Michigan Department of Natural Resources
Status of the Fishery Resource Report 98-1, 1998

DIAMOND LAKE

Cass County (T7S, R14W, Sections 31 and 32)
Surveyed May 9-14, 1994

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Environment

Diamond Lake lies in central Cass County of southwestern Michigan, about 1 mile southeast of the city of Cassopolis. Diamond Lake is natural, having been formed during the Wisconsinan glacial stage (10,000 to 75,000 years ago). The 3,843-acre watershed drains to Christiana Creek which flows south to the St. Joseph River of Lake Michigan.

The topography of the watershed is that of gently rolling hills made of well-drained sandy outwash plains and moraines. The soils are classified as Kalamazoo - Schoolcraft associations, which are well drained loamy soils. The watershed is primarily made up of farms, woodlots, and residential homes around the lake.

Diamond Lake is 1,020 acres in size and up to 64 feet deep (see map). It has a flushing rate of 2.9 years (Water Quality Investigators 1994). Diamond Island (43.1 acres) is found in the center of the lake. Shoal areas (less than 20 feet deep) account for about 68% of the surface area of the lake. Aquatic vegetation is very sparse, with some of the shoal areas having Chara interspersed with Sagittaria, Potamogeton, and Vallisneria. The substrate is mostly made up of gravel, cobble, and marl.

Water quality conditions were surveyed August 17, 1994. The water was clear to light green in color with a Secchi disc reading of 9.3 feet. Within the water column, alkalinity ranged from 156 to 180, and pH was 8.6. These values indicate that the water is hard and well buffered. Water temperature varied from 74F at the surface to 54F at the bottom (60 feet), with the thermocline occurring between 29 and 38 feet. Oxygen levels dropped below 3 ppm between 30-31 feet, effectively prohibiting most fish from using the water column deeper than 31 feet.

There are historical water quality data from September 10, 1958 and August 22, 1985. Results were similar except alkalinity ranges were lower, 135-165 ppm in 1958 compared to 113-139 ppm in 1985. Secchi disc depths were also 2-3 feet shallower in the historical water quality surveys.

Diamond Lake is a popular recreational lake. The entire shoreline of the lake and Diamond Island are lined with cottages and homes, except the wetland area near the outlet. There is one marina, and a public boat launch that can accommodate up to 60 vehicles with trailers. During summer months, lake activity is very high, and there have been some complaints from anglers regarding boat traffic.

Fishery Resource

The first fishery survey of Diamond Lake was conducted in 1887. Gill nets were used for 1 night. The lake at that time had sand and gravel substrate, and the shore was described as having severely high banks all around the lake. Smallmouth bass, largemouth bass, perch, rock bass, bluegills, and walleye were noted as present. An abundance of crayfish was noted in the stomachs of smallmouth bass and perch. The fish appeared to be in excellent condition and extra large.

Walleye stocking (2 million fry) occurred as early as 1892 according to Michigan Fish Commission reports. Walleye fry were stocked again in 1921, 1923, and 1930. Between 1934 and 1945 various combinations of bluegill, large and smallmouth bass, and yellow perch were stocked. The lake was known to support a good fishery at that time. In 1958, a gill net and seine survey was conducted by the Institute for Fisheries Research. All game fish collected in that survey were growing above state average rates except for walleye, which were growing at state average rates. Twelve gill net sets (experimental mesh, 125 ft. long x 6 ft. deep) were fished at various depths (4-27 feet deep) around the lake. Five hauls with a 20 ft x 4 ft seine were also made. A total of 436 fish were collected.

In the 1960s and early 1970s, a few anglers requested a walleye stocking program to supplement the small natural population. Stocking of walleye resumed 1974. A boomshocking survey was conducted in October of 1975 to evaluate walleye stocking success. In a 2-hour period, 1,142 fish were sampled, including only one walleye. All the fish showed good growth rates. Fishing reports were good for most species with an occasional walleye being caught. Compared to 1958, the fish community was unchanged. In 1976, half of the shoreline was sampled using a boomshocker before equipment problems occurred. Six walleye were taken ranging in size from 8-22 inches.

