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TO: Silver Lake Files

FROM: Steve Hogler

SUBJECT: Spring 2012 Survey Results

Silver Lake (WBIC 67400) is located in east-central Wisconsin, near the Manitowoc city limits (Figure 1). It is a 69-acre drainage lake that lies in a zone of glacial outwash. The lake has a maximum depth of forty-three feet and a mean depth of sixteen feet. Silver Lake is located in a watershed that is highly agricultural with scattered low density residential developments. In addition to being near the bottom of an agricultural watershed, road construction in the 1930's expanded the watershed draining into Silver Lake significantly resulting in a watershed size to lake acreage of nearly 200 to 1. Before 2003, the lake experienced very poor water quality that resulted in many fish kills and a fish population dominated by common carp, black bullhead, stunted panfish and low numbers of largemouth bass and northern pike.

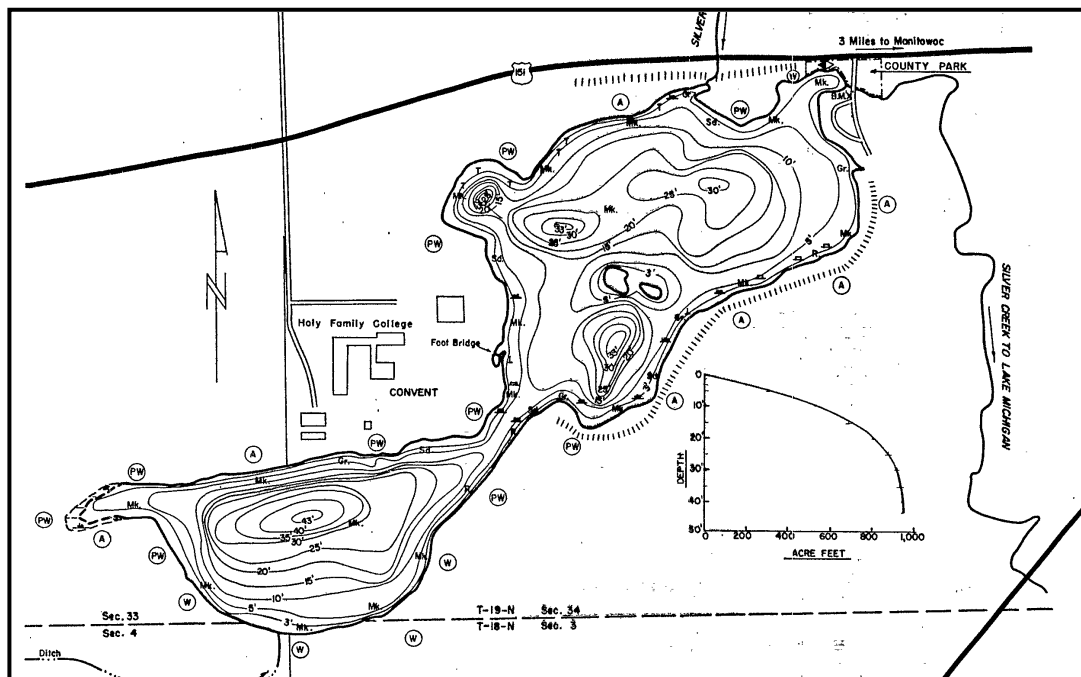


Figure 1. Morphometric map of Silver Lake showing where Silver Creek entered the lake prior to construction of the berm in 2003.

In 2003, after many years of small scale projects designed to improve either water quality or the fishery and larger scale lake studies, a comprehensive plan was developed that sought to improve water quality, habitat and the fishery of Silver Lake. This plan called for bypassing Silver Creek out of Silver Lake to control external phosphorus loading, a rotenone treatment to remove the fish population, an alum treatment to reduce internal levels of phosphorus and restocking a desirable mix of fish species back into the lake.

Since 2004, Silver Lake has been stocked with a variety of fish species that are desired by anglers and that will help to maintain the water quality goals of the restoration project. To date, six species and over 225,000 individual fish have been stocked (Table 1). In addition to the fish stocked by the State, several species of fish, most notably bluegill and pumpkinseed have been found in the lake during surveys since 2004. It is suspected that these fish were illegally stocked into the lake following the rotenone treatment.

Surveys conducted from 2004 through 2009 have found that most fish goals set by the restoration plan have been met, with surveys finding good survival and growth for all species and some limited natural reproduction by several species most notably yellow perch, bluegill and bass.

