Fisheries Branch Report

MS 2026 - 02

Cedar Lake
2025 Fish Stock Assessment

Manitoba Natural Resources and Indigenous Futures
Published 2026

Manitoba

Summary

Data collected from index gill netting between 2009 and 2025 suggest an improvement in the status of the Walleye, but little change for Northern Pike in Cedar Lake. There has been variability in catch rates for both species because of year class strength.

Walleye abundance is above the amount required to produce maximum sustainable yield, and overfishing is not occurring. The 2026/27 quota for Walleye will be 232,000 kg. The Walleye quota is unlikely to be reached given the recent low winter commercial fisher effort in the fishery.

Northern Pike mortality rate is lower than the threshold that would trigger a quota reduction. The 2026/27 quota for Northern Pike will be 366,000 kg.

Lake Whitefish abundance is below the amount required to produce the maximum sustainable yield, but overfishing is not occurring. The 2026/27 quota for Lake Whitefish will be 29,000 kg.

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Introduction

Cedar Lake is located northwest of Lake Winnipeg and north of Lake Winnipegosis in the province of Manitoba (see Figure 1.1). Cedar Lake is approximately 200 km in length, 25 km in width, with depths up to 12 meters. Cedar Lake drains into Lake Winnipeg. Cedar Lake has several tributaries, which include the Saskatchewan River and Moose Lake via Moose Creek.

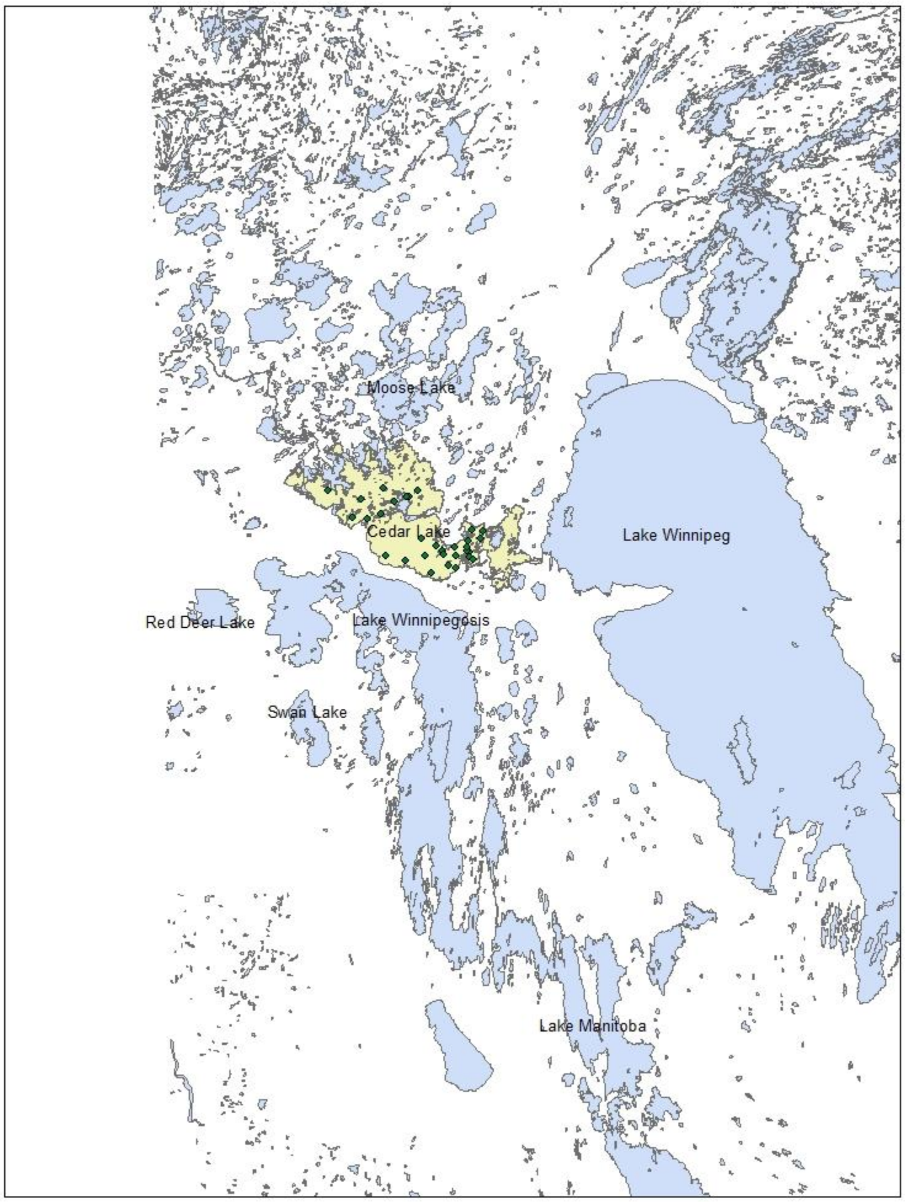


Figure 1.1. Map location of Cedar Lake.

The Cedar Lake fish community supports a commercial fishery, subsistence fisheries, and to a lesser degree recreational fishers who primarily fish the eastern most portion (Cross Bay east) that is off limits to commercial fishing (Figure 1.2). There are 16 fish species present throughout the lake. Walleye (*Sander vitreus*) and Northern Pike (*Esox lucius*) are the target species in the fishery and make up the majority of commercial production. White Sucker (*Catostomus commersoni*) and Lake Whitefish (*Coregonus clupeaformis*) are the main bycatch species (greater than 5% of the catch). The remaining species harvested have unlimited quota including Yellow Perch (*Perca flavescens*), Sauger (*Sander canadensis*), and Lake Cisco (*Coregonus artedii*) marketed as 'tullibee'.

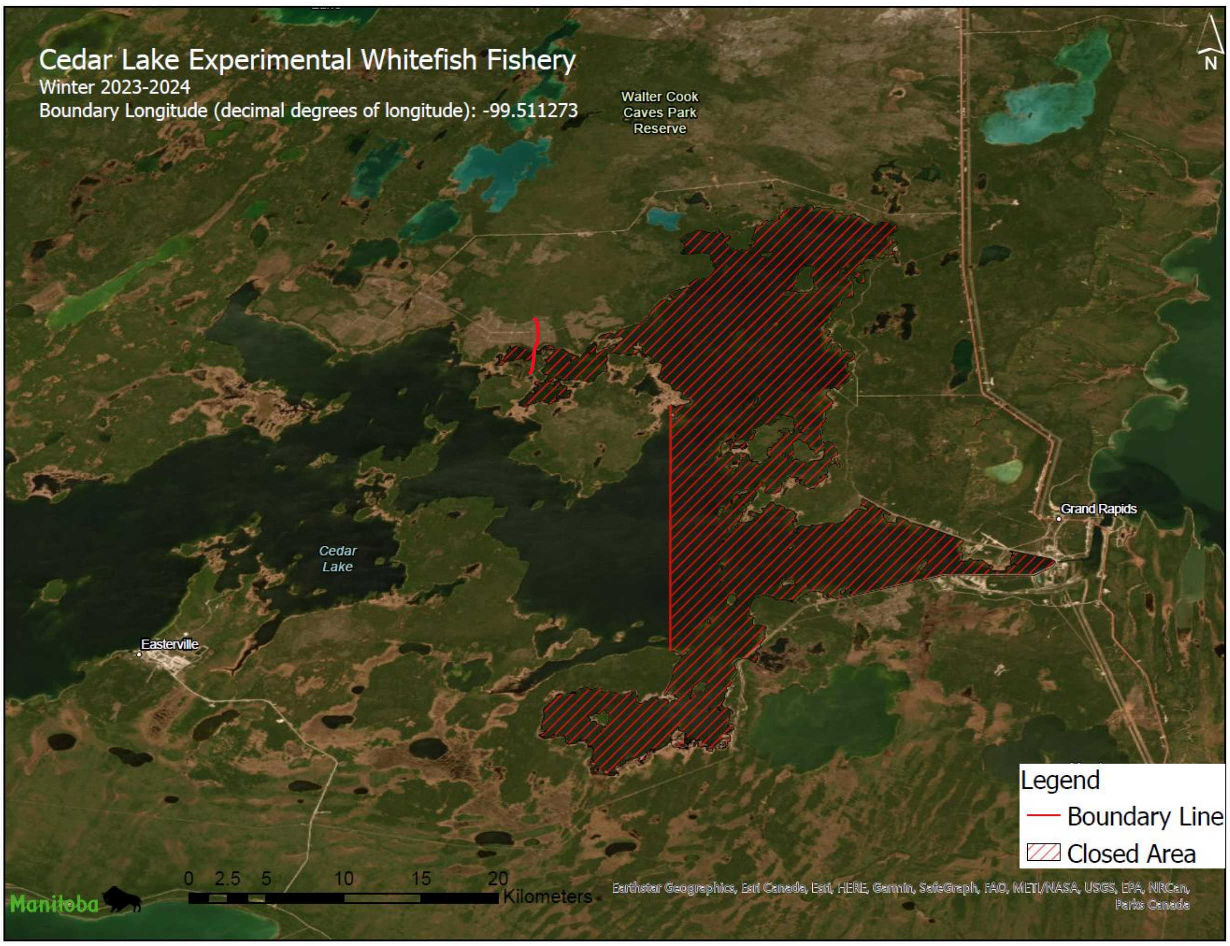


Figure 1.2. Map of Cedar Lake commercial fishing closed zone at the western boundary line is the typical start of the closed zone extending east through Crossing Bay to Grand Rapids dam. In the 2023/24 winter season the closed area was reduced to just the cross hatched area to allow more targeted Lake Whitefish fishing for fish sampling purposes.

History of the Fishery

In 1964 the Grand Rapids hydro-electric dam was built on the lower Saskatchewan River, preventing upstream fish passage from Lake Winnipeg. Cedar Lake doubled in size as the water rose. The lake elevation is drawn down an average 1.8 metres during winter for hydroelectric power generation. Fisheries evolved in a predictable manner. The surge of nutrients from flooding led to an increase in fish production, and flooding of vegetation caused the inorganic mercury to convert to methylmercury and lead to fish mercury contamination. Fish yields peaked 15 to 20 years after impoundment and then collapsed due to exhaustion of nutrients and overfishing. The commercial fishery was closed from 1998 to 2002 for restructuring and rebuilding. The fishery today operates at a sustainable level providing economic benefits to Easterville and Chemawawin Cree Nation and food for those communities as well as for Grand Rapids and Misipawistik Cree Nation. Visiting anglers enjoy the services of cabins and campgrounds that have developed around the reservoir forebay, Cross Bay.

Stock Monitoring

The Cedar Lake fishery monitoring program has been carried out annually since 2008, with standardized sampling conducted under the Coordinated Aquatic Monitoring Program (CAMP). CAMP is part of a broadscale monitoring program administered by Manitoba Hydro and Manitoba Fisheries Branch. The Collaborative Stock Monitoring Program (CSMP) started in 2020 and added to assessment coverage of the lake by including sites on the east side of Cedar Lake and in Cross Bay. The monitoring program is comprised of two components:

- Index gill netting provides independent estimates of fish abundance, fish species diversity and descriptions of Walleye growth maturity and mortality regimes.
- Commercial catch sampling and production analysis provides a description of ages and body size classes of commercially caught Walleye.

Variable amounts of index netting have been added from the CSMP.

Harvest Control Rules

For Walleye, a base quota (set in 2017) of 211,000 kg subject to the following.

- If total annual mortality is less than 40%, and quota is reached, quota increases by 10%
- If relative weight is less than 80, quota is increased by 10%/year until Wr > 80
- If total annual mortality is greater than 40%, quota is reduced 10%/year until A < 40%

For the first time since the rules were adopted in 2017 the catch exceeded 211,000 kg in the 2019/20 fishing year and mortality was below the threshold. This increased walleye quota to 232,100 kg, where it has been for the past five fishing years. Mortality has remained below the maximum threshold, relative weight above the minimum threshold, and catch has remained within the approved quota limits.

For Northern Pike, a base quota (set in 2017) of 366,000 kg subject to the following.

- If total annual mortality is less than 64%, and quota is reached, quota increases by 10%.
- If total annual mortality is greater than 64%, quota is reduced by 10%/year until A < 64%.

The quota has not been reached since inception and mortality thresholds not exceeded, so quota remains at 366,000 kg.

For Lake Whitefish, a base quota (adjustment in 2025) of 29,000 kg subject to the following.

- If $F < F_{MSY}$ and quota is caught, quota is increased by 10%.
- If $F > F_{MSY}$, quota is reduced by 10%/yr until $F < F_{MSY}$.

Due to the original HCR set in 2017 causing the quota to fall below the modelled MSY for two years in a row, and theoretical potential based on new modelling runs (see Appendix 2, 2024 Cedar Lake Stock Assessment) for the stock to collapse given the 2017 HCR quota increase function, the 2017 HCR will be cancelled. The Klein (2025) Management Strategy Evaluation of the Cedar Lake Whitefish Harvest Control Rule recommended a quota base for 2025 at 29,000 kg and new HCRs as presented above.

This stock assessment uses index netting from 2009 to 2025 and commercial delivery data from 2003 to the 2025/26 fishing season to inform harvest control rules that prescribe commercial quotas for Walleye, Northern Pike, and Lake Whitefish for the 2026/27 commercial fishing season.

Methodology

Annual Index Gill Netting

Fisheries Branch conducts annual index-gillnet surveys to assess the status of fish stock in Cedar Lake. Twelve nets are set at standard locations in the central part of the lake every year (Figure 2.1). Large mesh gillnets are comprised of 51, 76, 96, 108, and 127 mm (2, 3, 3.75, 4.25, and 5”) in 25-yard panels and small mesh gillnets are comprised of 16, 20, and 25 mm in 10-meter panels. In every third or fourth year, an additional dozen nets are set in the west end of Cedar Lake (CAMP 2017). A second index netting program, the CSMP, is a collaboration between local First

Nations, Indigenous Services Canada, and Manitoba Fisheries Branch. The CSMP has bolstered annual index effort since 2020, with areas in the eastern portions of the lake getting coverage.

Supplementary data were gleaned from a bycatch netting program using nets similar to commercial sets in material, mesh size, and fishing style. Where indices of abundance are calculated, areas are weighted as though effort was equal in all areas. Actual soak time of net sets varies, but nets are always in the water for at least a dusk period and the following dawn. Effort among the sampling areas varies from year to year with the number of net sets ranging from 8 to 29.

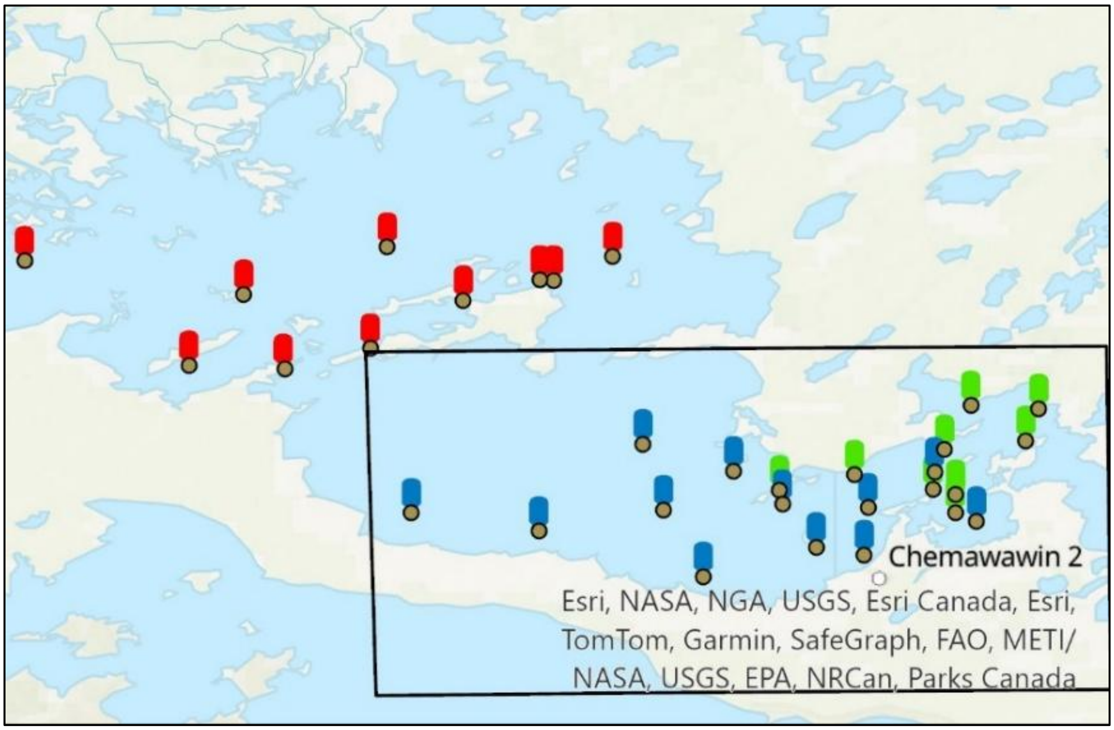


Figure 2.1. Index netting sites in mid portion of lake marked blue monitored every year. Sites marked in red in the western portion of Cedar Lake are monitored every 3 to 4 years as part of the Cedar Lake CAMP. Green marked sites in the eastern portion of lake are from the CSMP monitored annually.

The CAMP index netting program in 2025 took place over five nights spread over nine days in the mid-portion of the lake with the first sets on August 6th, and the last lifts occurring on August 14, 2025. The index netting team consisted of three Manitoba government staff and four individuals from Chemawawin First Nation. Surface water temperature was between 18 and 20.5 degrees Celsius (^{o}C). The Collaborative Stock Monitoring Program (CSMP) assessing the eastern portion of the lake took place overnight of October 14th, 2025. Surface water temperature was 5^{o}C in the eastern lake portion. The CSMP program only completed three of the usual nine sets due to extenuating circumstances and no time remaining to complete the work.

The index-netting program provides population data to inform the surplus production modeling and biological performance metrics. Each fish is measured by fork length to the nearest 2 mm on a measuring board. The weight is also measured to the nearest 10 grams. When the age of the fish species is to be determined, an aging structure (i.e. otoliths, cleithrum, operculum) is collected. The sex and state of maturity (immature or mature) are determined.

Relative weights

Relative weight is a measure of weight at length compared to a standard weight. The standard weight equations used in this assessment are:

Walleye	Wr = 3.180(log10(Length)) - 5.453	(Murphy et al 1990)
Northern Pike	Wr = 3.059(log10(Length)) - 5.369	(Willis 1989)

Relative weights of individual fish between 50 and 150 were retained to calculate summary values, reasoning that values outside that range were unlikely and represented errors in observation or deformed/non-typical fish.

The following length-based size classes were used to compare condition (Gabelhouse 1984):

Class	Walleye	Pike
Stock	250-380 mm	350-530 mm
Quality	380-510 mm	530-710 mm
Preferred	510-630 mm	710-860 mm
Memorable	630-760 mm	860-1020 mm

Growth

Growth rates were modeled using the von Bertalanffy growth function:

$$L_t = L^{\infty} - (L^{\infty} - L^{0})e^{-kt}$$

Where L_t is the length at time t. L^{∞} is the estimated length asymptote if fish were to achieve infinite age. Priors for L^{∞} were set at 550 mm for female Walleye and 500 mm for male Walleye. The prior for the standard error of L^{∞} was set at 10 mm. L^{0} is the length at age zero which was set at 80 mm for both female and male, and standard error for L^{0} was set at 5 mm. k is the Brody growth coefficient, which had no prior. Growth rates were modeled using the *BayesGrowth* package in R (Smart 2023).

