2024 lands within the suggested value for a balanced population (30-60; Anderson and Weithman 1978) but has typically been greater than that in recent years (Figure 14).

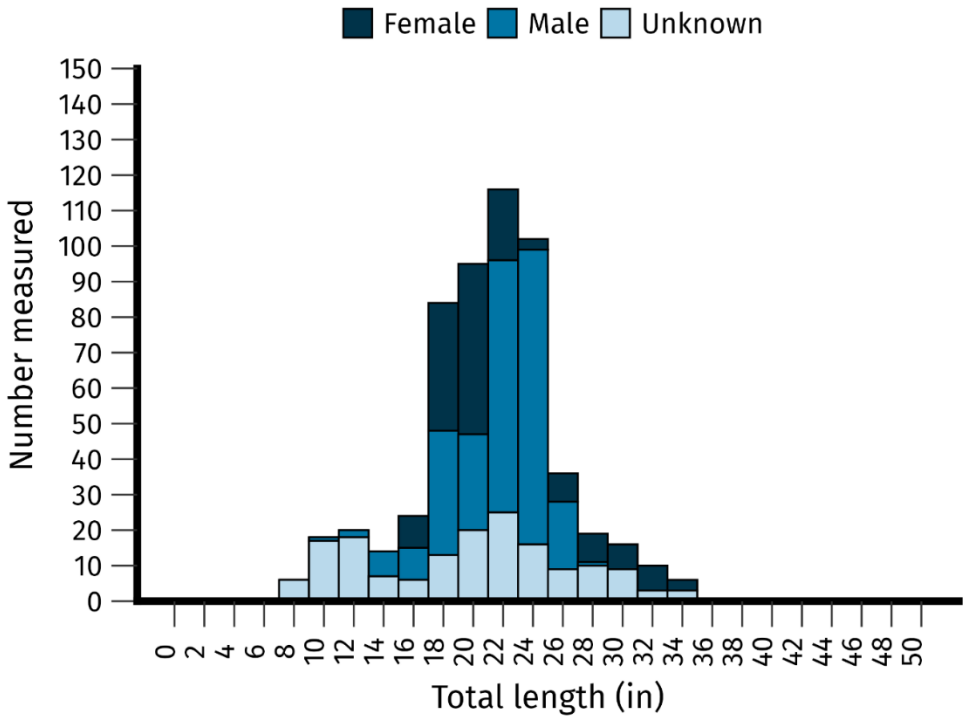

Figure 13. Length frequency of northern pike captured in Pelican Lake, Oneida County, WI during the 2022-2024 comprehensive survey. Lengths bins are every 2 inches.

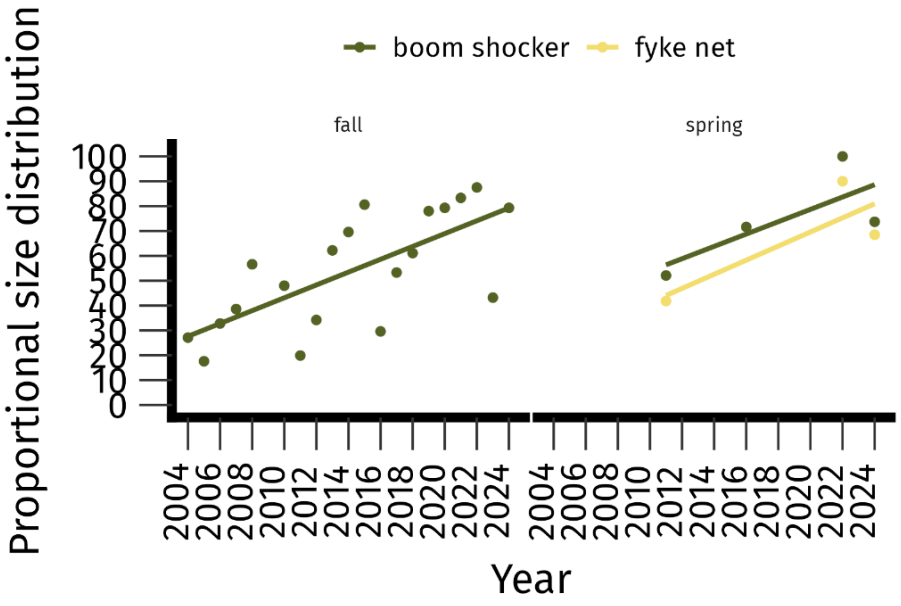

Figure 14. Population size structure using proportional size distribution (PSD) for northern pike during the fall (left) and spring (right) boom shocker (green) and fyke net (yellow) surveys.

PUMPKINSEED

A total of 2,921 pumpkinseeds (28 electrofishing, 2,898 netting) were captured while surveying Pelican Lake. Pumpkinseed catch rate was 13.0 per net-night during netting and 13.9 per mile during electrofishing. Pumpkinseed catch per mile was around the 50th percentile per mile for complex-cool-dark lakes. Pumpkinseed catch rate has been variable through time during electrofishing and fyke netting (Figure 2).

