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Study 4
Job 862

Minnesota Department of Natural Resources
Division of Fish and Wildlife

Completion Report

Largemouth and smallmouth bass population estimate on two Walker area lakes

by

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ABSTRACT:

A population estimate for largemouth bass was calculated on Blackwater and Mule Lakes in 2011 using Chapman modification of the Peterson estimate and their respective 95% confidence intervals. The estimated population size of largemouth bass 8 inches and longer was 15.78 (7.45 – 36.40) fish per acre for Blackwater Lake and 8.19 (7.39 – 16.76) for Mule Lake. Several largemouth bass were reported to be caught twice during the summer of 2011.

INTRODUCTION

A catch and release (i.e., no-kill) regulation for largemouth and smallmouth bass was implemented on Blackwater and Mule Lakes in 2004. In 2007, a creel survey was conducted on these lakes a part of a multi-lake survey and documented a considerable number of largemouth bass were caught and released on both Blackwater and Mule Lakes (Shavlik 2008). In 2009, the no-kill regulation was reviewed and, based on public input, was modified to require that all bass (i.e., largemouth and smallmouth) over 12 inches must be immediately released.

A summer creel survey (Cook 2001) and largemouth bass population estimate (Walker Fisheries unpublished data) were completed on Portage Lake in 2000. A conservative comparison of angler catch relative to the population estimate indicated each bass was caught an average of 2.94 times annually. Similar "recycling" of largemouth bass was suspected to be likely on Blackwater and Mule Lakes, and this could be impacted by harvest of fish shorter than 12 inches per the recently revised regulation. Thus, fisheries staff determined that a population size estimate combined with a creel survey in 2011 would provide guidance for future management alternatives on these and other area waters capable of supporting quality bass populations.

STUDY AREA

Blackwater (DOW# 11-274), located in upper Cass County near Longville, Minnesota is a 766.67-acre lake with 7.63 miles of shoreline and a maximum depth of 67 feet (Figure 1; Table 1). The lake is primarily managed for northern pike, largemouth bass, smallmouth bass, and walleye and secondarily for bluegill, black crappie, yellow perch, and cisco. Blackwater Lake is in Lake Class 25; lakes in this class are deep, clear, and irregularly shaped lakes. Relative to

other Class 25 lakes, Blackwater Lake currently supports an abundant northern pike population with a declining size structure, a moderately abundant walleye population, and a relative low-density yellow perch population.

Mule Lake (DOW# 11-200), located in upper Cass County near Longville, Minnesota, is a 524.57-acre lake with 7.31 miles of shoreline and a maximum depth of 47 ft (Figure 1; Table 1). The lake is primarily managed for northern pike, walleye, and yellow perch and secondarily for smallmouth bass, largemouth bass, bluegill, and black crappie. Mule Lake is in Lake Class 23; these lakes tend to be clear, deep and have a very low proportion of area less than 15 ft deep. Relative to other Class 23 lakes, Mule Lake currently supports an abundant northern pike population with a declining size structure, a low-density walleye despite elevated stocking efforts, and a low-density yellow perch population.

METHODS

Population size was estimated from a single recapture event using the Chapman modification of the Peterson estimate (Van Den Avyle and Hayward 1999) and 95% confidence intervals were calculated for Poisson-distributed recapture data (Ricker 1975). Estimates were calculated using both recapture methods of angling and fall electrofishing.

Marking

Bass were collected in June 2011 by electrofishing with a flat bottom boat equipped with a 2VPP Coeffelt unit. Anode arrangement was a single spider cable array. All largemouth and smallmouth greater than 200 mm total length (TL) were tagged with two T-bar anchor tags (Hallprint External tag with individual number) between the pterygiophores at the rear of the dorsal fin. All fish were marked with two tags to estimate tag loss. Electrofishing stations were

based on previous sampling locations for largemouth and smallmouth bass which were stored in the Lake Survey Module database (Figure 2)

Recapture

Largemouth and smallmouth bass were recaptured during angling events by Minnesota Department of Natural Resources Fisheries staff and several volunteer anglers during the period June 16 – 30, 2011. Additional electrofishing survey was completed in October 2011 and all marked fish were examined for tag loss.