Data for modeling Walleye growth rates were restricted to those collected in 2009 to 2025. Growth was modeled over four chains. Each chain used 5000 draws from the posterior using Hamiltonian Monte Carlo (HMC) and the no U-turn sampling algorithm (NUTS). The first 2500 draws from each chain were tossed as warm-up leaving a total of 10,000 draws. No thinning was imposed on the posterior draws.

Abundance

Abundance was measured in two different ways: the relative abundance for use as an index of abundance in biomass dynamics modeling; and the abundance by age for use in mortality estimates and per recruit modeling. Relative abundances for biomass dynamics modeling were measured as either a) the number of individual fish or the total weight of all fish in the index netting program above a given mesh size, or b) the commercial catch per daily catch record. Commercial Production Size Class Abundance was also investigated for trends in catch size demographics over the past two decades.

Spawning Female Age Diversity

The reference limits for Shannon Diversity (H) of mature female ages come from Gangl and Pereira’s (2003) study of Minnesota’s ten large lakes (Figure 2.2). Shannon’s Diversity Index is being used as the measure of spawning female age diversity; calculated as:

$$H = (n\log n - \sum(k_i \log k_i))/n$$

Where ‘n’ is the total number of mature females in index nets, and ‘k’ is the number of mature females of age ‘i’.

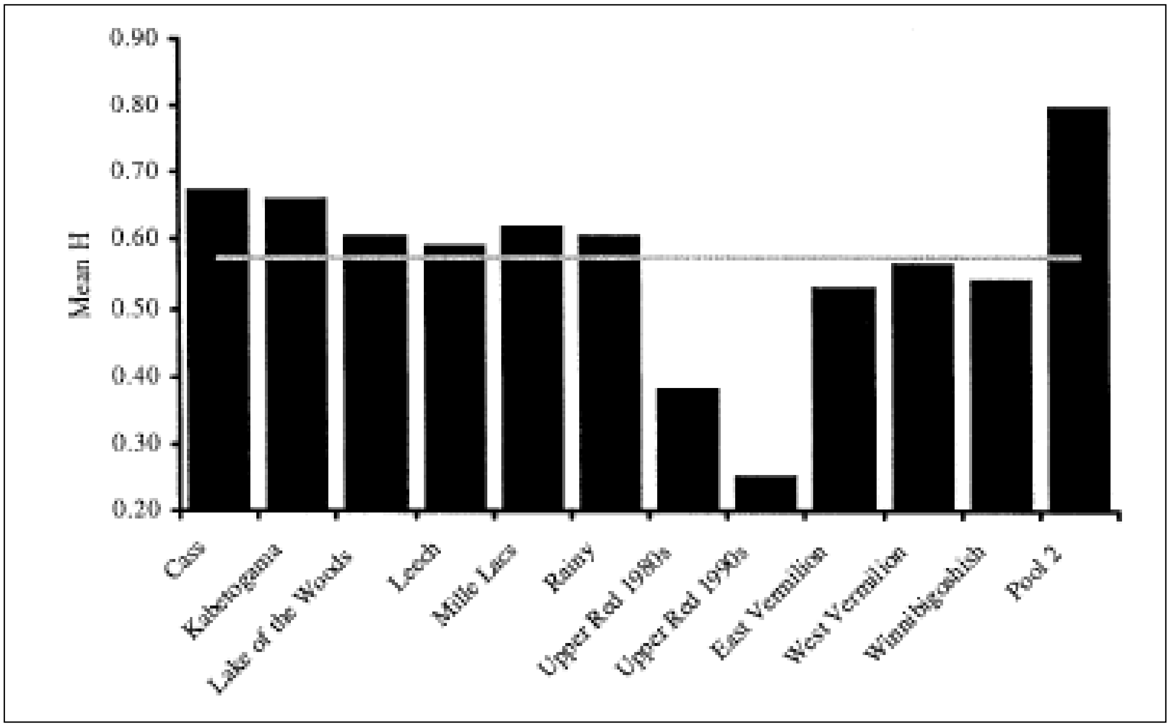


Figure 2.2. Shannon Diversity Index values for Minnesota's ten large lakes with Upper Red Lake shown pre and post Walleye stock collapse and Pool 2 of the Mississippi representing an unharvested Walleye stock. The line at H = 0.58 represents the lower boundary of the 80% confidence interval around the mean of 0.60 for the ten large lakes (Gangl and Pereira 2003).

Spawner Potential Ratio (SPR) – Walleye and Northern Pike

SPR takes several biological metrics into account when calculating the status of the species in relation to sustainable fishing levels (i.e. F40) and levels of impairment (i.e. F20). The SPR was calculated using modeled weights at age of female Walleye and pike, the maturity schedules estimated from the fitted curves of percent maturity, the mean natural mortality estimates, and the Robson-Chapman estimates of survival. The survival estimates were adjusted to values between the natural mortality estimate and the Robson-Chapman estimate of mortality according to the selectivity of the 108 mm stretch measure minimum allowable mesh size in use in the fishery. Beyond the modal value of each mesh's catch, selectivity was assumed to be one. The following metrics outline the methods of calculation and assumptions made.

Survival

Total annual survival for Walleye was calculated using the Chapman-Robson (Chapman and Robson 1960) estimator:

$$\hat{S} = \frac{T}{n+T-1}$$

Where $\hat{S}$ is the annual survival rate, n is the total number of fish caught, and T is the sum of the products of the catch at age, where age has been rescaled so that the start of the descending limb of the catch curve is zero, and ages greater than the start of the descending limb are the difference between the actual age and the new starting age.

Maturity

Maturity ogives were modeled with logistic regression for both 50% maturity at age and 50% maturity at length using the *Aquatic Life History* package in R. Regressions are based on 2009 to 2025 index netting data.

Natural mortality

Natural mortality rates were estimated using the natural mortality tool (Hamel and Cope 2022). The estimator based on the *Fish Life* database was set to only a 25% weighting because it was consistently optimistic about the natural mortality rate. This overestimation was likely due to the northern location of Cedar Lake relative to most stocks that would have informed *Fish Life*.

Selectivity

Selectivity's were determined for the 108 and 127 mm meshes. First, the average weight of each age group of female fish was calculated. The number of individuals equal to or smaller than the average weight for each year class was tallied, and those numbers were divided by the number of fish smaller than the modal weight for that mesh size. The samples that were used to estimate selectivity were fish from all programs between 2009 and 2025 where a mesh size and a weight were available.

Total Mortality** - **Walleye Assessment

The catch rate of Walleye in the index program appears to have varied slightly during the first decade of the CAMP program (2009 to 2020); more than could be explained by changes in fishing effort due to severe winters or number of active fishers. Also, individual large year-classes distort the catch curve. Attempting to calculate mortality rates was not possible in years with low catch rates and among years, mortality rates were variable. As a result, sex-based differences in mortality rates were abandoned some years and mortality rates were estimated only for both sexes together. The regression method of estimating mortality could not be used due to the distortion of the catch curve by large year-classes, especially as they approached age of recruitment to the fishery (~5 years of age). As most of the available fish in the fishery were from the strong recruitment year-classes, the decision was made to estimate mortality as the mortality exerted on the individual large year-classes and potentially use annual estimates when the distortion of descending age-class catch curve is absent.

Total Mortality - ***Northern Pike Assessment***

The catch rate of pike in the index program appears to have varied by a large amount during CAMP program (2009 to 2025), with most pike being caught during years where the western basin was also covered. Attempting to calculate mortality rates by sex was not possible in most years with low catch rates, and among year catch rates were highly variable, and without trend. As a result, attempts to calculate sex-based differences in mortality rates were abandoned and mortality rates were estimated only for both sexes together. Even then, estimates are poor given the lower abundance of pike captured in the index program compared to what commercial fishers are catching, primarily during the winter season.

Total Mortality - ***White Sucker Assessment***

Three sucker species appear commonly in the large-mesh gillnet fishery on Cedar Lake: White Sucker, Longnose Sucker (*Catostomus Catostomus*), and Shorthead Redhorse (*Moxostoma macrolepidotum*). For marketing purposes, the three species are sold together as ‘mullet’. This inconvenience in commercial catch data recording is easily overcome by applying catch ratios from the index netting program for meshes that are at least as large as the legal minimum mesh size allowed in the commercial fishery; 108- and 127-mm. Aging structures were collected from most suckers from 2021 to 2023 and in 2025 index netting efforts, but only 6 had aging structures collected in 2024. Female White Sucker data were regressed from age 5 to 16, when fully recruited to commercial fishing gear, to estimate mortality.

Schaefer surplus production modeling (Whitefish)

The fundamental estimands of the surplus production model are *the* intrinsic growth rate, the carrying capacity, and the catchability:

$$B_t = B_{t-1} + rB_{t-1}\left(1 - \frac{B_{t-1}}{K}\right) - C_{t-1}$$

$$\frac{C}{E} = qB_t$$

Where B_{t-1} is the biomass in the year preceding year *t*, *r* is the intrinsic growth rate of the stock, *K* is the carrying capacity of the habitat, C_{t-1} is the catch in the year preceding the year *t*, and *q* is catchability. Surplus production modeling was completed using the Bayesian Schaefer Model in CMSY++ (Froese et al. 2021; Froese et al. 2023).

Total catch, C_t, is the total amount of round-weight, by species, caught during the fishing year. The fishing year begins May 1 and ends the following April 30. Catch per unit effort, C/E, is based on fisher declarations of their daily catch. Daily catch of each fisher who makes a delivery is provided to Fisheries Branch as a daily catch record (DCR). DCRs are submitted by the first buyer of the fish. The fisher and the date of the delivery are identified along with the catch delivered at that time. The catch is broken out by species, form, and for some species, size grade. Culled fish and discards are not included in the daily catch record. The unit of effort is the delivery. It is not known how many nets were fished, or how long they soaked to produce the fish appearing on the daily catch record. The weights appearing on the daily catch record are converted to their round-weight equivalents and then summed for all sizes and forms of fish to generate the total weight for that delivery.

The modelling requires some index of abundance to approximate how much effort it takes to harvest the total catch. For species that had rare occurrence in the index program (Lake Whitefish), the geometric mean weight of DCR for each year or season was used as the index of abundance for modelling. Lake Whitefish is a relatively high value species, so we assumed there were no discards, and that all, or most of the whitefish caught were delivered. Most daily catch records contained no whitefish. We ignored catch records <2 kg to calculate the geometric mean. We assumed a one percent effort creep in the model, meaning that we assumed fishers become slightly better at their vocation each year due to technological advances in equipment and knowledge gained in the industry. One percent is at the low end of the typical range of effort creep in fisheries (Palomares and Pauly 2019). For index netting based abundance modelling there was no effort creep assumed. Priors were used to inform the model based on information about the fishery or from other length-frequency based analyses.

Commercial Production Analysis and Catch Sampling

Commercial production analysis and commercial catch sampling has been conducted on Cedar Lake to better understand the stock structure of fish communities when assessment data is limited. Production information is gleaned from commercial catch DCRs as recorded at packing sheds by various fish buyers. Supplementary commercial catch data were gleaned from a bycatch netting program using nets similar to commercial sets in material, mesh size, and fishing style. Bycatch netting is carried out during the same period as the CAMP index program to assess age representation of the target fish being captured in commercial sized gill nets at areas typically used by commercial fishers. This program was initiated in 2023 to measure selectivity and estimate bycatch in the commercial fishery. Fish caught were also used in estimating growth rates and maturity schedules where appropriate.

For commercial sampling of fisher catch at packing sheds, each fish is measured by fork length to the nearest 2 mm on a measuring board. The weight is also measured to the nearest 20 or 25 grams. When the age of the fish is to be determined, an aging structure (i.e. dorsal spine, fin ray, scales) is collected. This information is used to supplement index data when target species catch numbers are not sufficient for analysis certainty estimates.

Results

Index Gillnetting

Catch composition from index gill net surveys for 2009 to 2025 is illustrated in Table 1. White Sucker was the dominant species in the catch in most years, with Walleye coming in a close second in most years and surpassing in eight since 2009. Cisco were also caught in large numbers when their population peaked in 2010 and 2024. Walleye is the least variable species in relative abundance among years and is quite evenly distributed amongst the netting sites around the lake. Northern Pike relative abundance has been variable, and commercial production has been declining over the past decade, but presence and catch per index netting net night (CUE) appear to be relatively evenly distributed amongst the netting sites. Cisco were the most variable, mainly due to the relatively large amount caught in the index program this year compared to the light catches from 2014 to 2018.

Table 1. Total catch by species from the index netting programs represented using 12 overnight net sets at the same locations every year (additional net sets some years as indicated and back calculated to 12 net average). Index nets are a Manitoba Standard Net Gang consisting of five panels from 51 millimeter (mm) (2") to 127 mm (5") stretch measure mesh.

Year	Walleye	White Sucker	Northern Pike	Yellow Perch	Sauger	Cisco	Long-nose sucker	Shorthead Redhorse	Burbot	Lake Whitefish	Goldeye	Net Sets
2009	226	186	27	100	74	29	14	7	0	1	0	15
2010	129	182	27	67	109	339	20	1	1	0	0	14
2011	174	142	36	65	190	215	12	3	1	1	1	24
2012	117	125	46	66	76	312	26	0	0	9	0	12
2013	144	100	24	58	87	146	4	0	0	1	0	12
2014	161	176	66	21	70	88	11	7	3	1	3	24
2015	157	199	58	119	50	78	24	0	1	0	0	12
2016	166	132	36	38	21	64	6	3	1	0	0	12
2017	85	163	28	53	23	12	6	3	2	0	0	12
2018	179	194	68	12	70	28	3	12	4	0	1	24
2019	63	51	29	32	34	140	5	1	0	0	0	12
2020	118	110	96	7	59	98	2	2	6	7	4	34
2021	178	144	71	32	8	206	5	5	1	6	0	20
2022	121	77	86	29	16	158	5	3	1	7	0	20
2023	196	227	53	68	108	100	2	11	0	2	16	31
2024	209	287	98	118	10	335	9	2	1	10	0	21
2025	170	182	53	68	28	142	8	11	1	2	0	15
Average	152.5	157.4	53.0	56.1	60.6	146.3	9.4	4.1	1.3	2.7	1.4	
s.d	41.6	55.6	23.9	32.7	45.2	101.1	7.2	3.9	1.6	3.4	3.9	
C.V.	0.27	0.35	0.45	0.58	0.75	0.69	0.77	0.94	1.20	1.27	2.67	

Walleye

Relative weight

Walleye size classes were analyzed using relative weights to see if any trends could be detected in condition of individual Walleye given changes in community composition, abundance, and fishing pressure. As seen in Figure 3.1, Walleye relative weight has remained in good condition (> 85). Stock, Quality, and Preferred fish have averaged relative weights of 92.5, 95.2, and 85.8. Relative weights have returned to around the global average.

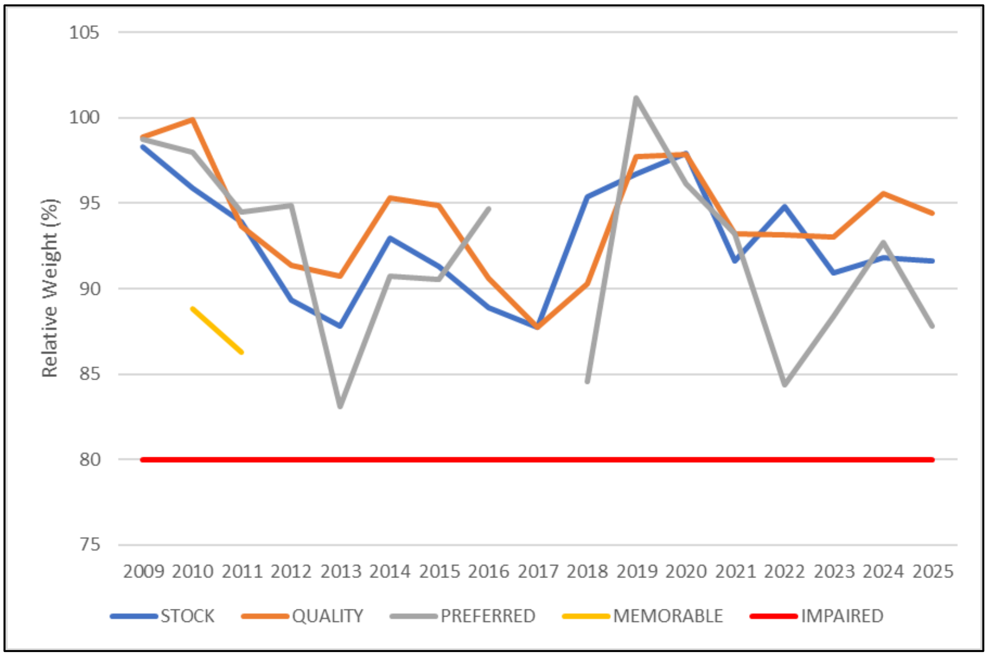


Figure 3.1. Walleye size class average relative weights in Cedar Lake 2009 to 2025. Total length size classes are Stock (250-380 mm), Quality (380-510 mm), and Preferred (510-640 mm).

Growth (2024)

Cedar Lake Walleye grow relatively slowly compared to other more southern commercial fisheries in the province. The von Bertalanffy growth function was used to model growth in Walleye and White Sucker. Modeling was done using the BayesGrowth package in R (Smart 2023). Female Walleye achieve an asymptotic length of 591 mm and males noticeably smaller at 515 mm (Figure 3.2). Females have a smaller Brody growth coefficient than males; 0.15 yr-1 compared to 0.19 yr-1 (Tables 2 and 3). The differences in growth coefficients between the sexes is due more to the correlation with length at infinite age, L^∞, than actual early life growth differences (Figures 3.2). Growth between the sexes is very similar until age six when males reach sexual maturity and begin to curb their somatic growth.

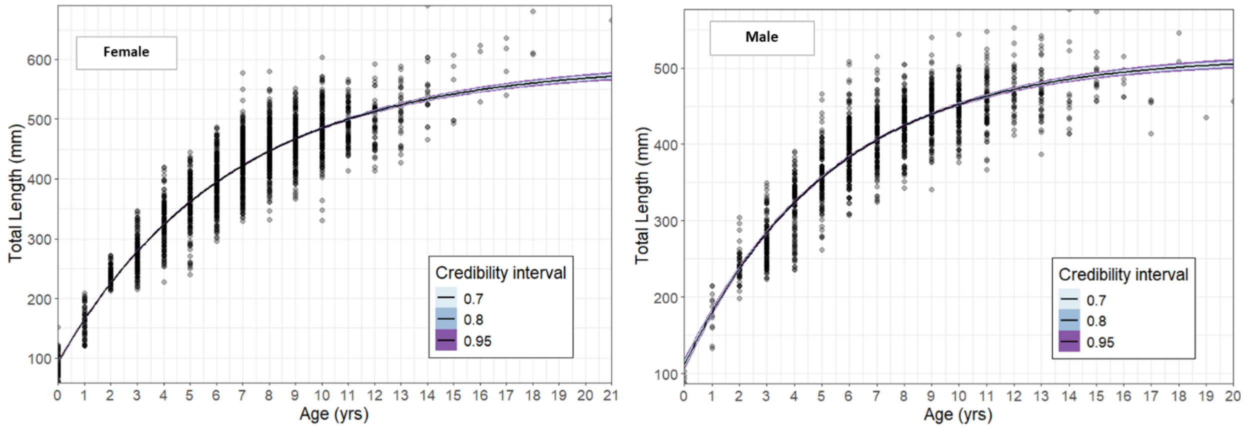


Figure 3.2. Von Bertalanffy growth models of female (left) and male (right) Walleye from Cedar Lake index netting data between 2009 and 2025.

