Everett Lake

Allen County

Fish Management Report– 2009

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EXECUTIVE SUMMARY

Fishing quality deteriorated at Everett Lake, a 43-acre natural lake in northwest Allen County, following an influx of gizzard shad in the late 1990s. By 2004 gizzard shad became the most abundant fish by number and weight. Follow-up surveys conducted in 2005, 2007, and 2008 indicated shad abundance remained high.

To reduce the number of gizzard shad, 21 gallons of rotenone were applied to the Everett Lake on September 18, 2008. Few dead shad, however, were noted afterwards. Approximately 4,300 largemouth bass fingerlings were subsequently stocked on November 6, 2008.

The Division of Fish and Wildlife conducted a follow-up fish population survey at Everett Lake on June 9-10, 2009 to quantify changes in shad abundance and assess the initial effect of the rotenone application on the overall fish community.

During the survey, 170 fish representing 10 species were collected. Total weight was 89 pounds. Bluegill accounted for 48% of the number and 8% of the weight. Largemouth bass ranked second by number (22%) and comprised 45% of the weight. Fourteen gizzard shad made up 8% of the catch by number and 15% by weight.

Eighty-two bluegills from 1.4–8.3 inches long were caught. Of all 3-inch and larger bluegills, 21% were 6-inch or larger, 13% were 7-inch or larger, and 6% were 8-inch or larger. The number of bluegills captured by electrofishing (9/15-min) was very low compared to other lakes in the area (average 100/15-min). Thirty-eight largemouth bass were collected in the survey and were 4.2-20.8 inches long. All but four were 8-inch or larger, and of those only nine were legal-size (≥14-in). Of 14 gizzard shad collected during the survey, all were 13.1-15.1 inches long. Four shad were caught by electrofishing at a rate of 2/15-minutes and 10 were caught in gill nets at a rate of 5/lift.

Despite the low number of dead gizzard shad observed after the rotenone application, the project apparently reduced shad abundance by more than 90%. Meanwhile, the number of largemouth bass caught in 2009 was similar to numbers caught since 2004. Bluegill abundance has varied widely in previous surveys, so the number captured in 2009 and catch rate were not unusual.

It is recommended that another fish population survey be conducted at Everett Lake in June 2010 to continue monitoring changes in gizzard shad abundance and size and assess overall changes in the fish community.

CONTENTS

	Page
LIST OF TABLES AND FIGURES	4
INTRODUCTION	5
METHODS	5
RESULTS	6
DISCUSSION	6
RECOMMENDATION	7
APPENDICES	11

TABLES

Table Page

1. Historic oxygen levels (ppm) and water clarity (secchi depth) at Everett Lake from 1985 through 2009 (source - Division of Fish and Wildlife files). 8

2. Number and weight of fish collected during fish population surveys at Everett Lake from 1985 through 2009. EF represents electrofishing hours, GN equals gill net lifts, and TN equals trap net lifts. 9

3. Size of largemouth bass, bluegills, and gizzard shad collected by electrofishing at Everett Lake from 1985 through 2009. 10

INTRODUCTION

Fishing quality deteriorated at Everett Lake, a 43-acre natural lake near Arcola in northwest Allen County, following an influx of gizzard shad in the late 1990s. Although small gizzard shad provide forage for a variety of predator fish, many of the shad grew too large and competed for food with bluegills and other sport fish. By 2004, gizzard shad became the most abundant fish by number and weight. Follow-up surveys conducted in 2005, 2007, and 2008 indicated shad abundance remained high. Because gizzard shad are susceptible to a low concentration of rotenone (0.1 ppm), 15 gallons of the toxicant were applied to Everett Lake on September 18, 2008. Few dead shad were noted, so six additional gallons were applied the same day. Several small bluegills and some largemouth bass were also killed. Approximately 4,300 largemouth bass fingerlings were subsequently stocked on November 6, 2008.

Plans were to sample two days before and after the rotenone application to quantify the immediate reduction in shad. Because only nine shad were caught in 15 minutes of electrofishing before the treatment, the post-treatment sampling was cancelled. However, to assess the change in shad abundance and the impact on the overall fish community, the Division of Fish and Wildlife conducted a follow-up survey at Everett Lake on June 8-9, 2009. The results of this June survey, along with data from previous June surveys, are presented in this report.