Lengths of measured pumpkinseed varied between 2.9 and 7.9 inches with a mean length of 5.0 inches (Figure 15). Mean length of pumpkinseed was around the 75th percentile for complex-cool-dark lakes. Proportional size distribution of pumpkinseed has been variable through time (Figure 4).

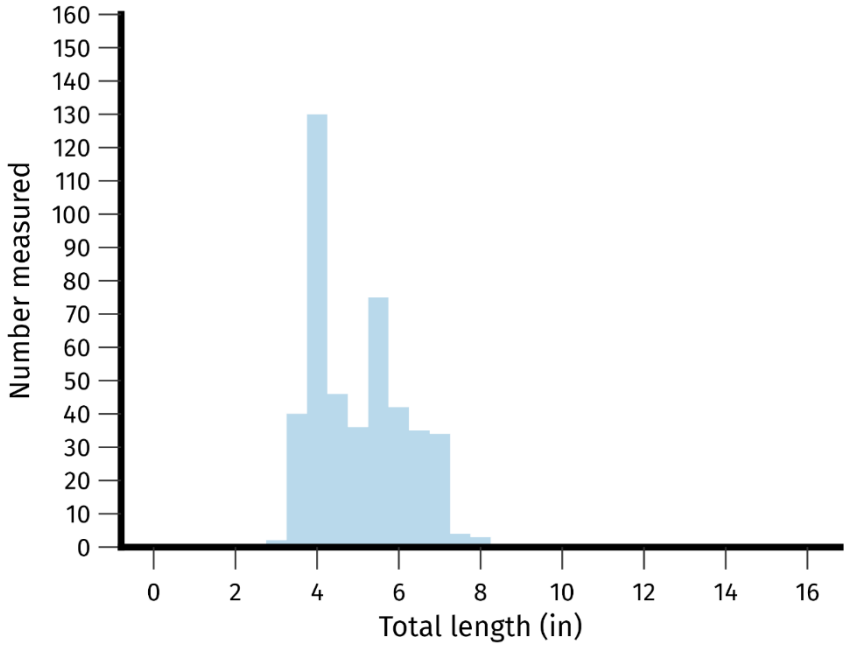

Figure 15. Length frequency of measured pumpkinseed in Pelican Lake, Oneida County, WI during the 2022-2024 comprehensive survey. Length bins are every 0.5 inch.

ROCK BASS

A total of 485 rock bass (30 electrofishing, 455 netting) were captured while surveying Pelican Lake. Rock bass catch rate was 2.0 per net-night during netting and 14.9 per mile during electrofishing. Catch per mile of rock bass in Pelican Lake was around the 75th percentile per mile for complex-cool-dark lakes. Lengths of measured rock bass varied between 3.0 and 9.8 inches with a mean length of 6.9 inches (Figure 16). Mean length of rock bass was around the 90th percentile for complex-cool-dark lakes.

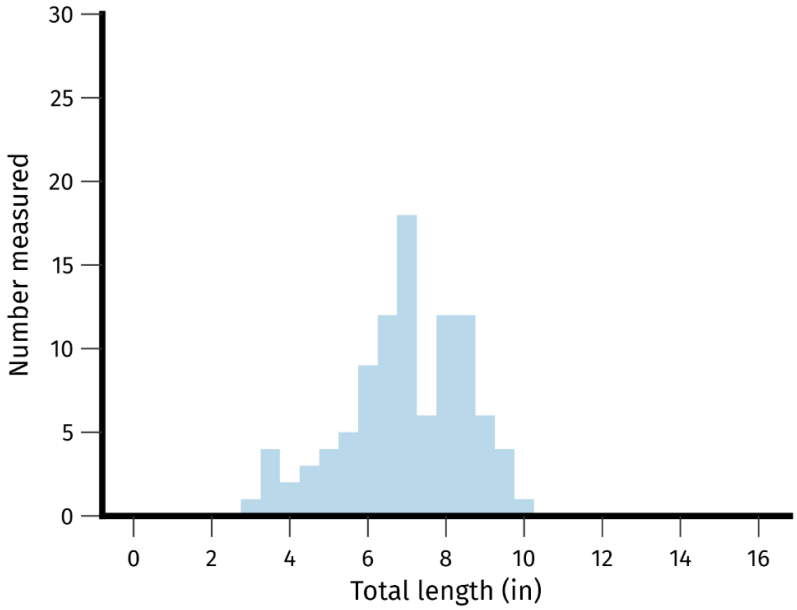

Figure 16. Length frequency of measured rock bass in Pelican Lake, Oneida County, WI during the 2022-2024 comprehensive survey. Length bins are every 0.5 inch.