Table 2. Von Bertalanffy growth model parameter estimates for Cedar Lake female Walleye using all females from the index netting program between 2009 and 2025. Prior estimates were L^{∞} = 630 mm (s.e. = 10 mm), and L^{0} = 120 mm (s.e. = 5 mm).

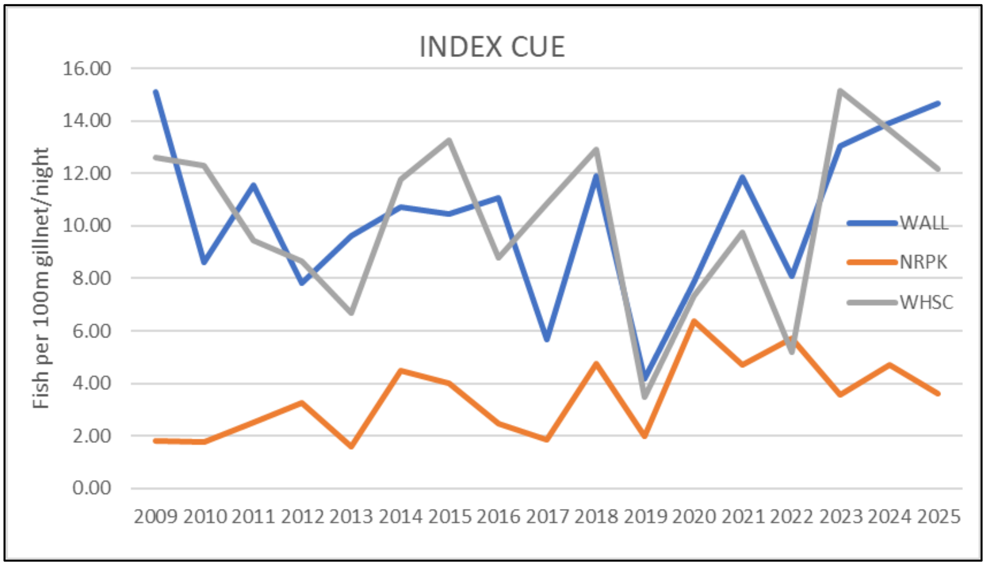
	Mean	s.e.	s.d.	2.5%	25%	50%	75%	97.5%	n. eff.	R-hat
L^{∞}	590.94	0.08	4.94	581.50	587.54	590.90	594.24	600.73	4076	1.0
k	0.15	<0.01	<0.01	0.15	0.15	0.15	0.16	0.16	3968	1.0
L^{0}	93.65	0.02	1.76	90.22	92.47	93.63	94.84	97.14	5768	1.0
σ	35.80	0.01	0.51	34.82	35.45	35.80	36.14	36.81	6398	1.0

Table 3. Von Bertalanffy growth model parameter estimates for Cedar male Walleye using all males from the index netting program between 2009 and 2025. Prior estimates were L^{∞} = 600 mm (s.e. = 10 mm), and L^{0} = 120 mm (s.e. = 5 mm).

	Mean	s.e.	s.d.	2.5%	25%	50%	75%	97.5%	n. eff.	R-hat
L^{∞}	514.52	0.07	4.17	506.70	511.63	514.38	517.42	522.82	3664	1.0
k	0.19	<0.01	0.01	0.18	0.18	0.19	0.19	0.20	3314	1.0
L^{0}	111.61	0.06	4.06	103.80	108.88	111.60	114.34	119.73	4151	1.0
σ	33.72	0.01	0.63	32.51	33.28	33.71	34.15	35.00	5453	1.0

Abundance

The Walleye catch in the 2025 index program was 275 individuals (small and large mesh), resulting in the highest CUE of Walleye since the initial year of the current index program (Figure 3.3). Abundance of young-of-the-year (YOY) Walleye in the small mesh tie-ons is back down below its long-term average of 22.3 fish per net for 2009 to 2025.



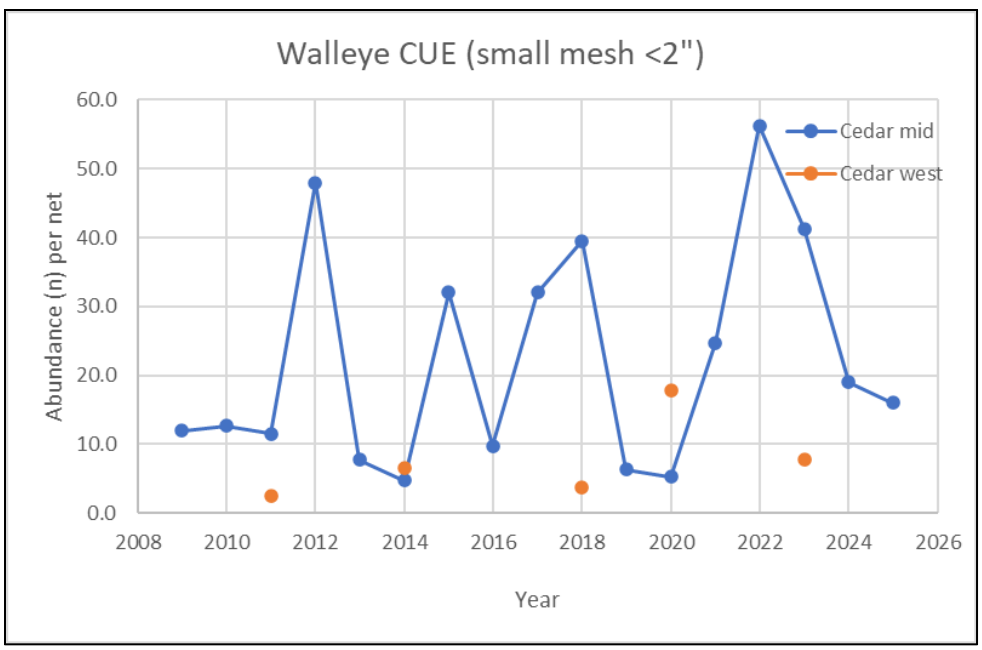


Figure 3.3: Catch-per-unit effort of Walleye, Northern Pike, and White Sucker from index netting (small and large mesh gangs) 2009 to 2025 (top) and Walleye CUE from small mesh 2009 to 2025 (bottom).

Walleye abundance in terms of catch per unit effort (CUE) – the average number of Walleye caught per index net night – increased in 2025 over 2024. The posterior modal estimate was 15.33 Walleye per net night (mean = 15.35, s.d. = 0.677, shape = 514.5, rate =33.5) based on a 2025 index net catch of 212 Walleye captured in 12 nets, and a gamma prior based on the 2024 hyperparameters (shape = 302.5, rate = 21.5) (Figure 3.4) (See Figure A1 for the distribution of the estimate and the chain comparison).

$$Y \sim \text{Poisson}(\lambda)$$

$$\lambda \sim \text{Gamma}(302.5, 21.5)$$

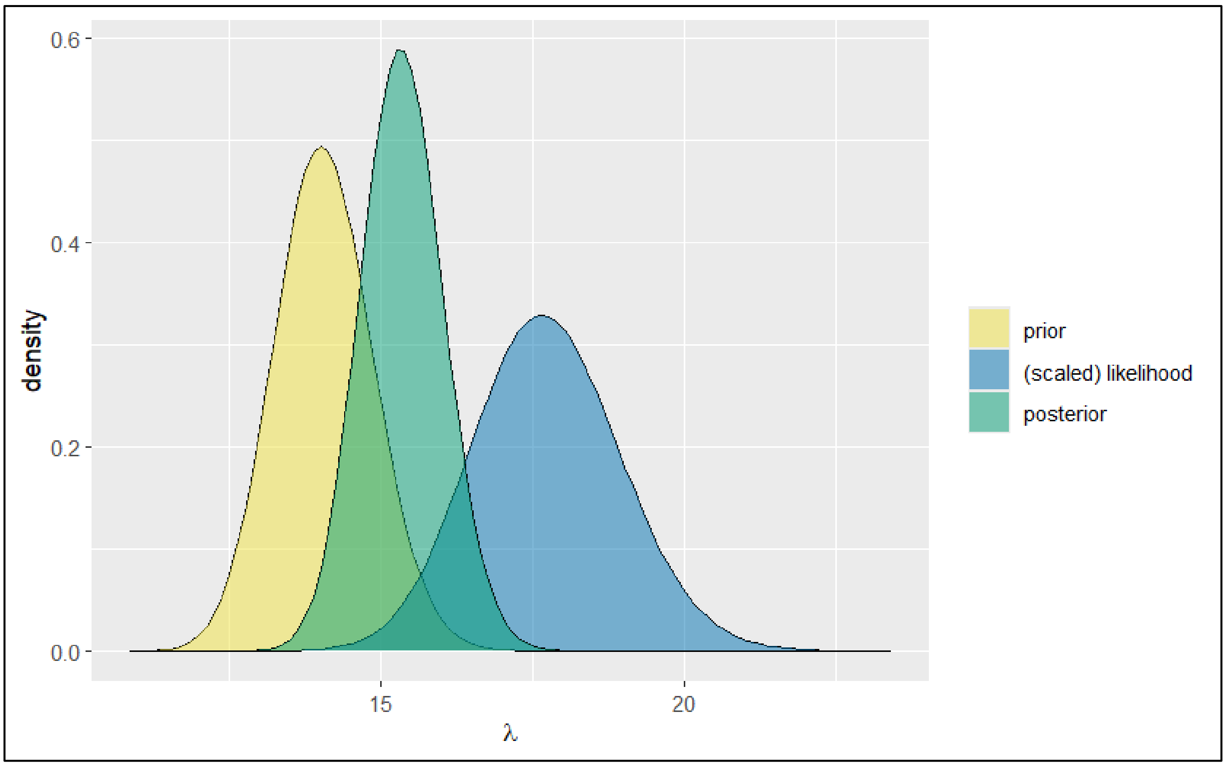


Figure 3.4. Abundance of Walleye in the Cedar Lake index netting program. The posterior estimate of the Walleye catch per net night (shaded green, modal value of 15.33), relative to the gamma prior in yellow (the 2024 modal value of 14 Walleye per net night), and this year's catch in blue of 212 Walleye over 12 nets.

Walleye age class strength over the years has been variable with occasional strong year classes in portions of the lake (Figure 3.5). The 2020 year-class of Walleye (age 5) was the most abundant in the 2025 index survey, with 59 of the 213 Walleye caught (27.7 %) (Figure 3.6). The 2018 year-class (age 7) was the second most abundant. The small mesh index survey caught 64 Walleye, with most estimated to be 1-year-olds (n=43). The fish in the 12+ years age bracket has increased over the past decade and represents a strong spawning stock.

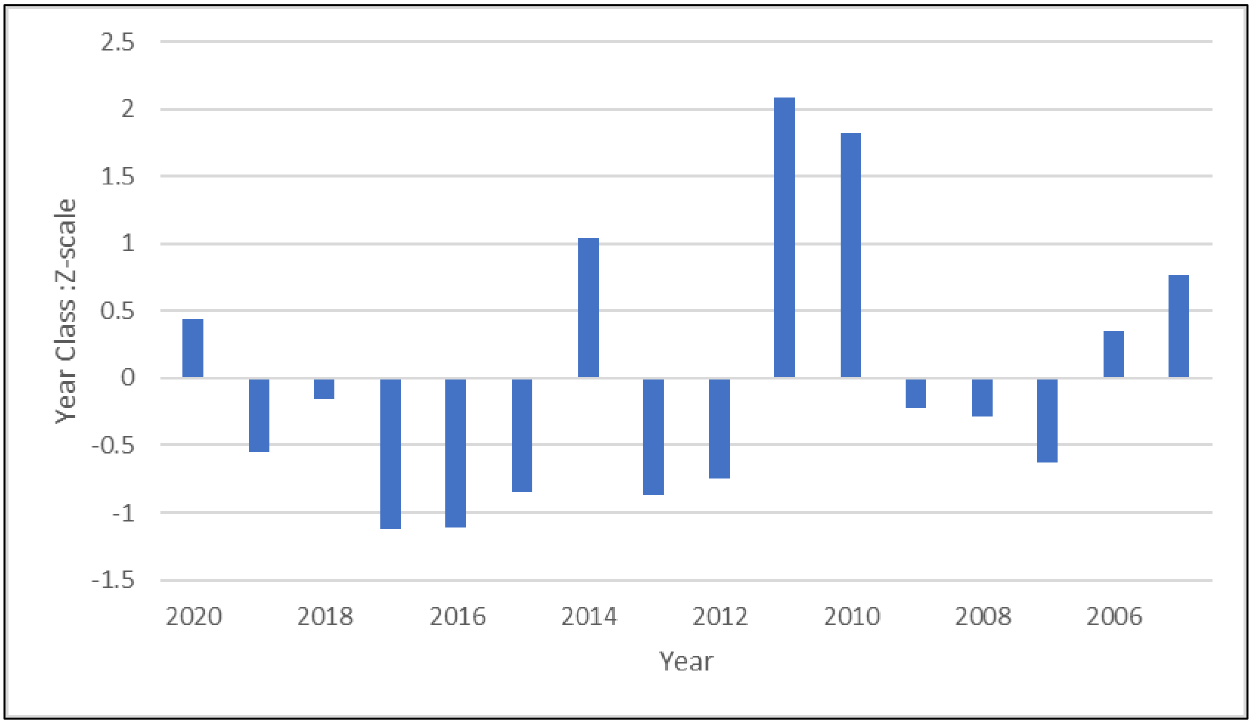


Figure 3.5. Recruitment index of Cedar Lake Walleye. Height of the bars represents the average value for index net counts of Walleye by age class of 2 – 7-year-old Walleye compared to the averages for each age. A value of 0 represents an average year class. Values below -0.5 are weak year classes and values above 0.5 are strong year classes.

Figure 3.6. Age composition of Walleye from 2019 to 2025 Cedar Lake index gillnet surveys (Large mesh only). Large mesh gillnets are comprised of 51, 76, 96, 108, and 127 mm (2, 3, 3.75, 4.25, and 5”) panels.

Spawning Female Age Diversity

Spawning female Walleye of different ages confer different fitness to their eggs due to differences in egg size and quality (Johnston et al. 1995). As seen in Figure 3.7, there have been occasional years when index netting effort or total catch has been insufficient to find enough older mature females, resulting in an isolated year stressed/unstable 'H' score. The majority of the 2009 to 2025 time series has scores in the healthy/stable category.

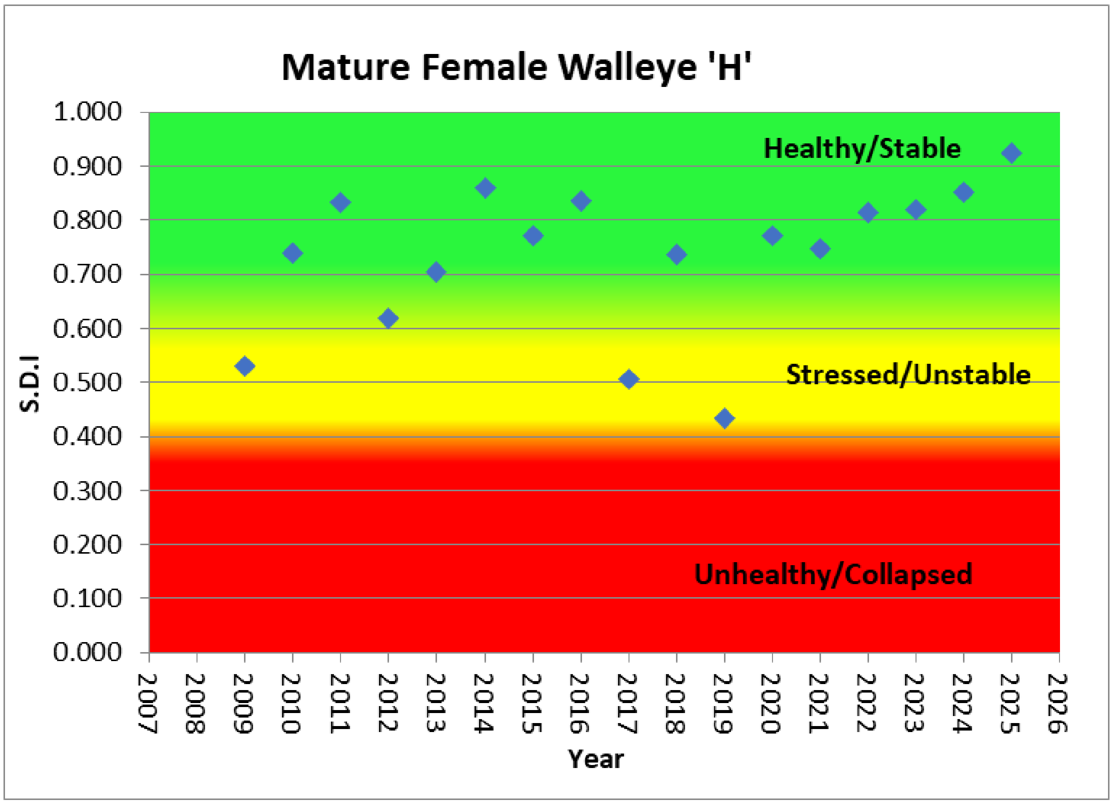


Figure 3.7. Spawning stock diversity index of mature female Walleye in Cedar Lake 2009 to 2025.

Maturity

Age and length maturity ogives of Walleye were estimated using the AquaticLifeHistory package in R (Smart et al 2016, Smart 2026). Half of female Walleye mature for the first time at 7.98 years of age (s.e. = 0.31 years). At 10.62 years of age (s.e. = 0.67 years), 95% of female Walleye have reached maturity; many having already spawned two to three times. The length at first maturity (50%) is 450 mm (s.e. = 6.1 mm). While 95% of fish longer than 508 mm (s.e. = 12.5 mm) are sexually mature (Figure 3.8). Male Walleye reach the same maturity levels at younger ages and shorter lengths. Among male Walleye, the age at first maturity (50%) is 7.3 years old (s.e.: 0.46

years), and 95% of males are mature by age 10.73 (s.e. = 1.04 years). Males reach 50% maturity at a length of 409 mm (s.e. = 7.3 mm), and 95% maturity at a length of 469 mm (s.e. = 16.7 mm) (Figure 3.9).