Everett Lake lies in the Eel River watershed and drains 685 acres. The surrounding area is mostly farmed. A tile enters the southwest corner and the outlet, Johnson Ditch, leaves the east end. Retention time is about 405 days. Much of the shoreline is residential, although alterations have been minimal. A public boat ramp is present on the north side at a site leased since 1993 by the Department of Natural Resources. Maximum depth is 44 feet and average depth is 18 feet. The bottom is sand and muck. Water level is controlled by a concrete structure installed in 2002 to replace a metal culvert. Water clarity, based on secchi disk readings taken at the time of the fish surveys, declined from 9 feet in August 1985 and averaged 4 feet from June 2004 to 2008 (Table 1). Clarity increased to 11 feet after the shad kill, although the water remained tea-colored. Enough oxygen for fish (≥5 ppm) had been present only in the top 5-10 feet of water during the summer months and did not increase in 2009 despite the improved clarity. Coontail is the dominant aquatic plant. Eurasian water milfoil and sago pondweed are common. Spatterdock rings much of the shoreline. Filamentous algae covered much of the nearshore area during the 2009 survey and reduced the effectiveness of shallow-water electrofishing.

METHODS

Sampling in June 2009 consisted of 0.5 hour of night-time pulsed DC electrofishing (504V) with two dip-netters, as well as two 250-foot experimental gill-net lifts and two trap-net lifts fished overnight. All captured fish were measured to the nearest 0.1-inch. Weights of fish were estimated from standard length-weight formulas generated from data on file for natural lakes in the area. Scales were taken from bluegills and largemouth bass for age and growth analyses and an 0.8-inch body length:scale-length intercept was used in back-calculations. To compare bluegill, largemouth bass, and gizzard shad size with previous data on file Everett Lake, fish lengths were grouped into five categories (Table 3). Half-inch length distributions for each species (see Appendices) were also compiled according to previous categories (e.g. 2.8-3.2=3.0).

RESULTS

During the survey, 170 fish representing 10 species were collected. Total weight was 89 pounds. Bluegill accounted for 48% of the number and 8% of the weight. Largemouth bass ranked second by number (22%) and comprised 45% of the weight. Fourteen gizzard shad made up 8% of the catch by number and 15% by weight. Altogether, sport fish comprised 83% of the number and 59% of the weight.

Eighty-two bluegills from 1.4–8.3 inches long were caught. Of all 3-inch and larger bluegills, 21% were 6-inch or larger, 13% were 7-inch or larger, and 6% were 8-inch or larger. The number of bluegills captured by electrofishing (9/15-min) was very low compared to other lakes in the area (average 100/15-min). Their growth rate was normal with age-4 fish averaging 5.9 inches long.

Only 38 largemouth bass, despite stocking 4,300 fingerlings after the rotenone treatment, were collected. They were 4.2-20.8 inches long, but only four were age-1. Only nine were legal-size (≥14-in). The electrofishing catch rate (19/15-min) was also low compared to other Indiana natural lakes. Although only one bass larger than 16 inches was caught, growth rates of bass up to age-4 were better than average, compared to other lakes in the area.

Four other sport species and four non-sport species were collected. Sport fish included 13 redear, five warmouth, two brown bullheads, and a pumpkinseed. Of 14 gizzard shad collected during the survey, all were 13.1-15.1 inches long. Four shad were caught by electrofishing at a rate of 2/15-minutes and 10 were caught in gill nets at a rate of 5/lift. Other non-sport fish included 12 spotted gar, two white suckers, and a spotted sucker.

DISCUSSION

Despite the low number of dead shad observed immediately after the rotenone application, the treatment apparently reduced shad abundance by more than 90%. Only 14 shad were collected in June 2009 compared to an average of 259 with identical sampling effort in 2005 and 2008 (Table 2). Although electrofishing catch rates of gizzard shad have varied since 2004 (Table 3), the 2009 catch rate (2/15-min) was 97% lower than the 2008 catch rate (69/15-min) and 92% lower than the 2006 catch rate (25/15-min). Why so few shad, however, were captured immediately prior to the treatment is not known, not is it known why so few dead shad were apparently killed at the time of the rotenone application.

