

LAKE MANITOU
Fulton Counties
2011 Fish Management Report

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2012

EXECUTIVE SUMMARY

- Lake Manitou is a 713-acre natural lake located near Rochester, Indiana in Fulton County. Maximum depth of the lake is 49 ft and the average depth is 12.7 ft. The Indiana Division of Fish and Wildlife (DFW) maintain a public access site on the west shore. The north shore near the outflow dam has a city park with a boat ramp, handicap accessible fishing pier, swimming beach, picnic shelter, and restrooms.
- A standard fisheries survey was conducted from May 31 to June 3, 2011. Fish were collected using three sampling gears. Pulsed DC, shoreline electrofishing was conducted for 1.75 h at night with two dippers. Two trap nets and four standard gill nets were also fished for three nights each.
- A total of 780 fish was collected that weighed 524.5 lbs and represented 17 species. The most abundant species by number were bluegill (27.4%), yellow perch (21.3%), largemouth bass (13.3 %), gizzard shad (11.3%), and channel catfish (5.9%). By weight the most abundant species were common carp (26.2%), gizzard shad (14.3%), channel catfish (13.8%), largemouth bass (11.7%), and bowfin (3.8%).
- A total of 214 bluegills was collected ranging in length from 2.1 to 9.4 in, and 33% of fish were considered harvestable ($TL \geq 6.0$ in). Twenty-eight fish were collected that were 8.0 in and longer, a desirable size to anglers. Bluegill PSD was 41 and PSD-P was 17.
- Yellow perch was the second most abundant species with 166 individuals that weighed 11.6 lbs. Perch ranged in length from 3.8 to 11.9 in with 84% of those being age-1 and measuring less than 5.5 in.
- There were 104 largemouth bass collected that weighed an estimated 61.5 lbs. Collected fish ranged in length from 3.6 to 16.3 in, and twelve bass were legal length or longer ($TL \geq 14.0$ in). Bass PSD was 85 and PSD-P was 12.
- A tier II aquatic vegetation survey was conducted on August 2. Due to the fluridone treatments coontail was the only species of aquatic vegetation collected. Coontail was collected at three of the possible 90 sample sites. Filamentous algae were collected at 72.2% of sites. It is apparent that the fluridone treatments are successful at controlling hydrilla, but have had detrimental impacts to the rest of the plant community.
- No immediate management actions need to be taken, but another standard survey should occur by 2016 to monitor the fish community response to hydrilla treatments.

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INTRODUCTION

Lake Manitou is a 713-acre natural lake located near Rochester, Indiana in Fulton County. Maximum depth of the lake is 49 ft and the average depth is 12.7 ft. The lake was formed in 1827, when a grist mill was built damming Rain Creek thus impounding five small lakes into one lake. The Indiana Division of Fish and Wildlife (DFW) maintain a public access site on the west shore. The north shore near the outflow dam has a city park with a boat ramp, handicap accessible fishing pier, swimming beach, picnic shelter, and restrooms. The city park was developed through the Indiana Waters Program.

Lake Manitou inlets are Graham, Masteller, and Eiler ditches and Rain Creek. The outlet dam flows into Mill Creek and drains into the Tippecanoe River north of Rochester, Indiana. The watershed is approximately 27,839 acres composed of agriculture (69%), forest (11%), 7% each pasture and water (including the lake itself), residential (6%), and less than one percent commercial development (Theller and Engel 2012). The majority of the shoreline is developed except for the southern section which includes a 107-acre Manitou Islands Nature Preserve.

Since 1970, there have been 13 fisheries surveys and two angler creel surveys at Lake Manitou (Table 1). Early management was focused on reducing abundant gizzard shad abundance thus allowing for more desirable game fish. In 1971, a gizzard shad selective was conducted followed by stocking of 5,000 largemouth bass fingerlings. Shad numbers were initially depressed, but quickly rebounded. In 1975, to diversify the fishery 2.5 million walleye fry were stocked, but few fish survived and stocking stopped. To create a self-sustaining northern pike population over 13,000 fall fingerling northern pike were stocked from 1980 to 1995. Few pike were subsequently collected and minimal natural reproduction occurred therefore, stocking was discontinued.

