



09/27/2021 - 09/27/2021

Fish Collection System

Produced: April 4, 2022

Water: Brevoort Lake

T/R/S: 42N 05W 34

Status: Approved

Primary county: Mackinac

Dis. county: Mackinac

Survey begin: 09/27/2021

end: 09/27/2021

Special regs:

Purpose: Discretionary survey
Walleye Recruitment

Gear: BOOMSHK

Envelop

Effort #	Gear Type	Effort start, end	Effort meas.	Net Inv. #	Location
1	Boomshocker	09/27/2021 21:31 - 09/27/2021 23:56	8433 Seconds	8599	North Shoreline from reef pt to east bay with Moran ramp
2	Scale Envelopes	09/27/2021 21:31 - 09/27/2021 23:56			
3	Boomshocker	09/27/2021 21:14 - 09/27/2021 23:55	9510 Seconds		North Shore starting at reef complex going counter clockwise - Sault Tribe Boat

Analysis by: Martin

Collection by: Steimel, Martin, Crissman, Sault Tribe

Id. by: same

Water	Brevoort Lake T42N R05W S34							
Survey	09/27/2021-09/27/2021							
Gear	BOOMSHK, BOOMSHK, Envelop							
Effort meas.	9510.00 Seconds, 8433.00 Seconds, 0						Meas. total: 17943	
Species	Walleye							
Legal size (in)	>=15.00		>=		>=		>=	
Avg. length (in)	17.2		0.0		0.0		0.0	
Avg. weight (lb)	1.78		0.00		0.00		0.00	
	No.	Lb.	No.	Lb.	No.	Lb.	No.	Lb.
Total	58	103.03	0	0.00	0	0.00	0	0.00
No. legal	54		0		0		0	
% Legal size	93.10%							
% Total catch	100.00%		0.00%		0.00%		0.00%	
CPE	0.00		0.01					
Inch group								
0								
1								
2								
3								
4								
5								
6								
7								
8	1	0.19						
9								
10								
11								
12								
13	1	0.79						
14	2	1.97						
15	14	16.88						
16	15	21.86						
17	10	17.42						
18	3	6.19						
19	3	7.26						
20	4	11.27						
21								
22	4	14.94						
23	1	4.26						
24								
25								
26								
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
Sample total:	58	103.03	0	0.00	0	0.00	0	0.00
Effort date(s):	9/27/2021 21:14 - 9/27/2021 23:55, 9/27/2021 21:31 - 9/27/2021 23:56, 9/27/2021 21:31 - 9/27/2021 23:56							
All species total:	Number:		58		Pounds:		103.03	
	North Shore s Moran ramp							



DNR

Fish Collection System

All Efforts

Produced: April 4, 2022

Water: Brevoort Lake

County T/R/S: Mackinac

Watershed: Brevoort

42N 05W 34

Survey begin: 09/27/2021 end: 09/27/2021

Status: Approved

Survey purpose: Discretionary survey
Species evaluation

No. gear used	Gear type	Common name
2		
	BOOMSHK	Boomshk
	ENVELOP	Envelop

Species / Age	No. aged	Length range (in.)	State avg. length (in.)	Weighted mean len. (in.)	Weighted age freq.	Mean growth index*
Walleye						+1.2
	1			17.30	1.72%	
Age 0:	1	8.00-8.00	7.1	8.00	1.72%	
Age II:	2	13.60-14.50	13.3	14.05	3.45%	
Age III:	34	14.20-19.20	15.2	16.44	72.41%	
Age IV:	2	17.70-20.00	17.2	18.85	3.45%	
Age V:	1	22.50-22.50	18.6	22.50	1.72%	
Age VIII:	3	20.90-22.70	22.1	21.93	5.17%	
Age IX:	2	20.80-23.70	22.9	22.25	3.45%	
Age XIII:	1	19.70-19.70		19.70	1.72%	
Age XIV:	2	20.20-22.20		21.20	3.45%	
Age XV:	1	19.50-19.50		19.50	1.72%	

* Mean growth index is the average deviation from the state average length at age.