Meanwhile, the number of largemouth bass caught in 2009 was similar to numbers caught since 2004. Bass electrofishing catch rates have also been fairly constant. Although perhaps more age-1 bass should have been caught as a result of stocking 4,300 age-0 fingerlings seven months earlier, they may not have been vulnerable to the sampling gear due to their size and difficulty created by dense algae mats near shore. In addition, some may have simply replaced small bass killed during the rotenone application and some may have succumbed to predation by older bass. Additional sampling is needed to more adequately assess the impact of the bass stocking on bass numbers.

Although bluegill abundance has varied widely in previous surveys, the number captured in 2009 and catch rate were not that unusual for Everett Lake. Fewer than 100 were caught in 1995 and 2005. Likewise, more spotted gar but fewer yellow bullheads, spotted suckers, and white suckers were collected in 2009. Whether changes in catches of these species, as well as the apparent decrease in gizzard shad, simply reflect differences in conditions at the time of sampling or real changes within the fish community will not be fully known without additional monitoring.

RECOMMENDATION

The attempt to reduce gizzard shad abundance in Everett Lake appears to have been initially successful. Whether shad abundance remains low and fishing improves for bluegills and other species remains to be seen. This project, along with similar projects underway throughout the state, provides an opportunity to test various shad management techniques. Therefore, it is recommended that another fish population survey be conducted at Everett Lake in June 2010.

Submitted by: Jed Pearson, fisheries biologist
September 11, 2009

Approved by: _____
Stu Shipman, fisheries supervisor
September 20, 2009

Table 1. *Historic oxygen levels (ppm) and water clarity (secchi depth) at Everett Lake from 1985 through 2009 (source - Division of Fish and Wildlife files).*

Depth (ft)	8/5/85	6/12/95	6/28/04	6/20/05	6/9/08	6/8/09
0	7.0	10.0	9.6	11.6	9.0	6.8
5	8.0	10.0	8.5	11.4	9.0	6.0
10	7.0	4.5	1.4	2.9	5.0	0.6
15	1.0	0.2	0.7	0.6	0.4	0.2
20	0.5	0.4	0.5	0.5	0.4	0.1
25	0.0	0.6	0.3	0.4	0.0	0.1
30	0.0	0.6	0.3	0.4	0.0	0.1
35	0.0	0.6	0.3	0.4	0.0	0.0
40	0.0	0.6	0.2	0.3	---	---
Secchi (feet)	9.0	5.0	2.5	3.5	6.0	11.0

Table 2. *Number and weight of fish collected during fish population surveys at Everett Lake from 1985 through 2009. EF represents electrofishing hours, GN equals gill net lifts, and TN equals trap net lifts.*

	Number per year						Pounds per year					
Species	1985	1995	2004	2005	2008	2009	1985	1995	2004	2005	2008	2009
Black crappie	5	4	8	0	6	0	0.9	2.3	2.1	0	1.0	0
Bluegill	312	81	248	53	226	82	37.1	17.0	34.5	8.5	24.5	7.4
Brown bullhead	1	3	1	1	0	2	1.5	3.1	0.9	0.7	0	1.5
Channel catfish	1	0	0	0	0	0	1.7	0	0	0	0	0
Green sunfish	1	2	0	0	0	0	0.1	0.3	0	0	0	0
Hybrid sunfish	0	0	22	0	0	0	0	0	6.4	0	0	0
Largemouth bass	100	214	45	49	35	38	32.0	110.0	34.5	43.9	34.5	39.8
Pumpkinseed	10	1	1	0	0	1	1.2	0.2	0.2	0	0	0.2
Redear	21	4	23	1	31	13	4.6	1.1	5.8	0.4	6.9	3.1
Warmouth	41	19	0	1	15	5	4.5	2.6	0	0.4	2.9	0.7
Yellow bullhead	15	3	15	12	12	0	7.6	1.6	7.6	6.5	7.4	0
Yellow perch	6	1	2	0	1	0	2.7	0.8	1.6	0	0.1	0
Bowfin	0	0	0	0	1	0	0	0	0	0	2.6	0
Carp	1	4	3	4	0	0	6.0	42.0	31.8	34.2	0	0
Carpsucker	0	0	0	1	0	0	0	0	0	1.7	0	0
Gizzard shad	0	0	329	283	234	14	0	0	249.5	252.5	203.5	13.1
Lake chubsucker	2	0	0	0	1	0	0.8	0	0	0	0.5	0
Spotted gar	0	0	1	1	2	12	0	0	2.6	0.4	3.0	19.0
Spotted sucker	0	0	35	26	4	1	0	0	47.4	42.1	7.1	1.9
White sucker	1	0	39	37	30	2	1.8	0	39.0	47.9	31.1	2.6
TOTAL	517	336	772	469	598	170	102.3	180.9	463.8	439.0	325.0	89.3
Sampling Effort												
EF hours	1ac	¾dc	1dc	½dc	½dc	½dc						
GN lifts	6	4	2	2	2	2						
TN lifts	8	6	2	2	2	2						

