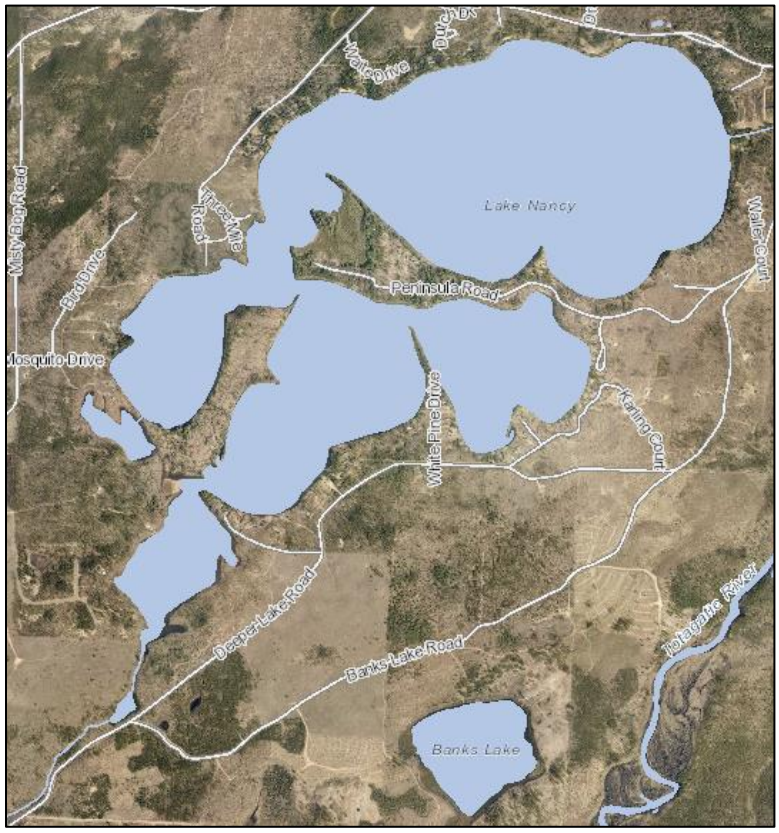
Lake Nancy Fishery Survey, Washburn County, Wisconsin

2019

WBIC 2691500



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Executive Summary

A comprehensive survey of Lake Nancy, Washburn County, was conducted during the 2019 sampling season. The main objective of this survey was to assess the gamefish and panfish populations. Secondary objectives were to evaluate walleye stocking success from the Wisconsin Walleye Initiative.

Gamefish collected included walleye, northern pike, muskellunge, and largemouth bass. The 2019 adult walleye population estimate was 514 fish (0.7 fish/acre), an increase from 2012 (0.1 fish/acre). Catch rates for northern pike were 1.2 fish/acre, a decrease from 2012 (2.0 fish/acre). Largemouth bass catch was 34.7 fish/mile, nearly double the 2012 catch rate (19.2 fish/mile). Bluegill mean length was 6.5 inches (in). Black crappie, pumpkinseed, yellow perch, rock bass, and hybrid sunfish were the other panfish species collected in Lake Nancy.

Management recommendations include: 1.) Largemouth bass densities are higher, the current regulation should continue. 2.) Northern pike densities appear lower, sampling did not target them. 3.) Walleye stocking should continue as it solely supports the fishery. 4) If natural reproduction is not measured, the current regulation should revert to base regulation for walleye. 5.) Bluegill monitoring will be needed as bass densities lower. 6). A fisheries habitat survey should occur in Lake Nancy. 7.) Invasive species monitoring and control programs should continue. 8.) Gather public input using novel techniques to help educate fisheries management decisions for Lake Nancy.

Introduction

Lake Nancy is a soft-water drainage lake in northern Washburn County. The lake's shoreline is primarily privately owned and developed. Lake Nancy is 772 acres with a maximum depth of 39 feet and mean depth of 11 feet. An unnamed, intermittent outlet on the south end of Lake Nancy drains into the Totagatic River. Lake Nancy is classified as a complex-warm/clear lake (Rypel et al. 2019). Complex meaning it has four or more species of gamefish and warm/clear meaning it is projected to have prolonged warmer water temperatures (above 50 F) and clearer water compared to the baseline for temperate lakes (Rypel et al. 2019).

Lake Nancy is a clear water, mesotrophic lake. TSI is an index for evaluating trophic state or nutrient condition of lakes (Carlson 1977; Lillie et al. 1993). Lake Nancy is considered a mesotrophic/oligotrophic lake (moderate to low productivity) according to its TSI index (WDNR 2019). Substrate in Lake Nancy is mostly sand, with some muck, and a small amount of rock and gravel.

Gamefish species present in Lake Nancy include largemouth bass *Micropterus salmoides*, walleye *Sander vitreus*, northern pike *Esox lucius*, and muskellunge *Esox masquinongy*. Smallmouth bass *M. dolomieui* have been documented in previous surveys. Panfish species include bluegill *Lepomis macrochirus*, black crappie *Pomoxis nigromaculatus*, pumpkinseed *L. gibbosus*, yellow perch *Perca flavescens*, and rock bass *Ambloplites rupestris*. Other species common in Lake Nancy include bowfin *Amia calva*, white sucker *Catostomus commersoni*, and brook silverside *Labidesthes sicculus*. Invasive species present in Nancy Lake include Chinese mystery snail *Bellamya chinensis*, curly-leaf pondweed *Potamogeton crispus*, and Eurasian watermilfoil *Myriophyllum spicatum*.

Fisheries management by the Wisconsin Department of Natural Resources (WDNR) has consisted of fish surveys and stocking. Early stockings (1933 – 1997) consisted of walleye, largemouth bass, white sucker, northern pike, panfish, and muskellunge. Leech Lake strain muskellunge were stocked as part of a research project in 1984, 1987, and 1990. These stocking events were evaluated. WDNR research biologists concluded that Leech Lake muskellunge had below-average survival, better growth, poor body condition, and resulted in a low-level of muskellunge natural reproduction in Lake Nancy (Margenau and Hanson 1997) . The end recommendation was to discourage stocking with Leech Lake strain muskellunge in Wisconsin because of the potential negative consequences of genetic introgression with native stocks (Margenau and Hanson 1997). Walleye have been the only fish stocked since 1991 (Appendix Table 1). Recently, Lake Nancy has been included in the Wisconsin Walleye Initiative receiving large fingerling walleye every other year since 2014 at rate of 20 large fingerlings/acre (Appendix Table 1).

