WISCONSIN DEPARTMENT OF NATURAL RESOURCES

Fishery Survey Report for Lake Namakagon*, Bayfield County, Wisconsin 2021-2022

Waterbody Code: 2732600

Photo Credit: Wisconsin DNR

* The lake names of Namakagon and Namekagon are often used interchangeably.

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Executive Summary

A comprehensive fisheries survey was conducted on Lake Namekagon from May 2021 to March 2022 to assess the status of the fishery, evaluate trends in fish populations and assess angler effort and harvest. The adult walleye population had a density of 4.3 fish/acre with low size structure. The adult walleye density increased by 87% since the 2017 survey, a result of increased levels of natural recruitment in recent years. Walleye anglers experienced about a two-fold increase in catch rates compared to the previous creel survey in 2002. Despite a high population abundance and angler catch rates, angler effort and harvest of walleye were low. The adult muskellunge population had a density of 0.21 fish/acre and has remained stable at a low to moderate density with high size structure. This population is supported by stocking and provides a trophy fishery. Muskellunge angling effort was similar to previous creel surveys. Relative abundance and size structure of black crappie has remained stable since 2002 despite an increase in angling effort, catch rates and harvest. Bluegill relative abundance is low and size structure is moderate. The angling effort, catch rates and harvest of bluegill have decreased since 2002. Northern pike relative abundance decreased from 2002 and is at a moderate level along with the size structure which has remained stable since 1993. The largemouth bass population has low relative abundance, and the smallmouth bass population has moderate relative abundance and high size structure. Since 1993, angling effort for both largemouth and smallmouth bass have steadily increased, while effort for northern pike decreased. Despite the change in angler effort, there were no noticeable trends with angler catch rates and harvest for these three species. During the 2021-2022 fishing season, the majority of the angling effort was directed at muskellunge (27.3%), black crappie (20.2%) and walleye (15.7%). Overall, the Lake Namekagon fishery is in good condition with a high density, naturally reproducing walleye population, trophy muskellunge fishery supported by stocking, and the black crappie, bluegill, smallmouth bass and northern pike populations have moderate to high size structures.

Future monitoring should include annual fall electrofishing surveys to evaluate walleye recruitment and mark recapture surveys to estimate adult walleye abundance should be conducted every 6 years (similar frequency to what has been done since 1989). Adult muskellunge population estimates should be completed every 12 years. The next adult walleye population estimate planned for 2027 will provide an opportunity to evaluate contribution of the 2020 and 2021 large fingerling walleye stockings to the adult population and determine cost effectiveness of rearing methods by comparing relative survival of pond raised vs. indoor recirculating tank raised fish. Recommended management actions are to continue stocking large fingerling muskellunge, retain all current fishing regulations and continue collaborative partnership with Red Cliff Tribe and UW-Stevens Point Northern Aquaculture Demonstration Facility to collect Lake Namekagon gametes from walleye, rear fish in ponds and recirculating indoor tanks and stock fish back into

Lake Namekagon. Recommendations on walleye stocking will be made from the 2027 stocking evaluation.

Introduction

Wisconsin Department of Natural Resources (DNR) fisheries management staff surveyed Lake Namekagon and Garden Lake in 2021-2022 to assess the status of the fishery. Garden Lake is a 558-acre drainage lake with a navigable outlet channel to Lake Namekagon and hereafter information refers to both lakes as they are managed as one waterbody. Population estimates of adult walleye and muskellunge were determined using mark-recapture sampling methods. The catch-per-unit effort (CPUE) of muskellunge, black crappie, bluegill, northern pike, largemouth bass and smallmouth bass were used to index relative abundance and size structure was assessed for all species when appropriate. Additionally, an angler creel survey was conducted during the 2021-2022 fishing season to assess overall angler effort, species specific fishing effort, catch rates, harvest/acre as well as walleye exploitation (i.e., percent of the population harvested) and mean length of harvested bluegill and black crappie.

There have been various stockings of walleye and muskellunge in Lake Namekagon (Table A1 Appendix). Since 1997, large fingerling muskellunge have been stocked every other year (Table A1 Appendix). From 1990-1993, a mix of fry, small fingerling and large fingerling walleye were stocked. Walleye stocking was discontinued after 1993 because natural recruitment was sustaining this population. Since 2020, using gametes collected from Lake Namekagon walleye, large fingerlings have been stocked as part of a project evaluating two different types of rearing methods, minnow fed outdoor ponds and pellet fed indoor recirculating tanks.

Walleye fishing regulations have changed over time with a no minimum length limit pre-1990, 15-inch minimum length limit from 1990-1997, no minimum length limit one fish >14 inches from 1997-2014 and since 2015 the Ceded Territory base regulation of a 15-inch minimum length limit with a 20-24 inch no harvest slot. Walleye bag limits adjusted according to tribal spearing harvest from 1988-2014 and currently the bag limit is three fish and only one over 24 inches. The muskellunge minimum length limit was 30 inches pre-1983, 32 inches from 1983-1991, 40 inches from 1992-1996 and the current 50-inch minimum length limit and one fish bag limit since 1997. Since 2018, there has been a no minimum length limit on largemouth bass and an 18-inch minimum length limit on smallmouth bass with a combined bass bag limit of five fish total with only one smallmouth bass. Other species have been managed using statewide or regionwide regulations. Fisheries management on Lake Namekagon has focused on maintaining a trophy muskellunge fishery and a self-sustaining walleye fishery.

In 2018 a fishery initiative was collaboratively developed amongst several public stakeholders of Lake Namekagon and fisheries professionals from WDNR, Great Lakes

Indian Fish and Wildlife Commission (GLIFWC) and the Red Cliff Band of the Lake Superior Chippewa with the overall mission to provide healthy fish communities for current and future users. Included in this initiative were objectives for the walleye population, habitat restoration, and updating population metrics for other fish species of interest. Also, included in this document were agreed upon management actions to accomplish these objectives. As a result of the initiative, an extensive amount of habitat work has been completed on Lake Namekagon. The lake association was successful at securing grant money and matching funds from the Bayfield County Land Water Conservation Department to improve fish habitat by installing fish sticks and improve natural buffers through shoreline restoration complexes. In collaboration with the U.S. Forest Service, locations for tree drops on the shoreline within the Chequamegon-Nicolet National Forest have been identified and approved through the federal permitting process. To date these efforts have led to the completion of 24 habitat improvement projects with another 40+ locations identified for future work. In addition to the habitat restoration, completion of the comprehensive fisheries survey and this report are important management actions integral to carrying out the mission of the 2018 fishery initiative. An updated version of the fishery initiative will be completed now that contemporary data has been collected from the comprehensive fisheries survey.

LAKE & WATERSHED CHARACTERISTICS

Lake Namekagon is a 3,227-acre drainage lake located at the headwaters of the Namekagon River in southeastern Bayfield County. The lake has a mean depth of 16 feet and a maximum depth of 51 feet with a total watershed area of 25,907 acres. Lake Namekagon has moderate productivity based on the July-August 2018 mean trophic state index values of 44 for secchi, 61 for total phosphorous and 54 for chlorophyll. The current trophic state of Lake Namekagon is mesotrophic. Based on the number of fish species present, water temperature and clarity, Lake Namekagon is classified as “Complex-Cool-Dark” based on the DNR fisheries lake classification system (Rypel et al. 2019).

The watershed is primarily forest (57%) with wetlands (21%) and surface waters (15%) the other natural land cover types. Only 4.6% of the watershed is developed (i.e., urban or agriculture). Relative to the entire watershed, the shoreline of Lake Namekagon has slightly more development as year-round and seasonal residences and resorts comprise 6.5 miles (15%) of the entire 43 miles of shoreline (source: Midwest Glacial Lakes Conservation Planner). Lake Namekagon has four public boat landings. The DNR Lake Page for Lake Namekagon (wi.gov) provides information on additional lake characteristics such as substrate types, bathymetry and invasive species present.

Methods

FISH SURVEY

Survey methods followed standard DNR Treaty comprehensive assessment protocols (Cichosz 2021). Sampling consisted of fyke net surveys in the spring and electrofishing surveys in the spring and fall. All fish captured during these surveys were identified to species, counted and measured to the nearest 0.1 inch. Additional details about these standard DNR surveys are listed in the appendix (Table A2 Appendix). Fyke nets were deployed immediately after ice-out for the early spring netting survey (SN1) to mark walleye with fin clips. This was followed by an early spring electrofishing survey (SE1) of the entire shoreline that targeted walleye. All walleye collected during the SE1 survey were examined for marks. Following the SE1 survey, a late spring fyke net survey (SN2) was conducted for muskellunge. All muskellunge captured in the 2021 SN2 survey were examined for marks from the 2019 SN2 survey (marking usually occurs the previous year, however, sampling in 2020 did not occur due to COVID restrictions). The number of fish marked during the SN1 (walleye) and the SN2 in 2019 (muskellunge) and the number of marked and unmarked fish captured during the SE1 (walleye) and the SN2 (muskellunge) in 2021 were used to calculate a population estimate for adult walleye and muskellunge by means of the Lincoln-Peterson estimator with Chapman modification (Ricker 1975):

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

where N = population estimate, M = number of fish marked during the SN1 (walleye) or the SN2 in 2019 (muskellunge), C = total number of fish captured during the SE1 (walleye) or the SN2 in 2021 (muskellunge) and R = number of marked fish captured during the SE1 (walleye) or the SN2 in 2021 (muskellunge).

Male, female and immature walleye ≥15 inches and immature muskellunge ≥30 inches were included in the population estimate for each species. The muskellunge population estimate was adjusted for recruitment by excluding fish <34 inches in 2022 because they were assumed to have been less than 30 inches during the 2019 marking event. Aging structures were collected from five walleye per half inch length bin per sex, dorsal spines from fish ≥12 inches and scales from fish <12 inches. The von Bertalanffy growth model was fit to mean length at age data to model growth of the walleye population for females and males separately due to sex-specific growth variation using the following equation (von Bertalanffy 1938):

$$Lt = L_{inf}\,(1-e^{-k(t-t_0)}),$$

where Lt = length at time, L_{inf} = maximum theoretical length (length infinity), e = exponent for natural logarithms, k = growth coefficient, t = age in years, and t_0 = age when Lt is zero.

The CPUE of muskellunge, black crappie and northern pike were calculated from both the SN1 and the SN2 surveys combined to index the relative abundance of these species. A late spring electrofishing survey (SE2) was conducted to assess the abundance of bass and bluegill. The SE2 survey consisted of six randomly distributed two-mile-long shoreline stations. Within each station, all species were targeted in a half mile section and in the remaining one and a half miles only gamefish were targeted. The CPUE (fish/mile) was used to assess the relative abundance of bluegill, largemouth bass and smallmouth bass. Size structure for each species was visualized using length frequency plots and quantified using the proportional size distribution (PSD) metric:

$$PSD = \frac{\#\ of\ fish \geq given\ length\ category}{\#\ of\ fish \geq stock\ length} * 100.$$

For PSD evaluations length categories established for North American freshwater fish species were used (Gabelhouse 1984: Table A3 of Appendix).

A fall electrofishing (FE1) survey was conducted to evaluate walleye recruitment. The CPUE of age-1 walleye (fish that hatched the previous year) was calculated to index the relative abundance of that year class. Typically, CPUE of age-0 walleye is used to assess recruitment, however, on Lake Namekagon age-0 walleye are not as reliable of an index compared to age-1 CPUE because of low capture efficiency.

When applicable, comparisons were made to previous surveys conducted on Lake Namekagon (1993 and 2002) to evaluate trends through time and compared to reference lakes to determine the status relative to other populations from similar lakes. For walleye, reference lakes included Ceded Territory lakes sustained primarily by natural recruitment. For muskellunge, reference lakes included all Ceded Territory lakes. For all other species, reference lakes included Bayfield, Douglas, Ashland, Iron, Burnett, Washburn, Sawyer, Price, Oneida and Vilas counties of the same “Complex-Cool-Dark” lake class. Sample sizes for fish survey comparisons ranged from 16-89 reference lakes.

CREEL SURVEY

An angler creel survey was conducted during the open water (May-October 2021) and the ice seasons (December 2021-March 2022) following standard DNR treaty comprehensive assessment protocols (Cichosz 2021). Total angler effort was estimated along with species-specific fishing effort, catch rates, harvest/acre and mean length of harvested fish. Angler exploitation of walleye was calculated by dividing the estimated number of angler harvested marked walleye by the total number of walleye marked during the spring surveys in 2021. Exploitation of walleye by tribal spearing was calculated by dividing the total number of spear-harvested walleye by the walleye population estimate. Total walleye exploitation was calculated

as the sum of angler and spear exploitation. Comparisons were made to previous creel surveys conducted on Lake Namekagon (1993 and 2002) to evaluate trends through time and compared to other creel surveys to determine status relative to similar lakes. For walleye creel metrics, reference lakes included Ceded Territory lakes sustained primarily by natural recruitment, for muskellunge reference lakes included all Ceded Territory lakes and for all other species reference lakes included Bayfield, Douglas, Ashland, Iron, Burnett, Washburn, Sawyer, Price, Oneida and Vilas counties of the same "Complex-Cool-Dark" lake class. Sample sizes for creel survey comparisons ranged from 9-25 reference lakes.

