

SILVER LAKE
Kosciusko County
2006 Fish Management Report

Angela C. Benson
Assistant Biologist



Fisheries Section
Indiana Department of Natural Resources
Division of Fish and Wildlife
I.G.C.-South, Room W273
402 W. Washington Street
Indianapolis, IN 46204

2006

EXECUTIVE SUMMARY

- A general lake survey was completed on Silver Lake from June 5 to 6, 2006. During this survey, water chemistry data was also collected. Aquatic vegetation surveys were conducted on April 19 and July 18, 2006.
- The Secchi disk reading was 3 ft on April 19 and 7 ft July 18 and dissolved oxygen concentration was adequate for fish survival above 14 ft on June 6. Submersed vegetation was found to a maximum depth of 11 ft on April 19 and 9 ft on July 18. Coontail *Ceratophyllum demersum* dominated the plant population in the spring and summer vegetation surveys.
- A total of 521 fish, representing 17 species and 1 hybrid sunfish, was collected during the general survey. Bluegill ranked first by number, followed by largemouth bass and gizzard shad. Largemouth bass ranked first by weight, followed by gizzard shad and carp. Overall, the quality of the largemouth bass fishery was good based on the relatively high PSD (70) and RSD-14 (51). Largemouth bass reached 14.0 in TL at age 4. Similarly, the bluegill population was good quality because PSD was 32 and RSD-8 was 8.
- In Silver Lake, the DFW should maintain a 14-in minimum size limit on largemouth bass; the District Biologist should not permit the control of native aquatic vegetation beyond the creation of boating lanes; the DFW should work with IDEM and the SWCD to encourage the lakeshore landowners to participate in best management practices to improve Silver Lake water quality.

TABLE OF CONTENTS

	Page
LIST OF TABLES	iv
INTRODUCTION	1
METHODS	1
RESULTS	2
DISCUSSION	3
RECOMMENDATIONS	4
LITERATURE CITED	5
APPENDIX: Lake pages.....	12

LIST OF TABLES

Table	Page
1. Silver Lake vegetation survey results by rake score on April 19 and July 18, 2006. A total of 50 sites was sampled during both surveys.....	6
2. Fish species and number of individuals captured in Silver Lake general surveys from 1972 through 2006	8
3. Mean lengths-at-age and standard error (SE) for largemouth bass and bluegill collected for the general survey on Silver Lake in June 2006. The ‘-‘ denotes where SE could not be calculated because only one fish was captured.....	9
4. Age-length key for bluegill captured on Silver Lake in June 2006.....	10
5. Age-length key for largemouth bass captured during the general survey on Silver Lake in June 2006	11

INTRODUCTION

Silver Lake is a 102-acre natural lake located in southern Kosciusko County in the town of Silver Lake, Indiana (Figure 1). A county-owned easement and private boat ramp are located on the east shore. Maximum depth is 33 ft with an average depth of 15 ft. This lake was classified as eutrophic in 2004 based on the Indiana Trophic Status Index, meaning that there is high productivity within the lake (Indiana Department of Environmental Management (IDEM), 2004). Previous fish population surveys were conducted by the Indiana Department of Natural Resources in 1962, 1969, 1972, 1973, 1974, 1975, 1980, 1986, 1987, and 1989. Silver Lake was renovated in 1970, but by 1973, carp, gizzard shad, and suckers had reestablished populations in the lake. In addition, northern pike were stocked in order to improve the fishery, but with no success. A fisheries survey was conducted in order to evaluate the current fishery of Silver Lake at the request of the lake association.

METHODS

The Silver Lake general survey was conducted from June 5 to 6, 2006 as part of DFW Work Plan 204755 that covers general fisheries surveys of natural lakes. Some physical and chemical characteristics of the water were measured in the deepest area of the lake (Indiana Division of Fish and Wildlife 2001). Submersed aquatic vegetation was sampled on April 19 and July 18, 2006 using guidelines written by Pearson (2004). A global positioning system (GPS) device was used to record the location of the limnological data collection site, aquatic vegetation sample sites, and fish collection sites.

Fish were collected by pulsed D.C. electrofishing the shoreline at night with two dippers for a total of 1 h (4 different locations, 15-minute stations). Two trap nets and four experimental-mesh gill nets were also fished overnight. All fish collected were measured to the nearest 0.1 in TL and weighed in the field to the nearest 0.01 lb.

