CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: October 27, 2015 FILE REF: [Click **here** and type file ref.]

TO: Carstens Lake File

FROM: Steve Hogler
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SUBJECT: 2015 Carstens Lake Electroshocking Survey

Carstens Lake is a small lake located 4 miles southwest of the city of Manitowoc in eastern Manitowoc County. The lake has a surface area of 20 acres, a maximum depth of 30 feet and is surrounded by agricultural land (WDNR 2001). Carstens Lake is moderately developed and has access available through a town road and county park located on the west side of the lake.

Since the early 1980's, Fish Management has used nearly every lake management strategy, including mechanical fish removal, chemical removal, construction of a fish barrier on the outlet stream to prevent Common Carp from entering the lake, aeration and stocking to improve the lake's fishery. Following the construction of the barrier and a rotenone treatment to remove the fish population in 1984, stocking has focused on Largemouth Bass, Northern Pike and Yellow Perch (Table 1). Most of these fish were field transfers from Rush Lake or other local lakes. High angler harvest, small founder populations, illegal stocking and continuing issues with poor water quality has made past management efforts only marginally successful (Surendonk 2002). Carstens Lake is currently managed as a bass-panfish lake with Largemouth Bass and Bluegill as the keystone species.

Table 1. The stocking history of Carstens Lake for fish stocked between 1972 and 2015.

Year	Species	Age Class	Number Stocked	Average Length
1974	NORTHERN PIKE	YEARLING	100	15
1975	NORTHERN PIKE	YEARLING	200	-
1976	NORTHERN PIKE	FINGERLING	100	11
1977	NORTHERN PIKE	FRY	30000	-
1978	YELLOW PERCH	ADULT	500	-
1978	LARGEMOUTH BASS	FINGERLING	3000	3
1983	LARGEMOUTH BASS	ADULT	39	11
1984	YELLOW PERCH	ADULT	50	11
1984	YELLOW PERCH	YEARLING	50	10
1985	YELLOW PERCH	ADULT	100	11
1985	NORTHERN PIKE	FINGERLING	200	9
1986	YELLOW PERCH	ADULT	1000	5
1998	YELLOW PERCH	ADULT (BROODSTOCK)	750	-
1998	FATHEAD MINNOW	ADULT (BROODSTOCK)	250000	-
1999	NORTHERN PIKE	LARGE FINGERLING	105	7.4
1999	LARGEMOUTH BASS	SMALL FINGERLING	1050	1.2
2011	YELLOW PERCH	ADULT	2000	6
2014	FATHEAD MINNOW	ADULT	19997	2
2014	YELLOW PERCH	YEARLING	2367	6
2014	YELLOW PERCH	LARGE FINGERLING	150	4

The most recent fish surveys on Carstens Lake were a survey in October 1998 to assess the status of the fish population following a partial winterkill during the winter of 1997-98 (Surendonk and Rohr 1998) and a 2010 survey to assess the fish populations of the lake (Hogler 2010). Bluegill and Largemouth Bass dominated the catch of these surveys with lower catches of other species.

Carstens Lake was surveyed in 2015 following statewide sampling protocols for bass/panfish lakes.

2015 Survey Results

Carstens Lake was surveyed on the night of May 12 following state protocols for surveying bass/panfish lakes. The water temperature at the time of the survey was 56 F. During the 40 minutes of electrofishing, the entire shoreline (0.77 mile) was shocked and all fish netted. Fish were identified, measured and a subsample of Largemouth Bass and Bluegill had the second dorsal spine removed and Black Crappie had scales removed to allow us to estimate age and growth.

We captured 182 individual fish representing five species during shocking (Table 2). Overall, our catch per effort (CPE) was 236.4 fish per mile shocked or 271.6 fish per hour. The dominant species in our catch were Bluegill and Largemouth Bass. Other species were captured in much lower abundances (Table 2).

Table 2. Catch summary of the May 12, 2015 night electroshocking survey of Carstens Lake.

Species	Number Caught	Size Range mm (in)	CPE Fish/ Mile	CPE Fish/ Hour
Bluegill	120	57-161 mm (2.2" to 6.3")	155.8	179.1
Black Crappie	13	165-201 mm (6.5" to 7.9")	16.9	19.4
Green Sunfish	1	100 mm (4")	1.3	1.5
Largemouth Bass	47	177-464 mm (7" to 18.3")	61.0	70.1
Yellow Perch	1	110 mm (4.3")	1.3	1.5
Total	182		236.4	271.6

Gamefish

The 47 Largemouth Bass that we collected during the survey ranged in size from 177 mm to 464 mm (7" to 18.3" and had an average length of 315 mm (12.4") (Table 3). Sixteen of the forty-seven bass (34.0%) were longer than the 356 mm (14") size limit and ten bass (21.3%) were greater than 400 mm (16") in length.