SMALLMOUTH BASS

A total of 335 smallmouth bass (221 electrofishing, 114 netting) were captured while surveying Pelican Lake. Smallmouth bass catch rate was 0.56 individuals per net-night during netting and 2.8 individuals per mile during electrofishing in Pelican Lake. Spring and fall smallmouth bass relative abundance has been increasing through time (Figure 7). Smallmouth bass catch per mile in Pelican Lake was in the 59th percentile statewide and around the 75th percentile per mile for complex-cool-dark lakes. Lengths of measured smallmouth bass varied between 2.5 and 21.7 inches with a mean length of 14.8 inches (Figure 17). Mean length of smallmouth bass was around the 99th percentile for complex-cool-dark lakes.

WALLEYE

A total of 6,261 walleye (2,756 electrofishing, 3,505 netting) were captured with a male to female ratio of 1.1:1 while surveying Pelican Lake. Of walleyes captured during population estimate resample, there were 537 unmarked individuals, and 108 previously marked individuals captured from the 3,002 marked individuals at large. The walleye population was estimated to be 15,581 ± 1,411 fish (4.3/acre; CV = 0.09), a slight decrease from the 2016 estimate (Figure 18). An additional 2,614 walleyes were handled outside the population estimate sampling or were juveniles less than 15 inches. Walleye catch rate was 24.8 per net-night during netting and 32.3 per mile during electrofishing. Walleye catch per mile was in the 66th percentile statewide and around the 90th percentile for complex-cool-dark lakes. Angler creel survey found 271 harvested walleyes during the 2024-25 fishing season had fin clips out of the 3,539 that were marked during the spring survey for an estimated exploitation rate of 8% (unpublished data; T. Cichosz Wisconsin Department of Natural Resources).

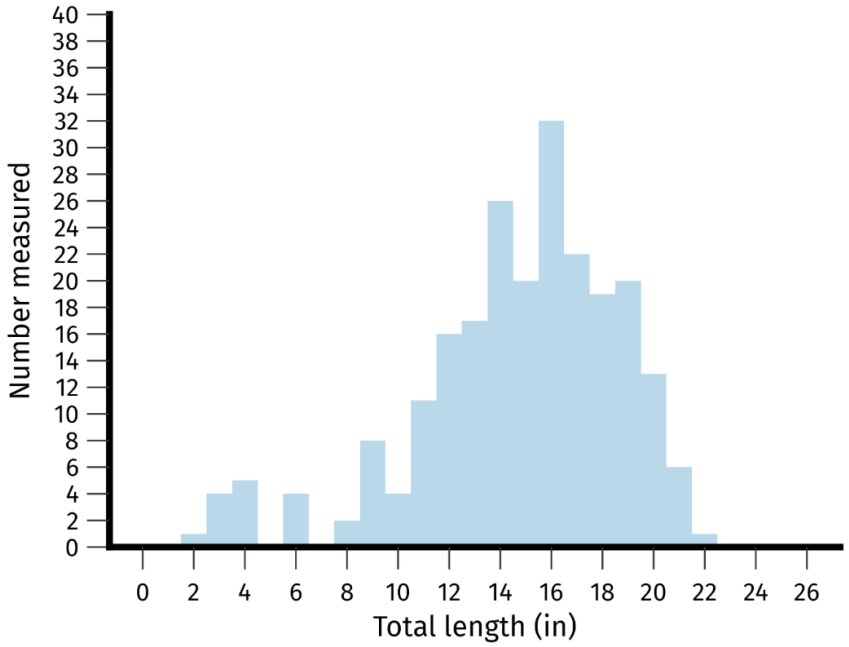

Figure 17. Length frequency of measured smallmouth bass in Pelican Lake, Oneida County, WI during the 2022-2024 comprehensive survey. Length bins are every 1.0 inch.

