

EMMA LAKE  
LaGrange County  
2006 Fish Management Report

Larry A. Koza  
Assistant Fisheries 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

## EXECUTIVE SUMMARY

- A general lake survey was conducted on Emma Lake on June 27 through 29, 2006. Water chemistry and aquatic vegetation data were also collected.
- The Secchi disk reading at Emma Lake was 2.5 ft and dissolved oxygen concentrations were not adequate for fish survival below 9 ft. Additional water chemistry conducted on August 9 in conjunction with the plant survey revealed a secchi disk reading of 3 ft with dissolved oxygen concentrations inadequate for fish survival below 4 ft. Submersed vegetation was found to a maximum depth of 9 ft. Coontail was the dominant plant found throughout the lake. Chara, flat-stemmed pondweed, sago pondweed and variable pondweed were also found in low frequency in the lake.
- A total of 330 fish representing 17 species were collected during this survey. Bluegill ranked first by number, followed by largemouth bass and white sucker. Common carp was the dominant species collected by weight followed by white sucker, largemouth bass and bluegill.
- Bass and bluegill dominated the survey and together comprised 73% of the fish sample by number. The percentage of harvestable size bluegill and bass collected declined from previous surveys. However, bass and bluegill continue to grow at an average rate for northern Indiana lakes.
- Due to the presence of a satisfactory sport fish population and lack of need for aquatic vegetation control, there is no fish management recommended for Emma Lake at this time.
- Construction of brush pile fish attractors was mentioned in the 1990 survey report as a viable option to increase habitat availability in Emma Lake. To date no one has approached the DFW and expressed interest in the placement of these structures. This remains an alternative.

## TABLE OF CONTENTS

	Page
LIST OF TABLES.....	iii
LIST OF FIGURES.....	iii
INTRODUCTION.....	1
METHODS.....	1
RESULTS.....	2
DISCUSSION.....	3
RECOMMENDATIONS.....	5
LITERATURE CITED.....	5
APPENDIX 1- Survey Data Pages.....	9

LIST OF TABLES

Table	Page
1. Sampling effort, species composition and relative abundance of fish collected during 1974, 1985, 1990 and 2006 fisheries surveys of Emma Lake. ....	6
2. Relative abundance by select size ranges for bluegill and largemouth bass collected during 1974, 1985, 1990 and 2006 fisheries surveys of Emma Lake. ....	7

LIST OF FIGURES

Figure	Page
1. Aerial photo of Emma Lake with sample locations. ....	8

## INTRODUCTION

Emma Lake is a 42-acre natural lake located in Emma, Indiana in LaGrange County. It has an average depth of 16.5 feet and a maximum depth of 34 feet. There are two inlets to Emma Lake, both of which are unnamed. These are located on the south shore of the lake and originate from drainage. The outlet, Bontrager Ditch, is located on the north shore of Emma Lake and flows into the Little Elkhart River. There is a state owned access site with a concrete boat ramp located on the east side of the lake off of County Road 600W. Homes occupy roughly 35% of the shoreline while 50% is agricultural and 15% is undeveloped.

Emma Lake was hydrographically surveyed in July 1959 and the initial fisheries survey by Indiana Department of Natural Resources, Division of Fish and Wildlife (DFW) biologists occurred in 1974. The purpose of this survey was to evaluate the quality of the sport fishery. The major sport fish collected were bluegill and largemouth bass (Table 1). Additional general fisheries surveys were conducted in 1985 and 1990. Following the 1985 survey it was recommended the lake be stocked with northern pike. This stocking took place in 1986. A spot check survey to evaluate the stocking took place in 1987 and a sufficient number of fish were collected to indicate a successful stocking. Based on these results, an additional stocking of northern pike occurred in 1988. The current survey was conducted to evaluate fish population changes since the last survey in 1990.