The most recent fisheries survey in 2006 collected 606 fish. Bluegills were the most abundant species followed by largemouth bass, yellow perch, and gizzard shad. Collected bluegill ranged in length from 2.3 to 8.7 in and proportional size distribution (PSD) was 38. Bass length ranged from 1.8 to 14.2 in and PSD was 38. Only two bass collected were legal length ($TL \geq 14.0$ in). Bass growth was slower than in the 2003 survey. In 2006, all the perch collected were less than 6.0 inches.

As part of the standard surveys two tier II submersed aquatic vegetation surveys were conducted in Lake Manitou. In the May 2006 tier II survey, 11 species of submersed vegetation

were collected and the most abundant were *Chara sp.*, coontail, eelgrass, and northern water milfoil. The second tier II was conducted in August and collected nine species of plants. The most abundant were eelgrass, coontail, *Chara sp.*, and slender naiad. Most importantly during this survey hydrilla was detected. This was the first collection of hydrilla in the Midwest and following detection an aggressive vegetation control strategy was created. Yearly fluridone treatments have been successful at preventing the spread of hydrilla within the lake, and the goal of complete eradication of hydrilla from Lake Manitou remains a possibility (SePRO 2012). The city boat ramp and DNR public access site were closed from early 2007 through late 2008 to prevent the spread of hydrilla to other area lakes by boaters. In 2009 and 2010, both boat ramps were closed from mid-April through early July until actively growing hydrilla had been killed by the fluridone treatment. There was very limited fishing pressure at the lake during these years from the lack of access and fishing was primarily done through the ice. Due to the significant reduction of hydrilla present in the lake, the ramps remained open all year in 2011. Yearly plant surveys have been conducted to determine the effects of the fluridone treatments and determine the location of hydrilla tubers. Throughout these surveys, the plant community has dramatically declined with each year of treatment. The few plants that remain in the lake are a couple of locations with coontail despite at least 11 species being present prior to fluridone treatments.

The goal of the 2011 fisheries survey was to evaluate the fish community at Lake Manitou under work plan 300FWF10D41621. This survey was initiated in response to the fluridone treatments to determine the effect on the fish population in the absence of aquatic vegetation and reduction in angling effort.

METHODS

A standard fisheries survey was conducted from May 31 to June 3, 2011. Physical and chemical characteristics were collected in the deepest area of the lake according to the DFW sampling guidelines (Shipman et al. 2001). Aquatic vegetation was sampled on August 2, 2011 according to the DFW Tier II Aquatic Vegetation Survey Protocol (IDNR 2007).

Fish were collected using three sampling gears. Pulsed DC, shoreline electrofishing was conducted for 1.75 h at night with two dippers. Two trap nets and four standard gill nets were also fished for three nights each. All fish collected were measured to the nearest 0.1 in total length (TL) and a length-weight regression was used to estimate fish weight. Five scale samples

were taken per half-inch group (X.0-X.4 for inch group and X.5-X.9 for half-inch group) from all sportfish for age and growth analysis. Catch per unit effort (CPUE) was calculated for the dominant fish collected as catch divided by effort for each sampling gear. Proportional stock density (PSD) was calculated for largemouth bass and bluegill captured via electrofishing (Anderson and Neumann 1996).

RESULTS

A total of 780 fish was collected that weighed 524.5 lbs and represented 17 species. The most abundant species by number were bluegill (27.4%), yellow perch (21.3%), largemouth bass (13.3%), gizzard shad (11.3%), and channel catfish (5.9%). By weight the most abundant species were common carp (26.2%), gizzard shad (14.3%), channel catfish (13.8%), largemouth bass (11.7%), and bowfin (3.8%).

A total of 214 bluegills was collected making it the most abundant species, while only weighing 32.6 lbs. Bluegills were primarily captured with electrofishing (CPUE = 118.9/h) and a few individuals were collected with trap (CPUE = 0.7/lift) and gill (CPUE = 0.2/lift) nets. Collected bluegill ranged in length from 2.1 to 9.4 in, and 33% of fish were considered harvestable ($TL \geq 6.0$ in). Twenty-eight fish were collected that were 8.0 in and longer, a desirable size to anglers. Bluegill PSD was 41 and PSD-P was 17. Bluegill ages ranged from 1 to 10 and consistent recruitment was evident. Back-calculated length-at-age for bluegill from ages 1 to 5 was 1.8, 3.2, 5.1, 6.4, and 7.1 in, respectively.

