WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Fishery Survey Report for Wapogasset and Bear Trap Lakes, Polk County, Wisconsin 2019-2021

WATERBODY IDENTIFICATION CODES: 2618000 AND 2618100

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Introduction

Wapogasset and Bear Trap lakes are highly productive lakes that receive extensive recreational boating use, high angling pressure and have quality, diverse fisheries. The Wisconsin Department of Natural Resources (DNR) surveyed Wapogasset and Bear Trap lakes to assess the status of their fisheries during 2019 and 2021. A mark-recapture survey was performed to estimate adult densities for both walleye and muskellunge. We assessed catch rates of largemouth bass, smallmouth bass, northern pike, bluegill and other panfish species to estimate relative abundance. We characterized population characteristics, size structure and growth for all species when possible. Recent management efforts have focused on walleye and muskellunge stocking, liberalizing the harvest of largemouth bass through regulation changes, public outreach and maintaining littoral zone habitat and water quality.

LAKE CHARACTERISTICS

Wapogasset and Bear Trap lakes are connected lakes located in south-central Polk County. Wapogasset and Bear Trap lakes are eutrophic and are both classified as complex-warm-dark lakes (Tables 1 & 2; Rypel et al. 2019). More information on water quality and invasive species can be found at the DNR lake pages for Wapogasset and Bear Trap lakes.

Table 1. Lake and watershed characteristics for Wapogasset and Bear Trap lakes, Polk County, WI.

	BEAR TRAP LAKE	WAPOGASSET LAKE
Size (ac)	247	1,189
Max depth (ft)	25	32
Mean depth (ft)	17	17

Table 2. July-August mean Trophic State Index (TSI) values for Wapogasset and Bear Trap lakes, Polk County, WI.

	BEAR TRAP LAKE	WAPOGASSET LAKE
Secchi disk visibility	42	53
Total phosphorous	55	57
Chlorophyll-a	54	59

There are two public boat landings on Wapogasset Lake off Sunrise Beach Dr. (latitude, longitude; 45.342, -92.440) and 130th St. at Garfield Park (45.322, -92.435) and one boat access location on Bear Trap Lake off S. Shore Ct. (45.315, -92.417).

STOCKING HISTORY

Walleye fry and small fingerlings have been regularly stocked at variable rates into Wapogasset Lake since 1973 (Appendix Table 1). Beginning in 2013, as part of the

Wisconsin Walleye Initiative, large fingerling walleye have been stocked biannually into Wapogasset Lake and Bear Trap Lake at a rate of 15 fish/acre. Large fingerling muskellunge have been stocked biannually into Wapogasset Lake since 2005 and Bear Trap Lake since 2015 at a rate of approximately 0.5 fish/acre (Appendix Table 1).

FISHING REGULATIONS

The only special fishing regulation in Wapogasset and Bear Trap lakes is a 14–18-inch protected slot limit for largemouth bass and smallmouth bass. This regulation has a five fish daily bag limit, but only one fish over 18 inches can be harvested. All other species follow statewide or Ceded Territory regulations.

Methods

Wapogasset and Bear Trap lakes were sampled during 2019, following the DNR's comprehensive treaty assessment protocol (Cichosz 2021) to estimate adult walleye and muskellunge population abundance and index northern pike abundance. Muskellunge population estimates are two-year surveys. The recapture netting for the muskellunge population assessment was delayed during 2020 due to COVID-19 and subsequently occurred during 2021.

Late spring electrofishing (SE2 survey) was conducted in both Wapogasset and Bear Trap lakes to assess largemouth bass, smallmouth bass and panfish populations. The SE2 survey consisted of 0.5-mile index stations where all gamefish and panfish were captured and 1.5-mile stations where only gamefish were collected. There were two index stations and gamefish stations completed on Bear Trap Lake and three index stations and gamefish stations on Wapogasset Lake. Information collected from captured fish included total length and weight, and aging structures were collected from a subsample of fish.

Fall electrofishing surveys were conducted on both lakes to assess the relative abundance of age-0 and age-1 walleye. Descriptions of standard DNR survey type, gear used, target water temperatures and target species are listed in Appendix Table 2.

Lake Class Standards catch per unit effort (CPUE) was calculated by comparing Wapogasset and Bear Trap lakes CPUEs of each species to the CPUES of the other 196 complex-warm-dark lakes in Wisconsin (Rypel et al. 2019). When possible, comparisons were also made to past surveys for these lakes.

Walleye and largemouth bass were aged with dorsal spines. Muskellunge were aged with anal fin rays. Bluegills and black crappies were aged with scales. All spines and fin rays were cut with a Dremel tool and aged under a microscope. The mean length at age was compared to the median length at age for complex-warm-dark lakes. Size structure was assessed using the proportional size distribution (PSD) indices (Neumann et al. 2013). The PSD value for a species is the number of fish of a specified length and longer divided by the number of fish of stock length or longer, the result

multiplied by 100 (Appendix Table 3). Fish condition was assessed by estimating the relative weight (W_r) of each fish, or the actual weight of a fish divided by its standard weight (Wege and Anderson 1978). The total annual mortality of largemouth bass was estimated using catch curve analysis.