Fish scale samples were taken from bluegill, largemouth bass, yellow perch, redear sunfish, and black crappie for age and growth analysis. Proportional stock density (PSD) and relative stock density (RSD) was calculated for bluegill and largemouth bass (Anderson and Neumann 1996). Additionally, age-length keys and mean length-at-age were created and calculated for bluegill and largemouth bass captured during this general survey. Unfortunately,

because the previous survey in 1989 was conducted in August, length-age comparisons cannot be made.

RESULTS

Silver Lake was at normal pool. On June 5, dissolved oxygen concentrations were adequate for fish survival to 14 ft and Secchi depth was 8 ft, 2 in. The thermocline was located between 8 and 12 ft.

The Secchi disk reading was 3 ft on April 19 and 7 ft on July 18. Submersed vegetation was found to a maximum depth of 11 ft on April 19 and 9 ft on July 18 (Table 1). In both the spring and summer vegetation surveys, coontail *Ceratophyllum demersum* dominated the vegetation population. Slender naiad *Najas flexilis* and *Elodea nuttalli* were also present in the lake. Curly-leaf pondweed was also found, but only during the spring survey and with a low frequency of occurrence (8%). A low-dose Aquathol K treatment was conducted in April by a contractor to control curly-leaf pondweed.

A total of 521 fish, representing 17 species and 1 hybrid, was collected during this survey. Total weight of the fish sample was approximately 344 lbs. Species collected in past surveys, but not in this survey, include common shiner, longear sunfish, rock bass, grass pickerel, creek chub, black bullhead, green sunfish, and northern pike (Table 2). By number, bluegill ranked first, largemouth bass ranked second, and gizzard shad ranked third in the survey sample. By weight, largemouth bass ranked first followed by gizzard shad and carp.

A total of 199 bluegill was sampled that weighed 29.9 lbs. They ranged in length from 2.0 to 9.1 in TL. Relative abundance by number and weight were 38.2% and 8.7%, respectively. The electrofishing, gill net, and trap net catch rates were 124.0 fish/h, 4.0 fish/lift, and 29.5 fish/lift, respectively. The bluegill PSD was 32. The bluegill RSD-8 was 8. Overall mean length of bluegill was 5.5 in (Table 3). Mean length-at-age data from the age-length key indicated bluegill reached 6 in (i.e. quality size) between their 3rd and 4th year of growth (Table 4).

A total of 99 largemouth bass was sampled that weighed 106.1 lbs. They ranged in length from 3.7 to 19.1 in TL. Relative abundance by number and weight were 19.0% and 30.8%, respectively. The electrofishing, gill net, and trap net catch rates were 89.0 fish/h, 2.5 fish/lift, 0 fish/lift, respectively. The largemouth bass PSD was 70 and RSD-14 was 51. This indicates that the quality of the largemouth bass fishery is good based on the relatively high PSD

and RSD-14. Overall mean length of bass was 12.4 in (Table 3). Mean length-at-age data from the age-length key indicated bass reached 14 in (i.e. harvestable size) between ages 4 and 5 (Table 5).

A total of 28 redear sunfish was sampled that weighed 16.4 lbs. They ranged in length from 6.6 to 11.0 in TL. Relative abundance by number and weight were 5.4% and 4.8%, respectively. The electrofishing, gill net, and trap net catch rates were 0 fish/h, 0 fish/lift, 14.0 fish/lift. Back-calculated lengths indicated redear sunfish reached 7 in (i.e. quality size) between their 2nd and 3rd year of growth. No comparisons can be made to the 1989 survey because no redear were captured at that time (Braun 1990).

A total of 16 yellow perch was sampled that weighed 6.13 lbs. They ranged in length from 6.4 to 12.0 in TL. Relative abundance by number and weight were 3.1% and 1.8%, respectively. The electrofishing, gill net, and trap net catch rates were 0 fish/h, 4 fish/lift, 0 fish/lift. Back-calculated lengths indicated yellow perch reached 8 in (i.e. quality size) between their 3rd and 4th year.

A total of 12 black crappie was sampled that weighed 2.38 lbs. They ranged in length from 3.3 to 11.6 in TL. Relative abundance by number and weight were 2.3% and 0.7%, respectively. Crappie ranged in age from 1 to 3. Back-calculated lengths indicated black crappie reached 8 in (i.e. quality size) between ages 2 and 3.