Many surveys have taken place on Lake Nancy by DNR fisheries research, management and treaty. DNR management and treaty surveys focused on assessing walleye, gamefish, and panfish populations. In 2014, Lake Nancy was included in a new study of "Sentinel" walleye lakes looking at the impacts of stocking large fingerling walleye in lakes around Wisconsin. Comprehensive fish surveys have taken place in 1993, 1998, and 2012. Habitat work has also taken place in Lake Nancy. Walleye spawning reefs were placed in Lake Nancy in 1998. These rock reefs were created to improve walleye natural recruitment in the lake. Fishing regulations have generally followed statewide regulations. In 2005, a five-fish bag limit, no minimum size limit was put in place for largemouth bass. In 2011, a three-fish, 18-inch minimum size limit was put in place for walleye. Both regulations were put in place in response to the declining

walleye population and increasing largemouth bass population. The main objective of this survey was to assess the gamefish and panfish populations. Secondary objectives were to evaluate walleye stocking success from the Wisconsin Walleye Initiative.

Methods

Field sampling

Spring sampling started in late April following WDNR lake sampling protocols (Simonson et al. 2008). After ice out, seven fyke nets were set on 21 April in areas favorable for walleye spawning. Nets were removed on 25 April for a total effort of 28 net nights. After removal of nets, the entire shoreline of Lake Nancy was sampled with night electrofishing on 25 April for the walleye recapture run.

All walleye, northern pike, and muskellunge captured during netting and electrofishing were measured to the nearest 0.5 in and sex was determined based on the presence of gametes. A left ventral fin clip was given to adults and a top caudal fin clip was given to juvenile gamefish captured while netting.

Late spring electrofishing took place 5 June. This sampling was focused on largemouth bass, northern pike (due to low sample size in nets), and panfish. Gamefish were collected during three, two-mile index stations. A ½ mile index station was embedded in each station targeting panfish in addition to gamefish.

Fall electrofishing took place 16 September to assess any natural/stocked recruitment of walleye in Lake Nancy. This sampling took place once the surface water temperature dropped below 70 F. Walleye less than 12.0 in were collected in the sample.

Age and Statistical Analysis

All gamefish were measured to the nearest half inch. Panfish were measured to the nearest tenth of an inch. Age structures were collected from walleye, largemouth bass, and bluegill. Scale samples were taken on walleye less than 15.0 in, largemouth bass less than 12.0 in, and bluegill greater than 3 in. Dorsal spines were taken on all larger walleye and bass sampled.

Size structure quality of species sampled was determined by using the indices proportional stock densities (PSD) (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. Catch per unit effort (CPE) was calculated as the number of fish captured divided by the appropriate unit of sampling effort for that species (i.e. net night, mile of shoreline). CPE, mean length-at-age, and average length was compared with Wisconsin lake class standards for walleye (NW Wisconsin mean length-at-age), northern pike, largemouth bass, and bluegill.

An age-length key was used to estimate abundances of age-3, age-5, and age-7 walleye in the sample (assuming extremely low/no natural contributions to the walleye population). Cost of each stocking event for adults was estimated using mean cost per stocked large fingerling multiplied by the number of fish stocked. Cost per recruit was then estimated by dividing the total cost by the fish recruited to age-3, age-5, and age-7 cohorts (Olson 2015).

Results

Early Spring Fyke-Netting and Electrofishing

Walleye. The 2019 adult walleye population estimate for Lake Nancy was 514 walleye (CV = 0.14) (Figure 1) or 0.7 fish/acre. This estimate is higher than 2012 (0.1 fish/acre), but lower than

1998 (1.9 fish/acre) and the same as 1993 (0.7 fish/acre). The current estimate was below the average found in stocked walleye lakes in the Ceded Territory (Cichosz 2019 – 1.4 fish/acre).

A total of 326 walleye were collected netting and electrofishing. The CPE was 10.8 fish/net night for netting and 2.9 fish/mile for electrofishing. Both are increases from 2012 (0.5 fish/net night; 0 fish/mile). The netting catch rate was above the 75th percentile (3.7 fish/net night) for complex warm-clear fisheries in Wisconsin. Adult walleye ranged in length from 12.7 to 25.7 in (Figure 2). Mean lengths of male and female walleye were 15.0 in (standard deviation (SD) =1.0) and 20.6 in (SD=2.2), respectively. The male to female ratio was 1:1. Walleye size structure is smaller than 2012 and similar to 1998 (Figure 3). PSD was 72 and PSD-20 was 26. PSD for 2012 was not used to due to very low sample size. Growth rates for both sexes of walleye were similar/above regional averages for NW Wisconsin (Figure 4 & 5).

Walleye collected corresponded to a stocking event in 100% of the sample (based on age-length key). 99% of walleye sampled were from fish stocked during the Wisconsin Walleye Initiative or DNR large fingerlings (2012). The cost per recruit was estimated at $68.43 per age 3 cohort walleye, $130.32 per age 5 cohort walleye, and $55.47 per age 7 cohort walleye (age-7 walleye were stocked at 10 large fingerlings/acre before the Walleye Initiative in 2012).

Northern Pike. A total of 35 northern pike were collected netting ranging from 11.2 in to 23.6 in. The average length was 17.7 in (SD = 2.7), above the 75th percentile for complex warm-clear lakes. PSD was not calculated due to the small sample size. The CPE for northern pike was 1.2 fish/net night, a decrease from 2012 (2.0 fish/net night). The netting catch rate was slightly below the median (1.3 fish/net night) for complex warm-clear fisheries in Wisconsin.

Muskellunge. Two muskellunge were collected during 2019 sampling. These fish were 40.3 in and 40.5 in. The catch rate was .07 fish/net night, higher than 2012 (0 fish/net night).

Late Spring Electrofishing

Largemouth bass. A total of 208 largemouth bass were collected ranging from 3.6 to 21.3 in. PSD was 41 and PSD-15 was 3. PSD increased when compared to 2012 (PSD = 29), while PSD-15 was the same (PSD-15 = 3). Mean length was 11.2 in (SD = 2.4), a one-inch increase since 2012 (10.2 in), and above the 75th percentile for complex warm-clear Wisconsin lakes (Figure 6). CPE was 34.7 fish/mile, nearly double the 2012 catch rate (19.2 fish/mile). The electrofishing catch rate fell between the median (25.5 fish/mile) and 75th percentile (49.8 fish/mile) for complex warm-clear fisheries in Wisconsin. Largemouth bass grew near average for complex warm-clear lakes until age 7, similar to 2012 and slower than 1998 (Figure 7). Growth rebounds after age 10 and is above average.