To assess walleye stocking survival, an age-length key was used to estimate the abundances of walleye in each year class, assuming no natural reproduction and all fish were from stocked origin. Survival was estimated by dividing the population estimate for each age class by the total number of fish stocked for that year and multiplying it by 100. The cost of each stocking event was calculated by multiplying the number of large fingerlings stocked by the average cost per large fingerling ($1.06). Cost per recruit to age-3 and age-5 were estimated by dividing the cost of each stocking event by the estimated abundance of that year class.

The population size of adult muskellunge (≥ 30 inches during marking year) in Wapogasset and Bear Trap lakes (combined) was estimated using standard mark-recapture methods. Fish were marked (with fin clip and PIT tag) during 2019, and 2021 served as the recapture year. Recruitment was adjusted for by excluding fish < 32 inches in 2021. Size structure was assessed using the PSD-30, PSD-38 and PSD-42 indices (Neumann et al. 2013). The von Bertalanffy (1938) growth model was fitted using mean length at age data to assess the growth of muskellunge.

Results & Discussion

WALLEYE

The adult walleye population density estimate in Wapogasset Lake during 2019 was 4.3 fish/acre (CV = 0.10; Figure 1). The adult walleye population estimate in Bear Trap Lake was 4.0 fish/acre (CV = 0.22; Figure 2). The density of adult walleye in Wapogasset and Bear Trap lakes were similar, and both increased and are the highest ever reported for both lakes (Figures 1 & 2).

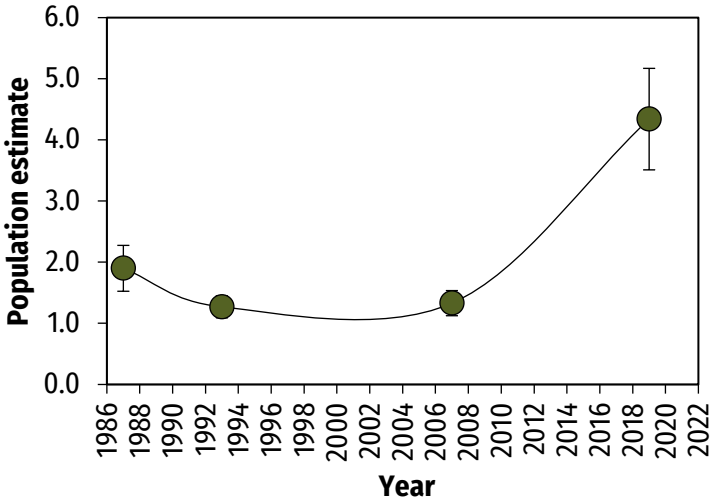

Figure 1. Population estimates of adult walleye (with 95% confidence intervals) in Wapogasset Lake, Polk County, 1987-2019.

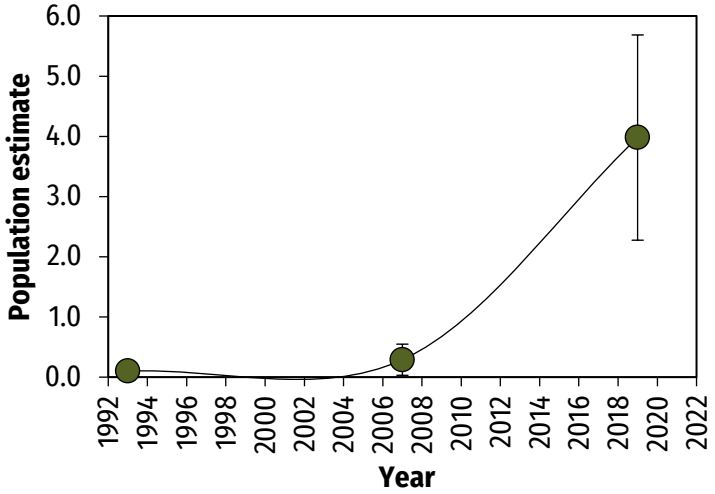

Figure 2. Population estimates of adult walleye (with 95% confidence intervals) in Bear Trap Lake, Polk County, 1993-2019.

A total of 1,891 walleyes were collected netting and electrofishing in Wapogasset Lake (Figure 3). The netting CPUE was 14.7 fish/net night. The catch per net night was above the 90th percentile (13.8 fish/net night) for complex-warm-dark Wisconsin lakes. Walleyes ranged in length from 4.5 – 27.5 inches, with an average length of 15.4 inches (Figure 3). The mean lengths of females and males were 18.0 and 15.2 inches, respectively. Walleye PSD-15 from netting was 74 and PSD-20 was 2. The male-to-female ratio was 5.7:1.

