

DATE: October 5, 2010 FILE REF: [Click [here](#) and type file ref.]

TO: Carstens Lake File

FROM: Steve Hogler

SUBJECT: 2010 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.

Although Carstens Lake continues to be a popular location to fish, angler complaints regarding overabundant small panfish, low abundance of gamefish and the abundance of carp were common as far back as the late 1960's. Since the early 1980's Fish Management has used nearly every lake management strategy, including mechanical fish removal, chemical removal, stocking and construction of a fish barrier on the outlet stream to improve the lake's fishery. High angler harvest, small founder populations, illegal stockings 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 the keystone species.

The last survey on Carstens Lake was conducted 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). Bluegill dominated the catch of the electroshocking survey followed by much lower numbers of black crappie, northern pike and largemouth bass. Bass ranged in length from 220 mm to 350 mm and averaged 283 mm while bluegill were small and averaged 112 mm in length.

### 2010 Survey Results

Carstens Lake was surveyed on the night of May 17 following state protocols for surveying Tier 1 bass lakes. The water temperature at the time of the survey was 60 F. During the 33 minutes of electrofishing the entire shoreline was shocked and all fish netted. Fish were identified, measured and a subsample of largemouth bass and bluegill had scales removed to allow us to estimate age and growth. We captured 184 individual fish representing five species during shocking (Table 1). Overall our catch per effort (CPE) was 238.96 fish per mile shocked or 334.55 fish per hour. The dominant species in our catch was bluegill. Other species were captured in much lower abundances (Table 1).

**Table 1. Catch summary of the May 17 electroshocking survey of Carstens Lake.**

Species	Number	Size Range (mm)	CPE (Fish/Mile)	CPE (Fish/Hour)
Largemouth Bass	36	141-495	46.75	65.45
Northern Pike	2	574-586	2.60	3.64
Bluegill	133	55-204	172.73	241.82
Black Crappie	12	143-216	15.58	21.82
Golden Shiner	1	163	1.30	1.82
Total	184		238.96	334.55

The thirty-six captured largemouth bass ranged in size from 141 mm to 495 mm and had an average length of 333 mm (Table 2). Seventeen of the thirty-six bass (47.2%) were longer than the 355 mm (14") size limit and eleven bass (30.6%) were greater than 400 mm (16") in length.

Analysis of scale samples taken from the bass that we captured indicated that ages 2 through age 5 and age 7 were present in our sample (Table 3). Age 4 and Age 5 were the most common age bass in our sample followed by age 2 and age 3. We did not capture any yearling bass or bass greater in age than 7 during our survey.

**Table 2. The length frequency for fish captured on Carstens Lake during the 2010 survey.**

Length (mm)	Largemouth Bass	Northern Pike	Bluegill	Black Crappie	Golden Shiner
50			1		
60					
70					
80					
90			9		
100			14		
110			19		
120			22		
130			8		
140	1		11	2	
150			13		
160	1		19		1
170			9		
180			6	3	
190	1		1	4	
200	1		1	2	
210				1	
220	2				
230	1				
240					
250	3				
260	1				
270	1				
280					
290					
300	2				
310	1				
320	3				
330					
340	1				
350	1				
360	3				
370					
380	1				
390	1				
400	1				
410	2				
420	1				
430	1				
440	2				
450	2				
460	1				
470					
480					
490	1				
500					
510					
520					
530					
540					
550					
560					
570		1			
580		1			
Total	36	2	133	12	1
Ave. Length	333	580	137	186	163
S.D.	94.37	8.49	27.63	21.70	--

**Table 3. The size and age distribution of largemouth bass captured during the May 2010 electroshocking survey of Carstens Lake.**

Length (mm)	Number	Age						
		1	2	3	4	5	6	7
140	1		1					
150								
160	1		1					
170								
180								
190	1		1					
200	1		1					
210								
220	2			2				
230	1			1				
240								
250	3			3				
260	1			1				
270	1				1			
280								
290								
300	2				2			
310	1				1			
320	3				3			
330								
340	1				1			
350	1				1			
360	3				3			
370								
380	1					1		
390	1					1		
400	1					1		
410	2					2		
420	1					1		
430	1					1		
440	2					1		1
450	2					2		
460	1					1		
470								
480								
490	1							1
500								
510								
520								
530								
540								
550								
560								
570								
580								
Total	36	0	4	7	12	11	0	2
Ave. Length	333		176	244	331	427		470
S.D.	94.37		25.94	16.94	28.75	26.39		35.36

A length at age comparison between largemouth bass in Carstens Lake to statewide averages can be made with the aging data we collected to determine how bass are growing in the lake. Our data indicates that bass in Carstens Lake at all ages are growing at statewide rates (Table 4).

**Table 4. Average length at age as determined by scales for fish captured during electroshocking on Carstens Lake. Average length at age from WDNR (1990) and are in mm.**

Species	AGE 1	AGE 2	AGE 3	AGE 4	AGE 5	AGE 6
Largemouth Bass 2010		176	244	331	427	
(State Averages)	(97)	(165)	(229)	(290)	(338)	(383)
Bluegill 2010	55	119	165	172		
(State Average)	(64)	(97)	(122)	(147)	(167)	(183)

Panfish were commonly captured during shocking with bluegill the most numerous (Table 1). The 133 bluegill ranged in length from 55 mm to 204 mm and had an average length of 137 mm (Table 2). Forty-nine of the 133 captured bluegill (36.8%) had lengths greater than 150 mm (6") but only 1 bluegill (0.75%) was greater in length than 200 mm (8").