Gizzard shad and carp were also captured during the general survey. Shad ranked third by number (N = 97) and second by weight (91.98 lbs). Gizzard shad have typically been ranked as first in previous surveys. The 2006 survey is the first where gizzard shad were not the most abundant fish in the lake since the 1970s. Additionally, four carp were captured, ranging in size from 24.4 to 30.9 in TL and were ranked third by weight.

DISCUSSION

Water quality in Silver Lake has improved since the previous survey in 1989 (Braun 1990). During the 1989 survey, dissolved oxygen was only high enough to support fish up to a depth of approximately 10 ft. In this 2006 survey, dissolved oxygen was high enough to support fish up to a depth of 14 ft. This lake was classified as eutrophic in 2004 based on the Indiana Trophic Status Index (Indiana Department of Environmental Management (IDEM), 2004). While this lake is productive, it is no longer as degraded as it was in previous surveys. The

improved water quality and the increased value of the fishery is most likely the result of best management practices (BMP) used in the Silver Lake watershed. The continuation of these practices and the implementation of new BMPs will allow Silver Lake water quality to continue to improve. For instance, restricting cattle access and creating a buffer to prevent runoff from pastureland will decrease the amount of nutrients entering the lake.

Aquatic vegetation in Silver Lake is prevalent throughout most of the shallow areas. While this may be a nuisance to anglers and residents alike, it is probably one of the contributing factors to the improved fishery. Historically, Silver Lake has had a problem with gizzard shad. The renovation that was conducted on this lake in 1970 did not keep gizzard shad out of the lake for long – they were found in the lake three years later. Gizzard shad populations are known to be detrimental to some popular game fish species, primarily bluegill (Aday et al. 2003). So, typically, bluegills in lakes with thriving populations of gizzard shad are often not as successful as bluegills in lakes without shad. However, research has shown that with an increase in the coverage of aquatic vegetation, the abundance of age-0 gizzard shad (and consequently older gizzard shad) is reduced while the proportion of bluegill populations containing large adults increased (Michaletz and Bonneau 2005). In Silver Lake, the coverage of aquatic vegetation may be one of the contributing factors leading to decreased success of gizzard shad in this lake. In 1989, more than 300 shad were collected during the survey and they were the most abundant species in the lake. In the 2006 survey, less than 100 shad were captured and they were only the third most abundant species in the lake behind bluegill and largemouth bass. In addition, the overall mean length of bluegill has also increased from 4.4 inches in 1989 to 5.5 inches in 2006, similar to observations made by Michaletz and Bonneau (2005). This is a good indication of an improved fishery due to decreased competition between bluegill and gizzard shad. In order to maintain or continue to improve the fishery, aquatic vegetation control in this lake should be carefully managed.

RECOMMENDATIONS

- The DFW should maintain the 14-inch minimum size limit on largemouth bass at Silver Lake.
- The District Biologist should not permit the control of native aquatic vegetation beyond the creation of boating lanes.
- The DFW should work with IDEM and the SWCD to encourage the lakeshore landowners to participate in best management practices to improve Silver Lake water quality.

LITERATURE CITED

- Aday, D. D., R. J. H. Hoxmeier, and D. H. Wahl. 2003. Direct and indirect effects of gizzard shad on bluegill growth and population size structure. *Transactions of the American Fisheries Society* 132:47–56.
- Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-481 *in* B. R. Murphy and D. W. Willis, editors. *Fisheries techniques*, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- Braun, E. R. 1990. Silver Lake Kosciusko County Fish Management Report 1989. Indiana Department of Natural Resources, Indianapolis, Indiana.
- DeVries, D. R., and R. V. Frie. 1996. Determination of age and growth. Pages 483-512 *in* B. R. Murphy and D. W. Willis, editors. *Fisheries techniques*, 2nd edition. American Fisheries Society, Bethesda, Maryland.
- Indiana Department of Environmental Management (IDEM). 2005. IDEM's Surface Water Quality Assessment Program, Lake Water Quality Assessment Fact Sheet.
- Indiana Division of Fish and Wildlife. 2001. S. Shipman, editor. *Manual of Fisheries Survey Methods*. Indiana Division of Fish and Wildlife, Indianapolis, Indiana.
- Michaletz, P. H., and J. L. Bonneau. 2005. Age-0 gizzard shad abundance is reduced in the presence of macrophytes: implications for interactions with bluegills. *Transactions of the American Fisheries Society* 134:149–159.
- Pearson, J. 2004. A proposed sampling method to assess occurrence, abundance and distribution of submersed aquatic plants in Indiana lakes. Indiana Department of Natural Resources, Indianapolis, Indiana. 37 pp.

