WISCONSIN DEPARTMENT OF NATURAL RESOURCES Muskellunge Survey Report for Little Sand Lake, Barron County, Wisconsin 2023-2024

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Executive Summary

Little Sand Lake was surveyed during 2023-2024 to determine the abundance and population demographics (size and age structure, growth and recruitment) of muskellunge as part of the Treaty assessment protocol for lakes within the Ceded Territory. This survey documented a high-density (0.63 adults/acre) population with high size structure. The 2023 adult muskellunge density estimate in Little Sand Lake was greater than other popular muskellunge fisheries in Barron and Polk counties and was the second highest adult density estimated in the Westside of the Ceded Territory since 2010. Muskellunge had good longevity (up to 17 years of age), an average growth rate, low annual mortality rate and above-average fish condition. Little Sand most closely resembles that of an 'action fishery' providing anglers a relatively unique opportunity to target a fishery with presumably high catch rate potential and reasonably good opportunities for memorable-sized (\geq 42 inches) fish. The muskellunge fishery in Little Sand Lake should be managed at a high density (\geq 0.5 adults/acre), which should continue to provide a quality 'action fishery' for anglers. Little Sand Lake remains a stocking-dependent system, characterized by strong recruitment from stocked fish, a low likelihood of establishing natural recruitment and thus the current stocking rate of 1 large fingerling per acre is recommended to continue. However, the rising cost of raising muskellunge and the need to prioritize the use of that limited resource established a need to implement a stocking quota tool across the state which emphasizes stocking of large, high angler use waters. Little Sand Lake is likely to rank lower compared to large, high angler use lakes which may jeopardize the future of DNR stocking in the lake. Should DNR stocking be reduced or discontinued then alternatives will be considered. Muskellunge in Little Sand Lake will continue to be managed with the 40-inch minimum length limit and one fish daily bag limit to maintain low harvest mortality and higher size structure.

Introduction

Little Sand Lake is a 94-acre drainage lake located in Northwestern Barron County, Wisconsin. An intermittent outlet stream flows into Sand Lake. A small water control structure operated by Barron County is located at the outlet. Little Sand Lake has 2.1 miles of shoreline, and most of which is undeveloped with only 6.7 dwellings/shoreline mile. The immediate shoreline landscape is comprised mostly of forest and wetlands. Little Sand Lake is a naturally stained, fertile, eutrophic system classified as a simple-cool-dark lake (Rypel et al. 2019). The lake has a maximum depth of 39 feet and a mean depth of 13 feet with approximately 13% less than 3 feet and 20% greater than 20 feet. Lake bathymetry is relatively simple with steep breaking shorelines and limited littoral area. Two deep holes are located on the north and south ends and some offshore rocky-rubble complexes are present. Bottom substrates are primarily composed of sand (80%) and muck (20%) and submerged and floating aquatic macrophytes are abundant in the nearshore littoral areas. There is one public boat ramp located on the northeast part of the lake off 3rd Street (45.573, -92.092; latitude, longitude).

The sportfish community in Little Sand Lake consists of bluegills, pumpkinseeds, black crappies, largemouth bass, yellow perch, northern pike and muskellunge.

Muskellunge were first stocked into Little Sand Lake during 1973 as part of a research project that evaluated muskellunge stocking techniques. During the 1970s, large fingerling muskellunge stocking occurred four years at a rate of 4 fish/acre and small fingerlings were stocked once at a rate of 10 fish/acre. Infrequent stocking occurred during the 1980s and despite decades of at least inconsistent stocking, Little Sand Lake was not formally managed for muskellunge and no formal surveys occurred. A fall electrofishing survey was performed during 1989 to assess the status of the fishery. The muskellunge population at this time was considered low density, with above-average growth rates and stocking dependent as all fish were from stocked year classes and no natural reproduction was observed (Cornelius 1990). The development of a good muskellunge population in Little Sand Lake was thought possible with additional stocking and would expand muskellunge angling opportunities in the area. Stocking of large fingerling muskellunge (1 fish/acre) was resumed during 1991 and continued through 1993. Consistent alternate year stocking of large fingerling muskellunge began again during 2004 and continued regularly through 2024 (Appendix Table 1). The Wisconsin Department of Natural Resources (DNR) currently designates Little Sand Lake as a Class B muskellunge fishery, which is considered an intermediate class that provides good fishing but generally lower angler success and catch rates compared to other higher quality fisheries.