Bluegill. A total of 356 bluegill were collected ranging from 1.3 to 9.0 in. Mean length was 6.5 in (SD = 1.7), a large increase from 2012 (4.9 in), and two inches higher than the average for complex warm-clear lakes (Figure 8). Bluegill CPE was 237.3 fish/mile, a decrease from 2012 (337.0 fish/mile), was above the 75th percentile for complex warm-clear lakes. Bluegill PSD was 71, a large increase from 2012 (37). Bluegill average length at age was also higher for age-7 to age-10, when comparing 2004 and 2019 (Figure 9). It was below average until age-7 for complex warm-clear lakes in Wisconsin.

Other panfish. Black crappie, pumpkinseed, yellow perch, rock bass, and hybrid sunfish were the other panfish species collected in Lake Nancy. Six black crappie were collected averaging 9.2 in (SD = 0.7). Twenty-seven pumpkinseed were collected averaging 7.2 in (SD = 1.2). Fourteen yellow perch were collected averaging 3.5 in (SD = 1.0). Twenty-four rock bass were collected averaging 6.6 in (SD = 1.5). One hybrid sunfish was collected that measured 8.5 in.

Fall electrofishing

The 2019 CPE for age-0 walleye was 0. The 2019 CPE for age-1 walleye was 0.3 fish/mile. The age-0 catch is well below Ceded Territory averages for stocked lakes (5.6 fish/mile age-0 average in Cichosz 2019). The average catch rate of age-0 walleye in Lake Nancy conducted WDNR and Great Lakes Fish and Wildlife Commission between 1990 and 2019 was 4.2 fish/mile (SD=8.1;N=26; (Figure 10)). Age-1 walleye catch has been lower averaging 1.5 fish/mile (SD=2.4;N=22;(Figure 10)).

Discussion

Lake Nancy remains a healthy fishery for largemouth bass, northern pike, and panfish. Walleye remain at low densities in the lake but provide another option for anglers. Muskellunge are present but anglers are unlikely to encounter them.

Walleye are where WDNR invests the most resources for Lake Nancy (stocking and surveys). However, they remain at a low density and below the current recommendations for walleye stocking (1.5 fish/acre – WDNR Stocking Guidance, internal document 2019). This trend has become common for many lakes in NW Wisconsin (Cole 2017; Olson 2015; Wendel 2013).

Lake Nancy had a high-density walleye fishery in 1965 (Johannes 1976), and in 1976 walleye were considered the most abundant gamefish and stocking was discontinued (Johannes 1976). Since those surveys, despite efforts with walleye stocking, spawning habitat, and more restrictive walleye regulations, and liberal bass regulations, the walleye population became and remains low. Walleye natural reproduction now appears to be non-existent while largemouth bass have become abundant in Lake Nancy. The creation of spawning reefs in the early 2000s

did not result in increased natural reproduction (Neuswanger and Bozek 2004). Stocking has become the main source of recruitment for Nancy walleye. The cost when compared with other fisheries in Northern Wisconsin was shown to be reasonable (Olson 2015). However, there are currently no DNR guidelines on what is considered an appropriate cost per recruit for stocked walleye. Age-3 females are not fully represented in our population estimate or this cost analysis, since females typically mature at age-4 or age-5. When these females mature and we sample the lake again, it may increase the population size and further decrease the estimated cost of the 2012 cohort.

Walleye growth was generally above average, though very few year classes are represented. The male to female ratio (1:1) also suggests a low-density population. These characteristics are typical for most stocked walleye fisheries in Washburn and Burnett Counties (Roberts 2015, 2017; Wendel 2013).

It is currently assumed that a combination of factors are causing walleye declines in Lake Nancy and other lakes in Northern Wisconsin. Hansen et al. (2015) predicts that walleye should no longer be present in Lake Nancy based on a predictive model for walleye recruitment: https://owi.usgs.gov/vizlab/climate-change-walleye-bass/explore/map.html . This model found that lake area, water temperatures, and shoreline development played a large role in whether walleye could survive in certain lakes into the future. This model is correct that without the current stocking program walleye would be at lower levels or non-existent in Lake Nancy (they were almost extirpated in 2012).

Northern pike catch rates were lower than 2012, when looking at fyke-net catch data. We also did not see any large female pike. These results are due to our netting locations not being effective for northern pike in this survey. Our sites were focused on sampling walleye, so nets

were set near sand and gravel and adjacent to deeper water. Due to timing constraints and a lack of staff, we opted to not set nets specifically for northern pike in the weedy areas on the southwest portion of the lake. Due to this change in sampling, we did not capture the numbers or size of spawning pike that was seen in 2012.

Muskellunge are likely present because an extremely low level of natural reproduction is still occurring in Lake Nancy from the experimental stockings in 1984, 1987, and 1990. This study concluded that there is no evidence to suggest that Leech Lake muskellunge would perform better than Wisconsin muskellunge in Wisconsin waters (Margenau and Hanson 1997). However, during the study the researchers did conclude that Leech Lake muskellunge did reproduce in Lake Nancy. The rates of natural reproduction were lower than average for self-sustaining muskellunge populations in Wisconsin (Margenau and Hanson 1997). The two muskellunge we sampled netting were likely a remnant of that stocked muskellunge population established with the research study. However, it is unlikely the lake would ever achieve a fishable population again without stocking.

Largemouth bass are currently present at higher densities than 2012. However, the average size increased from 2012 by one inch and the overall size structure appears better. For its lake classification, largemouth bass grew near average for most ages. Growth, though good for its lakes classification, is similar to 2012. After 15 years of the no minimum length limit regulation, the density should be lower. Harvest did increase from 1998 to 2012 based on the latest WDNR creel survey, with seven times as many fish being harvested. It appears that more harvest may be needed to help increase Lake Nancy's largemouth bass size structure. When looking at CPE of bass over 8 in compared with PSD, Nancy is underperforming for Washburn and Burnett Counties (Figure 11).

