

MONTGOMERY CITY LAKE  
Daviess County  
2008 Fish Management Report

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## EXECUTIVE SUMMARY

- Montgomery City Lake, Daviess County, is a 24-acre impoundment located in Montgomery, Indiana. This fishery has been managed by the Department of Natural Resources since 1966, and is managed to provide fishing opportunities for panfish and largemouth bass. A 14-in minimum size limit for largemouth bass was in effect from 1976 to 2004, at which time a 12 to 15 in protected slot-size limit was instated to increase harvest of an abundant population of small largemouth bass. Channel catfish are also stocked at 25 fish per acre biennially.
- A Schnabel mark and recapture population estimate for largemouth bass was conducted April 21 through May 5, 2008 to evaluate the effectiveness of the slot limit. A total of 1,432 bass was collected and marked. There were 249 recaptures. The population estimate for the survey was 3,572 bass (6.3% SE) or 149 bass/acre for all sizes. Stock size bass and greater totaled 2,298 bass (7.3% SE) or 97 bass/acre.
- The fish community survey was conducted June 30 to July 1, 2008, and the vegetation survey was completed August 4, 2008. A total of 250 fish, representing seven species, was collected during this survey. Total weight of fish collected was approximately 75 lbs. Bluegill was the most abundant species, followed by largemouth bass, and then black bullhead.
- There was a 45% reduction in the electrofishing catch rates of largemouth bass during the summer fish community surveys from 2002 to 2008 (302 bass/h in 2002 to 166 bass/h 2008). This suggests anglers are taking advantage of the slot limit.
- The abundant bass have impacted the bluegill population. There was a high number of quality size bluegill, along with a substantial number of 1.5 to 3.0 in fish. There was nearly a complete lack of 4 to 6 in bluegill. However, the electrofishing catch rate for bluegill increased from 160/h in 2002 to 240/h, suggesting increased recruitment correlated with the largemouth bass population decrease. Currently, the lake displays a healthy number of harvestable size bluegill, but the lack of fish in the 4 to 6 in range could affect harvestable populations in the future.

## INTRODUCTION

Montgomery City Lake, Daviess County, is a 24-acre multi-purpose impoundment located in Montgomery, Indiana. It is owned by the city of Montgomery and maintained by the Montgomery Ruritan Club. There are several recreational facilities at the lake including a concrete boat ramp and dock, beach, fish cleaning station, boat rentals and full hook-up campground.

This fishery has been managed by the Department of Natural Resources since 1966, and is managed to provide fishing opportunities for panfish and largemouth bass. A 14-in minimum size limit for largemouth bass was in effect from 1976 to 2004, at which time a 12 to 15 in protected slot-size limit was instated to increase harvest of an abundant population of small largemouth bass. Channel catfish are also stocked at 25 fish per acre biennially. The watershed is primarily agriculture and has a high nutrient load. The shoreline was dredged in 1993 to remove excessive sediment from the lake, and was also successful in reducing the abundant rooted aquatic vegetation. Currently, this lake is void of rooted vegetation, important nursery habitat for panfish. The most recent survey was conducted July 1 and 2, 2002 (Sapp 2003). Two areas of concern were the largemouth bass population and water quality characteristics. The current survey was conducted to evaluate changes in fish populations as a result of the slot size limit, water quality, and aquatic plant growth since 2002. A largemouth bass population estimate was conducted April 21 through May 5 to evaluate the effectiveness of the slot limit. A general fish community survey was also conducted to monitor the fish population. This report presents the findings of the 2008 largemouth bass population estimate, general survey and recommendations for future work.

## METHODS

A Schnabel mark and recapture population estimate was conducted April 21 to May 5, 2008. Once a week, largemouth bass were collected and marked using a hole punch on the caudal fin. The entire shoreline was electrofished using two dippers. The mark and recapture survey ran three consecutive weeks. Scales samples as well as cross-sectioned dorsal spines were collected for age and growth determination. Total length of individual bass and catch per unit effort was also documented. Fisheries Analyses

Simulation Tools (FAST 3.0) software was used to calculate total annual mortality as well as estimate exploitation for the bass population (Slipke and Maceina 2000).

The fish community survey was conducted June 30 to July 1, 2008 and the vegetation survey was completed August 4<sup>th</sup> 2008, in accordance with standard methods. This survey was conducted to monitor the general health of the fishery as a whole. Standard water chemistry parameters were measured in the deepest area of the lake. A GPS unit was used to record the locations of limnological data collection, vegetation collection, and fish collection sites (Figure 1).