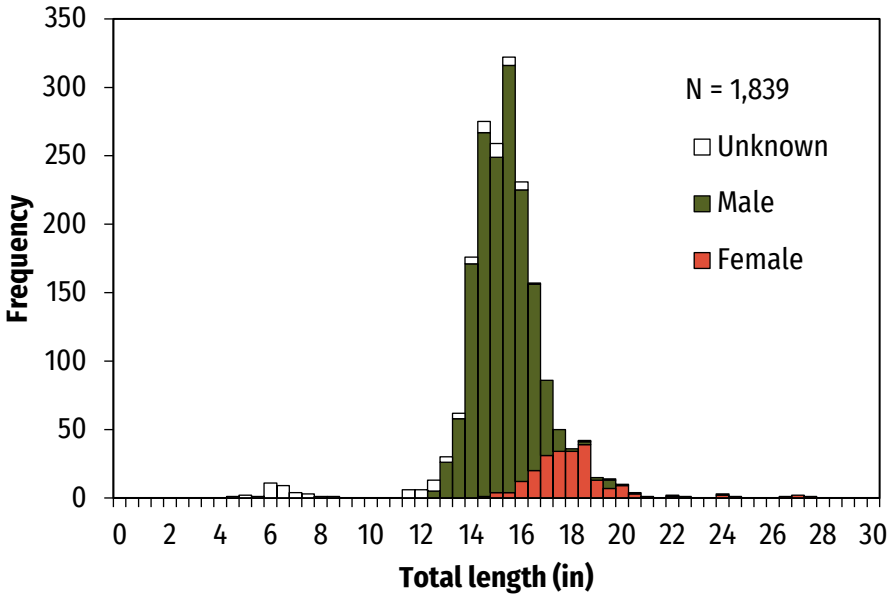

Figure 3. Length frequency of all walleyes captured in Wapogasset Lake during the spring 2019 SN1 and SE1 surveys.

There were 422 walleye collected netting and electrofishing in Bear Trap Lake (Figure 4). The netting CPUE was 8.7 fish/net night, and the electrofishing CPUE was 20.9 fish/mile. The catch per net night was above the 75th percentile (5.8 fish/net night) for complex-warm-dark Wisconsin lakes and has increased since 2014 (0.3 fish/net night). Walleyes ranged in length from 5.0 – 26.5 inches, with an average length of 14.6 inches (Figure 4). The mean lengths of females and males were 17.9 inches and 14.6 inches, respectively. Walleye PSD-15 from netting was 62 and PSD-20 was 3. The male-to-female ratio was 2.2:1.

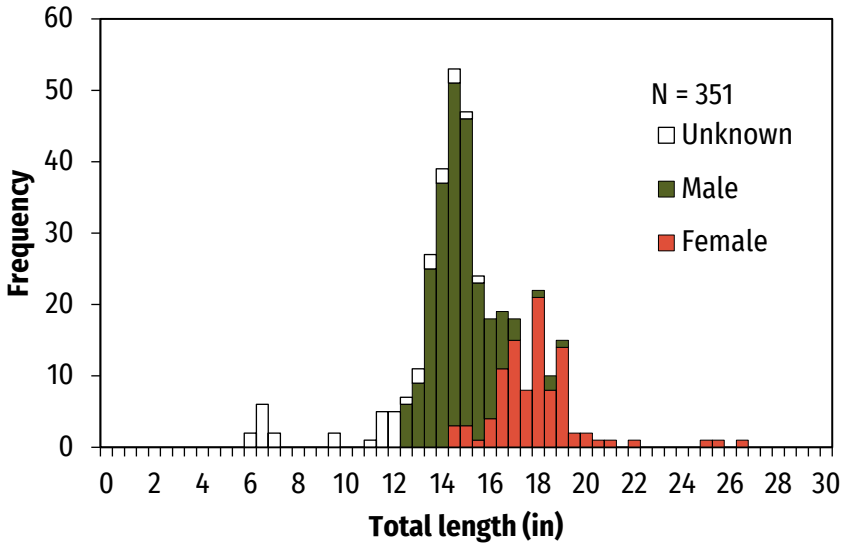

Figure 4. Length frequency of all walleyes captured in Bear Trap Lake during the spring 2019 SN1 and SE1 surveys.

Size structure indices for both lakes declined since the 2013-2014 survey, reflected by fewer large (> 20 inches) fish sampled and greater abundances of fish near the minimum length limit. The average size of walleye (sexes pooled) declined from 21.1 inches during 2013 to 15.7 inches during 2019, and PSD-20 decreased from 2013 (62) to 2019 (2), but PSD-15 has remained similar between surveys. This change in size structure between 2013 and 2019 was likely due to the increase in young walleye from recent large fingerling stockings. Despite this, walleye W_r was 101, indicating fish were in average condition.

Walleye growth rates in Wapogasset and Bear Trap lakes were fast, consistently above the median for complex-warm-dark lakes, and the mean length at age for ages 1 to 10 averaged 2.0 inches greater than the lake class median.