Other considerations

Blackwater and Mule Lakes were part of a 12-lake creel survey in the Walker Area in 2011 (Shavlik 2012). Other tag number returns reported to website and call-in to the Walker office were summarized but were of limited value when calculating modified Peterson estimates because the anglers did not record the lengths of untagged fish. Largemouth and smallmouth bass were sampled in summer nets taken during a standard lake survey in July 2011 on Blackwater Lake. Mule Lake was not surveyed in 2011.

RESULTS AND DISCUSSION

A total of 652 largemouth bass and 60 smallmouth bass for Blackwater Lake (Table 2) and 569 largemouth bass and 63 smallmouth bass on Mule Lake (Table 3) were captured during spring electrofishing, angling events, and fall electrofishing. Population size estimates were attempted for largemouth and smallmouth bass on both lakes. However, the small sample size was an issue for smallmouth bass on both lakes and was consistent with historical sampling data in both cases. The length frequency distribution of largemouth bass caught on both lakes between spring electrofishing, angling, and fall electrofishing were similar; however, any

potential bias would be overshadowed by the low sample size of recaptures. Also, the State of Minnesota government shutdown (July 1 to 21) limited the ability to follow up with volunteer anglers to determine if more angling was needed during the first two weeks of July to increase the sample size of fish caught.

Modified Peterson estimates

Blackwater A total of 447 largemouth bass were tagged during 22 spring electrofishing runs across four evenings. The entire shoreline was sampled at least once during the 22 electrofishing runs (Figure 2). During ten angling events (boat-days), anglers caught 161 largemouth bass of which five were marked. The estimated population size (8 inches or larger ± 95% confidence interval) was 15.78 (7.45 – 36.40) fish per acre (Table 4). For largemouth bass greater than 12 inches, the estimated population size was 14.24 (6.36 – 35.61) fish per acre (Table 4).

During fall electrofishing, 44 largemouth bass were captured and seven had tags. Of the tagged fish, fish grew an average of 0.35 inches (range: 0.08 – 0.51 inches) from the time of tagging in spring to recapture in the fall.

For smallmouth bass, 49 fish were tagged, and anglers captured 10 fish with one having a tag. The estimated population size with this low sample size was 0.36 (0.11 – 0.65) fish per acre further indicating the population is low-density. Only one smallmouth bass was captured during fall electrofishing.

Mule A total of 415 largemouth bass were tagged during twelve spring electrofishing runs across three evenings. During five angling events (boat-days), anglers caught 92 largemouth bass of which eight were marked. The estimated population size (8 inches or larger) using spring electrofishing and angling data was 8.19 (4.39 – 16.76) fish per acre (Table 4). This

estimate is higher than the 2003 estimate of 4.14 fish per acre (unpublished data). For largemouth bass greater than 12 inches, the estimated population size was 5.69 (2.69 – 13.14) fish per acre (Table 4).

During fall electrofishing, 62 largemouth bass were captured and 11 of them had tags. Of the tagged fish, largemouth bass grew an average of 0.25 inches (range: -0.11 – 0.63 inches) from tagging in spring to recapture in the fall.

For smallmouth bass, 52 fish were tagged, and anglers captured 11 fish with three having a tag. Even when using these small sample size, the estimated population size (8 inches or larger) was 0.30 (0.12 – 0.76) fish per acre. No smallmouth bass was captured during fall electrofishing.

Tag loss

All bass caught during fall electrofishing were observed to evaluate tag loss. Zero tag loss was observed on Blackwater Lake from fall electrofishing (n=7) or from angled fish (n=6). Conversely, single tag loss (18%) was observed on Mule Lake in both the fall electrofishing sample (n=11) and in angled catch (n=11) but there was no double tag loss observed.

Multiple recapture

A total of 34 tagged largemouth bass caught in Blackwater Lake were reported to the Walker office, and three of them were reported twice by anglers (different name/date; Table 5). For Mule, 42 tagged largemouth bass were reported and four of them were reported twice by anglers (different name/date; Table 5). For either lake, no fish was reported more than twice.

When looking at the estimated population sizes of largemouth bass 8 inches or longer and the associated total catch from the 2011 creel survey in 2011, the average largemouth bass on Blackwater Lake was caught once every year, while on Mule Lake each largemouth bass was

approximately 2.58 times per year (Table 6).

Other

Thirty-three largemouth bass and seven smallmouth bass were captured during summer netting on Blackwater Lake. One largemouth and one smallmouth bass were marked and both tags were in the fish. Netting occurred after the population size was estimated, and thus had no effect on the outcomes of this investigation. In the creel survey, only two angling parties interviewed on Blackwater reported tag information from that day of fishing, no such interviews were obtained on Mule Lake.