Bluegill size structure seems to have benefitted from higher predator numbers in Nancy Lake. The average size of bluegill increased 1.6 in since the last survey. At the same time, CPE decreased by 100 fish/mile since 2012. Growth had an inverse relationship after age-6 when comparing 2004 and 2019. The improved bluegill size structure is likely due to increased numbers of walleye and largemouth bass (Guy and Willis 1990). Stocked walleye have also been shown to prey heavily on small bluegill (Santucci and Wahl 1993). Therefore large fingerling walleye stockings and naturally increasing bass numbers have created a better bluegill fishery. However, bluegill growth appears to have slowed in fish younger than age-7 (Figure 9). This pattern will need evaluation during the next survey to see if the good bluegill growth is a temporary pattern or a lasting effect of increased piscivores in the lake.

Management Recommendations

1) The largemouth bass relative abundance appears higher since 2012. Increased harvest is not having the desired effect, however, there is no reason to restrict harvest with an abundant bass population. The regulation should continue with a goal of reducing bass densities to 25 fish/mile or less.
2) Northern pike densities were lower; however, sampling did not target them well. The five-bag limit, no minimum size limit should continue.
3) Walleye densities did improve since 2012 as a direct result of stocking but are still under 1.5 fish/acre, which is the adult population goal based on 2019 WDNR stocking guidance. The walleye fishery would be non-existent without stocking.
4) If measurable natural reproduction (≥ 10 fish/mile) is not found during the next five fall surveys (2020-2024), then the walleye regulation should switch to the base regulation for

the Ceded Territory. This change acknowledges that efforts to protect females and establish natural reproduction were ineffective and that the lake will be considered a put-grow-take lake for walleye.

5) Bluegill populations should be monitored in light of the noticeable change in growth. Largemouth bass densities remain high, but an increase in bass harvest could change the bluegill size structure. A spring electrofishing run should be used to reassess bluegill abundance during the next survey.
6) A count of woody habitat in the riparian zone of Lake Nancy is needed. This survey would provide a baseline for shoreline habitat and could be completed by interested volunteers. Efforts to increase habitat complexity should also be encouraged. Input of coarse woody habitat, protection/promotion of aquatic vegetation, and maintenance/restoration of vegetation buffers are a few options that would benefit Lake Nancy. This website: www.healthylakeswi.com is a great resource to learn about this recommendation.
7) Invasive species monitoring and control programs should continue. Efforts to keep aquatic invasive species out of a waterbody are much more effective than controlling invasive species once they are established.
8) Gather public input using novels techniques (i.e. survey monkey or online survey formats) to help educate fisheries management decisions (stocking, regulations, habitat) for Lake Nancy.

Acknowledgements

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References

Carlson, R. 1977. A trophic state index for lakes. Limnology and Oceanography 22: 361 – 369.

Cichosz, T.A. 2019. Wisconsin Department of Natural Resources 2017-2018 Ceded Territory Fishery Assessment Report. Wisconsin Department of Natural Resources. Administrative Report #91, Madison, WI.

Cole, A.J. 2017. Pipe and North Pipe lakes Fishery Assessment, 2015 Polk County, WI (MWBIC: 2490500 & 2485700). Wisconsin Department of Natural Resources, Barron, WI.

Guy, C.S. and D.W. Willis. 1990. Structural relationships of largemouth bass and bluegill populations in South Dakota ponds. North American Journal of Fisheries Management 10:338-343.

Hansen G.J.A., S.R. Carpenter, J.W., Gaeta, J.M. Hennessy, and M.J. Vander Zanden. 2015. Predicting walleye recruitment as a tool for prioritizing management actions. Canadian Journal of Fisheries and Aquatic Sciences 72: 661-672.

Johannes, S.J. 1976. Fish management project evaluation survey – Nancy Lake, Washburn County. Wisconsin Department of Natural Resources, Internal Fisheries Management Report, Spooner Field Office.

Lillie, R.A., S. Graham, and P. Rasmussen. 1993. Trophic state index equations and regional predictive equations for Wisconsin lakes. Bureau of Research – Wisconsin Department of Natural Resources, Research Management Findings, Number 35.

Margenau, T.L., and D.A. Hanson. 1997. Performance of Leech Lake, Minnesota, muskellunge in a Wisconsin lake. Wisconsin Department of Natural Resources, Research Report 175, Spooner Office.

Neumann, R.M., C.S. Guy, and D.W. Willis. 2013. Length, weight, and associated indices. Pages 637-676 in A.V. Zale, D.L. Parrish, and T.M. Sutton, editors. Fisheries techniques, 3rd edition. American Fisheries Society, Bethesda, Maryland.

Neuswanger, D. and M.A. Bozek. 2004. Preliminary assessment of effects of rock habitat projects

on walleye reproduction in 20 Northern Wisconsin lakes. A summary of case histories as of March 2004. Wisconsin DNR internal report.

Olson, K. 2015. Lake Owen Walleye and Bass Update. Bayfield County, WI WBIC: 2900200. Wisconsin Department of Natural Resources, Brule, WI.

Roberts, C. 2015. North Sand Lake Fishery Survey, Burnett County, Wisconsin 2014-2015 WBIC Sand Lake 2495100. Wisconsin Department of Natural Resources. Spooner, WI.

Roberts, C. 2017. Lipsett Lake Comprehensive Fishery Survey, Burnett County, Wisconsin 2016-2017 WBIC Lipsett Lake – 2678100. Wisconsin Department of Natural Resources. Spooner, WI.

Rypel, A.L., T.D. Simonson, D.L. Oele, J.D. Griffin, T.P. Parks, D. Seibel, C.M. Roberts, S. Toshner, L. Tate, and J. Lyons. 2019. Flexible classification of Wisconsin lakes for improved fisheries conversation and management. Fisheries. Doi:10.002/fsh.10228.

Santucci, V.J., Jr., and D.H. Wahl. 1993. Factors influencing survival and growth of stocked walleye in a centrarchid-dominated impoundment. Canadian Journal of Fisheries and Aquatic Sciences 50: 1548-1558.

Simonson, T., A. Fayram, J. Hennessy, and T. Treska. 2008. Fisheries Assessments - Lakes 2007-09 Sampling Procedures. Wisconsin DNR internal publication. Madison, WI.

WDNR 2019. Citizen monitoring lake water quality database. Available from: http://dnr.wi.gov/lakes/CLMN .

Wendel, J. 2013. Big McKenzie Lake Fishery Survey, Burnett County, Wisconsin 2012 MWBIC 2706800. Wisconsin Department of Natural Resources Spooner, WI.

