

# Fremont Lake, Newaygo County

## 2022 Walleye Population Estimate Report

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### Introduction

Fremont Lake is a 790 acre natural lake located in the southern portion of Newaygo County. The City of Fremont is located just to the northwest of the lake. Fremont Lake has about 5.1 miles of shoreline and the maximum depth is 86 feet (O'Neal 2009). Fremont Lake lies in the Muskegon River Watershed and its outflow forms the headwaters of Brooks Creek. Fremont Lake is fed by several small tributaries, the most significant of which is Daisy (also known as Darling) Creek. There are two boat launches on Fremont Lake. One is Fremont Lake Park, located along the north shore within the City of Fremont, and the other is Sheridan Park, located along the south shore and administered by Sheridan Township.

Fremont Lake has a long fisheries management history dating back to the late 1800s. The original fish community included cisco, which have since been extirpated (O'Neal 2009). The lake struggled with pollution issues for much of the 20<sup>th</sup> century (Trimberger 1982) and became overrun with invasive Common Carp. The fish population was killed off by the Michigan Department of Natural Resources (MDNR) with rotenone in 1982. Since then, Fremont Lake has been intensively managed for Walleye (O'Neal 2009; Table 1), with Walleye being stocked frequently since 1983 by MDNR. In recent years, the management plan has been to stock Fremont Lake every other year with 39,500 spring fingerling Walleye (a rate of about 50/acre). Due to lack of Walleye production in 2020 due to the COVID-19 pandemic, there was a four-year period in which stocking did not occur from 2018-2021 until stocking resumed in 2022. Since the population was re-established after the 1983 fish kill, Fremont Lake has been very popular with Walleye anglers.

The State of Michigan has recently developed a new Walleye management plan for inland waters to guide the department's management effort toward maximizing both the ecological benefits and angler satisfaction of inland Walleye fisheries (Herbst et al. 2021). Within this plan, Fremont Lake is classified as a Class 2 lake with variable natural reproduction. Class 2 lakes are systems with a surface area over 400 acres with slightly cooler mean temperatures and Walleye populations in Class 2 lakes are typically maintained through a combination of inconsistent natural reproduction and stocking, which has been the case for Fremont Lake since the 1980s (Herbst et al. 2021).

Fremont Lake is also of interest to Native American tribes in the area and is listed as a Walleye Lake System in the 2007 Inland Consent Decree, which means spring Walleye spearing by tribal members can be permitted by individual tribes. The number of fish available for harvest is based on either a recent empirical population estimate (completed within the last 5 years) or an estimate calculated using the Wisconsin Regression as outlined in the Decree.

The most recent comprehensive fishery survey of Fremont Lake was conducted in 2009 (O'Neal 2009), and that survey showed excellent Walleye catch rates and growth. The 2009 survey also showed that Fremont Lake had a well-balanced fish community. The most recent fall electrofishing survey targeting Walleye was conducted in September 2018 (Tonello 2019). Both surveys revealed good numbers of Walleye from multiple year classes, both stocked and unstocked. Walleye growth rates from both surveys were well above the State average. In August of 2018 there was a fish kill on Fremont Lake in which anglers reported dozens of dead adult Walleye of various sizes. While the primary purpose of the October 2018 survey was to assess the success of the 2018 stocking effort, a secondary purpose was to see if any adult Walleye remained alive. While fall electrofishing surveys typically do not target adult Walleye, they are often caught, and they were observed during the 2018 survey.

Due to interest in expanding the number of Walleye population estimates conducted on waters with the 1836 Ceded Territory and public interest in Fremont Lake, a Walleye population estimate was

conducted on Fremont Lake in late March 2022 by MDNR's Tribal Coordination Unit. The goal of this assessment was to provide a current population estimate that could be used to set tribal harvest limits for the next several years. This population estimate also provided current information on the Walleye population for state management. As a follow up to the Walleye assessment in the spring, a Walleye recruitment survey was conducted in October 2022.