The walleye population was predominately young fish. Year classes ranged from ages 1 – 10, with greater than 90 percent of the total catch representing ages 2 – 5. The survival to age-3 was 7.5%, and the cost per age-3 walleye was estimated at $14.07. The survival to age-5 was 8.3%, and the cost per age-5 walleye was estimated at $12.74. Age-3 walleye were slightly below harvestable size (14.6 inches) on average and were not fully mature; therefore, age-3 fish may have been underrepresented in this survey. The survival rate was likely higher, and the cost per recruit was lower than estimated for age-3 fish. Age-5 fish had an average length of 18.1 inches and were greater than the minimum harvestable size (15 inches) for one to two years. The relative abundance of age-5 walleye was reduced by recreational harvest.

The age-1 catch rate during the fall electrofishing surveys was 2.8 fish/mile in Wapogasset Lake and 2.3 fish/mile in Bear Trap Lake. The age-1 catch rate would have corresponded to the 2018 stocking event. The age-0 catch rate during the fall electrofishing surveys was 0.4 fish/mile in Wapogasset Lake and 2.0 fish/mile in Bear Trap Lake. It is unknown if these age-0 walleye were from natural reproduction or tribal small fingerling stockings. Both lakes are currently classified as combination lakes where natural recruitment occurs, but the walleye fishery is primarily driven by stocking. Large fingerling stockings began in 2014 and have had high survival and successfully created a high-quality walleye fishery with a high adult density and quality size structure. The walleye fishery should continue to improve in the coming years as age and size structure improves and additional stockings occur. Fish greater than age-5, or approximately 19 inches or greater, represented 14.9% of the catch and were either from small fingerling stockings or naturally recruited.

MUSKELLUNGE

The adult (≥ 30 inches) muskellunge population density estimate for both lakes combined was 0.24 fish/acre (CV = 0.22). The current muskellunge population density has remained similar to that observed during the 2013 fishery survey (0.20 adult fish/acre). The catch per effort (pooled 2019 and 2021) was 0.96 fish/net night for Wapogasset Lake and 0.54 fish/net night for Bear Trap Lake. Catch rates in Wapogasset Lake were above the 75th percentiles (0.88 fish/net night) for similar complex-warm-dark Wisconsin Lakes and remained similar to catch rates during the 2013-2014 survey (0.89 fish/net night in Wapogasset Lake and 0.36 fish/net night in Bear Trap Lake) and were well above catch rates observed during 2007 (0.10 fish/net night in Wapogasset Lake and 0.05 fish/net night in Bear Trap Lake).

The average length of muskellunge was 37.5 inches, and lengths ranged from 14.9 – 48.0 inches (Figure 5). Females ranged in length from 32.0 – 48.0 inches with an average length of 42.8 inches, and males ranged from 25.1 – 41.4 inches with an average length of 33.7 inches. Adult muskellunge remained in good condition and had a W_r of 99. PSD-30 was 74, PSD-38 was 62, PSD-42 was 39, and no memorable-sized fish (> 50 inches) were observed during this survey. Muskellunge size structure was good and remained similar to the 2013 survey. Using von Bertalanffy growth models, the predicted theoretical maximum (mean) length for females was 47.0 inches and 39.6 inches for males (Figure 6). Two tiger muskellunge (muskellunge x northern pike hybrid) were collected during the fishery survey, ranging in length from 14.9 – 33.9 inches.

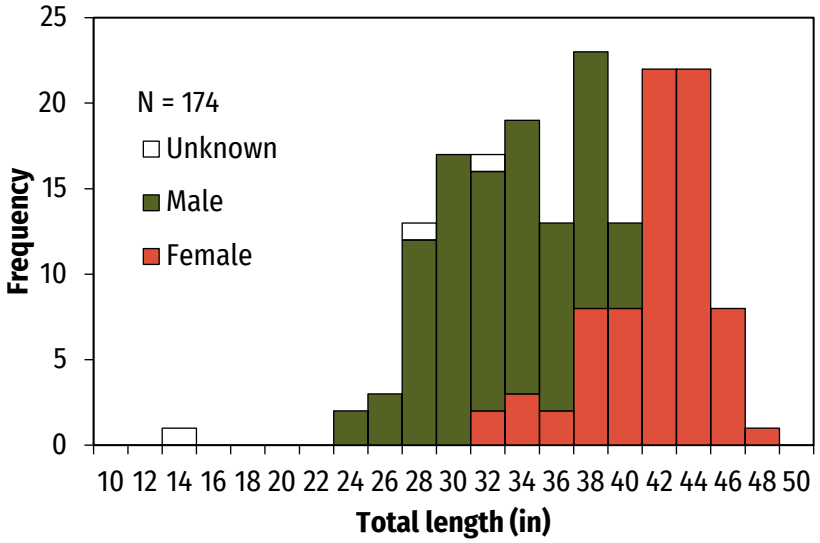

Figure 5. Length frequency of all muskellunge captured in Wapogasset and Bear Trap lakes during the spring 2019 and 2021 fyke netting surveys.