Table 3. *Size of largemouth bass, bluegills, and gizzard shad collected by electro-fishing at Everett Lake from 1985 through 2009.*

Largemouth bass

Inches	8/5/85*	6/12/95	6/28/04	6/20/05	6/5/06	6/12/07	6/9/08	6/8/09
<7.8	23	18	2	2	1	0	1	3
7.8-11.7	70	181	23	17	19	8	9	6
11.8-13.7	5	11	16	25	31	11	9	18
13.8-17.7	2	0	4	5	25	15	11	9
≥ 17.8	0	4	0	0	0	0	0	1
Total	100	214	45	49	76	34	30	37
Effort (minutes)	60	45	30	30	30	45	30	30

Bluegills

Inches	8/5/85*	6/12/95	6/28/04	6/20/05	6/5/06	6/12/07	6/9/08	6/8/09
<2.8	19	4	56	1	3	0	9	3
2.8-5.7	101	17	24	10	4	8	4	7
5.8-6.7	22	8	11	3	3	1	3	1
6.8-7.7	13	18	7	8	2	3	7	3
≥ 7.8	0	12	0	4	0	0	1	4
Total	155	59	98	26	12	12	24	18
Effort (minutes)	60	45	30	30	30	45	30	30

Gizzard shad

Inches	8/5/85*	6/12/95	6/28/04	6/20/05	6/5/06	6/12/07	6/9/08	6/8/09
<1.7	0	0	2	0	0	0	0	0
1.8-5.7	0	0	0	0	0	0	0	0
5.8-9.7	0	0	3	0	1	15	11	0
9.8-13.7	0	0	201	142	22	239	86	2
≥ 13.8	0	0	80	94	26	187	40	2
Total	0	0	286	236	49	441	137	4
Effort (minutes)	60	45	30	30	30	45	30	30

*denotes AC electro-fishing gear used in 1985.

SAMPLING EFFORT										
ELECTROFISHING				Day hours		Night hours		Total hours		
						0.50		0.50		
TRAPS				Number of traps		Days		Total lifts		
				2		1		2		
GILL NETS				Number of nets		Days		Total lifts		
				2		1		2		
PHYSICAL AND CHEMICAL CHARACTERISTICS										
Color				Turbidity						
Tea				11		Feet		0	Inches (Secchi disk)	

TEMPERATURE, DISSOLVED OXYGEN (ppm), TOTAL ALKALINITY (ppm), pH

Depth (ft)	Degrees °F	Oxygen*		Depth (ft)		Degrees °F	Oxygen*	
Surface	71.4	6.8		55				
2	71.6	6.7		56				
4	71.6	6.6		58				
5	69.8	6.0		60				
6	68.5	5.6		62				
8	63.9	1.6		64				
10	60.4	0.6		65				
12	55.4	0.3		66				
14	50.7	0.5		68				
15	48.4	0.2		70				
16	46.8	0.1		72				
18	45.5	0.1		74				
20	45.1	0.1		75				
22	44.8	0.1		76				
24	44.6	0.1		78				
25	44.6	0.1		80				
26	44.6	0.1		82				
28	44.6	0.0		84				
30	44.4	0.1		85				
32	44.2	0.1		86				
34	44.1	0.0		88				
35	43.9	0.0		90				
36	43.9	0.0		92				
38	43.9	0.0		94				
40	43.7	0.0		95				
42	43.7	0.0		96				
44				98				
45				100				
46				Sampling date:				
48						Surface	Bottom	
50				pH		8.5		
52				Alkalinity*		120		
54				Conductivity				
*ppm = parts per million								