Submitted by: Angela C. Benson, Assistant Fisheries Biologist
Date: July 19, 2006

Approved by: Ed Braun, Fisheries Biologist

Approved by: Stu Shipman, Fisheries Supervisor

Date: July 20, 2006

Table 1. Silver Lake vegetation survey results by rake score on April 19 (a) and July 18, 2006 (b). A total of 50 sites was sampled during both surveys.

(a)

Occurrence and abundance of submersed aquatic plants in Silver Lake						
County: Kosciusko	Sites with plants: 42	Mean species/site: 0.68				
Date: 4/19/2006	Sites with native plants: 28	Standard error (ms/s): 0.09				
Secchi (ft): 3	Number of species: 3	Mean native species/site: 0.60				
Maximum plant depth (ft): 11	Number of native species: 2	Standard error (mns/s): 0.08				
Trophic status Eutrophic	Maximum species/site: 2	Species diversity: 0.43				
Total sites: 50		Native species diversity: 0.29				
All depths (0 to 20 ft)	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Ceratophyllum demersum	50.0	50	22	18	10	25.2
Potamogeton crispus	8.0	92	8	0	0	1.6
Elodea spp.	8.0	92	8	0	0	1.6
Unknown Potamogeton	2.0	98	2	0	0	0.4
Filamentous Algae	50.0	50.0	50.0	0.0	0.0	10.0
Depth: 0 to 5 ft	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Ceratophyllum demersum	65.2	34.8	26.1	30.4	8.7	32.2
Elodea spp.	17.4	82.6	17.4	0.0	0.0	3.5
Potamogeton crispus	8.7	91.3	8.7	0.0	0.0	1.7
Unknown Potamogeton	4.3	95.7	4.3	0.0	0.0	0.9
Filamentous Algae	87.0	13.0	87.0	0.0	0.0	17.4
Depth: 5 to 10 ft	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Ceratophyllum demersum	52.9	47.1	23.5	11.8	17.6	29.4
Potamogeton crispus	11.8	88.2	11.8	0.0	0.0	2.4
Filamentous Algae	23.5	76.5	23.5	0.0	0.0	4.7
Depth: 10 to 15 ft	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
Species		0	1	3	5	
Ceratophyllum demersum	10.0	90.0	10.0	0.0	0.0	2.0
Filamentous Algae	10.0	90.0	10.0	0.0	0.0	2.0

(b)

Occurrence and abundance of submersed aquatic plants in Silver Lake

County: Kosciusko	Sites with plants: 29	Mean species/site: 0.62
Date: 7/18/2006	Sites with native plants: 29	Standard error (ms/s): 0.08
Secchi (ft): 7	Number of species: 3	Mean native species/site: 0.62
Maximum plant depth (ft): 9	Number of native species: 3	Standard error (mns/s): 0.08
Trophic status Eutrophic	Maximum species/site: 2	Species diversity: 0.23
Total sites: 50		Native species diversity: 0.23

All depths (0 to 15 ft)	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
Ceratophyllum demersum	54.0	46.0	12.0	28.0	14.0	33.2
Najas flexilis	6.0	94.0	2.0	2.0	2.0	3.6
Elodea nuttalli	2.0	98.0	2.0	0.0	0.0	0.4
Filamentous Algae	34.0	66.0	34.0			

Depth: 0 to 5 ft	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
Ceratophyllum demersum	82.6	17.4	26.1	26.1	30.4	51.3
Najas flexilis	13.0	87.0	4.3	4.3	4.3	7.8
Elodea nuttalli	4.3	95.7	4.3	0.0	0.0	0.9
Filamentous Algae	60.9	39.1	60.9			

Depth: 5 to 10 ft	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
Ceratophyllum demersum	47.1	52.9	0.0	47.1	0.0	28.2
Filamentous Algae	17.6	82.4	17.6			

Depth: 10 to 15 ft

No species found

Table 2. Fish species and number of individuals captured in Silver Lake general surveys from 1972 through 2006. EF is electrofishing.