Brevoort Lake, Mackinac County
2021 Fall Walleye Recruitment Survey
Emily K. Martin, Tribal Coordination Unit

Introduction

Brevoort Lake is a large, 4,001-acre, shallow lake located in central Mackinac County in Michigan's Upper Peninsula (Figure 1). In Mackinac County, St. Ignace is to the southeast while Brevoort Township is located just west of Brevoort Lake approximately 15 miles northwest of the Mackinac Bridge. Little Brevoort Lake is connected to and flows into Boedne Bay of Brevoort Lake via the Little Brevoort River. Silver Creek also serves as tributary to Brevoort Lake located in the northeast of Boedne Bay. The Little Cut River flows into Brevoort Lake on the northeast shore near Walker Road. Brevoort River is the sole outflow of Brevoort Lake and serves as a tributary to Lake Michigan 10.8 miles downstream of Brevoort Lake. A water level control structure, built in 1935, is located near the mouth of the Brevoort River and has been operated annually by USFS staff. The littoral zone of Brevoort Lake consists of unstable sand substrate with scattered beds of bulrush, while Boedne Bay (west) and Christiansen's Bay (east) provide more productive substrates consisting of loose organic and mixed sand-organic substrates (Bassett 1987). A 2000-ft rock structure, or diversity reef, was installed in Brevoort Lake in 1984-85 to increase spawning habitat for Walleye and other species. This project was in response to surveys in the 1970s which indicated that spawning habitat was limiting the fishery. The structure was modified in the early 2000s to submerge a larger percentage of the rock and improve its suitability for Walleye spawning.

The Brevoort Lake area is a recreational destination located in the eastern region of the Hiawatha National Forest offering diverse opportunities for outdoor activities (e.g., camping, hunting fishing, hunting, ORVing, hiking, ice fishing, snowshoeing). Nearly the entire south shore of Brevoort Lake is public land (USFS ownership). Two public boat launches exist in Brevoort Lake: 1) located in Boedne Bay as part of a USFS campground and 2) located in Christiansen's Bay in the southeast corner of the lake off Dukes Road (Bauman 2018). Brevoort Lake also has private ownership along its shoreline but has a residential development level that is below average compared to other waterbodies in the area and across the state of Michigan. The Straits Area Sportsmen's Club is an active participant in management of the Brevoort Lake fishery and from 2003 to 2013 the Straits Area Sportsmen's Club built and deployed 220 fish cribs into Brevoort Lake to increase participation for anglers in the area (Bauman 2018).

Records indicate that fisheries management in Brevoort Lake began in the late 1800s with stocking of Walleye and Lake Trout. Due to the shallow and warm water characteristics of the system, Lake Trout survival would have been extremely limited. Following these early efforts, Largemouth Bass and Smallmouth Bass were stocked in addition to Walleye through the 1920s. Over the next 100 years, Brook Trout, Walleye, Yellow Perch, Northern Pike, Muskellunge, Bluegill, Largemouth Bass, and Smallmouth Bass were stocked periodically in Brevoort Lake. After 1979, stocking efforts focused primarily on Walleye (Table 1), though Muskellunge were stocked in 1994. Walleye stocking ceased for several years after a 1989 survey indicated that substantial natural reproduction was occurring, but the Walleye population declined despite documented natural reproduction, and stocking was resumed in 1997 (Bauman 2018). Brevoort Lake is currently managed as a 'mixed-bag' fishery where Walleye, Smallmouth Bass, Northern Pike, Muskellunge, Yellow Perch and various panfish species offer diverse angling opportunities.

Brevoort 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 recruitment source (or recruitment code) for a Walleye population determines the version of the Wisconsin Regression that is used for this estimate. Spring spearing harvest of Walleye in Brevoort Lake is low, with only 40 Walleye harvested during the spring spearing season since 2008. Currently, Brevoort Lake is listed as being a stocked system (more than 50% of Walleye are from stocking). There have been many fall Walleye recruitment surveys conducted in this system by MDNR and the U.S. Forest Service. Age-0 Walleye catch rates have varied considerably indicating that natural reproduction is intermittent, and survival of stocked Walleye may be inconsistent (Figure 1). A fall Walleye recruitment survey was completed in Brevoort Lake by MDNR's Tribal Coordination Unit and the Sault Tribe of Chippewa Indians to evaluate natural recruitment in this system prior to the October 2021 private Walleye plant.