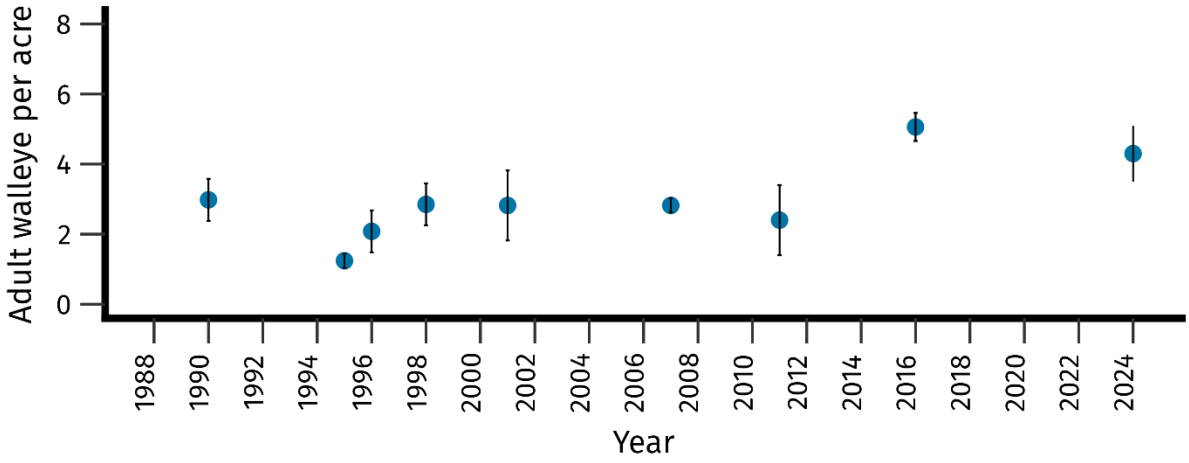

Figure 18. Adult walleye population estimate (±1 standard deviation) in Pelican Lake, Oneida County, WI.

Lengths of captured walleye in Pelican Lake varied between 4.2 and 28.3 inches with a mean length of 13.9 inches, which is around the 50th percentile for complex-cool-dark lakes (Figure 17). Size structure of walleye was larger in 2024 than 2011 (KS test; D = 0.06, P = 0.001). Female walleyes tended to be larger than male walleyes (Figure 19). Walleye PSD-15 was 71, and PSD-20 was 4 in 2024, increasing from the PSD-15 of 66 and PSD-20 of 2 observed during the 2011 survey. Walleye PSD-20 of 4 is around the suggestion for a balanced population (PSD-20 = 10-20; Pedersen 2020), while PSD-15 of 71 is higher (PSD-15 = 30-60; Anderson and Weithman 1978).

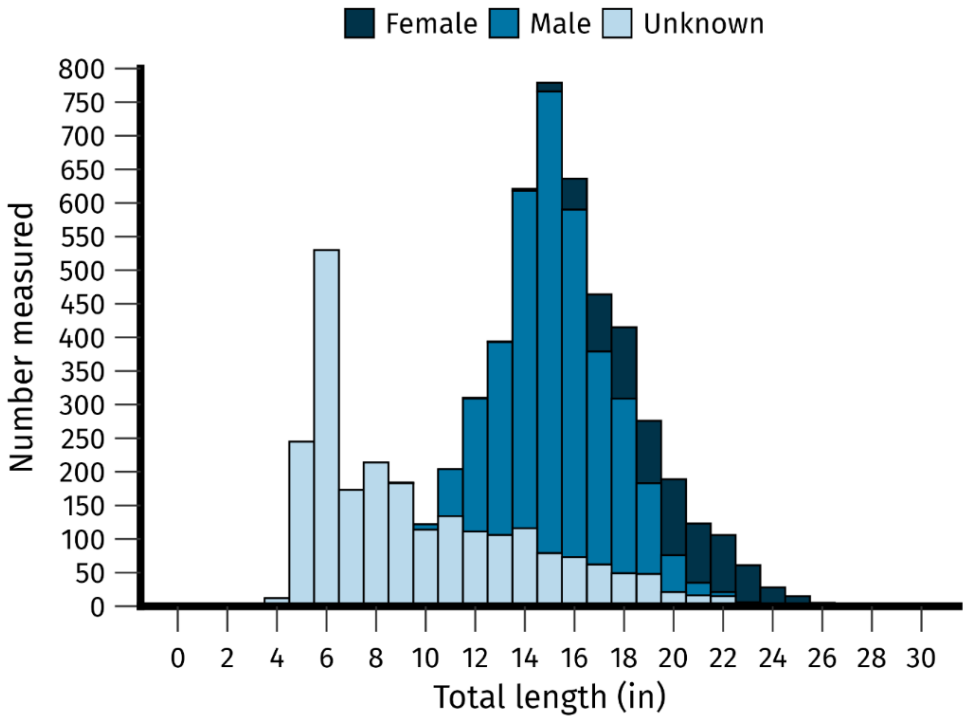

Figure 19. Length frequency of measured walleye in Pelican Lake, Oneida County, WI during the 2022-2024 comprehensive survey. Length bins are every 1.0 inch.

Walleye were represented by 17 age classes varying from age-0 to age-17 in 2024. This is a similar number of age classes found in the 2016 survey completed by Mole Lake (ages 0-17) and that of the 2011 survey (ages 0-15). Female walleyes grew faster than male walleyes in Pelican Lake (Figure 20). Male walleye growth was slower than your typical walleye in other complex-cool-dark lakes while females was similar (Figure 18). The predicated theoretical mean maximum length from the von Bertalanffy growth model for males was 22.1 (95% confidence interval; 21.7 – 22.6 inches) and 25.7 (95% confidence interval; 24.6-27.6) inches for females. Total annual mortality of adult walleyes estimated using a catch curve regression model was estimated at 21% (95% confidence interval; -2-40) for females and 30% (95% confidence interval; 21-38) for males in 2011 increasing to 27% (95% confidence interval; 17-36) for females and 35% (95% confidence interval; 23-47) for males in 2024 (Figure 21).