Fish sampling effort consisted of 0.5 h of night DC electrofishing with two dippers. Two experimental gill net lifts and two overnight trap net lifts were used as passive sampling gears at strategic points in the lake. All fish collected were measured to the nearest 0.1 in TL. The weight of fish was taken to the nearest 0.01 lb. Scale samples were collected for age and growth analysis. Proportional stock density (PSD) and relative stock density (RSD) were calculated for bluegill and largemouth bass (Anderson and Neumann 1996).

#### Largemouth Bass Population Estimate Results

A total of 1,432 bass was collected and marked. There were 249 recaptures. The population estimate for the survey was 3,572 bass (6.3% SE) or 149 bass/acre for all sizes (Table 1). Stock size bass and greater totaled 2,298 bass (7.3% SE) or 97 bass/acre. The average catch rate for the three nights of sampling was 371.7 bass/h. The PSD was 36 and RSD-15 was 2. A balanced bass/bluegill population has a bass PSD range of 40 to 70, with a RSD 15 of 10 to 40.

Bass growth appears to be slower than the previous survey in 2002. Data collected in the spring included more year classes and is likely more representative of the population. Currently, it takes between 5 and 6 years to produce a 14 in bass at Montgomery City Lake. Total annual mortality was calculated from age data using FAST and Ricker (Ricker 1975). Total annual mortality was estimated to be 54% (Table 2).

Water quality parameters for Montgomery City Lake indicated a hypereutrophic system. There was a heavy algal bloom reducing the Secchi disk reading to 2 ft. The dissolved oxygen was sufficient for fish survival to a depth of 8 ft. Very little submersed

vegetation was found due to high turbidity and the presence of grass carp. A southern naiad specimen was collected at a depth of 6 ft, representing the maximum depth vegetation was found. No single plant could be termed dominant because the lake was almost completely void of submersed aquatic vegetation. Other species observed or collected included sago pondweed, southern naiad, brittle naiad, giant duckweed, chara, algae, blue-green algae, water willow, creeping water primrose, button bush, and cattails.

### Fish Community Survey Results

A total of 250 fish representing seven species was collected during this survey. Total weight of fish collected was approximately 75 lbs (Appendix). Bluegill was the most abundant species, followed by largemouth bass, and black bullhead. Largemouth bass ranked first by weight followed by bluegill, and black bullhead.

Bluegill made up 19% of the total sample. There were 121 bluegill collected, at a weight of 14.47 lbs. They ranged from 1.5 to 10.0 in TL. The electrofishing catch rate was 240/h, the CPUE for gill nets was 1fish/lift, and the trap nets resulted in zero fish captured. The bluegill PSD was 52 and the RSD-8 was 34. Bluegill growth remains well above average.

There were 84 largemouth bass collected, ranging from 1.8 to 6.7 in TL and weighing 25.10 lbs. This made the largemouth bass sample 1/3 of the total weight of all fish collected, and approximately the same ratio when evaluated by total number collected. The electrofishing catch rate was 166/h. The largemouth bass PSD was 17 and the RSD-15 was 9.

Black and yellow bullhead made up 14% of the fish collected by number and 31.8% by weight.

There were 5 redear collected at a length range of 3.3 to 10.2 in TL. During the bass population estimate, redear were quite plentiful and quality size fish were not uncommon. The redear catch most likely under-represents this population.

## DISCUSSION

The primary objective of this fisheries investigation was to monitor the progress of the largemouth bass protected slot size limit and its affect on the rest of the fish community. There was a 45% reduction in the electrofishing catch rate of largemouth

bass from the 2002 summer fish community survey to the 2008 survey (302 bass/h in 2002 to 166 bass/h 2008). This suggests anglers are taking advantage of the slot limit. The PSD decreased slightly from the 2002 survey, but the RSD-15 increased, indicating a shift in size structure towards larger bass. A population estimate was not calculated in the past survey. However, age data from 2002 was used to model total annual mortality and natural mortality (Ricker 1975). In 2002, total annual mortality was estimated to be 60% with an exploitation of 23%. In order to compare 2008 data, only ages 2 to 4 were used in the calculation since these were the same ages that were used for the 2002 estimate. In addition, the harvestable population under the slot size limit included these year classes. Total annual mortality for the 2008 harvestable size bass was 83% with an exploitation rate of 39%. This is another indication that anglers are participating in the management of this lake. As the numbers of bass are reduced, the panfish recruitment should improve. It is recommended that the 12 to 15 in slot-size limit remain in place until either the bass size structure improves to adequate stock densities for a balanced bass/bluegill population and/or the bass growth improves to the point where they reach 14 inches in 4 years. Harvest of bass should be encouraged.