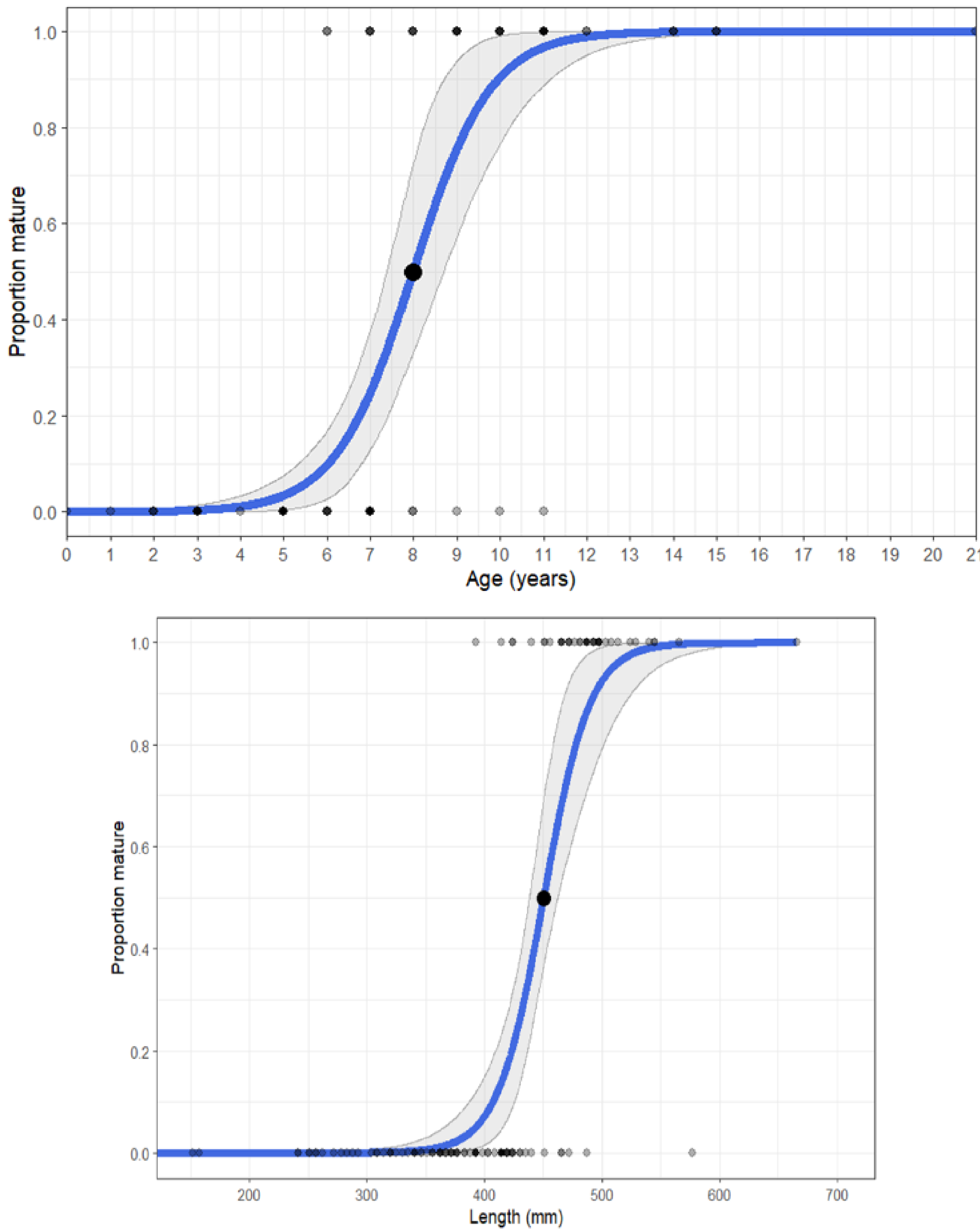


Figure 3.8. Maturity schedules of female Cedar Lake Walleye using 2025 index netting age (left) and total length (right) data.

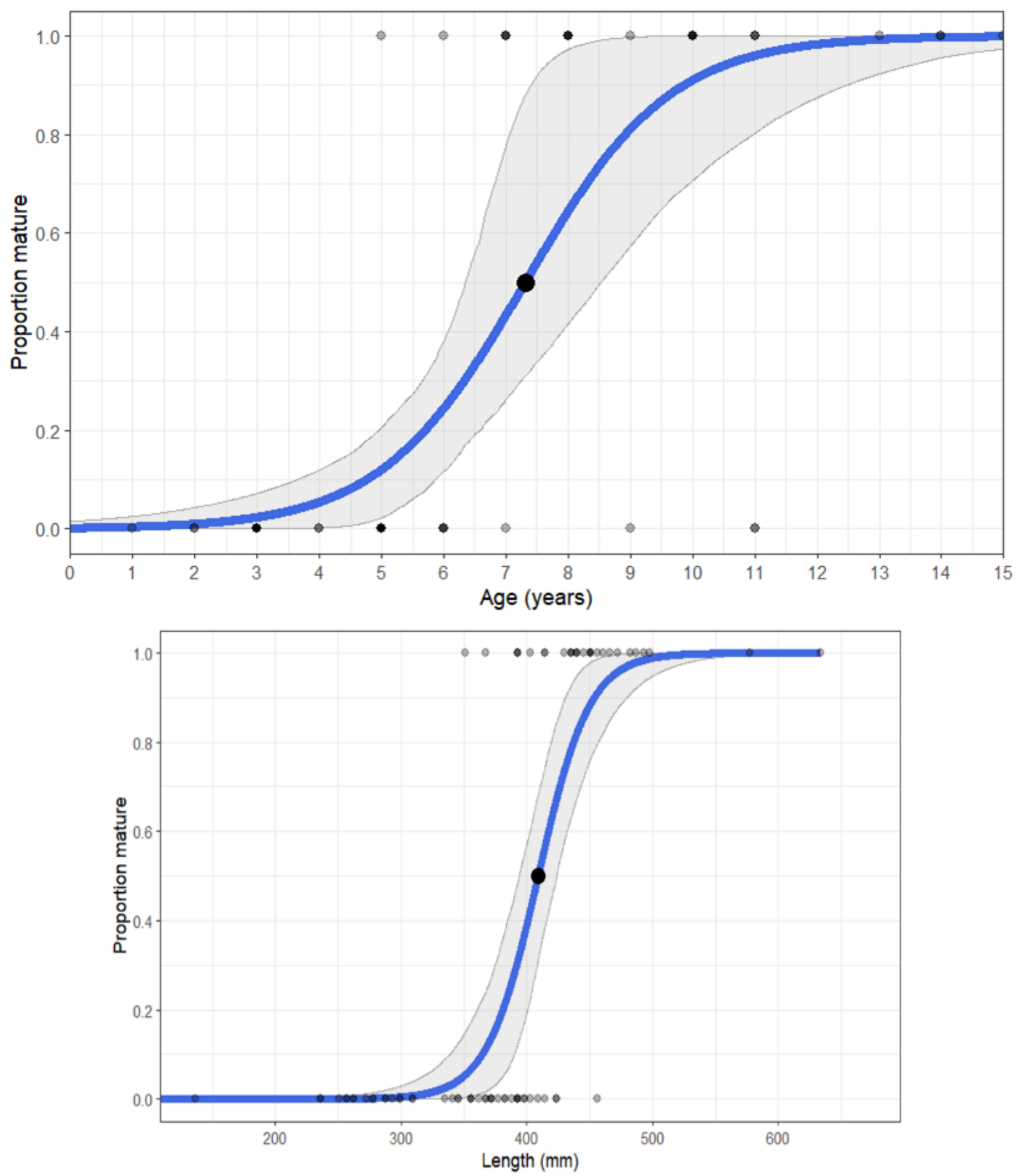
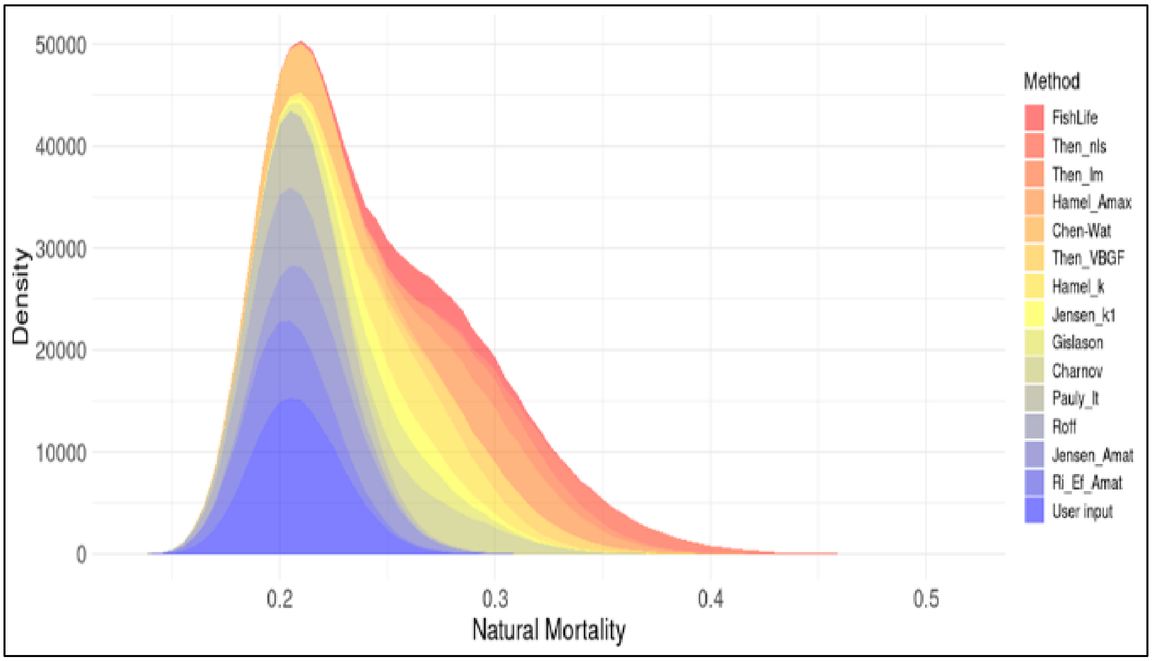


Figure 3.9. Maturity schedules of male Cedar Lake Walleye using 2025 index netting age (left) and total length (right) data.

Mortality

Ages and lengths at first maturity, along with maximum ages measured in the index program, and von Bertalanffy growth parameters were used to populate the model options in the Natural Mortality Tool (Cope and Hamel 2022*)* for each sex of Walleye in Cedar Lake. A temperature of 5°C was imputed to Pauly's (1980) estimator of natural mortality. Where a stage-specific length was required (Charnov et al 2013, Gislason et al 2010), the length at 50% maturity was calculated using generalised linear modeling. Female Walleye were estimated to have a median instantaneous natural mortality rate of 0.235, or an annual natural mortality rate of 20.9%. The median estimate of instantaneous natural mortality for male Walleye was 0.257, or an annual natural mortality rate of 22.7% (Figure 3.10). The modelled figures along with previous estimates of natural mortality make it seem more likely that natural mortality is approximately 21%.



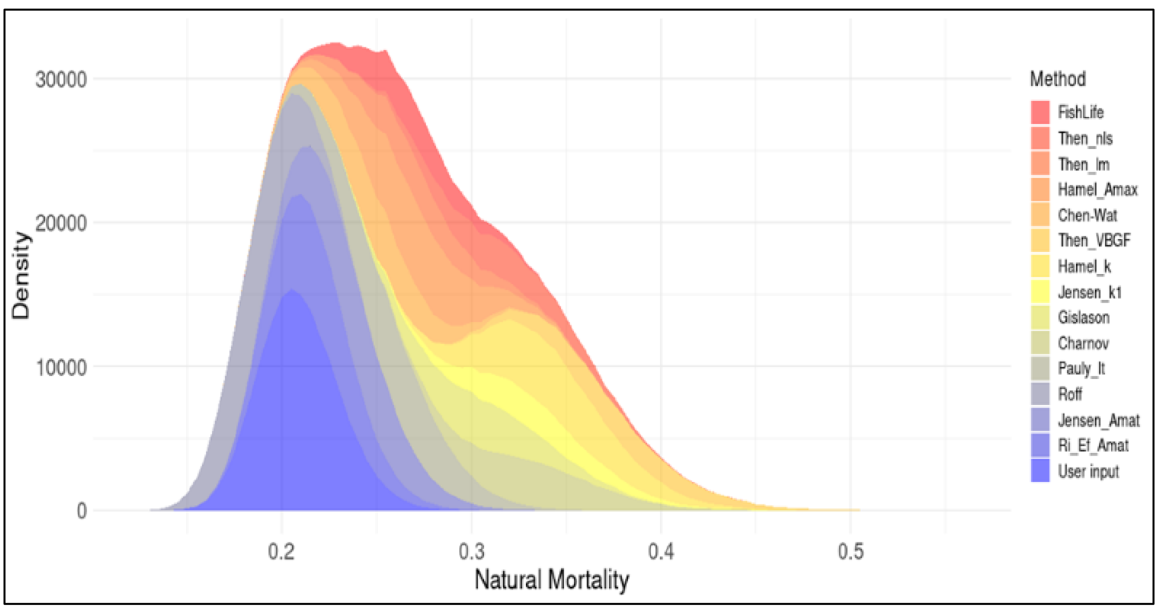


Figure 3.10. Composite of thirteen estimates of natural mortality rates for Cedar Lake Walleye. Left frame shows female estimates. Right frame shows male estimates.

The total annual mortality rate remained slightly above the reference threshold in 2025 when using the 5 year average age class estimate for current year (Figure 3.11). The upper stock reference point is set at a little less than two times the natural mortality rate (40% instead of 42%). Two times the natural mortality rate is often used as an estimate of maximum sustainable yield. No reduction in quota was triggered for the 2025/26 fishing year.

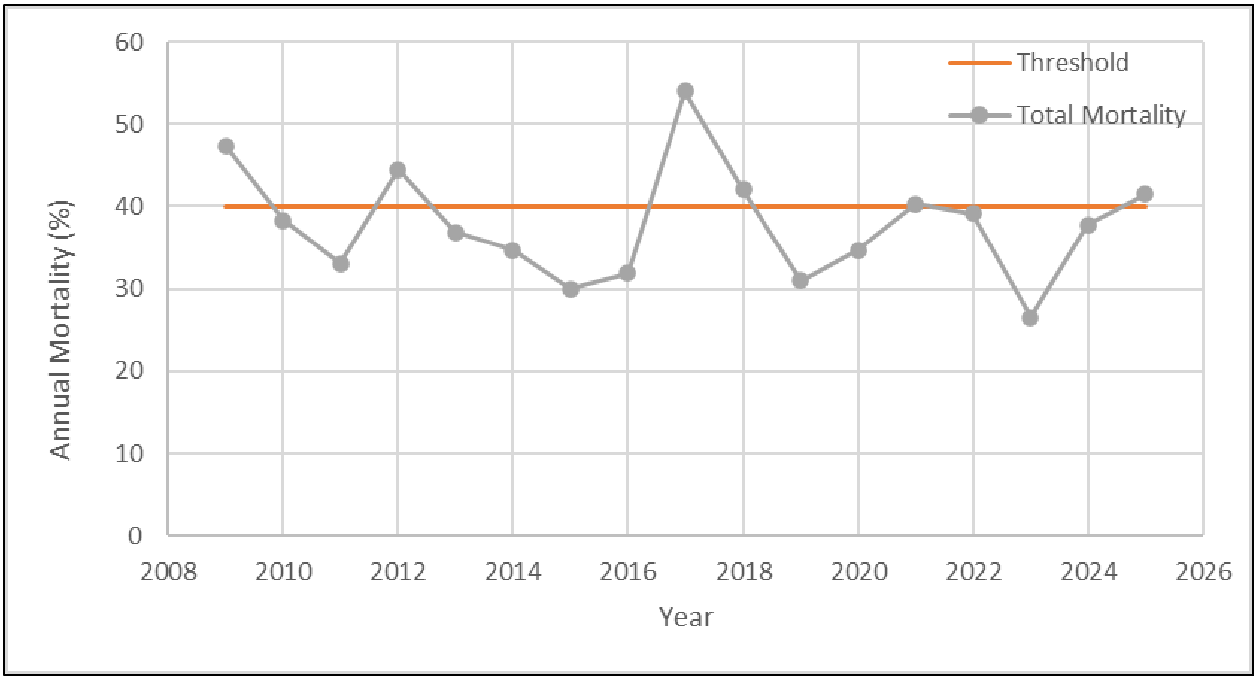


Figure 3.11. Walleye annual mortality (A%) in Cedar Lake from 2009 to 2025 index, calculated using linear regression of female Walleye age counts from the descending limb log transformed. A descending limb was not present in the 2025 data to calculate a regression and in its place a compilation of the 2021 to 2025 catch curves were used.

Using the strong 2005 and 2011 Walleye year-classes, cohort-based mortality seemed to be a better estimate that takes the variable recruitment factor out of the equation. The 2005 year-class regression of ages 6 to 20 estimated mortality to be 36.2%. The strong 2011 year-class is also one to watch in future years, but with just ages 7 to 14 to regress did not have as much of a descending limb to calculate an accurate estimate from. The regression of the 7- to 14-year-olds estimated mortality to be 19.9%.

Walleye Stock Status Relative to Recruitment Impairment

Spawning potential ratio (SPR), $F_{35\%}$ (Clark 1993), compared well with modeled maximum sustainable yield (A-MSY) (Figure 3.12). The maximum age Walleye from the index netting program to date has been 21, so the SPR was modeled out to that age. The entire series of index netting, 2009 to 2025, was used to construct the catch curve from which current total annual mortality was calculated. The catch curve of Cedar Lake Walleye from 2009 to 2025 peaked at age six. Counts against age on the descending limb of the catch curve were regressed twice. Once for ages 9 to 11, where data was abundant and the fit was very good, again for ages 11 to 18 where the fit was affected by increased susceptibility to the commercial fishing gear. The current SPR (z-current) is above the target reference point of $F_{35\%}$. The stock is above the point where recruitment impairment would occur.

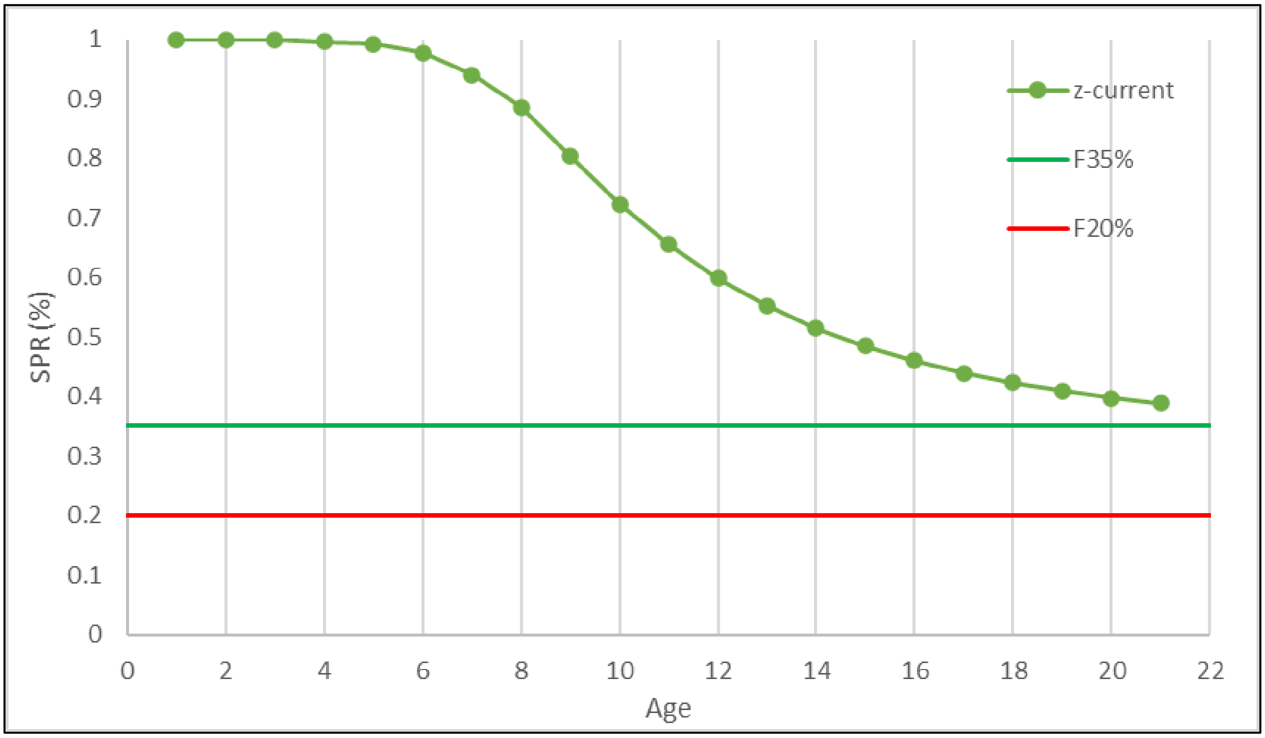


Figure 3.12. Spawner potential ratio of Cedar Lake Walleye. The green line represents the target reference point of $F_{35\%}$ and the red line is the limit reference point of $F_{20\%}$. The green dotted line (z-current) is the current SPR (2009 to 2025).