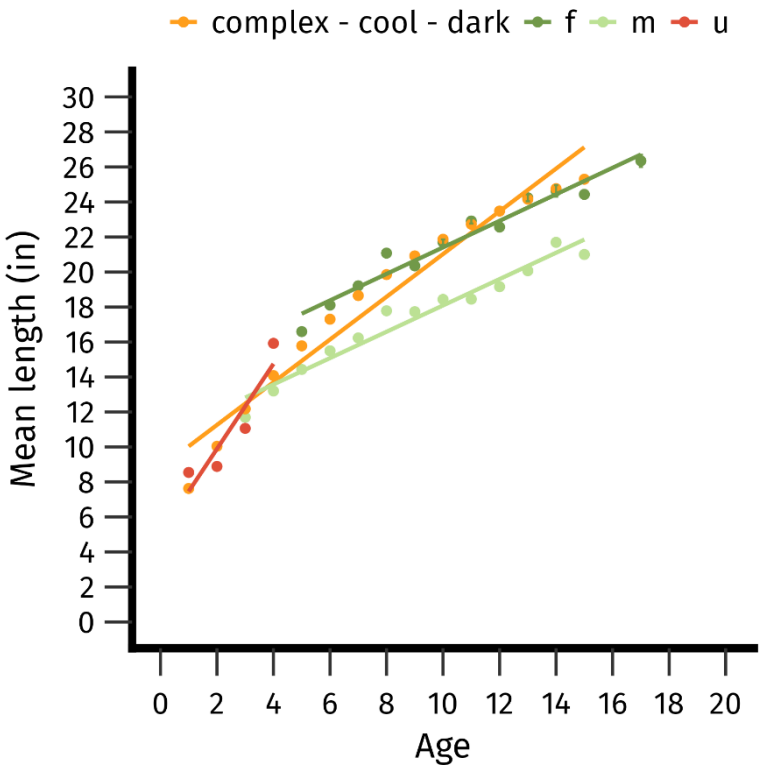

Figure 20. Mean total length (±1 standard error) at estimated age of walleye within Pelican Lake for each sex. Walleye ages were assigned using dorsal fin rays. Length of individuals with an unknown age were assigned an age with a sex specific age-length key. The median length at age for similar complex-cool-dark Wisconsin lakes is included for comparison.

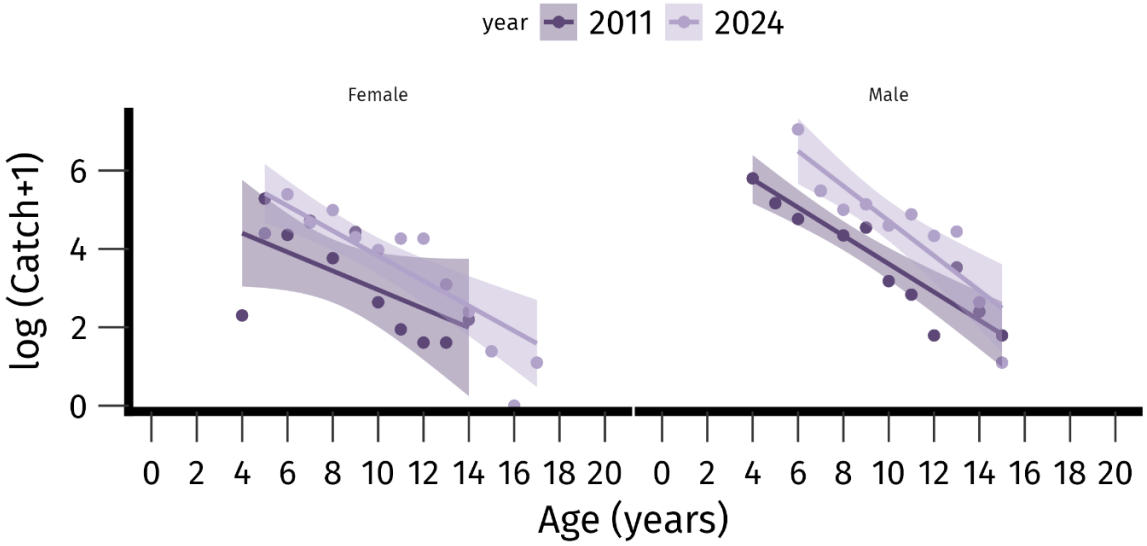

Figure 21. Catch curve of walleye within Pelican Lake, Oneida county, WI. Ages were assigned from dorsal spines in 2024 and 2011. Each year is represented by a unique color. Best fit line fit assigned based off linear model of fully vulnerable ages for each year and sex combination where the catch curve started descending with the associated 95% confidence interval of the estimate.