Yellow perch were the next most abundant representing 166 individuals that weighed 11.6 lbs. The majority of perch were collected with electrofishing at a rate of 87.4/h. Perch ranged in length from 3.8 to 11.9 in with 84% of fish being less than 5.5 in and age-1 fish. Ages ranged from 1 to 5, averaging 4.6, 6.6, 7.6, 9.3, and 10.8 in, respectively.

There were 104 largemouth bass collected that weighed an estimated 61.5 lbs. Bass electrofishing CPUE was 56.0/h, while gill and trap nets CPUE was 0.4 and 0.2/lift, respectively. Collected fish ranged in length from 3.6 to 16.3 in and 12 bass were legal length or longer ($TL \geq 14.0$ in). Bass PSD was 85 and PSD-P was 12. No bass were collected between 9.0 and 11.4 in. Bass ages ranged from 1 to 8 and 37% of collected fish were age-2. Back-calculated length-at-age for ages 1 to 4 was 3.5, 6.4, 9.6, and 11.9 in, respectively.

Only 88 gizzard shad were collected that weighed 74.8 lbs making it the second most abundant species by weight. Shad ranged in length from 5.4 to 15.5 in, but only one shad was collected less than 11.0 in.

Channel catfish ranked third in relative abundance by weight (72.2 lbs), and 46 fish were collected. Catfish ranged in length from 12.3 to 22.1 in and 59% of catfish collected were between 16.0 and 18.0 in.

A total of 33 black crappies was collected and ranged in length from 3.6 to 13.5 in. Twenty-three crappies were age-1 with lengths between 3.5 and 6.5 in. The remaining 10 crappies were larger than 10.5 in.

Other notable catches include collecting 34 rock bass up to 9.2 in. Of those 26.5% of the rock bass collected larger than 8.0 in. Fifteen common carp were caught that weighed 137.7 lbs and ranged in length from 21.1 to 31.7 in. There were six white bass collected. Five white bass were between 8.5 and 9.6 in, while the other fish was 14.2 in. A brown bullhead was collected that was 15.2 in long. There were two redear sunfish collected that lengths were 10.2 and 10.5 in.

A tier II aquatic vegetation survey was conducted on August 2. Due to the fluridone treatments coontail was the only species of aquatic vegetation collected. Coontail was collected at three of the possible 90 sample sites. Filamentous algae were collected at 72.2% of sites. It is apparent that the fluridone treatments are successful at controlling hydrilla, but have had detrimental impacts to the rest of the plant community.

DISCUSSION

Lake Manitou experienced limited angler access from 2007 to 2010 due to ramp closures intended to prevent the spread of hydrilla. Therefore, lower angling use and harvest would be expected during this time. Also, due to fluridone treatments little aquatic vegetation remained in the lake likely influencing the fish communities. The 2006 standard survey provides a useful comparison with this survey to determine the effects of angling and vegetation control on fish communities.

Comparing fish communities over time at Lake Manitou is difficult due to the varying degrees of effort (Table 1). In general, bluegill have remained the most abundant species even though, their total catch has declined since 2003. The high 2003 catch was primarily due to an

exceptional trap net catch rate of 103.5/lift. Electrofishing CPUE is more indicative of the trends in bluegill, and this has increased since 2003 (Table 2). Bluegill PSD is very similar from the 2003, 2006 and 2011 surveys, but PSD-P has increased dramatically and is within the desirable range for a balanced population. Growth has been very consistent across years; however, in 2011 an extended age structure produced larger bluegills. This is possibly due to the closure of the lake allowing fewer fish harvested at a younger age thus more years of growth and higher size structure. Currently the bluegill population has a size structure above the range indicating balance, but with the lake open to angling bluegill size structure may decline as anglers selectively harvest the larger individuals.