## METHODS

This survey was conducted on June 27 through 29, 2006 as part of DFW Work Plan 204755 that covers management of fish populations in natural lakes. Several physical and chemical characteristics of the water were measured in the deepest area of the lake according to the Manual of Fisheries Survey Methods (2001) standard lake survey guidelines. Submersed aquatic vegetation was sampled on August 9, 2006 using methods outlined in the Tier II Aquatic Vegetation Survey Protocol developed by the DFW Lake and River Enhancement Program and used in their aquatic vegetation control grant program. 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 0.5 hours. Two trap nets and two experimental-mesh gill nets were also fished overnight for

two nights. Unfortunately, one of the trap nets was tampered with the second night resulting in no fish capture for that lift. Therefore this lift was not included in the total sample effort. All fish collected were measured to the nearest 0.1 in TL. Length-weight regression equations for Fish Management District 2 were used to estimate the weight of all fish within the sample. Five scale samples per half-inch group were collected from game species for age and growth analysis. Average length-at-age for these species was estimated using the Fraser-Lee method of back calculation and standard intercepts (DeVries and Frie 1996, Carlander 1982).

## RESULTS

The Secchi disk reading at Emma Lake during the June survey was 2.5 ft and dissolved oxygen concentrations were not adequate for fish survival below 9 ft. Additional water chemistry conducted on August 9 in conjunction with the plant survey revealed a secchi disk reading of 3 ft with dissolved oxygen concentrations inadequate for fish survival below 4 ft. Thirty sites were randomly sampled during the plant survey, 16 of which fell within the littoral zone in water 9 ft in depth or less. A total of five native plant species were collected and identified. There were no exotic species discovered during the sampling. Aquatic plants were observed at 12 of the 16 littoral sites sampled. The maximum number of plant species found at one site was two and the mean was one. Coontail was the dominant plant found throughout the lake. Chara, flat-stemmed pondweed, sago pondweed and variable pondweed were also found in low frequency in the lake. Three emergent, floating or floating leaf plants associated with wetlands, cattails, spatterdock and yellow water lily, were also observed.

Algae blooms are becoming more common at Emma Lake, evidence that nutrient loading presents a problem. Further evidence exists in the form of the sediment deltas present in front of both inlets to the lake. A primary source of nutrients in lakes is runoff from agricultural land which carries fertilizer into the lakes along with the eroded sediment. The most current Trophic State Index (TSI) score for Emma Lake as measured by the Indiana Department of Environmental Management in 2003 is 42. This score places Emma Lake in the eutrophic lake class.

A total of 330 fish representing 17 species were collected from Emma Lake in 2006. Bluegill was the most common species collected numerically (45%) followed by largemouth bass (28%) and white sucker (15%). Common carp was the dominant species collected by

weight (31%) followed by white sucker (29%) and largemouth bass (19%).

Bluegill ranked first by number (45%) and fourth by weight (6%) among all species collected during this survey. The 149 bluegills collected ranged in length from 1.6 (age 1) to 8.9 (age 7) in TL and averaged 4.3 in TL. They weighed approximately 12 pounds. During electrofishing bluegills were collected at a rate of 192 fish per hour. Gill netting yielded 4.8 bluegills per lift and trap netting 11.3 bluegills per lift. Bluegill 6.0-in TL or larger, considered harvestable size, comprised 21% of the sample, reaching this size during their third year of life. Only 6% of the bluegill collected were 8 in TL or larger. All age groups of bluegill grew at an average rate for northern Indiana natural lakes. A total of 256 bluegill were collected during the previous survey. Harvestable size bluegill comprised 29% of that sample and there were no fish measuring 8 in TL or larger collected.

A total of 93 largemouth bass weighing approximately 38 pounds were collected. Bass ranked second numerically, comprising 28% of the sample, and third by weight (19%). They ranged in length from 3.1 (age 1) to 13.7 (age 6) in TL and averaged 8.8 in TL. There were no legal size bass (14 in TL or larger) collected during the survey. Bass grew at an average rate for northern Indiana natural lakes. The capture rate for largemouth bass during electrofishing was 158 fish per hour. Only 2.8 bass per lift were collected by gill netting while 1.0 per lift were collected from trap netting efforts. A total of 50 bass comprising 9% of the sample were collected in 1990. Twenty-two of these fish (44%) were legal size and the largest measured 19.3 in TL.