Results

CREEL SURVEY

Anglers spent a total of 64,592 hours fishing on Lake Namekagon in 2021 equating to 20.0 hours/acre which was lower than in 2002 (25.0 hours/acre) and in 1993 (30.4 hours/acre) and slightly higher than the median angler effort of 18.1 hours/acre on Ceded Territory lakes from 2016-2019 and 2021 (Figure 1). Angling effort was highest for muskellunge in 2021, with an estimated 7.4 hours/acre or 27.3% of the total species-specific effort followed by black crappie at 5.4 hours/acre (20.2%) and walleye at 4.2 hours/acre (15.7%; Figure 2). Walleye was the most targeted species in 1993 but was surpassed by muskellunge in 2002 and muskellunge and black crappie in 2021 (Figure 2). Other species targeted by anglers in 2021 were bluegill, northern pike, largemouth and smallmouth bass (Figure 2).

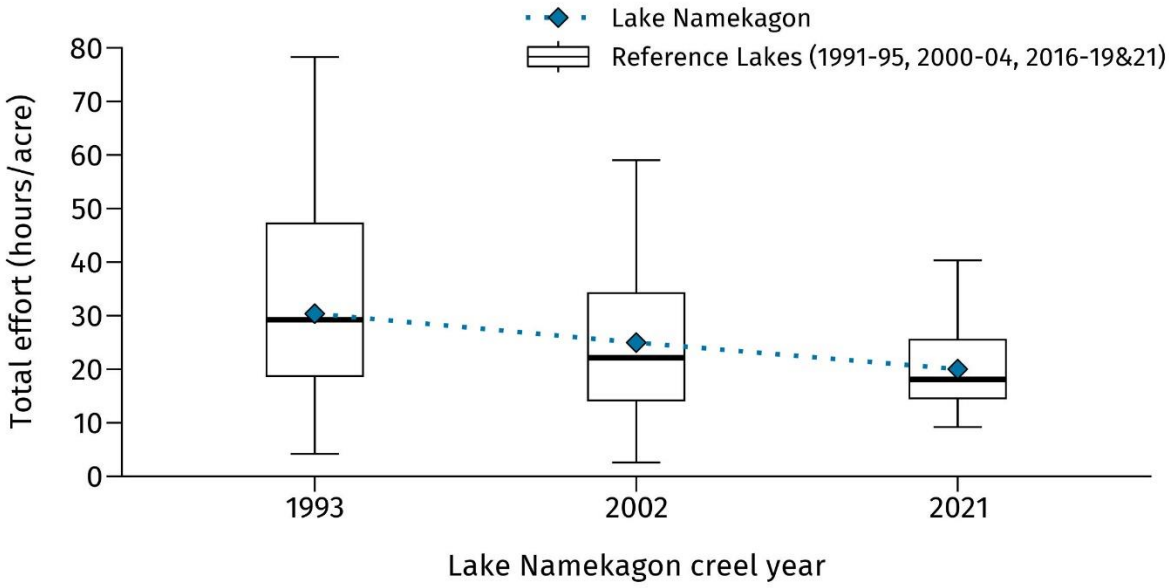

Figure 1. Total angling effort (hours/acre) in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and in Ceded Territory reference lakes (box and whisker plots). Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

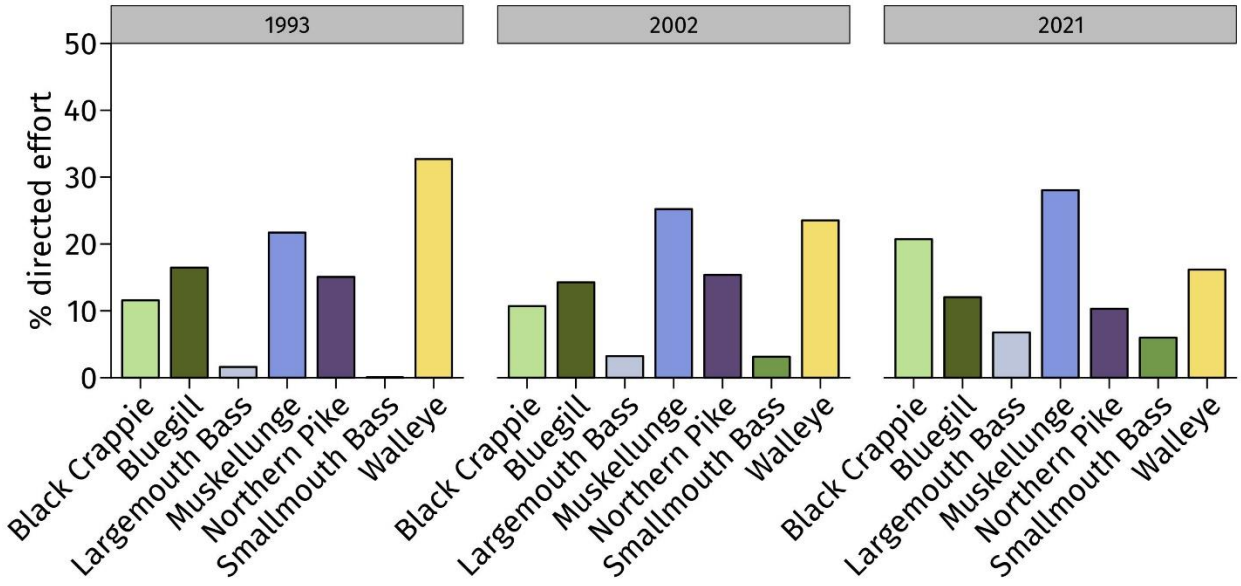

Figure 2. Percent of the total directed (species specific) angling effort by species in Lake Namekagon in 1993 (left), 2002 (middle) and 2021 (right).

WALLEYE

FISH SURVEY

The adult walleye (males, females and immature fish ≥ 15 inches) abundance estimate was 13,715 (95% CI = 12,345-15,085) fish or 4.3 (95% CI = 3.8-4.7) adults/acre (Figure 3). This density was 2.0 adults/acre higher than the previous estimate in 2017 of 2.3 adults/acre and similar to the 2011 estimate of 4.0 adults/acre (Figure 3). Walleye captured during the SN1 survey ranged from 8.2-27.0 inches, with 32% of the fish ≥ 15 inches (minimum length limit) and 3% of the fish within the 20-24 inch no harvest slot (Figure 4). The maximum observed length for males was 19.3 inches and for females was 27.0 inches (Figure 4). The PSD of walleye (% ≥ 15 inches) captured in the 2021 SN1 survey was 31, which was slightly lower than in 2002 (36) and lower than in 1993 (52) and higher than the 10th percentile (27) but lower than the 25th percentile (39) in reference lakes from 2018-2022 (Figure 5). Catch rates of age-1 walleye during fall electrofishing surveys have shown an overall increasing trend in recruitment since about 2010 and was 7.8 fish/mile in 2022 (Figure 6). Since 2016, age-1 catch rates have averaged 9.1 fish/mile, higher than the average catch rate from 2001-2015 (4.9) but lower than the average catch rate from 1986-2000 (12.6; Figure 6). It takes about five years for a female walleye to reach 15 inches and about six years for a male walleye to reach 15 inches in Lake Namekagon (Figure 7).

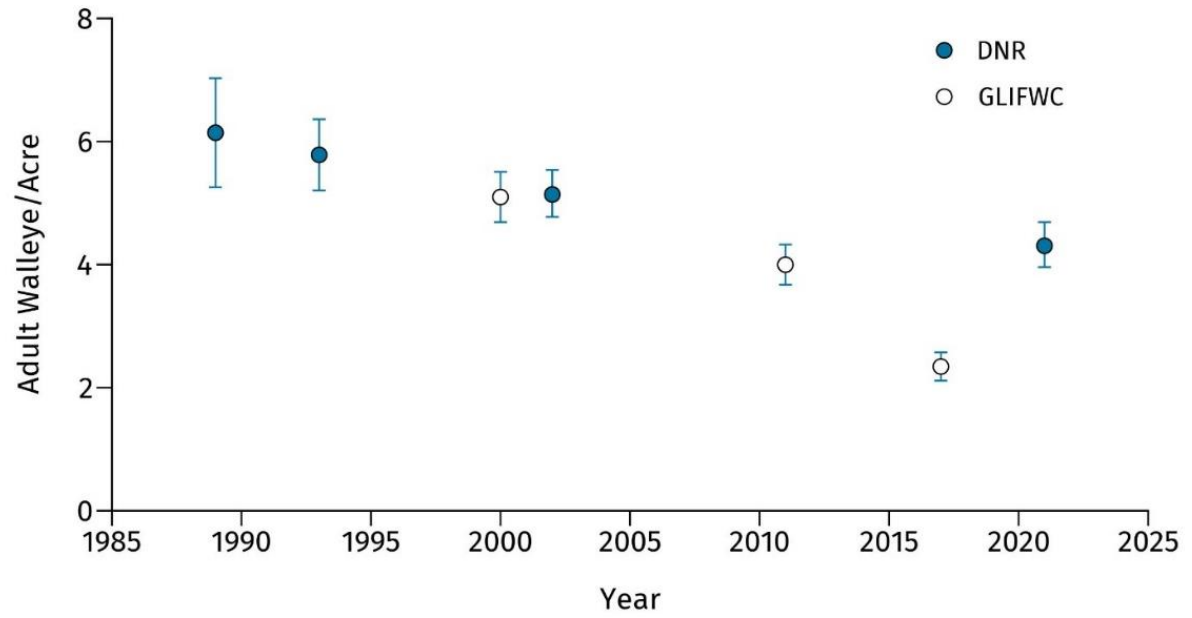

Figure 3. Walleye density estimates (adult fish/acre) with 95% confidence intervals (error bar) from DNR (blue circles) and Great Lakes Indian Fish and Wildlife Commission (GLIFWC; white circles) mark-recapture surveys in Lake Namekagon since 1989.

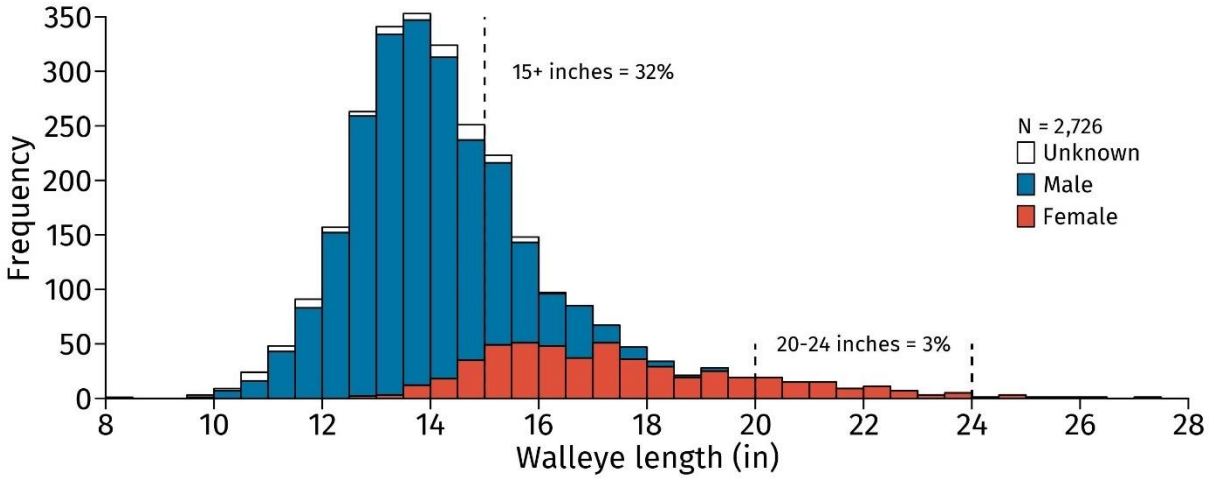

Figure 4. Length frequency histogram of female (red), male (blue) and unknown sex (white) walleye captured during the 2021 spring fyke net survey in Lake Namekagon. Thirty two percent of the fish were ≥ the 15-inch minimum length limit and three percent of fish were within the 20-24 inch no harvest slot (vertical dashed lines).