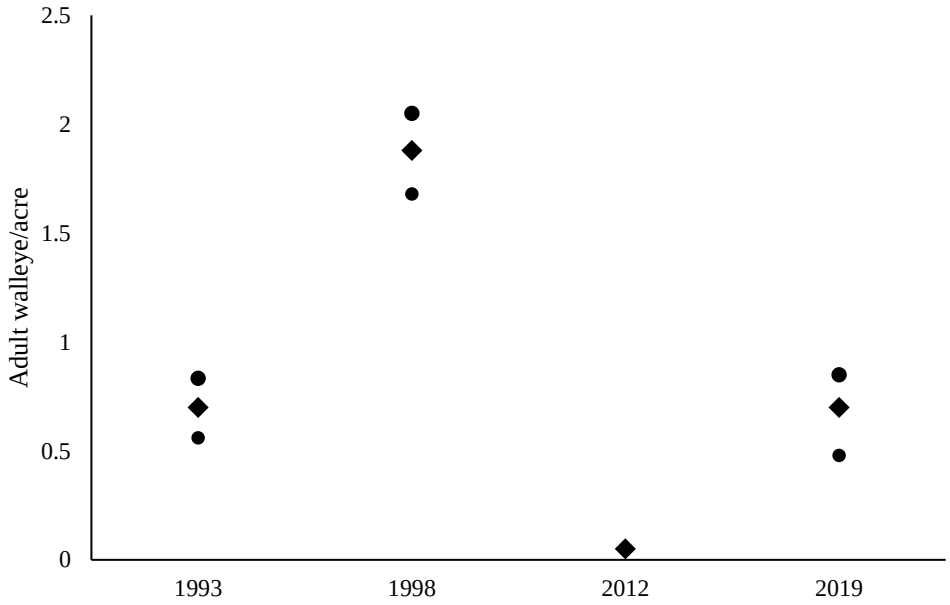

Figure 1. Adult walleye population estimates for Lake Nancy, Washburn County, Wisconsin. The black diamond symbol represents the population estimate and black circle represents the upper and lower 95% confidence intervals. The 2012 population estimate could not calculate confidence intervals due to low sample size.

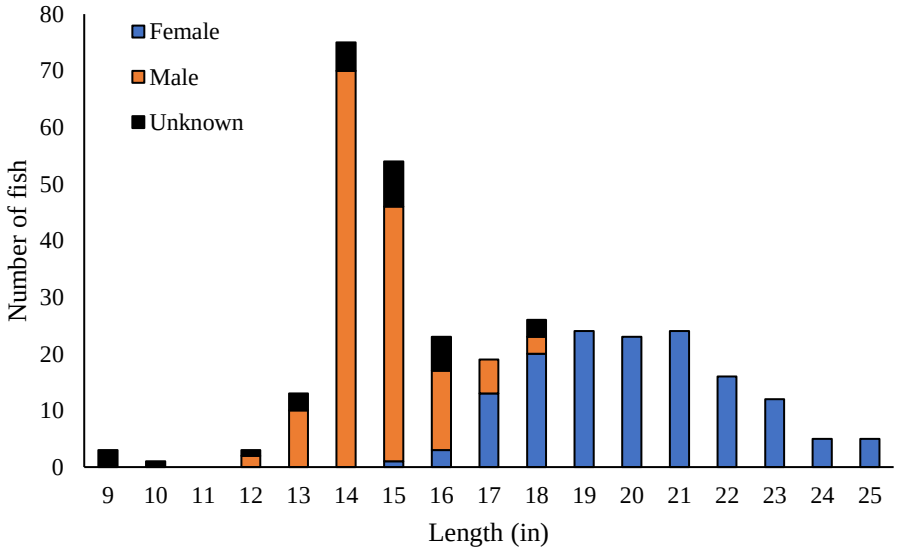

Figure 2. Length frequencies of all walleye captured during spring 2019 sampling in Lake Nancy, Washburn County, Wisconsin (n = 326).