White suckers ranked third numerically (15%) and second by weight (29%) among species collected. They ranged in length from 9.0 to 20.0 in TL. A total of 48 fish weighing approximately 60 pounds were collected. White suckers have always been plentiful at Emma Lake.

Other sport species of interest collected during this survey included 11 black crappie, the largest of which was 11.7 in TL, one channel catfish and one northern pike. The channel catfish is the first one ever collected from Emma Lake by the DFW.

## DISCUSSION

Emma Lake continues to support a satisfactory sport fish population dominated by largemouth bass and bluegill. Bass and bluegill together comprised 73% of the fish sample by

number. The percentage of harvestable size bluegill collected decreased to only 21% in this survey from 29% in 1990. This continues a general decline in the number of harvestable size bluegill collected since 1974. That year, 56% of the bluegill collected were harvestable size. This dropped to 42% in 1985. Despite these declines, bluegill continue to grow at an average rate for northern Indiana lakes at Emma Lake and desirable size fish are present for anglers, as evidenced by the 8.9 in TL specimen collected during this survey.

Largemouth bass at Emma Lake mirror the bluegill population in one respect, a decline in the number of harvestable size fish present. In the case of the bass, there were no legal size fish collected during this survey, a substantial difference from 1990 when 44% of the bass collected were 14 in TL or larger. Since only 12% were 14 in TL or larger in 1985, the 1990 figure may be more the exception than the norm at Emma Lake. However, Emma Lake bass continue to grow at an average rate for northern Indiana lakes and are relatively abundant.

Emma Lake is a popular fishing lake in the area. The fact that largemouth bass and bluegill grow at an average rate leads to the possibility that the lack of harvestable size fish of both species in the Emma Lake fishery is due to these fish being cropped off as they approach that size.

The capture of only one northern pike indicates that attempts to establish this species through stockings in 1986 and 1988 have failed. Natural reproduction of pike would have to be considered minimal at this point.

Aquatic vegetation abundance at Emma Lake has not created problems over the years due to a limited littoral zone throughout the lake and steep bottom drop offs. There was one area of coontail growth near the middle of the lake that served as an impediment to boat travel but this area was easily circumvented and should require no chemical treatment at this time.

Emma Lake is currently classified as a eutrophic lake. Eutrophic lakes are characterized as being rich in nutrients and having high productivity. They produce high numbers of phytoplankton and zooplankton that minnows and other small fish feed on. These small fish in turn provide food for larger fish. This generally results in good fishing opportunities at the lake. On the other hand, a lake that becomes too eutrophic begins to decline in productivity due to decreasing light penetration caused by increased turbidity. Algal blooms also become more and more prevalent as the nutrients that feed the algae increase. These lakes are also subject to swings in dissolved oxygen concentrations caused by the needs of the plants versus the amount

of available sunlight. This can result in summer fish kills when oxygen levels drop to unacceptable levels due to prolonged cloudiness that robs the plants in the lake of their ability to produce oxygen.

The DFW has a Lake and River Enhancement (LARE) section which helps lake associations and other local entities to address watershed problems that lead to lake eutrophication, primarily through the awarding of grants. Unfortunately Emma Lake has no organization we are aware of to take advantage of the help that is available.

No fish diseases or parasites were observed during the survey. Some shoreline erosion is evident on the west shore of Emma Lake but poses no major problems at this time.

### RECOMMENDATIONS

- Due to the presence of a satisfactory sport fish population, there is no fish management recommended for Emma Lake at this time.
- Construction of brush pile fish attractors was mentioned in the 1990 survey report as a viable option to increase habitat availability in Emma Lake. To date no one has approached the DFW and expressed interest in the placement of these structures. This remains an alternative.

### LITERATURE CITED

Carlander, K. D. 1982. Standard intercepts for calculating length from scale measurements for some centrarchid and percoid fishes. *Transactions of the American Fisheries Society* 111:332-336.

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.