A mark-recapture survey was performed during 2023 – 2024 to estimate the adult density of muskellunge in Little Sand Lake. The objectives of this survey were to

assess the current abundance, size structure and population demographics of adult muskellunge.

Methods Field Sampling

The abundance of adult muskellunge (≥ 30 inches) was estimated using markrecapture methodology during the early spring netting surveys and Chapman's modification of the Peterson model (Ricker 1975):

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

where N = population estimate; M = the number of fish marked in the first (marking) sample; C = the total number of fish (marked and unmarked) captured in the second (recapture) sample; and R is the number of marked fish captured in the second sample.

Muskellunge surveys are two-year fyke netting surveys, so 2023 served as the marking year, and 2024 was the recapture year. Nets were set shortly after ice-out and checked every 24 hours for 3 – 4 days each year. Muskellunge were measured to the nearest 0.1 inches and weighed to the nearest 0.1 pounds. Anal fin rays were collected to determine age. The sex of captured fish was determined by the presence of eggs or milt or by visual inspection of the urogenital pore as described by LeBeau and Pageau (1989). All adult fish were marked during 2023, and fish < 30 inches received a separate mark. During the recapture year, all fish were checked for marks, and to prevent double counting fish, all 2024 fish received a mark unique from the 2023 marks. Muskellunge were implanted with a uniquely coded passive integrated transponder (PIT) tag. The abundance of fish in 2023 was adjusted for recruitment over the 1-year period. For this, females < 32 inches and males < 31 inches collected in 2024 were excluded from the adult population estimate because they were assumed to have been < 30 inches during the 2023 marking event.

POPULATION DEMOGRAPHICS

Independent abundance estimates were calculated for mature muskellunge of each sex \ge 30 inches and for muskellunge \ge 30 inches, with sexes combined and including unknowns. Density estimates were compared to mean estimates for Barron and Polk counties and regional estimates (Westside of the Ceded Territory). The Barron and Polk counties mean estimate included the most recent density estimates for Wapogasset and Bear Trap lakes, Big Moon Lake, Bone Lake, Deer Lake, Sand Lake and Rice Lake. The regional mean estimate included only the most recent DNR surveys for lakes indexed during 2010 – 2023 (n = 40 lakes, Appendix Table 2). Both comparisons used estimates not adjusted for recruitment. Muskellunge anal fin rays were cut with a Dremel saw and aged by two interpreters under a dissecting microscope with side illumination from a fiber optic light. The von Bertalanffy (1938) growth model was determined using mean length at age data to assess growth using the following equation:

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

where L_t is length at time t, L_{inf} is the maximum theoretical length (length infinity), e is the exponent for natural logarithms, k is the growth coefficient, t is age in years and t₀ is the age when L_t is zero.

The von Bertalanffy growth equation was calculated with sexes combined due to limited sample sizes per sex. The von Bertalanffy growth parameters were compared to lake class standards and other muskellunge populations in Barron and Polk counties (Apple River Flowage, Wapogasset and Bear Trap lakes, Big Moon Lake, Bone Lake, Deer Lake, Rice Lake and Sand Lake).

Size structure was assessed using proportional size distribution (PSD) indices (Neumann et al. 2013). The PSD value for a species is the number of fish of a specified length and longer divided by the number of fish of stock length or longer, the result multiplied by 100. Stock length was set at 30 inches per DNR protocols. Relative weight (W_r) was used to describe fish condition. Relative weight is the ratio of a fish's weight at capture to the weight of a "standard" fish of the same length determined by a standard weight equation (Neumann and Willis 1994). The mean W_r was determined.

The instantaneous mortality (Z) and annual mortality (A = $1-e^{-Z}$) rates of muskellunge were determined using a catch curve regression fitted to those ages fully recruited to the gear (Miranda and Bettoli 2007).

To assess muskellunge stocking survival, an age-length key was used to estimate the abundances of muskellunge in each year class, assuming no natural reproduction and all fish were from stocked origin. Survival was estimated by dividing the population estimate for each age class by the total number of fish stocked for that year and multiplying it by 100. Cost per recruit was not calculated due to variability in the annual costs per large fingerling.