The largemouth bass population in Silver Lake continues to be low in number with the total number of bass captured during each survey changing little since 2005. It is believed that bass are reproducing in the lake, but at a low rate. Northern pike appear to be doing well in the lake and have exhibited very good growth. We have not found any evidence of successful pike reproduction in Silver Lake. Walleye are doing well in Silver Lake. Survival and growth of stocked walleye has been very good with the number of walleye greater than 457 mm (18") increasing. We have not found evidence of natural reproduction in the lake. Additional stocking of walleye, bass and northern pike may be needed to maintain their future abundance in the lake if they continue to fail to reproduce naturally.

Panfish, chiefly yellow perch and bluegill, are reproducing in the lake. Based on survey results, yellow perch are the dominant fish species in the lake. Young of year yellow perch have been noted as very abundant during most surveys since 2005. Although abundant as young, few captured yellow perch have been over 200 mm (8"). Bluegill catch per effort (CPE) has been somewhat variable since 2004, but bluegill average length has continued to steadily improve in the survey period. The lack of larger yellow perch or bluegill in our surveys may be due to angler harvest or from predation by gamefish.

Carp numbers continue to be low in Silver Lake. Several overtopping events of the berm following heavy rainfalls have likely resulted in carp getting back into the lake from Silver Creek since 2004. In 2009, we observed three adult carp and removed two of them from the lake and captured or noted bullhead swimming along the shoreline. To date, we have not seen any evidence of successful natural reproduction of carp in Silver Lake. The numbers of carp and bullhead observed during our recent lake assessments are much lower than were observed in the lake before the 2003 rotenone treatment.

2012 RESULTS and DISCUSSION

On the night of May 7, the entire shoreline of Silver Lake was electrofished to assess the bass and panfish community of the lake. The 2012 survey was a departure from the past five surveys in which the survey was conducted in fall. The switch in survey date from fall to spring and a change from an annual survey to an eight year rotating schedule reflects changes in state lake sampling protocols.

During 65 minutes of nighttime shocking, 62 individual fish representing ten species were captured. Total CPE was 57.2 fish per hour shocked or 28.2 fish per mile shocked (Table 2). Largemouth bass and northern pike dominated our catch (19 individuals of each species) with fewer fish of other species captured. In addition to the species listed in Table 2, we also observed many thousands of yearling yellow perch which were not netted. Our CPE expressed as either fish per hour or fish per mile shocked was substantially lower in 2012 than during any of the previous five fall surveys. While the decline in CPE could be the result of seasonal catch differences, it is more likely that the decline in CPE was due to a thick ring of Eurasian Water Milfoil around nearly the entire shoreline of the lake that reduced our ability to access shallow water and severely limited our ability to see and net fish.

Gamefish

The six walleye that we captured ranged in length from 355 mm (14") to 602 mm (23.7") and had an average length of 462 mm (18.2") (Table 3). Four of the six (66.7%) captured walleye were greater in length than the 457 mm (18") size limit on the lake. Based on the walleye length frequency, it appears that representatives from several of the stocked year classes were captured during the survey. Walleye were captured with a CPE of 5.5 per hour or 2.7 per mile shocked (Table 2).

The nineteen captured northern pike ranged in length from 260 mm (10.2") to 721 mm (28.4") and had an average length of 542 mm (21.3") (Table 3). Based on reported angler harvest and our surveys, growth appears to be good. None of the captured pike were larger than the current 813 mm (32") minimum size limit for pike in the lake. It is likely that high angler harvest before the current size restriction was enacted reduced the number of large pike in the lake. Northern pike CPE was 17.5 per hour shocked or 8.6 per mile shocked (Table 2).

Largemouth bass were also commonly captured during the survey. The nineteen bass that we captured ranged in length from 391 mm (15.4") to 470 mm (18.5) and had an average length of 437 mm (17.2") (Table 3). The average length of bass measured in 2012 has continued to increase as stocked bass get older. Three of the nineteen (15.8%) captured bass were greater than the 457 mm (18") size limit. CPE for bass was 17.5 fish per hour or 8.6 per mile shocked (Table 2). We collected scale samples from the bass we captured to determine by age and stocking history if they were stocked or naturally recruited. Age analysis indicated that the three smallest bass were age 4 fish with the remaining bass aged at age 8. Based on stocking records it appears the age 4 bass were naturally reproduced in Silver Lake. We are hopeful as the bass continue to age, that more natural recruits will be found.