The yellow perch population is more abundant than any previous survey. A strong 2010 year class represented 84% of all perch collected and was the reason for the record high abundance. The strong year class is surprising given the lack of aquatic vegetation as perch are strongly associated with vegetation during spawning and juvenile stages. The other year classes during the eradication of hydrilla are weak, but they are still present. As this year-class matures, the quality perch angling should increase for the next 3 to 4 years.

Largemouth bass abundance has declined slightly from 2003 and 2006 surveys; however, size structure is higher than it has ever been and PSD is above the desirable range for a balanced bass population (Table 2). Even though, it appears the bass population is doing well, the high PSD value was directly related to a nearly non-existent 2008 year class, only three age-3 bass were collected. No bass were collected between 9.0 and 11.4 in thus inflating the PSD and PSD-P values. Overall, compared to the 2006 survey the size range of bass was similar with no large fish collected. However, the number of legal-size bass collected has increased from the 2003 and 2006 surveys from only six and two legal length bass to 15 legal-length bass in 2011. The bass population in Lake Manitou provides anglers the opportunity to catch legal length bass, but there is currently little trophy potential.

The black crappie population is below historic high abundance in the 1980's but their populations have fluctuated throughout the surveys. Currently, crappies are more abundant than in the 2003 and 2006 survey, and an abundance of fish larger than 10.0 inch that will attract anglers. The redear sunfish population is well below a high catch in the 2003 survey but has also drastically fluctuated in abundance.

Non-game species abundance has changed little from the 2003 to 2011 surveys. Gizzard shad abundance has been variable over time, but is currently in low abundance. Sufficient predation pressure on the shad should keep their populations low. The rock bass population is more abundant in 2011 and many fish exceeded 8.0 in.

In this survey it was the first collection of channel catfish and white bass. It is highly unlikely that these species were present yet not collected in the past 13 surveys. These fish are likely illegal introductions. Indiscriminate stockings can have unintended and adverse ecological impacts on other native species. Additionally, introduced species could bring in diseases, invasive species, or other non-target species.

Overall, the fish community at Lake Manitou provides good angling opportunities for large fish especially with bluegill, black crappie, redear sunfish. There are good populations of yellow perch, largemouth bass, and channel catfish although they are not trophy size. There are no immediate management concerns at Lake Manitou as the lake has similar fish communities and abundance as previous surveys. However, given the ongoing changes in the lake due to the absence of vegetation and a potential return to historical levels of fishing pressure, it is recommended that the lake be resurveyed in 2016.

RECOMMENDATIONS

- Conduct a standard survey at Lake Manitou in 2016.

LITERATURE CITED

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Submitted by: Tom Bacula, Fisheries Biologist
Date: March 6, 2012

Approved by: Jeremy Price, North Region Fisheries Supervisor

Table 1. Species relative abundance by number (num.), percent by number (% Num.), and percent by weight (% Wt.) collected during the most recent fisheries surveys at Lake Manitou, Fulton County, Indiana.