Population metrics were compared to the lake class standards when possible. Limited data were available for the simple-cool-dark classification, so lake class comparisons were made using complex-cool-dark standards.

Results

There were five fyke nets set for three nights in 2022, which totaled 15 net-nights of effort, and 5 fyke nets set for 4 nights in 2023, which totaled 20 net-nights of effort.

Muskellunge catch-per-unit effort (CPUE) was 1.54 fish/net-night, which was near the the 90th percentile (1.56 fish/net-night) for complex-cool-dark Wisconsin lakes. The CPUE was well above the third quartile of muskellunge Class B waters (0.64 fish/net night) and most closely resembled the third quartile of Class A2 waters (1.50 fish/netnight). There were 24 muskellunge (\geq 30 inches; 12 males and 12 females) marked during 2023 and 27 muskellunge (7 males, 19 females and 1 unknown sex) collected during 2024. The adult population (sexes combined ≥ 30 inches) during 2023 was estimated to be 62 fish (95% confidence interval: 33 – 91 fish), or 0.63 adult fish/acre (coefficient of variation (CV) = 0.18; Figure 1). The 2023 Little Sand Lake muskellunge density estimate was greater than recent density estimates (0.34 adults/acre \pm 0.12; mean estimate \pm standard deviation; range = 0.22 – 0.53 adults/acre) for other popular muskellunge fisheries in Barron (Sand Lake, Big Moon Lake and Rice Lake) and Polk (Wapogasset and Bear Trap lakes, Deer Lake and Bone Lake; Figure 1) counties. Similarly, Little Sand Lake had the second highest adult density estimate in the Ceded Territory (Westside) since 2010 (0.26 adults per acre ± 0.19; regional mean estimate \pm standard deviation; Figure 1). Population estimates by sex (\geq 30 inches) for 2023 were 21 males (CV = 0.29) and 34 females (CV = 0.29).



Figure 1. Population density estimate of adult (≥ 30 inches; black circles) muskellunge in Little Sand Lake, Barron County, WI during 2023 compared to estimates from Barron and Polk counties and the Ceded Territory (Westside). 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. The X symbol represents the mean of adult muskellunge density estimates.

Muskellunge ranged in length from 13.2 to 48.0 inches and the mean length of muskellunge (sexes combined) was 35.5 inches (± 6.5 inches; standard deviation; Figure 2), which was similar to the Barron and Polk counties mean estimate (35.9 ± 1.4 inches; mean total length ± standard deviation; Figure 3) and resembled the 95th percentile for complex-cool-dark Wisconsin lakes. The Barron and Polk counties mean estimate was indexed using the most recent survey data from muskellunge

waters in Barron (Rice Lake, Sand Lake and Big Moon Lake) and Polk (Wapogasset and Bear Trap lakes, Bone Lake and Deer Lake) counties (Figure 3). The mean length by sex was 35.7 inches (± 4.9 inches; standard deviation) for males and 37.1 inches (± 5.0 inches; standard deviation) for females.



Figure 2. Length frequency histogram for male (blue), female (red) and unknown sex (white) muskellunge captured with fyke nets in Little Sand Lake Lake, Barron County, WI 2023-2024. Recaptures were excluded.



Figure 3. Mean total length (inches; black circle) of muskellunge in Little Sand Lake, Barron County, WI during 2023 - 2024 compared to estimates from other muskellunge fisheries in Barron and Polk counties. 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. The X symbol represents the mean adult muskellunge average length in Barron and Polk counties.

Muskellunge PSD-34 was 90, PSD-38 was 43, PSD-42 was 23 and PSD-45 was 13. Collectively, these PSD indices suggest an above-average size structure was present during 2023-2024. The mean W_r was 96, which indicated muskellunge were in aboveaverage condition. The male-female sex ratio was 0.6:1.

Little Sand Lake muskellunge had average growth rates. Limited age-specific sample sizes of muskellunge in Little Sand Lake prevented numerical comparisons with the Barron and Polk counties mean estimates and lake class standards. However, using a qualitative approach (visual inspection of mean length at age plot; Figure 4), the mean length at age appeared similar to the Barron and Polk counties average and median length at age estimates for complex-cool-dark Wisconsin lakes.