Analysis of the spine samples taken from bass that were captured indicated that ages 2 through 10 were present in our sample (Table 3). Age 5 Largemouth Bass were the most common age bass in our sample followed by age 4. Based on our age estimates, we did not capture many bass greater than age 5 in our survey.

Length at age comparison between Largemouth Bass in Carstens Lake to statewide averages can be made with the aging data that we collected to determine how bass are growing in the lake. Our data indicates that largemouth Bass in Carstens Lake appear to be growing at slightly less than state average rates (Table 4).

Table 3. The size and age distribution of Largemouth Bass captured during the May 2015 electroshocking survey of Carstens Lake.

Length mm (in)	Number Caught	Age									
		Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8	Age 9	Age 10
(6") 150											
160											
170	1	1									
180	1		1								
190	6		3	3							
(8") 200	1			1							
210	1			1							
220	1					1					
230											
240	2					2					
(10") 250	1				1						
260	2				2						
270											
280											
290	2					2					
(12") 300	1				1						
310	3					3					
320	2					1	1				
330	1				1						
340	3				1	2					
(14") 350	4				1	3					
360	3					2			1		
370	1							1			
380	1								1		
390											
(16") 400	1								1		
410	2						1	1			
420	2								1	1	
430	2										2
440	2									1	1
(18") 450											
460	1										1
470											
480											
490											
(20") 500											
Total	47	1	4	5	7	16	2	2	4	2	4
Average Length	315 (12.4")	177 (7")	192 (7.6")	187 (7.3")	278 (10.9")	314 (12.4")	368 (14.5")	394 (15.5")	393 (15.5")	431 (17")	443 (17.4")
S.D.	93.1	--	3.9	13.6	63.7	44.1	67.1	22.6	24	14.8	15.9

Table 4. Average length at age for fish captured during electroshocking surveys in 2010 and 2015 on Carstens Lake. Average length at age information from WDNR (1990).Lengths are in mm or inches (in).

Species	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5	AGE 6
Largemouth Bass						
2010		176 (6.9")	244 (9.6")	331 (13.3")	427 (16.8")	
2015		192 (7.6")	187 (7.4")	278 (10.9")	314(12.4")	368 (14.5")
(State Averages)	97 (3.8")	165 (6.5")	229 (9")	290 (11.4")	338 (13.")	383 (15.1"
Bluegill						
2010	55 (2.2")	119 (4.7")	165 (6.5")	172 (6.8")		
2015	69 (2.7")	98 (3.9")	127 (5")	144 (5.7")	159 (6.3")	
(State Average)	64 (2.5")	97 (3.9")	122 (4.8")	147 (5.7")	167 (6.5")	183 (7.2")

Panfish

Bluegill were the dominant panfish that were captured during the survey (Table 2). The 120 Bluegill ranged in length from 57 mm to 161 mm (2.2" to 6.3") and had an average length of 119 mm (4.7)(Table 4). Only seven of the 120 (5.9%) bluegill had a length greater than 150 mm (6") and none were greater than 200 mm (8") in length.

Age was determined for a subsample of the Bluegill that we captured. Ages from that sample ranged from age 1 through age 5 (Table 5). Age 3 Bluegill were the most common with other age classes less abundant. Length at age for Bluegill from Carstens Lake was similar to statewide averages at ages indicating average growth of Bluegill in Carstens Lake (Table 4).

Other panfish captured during the survey included Black Crappie, Yellow Perch and Green Sunfish (Table 2). Black Crappie were the most numerous of these fish with the 13 captured crappie ranging in length from 165 mm to 201 mm (6.5" to 7.9") and having an average length of 182 mm (7.2"). Scales indicated that ages 3 and 4 were present in our sample with age 3 the most common.

In addition, one Yellow Perch and one Green Sunfish were collected (Table 2).

Table 5. The size and age distribution of Bluegill captured during the May 2015 electroshocking survey of Carstens Lake.