Submitted by: Larry A. Koza, Assistant Fisheries Biologist  
Date: 2/19/2007

Approved by: Stuart Shipman  
North Region Fisheries Supervisor  
Date: 2/20/2007

Table 1. Sampling effort, species composition and relative abundance of fish collected during 1974, 1985, 1990 and 2006 fisheries surveys of Emma Lake.

Species	1974	1985	1990	2006
Black crappie	15	39	69	11
Bluegill	88	368	256	149
Bowfin				1
Brook silverside				Present
Brown bullhead	1		2	1
Channel catfish				1
Common carp		1	1	6
Common shiner	3			
Golden redhorse	36	8	4	2
Golden shiner	56	30	9	
Grass pickerel	2	1		1
Green sunfish	2	2	3	
Largemouth bass	18	65	50	93
Northern pike	1	4	4	1
Pumpkinseed	16	29	34	3
Spotted gar		1		5
Spotted sucker	1		1	
Warmouth	2	9	6	2
White sucker	51	79	61	48
Yellow bullhead	3	30	8	5
Yellow perch	3	14	37	1
Total	298	680	545	330
Sampling Effort				
Electrofishing Effort	1.0 h AC	0.75 h DC	0.75 h DC	0.5 h DC
Gill Net Effort	6 lifts	4 lifts	6 lifts	4 lifts
Trap Net Effort	0	6 lifts	4 lifts	3 lifts

Table 2. Relative abundance by select size ranges for bluegill and largemouth bass collected during 1974, 1985, 1990 and 2006 fisheries surveys of Emma Lake.

Species	Length Range (TL)	1974	1985	1990	2006
Bluegill	3.0-5.5 in	39	211	172	76
	6.0-6.5 in	35	151	66	6
	7.0-7.5 in	13	4	7	16
	≥ 8.0 in	1	0	0	9
Largemouth bass	8.0-9.5 in	3	12	14	20
	10.0-11.5 in	1	14	7	24
	12.0-13.5 in	1	3	1	17
	14.0-17.5 in	3	7	18	0
	≥ 18.0 in	0	0	4	0



▲ Trap Net

●—● Gill Net

Figure 1. Aerial photo of Emma Lake with sample locations.

APPENDIX 1. Survey data pages.

# LAKE SURVEY REPORT

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

Lake Name Emma Lake	County LaGrange	Date of survey (Month, day, year) June 27-29, 2006
Biologist's name Neil D. Ledet and Larry A. Koza		Date of approval (Month, day, year)

LOCATION		
Quadrangle Name Topeka	Range 9E	Section 6
Township Name 36N	Nearest Town Emma, Indiana	

ACCESSIBILITY					
State owned public access site South of Emma on C.R. 600 West		Privately owned public access site		Other access site	
Surface acres 42	Maximum depth 34 ft.	Average depth 16.5 ft.	Acre feet 696	Water level 880.73 ft.	Extreme fluctuations
Location of benchmark					

INLETS		
Name Unnamed	Location South	Origin Drainage
Unnamed	South	Drainage

OUTLETS			
Name Bontrager Ditch	Location Northwest to Little Elkhart River		
Water level control			
POOL	ELEVATION (Feet MSL)	ACRES	Bottom type <input type="checkbox"/> Boulder <input type="checkbox"/> Gravel <input checked="" type="checkbox"/> Sand <input 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 Residential, pasture, and general farming.
Development of shoreline 30% residential, 60% general farming, 10% undeveloped.

Previous surveys and investigations U.S.G.S. Hydrological survey, July 1959. IDNR Fisheries Surveys: General surveys; Peterson, 1985; Ledet, 1990. Northern pike spot check; Koza, 1987.