## **Methods**

From March 28 – April 6, 2022, MDNR conducted a Walleye population estimate on Fremont Lake following a protocol agreed upon by the Inland Fisheries Committee (IFC) under the 2007 Inland Consent Decree. Under this protocol, the population estimated is calculated using Chapman modification of the Petersen formula (Ricker 1975). The marking period began on March 28 and ended on April 5. Trap nets and boat electrofishing were used for the marking period of the survey. The recapture period consisted of boat electrofishing and was completed on April 6. The entire shoreline was surveyed utilizing one boat during the recapture period. Length (to the nearest 0.1 inches) and sex (if it could be determined) were recorded for all Walleye captured and fish were given a dorsal fin clip to serve as a visible mark. Dorsal fin clips were also kept for use as an aging structure for the first 10 fish of both sexes from each inch group. Water temperatures ranged from 35-44 F throughout the survey.

On October 5, 2022 a fall Walleye recruitment survey was conducted on Fremont Lake using the Resource Inventory Program Walleye fall indexing protocol. The entire shoreline was surveyed using an electrofishing boat after dark and the total distance covered during the survey was 5.02 miles. Electrofisher settings were set to 23 amps, a pulse rate of 60, and a duty cycle of 30. All Walleye were measured to the nearest 0.1 inches and scales or spines were collected for aging before they were released. The water temperature was 64.3 F during the survey. Since Walleye stocked in spring 2022 were marked with oxytetracycline (OTC), all age-0 Walleye were kept for OTC analysis.

## **Results**

### Population estimate

A total of 345 individual Walleye (265 males, 80 females) were captured and marked during the marking phase of the survey. During the recapture period, 53 adult Walleye (39 males, 14 females) were captured and 9 were recaptures. The resulting population estimate was 1,944 adult Walleye. Walleye captured during the survey were all above the 15-inch minimum size limit (15.5 – 27.8 inches) with an average length of 20.4 inches (Figure 1). During the 2009 Status & Trends survey, 60 Walleye were captured (6-24 inches) and 88% of fish were over the 15 inch-minimum size limit.

There were 11 year classes of Walleye observed in the aged sample from the 2022 survey (Ages 3 – 13; N=126 Walleye). Walleye year class was compared to stocking history in Fremont Lake and year classes in which stocking occurred comprised 44.4% of aged fish. The 2015 year class (Age 7) when no stocking occurred accounted for 32.5% of all aged fish (Figure 2). Average length at age (N=126 Walleye) was greater than the state average for Ages 3-7 and the mean growth index for these ages was +1.8 (Table 2; Figure 3). Walleye captured in 2009 were also growing above the state average (mean growth index = +2.2; N=60).

Other species captured included Black Crappie, Common Carp, Northern Pike, Bluegill, Pumpkinseed, and Common White Sucker. Most of the bycatch was comprised of Black Crappie and Northern Pike. A total of 424 Northern Pike were captured that were 9-30 inches in length (average length = 21.3 inches). The majority of Black Crappie captured were under 7 inches (average length = 6 inches) and over 200 fish were handled during the survey.

### Fall Recruitment Survey

Four Age-0 Walleye (5-9 inches) and two adult Walleye (15-19 inches) were captured during the survey. The Age 0 catch rate was 0.80 Walleye/mile of shoreline sampled (Table 3). OTC analysis indicated that 2 out of 3 Age-0 Walleye samples were of stocked origin. During the 2018 fall Walleye recruitment survey, 162 Walleye were captured and 111 were Age 0 (21. Walleye/mile; Table 4). Based on OTC analysis, 50% of the 2018 Age-0 Walleye samples (N=30) were of stocked origin.

### **Discussion**

Fremont Lake supports a Walleye fishery with many fish over the minimum size limit and larger Walleye than would typically be expected in a lake this size. The population estimate, sizes of Walleye captured, and growth rates of Walleye indicate a healthy Walleye population, but it is still unclear how much naturally produced fish are contributing to the fishery. A non-stocked year class (2015, Age-7) represented 32.5% of all aged fish and several other non-stocked year classes were present, indicating that natural reproduction is contributing but may not be sufficient to sustain the population.