Relative Abundance, Size and Estimated Weight of Fish Collected at Everett Lake						
			Minimum	Maximum		
Common Name*	Number	Percent	Length (in)	Length (in)	Weight (lb)**	Percent
Bluegill	82	48.2	1.8	8.3	7.38	8.3
Largemouth bass	38	22.4	4.2	20.8	39.84	44.6
Gizzard shad	14	8.2	13.1	15.1	13.12	14.7
Redear	13	7.6	2.3	8.7	3.14	3.5
Spotted gar	12	7.1	17.5	28.7	18.97	21.2
Warmouth	5	2.9	3.4	7.6	0.68	0.8
White sucker	2	1.2	14.4	14.5	2.58	2.9
Brown bullhead	2	1.2	9.9	12.4	1.47	1.6
Spotted sucker	1	0.6	16.5		1.93	2.2
Pumpkinseed	1	0.6	6.4		0.19	0.2
TOTAL	170				89.3	
*Common names of fishes recognized by the American Fisheries Society.						
**Weights estimated from standard length-weight regression models.						

Number, catch by gear, percentage, estimated weight and age of bluegills

Length	Catch by gear			Total	%	Estimated	Age analysis (scales/half-inch)						Age Composition (number/age)					
(in)	EF	GN	TN	Number		Weight (lb)	1	2	3	4	5	6+	1	2	3	4	5	6+
0.5																		
1.0																		
1.5																		
2.0	1		5	6	7.3	0.01	5						6					
2.5	2		7	9	11.0	0.01	5						9					
3.0			1	1	1.2	0.02		1						1				
3.5			9	9	11.0	0.03		5						9				
4.0	4		16	20	24.4	0.05		3						20				
4.5	1		10	11	13.4	0.07		4	2					7	4			
5.0	1		7	8	9.8	0.09		3	2					5	3			
5.5	1	1	2	4	4.9	0.12			4						4			
6.0			1	1	1.2	0.16				1						1		
6.5	1		3	4	4.9	0.20			1	2	1				1	2	1	
7.0	1		2	3	3.7	0.26				3						3		
7.5	2			2	2.4	0.32			1	1					1	1		
8.0	2			2	2.4	0.39					2						2	
8.5	2			2	2.4	0.47												
9.0																		
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																		
Totals:	18	1	63	82		7.38	10	16	10	7	3	0	15	42	13	7	3	0
												Mean length (in):	2.3	4.1	5.3	6.8	7.5	
												Variance:	0.06	0.24	0.76	0.24	0.75	

Number, catch by gear, percentage, estimated weight and age of largemouth bass

Length	Catch by gear			Total	%	Estimated	Age analysis (scales/half-inch)						Age Composition (number/age)					
(in)	EF	GN	TN	Number		Weight (lb)	1	2	3	4	5	6+	1	2	3	4	5	6+
0.5																		
1.0																		
1.5																		
2.0																		
2.5																		
3.0																		
3.5																		
4.0			1	1	2.6	0.03	1						1					
4.5	1			1	2.6	0.04	1						1					
5.0	1			1	2.6	0.06	1						1					
5.5																		
6.0																		
6.5	1			1	2.6	0.13	1						1					
7.0																		
7.5																		
8.0																		
8.5																		
9.0	4			4	10.5	0.35		3						4				
9.5																		
10.0																		
10.5	2			2	5.3	0.57		1	1					1	1			
11.0																		
11.5																		
12.0	3			3	7.9	0.85			3						3			
12.5	7			7	18.4	0.97			4	2					5	2		
13.0	4			4	10.5	1.09			2	1					3	1		
13.5	4			4	10.5	1.23			2	2					2	2		
14.0	4			4	10.5	1.37				3	1					3	1	
14.5	3			3	7.9	1.53				2		1				2		1
15.0	1			1	2.6	1.70						1						1
15.5	1			1	2.6	1.88					1						1	
16.0																		
16.5																		
17.0																		
21.0	1			1	2.6	4.78												
Totals:	37	0	1	38		39.84	4	4	12	10	2	2	4	5	13	11	2	2
												Mean length (in):	5.0	9.3	12.5	13.5	14.8	14.8
												Variance:	1.17	0.45	0.60	0.56	1.13	0.13