Female weights used in SPR calculations were modeled using 2009 to 2025 data in two phases to reflect pre- and post-maturation differences in somatic growth (Figure 3.13).

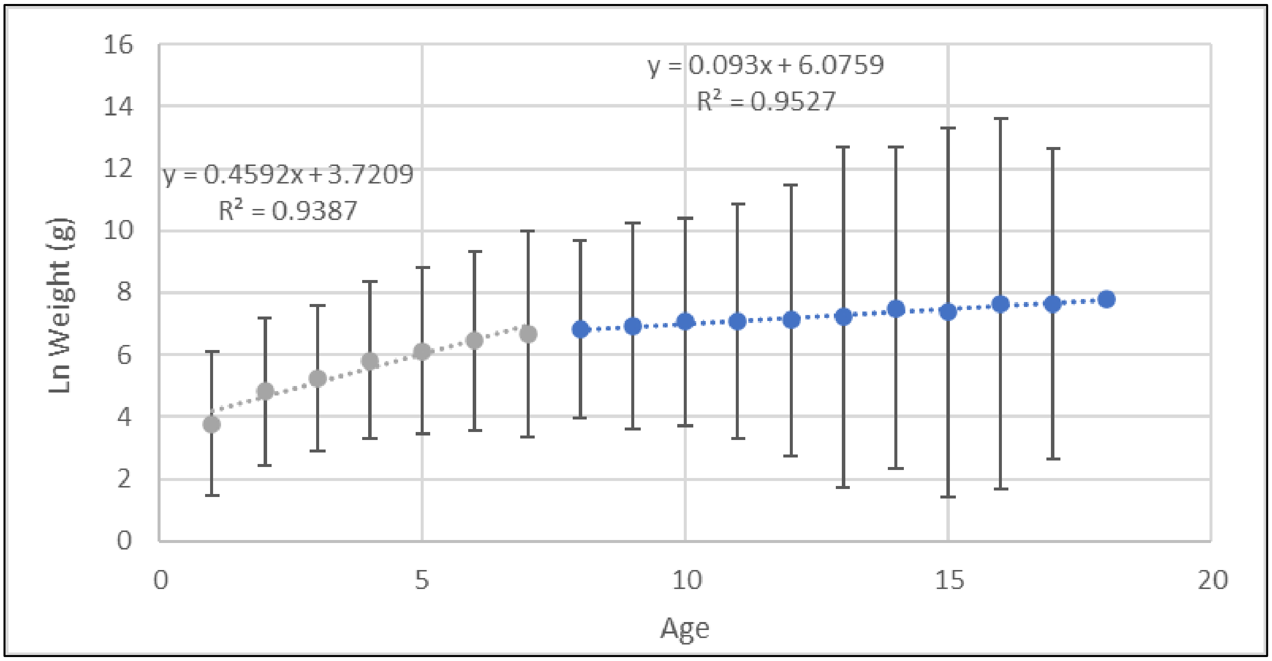


Figure 3.13. Size at age of female Cedar Lake Walleye caught in the index netting program 2009 – 2025. Models are for 1- to 7-year-old and 8- to 18-year-old fish. Error bars represent standard error and expand with age due in part to numbers caught.

Northern Pike

Relative Weight

Relative weights of pike size-classes were analyzed to see if any trends could be detected in health of size class pike given changes in community composition, abundance, and fishing pressure. As seen in Figure 4.1, Northern Pike relative weight remained relatively flat with a range of 90-100 for most size classes. The preferred size-class declined slightly but is still in good condition (> 85). The long-term trend throughout the available time series has been a slight decline in Northern Pike relative weights, even as relative weights remain high compared to those of other stocks.

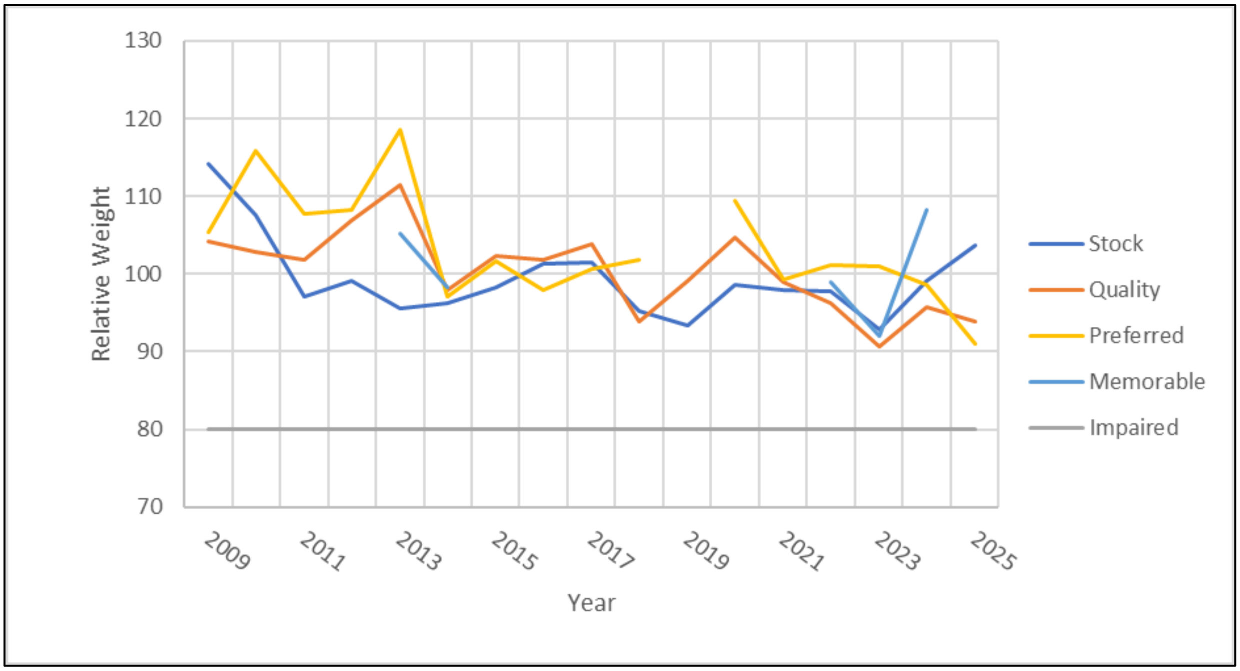


Figure 4.1. Cedar Lake Northern Pike size-class relative weights from 2009 to 2025 index netting.

Abundance

Based on 2025 stock monitoring results, 68 pike were caught in 15 nets. Twenty-four of those fish were four years and older. Four is typically the age at which Cedar Lake Northern Pike are first fully recruited to the index netting gear. In the 2025 index catch, 2- to 4-year-old pike made up the majority of the species' age composition (Figure 4.2).

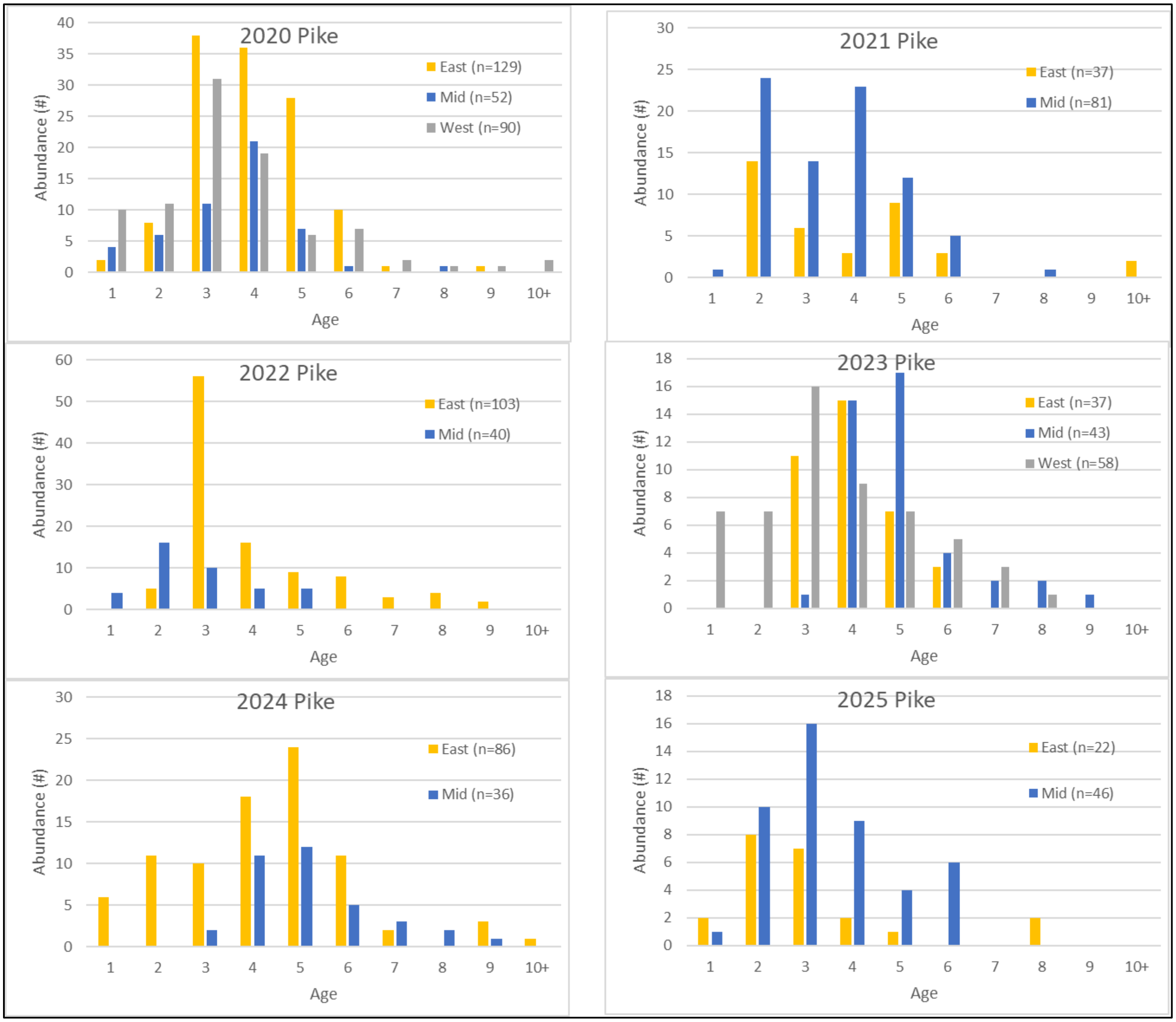


Figure 4.2. Age composition of Northern Pike from 2019 to 2025 index gillnet surveys. Middle portion of Cedar Lake indexed annually with western portion done approximately every 2 to 4 years and eastern portion done by CSMP staff annually since 2020.

The 2025 Northern Pike catch-per-unit-effort from index netting programs was down slightly, with 68 fish being caught in the 15 nets. Relative biomass of all Northern Pike from 3" and larger mesh index nets generally exhibited an increasing trend since the initiation of the netting program in 2009 but has come off the recent peak in 2020 (Figure 4.3).

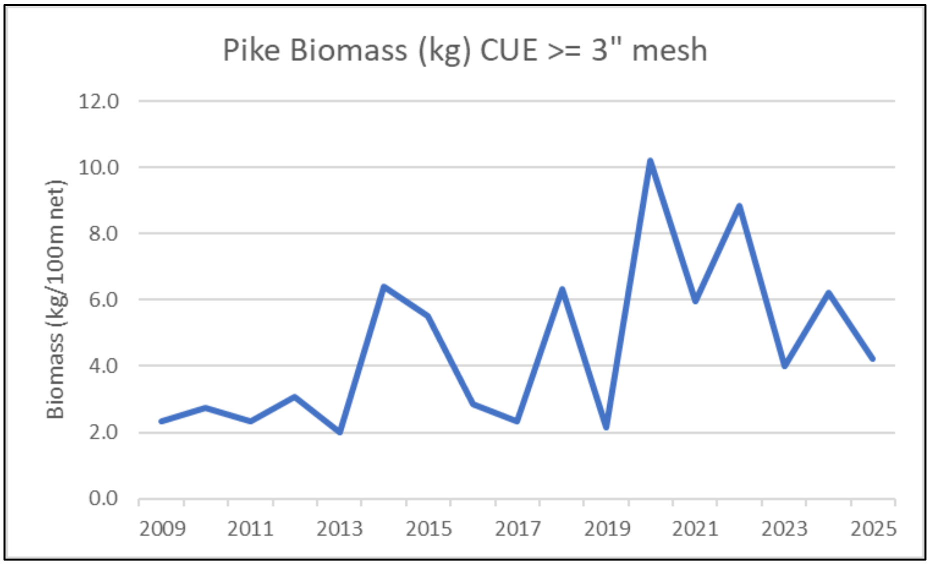


Figure 4.3. Catch-per-unit-effort by weight (kg) of Cedar Lake Northern Pike caught in 3” and larger mesh during index netting.

Mortality

The estimate of total annual mortality using the 2025 data alone was 38.2% (Figure 4.4). When combining the past five years of aged pike samples (2021-2025) the mortality rate works out to 53.5% for pike aged 4 to 10. This mortality rate is below the target reference point of 60% annual mortality, and well within the sustainable exploitation rate, which is estimated to be around 60-65% (SPOF 1983).

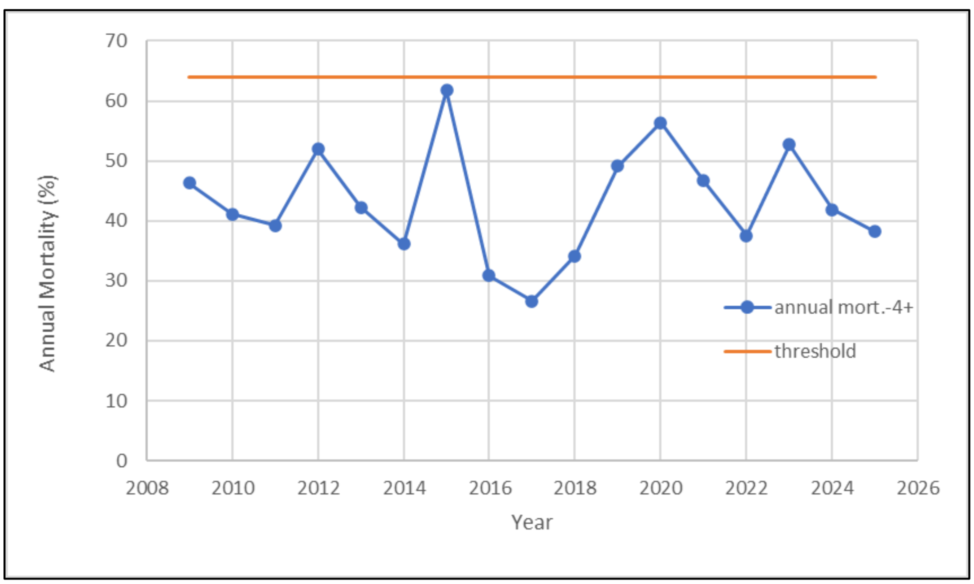


Figure 4.4. Annual mortality of all pike from annual monitoring on Cedar Lake, 2009 to 2025.

Northern Pike Stock Status Relative to Recruitment Impairment

Spawning potential ratio is likely a better measure of recruitment impairment for pike than is a stock-recruitment curve. The Northern Pike fishery in Cedar Lake is well above the point of recruitment impairment (Figure 4.5). Even if fished at F_{MSY}, spawner potential ratios are well above $F_{35\%}$, modeled all the way out the maximum female age encountered in the Cedar Lake index netting program of 14 years old. The reason is that the pike are not vulnerable to the large minimum mesh size used in Cedar Lake until they are three years old and not fully recruited to that 108 mm mesh until they are six. Meanwhile, female pike begin to mature in their first year and have reached 50% maturity already at two years of age. By the time they are fully recruited to the minimum 108 mm mesh at age six, around 90 percent pike are mature, and have been since age three (Table 4). A little less than ten percent of mature female pike appear to be in a resting state in any given year. The 95th percentile confidence limit of the mortality rate is above the point where recruitment would be impaired, so there is a high degree of certainty the stock is above the point of recruitment impairment.

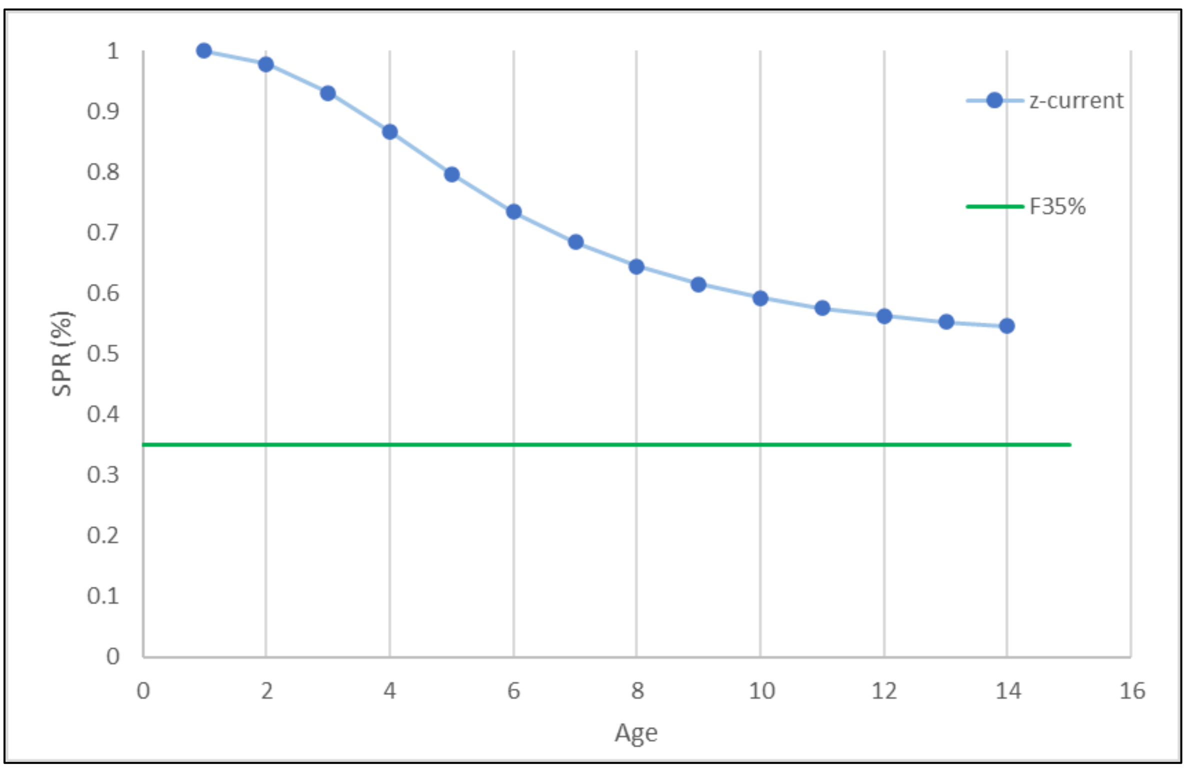


Figure 4.5. Spawner-per-recruit modeling of Cedar Lake Northern Pike under a 108 mm minimum mesh fishery. $F_{35\%}$ represents the point where recruitment impairment may occur. Data were modeled out to 14 years of age, which was the maximum age female pike caught in the index netting program between 2009 and 2025.