Walleye under the 15-inch minimum size limit were not captured during the population estimate or the fall walleye survey but were observed during the 2009 Status & Trends survey. Mature Walleye are the primary target of the spring population estimate, which coincides with the spawning period, so the lack of smaller Walleye is not uncommon. The Status & Trends survey protocol is intended to evaluate the entire fish community and uses a variety of gear types that may capture a wider size range of Walleye. However, the lack of Walleye under 15-inches in the spring survey could indicate that natural reproduction is not sufficient to sustain this population. Fremont Lake had not been stocked from 2018 to late spring 2022 and while some Walleye from the 2019-year class were present they comprised only 6% of the aged Walleye compared to the 2018-year class which represented 23% of Walleye. The results from fall Walleye surveys have been mixed; OTC results indicated that 50% and 66% of Age-0 Walleye were of stocked origin in 2018 and 2022, respectively. Fall Walleye catch rates are also not consistent so more recruitment evaluations would be needed to clarify the contribution of natural recruits (Table 3). The current stocking prescription could be reduced if further monitoring of Walleye in Fremont Lake can be conducted to assess the status of the fishery after reduced stocking, but it has produced a good Walleye fishery comprised of large individuals growing at rates above the state average.

The population estimate of 1,944 adult Walleye has been brought to the Inland Fisheries Committee and is awaiting their approval for inclusion in Table 1 of the 2007 Consent Decree. This estimate will also be helpful in development of a Michigan regression model for Walleye population estimates, which will help establish tribal harvest quotas based on Michigan data instead of the current Wisconsin model. While Fremont Lake is of interest to Native American tribes in the 1836 Ceded Territory, it is not a high priority system for tribal harvest and further assessment of the system by the Tribal Coordination Unit is not currently planned. However, Fremont Lake is a valuable and popular Walleye fishery in Newaygo County for state anglers and these results are informative for decisions about Walleye management in the future. Currently, the Fremont Lake Walleye population has high growth rates, and the population level is above target density of 2 Walleye/acre established in the Michigan Fish Stocking Guidelines II (Dexter and O'Neal 2004) to justify continued Walleye stocking. Monitoring through fall Walleye surveys would help assess the contribution of stocked and non-stocked year classes and provide an evaluation of the stocking prescription for future management decisions.

## **References:**

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- O’Neal, R. P. 2009. Fremont Lake Fisheries Survey Report. Michigan Department of Natural Resources, Cadillac.
- Tonello, M.A. 2019. Fremont Lake – 2018 Fisheries Survey Report. Michigan Department of Natural Resources, Cadillac.
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Table 1. Walleye stocking events in Fremont Lake, Newaygo County from 1983-2022. Asterisks (\*) indicate years with wild fish transplants.

Year	Species	Number	Avg. Length
1983	Walleye	2,965,000	0.4
1983*	Walleye	700	0.0
1984*	Walleye	107	22.6
1984	Walleye	21,381	3.7
1985	Walleye	3,273	4.3 - 9.7
1986	Walleye	51,684	1.5 - 9.1
1987	Walleye	24,600	1.7
1988	Walleye	1,276	2.9 - 5.7
1989	Walleye	30,814	2.0 - 2.2
1991	Walleye	60,803	1.4 - 1.73
1992	Walleye	93,597	1.1 - 2.73
1994	Walleye	83,088	1.1
1996	Walleye	82,131	1.1
1997	Walleye	72,787	1.9
1999	Walleye	81,068	1.1
2001	Walleye	101,319	0.9
2003	Walleye	79,098	1.0
2005	Walleye	79,384	1.1
2008	Walleye	39,444	1.1
2010	Walleye	41,343	1.1
2012	Walleye	41,862	1.0
2014	Walleye	51,646	1.8
2016	Walleye	39,300	1.1
2018	Walleye	39,500	1.5
2022	Walleye	35,694	1.0

Table 2. Weighted mean length at age from the 2022 Walleye population assessment on Fremont Lake, Newaygo County. Year class is also noted for each age and only age classes with 5 or more fish in the sample are included.

Age	Year Class	Average Length (in)	Length Range (in)	State avg. length (in)
3	2019	16.8	15.9 – 17.4	13.9
4	2018	18.8	17.0 – 21.0	15.8
5	2017	19.9	17.3 – 22.5	17.6
6	2016	22.6	20.0 – 25.1	19.2
7	2015	21.5	19.1 – 27	20.6
8	2014	22.1	20.3 – 25.9	21.6
9	2013	21.9	19.9 – 25.9	22.4

Table 3. 2022 Fremont Lake Walleye fall index survey results

Lake acreage:		790		
Miles of shoreline sampled:		5.02		
Hours of electrofishing:		2.14		
Water temperature:		64.3 F		
Year Class	Age	# Walleye captured	Catch Rate (# Walleye/mile of shoreline sampled)	Catch Rate (# Walleye/hour)
2022*	0	4	0.80	1.87

\*Indicates stocking year

Table 4. Comparison of Fremont Lake Walleye fall index survey data.