Species	<u>2011</u>			<u>2006</u>			<u>2003</u>			<u>1998</u>			<u>1989</u>		
	Num.	% Num.	% Wt.	Num.	% Num.	% Wt.	Num.	% Num.	% Wt.	Num.	% Num.	% Wt.	Num.	% Num.	% Wt.
Bluegill	214	27.4	6.2	255	42.1	12.3	1118	53.4	14.6	128	27.1	10.6	625	40.4	6.1
Yellow perch	166	21.3	2.2	75	12.4	1.4	114	5.4	2.0	123	26.1	9.5	50	3.2	0.5
Largemouth bass	104	13.3	11.7	103	17.0	16.5	141	6.7	11.4	51	10.8	22.5	81	5.2	6.3
Gizzard shad	88	11.3	14.3	67	11.1	24.1	360	17.2	29.7	21	4.4	7.9	213	13.8	21.1
Channel catfish	46	5.9	13.8	-	-	-	-	-	-	-	-	-	-	-	-
Rock bass	34	4.4	1.5	2	0.3	0.1	19	0.9	0.5	8	1.7	0.8	14	0.9	0.5
Black crappie	33	4.2	2.0	2	0.3	0.2	35	1.7	1.5	74	15.7	6.0	236	15.3	4.2
Brook silverside	22	2.8	0.0	3	0.5	*	16	0.8	*	-	-	-	2	0.1	*
White sucker	19	2.4	6.9	-	-	-	16	0.8	4.0	-	-	-	-	-	-
Common carp	15	1.9	26.2	28	4.6	27.9	11	0.5	7.9	4	0.8	4.0	15	1.0	5.9
Spotted gar	15	1.9	3.8	17	2.8	9.6	61	2.9	9.6	15	3.2	22.5	58	3.8	20.7
Bowfin	10	1.3	9.1	2	0.3	2.8	10	0.5	7.1	-	-	-	7	0.5	4.6
White bass	6	0.8	0.6	-	-	-	-	-	-	-	-	-	-	-	-
Brown bullhead	3	0.4	0.9	-	-	-	15	0.7	1.7	9	1.9	5.6	27	1.7	3.1
Redear sunfish	2	0.3	0.4	26	4.3	2.4	127	6.1	6.5	2	0.4	0.4	104	6.7	1.6
Yellow bullhead	2	0.3	0.3	1	0.2	0.5	18	0.9	1.4	4	0.8	1.1	20	1.3	1.5
Warmouth	1	0.1	*	20	3.3	2.1	16	0.8	0.2	10	2.1	1.9	17	1.1	0.5
Golden shiner	-	-	-	3	0.5	0.1	3	0.1	*	19	4.0	1.5	1	0.1	*
Pumpkinseed	-	-	-	1	0.2	*	5	0.2	*	-	-	-	23	1.5	0.2
Black bullhead	-	-	-	1	0.2	*	-	-	-	-	-	-	10	0.6	0.7
White crappie	-	-	-	-	-	-	7	0.3	0.3	2	0.4	*	-	-	-
Northern pike	-	-	-	-	-	-	1	*	0.9	1	0.2	4.1	39	2.5	22.0
Smallmouth bass	-	-	-	-	-	-	-	-	-	1	0.2	1.4	-	-	-
Longnose gar	-	-	-	-	-	-	1	*	0.6	-	-	-	-	-	-
Lake chubsucker	-	-	-	-	-	-	-	-	-	-	-	-	2	0.1	*
Walleye	-	-	-	-	-	-	-	-	-	-	-	-	1	0.1	0.5
Redfin pickerel	-	-	-	-	-	-	-	-	-	-	-	-	1	0.1	*
Total	780		524.5 lbs.	606		257.1 lbs.	2094		902.4 lbs.	472		181.3 lbs.	1546		936.8lbs

* Represents less than .1% of total

Gear	<u>Sampling Effort</u>				
	2011	2006	2003	1998	1989
Electrofishing (hrs)	1.75 (DC)	1.5 (DC)	2.0 (DC)	1.0 (DC)	2.0 (DC)
Trap netting (lifts)	6	6	8	8	12
Gill netting (lifts)	12	-	10	7	12

Table 2. Electrofishing catch per unit effort (CPUE) for largemouth bass (LMB) and bluegill (BLG) by size category and year with size structure indices (proportional stock density; PSD and PSD-preferred) for Lake Manitou, Fulton County, Indiana.

LMB Size Category	Electrofishing CPUE (fish/h)			
	2011	2006	2003	1998
Overall	56.0	68.0	67.5	43.0
Stock (TL \geq 8.0 in)	23.4	28.0	62.5	42.0
Quality (TL \geq 12.0 in)	20.0	8.0	32.0	15.0
Legal (TL \geq 14.0 in)	8.0	1.3	1.0	5.0
Preferred (TL \geq 15.0 in)	2.9	0	0	4.0

BLG Size Category	Electrofishing CPUE (fish/h)			
	2011	2006	2003	1998
Overall	118.9	96.0	133.5	76.0
Stock (TL \geq 3.0 in)	95.4	89.3	121.0	75.0
Quality (TL \geq 6.0 in)	39.4	38.0	49.0	49.0
Preferred (TL \geq 8.0 in)	16.0	0.7	3.5	0

Size Structure	2011	2006	2003	1998	Balanced Range*
LMB - PSD	85	38	50	36	40 - 70
LMB - PSD-P	12	0	0	10	10 - 20
BLG - PSD	41	43	41	65	20 - 60
BLG - PSD-P	17	1	3	0	5 - 20