Table 4. Maturity rates by age of female Northern Pike caught in the Cedar Lake index netting program from 2009 – 2025.

Age	Number of immature females	Number of mature females	Percent mature
0	2		0%
1	20	3	13%
2	39	92	70%
3	16	182	92%
4	10	170	94%
5	10	144	94%
6	2	68	97%
7+	3	79	96%

Lake Whitefish

Abundance

Very few whitefish are caught in the index netting program, just 75 whitefish since 2009 (Table 1). Distribution of Lake Whitefish caught during the index program is somewhat limited as well, possibly due to seasonal movement patterns, but are mainly caught in the east (Table 5). Sampling in the eastern portion of the lake started in 2020 with the initiation of the CSMP.

Table 5. Abundance of Lake Whitefish in Cedar Lake index nets by sampling site 2009 to present.

	Cedar East									Cedar Mid														
Year	GN01	GN03	GN04	GN05	GN06	GN07	GN08	GN09	East T	CL-08/	CL-10	GN01	GN03	GN04	GN07	GN10	GN11	GN13	GN14	GN7	GN8	SN3	Mid Total
2009																			1				1
2010																							
2011																	1						1
2012																		7		1	1	1	10
2013															1								1
2014													1										1
2015-2019																							
2020			1	13	4			1	19					1									1
2021		1	3	5		1			10														
2022				10			1	1	12														
2023	1				1			1	3								1						1
2024			2	7	1				10	1	1												2
2025												1				2							3
Grand Total	1	1	6	35	6	1	1	3	54	1	1	1	1	1	1	2	2	7	1	1	1	1	21

*Eastern portion only sampled since 2020.

Aging of whitefish from the index sample was done in most years, but due to the low catch, analysis of age structure and mortality was not carried out. Figure 6 shows the ages caught over the history of the index program with years where whitefish were caught displayed.

Table 6. Abundance/age sampling of Lake Whitefish in Cedar Lake index programs 2005 to present.

Age	2005	2009	2011	2012	2013	2014	2020	2021	2022	2023	2024	2025	Total
2				1	1				1				3
3				1			3			1	1	2	8
4	1		1	1			8		1		2	1	15
5		1					7	3	4		3		18
6							1	5	4		3		13
7				1				2	1				4
8									1		1		2
9										1	1		2
10						1				1			2
13										1			1
14											1		1
(blank)				6			1						7
Total	1	1	1	10	1	1	20	10	12	4	12	3	76

To better understand the Lake Whitefish stock additional sampling targeting the species was completed via opening of the Cross Bay area of Cedar Lake to commercial harvest for approximately 1 month in mid-January to early-February 2024. The Cross Bay area and eastern portions of the lake have deep water habitat and have a higher concentration of whitefish. The sampling effort resulted in 312 whitefish being sampled for age, size, sex, and maturity. A total of 6,192 kg of Whitefish were produced during the period, which was excluded from surplus production modeling for the year as it artificially raised the CPUE.

Maturity

Lake Whitefish age composition and sex/maturity breakdown from the 2024 commercial sample, as shown in Figure 5.1, reveals a notable variation in recruitment regime in Cedar Lake with some strong year classes (ages 6 to 10) entering the 4.25” mesh commercial fishery in recent years. Whitefish are mostly all mature by the time they are susceptible to commercial fishing gear at age 5 to 6.

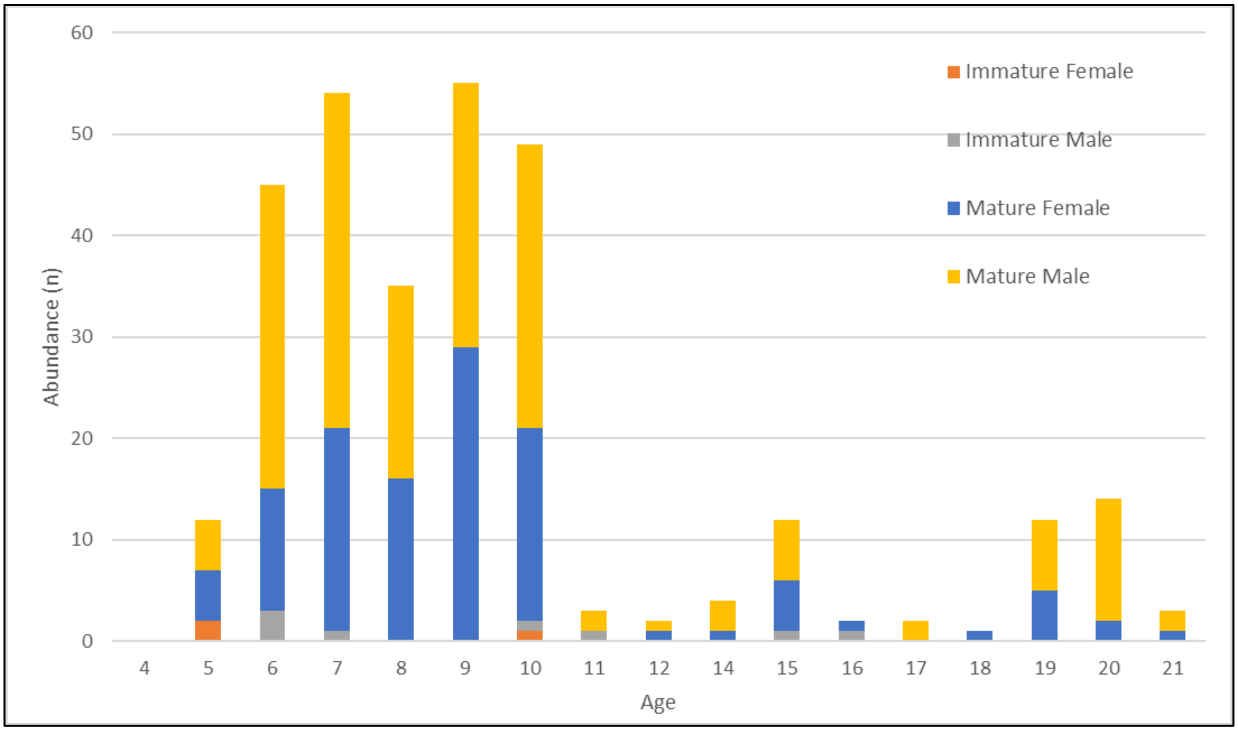


Figure 5.1. Age class and sex/maturity composition of Lake Whitefish commercial catch sample from Cedar Lake 2024.

Mortality

Due to the limited catch from index netting, a meaningful mortality rate estimate for whitefish is not available.

Whitefish Surplus Production Modeling

The model believes with nearly complete certainty (99.9%) that the stock size is currently smaller than the size required to produce the maximum sustainable yield. The model also believes with high certainty (91.5%) that the harvest fraction is smaller than the rate that would support the maximum sustainable yield (Figure 5.2).

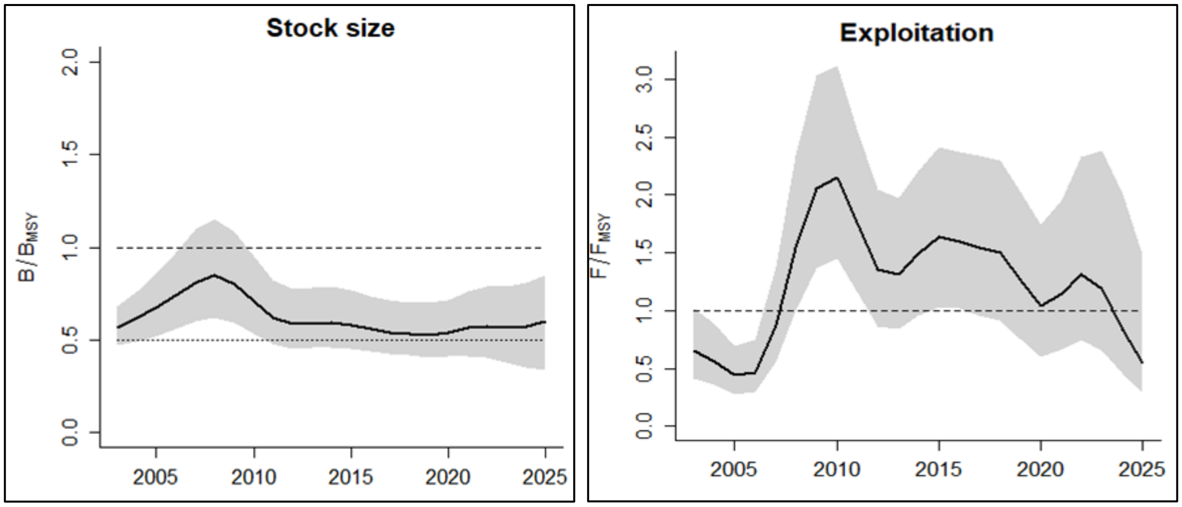


Figure 5.2. Estimated stock size relative to the biomass required for maximum sustainable yield and the estimated harvest rate relative to the rate at MSY for Lake Whitefish in Cedar Lake. Shaded areas are the 95% credibility intervals of the estimate.

The previous four years of fishing (2020-2023) demonstrated higher CUEs than what had been a long stretch of declining CUEs since 2010, but 2024-25 showed a return to lower CUEs. The model had some trouble straddling the jumps in CUE and found one unacceptably low residual (greater than 3 standard deviations) from the model (Figure 5.3).

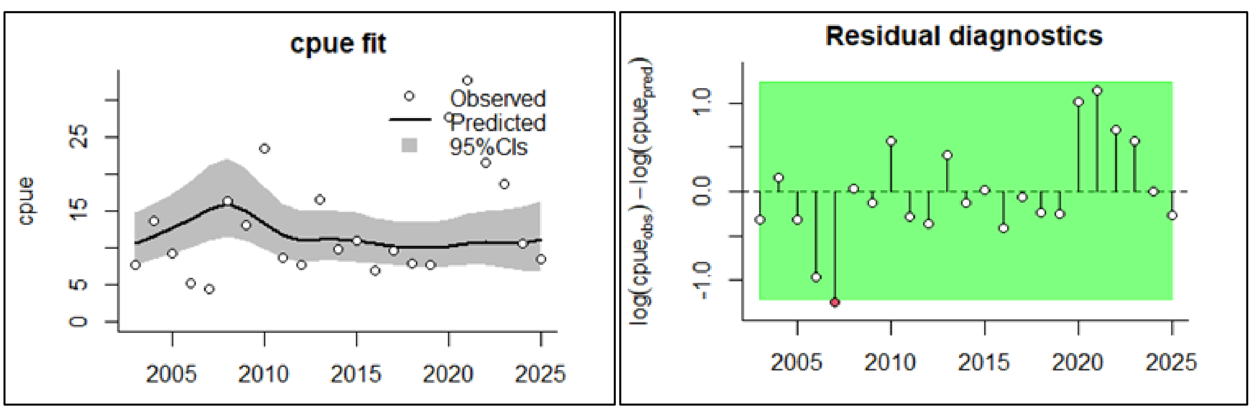


Figure 5.3. Left panel shows the model fit of catch per unit effort data to total catch (open circles are the geometric mean weights of Lake Whitefish on daily catch records showing whitefish production in a year). The shaded area represents the 95% credibility interval of the model. Right panel shows the residuals of the model fit from the left panel.

The model suggests that the maximum sustainable yield for Lake Whitefish in Cedar Lake is 29,400 kg (95% credibility interval = 24,100 - 38,200 kg), with Fmsy = 0.129. This is where quota has landed as a base level in 2025, which raises 10% if F is less than F@MSY and quota is reached or falls 10% if F is greater than F@MSY. The biomass required to generate the maximum sustainable yield would be 228,000 kg (95% C.I. = 124,000 – 435,000 kg), and the estimated biomass in 2025 was 135,000 kg (95% C.I. = 61,000 – 272,000 kg). The low abundance of whitefish and low harvest rate land the status of the fishery in the "overfished" and "overfishing not occurring" quadrant of stock status. The trajectory of the fishery suggests the Cedar Lake whitefish fishery has been in that quadrant since 2024 (Figure 5.4).

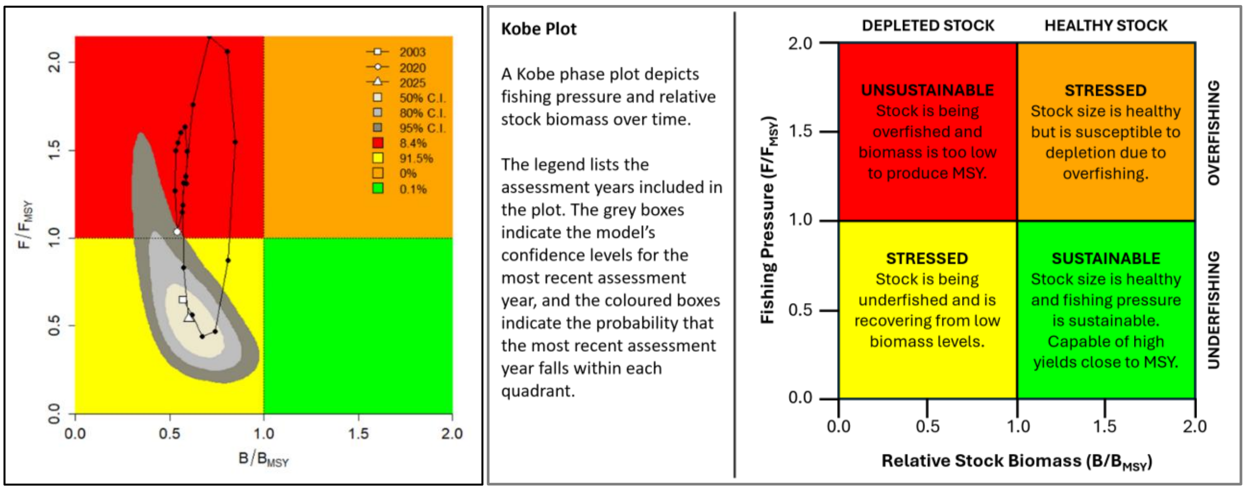


Figure 5.4. Kobe plot of Bayesian Schaefer surplus production model using index of abundance from the commercial daily catch records (left) and description of quadrant status (right).

White Sucker/Mullet Population Analysis

Currently, sucker species are referred to as 'mullet' in commercial purchaser classification. For mullet White Sucker accounted for 93.8%, Longnose Sucker 3.8%, and Shorthead Redhorse 2% caught over the past 5 years (2021-2025) (n=652) (Figure 6.1). With commercial production of mullet being 18.4% of the total catch (Table 1), the proportion of the three species towards total catch can be estimated at 17.64% White Sucker, 0.45% Longnose Sucker, and 0.31% Shorthead Redhorse. Longnose Sucker and Shorthead Redhorse do not meet the 2% criterion to be considered secondary main species.

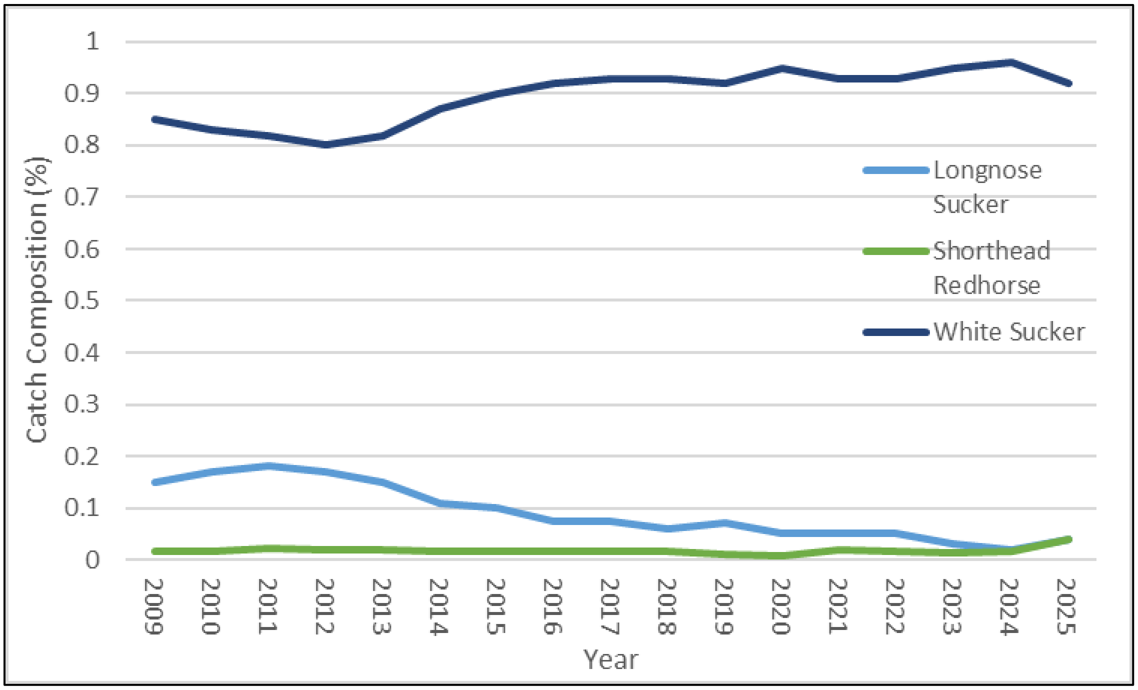


Figure 6.1: Mullet catch composition 2009 to 2025 index gillnet surveys.

Growth

Cedar Lake White Sucker grow relatively slowly compared to other more southern commercial fisheries in the province. Female suckers achieve an asymptotic length of 564 mm and males noticeably smaller at 506 mm (Figure 6.2). Females have a smaller Brody growth coefficient than males; 0.21 yr-1 compared to 0.25 yr-1. The differences in growth coefficients between the sexes is due more to the correlation with length at infinite age, L∞, than actual early life growth differences. Growth between the sexes is very similar until age four when males reach sexual maturity and begin to curb their somatic growth.

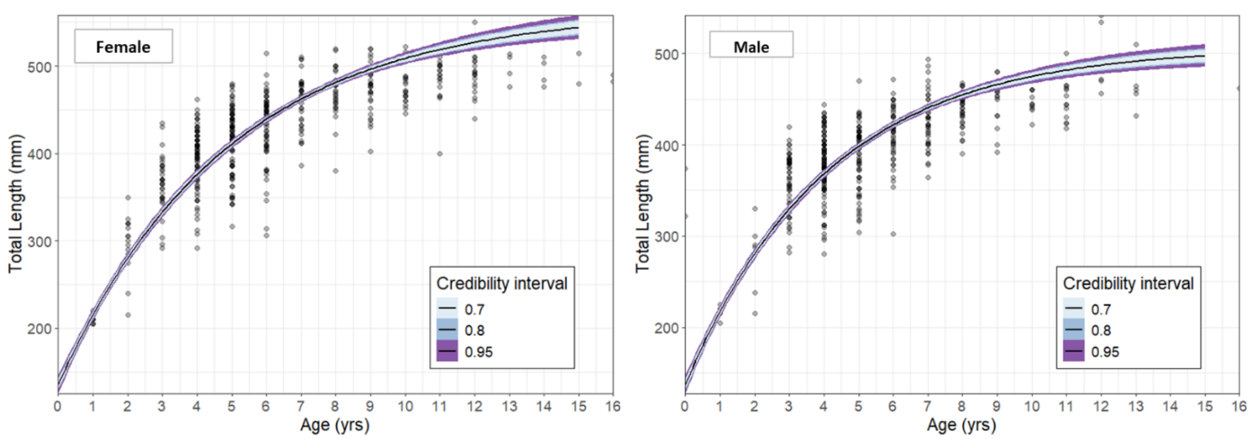


Figure 6.2. Von Bertalanffy growth models of female (left) and male (right) White Sucker from Cedar Lake index netting data between 2021 and 2025.