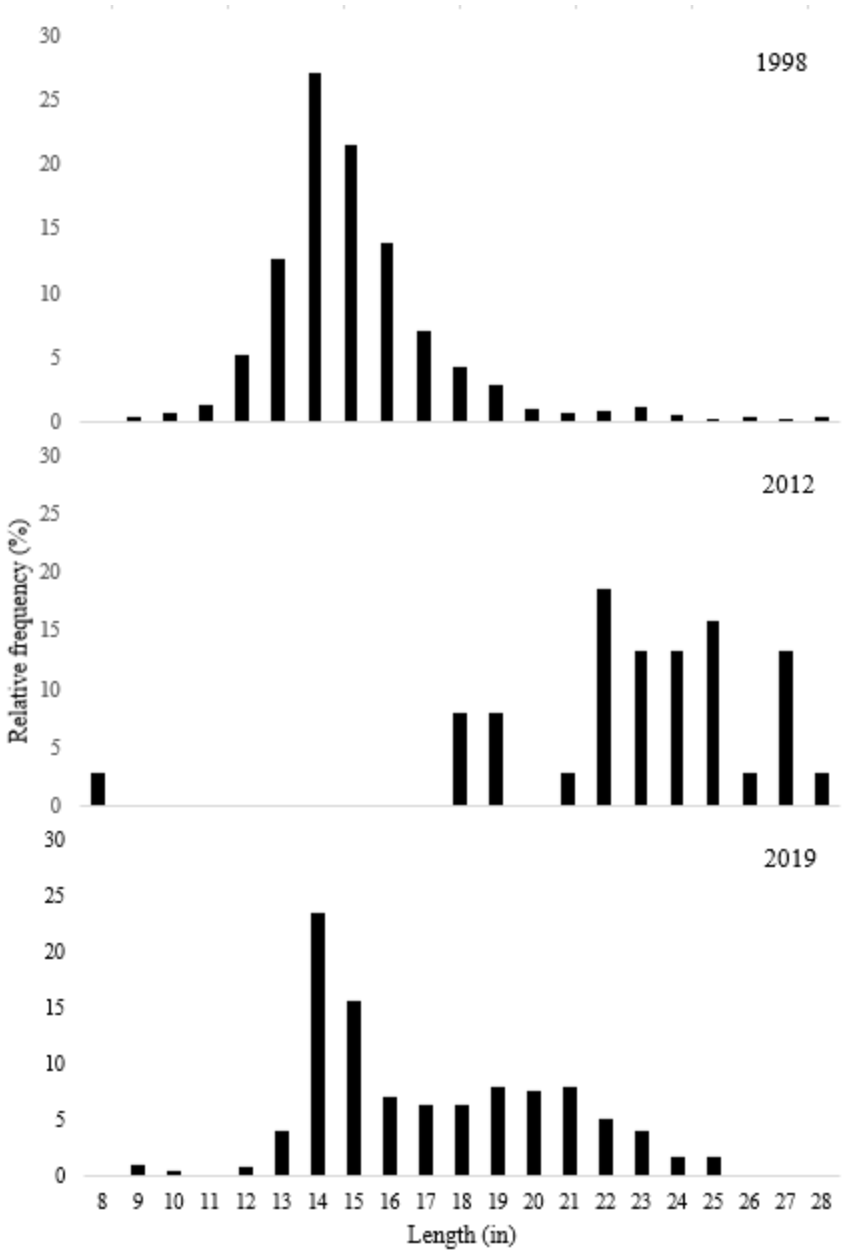

Figure 3. Relative frequency (%) of walleye captured in spring netting 1998, 2012, and 2019 in Lake Nancy, Washburn County, Wisconsin.

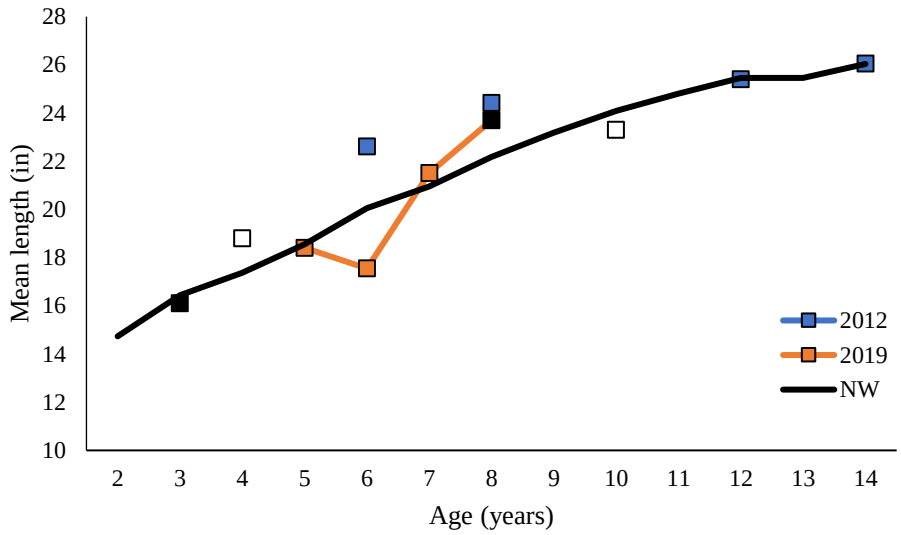

Figure 4. Mean length at age for female walleye captured during spring surveys on Lake Nancy, Washburn County, Wisconsin. NW = Northwest Wisconsin. Black symbols represent one fish aged for 2019, white symbols represent one fish aged in 2012. NW = Northwest Wisconsin.

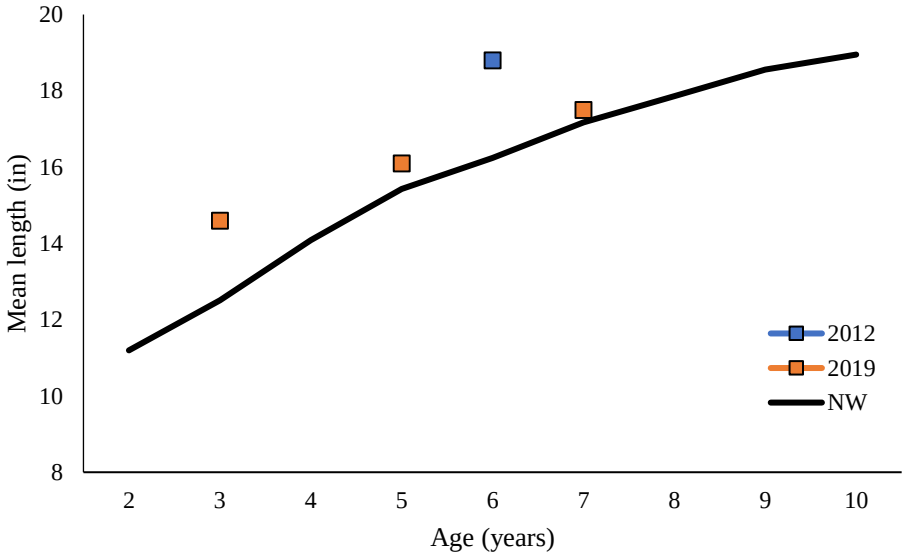

Figure 5. Mean length at age for male walleye captured during spring surveys on Lake Nancy, Washburn County, Wisconsin. NW= Northwest Wisconsin.

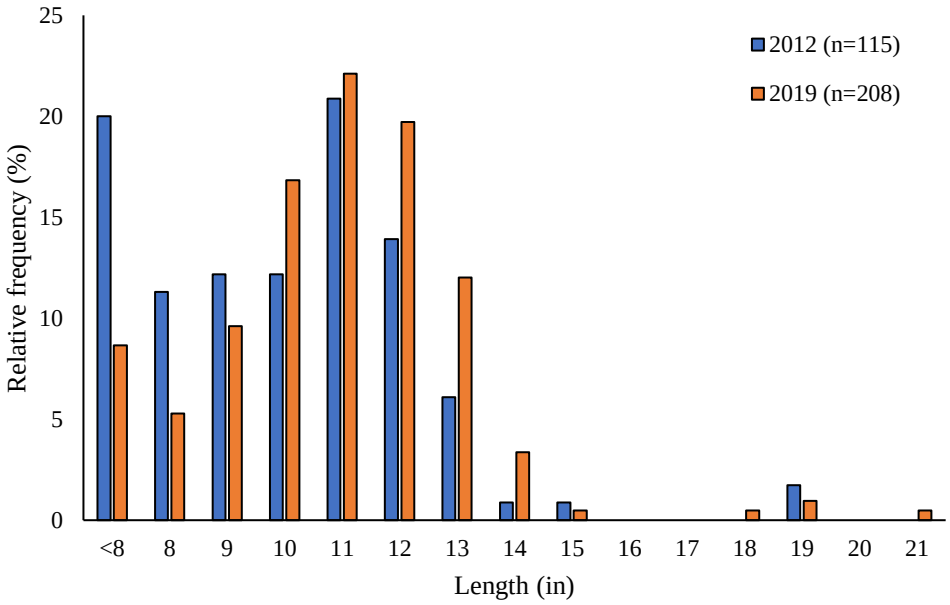

Figure 6. Relative frequency (%) of largemouth bass captured in spring 2012 and 2019 in Lake Nancy, Washburn County, Wisconsin.