Number, catch by gear, percentage, estimated weight and age of gizzard shad

Length	Catch by gear			Total	%	Estimated	Age analysis (scales/half-inch)						Age Composition (number/age)					
(in)	EF	GN	TN	Number		Weight (lb)	1	2	3	4	5	6+	1	2	3	4	5	6+
0.5																		
1.0																		
1.5																		
2.0																		
2.5																		
3.0																		
3.5																		
4.0																		
4.5																		
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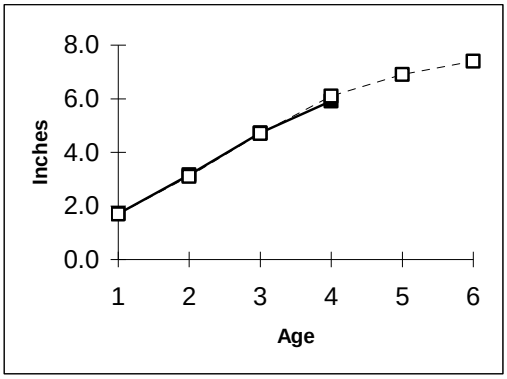
8.5																		
9.0																		
9.5																		
10.0																		
10.5																		
11.0																		
11.5																		
12.0																		
12.5																		
13.0	1	1		2	14.3	0.76												
13.5	1	3		4	28.6	0.85												
14.0	1	2		3	21.4	0.94												
14.5		3		3	21.4	1.04												
15.0	1	1		2	14.3	1.14												
15.5																		
16.0																		
16.5																		
17.0																		
17.5																		
18.0																		
Totals:	4	10	0	14		13.12	0	0	0	0	0	0						
										Mean length (in):								
											Variance:							

Bluegill
Intercept: 0.8 inch

BACK-CALCULATED LENGTHS (inches) AT EACH AGE

Year Class	Count	Mean L	I	II	III	IV	V	VI
2008	10	2.3	1.6					
	stdev	0.29	0.20					
2007	17	4.1	1.5	2.9				
	stdev	0.55	0.15	0.48				
2006	10	5.6	1.8	3.2	4.4			
	stdev	0.96	0.26	0.47	1.05			
2005	7	6.8	2.0	3.4	5.0	5.9		
	stdev	0.43	0.25	0.34	0.71	0.59		
2004	2	7.3	1.8	2.9	4.5	5.7	7.0	
	stdev	0.92	0.46	0.91	1.18	0.57	0.71	
2003	1	8.2	1.4	2.2	3.9	6.0	7.3	7.9
Mean*			1.7	3.2	4.7	5.9		
SD			0.20	0.27	0.43			
Count			44	34	17	7		

Bluegill growth (solid line) compared to other Indiana natural lakes (dotted line).



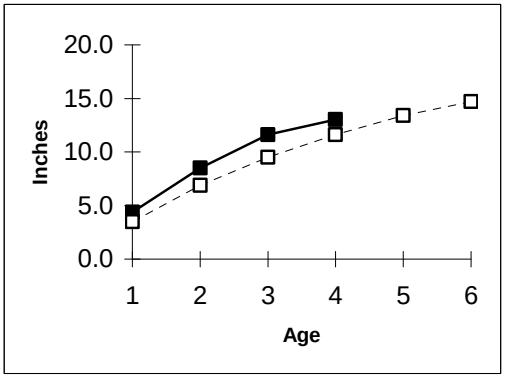
**Does not include age groups with less than three samples.*

Largemouth bass
Intercept: 0.8 inch

BACK-CALCULATED LENGTHS (inches) AT EACH AGE

Year Class	Count	Mean L	I	II	III	IV	V	VI
2008	3	5.3	4.0					
	stdev	0.97	0.70					
2004	4	9.4	5.7	8.7				
	stdev	0.75	0.57	0.75				
2003	12	12.5	3.9	8.5	11.7			
	stdev	0.76	0.86	2.00	0.84			
2002	10	13.5	3.9	8.4	11.5	13.0		
	stdev	0.73	0.80	1.58	1.22	0.80		
2001	2	14.8	5.2	8.7	11.3	13.3	14.3	
	stdev	1.06	0.42	0.69	0.68	0.82	0.98	
2000	2	14.6	4.0	8.9	10.1	12.6	13.8	14.4
	stdev	0.28	0.88	1.00	0.85	0.22	0.63	0.59
Mean*		10.2	4.4	8.5	11.6	13.0		
SD			0.86	0.17	0.12			
Count			29	26	22	10		

Largemouth bass growth (solid line) compared to other Indiana natural lakes (dotted line).



**Does not include age groups with less than three samples.*