*Anderson and Neumann 1996

APPENDIX I

LAKE SURVEY REPORT

Type of Survey	<input type="checkbox"/> Initial Survey	<input checked="" type="checkbox"/> Re-Survey
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Lake Name Manitou	County	Date of survey (Month, day, year) 5/31/11-6/3/2011
Biologist's name Jeremy Price and Tom Bacula		Date of approval (Month, day, year)

LOCATION		
Quadrangle Name Rochester	Range 3E	Section 9, 10, 15, 16, 22, 23
Township Name 30 N	Nearest Town Rochester	

ACCESSIBILITY					
State owned public access site East shore		Privately owned public access site		Other access site City owned - north shore	
Surface acres 713	Maximum depth 49	Average depth 12.7	Acre feet 9,053	Water level 778 MSL	Extreme fluctuations 1'
Location of benchmark Near the dam, northwest corner of lake					

INLETS		
Name Graham and Mastellar Ditch	Location East	Origin
Eiler and Rain Ditch	Southeast	

OUTLETS			
Name Mill Creek	Location Northwest		
Water level control Cement dam with fixed crest			
POOL	ELEVATION (Feet MSL)	ACRES	Bottom type
TOP OF DAM			<input type="checkbox"/> Boulder
TOP OF FLOOD CONTROL POOL			<input checked="" type="checkbox"/> Gravel
TOP OF CONSERVATION POOL			<input checked="" type="checkbox"/> Sand
TOP OF MINIMUM POOL			<input checked="" type="checkbox"/> Muck
STREAMBED			<input type="checkbox"/> Clay
			<input type="checkbox"/> Marl

Watershed use Mainly agricultural and residential near the lake
Development of shoreline Approximately 80% of the shore, shoreline also includes Manitou Wetland State Marsh.

Previous surveys and investigations Mapping 1924.
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Fisheries Surveys: 1970, 1973, 1975, 1977, 1979, 1981, 1982, 1984, 1987, 1989, 1998, 2003, 2006, 2011

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night hours		Total hours
			1.75		1.75
TRAP NETS	Number of traps		Number of Lifts		Total effort
	2		3		6
GILL NETS	Number of nets		Number of Lifts		Total effort
	4		3		12
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS					
Color			Turbidity		
Green			4 Feet		0 Inches (SECCHI DISK)
Alkalinity (ppm)*			pH		
Surface: 60		Bottom: 60	Surface: 9.5		Bottom: 9
Conductivity: 460		microsiemens	TDS: 458	Air temperature: 90	°F
Water chemistry GPS coordinates:			N 41.04914		W 86.17640

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	73.4	9.4	45	54.0	0.0	72		
2	73.4	9.4	38			74		
4	73.4	9.4	40			76		
6	73.4	9.3	42			78		
8	73.4	9.4	44			80		
10	73.2	9.2	46			82		
12	73.2	9.5	48			84		
14	72.7	9.9	50			86		
16	64.4	5.8	52			88		
18	62.6	5.4	54			90		
20	61.2	4.7	56			92		
22	61.0	4.5	58			94		
24	60.6	4.3	60			96		
26	59.2	3.0	62			98		
28	57.6	1.2	64			100		
30	55.8	0.1	66					
35	54.7	0.1	68					
40	54.3	0.1	70					

COMMENTS

*ppm-parts per million

Occurrence and Abundance of Submersed Aquatic Plants - Overall

Lake: Manitou	Secchi (ft): 2	Mean species/site: 0.03
County: Fulton	Sites with plants: 3	SE Mean species/site: 0.02
Date: 8/2/2011	Sites with native plants: 3	Mean native species/site: 0.03
Littoral Depth (ft): 4.5	Number of species: 1	SE Mean natives/site: 0.02
Littoral Sites: 49	Number of native species: 1	Species diversity: 0.00
Total Sites: 90	Maximum species/site: 1	Native species diversity: 0.00

All Depths	Frequency of Occurrence	Rake score frequency per species				Plant Dominance
		0	1	3	5	
Species						
Coontail	3.33	96.67	2.22	0.00	1.11	1.56