Figure 4. Mean length at age ± standard deviation of muskellunge (sexes pooled; black circles) sampled from Little Sand Lake during 2023 - 2024. The mean length at age estimates for Barron and Polk counties is represented by the green line and lake class (complex-cool-dark lakes) median length at age estimates by the red line. The von Bertalanffy growth curve is represented by the black line.

The predicted length infinity (L_{inf}) from the von Bertalanffy growth model was 45.9 inches (43.8 – 47.9 inches; 95% confidence interval) which was near average compared to L_{inf} estimates for other population muskellunge waters in Barron and Polk counties (Figure 5). Additionally, the growth trajectory of muskellunge in Little Sand Lake was nearly identical to the Barron and Polk counties average. Despite being a useful predictor of growth trajectories, two fish were observed that exceeded the von Bertalanffy estimated L_{inf} for Little Sand Lake (46.3 and 48.0 inches).



Figure 5. The von Bertalanffy predicted L_{inf} of muskellunge in Little Sand Lake (black circle), Barron County, WI during 2023-2024 compared to estimates from other muskellunge fisheries in Barron and Polk counties. The X symbol represents the mean of adult muskellunge L_{inf} estimates across lakes.

Muskellunge were long-lived and ages ranged from 1 – 17 years. The catch curve regression model (fitted to age 5 to age 17) estimated annual mortality to be 10.9% (Z= -0.12; Figure 6), although the model fit was fairly poor ($R^2 = 0.27$). Despite this, annual mortality of muskellunge in Little Sand Lake was low compared to other muskellunge waters in Barron and Polk counties (26.7 ± 4.8%; mean annual mortality estimate ± standard deviation; included Rice Lake during 2022, Bone Lake during 2017 and Big Moon Lake during 2021).



Figure 6. Catch curve analysis plot representing the natural logarithm of the catch for each muskellunge age class used in the analysis (black circles) and not (white circles). Z = instantaneous total mortality, A = annual total mortality rate.

The Little Sand Lake muskellunge population was primarily composed of stocked fish. Natural recruitment was low as non-stocked year classes represented very little of the population age structure (Figure 7). Age cohorts corresponding with stocked year classes composed 95% of the population, indicating stocking efforts have successfully maintained a quality population with multiple year classes present (Figure 7). Survival of stocked large fingerling muskellunge to age 5 was 33.3%, which was higher than recent survival estimates to ages 4 or 5 (age first susceptible to survey methods) for Wapogasset and Bear Trap lakes, Bone Lake, Rice Lake and Deer Lake (10.6 ± 9.1%, mean ± standard deviation; range 3.4% - 23.4%). Survival of stocked large fingerling muskellunge to ages 7, 9, 11, 15 and 17 was 11.5%, 1.5%, 4.4%, 11.4% and 7.9%, respectively. Survival rates of the 2006 (age 17), 2008 (age 15) and 2016 (age 7) stocked cohorts were high despite lower stocking rates relative to the 2012 (age 11) and 2014 (age 9) stocked cohorts (Appendix Table 1).



Figure 7. Population age structure of muskellunge during 2023 in Little Sand Lake, Barron County, WI. Blue bars represent non-stocked years and grey bars represent stocked years with survival of stocked fish indicated by the black dots.

Discussion

The 2023 adult muskellunge survey was the first population estimate on Little Sand Lake. This survey documented a high-density (0.63 adults/acre) population with high size structure. The 2023 adult muskellunge density estimate in Little Sand Lake was greater than other popular muskellunge fisheries in Barron and Polk counties and was the second highest adult density estimated in the Westside of the Ceded Territory since 2010. The PSD-42 was above the target level for Class A1 muskellunge waters (PSD-42 > 15) and the PSD-45 was high relative to other popular muskellunge waters in Barron and Polk counties. Muskellunge fisheries often have inverse relationships between density and size structure, where lower density populations typically have higher size structure and good fish condition, and vice-versa, which is typically the result of intra-specific competition. The population size structure and fish condition in Little Sand Lake were surprisingly high considering the high adult density and relatively consistent stocking rates through time. This provides anglers a relatively unique opportunity to target a fishery with presumably high catch rates and reasonably good opportunities for memorable-sized (\geq 42 inches) fish. Muskellunge had good longevity (up to 17 years of age), an average growth rate, low annual mortality rate and above-average fish condition. The low annual mortality likely resembles that of natural mortality as tribal harvest has not been recently documented in Little Sand Lake and fishing mortality is presumably low.