Species	1972	1980	1986	1989	2006
Bluegill	1,009	360	422	259	199
Largemouth bass	103	105	61	195	99
Yellow perch		147	118	124	16
Gizzard shad	2	385	447	302	97
Warmouth		34	38	38	8
Golden shiner	2	19	85	84	10
Yellow bullhead	1	14	6	19	6
Black crappie	19	172	79	16	12
Brown bullhead	2	34	13	18	9
Common shiner	3				
Pumpkinseed	14	49	34	33	1
Carp		16	4	5	4
Lake chubsucker			2	2	3
Rock bass		1			
White bass			12	19	5
Grass pickerel		1			
Creek chub			1		
White sucker	49	264	171	20	13
Spotted sucker		22	32	5	4
Hybrid sunfish			2	1	7
Black bullhead	1	7	30	5	
Green sunfish		2		1	
Northern pike		1	4	1	
Redear sunfish					28
Total	1,205	1,633	1,561	1,147	521

1972 effort: gill net = 4 lifts; AC EF: Day = 1 h

1980 effort: gill net = 9 lifts, trap net = 9 lifts, DC EF: Night = 1.29 h; PSDs calculated using only EF data

1986 effort: gill net = 7 lifts, trap net = 5 lifts, DC EF = 1 h; PSDs calculated using only EF data

1989 effort: gill net = 6 lifts, trap net = 4 lifts, DC EF = 1 h; PSDs calculated using only EF data

2006 effort: gill net = 4 lifts, trap net = 2 lifts, DC EF = 1 h; PSDs calculated using only EF data

Table 3. Mean lengths-at-age and standard error (SE) for largemouth bass (a) and bluegill (b) collected for the general survey on Silver Lake in June 2006. The ‘-’ denotes where SE could not be calculated because only one fish was captured.

a)

Age	Mean length	SE
1	3.5	-
2	8.9	0.176
3	11.5	0.000
4	13.4	0.131
5	15.2	0.160
6	15.6	0.274
7	17.0	0.289
8	19.0	-

b)

Age	Mean length	SE
1	2.8	0.17
2	4.0	0.06
3	5.8	0.07
4	7.5	0.08
5	7.8	0.20
6	8.6	0.13
7	9.0	0.00

Table 4. Age-length key for bluegill captured on Silver Lake in June 2006.

Length group	# in sample	# (age) in subsample	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7
2.0	2	1 (1)	2						
2.5	5	5 (1)	5						
3.0	5	1 (1), 4 (2)	1	4					
3.5	18	2 (1), 6 (2)	5	14					
4.0	23	6 (2)		23					
4.5	18	7 (2)		18					
5.0	19	8 (3)			19				
5.5	23	7 (3)			23				
6.0	25	7 (3)			25				
6.5	11	7 (3)			11				
7.0	15	4 (3), 2 (4), 2 (5)			8	4	4		
7.5	16	1 (3), 7 (4)			2	14			
8.0	7	1 (4), 4 (5), 1 (6)				1	5	1	
8.5	7	1 (4), 2 (5), 4 (6)				1	2	4	
9.0	5	1 (5), 2 (6), 2 (7)					1	2	2
Total	199		13	59	88	20	11	7	2

Table 5. Age-length key for largemouth bass captured during the general survey on Silver Lake in June 2006.

Length group	# in sample	# (age) in subsample	Age 1	Age 2	Age 3	Age 4	Age 5	Age 6	Age 7	Age 8
3.5	1	1 (1)	1							
7.0	2	1 (2)		2						
7.5	1	1 (2)		1						
8.0	9	5 (2)		9						
8.5	7	6 (2)		7						
9.0	5	5 (2)		5						
9.5	5	5 (2)		5						
10.0	3	2 (2)		3						
10.5	2	2 (2)		2						
11.0	3	3 (2)		3						
11.5	2	1(3), 1 (4)			1	1				
12.5	4	3 (4)				4				
13.0	7	7 (4)				7				
13.5	6	5 (4)				6				
14.0	5	4 (4), 1 (5)				4	1			
14.5	10	2 (4), 4 (5), 1 (6)				3	6	1		
15.0	8	6 (5), 1 (6)					7	1		
15.5	8	3 (5), 2 (6)					5	3		
16.0	2	1 (5), 1 (6)					1	1		
16.5	4	2 (5), 1 (6), 1 (7)					2	1	1	
17.0	3	1 (5), 1 (6), 1 (7)					1	1	1	
17.5	1	1 (7)							1	
19.0	1	1 (8)								1
Total	99		1	37	1	25	22	9	3	1

