

Crooked Lake - Noble & Whitley Counties

Fish and Wildlife Research and Management Notes

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BACKGROUND

Crooked Lake is a 206-acre natural lake located 7 miles north of Columbia City. It sits at the top of the Tippecanoe Watershed and drains one square mile. Maximum depth is 108 feet and average depth is 43 feet. Hydraulic retention time is nine years. Little Crooked Lake, a 13-acre basin at the east end, contains 2 percent of the lake volume. Access is available at a public ramp at the west end. Most of the north shore is a wooded nature preserve.

Water quality at Crooked Lake is very good. Secchi depths typically range from 8-16 feet, although 18 feet has been recorded ([Table 1](#)). It is one of Indiana's cleanest lakes (trophic index < 15). Oxygen (> 5 ppm) is often present for fish down to 70 feet deep in summer but levels sag to low amounts (< 3 ppm) on occasion below the thermocline at 20 feet. Spatterdock and water lilies are the major emergent plant species. Coontail is the major submerged plant and typically grows to 18 feet deep. The bottom is marl and sand.

Crooked Lake's management history dates back to an initial fish survey in 1969. Surveys were also done in 1978 and 1987. Cisco population status has been monitored annually since 1978 based on gill netting in September ([Table 2](#)). Annual fishing effort and catches were estimated during 1978-81 and late-fall cisco fishing was monitored from 1980-94. Crooked Lake has experienced cisco die-offs on occasion due to degraded water quality. One of the largest kills occurred in 1981. Since 1989 the Indiana Division of Fish and Wildlife has designated it one of three major cisco lakes in the state and supported efforts to protect cisco habitat by limiting shoreline alterations and use of aquatic herbicides, implementing watershed management practices, and installing a sewer system. Brown, lake and rainbow trout were previously stocked in Crooked Lake to utilize the available cold-water habitat and add diversity to fishing opportunities. In lieu of cisco declines however, brown and lake trout stockings were discontinued prior to 1986 and rainbow trout stockings were discontinued in 1995.

To obtain current data on the status of the lake, another fish population survey was conducted on June 19-22, 2000. Effort consisted of 60 minutes of DC electrofishing, eight gill net lifts and four trap net lifts. The results and comparisons to previous surveys are presented in this report.

SURVEY RESULTS

During the survey 694 fish weighing 228 pounds were collected. Eighteen species were noted. Bluegills comprised half the catch by number (50%), followed by largemouth bass (19%) and redear (11%). Bass also comprised most of the weight (34%). Redear made up 15% and bluegills 11%. Sport fish accounted for 93% of the total number and 82% of the weight.

Bluegills ranged from 1-10 inches long. Twenty were eight inches or larger and 30 were seven inches or larger. The number of bluegills captured by electrofishing (44/15-min) was low compared to other lakes in the area. The trap net catch (41/lift) was also low. Bluegill growth was average up to three years old and above average for older fish. Four-year-old bluegills were over seven inches long.

Of the 130 largemouth bass caught in the survey, all but six were captured by electrofishing at a rate of 31/15-minutes, a rate typical of most lakes in the area. Bass measured 1-19 inches long but only five met or exceeded the current 14-inch minimum size limit. Their growth rate was normal compared to bass in other lakes with four-year-old fish reaching 11 inches long.

Thirty yellow perch measuring 3-13 inches long were collected. Half were 10-inch or larger. Their growth rate was also above average with four-year-old fish reaching 8 inches and six-year-old fish over 10 inches.

Other sport fish in the survey catch included 76 reedear from 2-11 inches long, 21 rock bass up to 8 inches, 13 pumpkinseeds, 10 brown bullheads up to 16 inches, eight warmouth, four yellow bullheads and one green sunfish. In addition, three large ciscoes measuring 16-18 inches long were caught in one gill net set in deep water along the north shore of Brush Island. The remaining fish caught during the survey included 19 bluntnose minnows, 13 lake chubsuckers, 12 spotted gar, three longnose gar, two golden shiners and two bowfin. Brook silversides were noted but not collected.

SURVEY COMPARISONS

The number of fish collected at Crooked Lake between 1969 and 2000 varied from 426 to 766 and averaged 627 ([Table 3](#)). Some of the differences were probably due to changes in sampling and do not reflect any major shifts in species composition. There was considerable similarity in the number of fish caught in 1987 and 2000, especially largemouth bass, reedear, yellow perch, pumpkinseeds and several miscellaneous species. Very few largemouth bass were caught in 1978 and few crappies were caught in the last two surveys. Cisco abundance peaked in 1978. Trout are probably no longer present.