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night hours		Total hours
	0		0.5		0.5
TRAP NETS	Number of traps		Number of Lifts		Total effort
	2		2		3**
GILL NETS	Number of nets		Number of Lifts		Total effort
	2		2		4
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS			
Color		Turbidity	
Green		2 Feet 6 Inches (SECCHI DISK)	
Alkalinity (ppm)*		pH	
Surface: 257.4 Bottom: 377.5		Surface: 9.3 Bottom: 9.2	
Conductivity: 650 micromhos		Air temperature: 75 °F	
Water chemistry GPS coordinates: N 41.60304 W 85.54189			

TEMPERATURE AND DISSOLVED OXYGEN (D.O.)								
DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°F)	D.O. (ppm)
SURFACE	74.0	7.8	36			72		
2	74.0	7.8	38			74		
4	72.0	8.0	40			76		
6	71.0	8.2	42			78		
8	71.0	5.4	44			80		
10	68.0	2.9	46			82		
12	64.0	1.0	48			84		
14	61.0	0.8	50			86		
16	58.0	0.8	52			88		
18	57.0	0.8	54			90		
20	55.0	0.8	56			92		
22	54.0	0.8	58			94		
24	53.0	0.8	60			96		
26	52.0	0.8	62			98		
28	52.0	0.8	64			100		
30	52.0	0.8	66					
32			68					
34			70					

COMMENTS
** One trap net was tampered with the second day and did not capture any fish so was not included in the effort.

\*ppm-parts per million



**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	5	3.4	0.01	1	19.5				
2.0	17	11.4	0.01	1	20.0				
2.5	20	13.4	0.01	1	20.5				
3.0	8	5.4	0.02	1,2	21.0				
3.5	7	4.7	0.03	2	21.5				
4.0	19	12.8	0.04	2	22.0				
4.5	25	16.8	0.05	2	22.5				
5.0	12	8.1	0.07	2	23.0				
5.5	5	3.4	0.10	2,3	23.5				
6.0	2	1.3	0.14	3	24.0				
6.5	4	2.7	0.18	3,4,5	24.5				
7.0	9	6.0	0.22	4,5	25.0				
7.5	7	4.7	0.25	5	25.5				
8.0	5	3.4	0.30	5,6	26.0				
8.5	3	2.0	0.36	6	TOTAL	149			
9.0	1	0.7	0.41	7					
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	192.0/hr	GILL NET CATCH	4.8/lift	TRAP NET CATCH	11.3/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				
1.5					19.5				
2.0					20.0				
2.5					20.5				
3.0	1	1.1	0.01	1	21.0				
3.5	1	1.1	0.03	1	21.5				
4.0	1	1.1	0.04	1	22.0				
4.5	2	2.2	0.04	1	22.5				
5.0	8	8.6	0.06	1	23.0				
5.5	8	8.6	0.08	1	23.5				
6.0	7	7.5	0.10	1	24.0				
6.5	6	6.5	0.13	1,2	24.5				
7.0					25.0				
7.5					25.5				
8.0	3	3.2	0.20	2	26.0				
8.5	4	4.3	0.21	2	TOTAL	93			
9.0	5	5.4	0.31	2,3					
9.5	6	6.5	0.37	3					
10.0	4	4.3	0.41	3					
10.5	7	7.5	0.57	3,4					
11.0	5	5.4	0.61	4					
11.5	8	8.6	0.71	3,4					
12.0	6	6.5	0.80	3,4					
12.5	4	4.3	0.91	3,4					
13.0	5	5.4	1.05	4,5,6					
13.5	2	2.2	1.14	5,6					
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	158.0/hr	GILL NET CATCH	2.8/lift	TRAP NET CATCH	1.0/lift
----------------------	----------	----------------	----------	----------------	----------

**NUMBER, PERCENTAGE, WEIGHT, AND AGE OF WHITE SUCKER**

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	2.1	2.59	
1.5					19.5				
2.0					20.0	1	2.1	3.01	
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					24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	48			
9.0	2	4.2	0.29						
9.5									
10.0	2	4.2	0.39						
10.5	1	2.1	0.45						
11.0	2	4.2	0.52						
11.5	6	12.5	0.59						
12.0	3	6.3	0.67						
12.5	1	2.1	0.76						
13.0	3	6.3	0.85						
13.5	3	6.3	0.95						
14.0	3	6.3	1.06						
14.5	3	6.3	1.17						
15.0	4	8.3	1.29						
15.5	2	4.2	1.42						
16.0	1	2.1	1.56						
16.5	1	2.1	1.71						
17.0	2	4.2	1.87						
17.5	1	2.1	2.03						
18.0	3	6.3	2.21						
18.5	3	6.3	2.39						