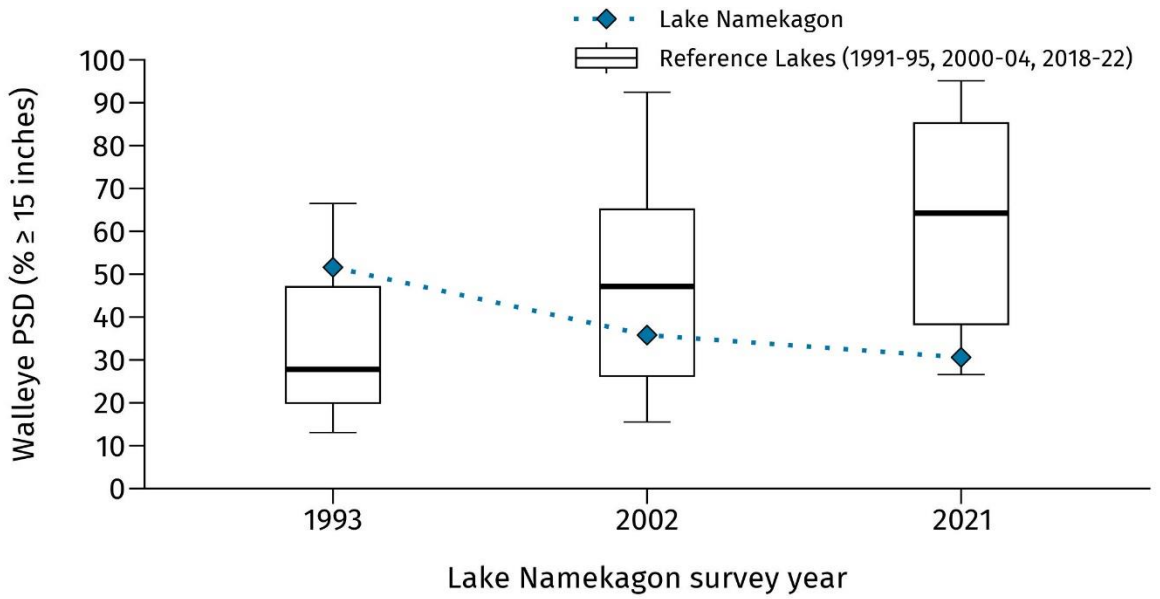

Figure 5. Proportional size distribution (PSD) of quality length (% ≥ 15 inches) walleye captured during spring fyke net surveys in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and Ceded Territory reference lakes (box and whisker plots) of the same walleye recruitment (primarily natural reproduction). Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

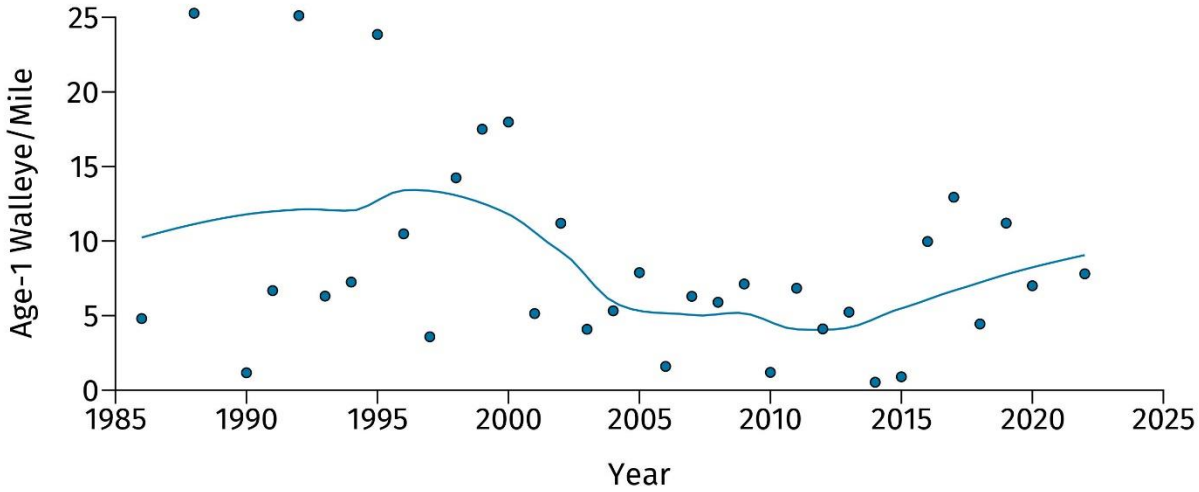

Figure 6. Number of age-1 walleye captured per mile (blue circles) during fall electrofishing surveys in Lake Namekagon since 1986 with smoothed running mean trend line (blue line).

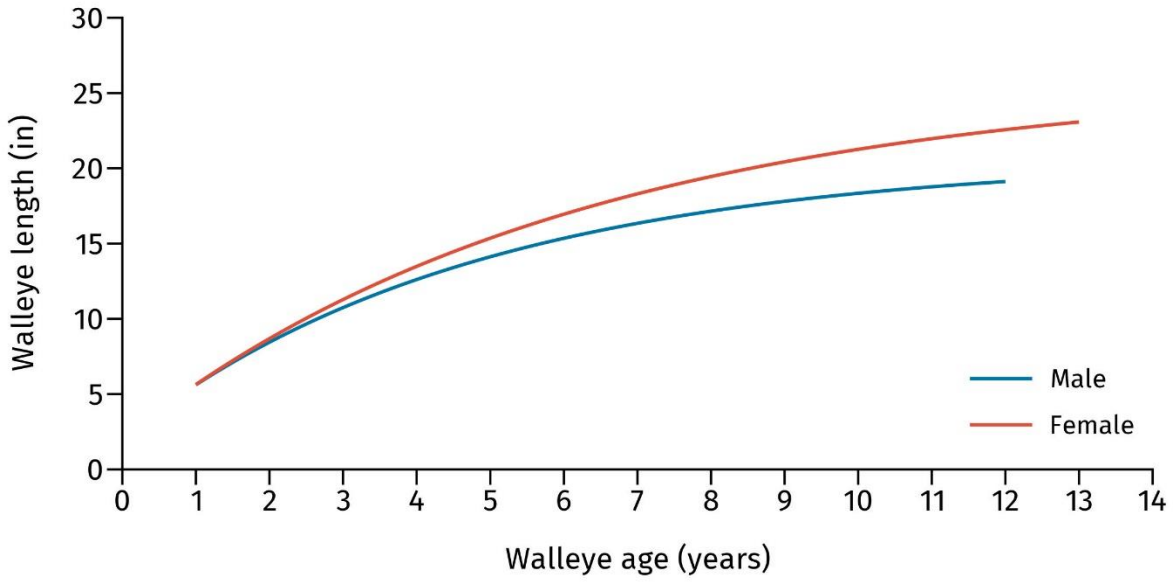

Figure 7. Von Bertalanffy growth curves for male (blue) and female (red) walleye captured during spring fyke net and electrofishing surveys in Lake Namekagon in 2021.

CREEL SURVEY

The estimated angling effort targeting walleye in 2021 was 4.24 hours/acre, which was lower than in 2002 (7.13) and 1993 (12.81) and slightly higher than the 25th percentile (3.56) in reference lakes from 2016-2019 and 2021 (Figure 8, left panel). The estimated walleye catch rate in 2021 was 0.59 fish/hour, which was higher than in 2002 (0.30) and 1993 (0.29) and higher than the 90th percentile (0.56) in reference lakes from 2016-2019 and 2021 (Figure 8, middle panel). The estimated walleye angler harvest in 2021 was 0.22 fish/acre, which was lower than in 2002 (0.90) and 1993 (0.59) and slightly below the median (0.30) in reference lakes from 2016-2019 and 2021 (Figure 8, right panel). The estimated angler exploitation of walleye in 2021 was 2.7%, which was lower than in 2002 (11.1%), higher than in 1993 (0.4%) and slightly higher than the 25th percentile (2.5%) in reference lakes from 2018-2022 (Figure 9, left panel). The estimated walleye exploitation by tribal spearing in 2021 was 8.9%, which was higher than in 2002 (5.1%) and 1993 (3.7%) and slightly higher than the median (8.4%) in reference lakes from 2018-2022 (Figure 9, middle panel). The estimated total (angler+spearing) walleye exploitation in 2021 was 11.6%, which was lower than in 2002 (16.2%) and higher than in 1993 (4.2%) and slightly higher than the 25th percentile (10.4%) in reference lakes from 2018-2022 (Figure 9, right panel).

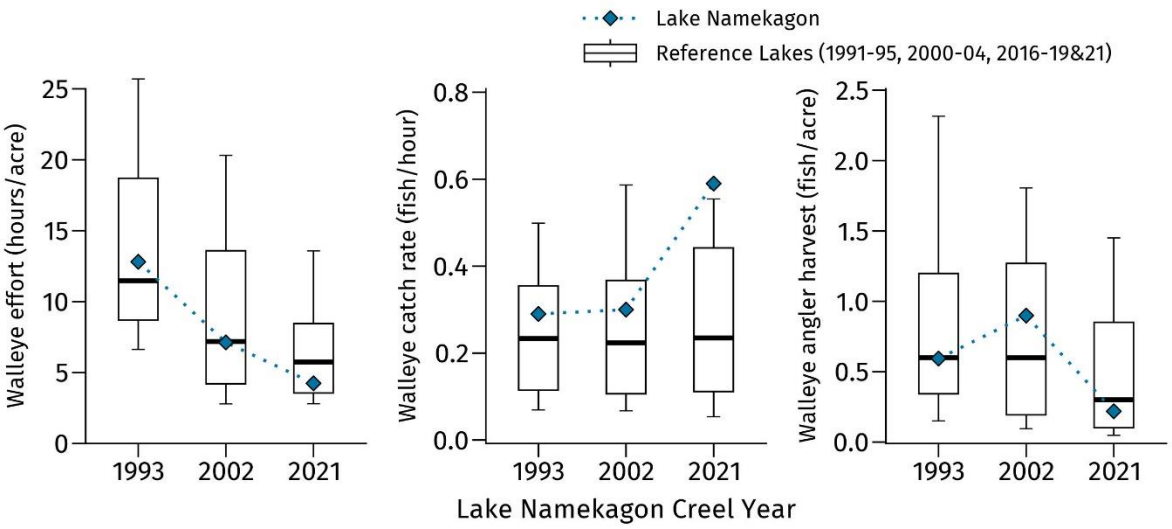

Figure 8. Walleye effort (left), catch rate (middle) and angler harvest (right) in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and Ceded Territory reference lakes (box and whisker plots) of the same recruitment (primarily natural reproduction). Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

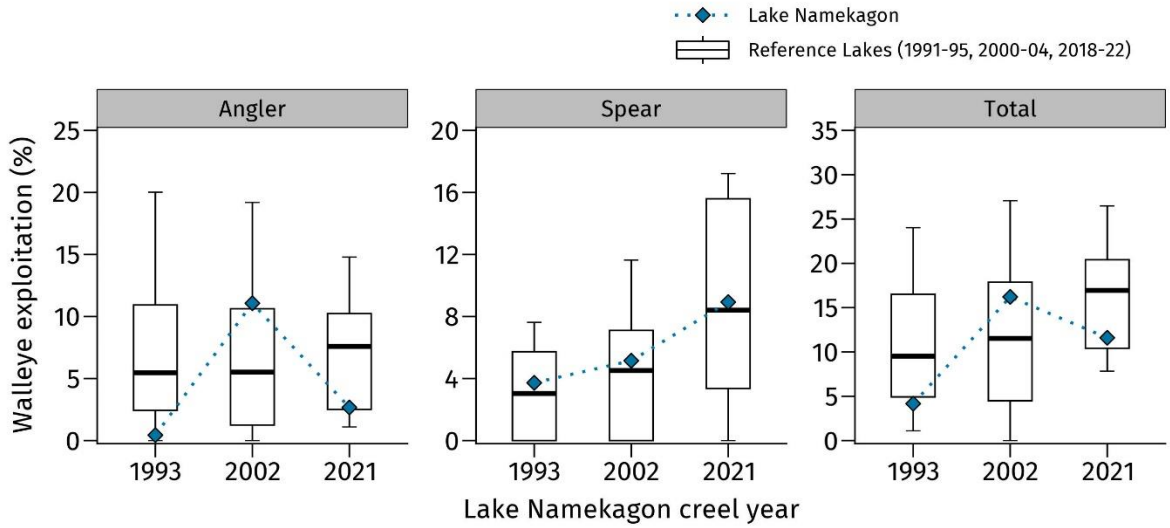

Figure 9. Angler (left), spear (middle) and total (right) walleye exploitation in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and Ceded Territory reference lakes (box and whisker plots) of the same recruitment (primarily natural reproduction). Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

MUSKELLUNGE

FISH SURVEY

The muskellunge population estimate was 666 (95% CI = 315-1,524) fish or 0.21 (95% CI = 0.10-0.47) adults/acre (Figure 10). This density estimate was higher than the previous estimate in 2002 (0.15 adults/acre) and slightly higher than the median (0.18 adults/acre) in reference lakes from 2018-2022 (Figure 10). The muskellunge mean CPUE was 0.63 fish/net-night in 2019 and 2021, which was higher than in 2002 and 2003 (0.33) and 1993 (0.53) and higher than the median (0.49) in reference lakes from 2018-2022 (Figure 11). Muskellunge captured during the spring fyke net surveys in 2019 and 2021 ranged from 24.1-50.5 inches, the maximum observed length for males was 43.8 inches and for females was 50.5 inches (Figure 12). The PSD-P of muskellunge (% ≥ 38 inches) in 2019 and 2021 was 56, lower than in 2002 and 2003 (64) and higher than in 1993 (22) and slightly higher than the 75th percentile (55) in reference lakes from 2018-2022 (Figure 13, left panel). The PSD-M (memorable; % ≥ 42 inches) was 31, lower than in 2002 and 2003 (35) and higher than in 1993 (5) and equal to the 90th percentile (31) in reference lakes from 2018-2022 (Figure 13, middle panel). The PSD-T (trophy; % ≥ 50 inches) was 0.75, which was higher than in 2002 and 2003 (0.00) and 1993 (0.00) and higher than the 90th percentile (0.33) in reference lakes from 2018-2022 (Figure 13, right panel).