The muskellunge fishery in Little Sand Lake should be managed at a high density (\geq 0.5 adults/acre), which should continue to provide a quality 'action fishery' for anglers. Despite this, Little Sand Lake is not stocked at a particularly high rate compared to other lakes in Barron and Polk counties. The current stocking rate is comparable (1 fish/acre) to other stocked lakes in Barron and Polk counties (mean stocking rate = 1.0 ± 0.4 fish/acre; standard deviation). The high adult density is likely due to high survival of stocked large fingerlings and low adult annual mortality rates. Survival of stocked fish to adulthood (age 5+) was greater than other popular muskellunge waters in Barron and Polk counties which indicates adequate habitat, environmental conditions and forage are and have been present in Little Sand Lake. However, if conditions change and lead to reduced stocked large fingerling survival, then adult densities would be expected to decrease correspondingly. Natural recruitment of muskellunge remained low and is not expected to increase to levels that would contribute significantly to the adult population.

The goal of muskellunge stocking in Little Sand Lake is to sustain a high-quality adult fishery, and the current stocking rate of 1 large fingerling per acre is recommended to continue. Little Sand Lake remains a stocking-dependent system, characterized by strong recruitment from stocked fish and a low likelihood of establishing natural recruitment. However, due to rising costs associated with raising muskellunge and competing program priorities, such as habitat restoration and monitoring, a ranking tool is used to prioritize muskellunge stocking efforts across the state. This tool evaluates a variety of factors, including stocking success, angler use, tribal harvest, and lake size. Little Sand Lake tends to rank lower compared to other muskellungestocked waters because of its small size, unknown angler use, and lack of tribal harvest. As a result, future muskellunge stocking in Little Sand Lake may be reduced or discontinued. A decline in population density is expected if stocking rates are reduced or halted, but higher survival during years with lower stocking rates may confound this expectation. Nonetheless, should DNR stocking be reduced or discontinued, privately sourced stocking (with appropriate genetic strain) could be pursued to ensure the continued viability of the muskellunge fishery. Moving forward, it will be essential to closely monitor stocking efficacy and the recruitment of stocked year classes to maintain the health of the fishery.

Little Sand Lake is currently classified as a Class B muskellunge water which is considered an intermediate class providing good fishing but generally lower angler success and catch rates compared to Class A waters (Classes A1 and A2; Simonson 2018, Simonson and Hewett 1999). The current stocking rate (1 large fingerling/acre) combined with high survival of stocked fish has yielded a high-density population resulting in an 'action fishery' that provides anglers higher catch rates. Action fisheries are typically Class A2 waters and important components to the Wisconsin 'muskellunge waters' portfolio by providing contrast to Class A1 'trophy waters' which are best characterized as low-density populations with high size structure and low catch rate potential. The benchmarks used to classify the fishing quality of muskellunge waters do not perfectly categorize the current muskellunge population in Little Sand Lake. Muskellunge density and CPUE in Little Sand Lake during 2023 most closely resembled the third quartile of Class A2 waters (0.54 fish / acre and 1.50 fish/net-night). Yet, muskellunge PSD-42 and PSD-45 in Little Sand Lake most closely resembled the third quartile of Class A1 waters (PSD-42 = 23 and PSD-45 = 10). Despite this, Little Sand Lake is a small waterbody which would likely prescribe its current classification as a Class B water despite population metrics and fishery quality that might warrant Class A status. Additionally, uncertainty regarding stocking may impact population dynamics the future.

Muskellunge in Little Sand Lake will continue to be managed with the 40-inch minimum length limit and one fish daily bag limit to maintain low harvest mortality and higher size structure.

All muskellunge were implanted with PIT tags during 2023 - 2024 and recaptures of those fish by both anglers and future fishery surveys will benefit future population assessments. PIT tags are a valuable tool for individual identification of fishes and recapture histories can be used as an alternate approach to estimating population growth parameters, mortality and longevity. Muskellunge can live upwards of 25 years of age and age estimates with anal fin rays become less reliable beyond 10 years of age (Crane et al. 2020). Estimation of growth parameters using PIT tag recapture growth models should be revisited as more recapture data become available following future surveys in Little Sand Lake.