Seven hundred and sixty-six age-0 walleyes and 352 age-1 walleyes were captured during fall electrofishing in Pelican Lake from 2022 – 2024. Catch rate of age-0 walleye was highest in 2024 at 21.4 individuals per mile and age-1 was highest in 2023 at 10.6 per mile. Variability in catch rate of age-0 and age-1 walleye has been common among years in Pelican Lake with recent years being below the 28 age-0 per mile average within non-stocked lakes (Figure 22).

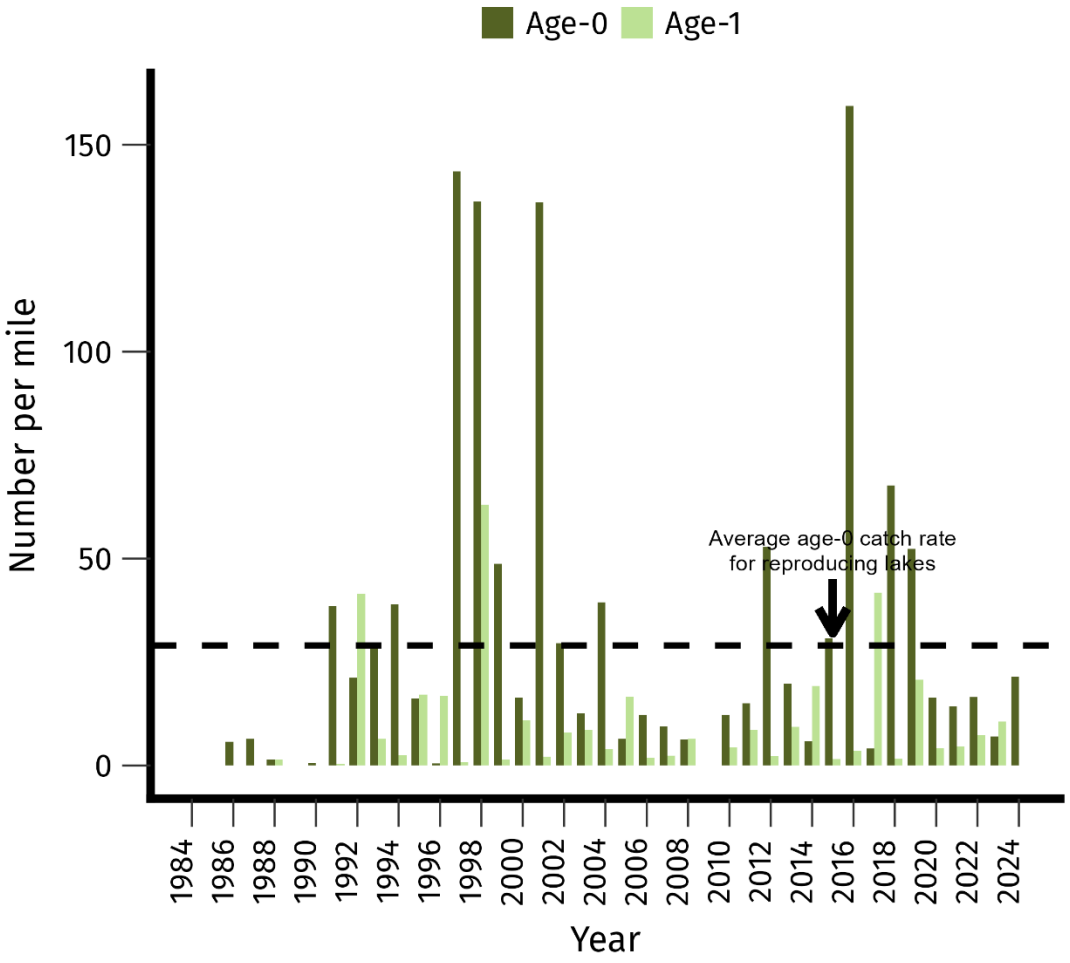

Figure 22. Number of age-0 and age-1 walleye per mile captured during fall boom shocking within Pelican Lake Oneida County, WI. Fish ages were assigned by scales.

WHITE BASS

A total of six white bass (six electrofishing, 0 netting) were captured while surveying Pelican Lake. White bass catch rate was 0.0 per net-night during netting and 0.1 per mile during electrofishing. Lengths of measured white bass varied between 4.2 to 5.1 inches with a mean length of 4.8 inches. Further size structure comparisons should be avoided due to limited sample size (< 75 individuals; Miranda 2007) and the data limitation of comparison to other complex-cool-dark lakes.

YELLOW PERCH

A total of 12,077 yellow perch (252 electrofishing, 11,825 netting) were captured while surveying Pelican Lake. Yellow perch catch rate was 53.0 individuals per net-night during netting and 125.4 individuals per mile during electrofishing. Yellow perch catch per mile in Pelican Lake was in the 97th percentile statewide and around the 90th percentile per net-night for complex-cool-dark lakes. Yellow perch catch rate has been variable through time during electrofishing and fyke netting (Figure 2).