From 1974 to 1982, Diamond Lake was stocked with walleye fry at a rate of 200-2,000 per acre. It was determined after a 1982 walleye survey that the fry plants were not contributing much to the population of the lake. It was suggested that fry plants be replaced by fingerling plants to increase survival rate. From 1983 to 1986, fingerlings were stocked annually at a rate of about 15-20 per acre. In 1987, walleye fingerling stocking changed to every other year rather than every year and the rate increased to 50 per acre. A 1990 Serns Index survey collected 19 walleye ranging from 8-24 inches with a mean growth index +2.3 inches above the state average for walleye. The Serns Index for young-of-the-year walleye was 0.5 fingerlings per acre.

The most recent survey was conducted in May, 1994 using four 6'x3'x1.5" standard trap nets, four 125' experimental gill nets, and 1.2 hours of night-time DC boomshocking. Netting was conducted for 2 nights.

The fish community found in 1994 did not differ significantly from any previous survey except for the absence of banded killifish and sand shiners (Table 1). Bluegill, yellow perch, smallmouth bass, and walleye are the mainstay of the fishery, with rock bass and

northern pike providing a good fishery in recent years. Overall, sport fish populations were in good shape.

Bluegill were the most abundant species collected by number. Over 51% of those collected were of acceptable size. Growth rates were below the state average (Table 2), with bluegill younger than age V exhibiting slow growth and older bluegill showing average growth. Growth has declined compared to past surveys. Age-frequency analysis (Table 3) shows some low recruitment levels of young bluegill, but this may be due to our sampling methods. Using Schneider's index of bluegill populations (1990), this population ranked average to good at 4.5 on a scale of 1-7, using trap net length-frequency data.

Yellow perch are growing above state average rates. Eight year classes of perch were collected, and recruitment of young perch was good. Over 77% of the perch were of acceptable size, which is exceptional for lakes in southwestern Michigan.

Although relatively few black crappie were collected, five year classes were present (Table 2). Growth rates were well above state average, and 46% were of acceptable size.

More largemouth bass than smallmouth bass were collected, although habitat is better suited for smallmouth bass. A total of 175 largemouth bass ranging from 5-19 inches were collected (Table 1). Twenty-eight percent were of legal size. There were six year classes collected, and growth rates were at the state average. Recruitment has been good except for the 1993 year class (Age I). Survival drops between age V and VI due to angling pressure once bass become legal size.

A total of 36 smallmouth bass were collected ranging in size from 4-17 inches. Growth rates were at the state average, and 30% of the catch was over the legal size. Six year classes were collected. Recruitment and survival appear to be consistent among year classes.

Northern pike made up the largest percent (16.8%) of the sport fish catch by weight at 142 pounds for 55 fish. Considering all species sampled, northern pike were only behind longnose gar (172 pounds) in the catch by weight category. Forty-six percent of the pike were over the legal size limit, and growth rates were at the state average. Seven year classes were present. Northern pike spawning habitat is limited to the wetland area near the outlet.

The recent walleye stocking program at Diamond Lake has been very successful. A total of 33 walleye were collected representing 10 age classes. This walleye population is older than populations in other area walleye lakes and may be a result of low angler harvest. Growth rates for walleye were over 1.5 inches above the state average. Most walleye collected were age I and III from the 1993 and 1991 year classes, respectively. Natural reproduction has made a significant contribution to the population. The strongest year class was in 1991 (age III), which was a year with no stocking. There

were also good year classes in 1987 and 1989; both were years with no stocking. Another possibility is that there may be some private, unpermitted stocking going on. Approximately 68% of the walleye were of legal size.