There was a high number of quality size bluegill making up 21% of the sample, along with a substantial number of 1.5 to 3.0 in fish comprising nearly 68% of the sample. There was nearly a complete lack of 4 to 6 in fish, comprising only 5.8% of the bluegill sample. However, the electrofishing catch rate for bluegill increased from 160/h in 2002 to 240/h, suggesting an increased recruitment correlated with the largemouth bass population decrease. Currently, the lake displays a healthy number of harvestable size bluegill, but the lack of fish in the 4 to 6 in range could affect harvestable populations in the future.

This survey brought to light three fish species (grass carp, black and yellow bullhead) that could potentially create problems for this lake. The grass carp, which were stocked by an unknown source at an unknown date, are now past their useful size for vegetation management. These fish are in excess of 40 lbs. At this size and age, these fish are simply maintaining their weight and are no longer effective at controlling vegetation. Montgomery City Lake is void of submersed aquatic vegetation, and is prone to planktonic algae blooms dense enough to inhibit rooted vegetation growth. This result

has been documented in other lakes including Dove Hollow Lake in Daviess County (King 2005). Future stockings of grass carp are not recommended.

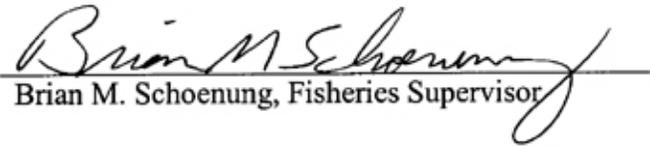
The bullhead population has increased according to the survey, and could potentially become a problem. Both bullhead species combined made up 31.8% of the total fish biomass sampled, whereas the 2002 survey showed bullhead comprising only 2.5% of the sample by weight. Harvest of bullhead should also be encouraged.

#### RECOMMENDATIONS

- Continue the 12 to 15 in protected slot size limit for bass.
- Harvest of bass should be encouraged.
- Discontinue grass carp program by removing adults, if caught, with no further stockings recommended.

#### LITERATURE CITED

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- Submitted by: David S. Kittaka, Fisheries Biologist and Nicholas Grzych, Naturalist aide  
Date: December 10, 2008

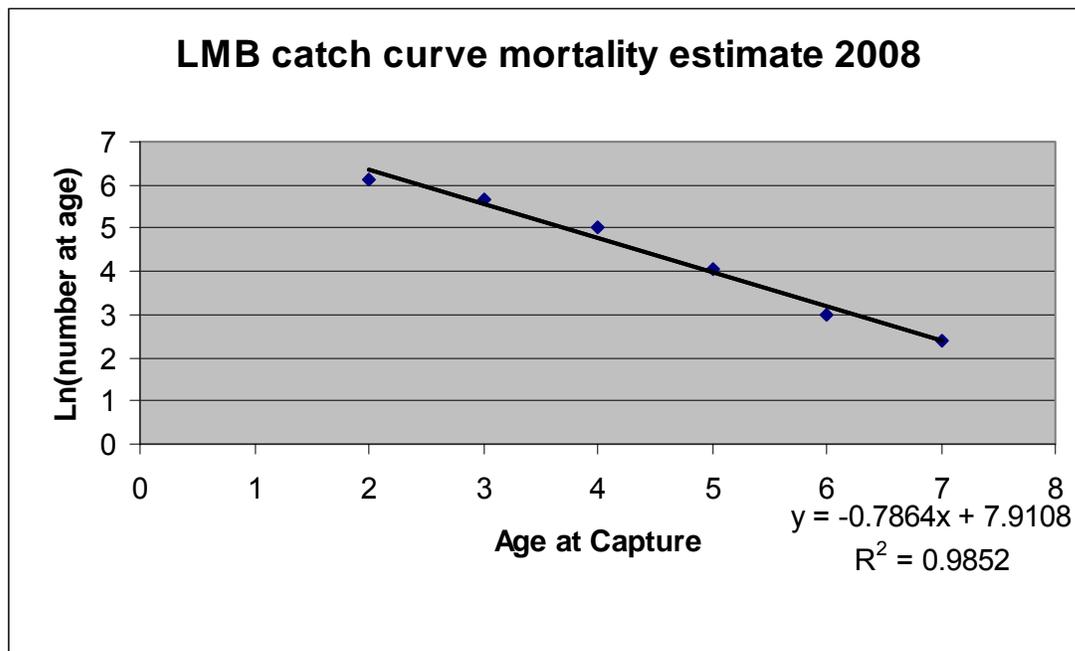
Approved by:   
Brian M. Schoenung, Fisheries Supervisor

Date: March 5, 2009

Table 1. Schnabel population estimate for largemouth bass at Montgomery City Lake, 2008.