Lengths of measured yellow perch varied between 2.3 to 11.4 inches with a mean length of 5.9 inches (Figure 23). Mean length of measured yellow perch in Pelican Lake was around the 75th percentile for complex-cool-dark lakes. Proportional size distribution of yellow perch has been variable through time but typically comprised of individuals smaller than 10 inches (Figure 4).

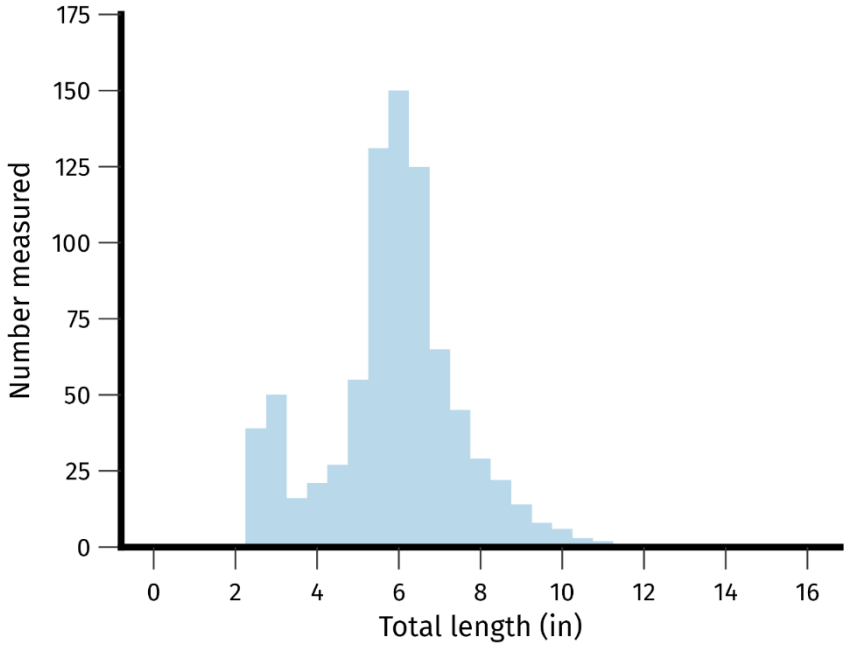

Figure 24. Length frequency of measured yellow perch in Pelican Lake, Oneida County, WI during the 2022-2024 comprehensive survey. Length bins are every 0.5 inch.

Other species

Other species captured in Pelican Lake included banded killifish (7), black bullhead (89), bluntnose minnow (2), common shiner (8), golden shiner (73), logperch (7), mottled sculpin (2), spottail shiner (23), white sucker (690) and yellow bullhead (130).

Discussion

Pelican Lake was found to have a mixed fishery with angler desired sizes of most fish species. Fish species were self-sustaining except muskellunge which receive supplemental stocking every three years when Pelican Lake serves as a brood source for state propagation. Shifts in the Pelican Lake fishery appear to be occurring requiring considerations of adapting management to ensure the system goals can be met.

Anglers reported decreases in panfish catch and expressed a desire to reduced harvest to ensure longevity of that fishery (personal communication; J. Kubisiak Wisconsin DNR). Panfish relative abundance and size structure has been variable within Pelican Lake through time. Catch rates of fish tend to be related to recruitment patterns (Isermann 2011) and panfish are notorious for having variable recruitment success (Tomcko and Pierce 2005; Boxrucker and Irwin 2002). Low angler catches of panfish may be a result of a few years of poor spawning success. Anglers now indicated panfish catch has been increasing despite no regulation changes being implemented yet (unpublished data; N. Lederman Wisconsin DNR). Decreasing angler harvest through a reduction in the bag limit may spread angler harvest of specific year class over a longer period potentially reducing the effects recruitment variability has on a fishery. However, abiotic and biotic factors influence panfish fisheries and merely altering angler harvest may not necessarily result in a more stable fishery (Bevil and Weber 2017). Continued monitored of the panfish fishery should occur ensuring the effects of any action or non-action can be determined.

Anglers have also reported increases in bass catch (personal communication; J. Kubisiak Wisconsin DNR). Largemouth and smallmouth bass have an increasing trend in relative abundance and a decreasing trend in size structure during fall surveys. Increasing abundances of bass has been found to reduce the size structure of individuals (Schramm and Willis 2012) which could impact the ability of Pelican Lake to be maintained as a trophy bass fishery. A protected slot limit has been shown to increase the length structure of bass in West Virginia (Keplinger et al. 2023) and in Wisconsin (Bass Team 2018). Anglers have also shown some willingness to harvest sub-quality fish when provided the opportunity (Keplinger et al. 2023, unpublished; N. Lederman DNR). Implementing a protected slot compared to an 18-inch minimum length limit may ensure Pelican maintains the trophy bass potential it is known for.