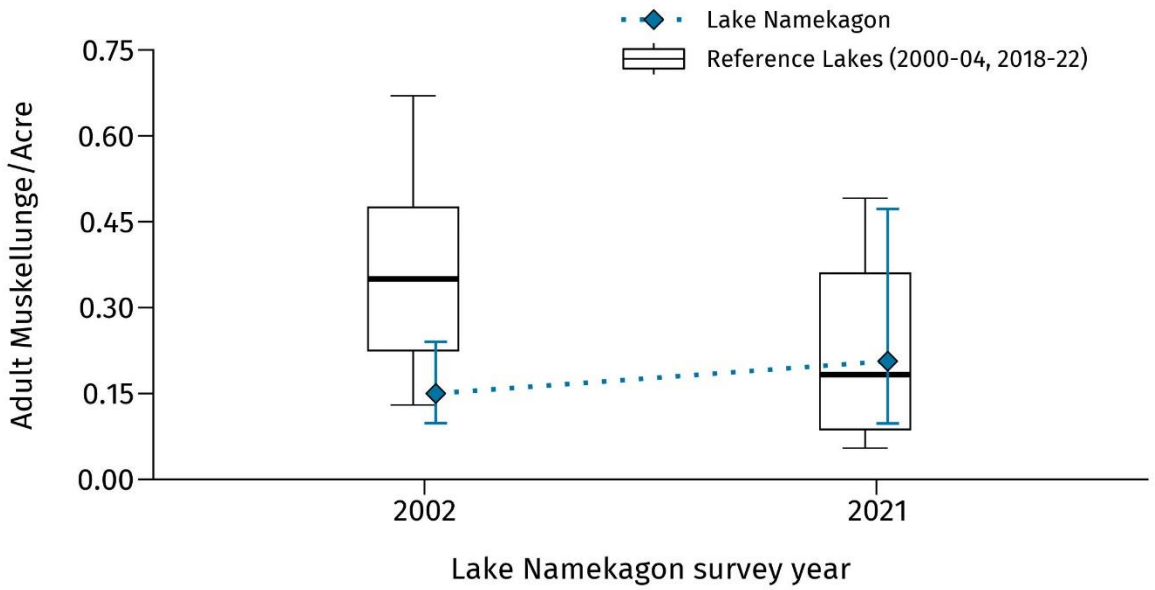

Figure 10. Muskellunge density estimates (adult fish/acre) from mark recapture spring fyke net surveys in Lake Namekagon (blue diamonds with 95% CI error bars) in 2002 and 2021 and Ceded Territory reference lakes (box and whisker plots). Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

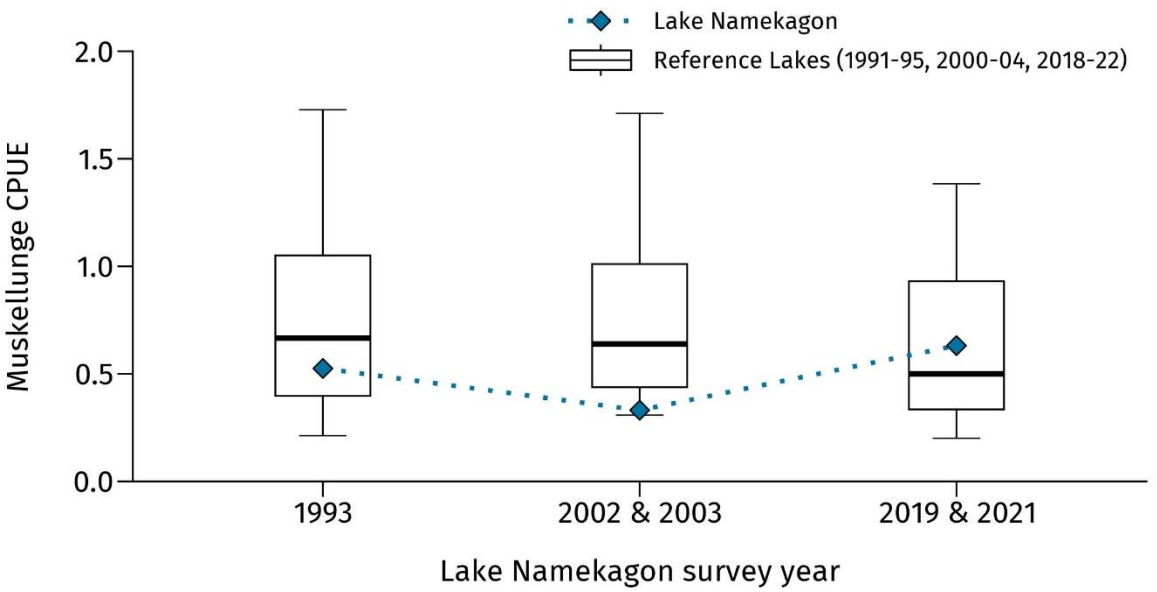

Figure 11. Muskellunge catch-per-unit-effort (CPUE; fish/net-night) during spring fyke net surveys in Lake Namekagon (blue diamonds) in 1993, 2002 & 2003 and 2019 & 2021 and Ceded Territory reference lakes (box and whisker plots). Data from a five-year time frame surrounding the Lake Namekagon survey years were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

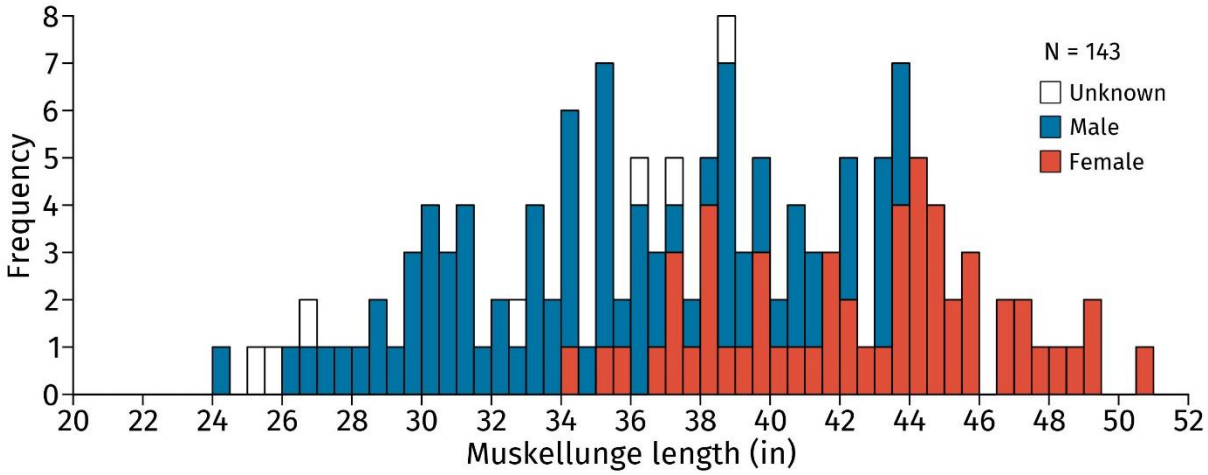

Figure 12. Length frequency histogram of female (red), male (blue) and unknown sex (white) muskellunge captured during spring fyke net surveys in Lake Namekagon in 2019 and 2021 with recaptured fish removed.

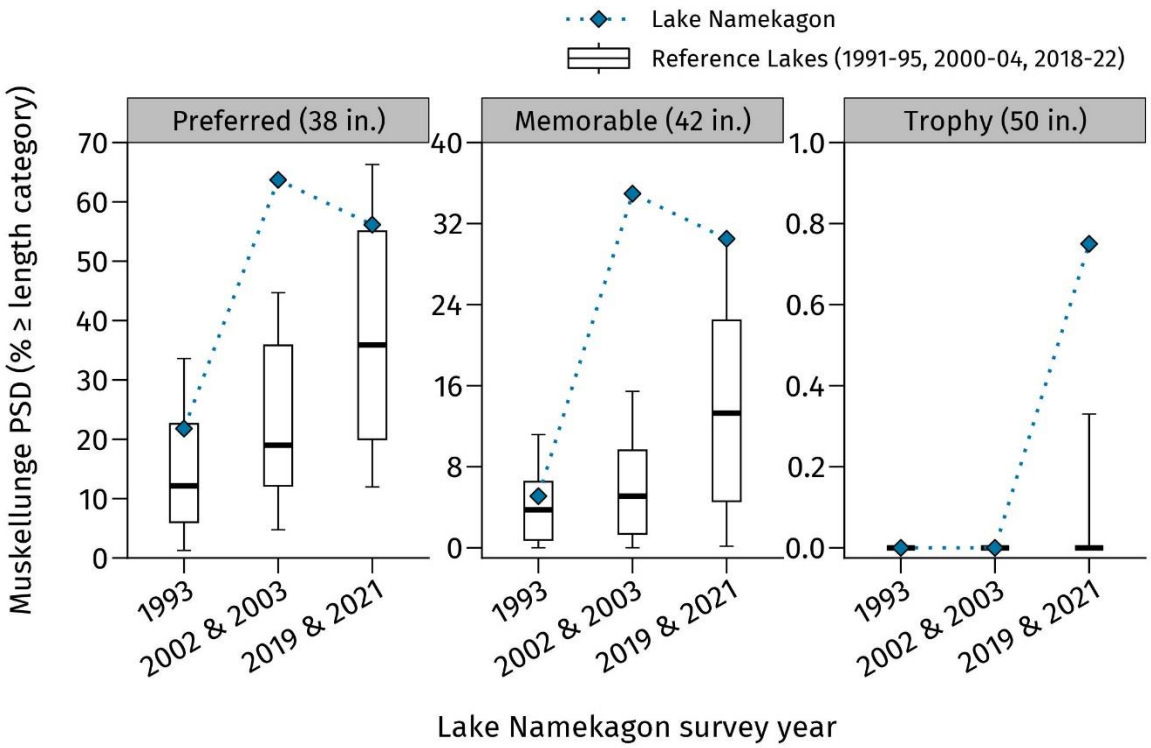

Figure 13. Proportional size distribution (PSD) of preferred (% ≥ 38 inches; left panel), memorable (% ≥ 42 inches; middle panel) and trophy (% ≥ 50 inches; right panel) length muskellunge captured during spring fyke net surveys in Lake Namekagon (blue diamonds) in 1993, 2002 & 2003 and 2019 & 2021 and Ceded Territory reference lakes (box and whisker plots). Data from a five-year time frame surrounding the Lake Namekagon surveys years were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

CREEL SURVEY

The estimated angling effort targeting muskellunge in 2021 was 7.36 angler hours/acre which was slightly lower than in 2002 (7.64) and in 1993 (8.50) and higher than the 75th percentile (6.11) in reference lakes from 2016-2019 and 2021 (Figure 14, left panel). The estimated muskellunge catch rate in 2021 was 0.016 fish/hour (62 hours/fish) which was higher than in 2002 (0.010 fish/hour or 100 hours/fish) and lower than in 1993 (0.020 fish/hour or 50 hours/fish) and slightly higher than the 25th percentile (0.015 fish/hour or 67 hours/fish) in reference lakes from 2016-2019 and 2021 (Figure 14, middle panel). The estimated muskellunge angler harvest in 2021 was 0.000 fish/acre which was the same as in 2002 (0.000) and lower than in 1993 (0.007) and equal to the median (0.000) in reference lakes from 2016-2019 and 2021 (Figure 14, right panel).

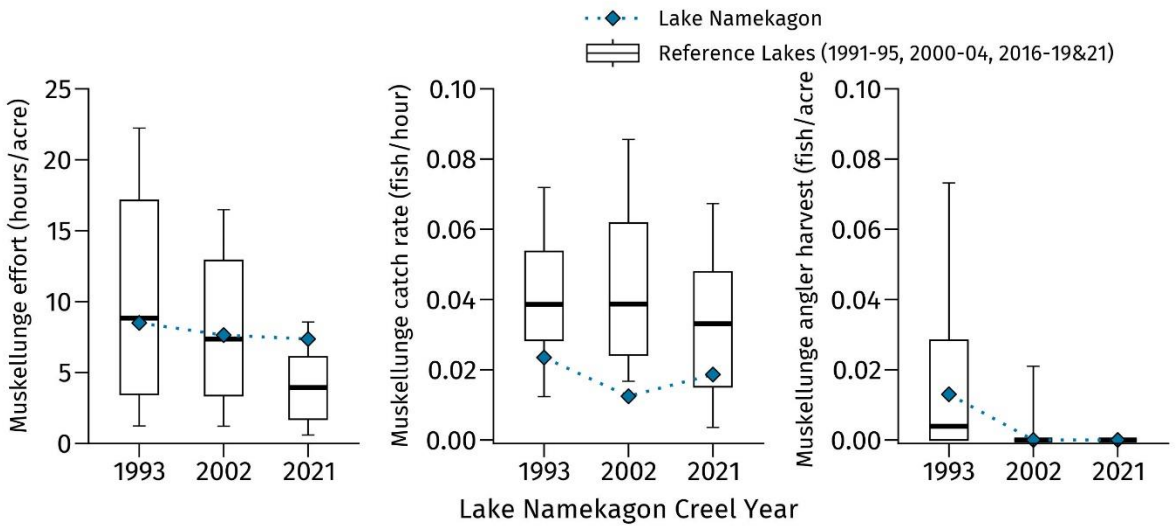

Figure 14. Muskellunge effort (left), catch rate (middle) and angler harvest (right) in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and Ceded Territory reference lakes (box and whisker plots). Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

BLACK CRAPPIE

FISH SURVEY

Black crappie CPUE was 2.37 fish/net-night in 2021, higher than in 2002 (1.13) and 1993 (0.30) and slightly higher than the 10th percentile (2.14) in reference lakes from 2018-2022 (Figure 15). Black crappie captured during the spring 2021 fyke net surveys ranged from 4.6-13.5 inches (Figure 16). The PSD of black crappie (% ≥ 8 inches) was 74, which was higher than in 2002 (64) and lower than the median (83) in reference lakes sampled from 2018-2022 (Figure 17).