RECOMMENDATIONS

1. Continue to document tag returns from anglers to see if tagged fish are being caught multiple times during their lifetime, mostly of tag return will recorded online.

2. Document the presence of tags during electrofishing assessments to enhance existing information on tag loss and growth.

ACKNOWLEDGMENTS

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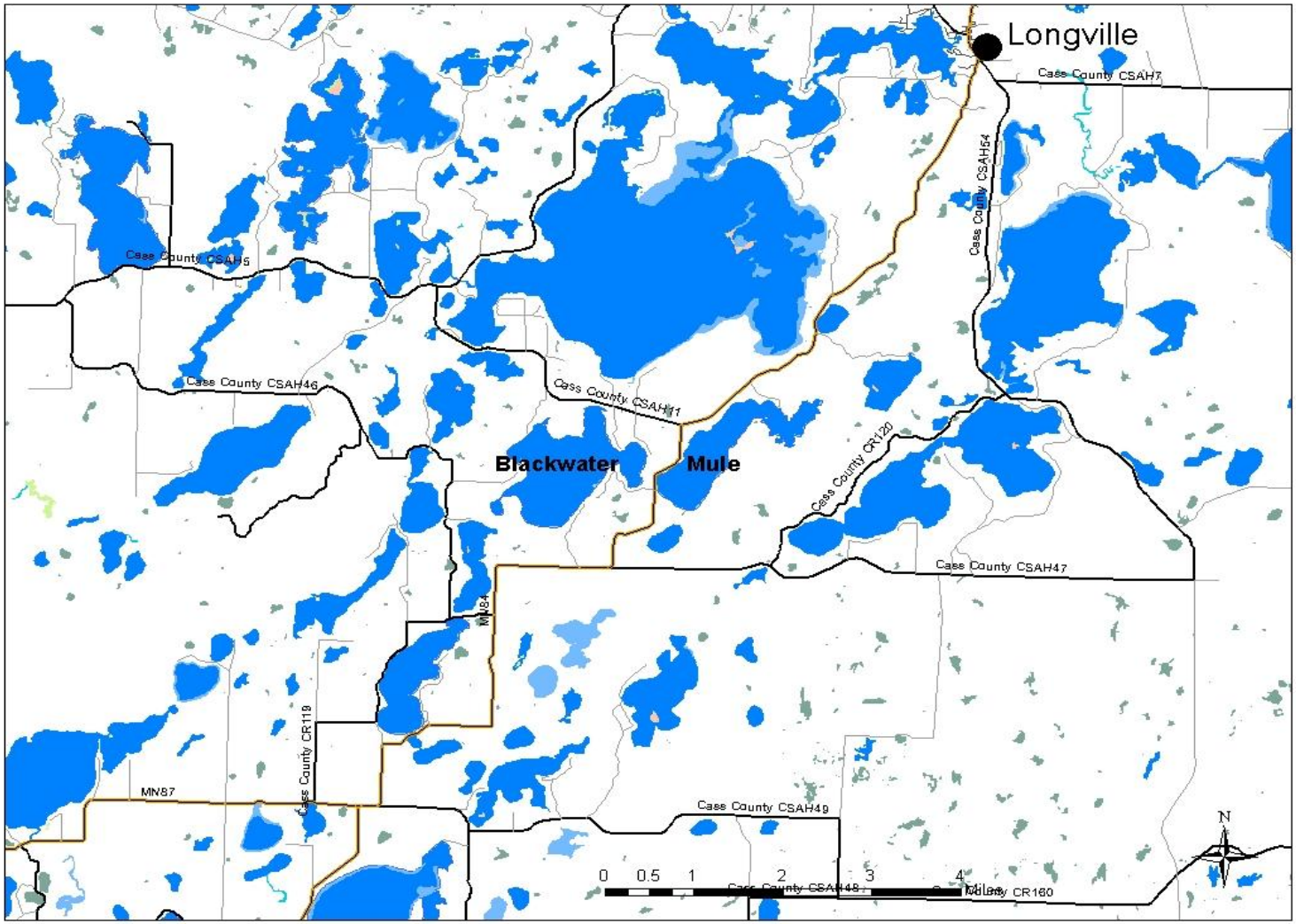

Figure 1. Map of Blackwater and Mule Lakes, Cass County, Minnesota in relations to Longville.