Filamentous Algae

72.22

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	8	3.7	0.01	1	20.0				
2.5	34	15.9	0.02	1	20.5				
3.0	17	7.9	0.03	1	21.0				
3.5	6	2.8	0.05	1, 2	21.5				
4.0	26	12.1	0.07	2	22.0				
4.5	27	12.6	0.09	2	22.5				
5.0	18	8.4	0.12	3	23.0				
5.5	7	3.3	0.15	3	23.5				
6.0	12	5.6	0.19	3	24.0				
6.5	9	4.2	0.23	3, 4	24.5				
7.0	2	0.9	0.28	4, 5	25.0				
7.5	20	9.3	0.34	4, 5, 6	25.5				
8.0	17	7.9	0.40	6, 7	26.0				
8.5	8	3.7	0.47	8, 9	TOTAL	214			
9.0	3	1.4	0.54	8, 10					
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	118.9 /h	GILL NET CATCH	0.2 /lift	TRAP NET CATCH	0.7 /lift
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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	5	3.0	0.03	1	21.5				
4.0	66	39.8	0.04	1	22.0				
4.5	47	28.3	0.05	1	22.5				
5.0	22	13.3	0.07	1	23.0				
5.5	1	0.6	0.08	2	23.5				
6.0	4	2.4	0.11	2, 3	24.0				
6.5	7	4.2	0.13	2, 3	24.5				
7.0	3	1.8	0.16	2, 3	25.0				
7.5	3	1.8	0.20	3, 4	25.5				
8.0	3	1.8	0.23	3	26.0				
8.5	1	0.6	0.27	3	TOTAL	166			
9.0									
9.5	1	0.6	0.37	4					
10.0	1	0.6	0.43	4					
10.5	1	0.6	0.49	5					
11.0									
11.5	1	0.6	0.62						
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	87.4 /h	GILL NET CATCH	1.0 /lift	TRAP NET CATCH	0 /lift
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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					21.0				
3.5	2	1.9	0.03	1	21.5				
4.0	4	3.8	0.04	1	22.0				
4.5	11	10.6	0.06	1	22.5				
5.0	7	6.7	0.08	1	23.0				
5.5	5	4.8	0.10	1, 2	23.5				
6.0	11	10.6	0.13	2	24.0				
6.5	15	14.4	0.17	2	24.5				
7.0	4	3.8	0.20	2	25.0				
7.5	2	1.9	0.25	2	25.5				
8.0	2	1.9	0.30	2	26.0				
8.5	2	1.9	0.36	2	TOTAL	104			
9.0									
9.5									
10.0									
10.5									
11.0									
11.5	2	1.9	0.84	3, 4					
12.0	6	5.8	0.95	3, 4, 5					
12.5	4	3.8	1.07	4					
13.0	7	6.7	1.20	4, 5					
13.5	5	4.8	1.34	5					
14.0	3	2.9	1.49	4, 5					
14.5	6	5.8	1.65	4, 5, 6					
15.0	3	2.9	1.81	5					
15.5	1	1.0	1.99	7					
16.0	2	1.9	2.18	6, 8					
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	56.0 /h	GILL NET CATCH	0.4 /lift	TRAP NET CATCH	0.2 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF GIZZARD SHAD									
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	1	1.1	0.06		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	88			
9.0									
9.5									
10.0									
10.5									
11.0	5	5.7	0.48						
11.5	8	9.1	0.55						
12.0	7	8.0	0.61						
12.5	15	17.0	0.68						
13.0	23	26.1	0.76						
13.5	14	15.9	0.84						
14.0	7	8.0	0.93						
14.5	5	5.7	1.02						
15.0	2	2.3	1.12						
15.5	1	1.1	1.23						
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	22.9 /h	GILL NET CATCH	4.0 /lift	TRAP NET CATCH	0 /lift
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NUMBER, PERCENTAGE, WEIGHT, AND AGE OF BLACK CRAPPIE									
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	1	3.0	0.03	1	21.5				
4.0	6	18.2	0.04	1	22.0				
4.5	4	12.1	0.05	1	22.5				
5.0	7	21.2	0.07	1	23.0				
5.5	2	6.1	0.09	1	23.5				
6.0	1	3.0	0.12	1	24.0				
6.5	2	6.1	0.15		24.5				
7.0					25.0				
7.5					25.5				
8.0					26.0				
8.5					TOTAL	33			
9.0									
9.5									
10.0									
10.5	3	9.1	0.60	3					
11.0	2	6.1	0.68	3					
11.5									
12.0									
12.5	1	3.0	0.99	5					
13.0	2	6.1	1.11	4, 7					
13.5	2	6.1	1.24	3					
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	2.3 /h	GILL NET CATCH	2.1 /lift	TRAP NET CATCH	0.7 /lift
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AGE-LENGTH KEY FOR YELLOW PERCH														
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE											
			1	2	3	4	5	6	7	8	9	10	11	12
1.0														
1.5														
2.0														
2.5														
3.0														
3.5	5	5	5											
4.0	66	5	66											
4.5	47	5	47											
5.0	22	5	22											
5.5	1	1		1										
6.0	4	4		3	1									
6.5	7	4		5	2									
7.0	3	2		2	2									
7.5	3	3			2	1								
8.0	3	3			3									
8.5	1	1			1									
9.0														
9.5	1	1				1								
10.0	1	1				1								
10.5	1	1					1							
11.0														
11.5	1													
12.0														
Total	166	41	140	11	10	3	1							
Mean TL			4.6	6.6	7.6	9.3	10.8							
SE			0.03	0.13	0.25	0.76								