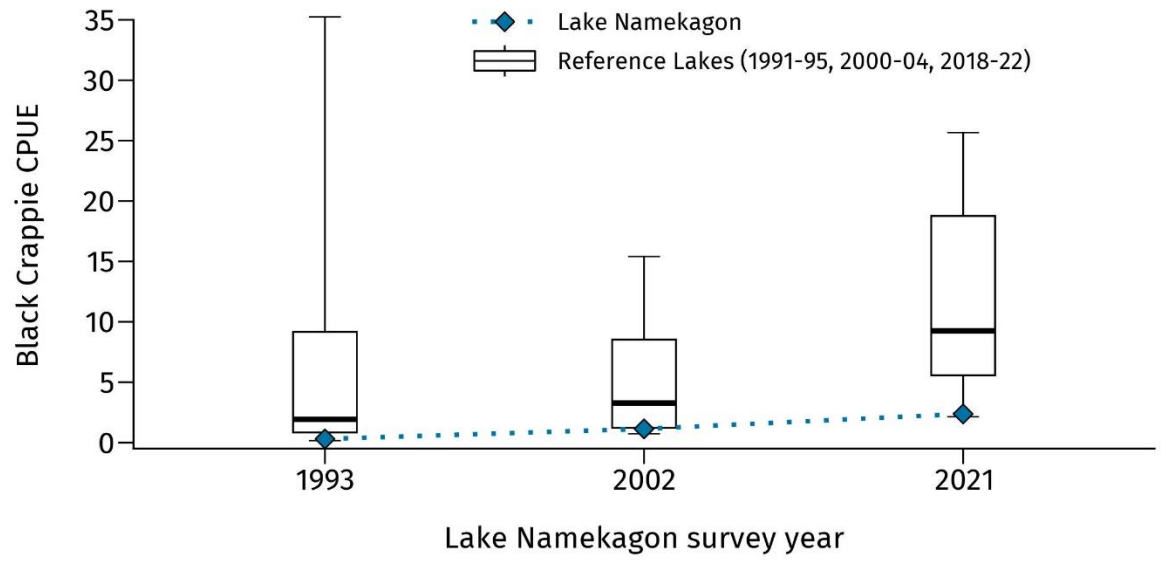

Figure 15. Black crappie catch-per-unit-effort (CPUE; fish/fyke net-night) during spring fyke net surveys in Lake Namekagon (blue diamonds) in 2002 and 2021 and northern WI reference lakes (box and whisker plots) of the same "Complex-Cool-Dark" lake class. Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

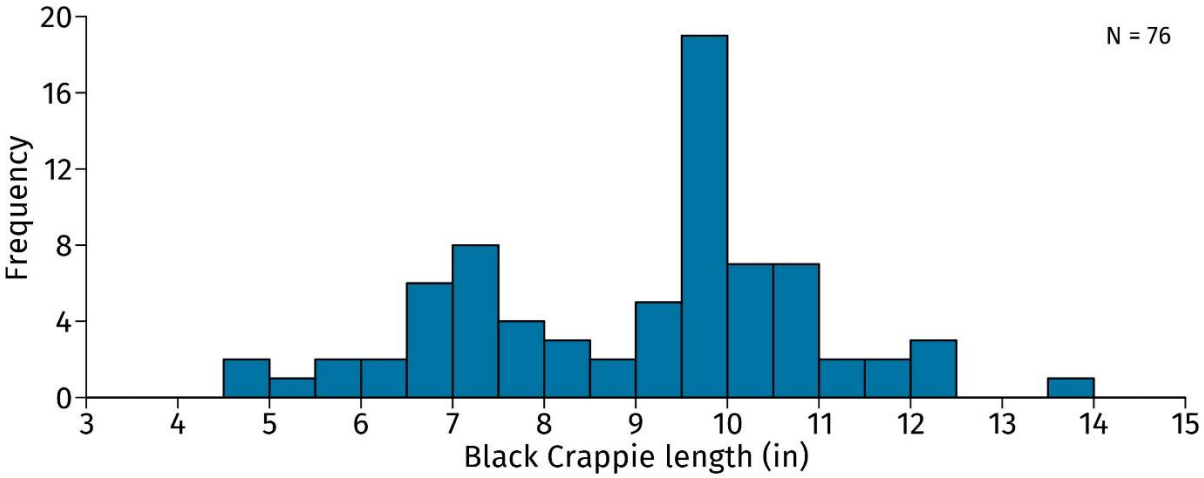

Figure 16. Length frequency histogram of black crappie captured during spring fyke net surveys in Lake Namekagon in 2021.

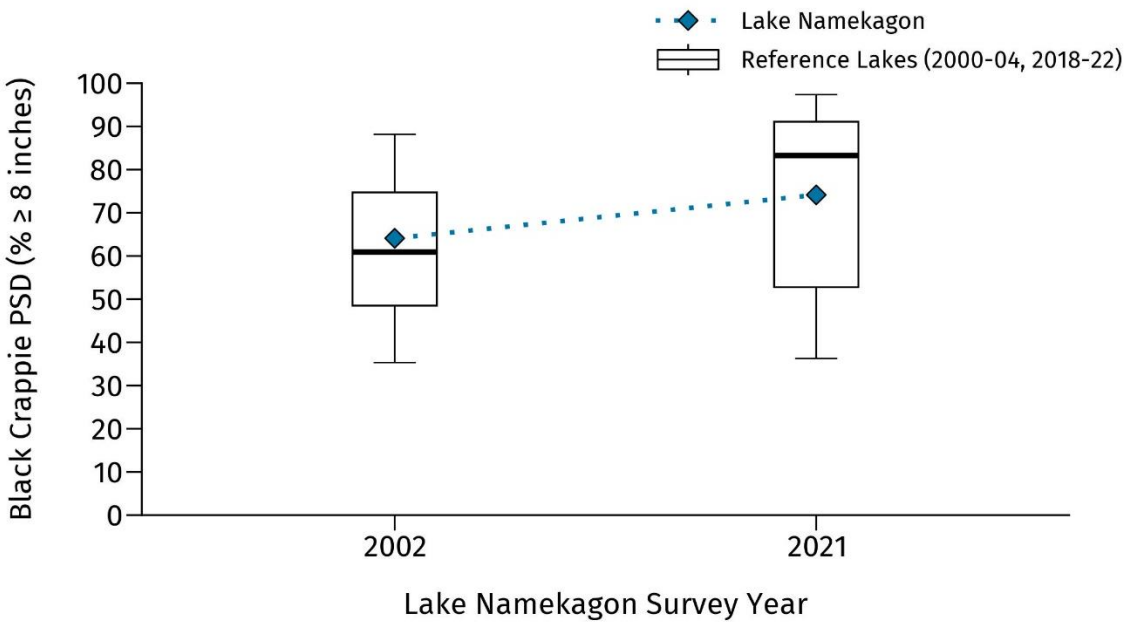

Figure 17. Proportional size distribution (PSD) of quality length (% ≥ 8 inches) black crappie captured during spring fyke net surveys in Lake Namekagon (blue diamonds) in 2002 and 2021 and northern WI reference lakes (box and whisker plots) of the same "Complex-Cool-Dark" lake class. Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

CREEL SURVEY

The estimated angling effort targeting black crappie in 2021 was 5.44 hours/acre which was higher than in 2002 (3.24) and in 1993 (4.53) and slightly higher than the median (5.14) in reference lakes from 2016-2019 and 2021 (Figure 18, left panel). The estimated black crappie catch rate in 2021 was 0.83 fish/hour which was higher than in 2002 (0.65) and in 1993 (0.35) and higher than the median (0.54) in reference lakes from 2016-2019 and 2021 (Figure 18, middle left panel). The estimated black crappie angler harvest in 2021 was 2.17 fish/acre which was higher than in 2002 (1.61) and in 1993 (1.15) and higher than the median (1.18) in reference lakes from 2016-2019 and 2021 (Figure 18, middle right panel). The mean length of harvested black crappie in 2021 was 10.1 which was the same as 2002 and lower than in 1993 (10.7) and lower than the median (10.3) in reference lakes from 2016-2019 and 2021 (Figure 18, right panel).

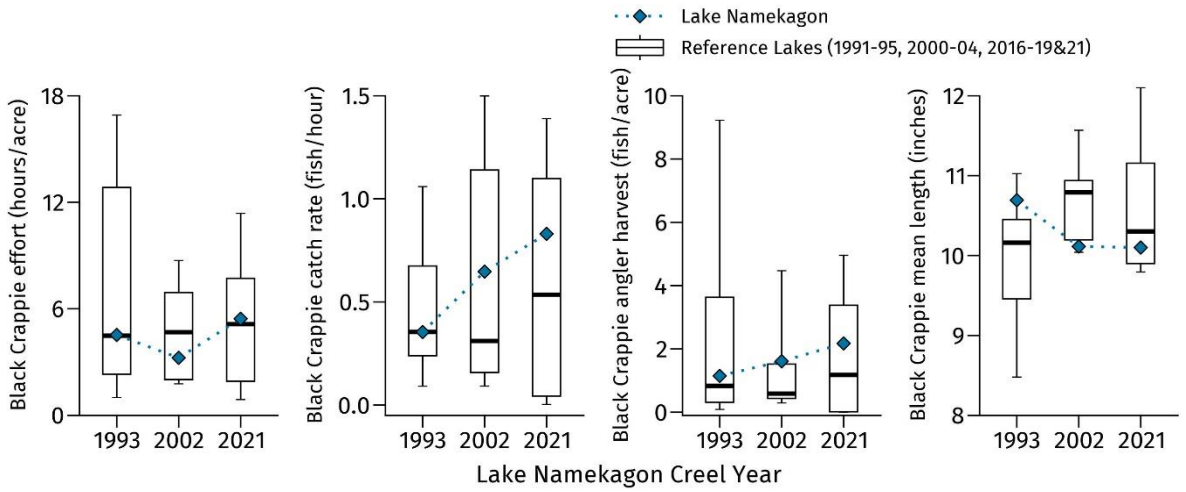

Figure 18. Black crappie effort (left), catch rate (middle left), angler harvest (middle right) and mean length (right) in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and northern WI reference lakes (box and whisker plots) of the same "Complex-Cool-Dark" lake class. Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

BLUEGILL

FISH SURVEY

Bluegill captured during the spring 2021 SE2 survey ranged from 2.6-9.0 inches (Figure 19). Bluegill PSD (% ≥ 6 inches) was 53, slightly higher than the median (46) in reference lakes from 2018-2022 (Table 1). Bluegill CPUE was 35 fish/mile, which was lower than the 25th percentile (63) in reference lakes from 2018-2022 (Table 1).

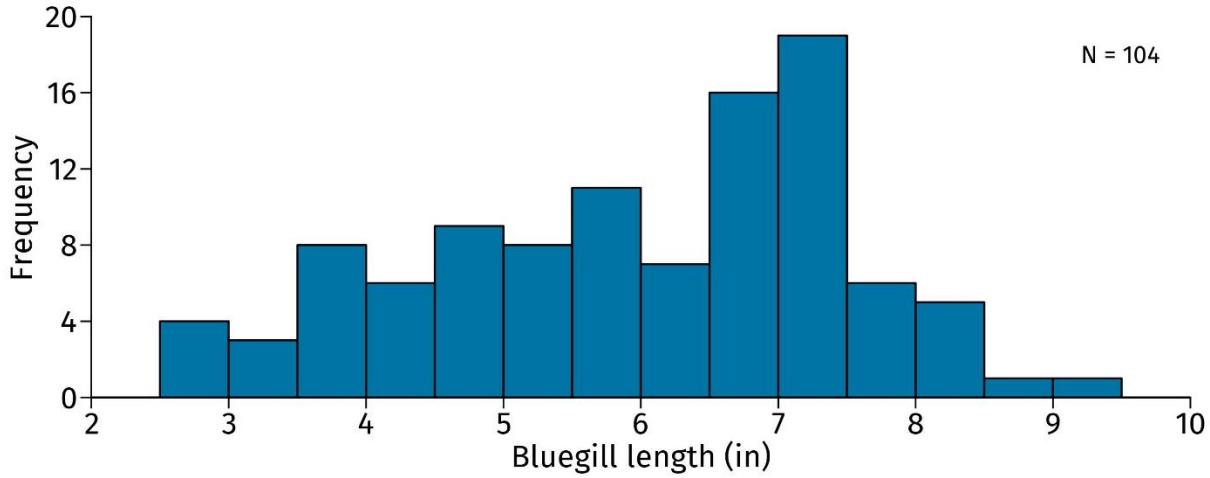

Figure 19. Length frequency histogram of Bluegill captured during the SE2 survey in Lake Namekagon in 2021.

Table 1. Size structure (PSD) and relative abundance (CPUE) metrics of bluegill captured during the SE2 survey in Lake Namekagon in 2021 and northern Wisconsin reference lakes of the same "Complex-Cool-Dark" lake class from 2018-2022.

METRIC	LAKE NAMEKAGON 2021	REFERENCE LAKES (2018-2022)		
		Median	25th Percentile	75th Percentile
Bluegill PSD (% ≥ 6 inches)	53	46	22	64
Bluegill CPUE (# fish/mile)	35	113	63	217

CREEL SURVEY

The estimated angling hours/acre targeting bluegill in 2021 was 3.16 which was lower than in 2002 (4.32) and in 1993 (6.44) and higher than the median (2.67) in reference lakes from 2016-2019 and 2021 (Figure 20, left panel). The estimated bluegill catch rate in 2021 was 1.41 fish/hour which was lower than in 2002 (2.42) and higher than in 1993 (1.14) and higher than the median (0.96) in reference lakes from 2016-2019 and 2021 (Figure 20, middle left panel). The estimated bluegill angler harvest in 2021 was 1.49 fish/acre which was lower than in 2002 (2.59) and lower than in 1993 (3.58) and higher than the 75th percentile (1.00) in reference lakes from 2016-2019 and 2021 (Figure 20, middle right panel). Mean length of harvested bluegill was 7.7 inches which was higher than in 2002 (7.2) and 1993 (6.7) and lower than the median (7.8) in reference lakes from 2016-2019 and 2021 (Figure 20, right panel).