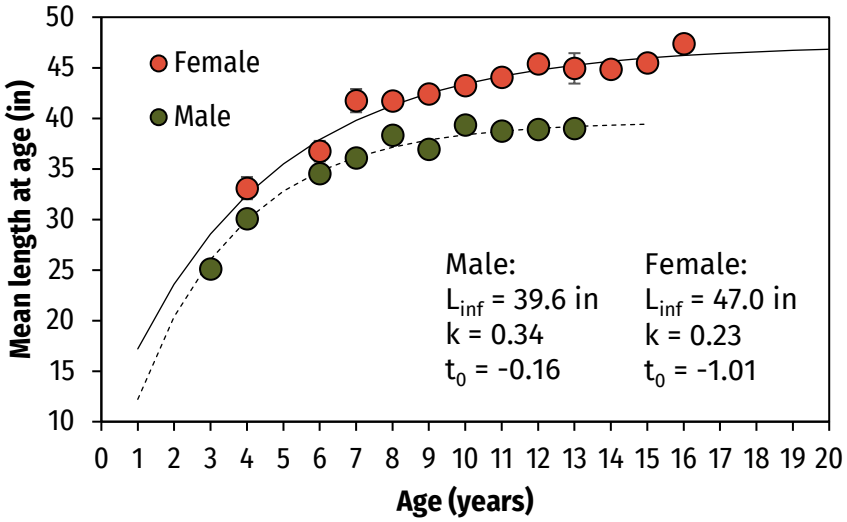

Figure 6. Mean lengths at age ± standard error for female (red circles) and male (grey circles) muskellunge from Wapogasset and Bear Trap lakes during 2019 and 2021. L_{inf} = theoretical maximum length, k = growth coefficient and t_0 = time at which length equals zero.

NORTHERN PIKE

A total of 65 northern pike were collected during the 2019 spring netting survey on Wapogasset and Bear Trap lakes, and lengths ranged from 10.7 – 36.2 inches (Figure 7). The average length was 19.3 inches, which is above the 75th percentile (18.3 inches) for complex-warm-dark Wisconsin lakes. The catch rate on Wapogasset Lake was 1.1 fish/net night, and the catch rate for Bear Trap was 0.9 fish/net night. The catch rate for both lakes was 1.0 fish/net night, which increased from the 2013 survey (0.31

fish/net night) and was similar to the 50th percentile (1.2 fish/net night) for complex-warm-dark Wisconsin lakes.

Wapogasset and Bear Trap lakes continue to have lower-density northern pike populations with desirable size structures. Northern pike PSD indices were high, with PSD-21 at 67 and PSD-28 at 25. Both size structure indices resembled those from the 2013 survey and remained greater than size structure metrics from the 2007 survey. Fish were in above-average condition (W_r = 97), and the male-to-female sex ratio was 1.2:1. Growth was good with an average size at age difference of +0.9 inches (ages 1 - 8) compared to similar complex-warm-dark Wisconsin lakes.

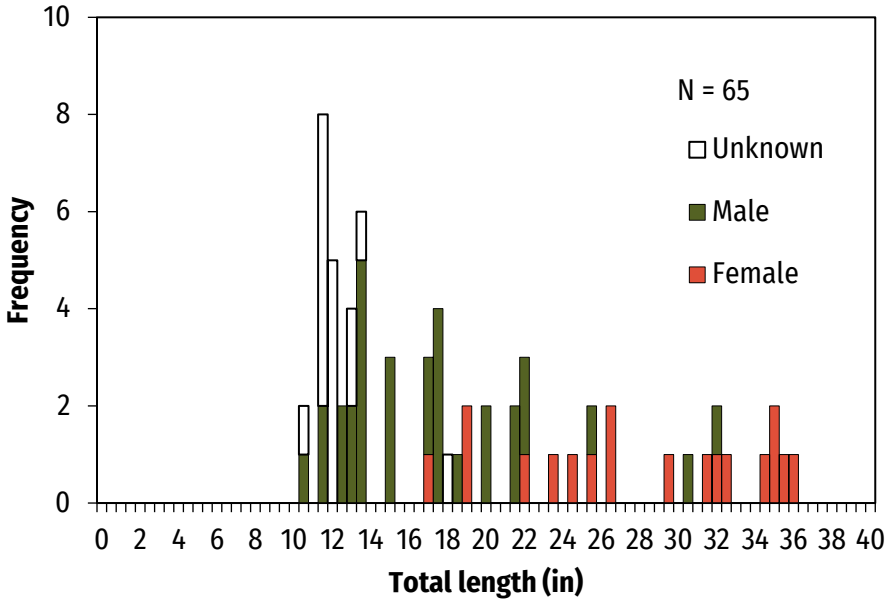

Figure 7. Length frequency of all northern pike captured in Wapogasset Lake and Bear Trap Lake during the spring 2019 fyke netting surveys.