APPENDIX

Lake Pages

LAKE SURVEY REPORT

Type of Survey	
<input type="checkbox"/> Initial Survey	<input checked="" type="checkbox"/> Re-Survey

Lake Name Silver Lake	County Kosciusko	Date of survey (Month, day, year) 6/5-6/2006
Biologist's name Edward R. Braun		Date of survey (Month, day, year)

LOCATION		
Quadrangle Name Silver Lake	Range 5E; 6E	Section 1; 6
Township Name 30N	Nearest Town Silver Lake	

ACCESSIBILITY					
State owned public access site		Privately owned public access site		Other access site County-owned easement with boat ramp	
Surface acres 102	Maximum depth 33 ft	Average depth 14.9 ft	Acre feet 1,520	Water level 861.73 MSL	Extreme fluctuations none
Location of benchmark East shore of lake, just north of inlet					

INLETS		
Name Funk Ditch	Location North end	Origin North Little Lake
Unnamed Ditch	East End	Runoff
Unnamed Ditch	Southeast corner	Runoff

OUTLETS			
Name Silver Creek	Location Southwest corner of lake, flows to Eel River		
Water level control Corrugated steel dam, non-adjustable level			
POOL	ELEVATION (Feet MSL)	ACRES	Bottom type <input type="checkbox"/> Boulder <input type="checkbox"/> Gravel <input checked="" type="checkbox"/> Sand <input checked="" type="checkbox"/> Muck <input type="checkbox"/> Clay <input checked="" type="checkbox"/> Marl
TOP OF DAM			
TOP OF FLOOD CONTROL POOL			
TOP OF CONSERVATION POOL			
TOP OF MINIMUM POOL			
STREAMBED			

Watershed use General farming, mostly feedlot operations, town of Silver Lake
Development of shoreline Approximately 60% developed for residential, west shore pasture, north shore wooded.
Previous surveys and investigations Fisheries surveys: 1962, 1969, 1972, 1973, 1974, 1975, 1980, 1986, 1987, and 1989

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night hours		Total hours
	0		1		1
TRAP NETS	Number of traps		Number of Lifts		Total effort
	2		2		2
GILL NETS	Number of nets		Number of Lifts		Total effort
	4		4		4
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

SILVER LAKE

PHYSICAL AND CHEMICAL CHARACTERISTICS			
Color	Turbidity		Air temperature: F
	8 feet	2 Inches (SECCHI DISK)	
Water chemistry GPS coordinates:		N 41.08236551	W -85.898586

WATER QUALITY PARAMETERS															
DEPTH (Feet)	Degrees (F)	D.O.	SpC	pH	TDS	D.O.%	Turb.	DEPTH	Degrees (F)	D.O.	SpC	pH	TDS	D.O.%	Turb.
SURFACE	73.9	10.99	0.507	9.51	0.3	132.7	6	52							
2	73.4	10.39	0.508	9.52	0.3	125	4.7	54							
4	73	9.53	0.51	9.45	0.3	114	4.3	56							
6	72.9	9.33	0.51	9.46	0.3	111.5	4.1	58							
8	72.6	8.75	0.51	9.42	0.3	104.2	3.6	60							
10	68.2	7.76	0.516	9.13	0.3	88.1	7.4	62							
12	63.9	5.7	0.52	8.82	0.3	61.7	11	64							
14	61.5	3.32	0.524	8.56	0.3	35	10.1	66							
16	59.9	1.22	0.53	8.42	0.3	12.6	8.2	68							
18	58.8	0.61	0.533	8.37	0.3	6.2	7.3	70							
20	57.2	0.5	0.538	8.33	0.3	5	8.1	72							
22	55.9	0.42	0.544	8.29	0.4	4.2	10.1	74							
24	54.9	0.41	0.547	8.27	0.4	4	10.4	76							
26	54.1	0.31	0.551	8.25	0.4	3	21.3	78							
27.3	53.8	0.3	0.554	8.11	0.4	2.9	79.9	80							
30								82							
32								84							
34								86							
36								88							
38								90							
40								92							
42								94							
44								96							
46								98							
48								100							
50															