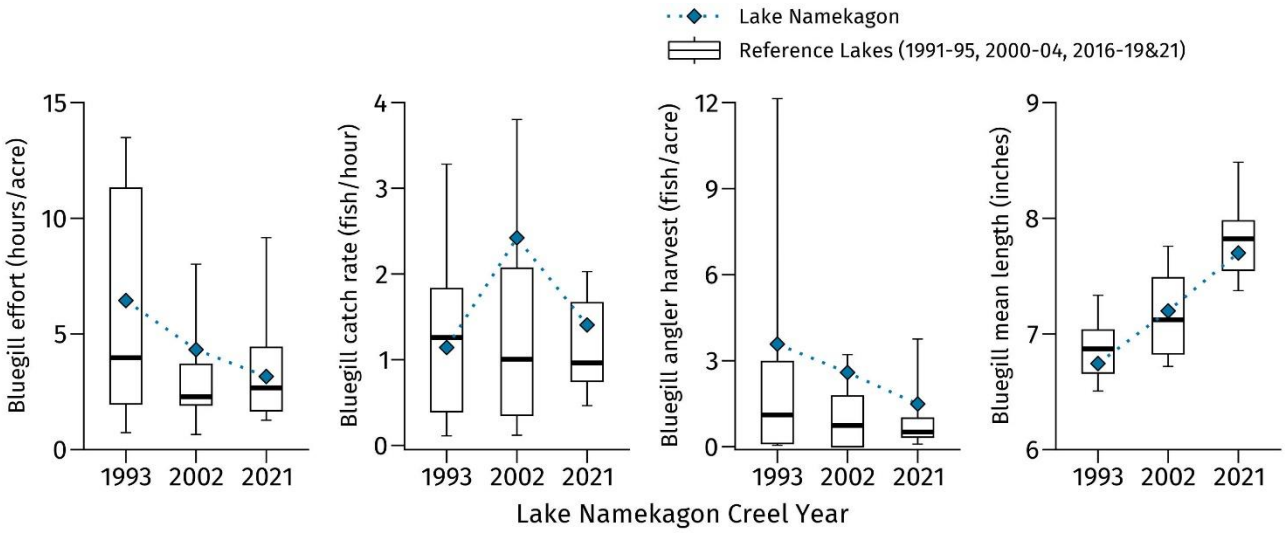

Figure 20. Bluegill effort (left), catch rate (middle left), angler harvest (middle right) and mean length (right) in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and northern WI reference lakes (box and whisker plots) of the same "Complex-Cool-Dark" lake class. Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

NORTHERN PIKE

FISH SURVEY

Northern pike CPUE was 1.74 fish/net-night in 2021, lower than in 2002 (10.75) and lower than in 1993 (2.95) and slightly higher than the median (1.66) in reference lakes from 2018-2022 (Figure 21). Northern pike captured during the spring fyke net surveys ranged from 9.5-36.1 inches (Figure 22). Northern pike PSD (% ≥ 21 inches) was 35, higher than in 2002 (29) and lower than in 1993 (42) and slightly higher than the median (34) in reference lakes from 2018-2022 (Figure 23).

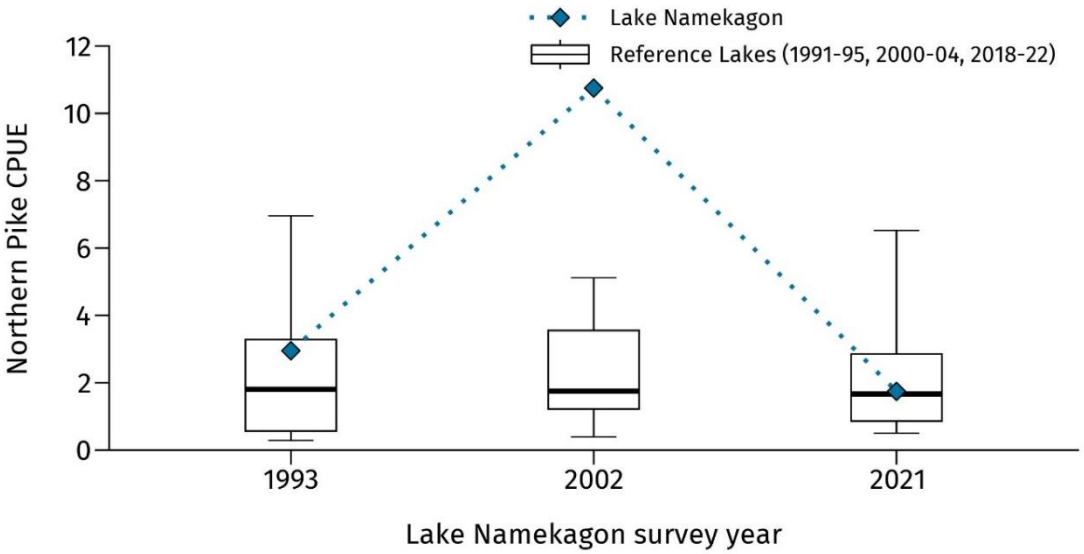

Figure 21. Northern pike catch-per-unit-effort (CPUE; fish/fyke net-night) during spring fyke net surveys in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and northern WI reference lakes (box and whisker plots) of the same "Complex-Cool-Dark" lake class. Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

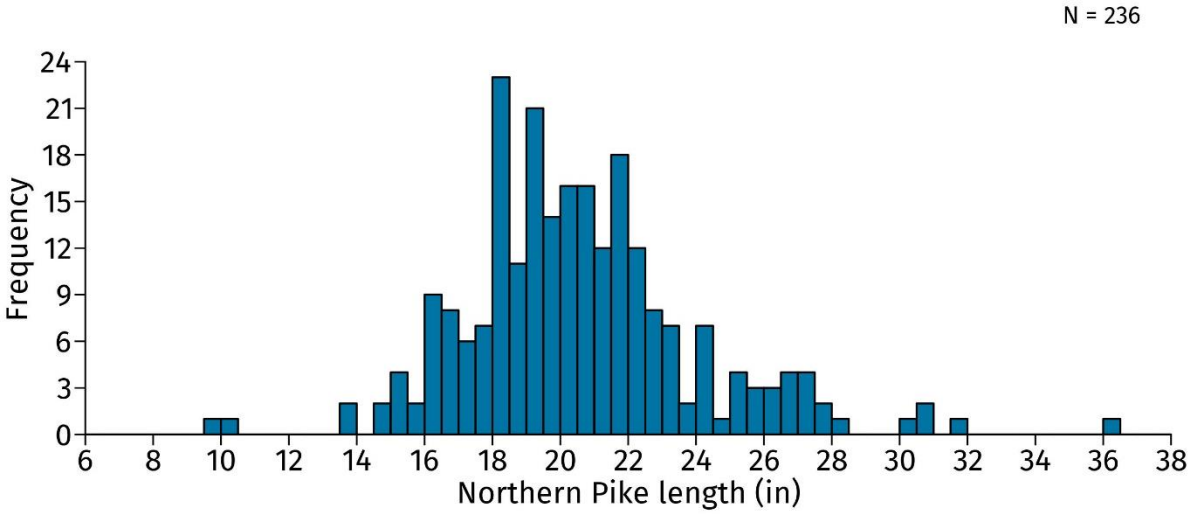

Figure 22. Length frequency histogram of northern pike captured during the spring fyke net surveys in Lake Namekagon in 2021.

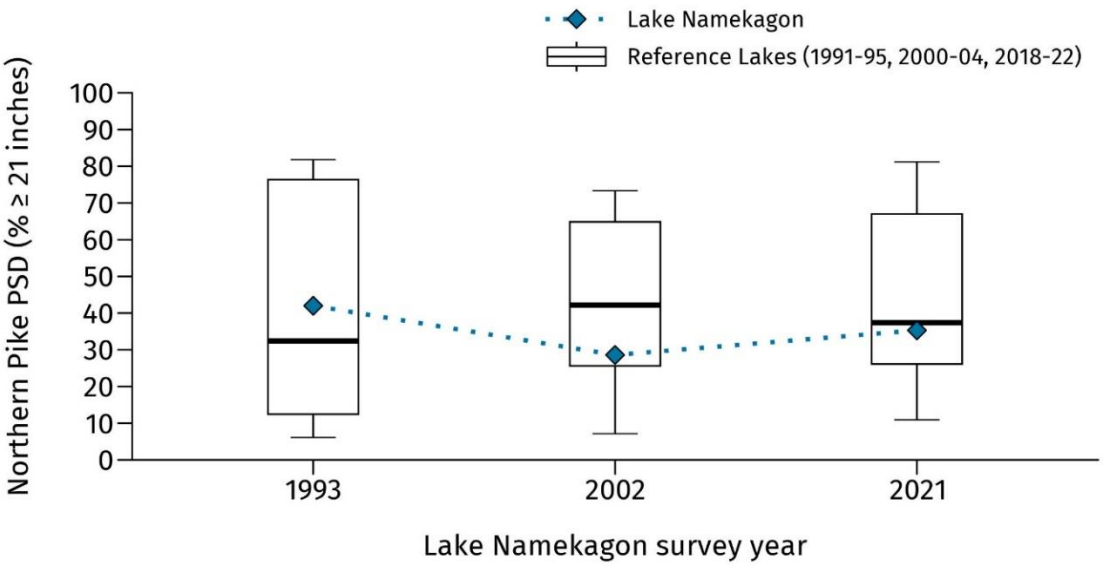

Figure 23. Proportional size distribution (PSD) of quality length (% ≥ 21 inches) northern pike captured during spring fyke net surveys in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and northern WI reference lakes (box and whisker plots) of the same "Complex-Cool-Dark" lake class. Data from a five-year time frame surrounding the Lake Namekagon survey year was used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

CREEL SURVEY

The estimated angling effort targeting northern pike in 2021 was 2.71 angler hours/acre which was lower than in 2002 (4.66) and lower than in 1993 (5.90) and slightly lower than the 90th percentile (2.87) in reference lakes from 2016-2019 and 2021 (Figure 24, left panel). The estimated northern pike catch rate in 2021 was 0.59 fish/hour, which was lower than in 2002 (0.94) and 1993 (0.70) and higher than the median (0.38) in reference lakes from 2016-2019 and 2021 (Figure 24, middle panel). The estimated northern pike angler harvest in 2021 was 0.09 fish/acre which was lower than in 2002 (0.81) and in 1993 (0.29) and equal to the 75th percentile (0.09) in reference lakes from 2016-2019 and 2021 (Figure 24, right panel).

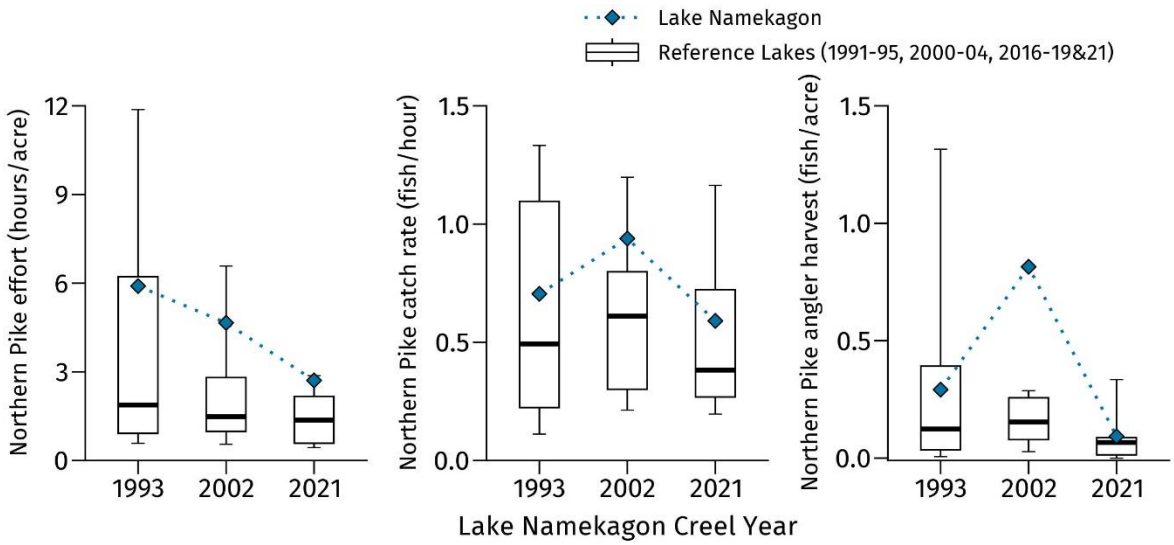

Figure 24. Northern pike effort (left), catch rate (middle) and angler harvest (right) in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and from other northern WI reference lakes (box and whisker plots) of the same "Complex-Cool-Dark" lake class. Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

LARGEMOUTH BASS

FISH SURVEY

A total of 12 largemouth bass were captured during the spring 2021 SE2 survey ranging from 3.5-17.4 inches (Figure 25). Largemouth bass CPUE was 2 fish/mile, which was equal to the 25th percentile in reference lakes from 2018-2022 (Table 2).