Successful muskellunge stocking and reproduction is likely aiding in the observed increase in abundance from 2011 to 2024 within Pelican Lake. Large fingerling muskellunge implanted with PIT tags have been stocked in Pelican Lake each year it serves as a brood source for the state since 2012. An average of 2% of those stocked year classes have been handled during surveys potentially indicating low survival of stocked individuals but a sufficient level to increase abundance. Reproduction of muskellunge within Pelican Lake continues to occurred with individuals not possessing PIT tags being captured and assigned ages not aligning with a stocking

year as it had in 2011 (Kubisiak 2012). Despite the increase in muskellunge abundance, growth to a theorical mean maximum length of 49.7 inches for females is similar to what was found in 2012 (Kubisiak 2012). With continued reproduction, a reduction in stocking rate could be considered ensuring trophy growth potential remains within Pelican Lake, the highest quality of genetic variability is available for propagation and the masking of natural reproduction is avoided.

Angler reported muskellunge data provided insightful information towards the management of muskellunge within Pelican Lake. Angler reported data improved the confidence in the population estimate marginally (1%). However, growth information from individuals caught during angling aligned with those captured during netting and electrofishing. Anglers also reported capturing seven times (28 vs 4) and two times (49 vs 22) more muskellunge than electrofishing in 2023 and 2024 respectfully. Thus, angler data could provide relevant information regarding the size structure, growth, and mortality of a muskellunge fishery. Angler reporting of muskellunge data could be considered in other lakes where muskellunge are being stocked with PIT tags or where muskellunge may be difficult to sample with traditional fisheries gears. Additionally, as a data set of angling data grows, the survival and recycling rates associated with the muskellunge fishery can begin to be assessed (Page et al. 2024).

The northern pike fishery in Pelican Lake has been declining and is a concern of the anglers and lake association members (unpublished data; N. Lederman Wisconsin DNR). Lymphosarcoma had been previously detected in northern pike and suggested as a source of the decline in Pelican Lake (Kubisiak 2012). No individuals were detected with the sores or lesions indicative of lymphosarcoma during 2022-2024. However, blue spot herpesvirus was detected on <1% of northern pike (n=11) in Pelican Lake during 2024. That infection rate is on the low end of those affected populations (<1%- 34%; Yamamoto et al. 1983; Margenau et al. 1995) and blue spot is thought to be of little threat to infected population (Margenau et al. 1995). Continuing to record detections of northern pike and muskellunge with blue spot or lymphosarcoma symptoms will be able to better indicate if the disease is negatively impacting the fishery. Negative interactions between northern pike and muskellunge are suspected to occur (Inskip and Magnuson 1986) which might be influencing each population. Successful sympatric populations of the muskellunge and northern pike do not commonly occur (Pankhurst et al. 2016). The increasing muskellunge fishery may be a factor influencing the observed decline of northern pike in Pelican Lake. Actively managing to improve northern pike within Pelican Lake would need to consider the potential effects on the capabilities of the system to serve as muskellunge brood source of state propagation.

White bass have not been stocked into Pelican Lake since the late 1800s but remain within the fishery (unpublished data; N. Lederman Wisconsin DNR). Small individuals from a narrow range of sizes were captured during the 2022-2024 survey. A narrow range of sizes was also found during the 2011 survey (13-15 inches; Kubisiak 2012). This narrow range of sizes likely indicates inconsistent reproduction of white bass

within Pelican Lake or capture gears used during sampling do not effectively sample white bass. If additional information or management actions are desired for white bass within Pelican Lake, some directed effort will be required to gain a comprehensive understanding of that population.

Pelican Lake should continue to be managed as a mixed fishery with consumptive and trophy opportunities. The self-sustaining walleye fishery appears to be healthy with some increases in total mortality that should be monitored potentially requiring future management action. Reducing largemouth bass abundance through a regulation change may help to maintain their trophy potential within Pelican Lake. The burbot population could be highlighted as a nontraditional angling opportunity not available everywhere within Oneida county to anglers. Muskellunge are reproducing in Pelican Lake and the amount of stocking required to ensure it maintains as a brood source of the state should be evaluated. These actions will ensure that Pelican Lake remains a destination within Oneida County for anglers.

Recommendations

1. Implement a 14- to 18-inch protected slot for largemouth bass and smallmouth bass with a combined daily bag of 5 to encourage harvest in hopes of reducing abundance and maintaining the trophy potential.
2. Pursue a 10 daily bag for panfish in hopes of stabilizing abundance trends of the harvest orientated panfish fishery while maintaining a desirable size structure.
3. Investigate reducing the muskellunge stocking rate to avoid potentially masking reproduction within the Pelican Lake and the impacts of density dependence growth if abundance continues to increase.
4. Continue the angling reporting program of muskellunge PIT tags increasing the time series of data and the potential for those data for use in management decisions.

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