SPECIES AND RELATIVE ABUNDANCE OF FISHES COLLECTED BY NUMBER AND WEIGHT

*Common name of fish	Number	Percent	Length range (in)	Weight (lbs)	Percent
Bluegill	199	38.2	2.0 - 9.1	29.90	8.7
Largemouth bass	99	19.0	3.7 - 19.1	106.10	30.8
Gizzard shad	97	18.6	11.5 - 16.8	91.98	26.7
Redear sunfish	28	5.4	6.6 - 11.0	16.43	4.8
Yellow perch	16	3.1	6.4 - 12.0	6.13	1.8
White sucker	13	2.5	12.8 - 17.3	18.10	5.3
Black crappie	12	2.3	3.3 - 11.6	2.38	0.7
Golden shiner	10	1.9	6.3 - 9.3	2.55	0.7
Brown bullhead	9	1.7	13.3 - 15.4	13.59	3.9
Warmouth	8	1.5	5.2 - 8.6	2.55	0.7
Hybrid sunfish	7	1.3	5.8 - 8.1	2.32	0.7
Yellow bullhead	6	1.2	8.6 - 12.3	4.41	1.3
White bass	5	1.0	7.1 - 15.3	3.56	1.0
Carp	4	0.8	24.4 - 30.9	36.47	10.6
Spotted sucker	4	0.8	13.5 - 18.4	7.10	2.1
Lake chubsucker	3	0.6	5.5 - 8.1	0.50	0.1
Pumpkinseed	1	0.2	6.9	0.29	0.1
Total (17 Species, 1 hybrid)	521	100.0		344.36	100.0

*Common names of fishes recognized by the American Fisheries Society.

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF BLUEGILL										
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	
1.0					19.0					
1.5					19.5					
2.0	2	1.0	0.01		20.0					
2.5	5	2.5	0.01		20.5					
3.0	5	2.5	0.02		21.0					
3.5	18	9.0	0.03		21.5					
4.0	23	11.6	0.04		22.0					
4.5	18	9.0	0.06		22.5					
5.0	19	9.5	0.08		23.0					
5.5	23	11.6	0.11		23.5					
6.0	25	12.6	0.14		24.0					
6.5	11	5.5	0.20		24.5					
7.0	15	7.5	0.26		25.0					
7.5	16	8.0	0.32		25.5					
8.0	7	3.5	0.37		26.0					
8.5	7	3.5	0.44		TOTAL	199	100			
9.0	5	2.5	0.53							
9.5										
10.0										
10.5										
11.0										
11.5										
12.0										
12.5										
13.0										
13.5										
14.0										
14.5										
15.0										
15.5										
16.0										
16.5										
17.0										
17.5										
18.0										
18.5										
ELECTROFISHING CATCH		124 fish/h		GILL NET CATCH		4 fish/lift		TRAP NET CATCH		29.5 fish/lift

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF LARGEMOUTH BASS									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0	1	1.0	4.16	
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5	1	1.0	0.02		21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5					24.5				
7.0	2	2.0	0.15		25.0				
7.5	1	1.0	0.15		25.5				
8.0	9	9.1	0.20		26.0				
8.5	7	7.1	0.26		TOTAL	99			
9.0	5	5.1	0.31						
9.5	5	5.1	0.36						
10.0	3	3.0	0.42						
10.5	2	2.0	0.47						
11.0	3	3.0	0.58						
11.5	2	2.0	0.69						
12.0									
12.5	4	4.0	0.94						
13.0	7	7.1	1.01						
13.5	6	6.1	1.10						
14.0	5	5.1	1.24						
14.5	10	10.1	1.40						
15.0	8	8.1	1.70						
15.5	8	8.1	1.81						
16.0	2	2.0	2.06						
16.5	4	4.0	2.39						
17.0	3	3.0	2.37						
17.5	1	1.0	2.78						
18.0									
18.5									

ELECTROFISHING CATCH	89 fish/h	GILL NET CATCH	2.5 fish/lift	TRAP NET CATCH	0 fish/lift
----------------------	-----------	----------------	---------------	----------------	-------------

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF YELLOW PERCH									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5	1	6.3	0.08		24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	16	100		
9.0	7	43.8	0.26						
9.5	2	12.5	0.36						
10.0	2	12.5	0.45						
10.5	1	6.3	0.55						
11.0									
11.5	2	12.5	0.67						
12.0	1	6.3	0.74						
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	0 fish/h	GILL NET CATCH	4 fish/lift	TRAP NET CATCH	0 fish/lift
----------------------	----------	----------------	-------------	----------------	-------------