LARGEMOUTH BASS

A total of 335 largemouth bass were collected from Wapogasset and Bear Trap lakes during the SE2 survey (Figure 8). The catch rate on Wapogasset Lake was 37.5 fish/mile, and the catch rate for Bear Trap was 27.5 fish/mile. The mean length was 12.7 inches. The average length improved from the 2013 survey (9.1 inches) and is in the 95th percentile for complex-warm-dark Wisconsin lakes. PSD-12 and PSD-15 were nearly identical between Wapogasset and Bear Trap lakes at 84 and 7, respectively, suggesting an overall good size structure. Both size structure indices have increased since 2013 (PSD-12 at 36 and PSD-15 at 3) and now resemble historically high values observed in the early 1970s (Figure 9). W_r from this survey (100) was similar to the 2013 survey (97), suggesting fish are in good condition. Growth rates have improved since the 2013 survey, with an average size increase of 1.4 inches from one – nine

years of age and resemble the northern region average. Total annual mortality estimated from a catch curve regression model was 55.8% (ages 4 – 9; Z = -0.82, R^2 = 0.65).

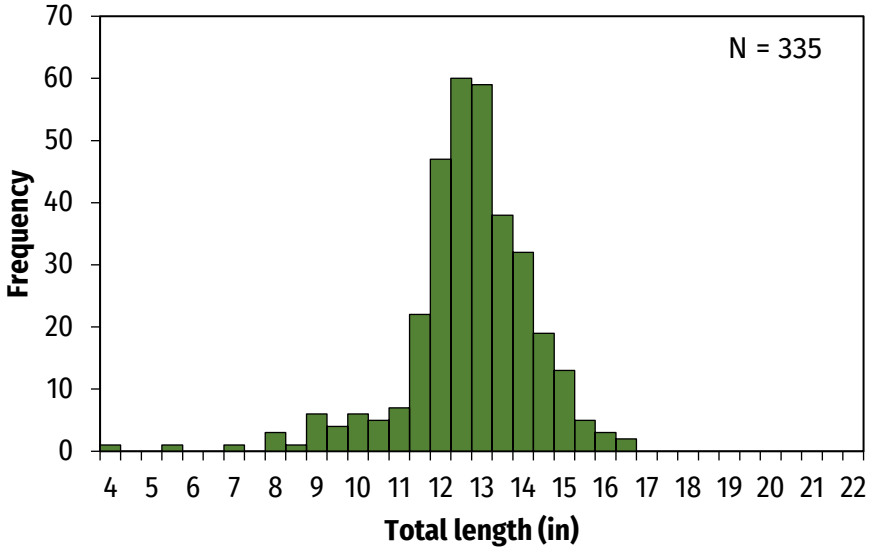

Figure 8. Length frequency of largemouth bass captured from Bear Trap and Wapogasset lakes during late spring electrofishing survey.

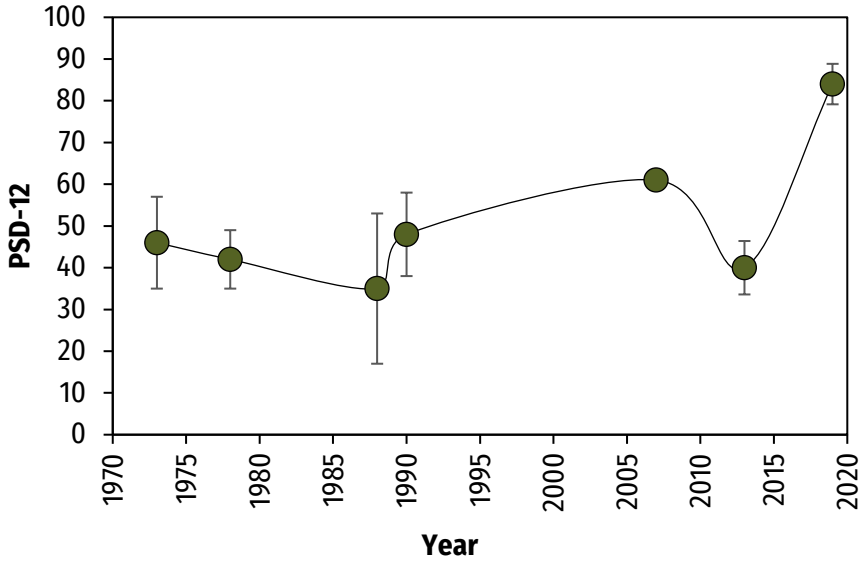

Figure 9. PSD-12 (with 95% confidence intervals) of largemouth bass sampled in Wapogasset Lake during the spring electrofishing surveys from 1973 - 2019.