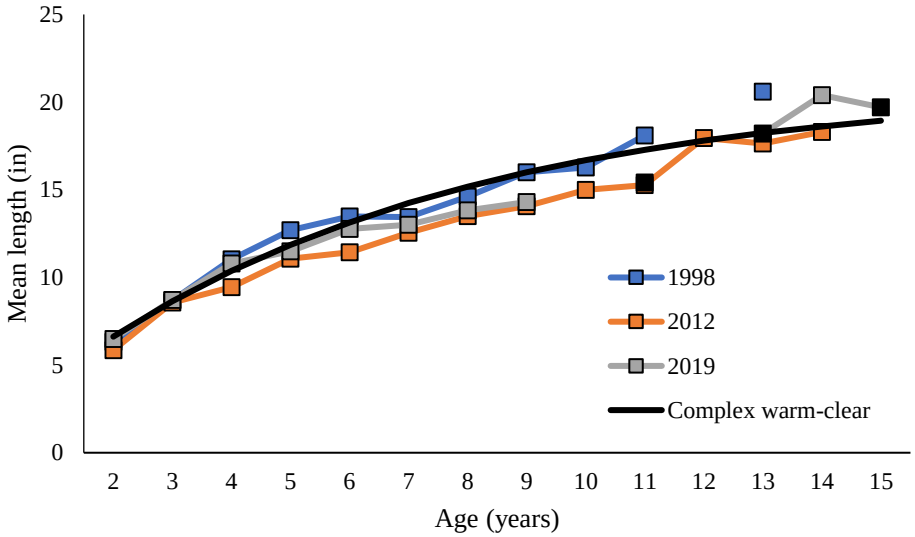

Figure 7. Mean length-at-age for largemouth bass collected in Lake Nancy, Washburn County, Wisconsin.

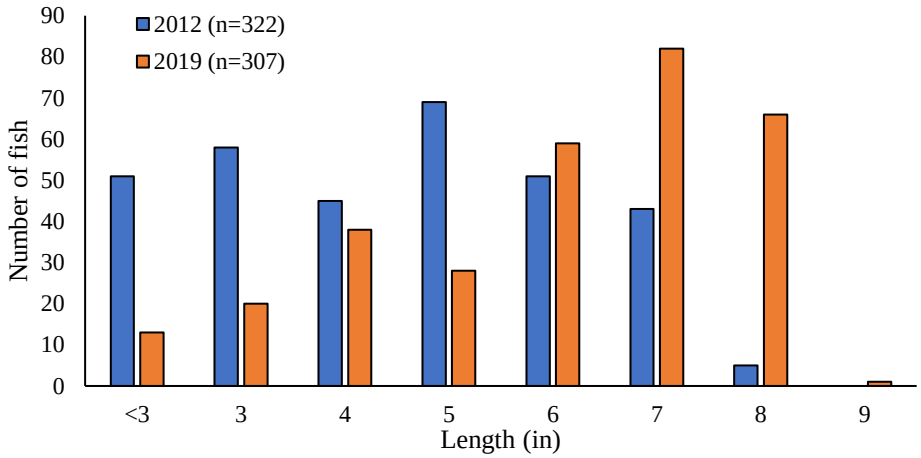

Figure 8. Length frequency of bluegill collected in Lake Nancy, Washburn County, Wisconsin.

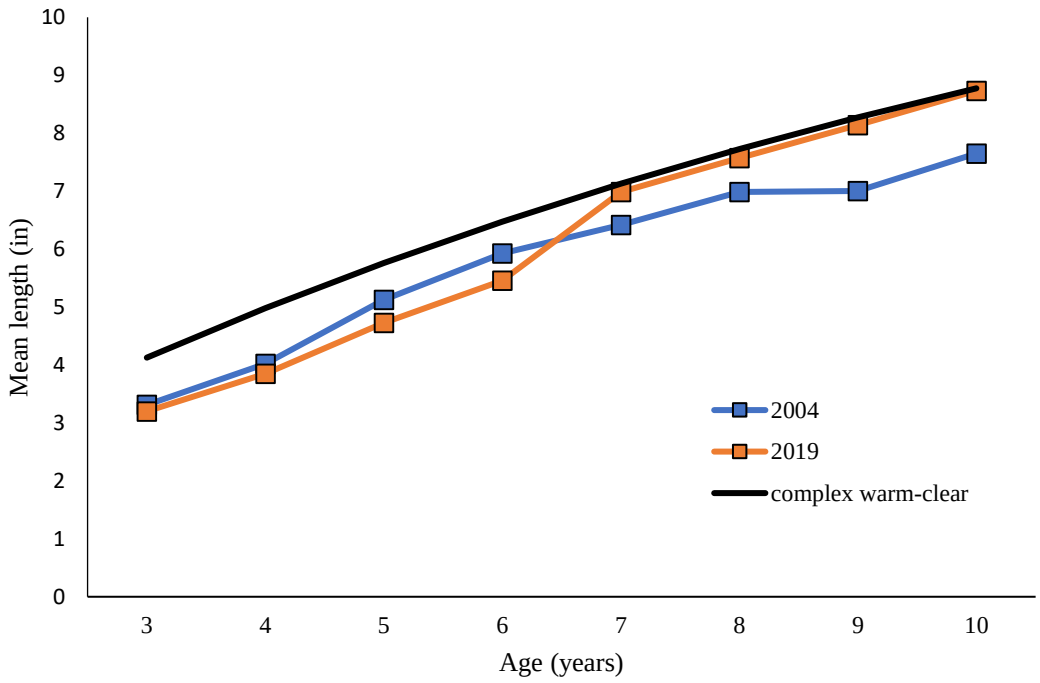

Figure 9. Mean length-at-age for bluegill collected in Lake Nancy, Washburn County, Wisconsin.