Large bluegills have been consistently present in Crooked Lake, although more 8-inch and larger ones were caught in the last two surveys ([Table 4](#)). Few 14-inch and larger bass were sampled in 1969 and 1978 compared to 1987 and 2000, while more 12- to 13 -inch bass were caught in the latest survey and may be attributed to imposition of a 12-inch size limit in 1991 and 14-inch size limit in 1998. ([Table 5](#))

MANAGEMENT IMPLICATIONS

Crooked Lake continues to support ample numbers of catchable-size bluegills, yellow perch and other sunfish. Recruitment and growth of these sport fish remain good. In addition, largemouth bass are now more abundant, although numbers of legal-size bass remain low. Imposition of a minimum size limit has apparently increased the number of bass but other steps may now be

needed to increase the number of larger bass. The lake also supports a good diversity of other fish species, including ciscoes.

Crooked Lake's cisco population, although more abundant now than in recent years, remains at a level lower than the peak years of 1979, 1986 and 1990. The presence of sexually-ripe ciscoes on the spawning grounds off the public access site in 1997, as well as the presence of smaller ciscoes observed in the latest gill net catches in September, indicate recruitment is occurring but not at levels comparable to the late 1970s. More information is needed on the factors that limit cisco recruitment.

Despite efforts to protect water quality at Crooked Lake, another cisco die-off occurred in late August and September 2000. Dissolved oxygen levels at 7:00am were less than 3ppm below 16 feet and less than one ppm at 20 feet and below ([Table 6](#)). Oxygen levels increased

considerably within the hour once photosynthesis got underway. Amounts as high as 20ppm were recorded at 10 feet, 12ppm at 16 feet, and 5ppm at 20 feet. As a result, dead and dying ciscoes of all sizes ([Table 7](#)) were noted primarily in the early morning hours. During brief periods of low oxygen, ciscoes were most likely forced into shallower water where they succumbed to warmer temperatures. Apparently numerous ciscoes survived, however, as indicated by the gill net catch in late September. While these observations indicate cisco mortalities may occur periodically due to natural conditions, the extent of the die-offs may be minimized by environmental measures in place.

No immediate fish management programs are needed at Crooked Lake at the present time, however efforts should continue to focus on protecting fish habitat and reducing nutrient and sediment inputs. Crooked Lake residents, based on past efforts to limit alterations to the shoreline and protect shoreline vegetation, have a unique opportunity to preserve and enhance the natural character of the lake.

Table 1. Oxygen levels (ppm) and water clarity (secchi depth) at Crooked Lake from 1969-2000.

Depth (ft)	8/69	8/72	8/87*	8/90*	8/91*	8/92*	6/00	9/00*
0	9.6	10.0	8.0	11.0	11.0	7.0	9.8	6.5
5	10.0	10.0	8.0	11.0	10.0	7.0	9.9	5.9
10	10.74	9.0	8.0	11.0	10.0	7.0	10.0	5.5
15	9.4	10.0	8.0	10.0	10.0	5.0	10.6	4.3
20	9.2	9.0	9.0	10.0	10.0	6.0	5.5	0.5
25	12.4	10.0	0.8	5.0	8.0	8.0	3.9	0.0
30	11.6	9.0	0.6	2.0	2.0	6.0	4.8	0.0
35	11.6	8.0	2.0	2.0	2.0	2.0	5.3	0.7
40	14.0	5.2	3.0	4.0	3.0	4.0	6.3	1.0
45	-----	4.2	-----	4.0	5.0	5.0	6.7	0.6
50	-----	5.4	5.0	4.0	5.0	5.0	6.7	0.9
60	-----	5.6	-----	5.0	6.0	0.8	6.0	0.4
70	-----	4.8	-----	3.0	5.0	3.0	5.2	0.0
80	-----	3.4	-----	4.0	2.0	1.4	3.6	0.2
90	-----	3.0	-----	0.3	0.8	0.6	2.3	0.5
Secchi (ft)	16.0	7.5	9.0	6.5	11.5	18.0	8.2	11.0

*other data available for multiple samples on various occasions.

Table 2. Number of fish collected during fish population surveys at Big Lake from 1963-2000.