Methods

On September 27, a fall Walleye recruitment survey was conducted on Brevoort Lake using the Resource Inventory Program Walleye fall indexing protocol. Due to weather conditions, only two stations were surveyed using two electrofishing boats after dark instead of the originally planned six, two-mile stations. The total distance covered during the survey was 9.69 miles. After completion of the survey, 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 60-62.5 F during the survey. All captured Walleye were released.

Results

A total of 58 Walleye (8-23 inches) were captured during the survey, including 1 Age-0 Walleye (8 inches). The Age 0 catch rate was 0.10 Walleye/mile of shoreline sampled (Table 2). There were 10 age classes represented (N=50) and the majority of Walleye (68%) aged were Age-3. During past surveys the catch rate for Age-0 Walleye has varied from 0-31.05 Age-0 Walleye/mile (Figure 1, Table 3). The water temperatures during the survey were 60-62.5 F.

Discussion

There is intermittent natural reproduction occurring in Brevoort Lake based on the results of the 2021 survey and past Age-0 catch rates (Figure 1, Table 3). Survival of stocked Walleye may be variable, based on variation in catch rates between stocking years. For example, the highest Age-0 Walleye catch rate observed in Brevoort Lake in a stocked year is 30.02 Walleye/mile surveyed in 1988 when 43,768 spring fingerlings were stocked, but when 38,335 spring fingerlings were stocked in 2013 there were no Age-0 Walleye captured. However, a 2015 fall survey conducted by SSMT documented the success of stocked spring fingerling Walleye, with over 93% of the young of year and juvenile fish captured verified as stocked through the presence of oxytetracycline marks (IFWD 2015). The variability of catch rates could also be due influences other than stocked fish survival, such as location of survey stations from year to year, number of miles surveyed, and weather conditions during the survey.

Fall Walleye surveys would need to be done in several, subsequent years to fully assess the status of natural reproduction and success of stocking in Brevoort Lake. Based on the results of the most recent Status & Trends survey the Walleye population is healthy with growth rates near the state average. There were 13 year classes present in the 2018 survey which

also indicates low mortality (Bauman 2018) and the 10 year classes observed within the small sample of Walleye collected during the 2021 survey indicates survival of both natural and stocked year classes. While the Brevoort Lake Walleye population may be self-sustaining, without stocking it may not remain at desirable levels and continued stocking at current levels appears to be sufficient.

References

Bassett. 1987. Monitoring report (1984 to 1986) Brevoort Lake Reef. United States Forest Service, St. Ignace, MI
 Bauman, J.M. 2018. Brevoort Lake, Mackinac County. Status & Trends report, unpublished.
 IFWD. 2015. An Assessment of the Walleye (*Sander vitreus*) population in Brevoort Lake, Michigan. Sault Ste. Marie Tribe of Chippewa Indians: Inland Fisheries and Wildlife