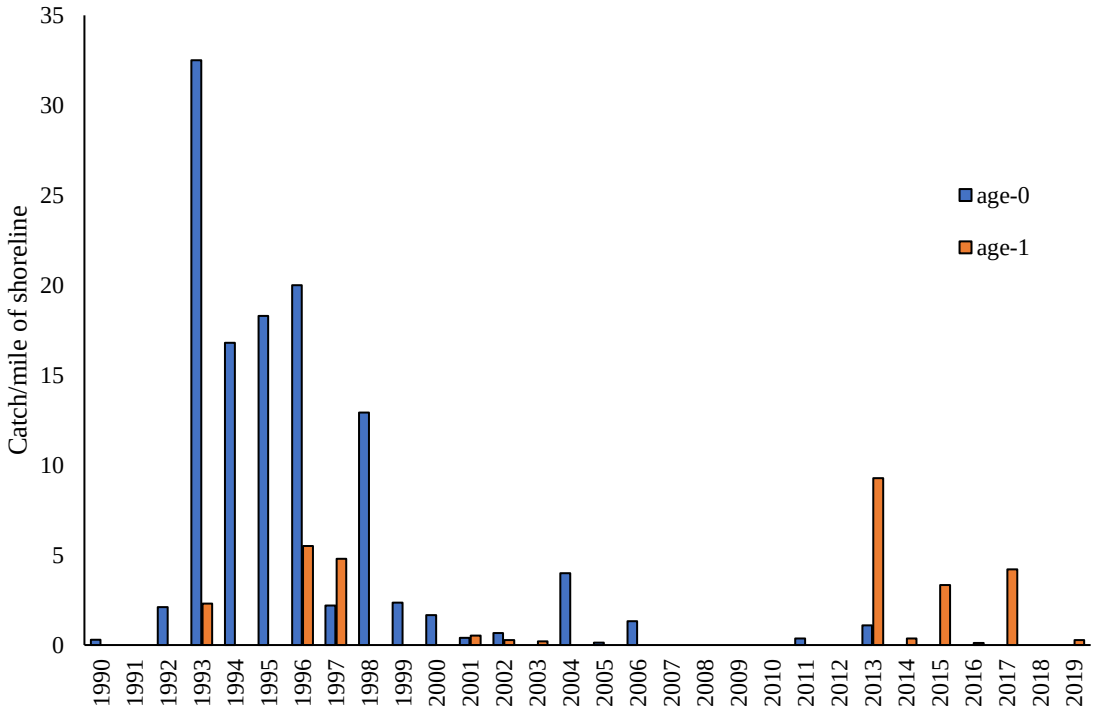

Figure 10. age-0 and age-1 walleye relative abundance determined by fall electrofishing surveys for Lake Nancy, Washburn County.

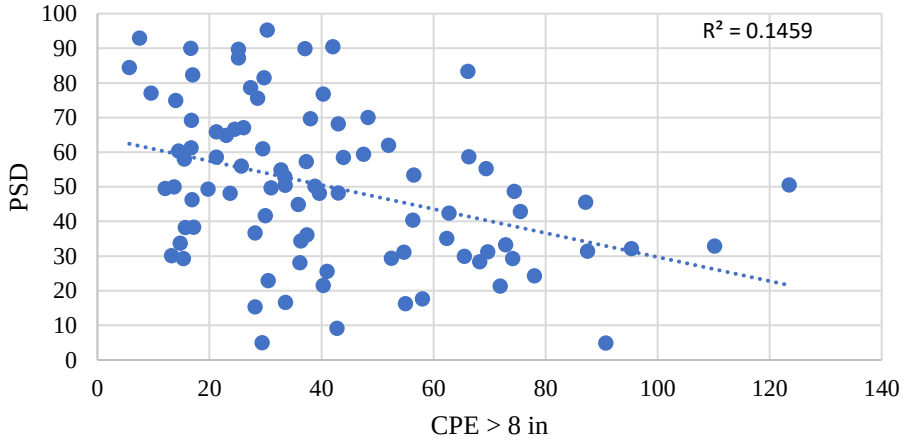

Figure 11. Relationship between CPE for largemouth bass > 8 inches and PSD for electrofishing runs for Washburn and Burnett Counties, 2000 – 2018. $R^2 = 0.146$

Appendix Table 1. Fish stocking records for Lake Nancy, Washburn County, WI. 1984 – 2018. All muskellunge stockings occurred as part of the leech lake strain muskellunge project described in Margenau and Hanson (1997).

Year	Species	Number Fish Stocked	Mean Fish Length (IN)	Source Type
1984	MUSKELLUNGE	1,187	11.7	DNR HATCHERY
1986	WALLEYE	39,450	3.0	DNR COOP PONDS
1986	WALLEYE	2,100	5.0	FIELD TRANSFER
1987	MUSKELLUNGE	1,581	11.4	DNR HATCHERY
1988	WALLEYE	31,522	2.3	DNR COOP PONDS
1989	WALLEYE	38,674	3.7	DNR COOP PONDS
1990	MUSKELLUNGE	2,294	13.9	DNR HATCHERY
1991	WALLEYE	19,300	3.0	DNR COOP PONDS
1992	WALLEYE	38,600	2.0	DNR COOP PONDS
1993	WALLEYE	38,600	2.0	DNR COOP PONDS
1993	WALLEYE	3,012	5.4	TRIBAL HATCHERY
1994	WALLEYE	54,080	2.1	DNR COOP PONDS
1996	WALLEYE	16,779	2.2	TRIBAL HATCHERY
1998	WALLEYE	38,600	2.0	DNR PONDS
2000	WALLEYE	38,136	1.8	DNR PONDS
2000	WALLEYE	14,636	2.4	TRIBAL HATCHERY
2002	WALLEYE	38,595	1.4	DNR HATCHERY
2004	WALLEYE	38,597	1.3	DNR HATCHERY
2004	WALLEYE	23,736	2.4	TRIBAL HATCHERY
2005	WALLEYE	32,397	2.1	TRIBAL HATCHERY
2006	WALLEYE	33,881	2.2	DNR HATCHERY
2008	WALLEYE	27,061	1.4	DNR HATCHERY
2011	WALLEYE	16,041	2.1	TRIBAL HATCHERY
2012	WALLEYE	7,720	7.5	DNR HATCHERY
2013	WALLEYE	16,417	1.9	TRIBAL HATCHERY
2014	WALLEYE	15,145	6.3	DNR HATCHERY
2016	WALLEYE	15,140	7.5	DNR HATCHERY
2018	WALLEYE	15,138	6.2	DNR HATCHERY