Year	N	Lifts	N/lift	Inches	Catch	Hours
1978	28	8	3.5	11.5	-----	-----
1979	84	8	10.5	11.0	-----	-----
1980	-----	0	-----	-----	5,524	1,058
1981	20	8	2.5	10.9	-----	-----
1982	1	10	0.1	11.5	1,709	804
1983	9	8	1.1	12.3	481	332
1984	9	4	2.3	12.8	578	530
1985	2	10	0.2	13.8	1,717	715
1986	44	7	6.3	12.8	38	168
1987	16	7	2.3	12.8	8	10
1988	8	5	1.6	14.1	46	66
1989	6	5	1.2	14.6	17	28
1990	18	5	3.6	13.4	77	37
1991	14	5	2.8	15.0	18	29
1992	2	6	0.3	15.2	12	18
1993	1	8	0.1	15.4	20	24
1994	15	10	1.5	16.4	-----	-----
1995	18	7	2.6	11.1	-----	-----
1996	0	8	0.0	-----	-----	-----
1997	1	9	0.1	16.7	-----	-----
1997*	13	-----	-----	-----	-----	-----
1998	3	8	0.4	11.6	-----	-----
1999	0	6	0.0	-----	-----	-----
2000	12	7	1.7	10.8	-----	-----

*Netting for 10 minutes on December 13 at the west end of the lake.

Table 3. Number of fish collected during fish population surveys at Crooked Lake from 1969-2000.

Species	1969	1978	1987	2000
Black bullhead	1	0	0	0
Black crappie	15	7	0	0
Blackchin shiner	0	1	0	0
Bluegill	85	241	239	347
Bluntnose minnow	-----	0	2	19
Brook silverside	-----	2	7	-----
Brown bullhead	0	4	3	10
Brown trout	0	25	0	0
Bowfin	2	1	5	2
Cisco	0	140	0	3
Grass pickerel	2	6	13	0
Green sunfish	3	13	2	1
Golden shiner	1	3	1	2
Hybrid sunfish	0	5	1	0
Lake chubsucker	41	64	18	13
Largemouth bass	104	14	143	130
Longnose gar	0	0	3	3
Pumpkinseed	46	24	14	13
Rainbow trout	0	0	5	0
Redear	5	38	79	76
Rock bass	35	34	13	21
Spotted gar	4	10	5	12
Warmouth	46	54	32	8
Yellow bullhead	3	7	3	4
Yellow perch	36	73	32	30
TOTAL	429	766	620	694
Sampling effort				
Electrofishing hrs	2ac	1.3ac	1dc	1dc
Gill net lifts	8	16	6	8
Trap net lifts	2	12	8	4
Seine hauls	4	0	0	0

*denotes observed but not collected.

Table 4. Size of bluegills collected at Crooked Lake from 1969-2000.

Inches	1969	1978	1987	2000
1-1	0	0	0	15
2-2	6	15	27	81
3-3	24	37	32	112
4-4	21	70	49	41
5-5	6	61	53	51
6-6	13	36	29	17
7-7	14	18	24	10
8-8	1	3	23	15
9-9	0	0	1	4
10-10	0	1	1	1

Table 5. Size of largemouth bass collected during surveys at Crooked Lake from 1969-2000.

Inches	1969	1978	1987	2000
<8	57	7	97	17
8-11	42	7	33	89
12-13	5	0	8	19
14-17	0	0	5	4
18	0	0	0	1

Table 6. Temperature (F) and dissolved oxygen levels (ppm) at Crooked Lake in September 2000.

Depth(ft)	F	ppm	F	ppm
0	79.0	6.5	74.5	7.5
2	79.2	5.9	14.7	7.7
4	79.3	5.8	74.7	7.7
6	79.3	5.8	74.8	8.0
8	78.3	5.7	74.8	7.8
10	77.9	5.5	74.8	7.8
12	77.0	5.0	74.5	7.8
14	76.6	4.8	74.3	7.3
16	74.8	3.8	73.9	7.0
18	71.6	2.1	73.4	6.3
20	67.8	0.5	68.4	2.3
22	63.5	0.3	60.4	1.5
24	57.7	0.0	56.7	1.3
26	54.5	0.0	54.1	0.8
28	51.8	0.0	52.7	0.9
30	50.0	0.0	50.7	0.9
32	48.0	0.1	49.3	1.0
34	47.1	0.5	48.2	1.0
36	46.4	0.8	47.5	0.9
38	46.0	1.0	46.6	1.0
40	45.9	1.0	46.0	1.7
42	45.7	0.9	45.9	1.8
44	45.5	0.9	45.5	1.9
46	45.3	0.8	45.3	2.0
48	45.0	0.8	45.1	2.0
50	44.6	0.9	45.0	2.0
60	43.5	0.4	43.7	1.0
70	42.8	0.0	43.7	0.7
80	42.4	0.2	-----	-----
90	42.1	0.5	-----	-----

Table 7. Size distribution of dead ciscoes observed on four occasions at Crooked Lake in 2000.

Inches	8/30/00	9/1/00	9/8/00	9/13/00
10	2	2		
10	1	1		
11	5	2		
11	2	5	5	
12	1	1		
12				
13				
13	1			
14	1			
14	1	2	1	
15	1	3	3	
15	1	1	1	1
16	3			
Total	2	6	24	15

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