The combined electrofishing catch rate for Wapogasset and Bear Trap lakes was 33.5 fish/mile. Catch rates from this survey declined compared to previous spring electrofishing surveys conducted during 2007 (52.4 fish/mile) and 2013 (42.1 fish/mile). Despite this, catch rates from this survey remain above the 50th percentile

for complex-warm-dark Wisconsin lakes and considerably above (i.e., nearly four times) those observed from surveys conducted during 1988 and 1990.

The largemouth bass population has improved since the establishment of a special fishing regulation (five fish daily bag limit with no minimum length limit, but fish between 14 – 18 inches in length may not be kept, and only one fish over 18 inches may be harvested) in 2016. Population abundance has declined, but notable improvements in size structure and growth were observed.

SMALLMOUTH BASS

Only seven smallmouth bass were collected from Wapogasset and Bear Trap lakes. The catch rate was 0.5 fish/mile on Wapogasset Lake and 0.8 fish/mile on Bear Trap Lake. Only one smallmouth bass was collected during the 2013 SE2 surveys from both lakes. Despite an increase in catch rate from 2013, the relative abundance of smallmouth bass remains low throughout the system but likely still contributes to the overall bass fishery.

BLUEGILL

A total of 118 bluegills were collected from Wapogasset and Bear Trap lakes, and lengths ranged from 3.1 to 9.3 inches with an average length of 5.9 in (Figure 10). The catch rate on Wapogasset Lake was 64.0 fish/mile, and the catch rate for Bear Trap was 22.0 fish/mile. The average length improved from the 2013 survey (4.9 inches) and is above the 95th percentile for complex-warm-dark Wisconsin lakes. PSD-6 was 50 and increased from the 2013 survey (23). Growth rates have remained similar to that observed in the 2013 survey and were similar to the northern region average.

The combined bluegill electrofishing catch rate for Wapogasset and Bear Trap lakes was 47.2 fish/mile. The catch rate of bluegill declined compared to 2007 (85.2 fish/mile) and 2013 (90.5 fish/mile) and is slightly below the 25th percentile for complex-warm-dark Wisconsin lakes. The bluegill population abundance has declined, but this corresponded with a notable improvement in population size structure.

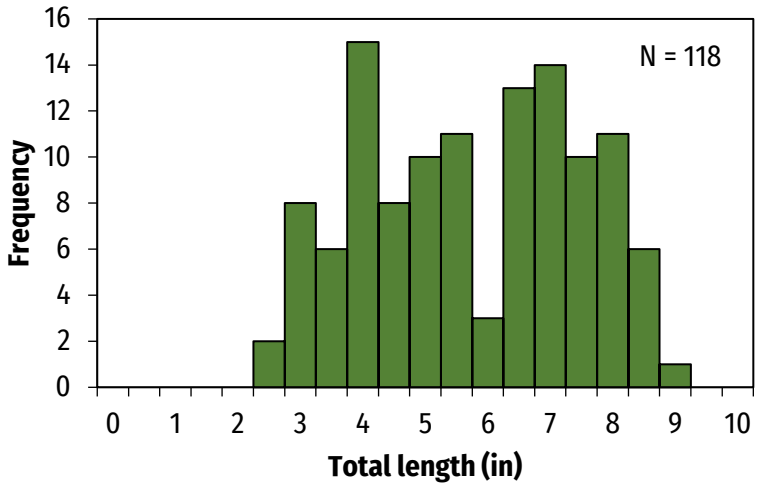

Figure 10. Length frequency of bluegill captured from Wapogasset and Bear Trap lakes during late spring electrofishing survey.

BLACK CRAPPIE

Twenty-two black crappies were collected in Wapogasset and Bear Trap lakes during the SE2 survey with a combined electrofishing catch rate of 8.8 fish/mile. The relative abundance of black crappies remained low and similar to the 2013 survey (1.6 fish/mile). Lengths ranged from 2.5 to 10.5 inches, with an average of 5.7 inches, which is above the 75th percentile for complex-warm-dark Wisconsin lakes. Black crappies have remained low in abundance with good size structure and similar to previous surveys.

YELLOW PERCH

Twenty-four yellow perch were collected in Wapogasset and Bear Trap lakes during the SE2 survey with a combined electrofishing catch rate of 9.6 fish/mile. Lengths ranged from 2.5 to 7.5 inches, with an average length of 2.9 inches. The average length of yellow perch was below the 25th percentile for complex-warm-dark Wisconsin lakes. The low relative abundance and low size structure of the yellow perch population in Bear Trap and Wapogasset lakes may not have a significant contribution to the recreational panfish fishery but serve as an important forage source for predatory fishes.

Management Recommendations

1.) Large fingerling walleye stockings have successfully established a quality fishery in Wapogasset and Bear Trap lakes. The walleye population should be maintained at a density of ≥ three fish/acre with the current stocking regime (15 fish/acre every other year). The next comprehensive survey is planned for 2027. The success of the large fingerling stocking should be further evaluated

during that survey by assessing the abundance, age structure, population demographics and stocking survival of the walleye population.