The forage base seems to be holding up well. Golden shiners, central mudminnows, chubsuckers, and white suckers were collected. Survey notes indicate that brook silversides, mayfly larvae, and crayfish were also abundant.

The overall fishery of this lake is very good. There have not been many complaints about the fishery in this lake; however, some anglers have suggested that more walleye be stocked. In recent years, ice-fishing anglers have been complaining about the large numbers of northern pike being caught. Diamond Lake is mostly used by Cass County anglers; some anglers come up from Indiana. The walleye fishery in Diamond Lake can be compared to Magician Lake in the northwestern corner of Cass County. Diamond and Magician Lakes are very similar in character, but Magician Lake produces better walleye catches. Northern pike fishing is good in both Diamond and Magician lakes.

Management Direction

Diamond Lake will continue to be managed as one of southwestern Michigan's premier warmwater fisheries and stocked walleye waters. Currently, the stocking level is 50 spring fingerlings per acre on an every- other-year basis (51,000 SF). Stocking sometimes occurs during off years if enough walleye are available and the previous years Serns Index results indicate failure of significant survival of stocked and natural walleye. Based on this survey and reports from anglers, a good walleye fishery has been created in Diamond Lake. Continued stocking will augment the natural walleye population and will ensure that this fishery continues.

Our goal into the next century will be to maintain the excellent health of the current fishery and continue the walleye stocking program. Serns Index surveys will continue to be conducted to monitor walleye survival. To further evaluate the amount of walleye natural reproduction, Serns surveys should be conducted three years in a row, including one stocked year and two unstocked years. If natural reproduction is significant, stocking levels should be reduced to decrease competition with natural fish. These lower stocking rates should be monitored for 6-10 years to evaluate the lower stocking levels and to determine future stocking levels. A voluntary postcard creel survey will be administered to evaluate walleye angler harvest, catch rate, and effort. Investigations will continue to identify possibilities of unpermitted walleye stocking.

Report completed: March 13, 1998.

References

Schneider, J.C. 1990. Classifying bluegill populations from lake survey data. Michigan Department of Natural Resources, Fisheries Technical Report 90-10, Ann Arbor.

Water Quality Investigators, 1994. An atlas and gazetteer of Michigan Lakes, Volume 4, 1994, pages 232-233. Dexter.

Table 1 Number, weight, and length (inches) of fish collected from Diamond Lake with trap nets, gill nets, and DC boomshocker, May 9-14,1994.

Species	Number	Percent by number	Weight (Pounds)	Percent by weight	Length range (inches)[1]	Average length	Percent legal size[2]
Bluegill	420	28.1	29.6	3.5	1-9	4.3	51 (6")
Pumpkinseed	84	5.6	25.0	3.0	2-8	6.8	51 (6")
Black crappie	50	3.3	20.2	2.4	5-12	8.4	46 (7")
Green sunfish	1	0.1	0.0	0.0	1-1	1.5	0 (6")
Hybrid sunfish	1	0.1	0.1	0.0	5-5	5.5	0 (6")
Rock bass	172	11.5	40.9	4.8	1-10	6.2	67 (6")
Largemouth bass	175	11.7	132.4	15.7	5-19	10.9	28 (14")
Smallmouth bass	36	2.4	33.0	3.9	4-17	11.1	30 (14")
Warmouth	41	2.7	14.7	1.7	4-9	7.5	81 (6")
Walleye	33	2.2	65.1	7.7	8-29	16.7	68 (15")
Yellow perch	136	9.1	42.4	5.0	3-13	7.9	77 (7")
Northern pike	55	3.7	142.4	16.8	11-33	21.9	46 (24")
Bullhead species	158	10.6	0.0	0.0	8-16	12.9	---
Bowfin	35	2.3	120.9	14.3	14-26	21.1	---
Grass pickerel	7	0.5	0.7	0.1	5-9	7.6	---
Longnose gar	67	4.5	172.6	20.4	21-42	29.2	---
White sucker	1	0.1	0.5	0.1	10-10	10.5	---
Johnny darter	1	0.1	0.0	0.0	1-1	1.5	---
Lake chubsucker	10	0.7	4.3	0.5	8-10	9.0	---
Logperch	3	0.2	0.0	0.0	3-3	3.5	---
Bluntnose minnow	6	0.4	0.1	0.0	2-3	3.0	---
Central mudminnow	2	0.1	0.0	0.0	2-2	2.5	---
Golden shiner	2	0.1	0.2	0.0	6-7	7.0	---
Total	1,496	100.0	845.0	100.0			