Abundance

The White Sucker sample from the index netting program was off peak levels of 287 fish averaged for a 12 net set program in 2024 (359 over 21 net sets), to 187 fish being caught for a 12 net set program in 2025 (228 over 15 net sets).

Maturity

Age and length maturity ogives of White Sucker were estimated using the AquaticLifeHistory package in R (Smart 2023). Half of female White Sucker mature for the first time at 4.46 years of age (s.e. = 0.19 years). At 5.79 years of age (s.e. = 0.32 years), 95% have reached maturity. The length at first maturity (50%) is 375 mm (s.e. = 7.3 mm). While 95% of fish longer than 431 mm (s.e. = 9.8 mm) are sexually mature (Figure 6.3). Male White Sucker reach the same maturity levels at younger ages and shorter lengths. Among the males, the age at first maturity (50%) is 3 years old (s.e.: 0.06 years), and 95% of males are mature by age 3.14. Males reach 50% and 95% maturity at a length of 315 mm as there was a definitive point of maturity in 2025 data (Figure 6.4).

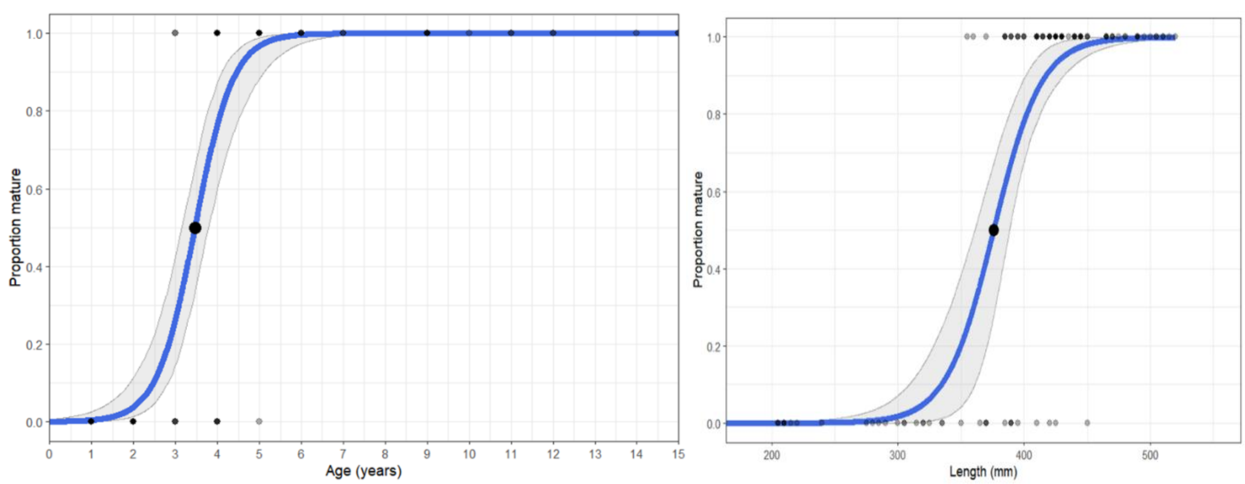


Figure 6.3. Maturity schedules of female White Sucker using age (2025 - left) and length (2025 - right) index netting data.

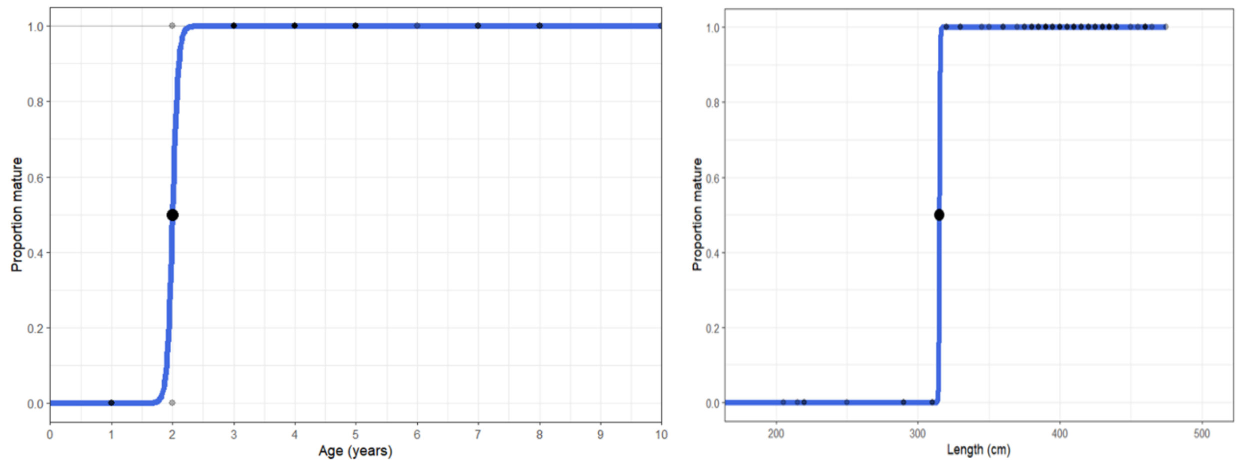


Figure 6.4. Maturity schedules of male White Sucker using age (2025 - left) and length (2025 - right) index netting data.

Mortality

The female White Sucker annual mortality rate is estimated to be 27.2%, well within safe harvesting levels estimated to be around 50% (Figure 6.5).

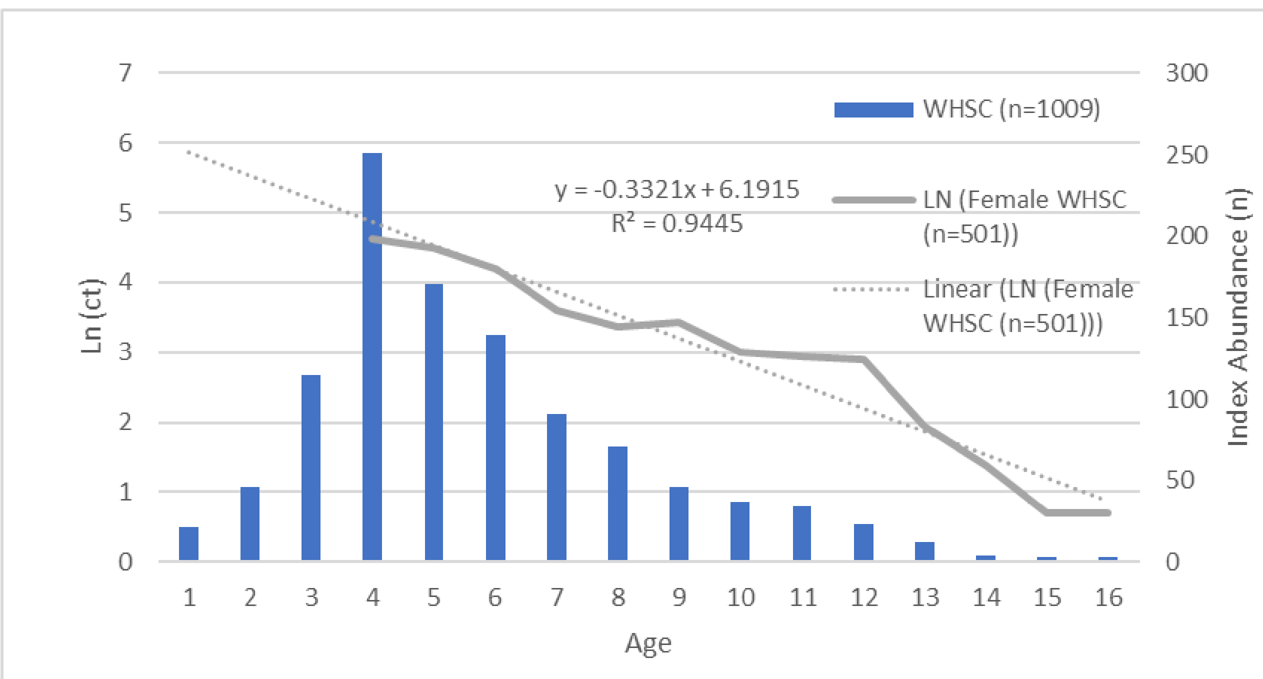


Figure 6.5. White Sucker age abundance and linear regressed mortality estimate of female White Sucker from 2021 to 2025 index netting data.

Commercial Harvest Production

Commercial deliveries continue to be dominated by three species: Walleye, Northern Pike, and White Sucker (Table 7, Figure 7.2). Looking at commercial production from a historical perspective, Walleye catch has stabilised around an average production of 176,500 kg over the past 20 years (Figure 7.1). Production levels of Walleye have uncoupled from the increase in index of abundance. Likely due to decreased fisher activity/effort.

Table 7. Commercial deliveries from Cedar Lake 2003 to present.

Year	Whitefish	Walleye	Pike	Mullet	Tullibee	Sauger	Perch	Deliveries
2003-04	9,853	298,634	187,798	159,045	4,736	16	0.2	2,467
2004-05	13,399	298,159	192,762	173,871	-	235	2	2,606
2005-06	6,853	248,191	114,229	104,701	-	600	18	2,286
2006-07	5,748	182,463	200,177	91,327	-	344	13	1,151
2007-08	4,992	108,630	208,066	76,908	-	555	10	1,044
2008-09	51,603	122,393	228,798	147,509	-	393	52	1,133
2009-10	64,183	185,650	257,033	138,897	-	509	67	1,566
2010-11	52,953	253,530	229,637	91,822	-	90	28	1,595
2011-12	24,355	213,413	229,901	72,356	-	256	19	1,396
2012-13	18,950	176,225	210,596	61,785	20	212	24	1,164
2013-14	16,959	200,166	115,729	116,827	40	44	3	1,267
2014-15	31,072	161,583	151,980	138,935	-	62	9	1,117
2015-16	29,195	232,749	173,769	141,957	206	14	4	1,442
2016-17	28,257	188,705	161,135	161,031	1,286	14	7	1,447
2017-18	17,812	207,385	203,089	217,859	629	97	1	1,561
2018-19	30,038	180,515	199,629	209,031	648	28	7	1,651
2019-20	21,198	222,930	139,863	140,083	22,739	18	1	1,700
2020-21	4,635	71,971	109,885	15,255	3,961	28	2	185
2021-22	19,949	141,064	85,852	32,555	9,123	8	2	493
2022-23	27,350	170,593	107,611	67,096	23,433	8	3	928
2023-24	27,179	200,407	75,369	93,788	17,354	14.78	11.5	1,307
2024-25	10,187	140,467	58,527	52,917	2,856	13.06	2	1,093
2025-26	7,113	174,528	72,569	62,296	1,989	10.16	3.7	1,146
Total 2021-2026	91,778	827,058	399,929	308,652	54,756	54	23	
5-year Avg. 2021-2026	18,356	165,412	79,986	61,730	10,951	11	5	
Percentage 2021-2026	5.5%	49.2%	23.8%	18.3%	3.3%	0.003%	0.001%	

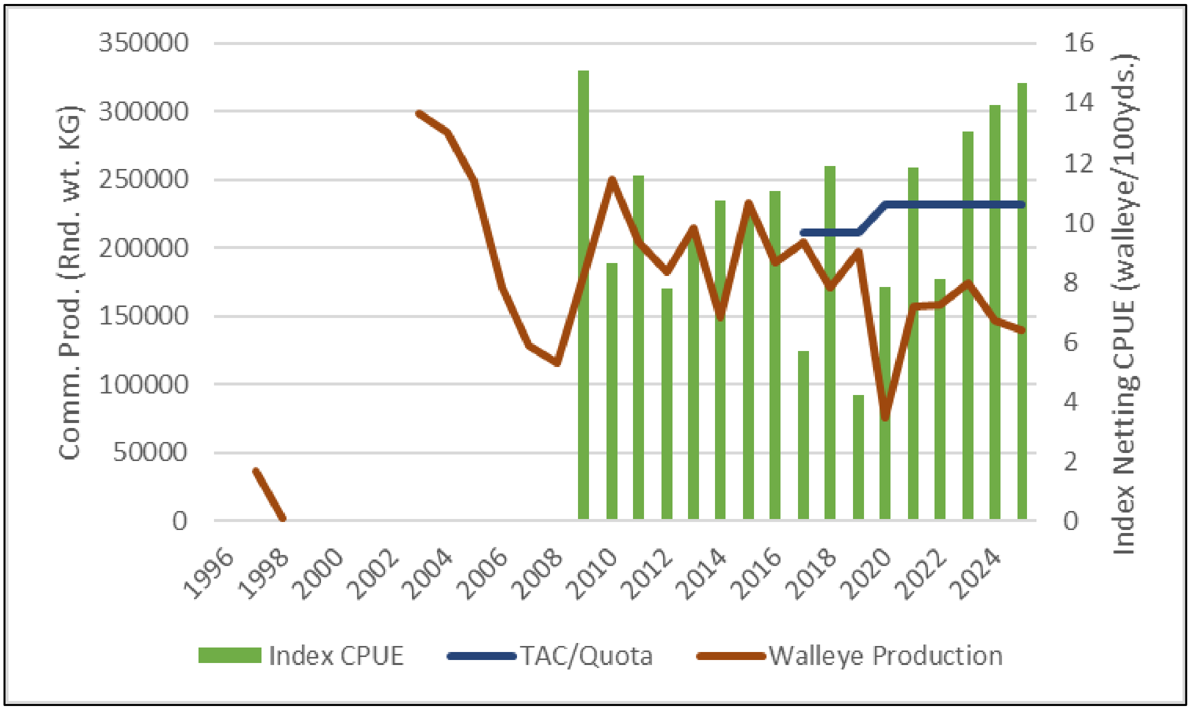


Figure 7.1. Commercial Production of Walleye in Cedar Lake (left axis) compared to index netting abundance of Walleye (right axis).

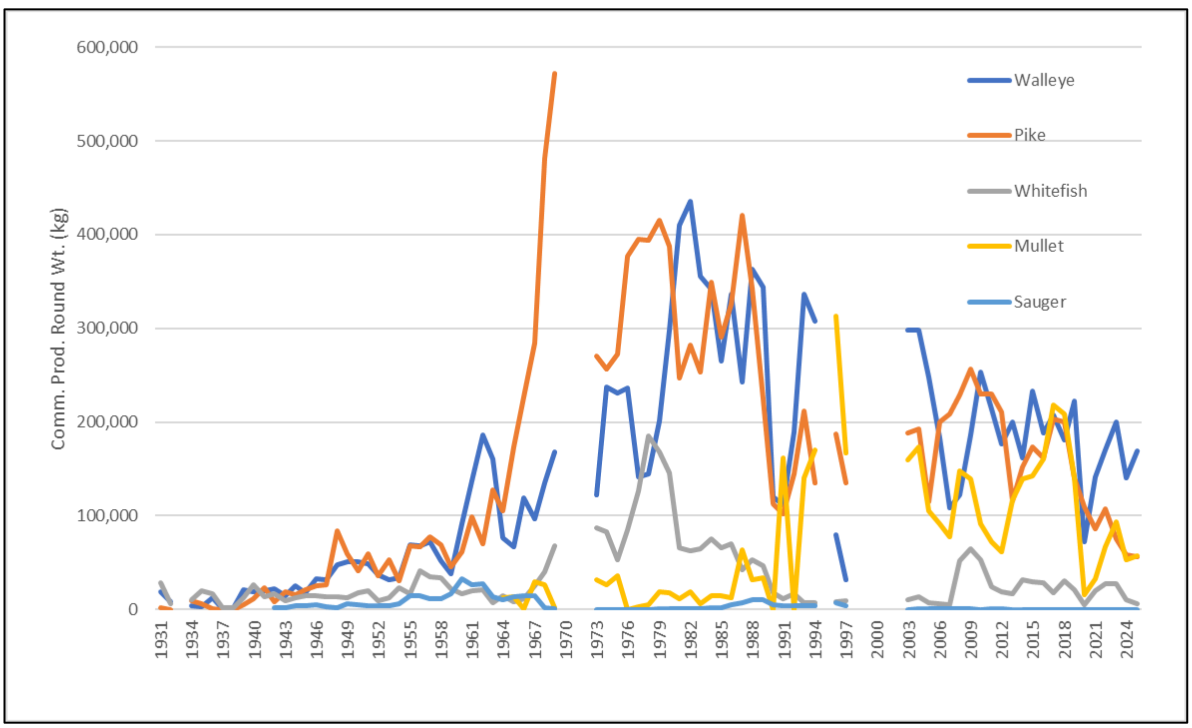


Figure 7.2. Commercial Production of main species caught in Cedar Lake from 1931 to 2025.

Walleye size-class composition of commercial catch has been steady when considering the size category change. Before 2011, the small size class referred to headless Walleye shorter than 33 cm, and large Walleye had a headless length of 40 cm or more. Beginning in 2011, small Walleye were those with a headless length of less than 30 cm, the large category was shifted to between 37 and 40 cm, and a jumbo category was created. The jumbo category was no longer used after 2019 and round fish were delivered more frequently resulting in an increase in small fish being delivered. (Figure 7.3).

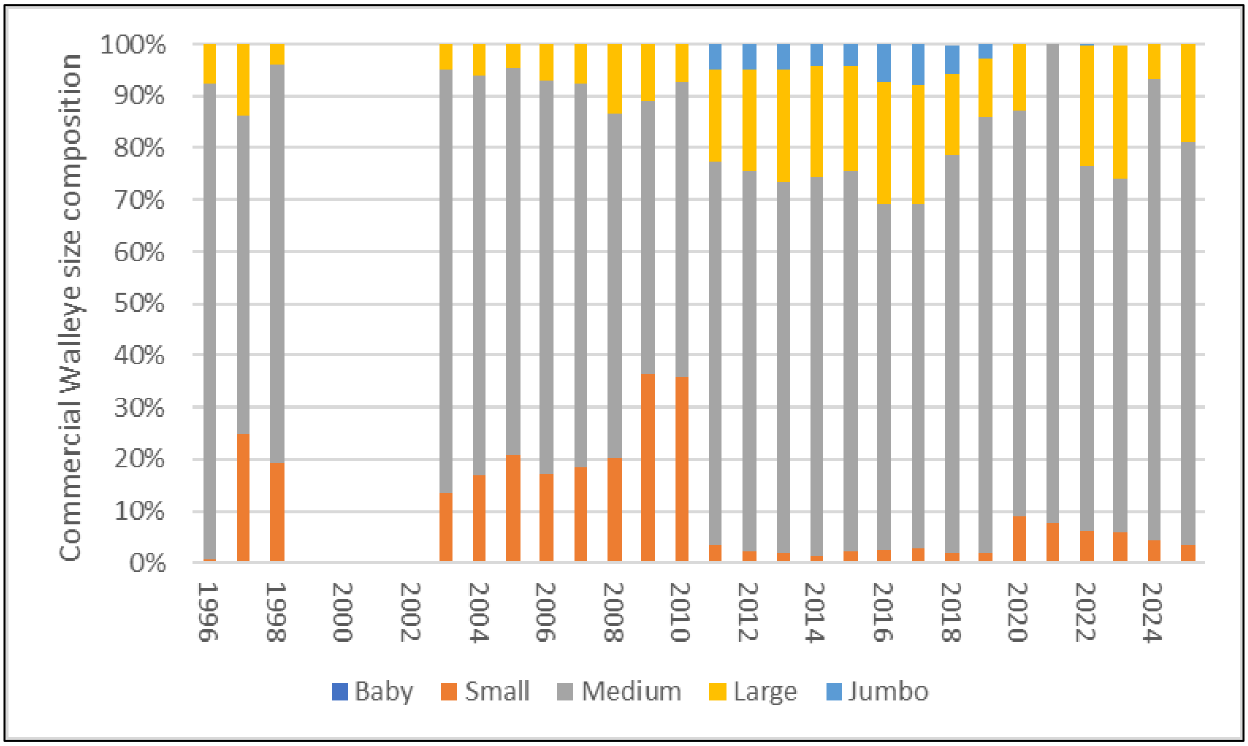


Figure 7.3. Commercial Production of Walleye size categories in Cedar Lake from 1996 to 2025.