Age was determined for a subsample of the bluegill that we captured. Ages from that sample ranged from age 1 through age 4 (Table 5). Age 2 bluegill were the most common age bluegill with other age classes less abundant. Length at age for bluegill from Carstens Lake was greater than statewide averages except at age 1 indicating average to good growth of bluegill in Carstens Lake (Table 4).

**Table 5. The size and age distribution of bluegill captured during the May 2010 electroshocking survey of Carstens Lake.**

Length (mm)	Number	Age				
		1	2	3	4	5
50	1	1				
60						
70						
80						
90	9		9			
100	14		14			
110	19		19			
120	22		22			
130	8		7	1		
140	11		6	5		
150	13		2	11		
160	19			17	2	
170	9			9		
180	6			5	1	
190	1			1		
200	1			1		
<b>Number</b>	<b>133</b>	<b>1</b>	<b>79</b>	<b>50</b>	<b>3</b>	<b>0</b>
<b>Ave. Length</b>	<b>137</b>	<b>55</b>	<b>119</b>	<b>165</b>	<b>172</b>	
<b>S.D.</b>	<b>27.63</b>	<b>--</b>	<b>14.96</b>	<b>13.84</b>	<b>11.55</b>	

## DISCUSSION

Carstens Lake continues to be a bass-bluegill lake. Largemouth bass are the dominant gamefish in the lake. The number of bass we captured in 2010 was a substantial increase to what was captured in 1998 but much lower than what was historically captured (Surendonk 2002). Size at capture in 2010 was similar, if not slightly larger than in previous surveys. Growth in 2010 was found to be slightly better than statewide averages (Table 4). Based on the bass length frequency, age distribution and length at age data, it appears that bass are doing well in Carstens Lake, but harvest and variable recruitment have hurt bass numbers in the lake. If harvest begins to affect recruitment, more conservative bass limits may be needed to protect the largemouth bass population in the lake.

Northern pike continue to be present in Carstens Lake but in low abundance. Pike abundance in 2010 was similar to previous surveys conducted since 1983 (Surendonk 2002). 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. Past surveys indicated that bluegill were abundant, small and somewhat slow growing (Surendonk 2002). The number of bluegill captured in 2010 was less than what was historically captured during electroshocking surveys perhaps indicating a decline in bluegill abundance. It is likely bluegill abundance was affected by the 1997-98 winterkill and by increasing numbers of large bass caused by changes in the bass minimum size limit. However, concurrent with the reduction in bluegill number, we have noted an improvement in bluegill average size. The average length of captured bluegill since 1988 has increased from 86 mm in 1988, 103 mm in 1993 and 112 mm in 1998 to average 137 mm in 2010. The percentage of bluegill greater than 150 mm has also increased going from 9% in 1998 to 36.8% in 2010. Despite increased growth rates, the lack of bluegill longer than 200 mm in length may indicate substantial angler harvest of bluegill after they reach 150 mm in length.

A small number of black crappie were captured during the 2010 survey. Since Carstens Lake was treated in 1982 to remove the entire fish population, black crappie have been rarely captured during electroshocking (Surendonk 2002). Evaluation of the 2010 black crappie length frequency indicates it is likely that only 1 or 2 age classes are present in the lake. The paucity of black crappie could be due to extremely limited recruitment or occasional illegal stocking events.

Also of note was the lack of yellow perch and forage fish captured during the 2010 survey. Since the initial restocking of the lake after the rotenone treatment, perch numbers have declined sharply (Surendonk 2002). Likely the lack of appropriate spawning substrate and angler harvest of the field transferred adult perch before they spawned limits the yellow perch population in Carstens Lake. Forage fish were almost absent from our catch in 2010. 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 that caused the need for the rotenone treatment still exist. Recent water quality analyzes indicates that both external and internal sources of phosphorus are very high (NES Ecological Services 2003). High levels of phosphorus encourages the growth of filamentous algae and rooted macrophytes and ultimately degrades water quality when the algae or plant blooms die. Manure spills and major runoff events that have added nutrients into the lake have also degraded nearshore fish habitat. The

poor water quality of the lake has necessitated the nearly annual operation of the lakes' aerator and has also led to 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

NES Ecological Services a division of Robert E. Lee & Associates, Inc. 2003. Carstens Lake Alum Treatment Feasibility Study. Wisconsin Lake Planning Grants LPL-773-02 and LPL-774-02 Report. 14 pages.

Surendonk, S. 2002. Completion Report for the 1982-1998 Fisheries Surveys on Carstens Lake, Manitowoc County. Unpublished. WDNR. Mishicot, WI. 35 pages.

Surendonk, S and J. Rohr. 1998. Fall 1998 Carstens Lake Electroshocking Report. Unpublished. WDNR. Mishicot, WI. 4 pages.

WDNR 1990. Fish Management Reference Book. WDNR. Unpublished. Madison, WI.

WDNR. 2001. State of the Lakeshore Basin Appendices. Report PUB WT 667A 2001. Wisconsin Department of Natural Resources. Madison Wisconsin. 100 pages.