[1]Note some fish were measured to 0.1 inch, others to inch group: e.g., "5"=5.0 to 5.9 inch, "12"=12.0 to 12.9 inches: etc.

[2] Percent legal size or acceptable size for angling. Legal size or acceptable size for angling is given in parentheses.

Table 2 Average total weighted length (inches) at age, and growth relative to the state average, for fish sampled from Diamond Lake with trap nets, gill nets, and DC boomshocker, May 9-14, 1994. Number of fish aged is given in parentheses.

						Age						Mean growth
Species	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**index[1]**
Black crappie		6.2	7.5	8.6	9.4	---	12.5					+1.6
		(20)	(7)	(10)	(6)	---	(1)					
Bluegill	1.7	2.4	3.6	5.2	6.6	7.8	8.1					-0.6
	(10)	(8)	(19)	(20)	(17)	(15)	(1)					
Largemouth bass	5.4	7.1	9.9	11.7	13.5	14.5						+0.2
	(1)	(21)	(19)	(18)	(15)	(4)						
Northern pike	11.3	19.6	20.2	27.4	23.5	27.9	24.6					+0.8
	(1)	(20)	(16)	(5)	(7)	(6)	(1)					
Smallmouth bass	4.8	7.9	10.8	12.3	14.2	15.8						+0.3
	(5)	(5)	(12)	(3)	(5)	(4)						
Walleye	9.4	13.4	14.5	17.5	19.1	19.6	20.5	---	24.4	29.1	24.5	+1.5
	(7)	(1)	(9)	(2)	(4)	(3)	(3)	---	(2)	(1)	(1)	
Yellow perch	3.7	5.3	7.6	9.1	11.0	11.0	11.7	11.4				+1.1
	(10)	(19)	(23)	(12)	(5)	(4)	(12)	(5)				

[1] Mean growth index is the average deviation from the state average length at age

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Table 3 Estimated age frequency (percent) of fish caught from Diamond Lake with trap nets, gill nets, and DC boomshocker, May 9-14, 1994.

	Age											Number
Species	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**	**IX**	**X**	**XI**	**caught**
Black crappie		45	16	23	14							50
Bluegill	11	9	21	22	19	17	1					420
Largemouth bass	1	27	24	23	19	5						175
Northern pike	2	36	29	9	13	11	2					55
Smallmouth bass	15	15	35	9	15	12						36
Walleye	21	3	27	6	12	9	9	---	6	3	3	33
Yellow perch	11	21	26	13	6	4	13	6				136

Appendix 1 History of walleye stocking in Diamond Lake, Cass County.

Year	Number	Size
1974	1,800,000	Fry
1975	1,000,000	Fry
1976	200,000	Fry
1977	600,000	Fry
1978	---	
1979	1,000,000	Fry
1980	1,000,000	Fry
1981	2,000,000	Fry
1982	1,435,000	Fry
1983	6,500	Fall fingerlings
1984	20,000	Spring fingerlings
1985	16,548	Spring fingerlings
1986	16,669	Spring fingerlings
1987	---	
1988	20,720	Spring fingerlings
1989	---	
1990	51,892	Spring fingerlings
1991	---	
1992	6,935	Fall fingerlings
1993	56,187	Spring fingerlings
1994	1,819	Fall fingerlings

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Questions, comments and suggestions are always welcome! Send them to tinchert@michigan.gov