Length (mm)		Number Caught	Age				
			Age 1	Age 2	Age 3	Age 4	Age 5
(2")	50	1	1				
	60						
	70	3	2	1			
	80	3		3			
	90	17		15	2		
(4")	100	19		19			
	110	9		1	8		
	120	29			29		
	130	22			18	4	
	140	10			3	7	
(6")	150	5				5	
	160	2					2
Total		120	3	39	60	16	2
Average Length		119 (7.2")	69 (2.7")	98 (3.9")	127 (5")	144 (5.7")	159 (6.3")
S.D.		20.7	11.1	7.3	9.1	7.9	9.6

DISCUSSION

Carstens Lake continues to be a bass-bluegill lake with Largemouth Bass the dominant gamefish in the lake. The number of Largemouth Bass that we captured in 2015 (47) was similar to what was caught in 2010 (36) but is much lower than what was historically captured (Surendonk 2002, Hogler 2010). The average length of largemouth Bass captured in 2015 (316 mm) was also similar to what was captured in 2010 (333 mm) but unlike the 2010 survey, few bass greater than 450 mm were captured in 2015. Growth of Largemouth Bass in 2015 was found to be slightly less than statewide averages at most ages but were much less than what was measured in 2010 (Table 4). Differences between 2010 and 2015 are likely due to differences in age estimates obtained from scales and spines. Based on the bass length frequency, age distribution and length at age data; it appears that largemouth Bass are doing well in Carstens Lake, although harvest appears to have reduced bass size in the lake and variable recruitment likely has occurred based on the age distribution. If harvest begins to affect recruitment, a more conservative bag and size limit may be needed for bass to protect the Largemouth Bass population in the lake.

Past surveys have captured low numbers of Northern Pike, but none were captured in 2015. Reduced vulnerability to our gear, low recruitment or angler harvest may explain the lack of pike in 2015. Likely limited spawning habitat and angler harvest suppresses the Northern Pike population in Carstens Lake.

Bluegill continue to dominate the fish community of the lake. The number of Bluegill captured in 2015 (120) was similar to what was captured in 2010 (133) but less than what was historically captured during electroshocking surveys perhaps indicating that Bluegill abundance has stabilized following the 1998 fish kill. Past surveys indicated that Bluegill were abundant, small and somewhat slow growing (Surendonk 2002). However, concurrent with the reduction in Bluegill number, we have noted an improvement in Bluegill average length at age since 2010 (Table 4). Despite increased growth rates, the lack of Bluegill longer than 200 mm in length may indicate substantial angler harvest of Bluegill once they reach 150 mm in length.

A small number of Black Crappie were captured during the 2015 survey. Since Carstens Lake was treated in 1982 to remove the entire fish population, Black Crappie have been only rarely captured during electroshocking (Surendonk 2002, Hogler 2010). The presence of Black Crappie could be due to extremely limited recruitment or from occasional illegal stocking events.

Also of note was the lack of Yellow Perch and forage fish captured during the 2015 survey. Since the initial restocking of the lake after the rotenone treatment and recent stockings by the Carstens Lake Association in 2011 and 2014, Yellow Perch numbers continue to decline. Likely the lack of appropriate spawning substrate and angler harvest are responsible for the low numbers of perch seen. Forage fish were almost absent from our catch in 2015 despite Fathead Minnow stocking by the Carstens Lake Association in 2014. The lack of forage could in the future reduce growth rates of bass and bluegill in the lake.

Fish populations in Carstens Lake continue to be negatively impacted by the poor water quality found in the lake. Many of the same environmental conditions including high levels of phosphorus and dissolved solids (TSS) that caused the need for the rotenone treatment still exist. High levels of phosphorus favor large planktonic and filamentous algal blooms followed by sharp declines of dissolved oxygen as the algae decomposes and as the suspended sediments settle out critical fish habitat is buried in soft sediment. These conditions lead to degraded water quality and degraded fisheries. Recent water quality analyzes and visual observation of abundant filamentous algae indicates that both external and internal sources of phosphorus are likely very high. Manure spills and major runoff events that have added nutrients and sediment into the lake that have also degraded nearshore fish habitat. The poor water quality of the lake has necessitated the nearly annual operation of the lakes' aerator and may have also led to partial winterkills.

Carstens Lake should periodically be surveyed to determine the status of the fish population. Lake residents and Manitowoc County should be encouraged to restore nearshore habitat and to improve lake water quality by reducing nutrient and sediment inputs from the watershed.

REFERENCES

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