	# Walleye captured	Catch Rate (# Walleye/mile of shoreline sampled)
<b>2005*</b>		
Age 0	12	4.2
Age 1	0	0
<b>2018*</b>		
Age 0	111	21.8
Age 1	9	1.8
<b>2022*</b>		
Age 0	4	0.80
Age 1	0	0

\*Indicates stocking year

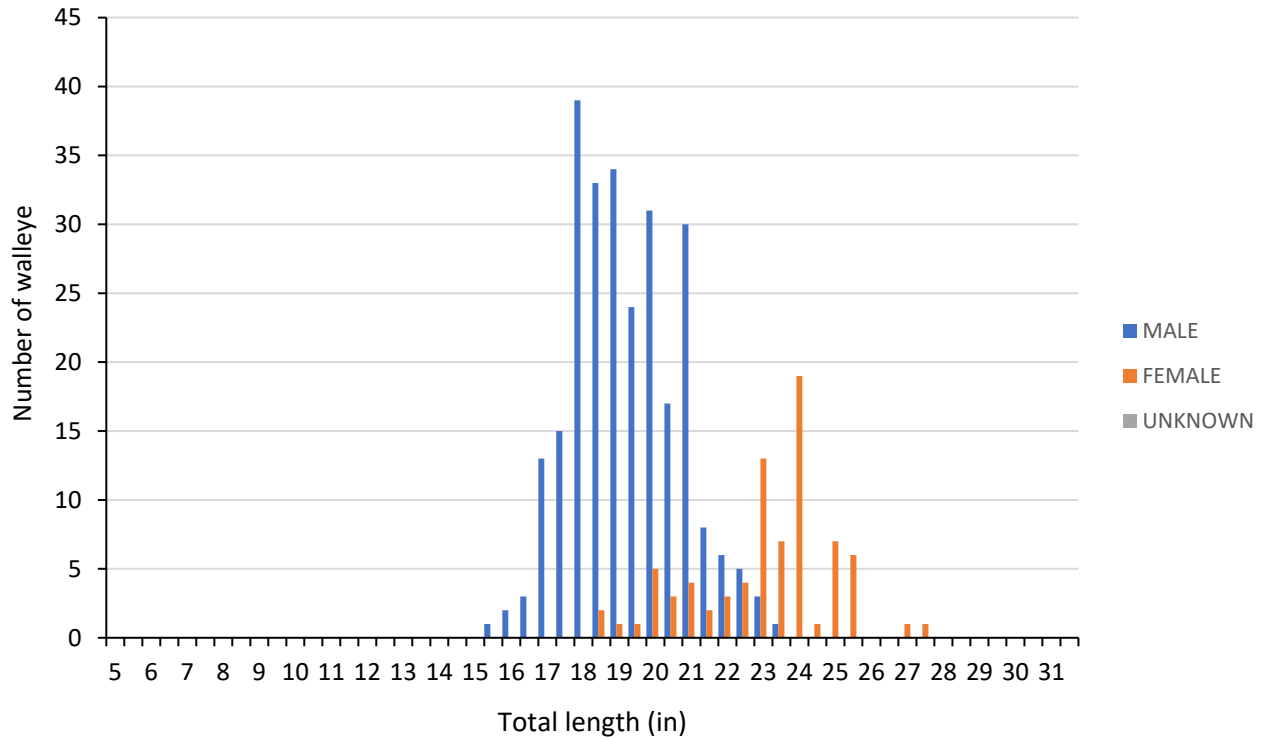


Figure 1. Length distribution of Walleye captured in the 2022 Fremont Lake survey marking phase.