ELECTROFISHING CATCH	0.0/hr	GILL NET CATCH	2.0/lift	TRAP NET CATCH	1.0/lift
----------------------	--------	----------------	----------	----------------	----------

Species Bluegill	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE								
				I	II	III	IV	V	VI	VII	VIII	
Intercept = 0.8	2005	8	2.4 - 3.2	2.0								
	2004	27	3.1 - 5.5	1.7	3.5							
	2003	3	5.7 - 6.5	1.5	3.0	5.1						
	2002	4	6.4 - 6.9	1.6	2.4	4.3	6.3					
	2001	9	6.6 - 8.0	1.4	2.5	4.2	6.1	7.2				
	2000	4	7.9 - 8.6	1.5	2.8	5.0	6.7	7.6	8.1			
	1999	1	8.9 - 8.9	1.7	2.6	3.7	5.1	6.7	8.2	8.7		
	AVERAGE LENGTH			1.6	2.8	4.6	6.3	7.4	8.1			
	NUMBER AGED			56	48	21	18	14	8	1		

Species Largemouth bass	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE								
				I	II	III	IV	V	VI	VII	VIII	
Intercept = 0.8	2005	29	3.1 - 6.6	4.9								
	2004	12	6.4 - 9.1	3.4	7.6							
	2003	17	8.7 - 12.3	3.3	6.3	9.8						
	2002	22	10.4 - 12.8	3.9	7.2	9.3	11.2					
	2001	2	12.9 - 13.3	3.5	6.2	9.4	11.3	12.7				
	2000	2	13.2 - 13.7	3.2	6.4	8.9	10.6	11.8	13.0			
	AVERAGE LENGTH			3.9	7.0	9.5	11.2					
	NUMBER AGED			84	55	43	26	4	2			

Species	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE								
				I	II	III	IV	V	VI	VII	VIII	
Intercept =												
	AVERAGE LENGTH											
	NUMBER AGED											

Species	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE								
				I	II	III	IV	V	VI	VII	VIII	
Intercept =												
	AVERAGE LENGTH											
	NUMBER AGED											

\*Not included in average length calculations.

GILL NETS				TRAP NETS				ELECTROFISHING			
1	N	41.59956	W 85.54191	1	N	41.59839	W 85.54048	1	N		W
	N		W	2	N	41.60141	W 85.54045		N		W
2	N	41.60262	W 85.54093	3	N	41.50294	W 85.54069	2	N		W
	N		W	4	N	41.60406	W 85.54253		N		W
3	N	41.60122	W 85.54089	5	N		W	3	N		W
	N		W	6	N		W		N		W
4	N	41.60637	W 85.54277	7	N		W	4	N		W
	N		W	8	N		W		N		W
5	N		W	9	N		W	5	N		W
	N		W	10	N		W		N		W
6	N		W	11	N		W	6	N		W
	N		W	12	N		W		N		W
7	N		W	13	N		W	7	N		W
	N		W	14	N		W		N		W
8	N		W	15	N		W	8	N		W
	N		W	16	N		W		N		W
9	N		W	17	N		W	9	N		W
	N		W	18	N		W		N		W
10	N		W	19	N		W	10	N		W
	N		W	20	N		W		N		W
11	N		W					11	N		W
	N		W						N		W
12	N		W					12	N		W
	N		W						N		W
13	N		W					13	N		W
	N		W						N		W
14	N		W					14	N		W
	N		W						N		W
15	N		W					15	N		W
	N		W						N		W
16	N		W					16	N		W
	N		W						N		W
17	N		W					17	N		W
	N		W						N		W
18	N		W					18	N		W
	N		W						N		W
19	N		W					19	N		W
	N		W						N		W
20	N		W					20	N		W
	N		W						N		W