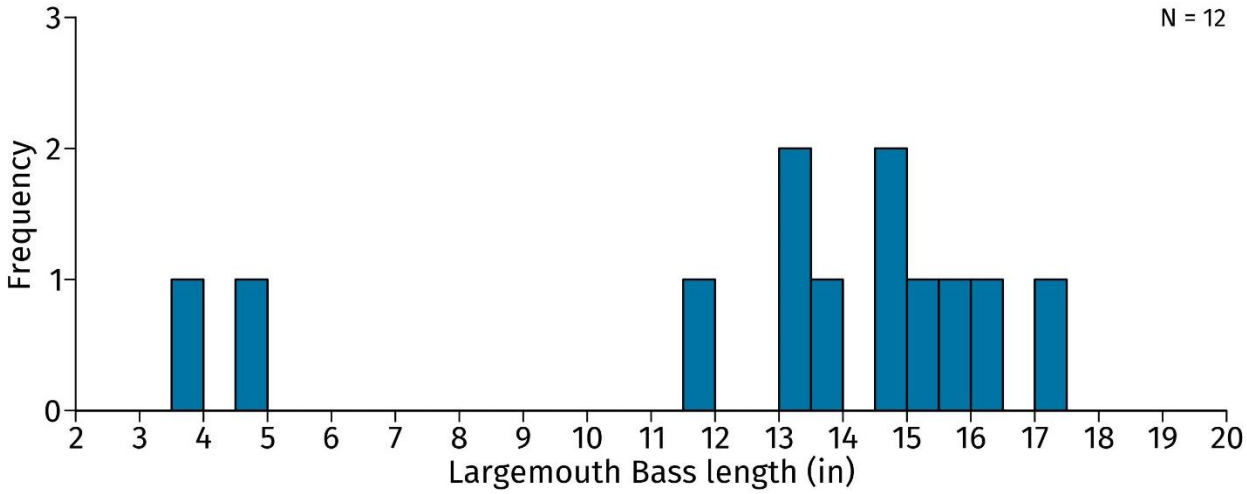

Figure 25. Length frequency histogram of largemouth bass captured during the SE2 survey in Lake Namekagon in 2021.

Table 2. Relative abundance (CPUE) metrics of largemouth bass captured during the SE2 survey in Lake Namekagon in 2021 and northern Wisconsin reference lakes of the same "Complex-Cool-Dark" lake class from 2018-2022.

METRIC	LAKE NAMEKAGON 2021	REFERENCE LAKES (2018-2022)		
		Median	25th Percentile	75th Percentile
Largemouth Bass CPUE (# fish/mile)	2	7	2	19

CREEL SURVEY

The estimated angling effort targeting largemouth bass in 2021 was 1.78 angler hours/acre which was higher than in 2002 (0.98) and in 1993 (0.63) and higher than the median (0.69) in reference lakes from 2016-2019 and 2021 (Figure 26, left panel). The estimated largemouth bass catch rate in 2021 was 0.09 fish/hour which was lower than in 2002 (0.20) and in 1993 (0.19) and lower than the median (0.12) in reference lakes from 2016-2019 and 2021 (Figure 26, middle panel). The estimated largemouth bass angler harvest in 2021 was 0.02 fish/acre which was higher than in 2002 (0.01) and 1993 (0.00) and higher than the median (0.00) in reference lakes from 2016-2019 and 2021 (Figure 26, right panel).

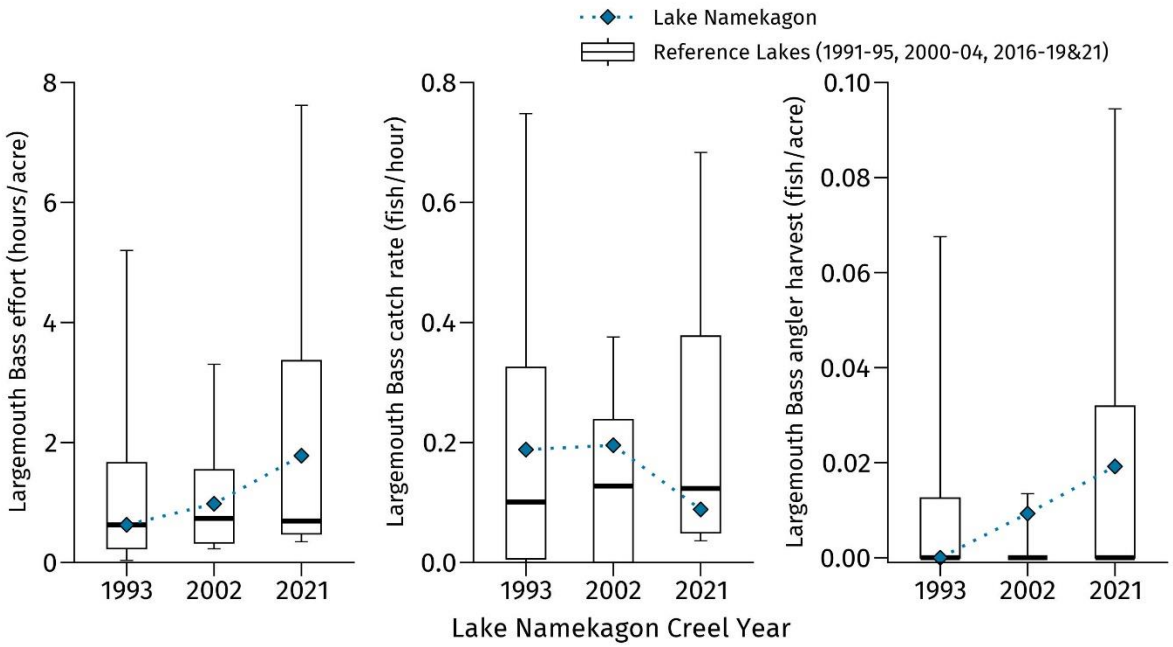

Figure 26. Largemouth bass effort (left), catch rate (middle) and angler harvest (right) in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and northern WI reference lakes (box and whisker plots) of the same "Complex-Cool-Dark" lake class. Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

SMALLMOUTH BASS

FISH SURVEY

Smallmouth bass captured during the spring 2021 SE2 survey ranged from 7.1-19.0 inches (Figure 27). Smallmouth bass PSD (% ≥ 11 inches) was 87, which was higher than the 75th percentile PSD (76) in reference lakes from 2018-2022 (Table 3). Smallmouth bass CPUE was 7 fish/mile, which was higher than the median (5) in reference lakes from 2018-2022 (Table 3).

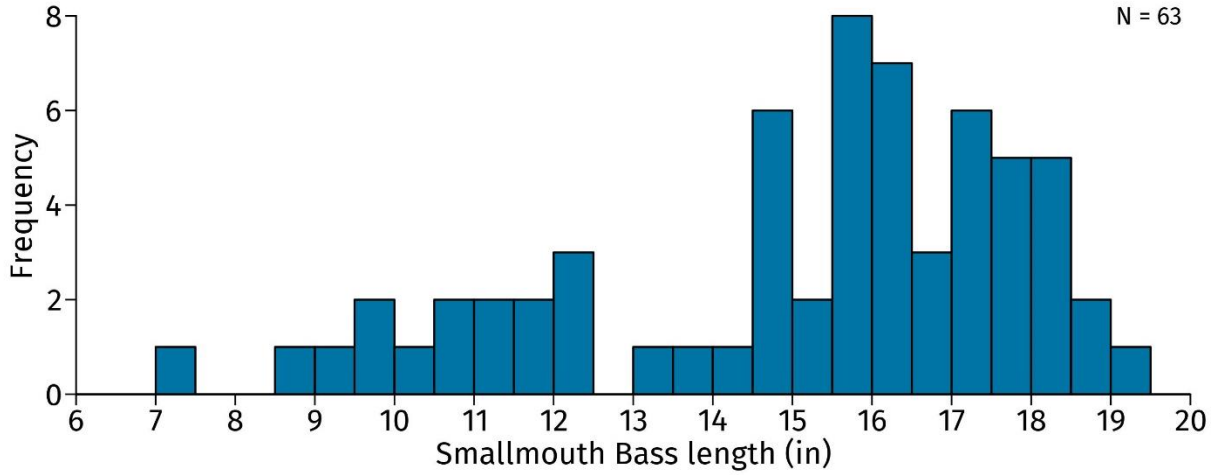

Figure 27. Length frequency histogram of smallmouth bass captured during the SE2 survey in Lake Namekagon in 2021.

Table 3. Size structure (PSD) and relative abundance (CPUE) metrics of smallmouth bass captured during the SE2 survey in Lake Namekagon in 2021 and northern Wisconsin reference lakes of the same "Complex-Cool-Dark" lake class from 2018-2022.

METRIC	LAKE NAMEKAGON 2021	REFERENCE LAKES (2018-2022)		
		Median	25th Percentile	75th Percentile
Smallmouth Bass PSD (% ≥ 11 inches)	87	60	49	76
Smallmouth Bass CPUE (# fish/mile)	7	5	2	10

CREEL SURVEY

The estimated angling effort targeting smallmouth bass in 2021 was 1.57 angler hours/acre which was higher than in 2002 (0.95) and in 1993 (0.02) and lower than the 25th percentile (1.69) in reference lakes from 2016-2019 and 2021 (Figure 28, left panel). The estimated smallmouth bass catch rate in 2021 was 0.16 fish/hour which was lower than in 2002 (0.52) and 1993 (2.34) and lower than the 10th percentile (0.23) in reference lakes from 2016-2019 and 2021 (Figure 28, middle panel). The estimated smallmouth bass angler harvest in 2021 was 0.00 fish/acre which was lower than in 2002 (0.01) and 1993 (0.01) and equal to the 25th percentile in reference lakes from 2016-2019 and 2021 (Figure 28, right panel).

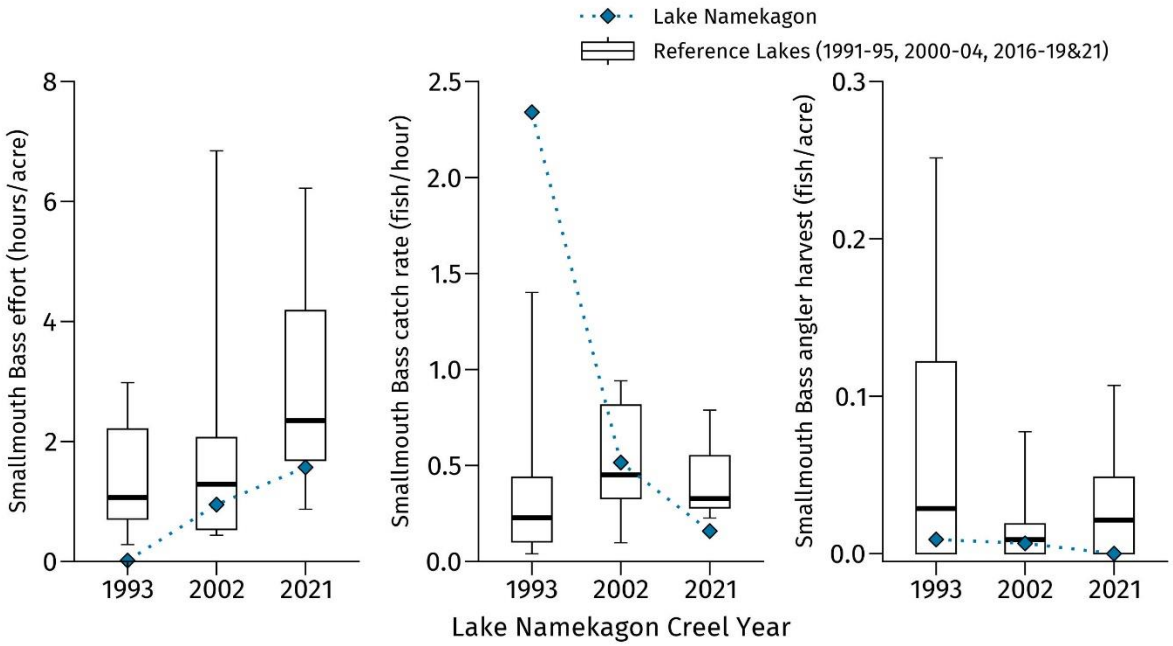

Figure 28. Smallmouth bass effort (left), catch rate (middle) and angler harvest (right) in Lake Namekagon (blue diamonds) in 1993, 2002 and 2021 and northern WI reference lakes (box and whisker plots) of the same "Complex-Cool-Dark" lake class. Data from a five-year time frame surrounding the Lake Namekagon survey year were used for the reference lakes to provide a comparison for that time period. Thick black line in the box is the median (50th percentile) value, top of the box is the 75th percentile, bottom of the box is the 25th percentile and whiskers are the 10th and 90th percentiles.

Discussion

The Lake Namekagon fishery is complex with moderate to high size structures for multiple species, providing anglers with a diverse array of opportunities that range from action to trophy fishing. Above average size structures indicate these populations are typically experiencing full growth potential a likely result of well-balanced predator prey dynamics and sustainable harvest. Muskellunge provided trophy opportunities with limited action while walleye provided an action fishery for smaller fish with some harvest opportunity and panfish, bass and northern pike offered fishing opportunities balanced between size and numbers. The majority of the angling effort during the 2021-22 fishing season focused on muskellunge, black crappie and walleye.

The walleye population is characterized by low size structure, high adult density and slow growth with moderate to high levels of natural recruitment in recent years. Abundance has rebounded from a historical low of 2.3 adults/acre in 2017 to 4.3 adults/acre in 2021. This adult density is well above the median adult density of 2.7 adults/acre in Ceded Territory lakes primarily sustained by natural recruitment since 2012. The 87% increase in adult density from 2017 to 2021 was likely due to strong year classes in 2015, 2016 and 2018 as indexed by elevated age-1 catch rates during

fall electrofishing surveys in 2016, 2017 and 2019. The 2015- and 2016-year classes were mature adults at 5 and 6 years old and the 2018-year class was probably a mix of immature (mostly females) and mature (mostly males) fish during the 2021 adult walleye population estimate. The age-1 catch rate in 2017 was the highest since 2000, which indicated a robust 2016-year class. This was further corroborated by the abundance of age-5 walleye collected during this survey that were largely in the 13–15-inch range. This is slightly slower growth compared to other walleye populations in northern WI where male walleye are about 15 inches at five years old and females are about 16 inches at five years old.