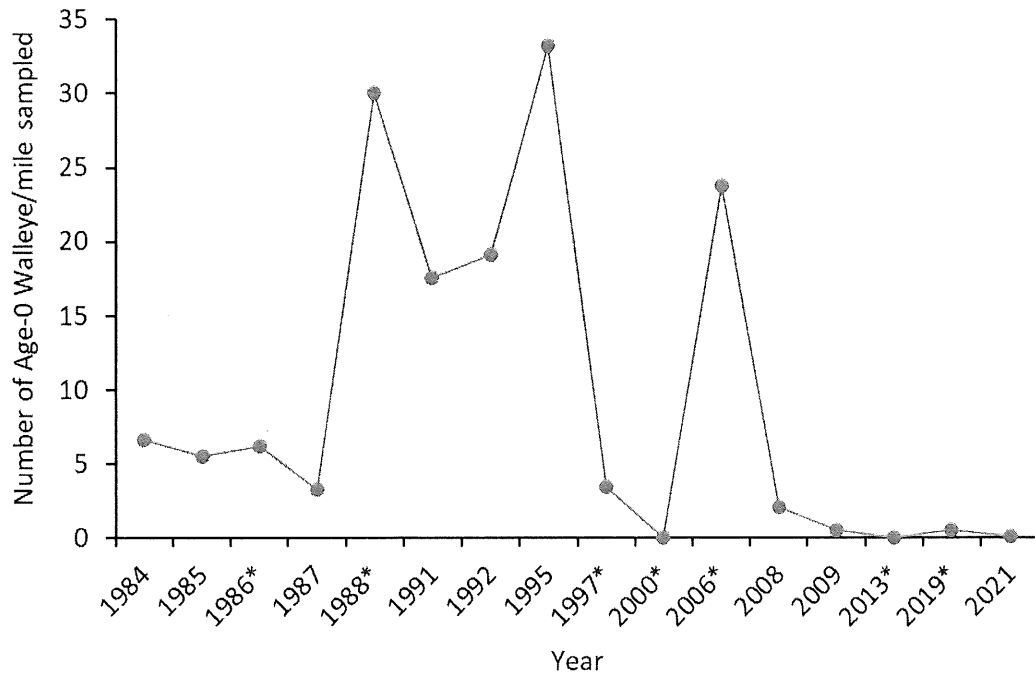


Figure 1. Age-0 Walleye captured per mile of shoreline sampled in each survey year on Brevoort Lake, Mackinac County. Years with a stocking event prior to the completion of the survey are noted by an asterisk (*).

Table 1. Walleye stocking history in Brevoort Lake, Mackinac County from 1889-2021.

Year	Species	Number Stocked
1889	Walleye	2,220,000
1905	Walleye	350,000
1933	Walleye	150,000
1933	Walleye	150,000
1935	Walleye	180,000
1935	Walleye	120,000
1936	Walleye	300,000
1937	Walleye	630,000
1938	Walleye	500,000
1939	Walleye	1,200,000
1940	Walleye	750,000
1941	Walleye	360,000
1978	Walleye	32,613
1979	Walleye	39,817
1980	Walleye	50,029
1981	Walleye	5,394
May 1982	Walleye	2,081,300
July 1982	Walleye	10,581
July 1983	Walleye	15,339
August 1983	Walleye	6,800
June 1986	Walleye	31,070
July 1986	Walleye	67,011
1988	Walleye	43,768
1989	Walleye	10,155
1997	Walleye	20,534
1998	Walleye	8,160
2000	Walleye	22,665
2003	Walleye	19,433
2006	Walleye	21,945
2011	Walleye	22,000
2013	Walleye	38,335
2014	Walleye	10,000
2015	Walleye	51,262
2017	Walleye	50,250
2018	Walleye	3,000
July 2019	Walleye	46,644
Oct. 2019*	Walleye	3,000

Oct. 2021* Walleye 400

*Denotes a private stocking event

Table 2. 2021 Brevoort Lake Walleye fall index survey results

Lake acreage:	4,001			
Miles of shoreline sampled:	9.69			
Hours of electrofishing:	4.98			
Water temperature:	60-62.5			
Year Class	Age	# Walleye captured	Catch Rate (# Walleye/mile of shoreline sampled)	Catch Rate (# Walleye/hour)
2021	0	1	0.10	0.20
2020	1	0	0	0

Note: Walleye stocking occurred in 2021 after the completion of the fall index survey

Table 3. Results from Walleye fall index surveys in Brevoort Lake, Mackinac County.

Year	Water Temp (F)	Hours Shocked	Miles Shocked	Age-0 Walleye collected	No. Age-0 per mile
1984	--	--	--	--	6.65
1985	--	--	--	--	5.48
1986*	--	--	--	--	6.23
1987	--	--	--	--	3.24
1988*	--	4.09	6.13	184	30.02
1991	54	3.27	6.54	115	17.58
1992	--	--	--	--	19.13
1995	--	--	--	--	33.25
1997*	56	3.1	4.1	14	3.41
2000*	--	0.52	--	0	0
2006*	--	--	--	--	31.05
2008	--	1.0	3.40	7	2.06
2009	--	3	3.60	2	0.55
2013*	57	1.50	3.85	0	0.00
2019**	--	2.69	6.07	3	0.50
2021*	60-62.5	4.98	9.69	1	0.10

*Denotes a year with Walleye stocking

**Indicates a year with a private stocking event