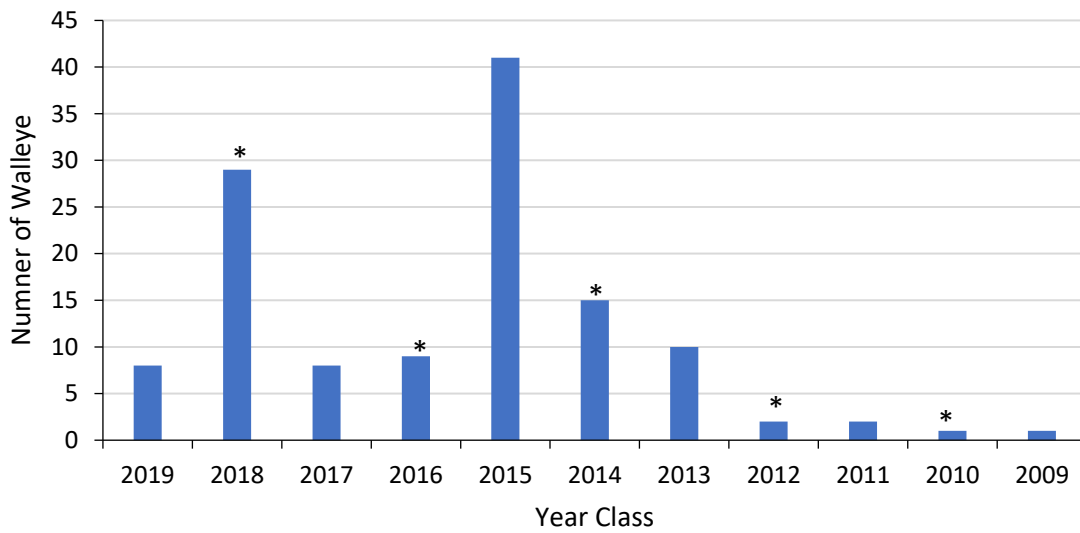


Figure 2. Number of Walleye caught from each year class during the 2022 Fremont Lake Walleye population assessment (N=126). Years with Walleye stocking are indicated by an asterisk (\*).

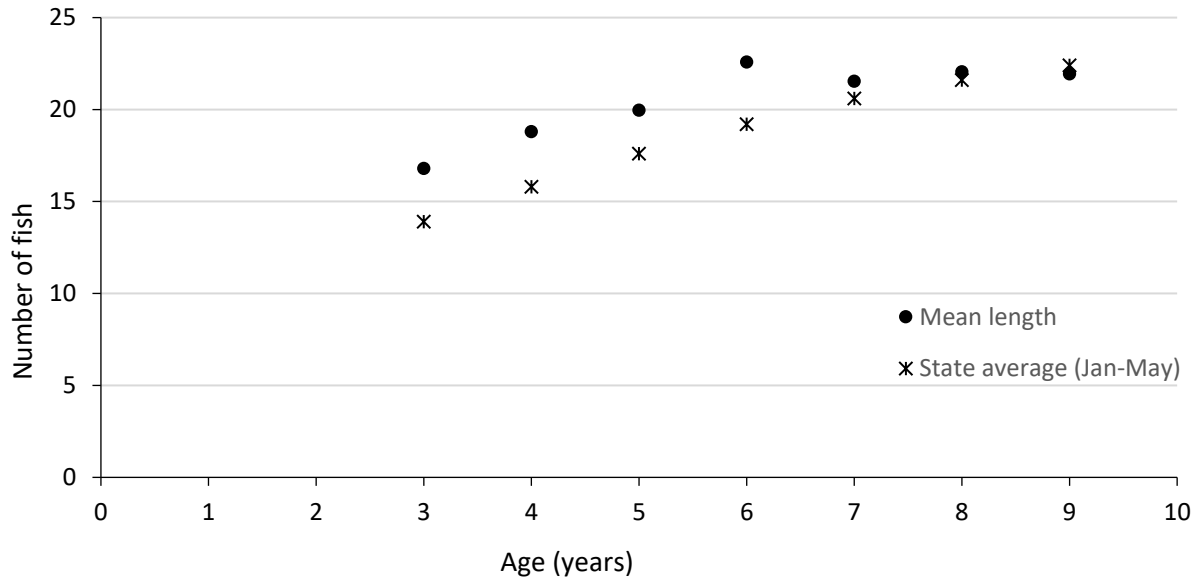


Figure 3. Weighted mean length at age for Walleye in Fremont, Newaygo County from the 2022 assessment. State average length at age for Walleye is included for comparison. Only age classes with 5 or more Walleye were included.