Lake Namekagon supports a viable recreational and tribal walleye fishery. Despite a declining trend in walleye angling effort from the 1993, 2002 and 2021 creel surveys, angler catch rates increased by 100% from 2002 to 2021. Angler exploitation was 2.8% in 2021, much lower than the 11.1% exploitation in 2002, likely a result of the harvest regulation changing from a no minimum length limit to a 15-inch minimum length limit in 2015. The low angler effort in 2021 could be a result of the historically low abundance estimated in 2017. With the increasing abundance and angler catch rates in 2021 effort will likely increase in the coming years and angler harvest opportunities should increase as well as those strong year classes in the late 2010s become legal size. Tribal spearing of walleye has occurred annually on Lake Namekagon and walleye exploitation by spear was 8.9% in 2021, which was slightly above the average tribal spearing exploitation of 7.3% on Lake Namekagon since the initial population estimate was conducted in 1989. Overexploitation is not currently a concern for this population as the total exploitation (angling + spearing) was 11.6% in 2021, well below the 35% limit reference point which is considered to the be the maximum exploitation an adult walleye population can sustain (Hansen 1989). Because of the tribal interest in Lake Namekagon, the Great Lakes Indian Fish and Wildlife Commission (GLIFWC) is jointly involved with the DNR in monitoring the walleye population allowing for more frequent surveys which is vital to effectively manage this resource.

Natural recruitment has sustained this walleye population since stocking was discontinued in the early 1990s. Many walleye populations in northwest WI (e.g. Pike Chain, Eau Claire Chain, Lake Owen) experienced declines in natural recruitment over the last few decades. However, Lake Namekagon has had strong recruitment in recent years after lower levels from 2005-2015. This is a promising sign of the future resilience of this population, likely a result of the lakes location in the watershed. Lake Namekagon is in the upper extent of the Namekagon River watershed with limited upstream anthropogenic disturbance. Only 4.6% of the Lake Namekagon drainage basin is classified as disturbed and 65% of the total land area is fully protected, a vast majority in the Chequamegon-Nicolet National Forest. According to climate projection models from the MGLP Conservation Planner (umich.edu) habitat will be suitable for walleye in 2050 and the Resist-Accept-Direct (RAD) DNR Walleye Decision Tool indicates high probability of successful natural recruitment in 2050 relative to other similar lakes (Complex-Cool-Dark lake class). Additionally, the RAD

decision tool predicts that in 2050 only four other lakes within 30 miles of Lake Namekagon will have >50% probability of successful natural recruitment, whereas in 2020 there were 22 other lakes. This prediction highlights the increasing socio-economic and cultural importance of this walleye fishery in the coming years.

The muskellunge population has remained relatively stable through time at a low to moderate abundance and high size structure. It is designated as an A1 trophy fishery (i.e., waters that produce large fish, but overall numbers may be low) in the DNR muskellunge management classification system (Simonson 2018). The high size structure of this population is likely a result of low to moderate adult abundance with a diverse forage base. Cisco are present in Lake Namekagon (Renik et al. 2020) and have a positive effect on muskellunge size structure in northern WI lakes (VanderBloemen et al. 2020). Additionally, white suckers are common in Lake Namekagon and can grow to a large size providing a desirable prey species for larger muskellunge (Gaeta et al. 2018). Although there is limited natural recruitment, suitable habitat and forage exists for juvenile and adult muskellunge as stocking large fingerlings on a two-year cycle has successfully sustained this population. The large fingerlings stocked in recent years showed good survival as 31% of the muskellunge captured during the 2021 spring fyke net surveys were <35 inches compared to just 17% in 2002.

Muskellunge continue to be a popular species for Lake Namekagon anglers. Muskellunge have become a larger part of the overall fishery since the 1993 creel survey and in 2021 muskellunge were the most targeted species experiencing 27.3% of the total species-specific angling effort. Although there has been a decline in overall angling effort on Lake Namekagon the amount of angling effort targeting muskellunge has remained relatively stable since 1993. Lake Namekagon has likely remained a popular muskellunge lake due to its capability to produce trophy-sized fish.

The panfish fishery in Lake Namekagon is moderately popular amongst anglers relative to other species and has shifted from bluegills to black crappies since 2002. Despite the increase in effort, catch and harvest black crappie population metrics have stayed relatively stable. There was a slight increase in black crappie CPUE since 1993 and PSD has slightly increased from 2002 to 2021. Black crappie creel survey metrics showed a more substantial change since 2002 with effort increasing by 68%, catch rate increasing by 31% and harvest/acre increasing by 35%. These three metrics all rank between the 75th percentile and 90th percentile when compared to other northern WI lakes of the same “Complex-Cool-Dark” lake class. Recent rapid advancements in fishing technology that can potentially allow anglers to more effectively locate and catch fish (Cooke et al. 2021, Feiner et al. 2020) and which in turn could increase popularity may be a factor in the increased angling effort, catch and harvest of black crappie. Additionally, there has been a concomitant decline in bluegill effort, catch and harvest indicating a potential change in species desired by Lake Namekagon panfish anglers. Yet despite the increase in popularity of the

harvest-oriented black crappie fishery, size structure as indexed by PSD and mean length of harvested fish and CPUE did not change from 2002 to 2021. A decline in size structure and CPUE could be an indicator of overharvest, but these data suggest this population is not being overharvested. The bluegill population is at a lower relative abundance compared to other similar lakes in northern WI and had a moderate size structure. The bluegill fishery has experienced a decline in effort, catch and harvest since 2002, which could be a result of the potential shift of interest to black crappie amongst panfish anglers. Because 2021 is the only year an SE2 survey was completed on Lake Namekagon, we were not able to compare bluegill PSD and CPUE data through time to better understand if declines in size structure or relative abundance potentially caused this decline in angling effort, catch and harvest.

Northern pike size structure and relative abundance in 2021 were moderate compared to other similar lakes in recent years and despite a decline in angling effort, catch and harvest since 2002, size structure has remained stable. The relative abundance of northern pike in 2002 was exceptionally high at 10.8 fish/net-night, an outlier compared to the relatively moderate CPUEs observed in 1993 and 2021. Size structure has been less variable since 1993 with PSD varying between 29 and 42. Overall, this population provides a fishery of moderate popularity amongst Lake Namekagon anglers relative to other species as northern pike were the fourth most targeted species in 1993, third most in 2002 and fifth most in 2021.

The angling effort directed at bass have steadily increased since the 1993 creel survey. This increase could be driven by the high size structure of smallmouth bass which ranks higher than the 75th percentile compared to other similar lakes in northern WI. Despite the increase in largemouth bass effort the relative abundance was low. Because there is only one year of SE2 data, we cannot attribute the increasing popularity of bass by Lake Namekagon anglers to actual increases in abundance or size structure of the populations. However, contrary to the increase in angling effort, bass catch rates by anglers decreased from 2002 to 2021. This could indicate a decrease in abundance but CPUE data from an SE2 survey would be the more reliable abundance metric. Creel survey data since 1993 indicate these species increased in popularity amongst Lake Namekagon anglers and currently offer a quality fishery with opportunities for large smallmouth.

ANGLER PREFERENCE SOCIAL SURVEY

In effort to better understand preferences of Lake Namekagon anglers a social survey was conducted from March – June 2023. Results from this survey indicate anglers were most interested in targeting walleye, black crappie, muskellunge and bluegill, with moderate interest in smallmouth bass, northern pike and minimal interest in yellow perch and largemouth bass. A balance between population abundance and individual size of fish was preferred for all species besides muskellunge, where most respondents preferred a less abundant population with larger fish (i.e., trophy fishery). In general, anglers desired a balance between catch-and-release and

harvest for walleye, bluegill and black crappie and catch-and-release for muskellunge. Overall, management actions are aligned with these desires by maintaining populations of walleye, bluegill and black crappie that provide some harvest opportunity with a balance between abundance and individual fish size and a low-density muskellunge population that provides opportunities for trophy sized fish.

Management Recommendations

WALLEYE

1. **Retain current Ceded Territory base regulation**
   The 15-inch minimum length limit, 20–24-inch protected slot with 3 fish bag limit and only 1 fish >24 inches regulation helps protect this self-sustaining population by allowing most fish to spawn, at least once for females and at least twice for males, prior to being susceptible to angling harvest.
2. **Coordinate with GLIFWC to conduct annual fall electrofishing surveys**
   Closely monitor natural recruitment to determine if timely management actions are needed (e.g., regulation change, stocking).
3. **Coordinate with GLIFWC to conduct mark recapture population estimates of adult walleye every 6 years**
   This frequency is similar to what has been done on Lake Namekagon since 1989 and if the next survey is completed in 2027, the fin-clipped walleye stocked in 2020 and 2021 will be mature so the stocking contribution to those adult year classes and relative survival between the two aquaculture rearing methods could be evaluated (LV fin-clipped fish were pond raised and fed minnows and RV fin-clipped fish were raised in indoor recirculating tanks and fed pellets).

MUSKELLUNGE

1. **Retain current trophy regulation**
   Although harvest is minimal, the 50-inch minimum length limit regulation better allows fish to fully maximize growth potential and attain trophy sizes, which is why this fishery is so popular.
2. **Continue stocking of large fingerlings in alternate years at 0.8 fish/acre (2,500 fish/year)**
   Stocking large fingerlings has largely sustained this population that has limited natural reproduction.
3. **Conduct a mark recapture population estimate every 12 years (every other walleye population estimate survey)**
   Updated survey information is needed to evaluate and justify stocking practices of this popular fishery.

BLACK CRAPPIE

1. **Retain current base regulation**
   Although effort, catch and harvest have increased since 2002, relative abundance and size structure from fish survey data and mean length of harvested fish from creel data has not changed, further corroborating the fish survey data. With no observable change in size structure and relative abundance, the 25 fish bag limit for panfish should be retained. A regulation change will be reevaluated using the data collected during the next survey in 2027.
2. **Continue monitoring population with spring fyke net surveys every 6 years**
   Collect size structure and relative abundance data on black crappie during spring fyke net surveys when conducting walleye population estimates.
3. **Collect otoliths and estimate age at length to model growth**
   Age data would allow growth and mortality to be estimated and better inform management.

BLUEGILL

1. **Retain current base regulation**
   Relative abundance is low and size structure is moderate, indicating no need to change the regulation from a 25 fish bag limit for panfish.
2. **Continue monitoring population with SE2 survey every 6 years**
   Trends in size structure and relative abundance will provide useful information to inform management.

NORTHERN PIKE

1. **Retain current northern WI base regulation**
   Relative abundance and size structure are moderate, indicating no need to change the regulation from a no minimum length limit with a 5 fish bag limit.
2. **Continue monitoring population with spring fyke net surveys every 6 years**
   Collect size structure and relative abundance data on northern pike during spring fyke net surveys when conducting walleye population estimates.

LARGEMOUTH BASS

1. **Retain current no minimum length limit regulation**
   This consumptive regulation fits well with the restrictive smallmouth regulation by still providing a harvest opportunity for bass and should not be changed.
2. **Continue monitoring population with SE2 survey every 6 years**
   Trends in size structure and relative abundance will provide useful information to guide management.

SMALLMOUTH BASS

1. **Retain current trophy regulation**
   Relative abundance is moderate and size structure is high, indicating no need to change the regulation from an 18-inch minimum length limit with a one fish bag limit.
2. **Continue monitoring population with SE2 survey every 6 years**
   Trends in size structure and relative abundance will provide useful information to guide management.

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Appendix

Table A1. Stocking history in Lake Namekagon.

YEAR	WALLEYE			MUSKELLUNGE		
	Number Stocked	Size	Comments	Number Stocked	Size	Comments
2021	15577	Large Fing.	pond reared; LV clip	787	Large Fing.	
2021	5556	Large Fing.	tank reared; RV clip			
2020	3860	Large Fing.	pond reared; LV clip			
2020	4000	Large Fing.	tank reared; RV clip			
2019				750	Large Fing.	
2018	3097	Large Fing.		554	Large Fing.	
2017				825	Large Fing.	
2015				2500	Large Fing.	RV clip
2013				2500	Large Fing.	LV clip
2011				2500	Large Fing.	LP clip
2009				2500	Large Fing.	RP clip
2007				2491	Large Fing.	LP clip
2005				2500	Large Fing.	RV clip
2003				2500	Large Fing.	LV clip
2001				3227	Large Fing.	
1999				2500	Large Fing.	
1997				2500	Large Fing.	
1993	465	Large Fing.		3300	Large Fing.	
1992	11100	Fingerling		2500	Large Fing.	
1992	150	Large Fing.				
1991	6500	Fingerling		2500	Large Fing.	
1990	600000	Fry		1250	Large Fing.	

Table A2. Standard DNR surveys for inland lakes, gear used and target water temperature and species.

SURVEY	GEAR	TARGET WATER TEMPERATURE (°F)	TARGET SPECIES
Early Spring Netting (SN1)	Fyke Net	40-50	Walleye Muskellunge Northern Pike Black Crappie
Early Spring Electrofishing (SE1)	Boat Electrofisher	45-50	Walleye
Late Spring Netting (SN2)	Fyke Net	50-55	Muskellunge Northern Pike Black Crappie
Late Spring Electrofishing (SE2)	Boat Electrofisher	55-70	Bass and Panfish
Fall Electrofishing (FE1)	Boat Electrofisher	50-65	Juvenile Walleye

Table A3. Length categories for species of interest captured in Lake Namekagon, Bayfield County, WI.

SPECIES	LENGTH CATEGORY (inches)				
	Stock	Quality	Preferred	Memorable	Trophy
Muskellunge	20	30	38	42	50
Walleye	10	15	20	25	30
Northern Pike	14	21	28	34	44
Largemouth Bass	8	12	15	20	25
Smallmouth Bass	7	11	14	17	20
Bluegill	3	6	8	10	12
Black Crappie	5	8	10	12	15