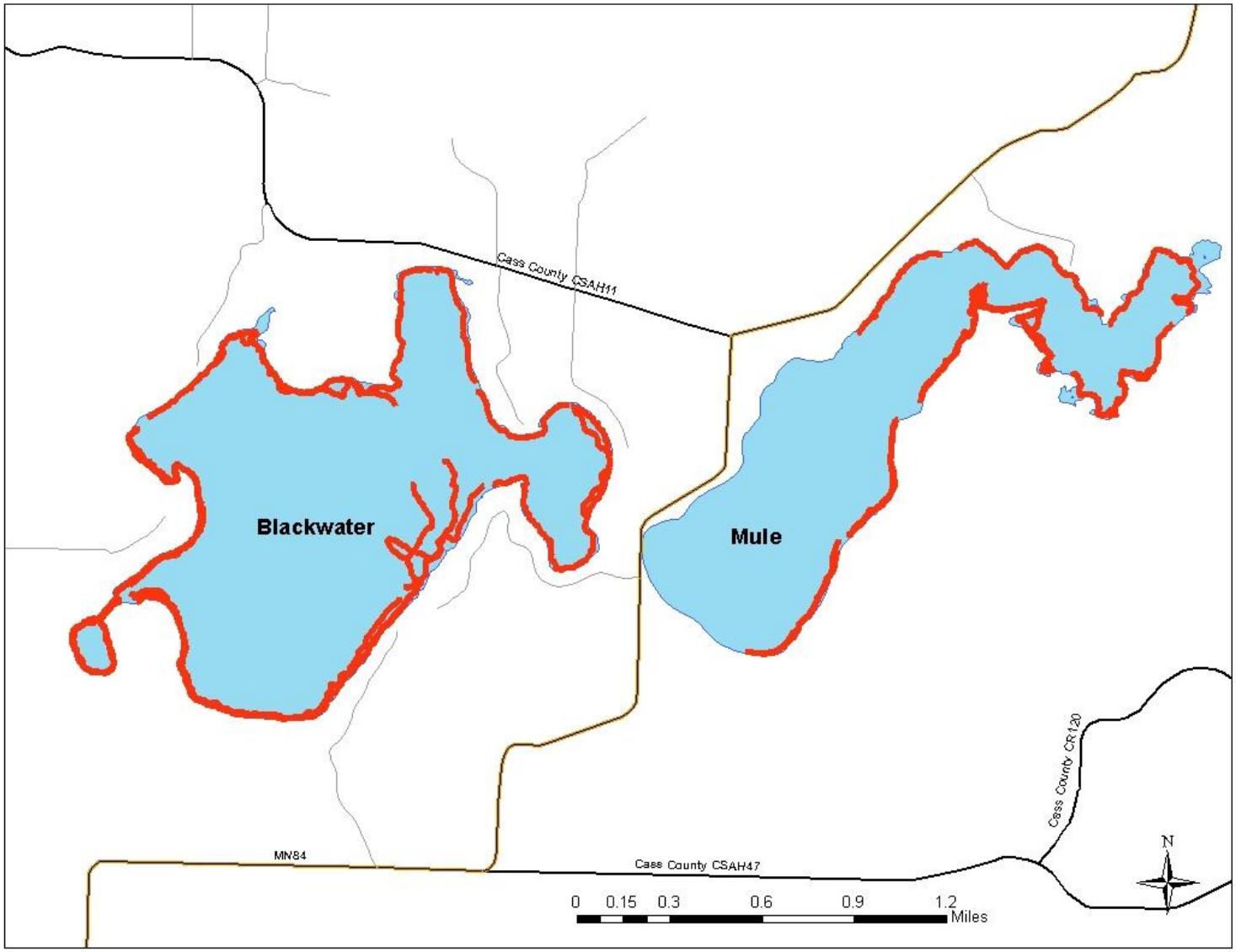

Figure 2. Sampling tracks on Blackwater and Mule Lake, Cass County, Minnesota.

Table 1. Selected descriptive characteristics for Blackwater and Mule Lake in Cass County, Minnesota.

Lake	DOW	Total surface area (acres)	Shoreline length (miles)	Max depth (ft)
Blackwater	11-274	766.66	7.63	67
Mule	11-200	524.57	7.31	47

Table 2. Length frequency distributions of the largemouth and smallmouth bass caught during electrofishing and angling in 2011 on Blackwater Lake, Cass County, Minnesota. The number in () is the number of tagged fish caught.