Little Sand Lake is a popular muskellunge lake. While creel data were not available to directly assess angler effort, it is presumed that directed effort (hours/acre) for muskellunge is moderate to high, especially considering the relatively small lake size. Since the lake does not support a walleye population, it is unlikely to receive a DNR Treaty creel survey. Therefore, alternative methods for gathering data on angler effort, catch rates and harvest patterns should be explored to gain a better understanding of fishing activity on the lake.

Management Recommendations

- The adult muskellunge population (≥ 30 inches) should be maintained at ≥ 0.5 adults/acre. PSD-42 should ≥ 15, the target level for Class B muskellunge waters.
- Little Sand Lake muskellunge stocking should be maintained at 1 large fingerling/acre in alternate years. This stocking rate is the upper end of DNR stocking guidance, but stocked fish have high survival rates in Little Sand Lake, which should continue to support a high-density adult population.
- 3. If DNR stocking is discontinued or decreased, then privately sourced stocking (with appropriate genetic strain) should be considered to maintain the current adult muskellunge fishery.
- 4. All muskellunge collected during future fisheries surveys will be implanted with PIT tags and an anal fin ray will be extracted for aging.
- 5. Efforts to protect and maintain natural shorelines and nearshore habitat is encouraged where applicable. Inputs of coarse woody habitat is also encouraged. The maintenance/restoration of vegetative buffers would be beneficial. This website <u>healthylakesWI.com</u> is a great resource to learn about this recommendation.

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Appendix

YEAR	AGE CLASS	NUMBER STOCKED
2001	Small Fingerling	500
2004	Large Fingerling	101
2006 Large Fingerling		56
2008	Large Fingerling	26
2012	Large Fingerling	101
2014 Large Fingerling		101
2016 Large Fingerling		64
2018	Large Fingerling	111
2022	Large Fingerling	100
2024	Large Fingerling	100

Appendix Table 1. Muskellunge stocking records for Little Sand Lake, 2001 – 2024.

Appendix Table 2. Muskellunge population estimates (fish \geq 30 inches/acre) used to estimate the regional (Westside Ceded Territory) mean index value during 2010 - 2023. Only the most recent DNR survey per lake was included.

YEAR	COUNTY	LAKE	DENSITY
2023	Bayfield	Pike Chain of Lakes	0.09

2023	Iron	Echo Lake	0.29
2023	Sawyer	Sand Lake	0.03
2022	Ashland	Mineral Lake	0.41
2022	Barron	Rice Lake	0.25
2022	Barron	Sand Lake	0.35
2022	Bayfield	Middle Eau Claire Lake	0.04
2022	Sawyer	Evergreen/Mason Lake	0.81
2022	Sawyer	Lost Land	0.09
2021	Barron	Big Moon Lake	0.52
2021	Chippewa	Long Lake	0.13
2021	Chippewa	Round Lake	0.48
2021	Iron	Long Lake	0.34
2021	Sawyer	Lac Courte Oreilles	0.04
2021	St. Croix	Cedar Lake	0.36
2019	Bayfield	Namekagon Lake	0.20
2019	Polk	Wapogasset & Bear Trap lakes	0.24
2019	Rusk	Potato Lake	0.28
2019	Sawyer	Connors Lake	0.21
2019	Sawyer	Land of the Pines Lake	0.53
2018	Rusk	Amacoy Lake	0.54
2018	Price	Butternut Lake	0.19
2018	Sawyer	Grindstone Lake	0.02
2017	Polk	Bone Lake	0.34
2017	Iron	Pine Lake	0.15
2017	Bayfield	Upper Eau Claire Lake	0.13
2016	Iron	Turtle Flambeau Flowage	0.07
2015	Polk	Deer Lake	0.31
2015	Chippewa	Lake Wissota	0.01
2014	Ashland	Day Lake	0.20
2013	Sawyer	Lower Clam Lake	0.61
2013	Sawyer	Teal Lake	0.20
2013	Iron	Trude Lake	0.11
2012	Iron	Moose Lake	0.36
2012	Washburn	Shell Lake	0.03
2012	Sawyer	Spider/Fawn lakes	0.25
2011	Ashland	English Lake	0.42
2010	Sawyer	Sissabagama	0.07
2010	Ashland	Spider/Moquah lakes	0.40