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF REDEAR SUNFISH									
TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0					19.0				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0					23.0				
5.5					23.5				
6.0					24.0				
6.5	1	3.6	0.20		24.5				
7.0	4	14.3	0.28		25.0				
7.5	3	10.7	0.36		25.5				
8.0					26.0				
8.5	3	10.7	0.53		TOTAL	28	100		
9.0	4	14.3	0.59						
9.5	3	10.7	0.64						
10.0	6	21.4	0.79						
10.5	2	7.1	0.77						
11.0	2	7.1	0.95						
11.5									
12.0									
12.5									
13.0									
13.5									
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	0 fish/h	GILL NET CATCH	0 fish/lift	TRAP NET CATCH	14 fish/lift
----------------------	----------	----------------	-------------	----------------	--------------

Back-calculated lengths-at-age for bluegill, largemouth bass, yellow perch, and redear sunfish.

Bluegill Intercept = 0.8	Year	Number	Back Calculated Length (inches) at Each Age						
	Class	Aged	I	II	III	IV	V	VI	VII
	2005	9	2.2						
	2004	23	1.8	3.1					
	2003	34	1.5	3.3	5.2				
	2002	11	1.7	2.7	5.0	7.0			
	2001	9	1.7	3.1	5.6	7.2	7.6		
	2000	7	1.7	3.6	5.9	7.4	8.1	8.4	
	1999	2	1.7	3.2	5.4	7.6	8.3	8.7	8.9
	Average Length		1.8	3.2	5.4	7.2	7.8	8.4	0.0
	Standard Deviation		0.226	0.297	0.403	0.158	0.344	0.000	0.000

Largemouth bass Intercept = 0.8	Year	Number	Back Calculated Length (inches) at Each Age							
	Class	Aged	I	II	III	IV	V	VI	VII	VIII
	2005	1	2.9							
	2004	30	4.1	9.0						
	2003	1	3.4	8.6	11.1					
	2002	21	3.9	7.9	11.7	13.4				
	2001	18	4.4	8.9	12.3	14.3	15.3			
	2000	7	4.3	9.2	12.3	14.2	15.2	15.8		
	1999	3	4.6	9.2	12.2	14.1	15.3	16.3	17.0	
	1998	1	4.8	10.4	13.0	15.7	16.7	17.4	18.7	19.1
	Average Length		4.3	8.8	12.1	14.0	15.2	16.1	17.0	0.0
	Standard Deviation		0.302	0.548	0.270	0.433	0.014	0.391	0.000	0.000

Yellow perch Intercept = 0.8	Year	Number	Back Calculated Length (inches) at Each Age						
	Class	Aged	I	II	III	IV	V	VI	VII
	2004	1	4.7	7.4					
	2003	1	2.9	6.1	7.9				
	2002	8	3.2	5.3	7.3	8.4			
	2001	4	3.3	5.7	7.9	9.4	10.2		
	2000	1	3.1	6.3	8.3	9.8	10.6	11.1	
	1999	1	3.6	6.7	9.0	10.3	11.0	11.6	11.8
	Average Length		3.2	5.5	7.6	8.9	10.2	0.0	0.0
	Standard Deviation		0.057	0.266	0.428	0.689	0.000	0.000	0.000

Redear sunfish
Intercept = 0.6

Year Class	Number Aged	Back Calculated Length (inches) at Each Age					
		I	II	III	IV	V	VI
2004	8	2.2	6.2				
2003	9	2.2	5.7	8.6			
2002	6	2.4	6.3	9.1	9.9		
2001	3	2.0	4.9	8.4	9.5	10.0	
2000	1	2.4	5.6	9.1	9.9	10.4	10.7
Average Length		2.2	5.8	8.7	9.7	10.0	0.0
Standard Deviation		0.187	0.644	0.359	0.284	0.000	0.000

Locations of gear types in Silver Lake given in decimal degrees.

GILL NETS				TRAP NETS				ELECTROFISHING			
1 N	41.08490288	W	-85.89842507	1 N	41.08070791	W	-85.90513595	1 N	41.07877672	W	-85.89877375
2 N	41.08218849	W	-85.90733000	2 N	41.08001053	W	-85.89928874	N	41.08099222	W	-85.89853236
3 N	41.07890010	W	-85.90142914					2 N	41.08512282	W	-85.89948186
4 N	41.08302534	W	-85.90252348					N	41.08315408	W	-85.90205141
								3 N	41.08133018	W	-85.90837070
								N	41.08006954	W	-85.90449222
								4 N	41.07780576	W	-85.90141305
								N	41.07722104	W	-85.89857527