2.) Wapogasset and Bear Trap lakes support a high-quality muskellunge fishery. The muskellunge population should be maintained at an adult density of 0.2 – 0.3 fish/acre with the current stocking regime of 0.5 fish/acre every other year.
3.) Wapogasset and Bear Trap lakes are well-rounded and popular panfish lakes. No management actions are necessary for these species. Panfish populations should continue to be closely monitored as they represent a significant proportion of the recreational fishing pressure.
4.) Bass should continue to be managed with the 14-18-inch protected slot limit regulation. Largemouth bass and smallmouth bass populations will continue to be monitored every other year during fall electrofishing surveys. Evaluation of the special bass regulation will be re-evaluated during the next comprehensive survey in 2027.
5.) Efforts to increase habitat complexity in Wapogasset and Bear Trap lakes should also be encouraged where applicable. Inputs of coarse woody structure/habitat, protection/promotion of aquatic vegetation and maintenance/restoration of vegetative buffers would be beneficial. Efforts to increase habitat complexity in Wapogasset and Bear Trap lakes should also be encouraged where applicable. Inputs of coarse woody debris, protection/promotion of aquatic vegetation and maintenance/restoration of vegetative buffers would be beneficial. This website healthylakeswi.com is a great resource to learn about this recommendation.
6.) Invasive species monitoring and control programs should continue.

Acknowledgements

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Appendices

Appendix Table 1. Fish stocking records for Wapogasset and Bear Trap lakes, 1973 – 2021. SF represents small fingerlings, and LF represents large fingerlings.

YEAR	LAKE	SPECIES	AGE CLASS	NUMBER STOCKED	AVG. LENGTH (IN)
2000	Wapogasset	Walleye	SF	90,330	1.6
2002	Wapogasset	Walleye	SF	123,600	1.9
2004	Wapogasset	Walleye	SF	88,989	1.4
2005	Wapogasset	Walleye	Fry	3,700,000	0.2
2005	Wapogasset	Muskellunge	LF	711	11.8
2006	Wapogasset	Walleye	SF	41,485	1.8
2007	Wapogasset	Muskellunge	LF	395	12.4
2008	Wapogasset	Walleye	SF	41,746	1.5
2008	Bear Trap	Walleye	SF	8,423	1.5
2009	Wapogasset	Muskellunge	LF	593	10.0
2010	Wapogasset	Walleye	SF	41,510	1.7
2010	Bear Trap	Walleye	SF	8,435	1.7
2011	Wapogasset	Muskellunge	LF	593	10.1
2012	Wapogasset	Walleye	SF	42,073	1.7
2014	Wapogasset	Walleye	LF	17,798	6.4
2014	Bear Trap	Walleye	LF	3,711	6.3
2015	Wapogasset	Muskellunge	LF	1,188	12.3
2015	Bear Trap	Muskellunge	LF	247	12.4
2016	Wapogasset	Walleye	LF	17,784	7.0
2016	Bear Trap	Muskellunge	LF	166	11.8
2016	Bear Trap	Walleye	LF	3,711	7.1
2017	Wapogasset	Muskellunge	LF	105	11.5
2017	Bear Trap	Muskellunge	LF	22	11.5
2018	Wapogasset	Walleye	LF	17,826	6.2
2018	Bear Trap	Walleye	LF	3,706	6.1
2019	Wapogasset	Muskellunge	LF	450	12.6
2019	Bear Trap	Muskellunge	LF	65	12.6

2020	Wapogasset	Walleye	LF	17,830	7.2
2020	Bear Trap	Walleye	LF	3,711	6.9
2021	Wapogasset	Muskellunge	LF	174	13.1
2021	Bear Trap	Muskellunge	LF	121	14.4

Appendix Table 2. Survey types, gear used, target water temperature and target species.

SURVEY TYPE	GEAR USED	TARGET WATER TEMPERATURE (°F)	TARGET SPECIES
Spring Netting 1 (SN1)	Fyke Net	~45	Walleye, northern pike
Spring Electrofishing 1 (SE1)	Boat Electrofishing	45-50	Walleye
Spring Netting 2 (SN2)	Fyke Net	50-55	Muskellunge, black crappie, yellow perch
Spring Electrofishing 2 (SE2)	Boat Electrofishing	55-70	Largemouth bass, smallmouth bass, bluegill and other panfish, non-game species
Spring Netting 3 (SN3)	Fyke Net	65-80	Bluegill, black crappie
Fall Electrofishing (FE)	Boat Electrofishing	50-60	Juvenile walleye and muskellunge

Appendix Table 3. Proportional stock density values.

SPECIES	STOCK SIZE (in)	QUALITY SIZE (in)	PREFERRED SIZE (in)
Black crappie	5	8	10
Bluegill	3	6	8
Largemouth bass	8	12	15
Northern pike	14	21	28
Pumpkinseed	3	6	8
Rock bass	4	7	9
Smallmouth bass	7	11	14
Walleye	10	15	20

Yellow perch	5	8	10