	Largemouth bass				Smallmouth bass			
Inches	Spring EF	Spring angling	Fall EF	Summer Creel	Spring EF	Spring angling	Fall EF	Summer Creel
0.0 – 6.9				2				1
7.0 – 7.9	1			4				
8.0 – 8.9	18	8	1		2			
9.0 – 9.9	4	5(1)	1		5			
10.0 – 10.9	17	2		27	4	1		3
11.0 – 11.9	18	7	1		4			
12.0 – 12.9	55	13	2	110	3	1		3
13.0 – 13.9	117	28(1)	6(2)		5	2		
14.0 – 14.9	106	34(1)	9(1)	163	4	1		8
15.0 – 15.9	66	44(1)	18(3)	237	9	2(1)		4
16.0 – 16.9	31	16(1)	4(1)		3	2	1	
17.0 – 17.9	9	3	1	125	5			10
18.0 – 18.9	4		1		4			
19.0 – 19.9	1			11	1			1
20.0 -20.9		1		12		1		4
>21.0								1
N	447	161(5)	44(7)	691	49	10(1)	1	35

Table 3. Length frequency distributions of the largemouth and smallmouth bass caught electrofishing and angling in 2011 on Mule Lake, Cass County, Minnesota. The number in () is the number of tagged fish caught.

	Largemouth bass				Smallmouth bass			
Inches	Spring EF	Spring angling	Fall EF	Summer Creel	Spring EF	Spring angling	Fall EF	Summer Creel
0.0 – 6.9				3				
7.0 – 7.9	1			2				2
8.0 – 8.9	5	7	2		1	2		
9.0 – 9.9	8	9(2)	2	5				1
10.0 – 10.9	21	8	2	31	3	1		4
11.0 – 11.9	55	14(1)	3		2			
12.0 – 12.9	108	23(3)	15(1)	223	4	1(1)		14
13.0 – 13.9	69	19(1)	15(3)		4	1		
14.0 – 14.9	64	3	10(2)	197	4			13
15.0 – 15.9	40	6(1)	8(4)	241	5	3(1)		37
16.0 – 16.9	22	2	2	12	14	3(1)		1
17.0 – 17.9	16	1	1	81	8			47
18.0 – 18.9	4		1(1)		6			
19.0 – 19.9	2		1	2				9
20.0 -20.9				18	1			9
>21.0								
N	415	92(8)	62(11)	815	52	11(3)		137

Table 4. Estimated population size (#/acre) and 95% confidence intervals for largemouth and smallmouth bass longer than 8 and 12 inches on Blackwater and Mule Lakes, Cass County, Minnesota. Marking was completed with spring electrofishing and recapture effort was completed via angling.

Lake	Species	Size	N marked (N recap)	Estimated Population (#/acre)	95% Confidence Interval
Blackwater	Largemouth bass	8 inches and larger	447 (161)	15.78	7.45 – 36.40
		12 inches and larger	389 (139)	14.24	6.36 – 35.61
	Smallmouth bass	8 inches and larger	49 (10)	0.36	0.11 - 0.65
Mule	Largemouth bass	8 inches and larger	415 (92)	8.19	4.39 – 16.76
		12 inches and larger	325 (54)	5.69	2.69 – 13.14
	Smallmouth bass	8 inches and larger	52 (11)	0.30	0.12 – 0.76

Table 5. Number of tagged largemouth and smallmouth bass reported to website or call-in to the Walker fisheries office for Blackwater and Mule Lakes, Cass County, Minnesota.

Lake	Species	Reported	Caught twice
Blackwater	Largemouth bass	34	3
	Smallmouth bass	3	0
Mule	Largemouth bass	42	4
	Smallmouth bass	5	0

1. As of February 1, 2012

Table 6. Estimated total catch and harvest (#/acre) of largemouth bass 8 inches or longer from 2007 and 2011 creel surveys, largemouth bass population size 8 inches or longer (#/acre), and % of the 2011 population caught on Blackwater and Mule Lakes, Cass County, Minnesota.

Lake	2007		2011		Population estimate	% of 2011 population caught
	Catch	Harvest	Catch	Harvest	(#/acre)	
Blackwater	11.76	0.00	15.72	0.00	15.78	99.6
Mule	23.53	0.00	21.20	0.08*	8.19	258.9

* 28.6% were of illegal size