Species	YEP	Year Class	Number Aged	Back Calculated Length(inches)at Each Age												
				I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	
Intercept = 0.8		2010	20	3.3												
		2009	8	3.0	5.3											
		2008	9	2.5	4.5	6.9										
		2007	3	2.9	4.7	7.0	8.4									
		2006	1	3.5	5.8	7.4	9.1	10.2								
		Average Length		3.0	4.9	6.9	8.4									
		Standard Deviation		0.34	0.42	0.01										
		Yr. Classes Averaged		4	3	2	1									
		Number Aged		41	21	13	4	1								

NOTE: Year classes w with less than three fish samples are not included in year class averages or standard deviation.

AGE-LENGTH KEY FOR LARGEMOUTH BASS													
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE										
			1	2	3	4	5	6	7	8	9	10	11
1.0													
1.5													
2.0													
2.5													
3.0													
3.5	2	2	2										
4.0	4	4	4										
4.5	11	4	11										
5.0	7	6	7										
5.5	5	5	3	2									
6.0	11	5		11									
6.5	15	3		15									
7.0	4	4		4									
7.5	2	1		2									
8.0	2	2		2									
8.5	2	1		2									
9.0													
9.5													
10.0													
10.5													
11.0													
11.5	2	2			1	1							
12.0	6	4			2	3	2						
12.5	4	4				4							
13.0	7	4				4	4						
13.5	5	3					5						
14.0	3	3				2	1						
14.5	6	4				2	3	2					
15.0	3	1					3						
15.5	1	1							1				
16.0	2	2						1		1			
16.5													
17.0													
Total	104	65	27	38	3	15	17	3	1	1			
Mean TL			4.8	6.8	12.1	13.1	14.0	15.4	15.8	16.3			
SE			0.10	0.12	0.20	0.23	0.22	0.60					

AGE-LENGTH KEY FOR BLACK CRAPPIE														
LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE											
			1	2	3	4	5	6	7	8	9	10	11	12
1.0														
1.5														
2.0														
2.5														
3.0														
3.5	1	1	1											
4.0	6	5	6											
4.5	4	4	4											
5.0	7	5	7											
5.5	2	2	2											
6.0	1	1	1											
6.5	2	2	2											
7.0														
7.5														
8.0														
8.5														
9.0														
9.5														
10.0														
10.5	3	3			3									
11.0	2	2			2									
11.5														
12.0														
12.5	1	1					1							
13.0	2	2				1			1					
13.5	2	1			2									
14.0														
14.5														
15.0														
Total	33	29	23		7	1	1		1					
Mean TL			5.1		11.8	13.3	12.8		13.3					
SE			0.17		0.52									