Commercial Catch Sampling

Lake Whitefish are fully recruited to the fishery around 6-years-of-age based off periodic commercial catch sampling from winter fishers in 2024 (Figure 7.4). The age demographics show some variation in year class strength or recruitment failure for the time-period covered.

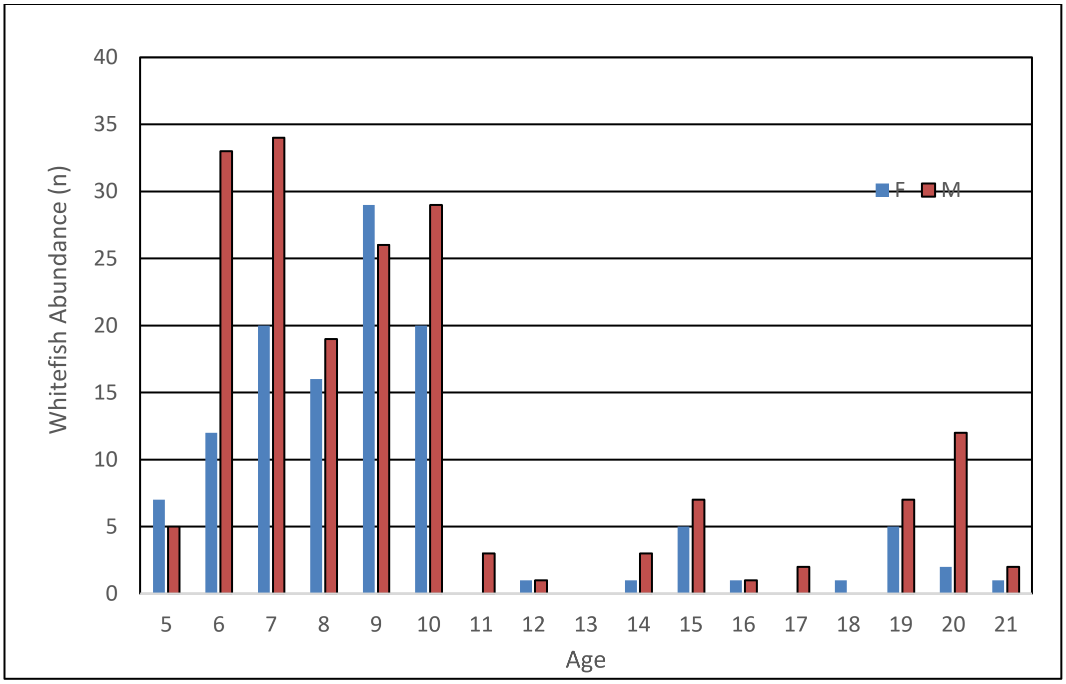


Figure 7.4. Lake Whitefish age and sex composition/abundance from 2024 commercial sampling.

The age composition of White Sucker sampled from the commercial fishery indicated that White Sucker ages 4 to 7 are the primary by-catch in the target Walleye fishery (Figure 7.5).

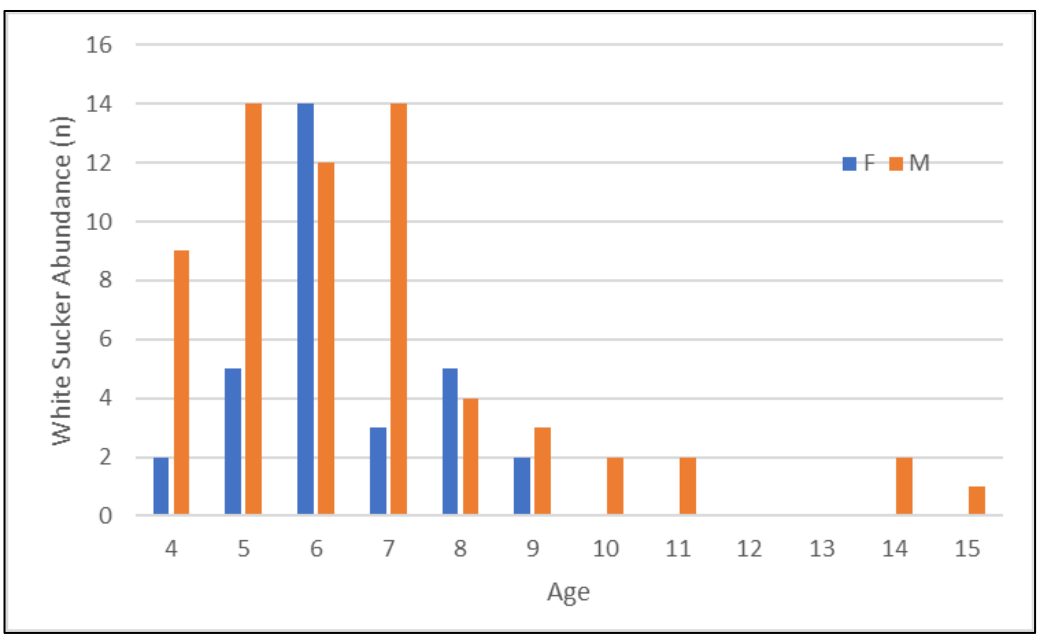


Figure 7.5. Age and sex composition of White Sucker from commercial sampling from 2023 and 2024.

Discussion

Walleye

Relative abundance of all Walleye from index netting generally exhibited a relatively flat trend from 2009 to present. The decline in production is likely due to decreased fishing effort on the lake, as index netting results for catch per unit effort are up this past decade.

The presence of older Walleye in a population is known to result in higher recruitment (Colby and Nepszy 1981, Venturelli et al 2010). Studies of some marine species with weak spawner-recruit relationships, as Walleye typically exhibit, have also shown that greater age diversity among spawning females has enhanced the spawner-recruit relationship (i.e. a higher diversity of age classes in the spawning stock (H) is associated with resilience to overfishing) (Marteinsdottir and Thorarinsson 1998).

In Cedar Lake, Walleye age-at-maturity is influenced by the strength of year-class ages seven to nine which are mature. In 2025, age-at-maturity of female Walleye (8.98 years) was above the published threshold of 5.1 years, which is positive based on growing season length (Gangl and Pereira 2003). Female total length at 50% maturity was as expected (i.e. females reached maturity at expected length, based on how quickly Walleye in Cedar Lake grew since age 3). Failing to exceed a threshold of a biological performance indicator is considered a negative indicator of stock status.

Walleye catch has stabilised around an average production of 176,768 kg over the past 20 years. Whereas pike and Sauger are lower, possibly due to more strict use of the 4.25” minimum mesh size restriction and fishing predominantly in the central portion of the lake near the community of Easterville.

Walleye abundance is above the amount required to produce maximum sustainable yield, and overfishing is not occurring. The 2026/27 quota for Walleye will be 232,000 kg. The Walleye is unlikely to be reached given the low winter commercial fisher effort in the fishery recently.

Northern Pike

The pike population has been relatively steady over the past 10 years and is off recent index netting CUE highs in 2020. Fishing pressure increases when the roe condition and market price/demand are optimal (i.e. primarily winter season).

Northern Pike mortality rate is lower than the threshold that would trigger a quota reduction. The 2026/27 quota for Northern Pike will be 366,000.

Whitefish

The whitefish population has been relatively steady over the past 10 years with some occasional poor recruitment but is still in good condition in the eastern zone closed to commercial fishing with limited targeted recreational fishing pressure. The whitefish stock may appear diminished due to lack of abundance in the mid and western portions of Cedar Lake index netting programs, or in commercial production due to fisher preference for catching Walleye that have recently become more available due to a growing stock lake-wide.

Lake Whitefish abundance is below the amount required to produce the maximum sustainable yield, but overfishing is not occurring. The 2026/27 quota for Lake Whitefish will remain at 29,000 kg.

White Sucker/Mullet

Due to interest in the eco-certified White Sucker product for pet food, fishers wish to have the stock certified in coming years. To aid in this goal, Fisheries Branch has started to sample and analyse the various sucker species. The sucker population has been relatively steady with good recruitment owing to their resilient nature, but some sucker species that tend to grow larger (like the Longnose Sucker) have declined or remain at a very low-level composition of the mullet catch. These species may be getting caught on average before they have matured or had more than one spawning occur before harvest. Surplus production modelling outcomes will help to guide targets in balancing the various target fish species. Mullet was classified as ‘over-fished’ by the modelling, which is where we would like to the biomass at MSY to be to allow for the target species (Walleye and pike) to be the ones maximizing uptake of the available nutrients and space in the ecosystem.

Additional sampling, either through more index netting with 4.25” mesh or commercial sampling targeting whitefish and Longnose Sucker will be pursued.

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Appendices

Appendix 1: Posterior of Walleye catch per net night

Walleye catch per net night was calculated using a gamma-Poisson pairing where the 2024 hyperparameters of shape = 302.5 and rate = 21.5, were used as the gamma prior, and the 2025 catch of 212 Walleye over 12 net nights were modeled in a Poisson distribution. The posterior estimate's shape hyperparameter was 514.5 with a rate hyperparameter of 33.5. The mean CUE of the posterior is 15.36 (s.d. = 0.677) Walleye per net night. The CUE was estimated using MCMC over four chains using 5000 samples after a 5000 sample warmup. Convergence was good among all four chains with r-hat of 1.00, and an effective sample size ratio of 0.3609 (Figure A1).

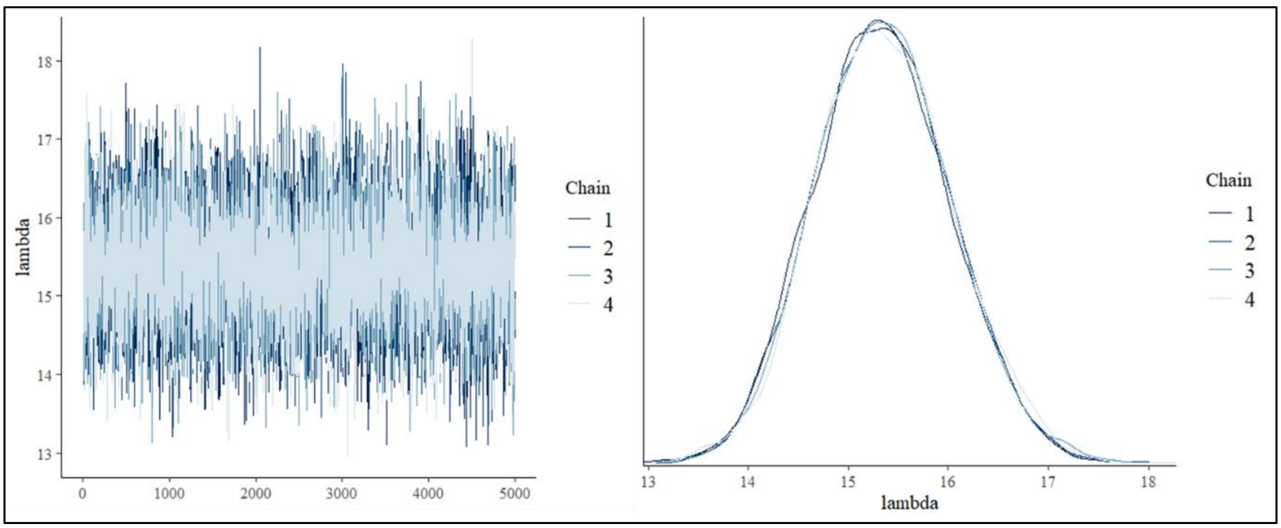

Figure A1. MCMC results of gamma-Poisson modeled Walleye catch per net night.

Appendix 2: Von Bertalanffy growth model for Cedar Lake female Walleye

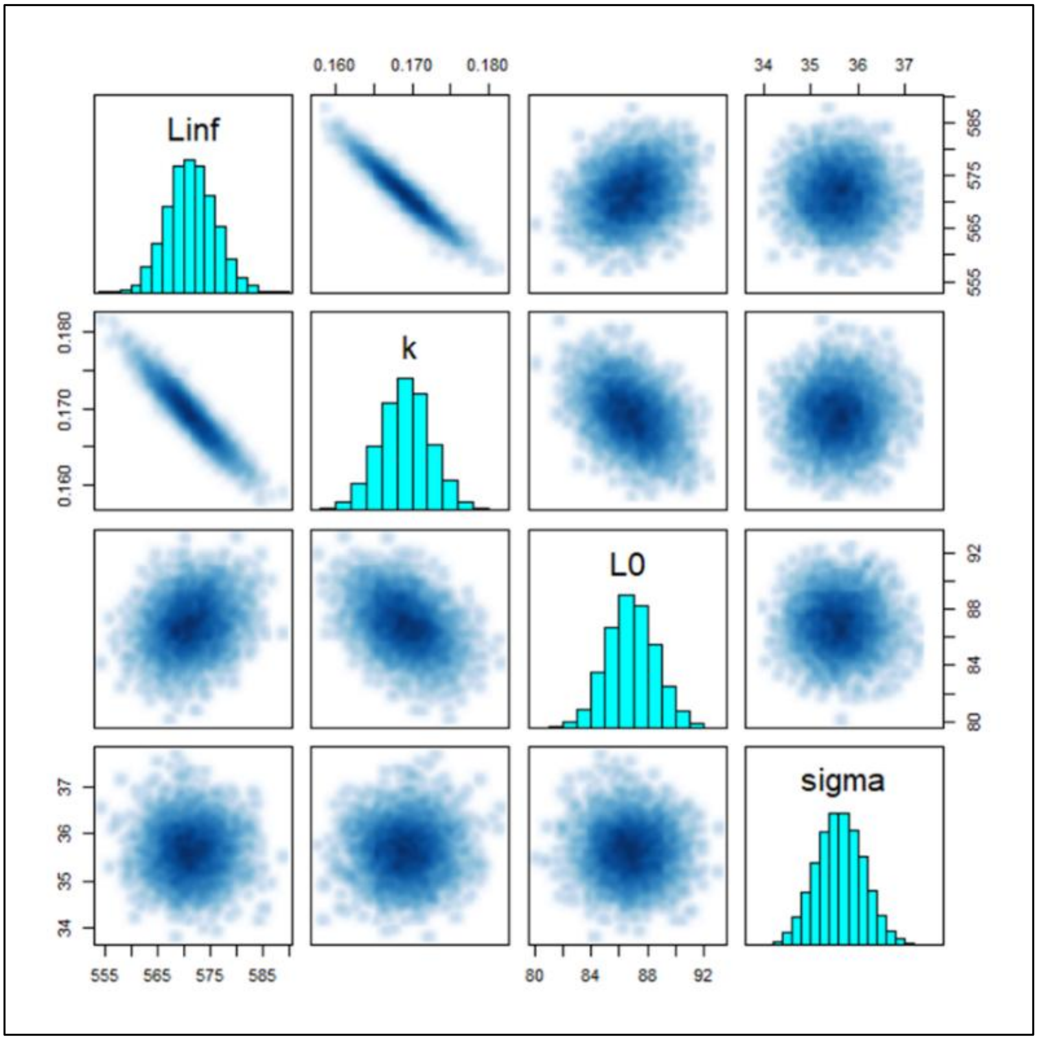

Figure A2. Von Bertalanffy growth model parameter estimates and correlation among estimates for Cedar Lake female Walleye.

Appendix 3: Von Bertalanffy growth model for Cedar Lake male Walleye

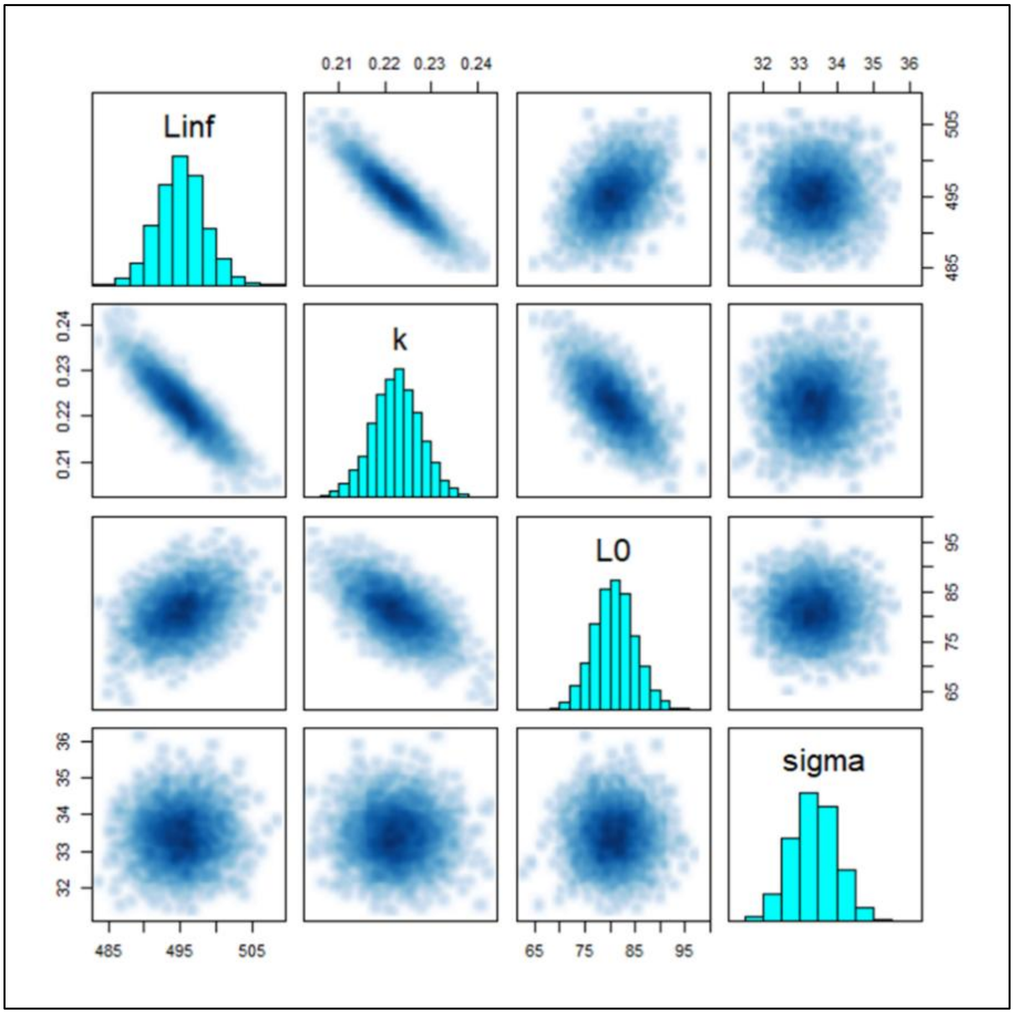

Figure A3. Von Bertalanffy growth model parameter estimates and correlation among estimates for Cedar Lake male Walleye.