Panfish

In 2012, as in preceding surveys, yellow perch were the dominant panfish we observed and captured (Table 2). Captured yellow perch length ranged from 78 mm (3") to 215 mm (8.5"). Many non-netted perch were similar in length to the 78 mm (3") that we did net. It is likely that these yellow perch were yearlings produced in 2011. We captured few bluegill in our survey although additional bluegill were seen but not captured because of the milfoil. The bluegill we did capture ranged in size from 131 mm (5.2") to 170 mm (6.7").

Other fish that we captured during our survey included black bullhead, white sucker, golden shiner and two large carp (Table 2). These carp were removed from the lake.

Conclusions and Recommendations

The current fish harvest regulations on Silver Lake, walleye-3 bag, 18" minimum, bass-1 bag, 18" minimum, northern pike- 1 bag, 32" minimum and panfish-10 bag in total were designed to promote a good fishing experience and to stabilize the fishery in order to maintain a high predator balance to reduce the ability of undesirable species to become established in the lake and to promote water quality and clarity goals by limiting the number of planktivorous fish in the lake. Based on random observations of lake use, the number of anglers (boat, shore and pier) has increased since the project was completed. Additionally, survey results have shown favorable size distributions of northern pike, walleye and largemouth bass that are not seen on other Manitowoc County lakes. It is recommended that these non-standard size and bags limits remain in place for at least the next ten years to ensure that the lake rehabilitation project successfully achieves and maintains all fishery goals. In addition, if the size and bag

limits continue to produce a desirable fishery on Silver Lake, they should be considered for other Manitowoc County lakes that have high fishing pressure and are over harvested.

Although Silver Lake is not scheduled to be surveyed again until 2020, it is suggested that in 2015 the lake be surveyed using current survey protocols and perhaps with a short fyke survey to determine the status of gamefish populations in Silver Lake.

Table 1. Fish stocked into Silver Lake by WDNR since the 2003 rotenone treatment.

	2004	2005	2006	2007	2008	2009	2010	2011	2012	Total
Largemouth Bass	10,000 (small fingerling)	1,000 (small fingerling)	--	--	--	--	--	2,997 (small fingerling)	3,400 (small fingerling)	17,397
Walleye	1,000 (small fingerling)	1,400 (large fingerling)	1,360 (small fingerling)	1,358 (small fingerling)	1,358 (small fingerling)	1,360 (small fingerling)	2,395 (small fingerling)	1,494 (small fingerling)	1,045 (small fingerling)	12,770
Northern Pike	2,000 (small fingerling)	6,800 (small fingerling)	--	--	6,800 (small fingerling)	6,790 (small fingerling)	8,482 (small fingerling)	7,995 (small fingerling)	6,790 (small fingerling)	45,657
Northern Pike	100 (large fingerling)	--	3,000 (large fingerling)	--	--	--				3,100
Yellow Perch	4,000 (small fingerling)	1,000 (small fingerling)	--	--	--	--				5,000
Fathead Minnow	150,000 (adult)	--	--	--	--	--				150,000
White Sucker	250 (adult)	250 (adult)	322 (adult)	--	--					822
Total	167,350	10,450	4,682	1,358	8,158	8,150	10,877	12,486	11,195	234,746

Table 2. Fish species captured during night shocking on Silver Lake on May 7, 2012.

Species	Number	Fish/ Hour Shocked	Fish/ Mile Shocked
Northern Pike	19	17.5	8.6
Largemouth Bass	19	17.5	8.6
Walleye	6	5.5	2.7
Yellow Perch	5	4.6	2.3
Bluegill	3	2.8	1.4
Black Bullhead	4	3.7	1.8
White Sucker	1	0.9	0.5
Golden Shiner	3	2.8	1.4
Common Carp	2	1.8	0.9
Total	62	57.2	28.2

Table 3. The length frequency of gamefish captured from Silver Lake during spring electroshocking on May 7, 2012.

Length (mm)	Walleye	Northern Pike	Largemouth Bass
250			
260		1	
270			
280			
290		1	
300			
310			
320			
330			
340		1	
350	1		
360	1		
370			
380			
390			2
400			1
410			1
420			1
430			1
440			6
450			4
460	1	1	2
470	1		1
480		1	
490		1	
500			
510			
520	1	1	
530			
540			
550		1	
560		1	
570			
580		2	
590			
600	1	1	
610		2	
620		1	
630			
640		1	
650		1	
660			
670			
680			
690			
700		1	
710			
720		1	
730			
Total	6	19	19
Ave. Length	462	542	437
S.D.	94.8	129.3	23.1