Year	95% Low CI	Population Estimate	95% high CI	SE%
All LARGEMOUTH BASS				
2008	3,167	3,572	4,060	6.3
LARGEMOUTH BASS ≥ 8 in				
2008	2,003	2,298	2,664	7.3

Table 2. Largemouth bass catch curve mortality estimate, Montgomery City Lake, 2008.



Total annual mortality 54%  
 Upper 95% confidence interval 60%  
 Lower 95% confidence interval 48%

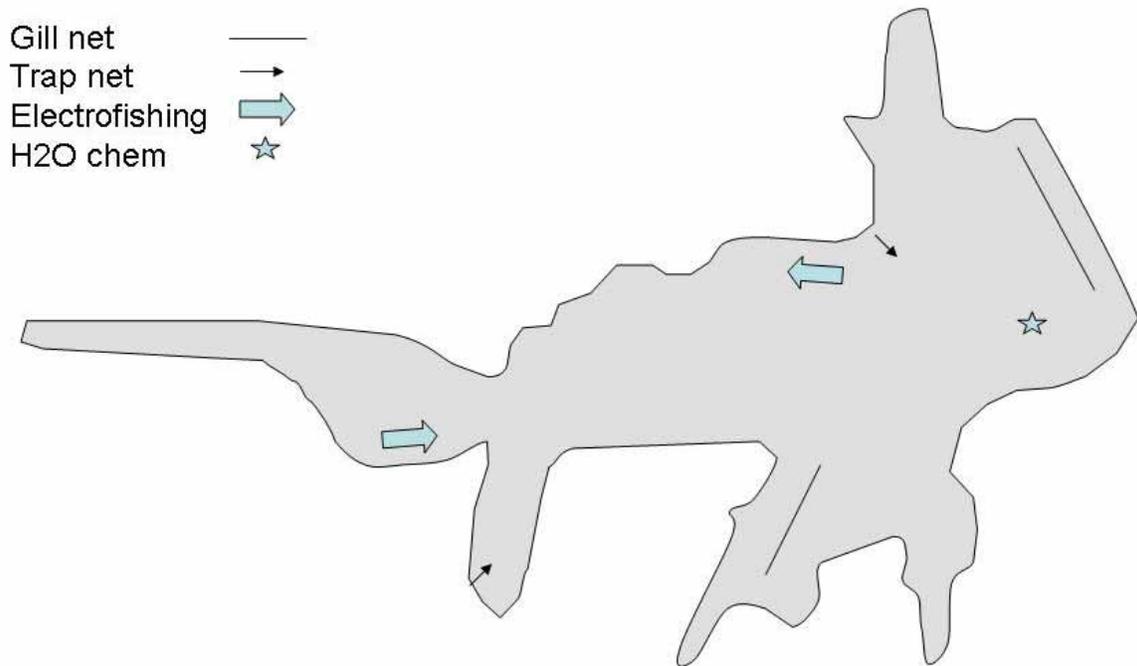


Figure 1. Sampling locations, Montgomery City Lake, 2008.

## APPENDIX

Lake survey report  
Water chemistry and sampling effort  
Fish species relative abundance by number and weight  
Individual game fish species by number weight and CPUE  
Sampling location  
Aquatic vegetation summary

# LAKE SURVEY REPORT

Type of Survey	<input type="checkbox"/> Initial Survey	<input checked="" type="checkbox"/> Re-Survey
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Lake Name Montgomery City Lake	County Sullivan	Date of survey (Month, day, year) June 30, 2008
Biologist's name Dave Kittaka, Debbie King, Nick Grych		Date of approval (Month, day, year) March 5, 2009

LOCATION		
Quadrangle Name Montgomery	Range 6W	Section 23
Township Name 3N	Nearest Town Montgomery	

ACCESSIBILITY					
State owned public access site		Privately owned public access site		Other access site City owned	
Surface acres 24	Maximum depth 17 Ft.	Average depth 7.5 Ft.	Acre feet 1800	Water level 500 MSL	Extreme fluctuations None
Location of benchmark					

INLETS		
Name runoff	Location West end	Origin

OUTLETS			
Name Tributary S Fork Prairie Creek	Location East		
Water level control Earthen dam with drain valve			
<b>POOL</b>	<b>ELEVATION (Feet MSL)</b>	<b>ACRES</b>	<b>Bottom type</b> <input type="checkbox"/> Boulder <input checked="" type="checkbox"/> Gravel <input checked="" type="checkbox"/> Sand <input checked="" type="checkbox"/> Muck <input checked="" type="checkbox"/> Clay <input type="checkbox"/> Marl
TOP OF DAM			
TOP OF FLOOD CONTROL POOL			
TOP OF CONSERVATION POOL			
TOP OF MINIMUM POOL			
STREAMBED			

Watershed use Agricultural land.
Development of shoreline Beach, campgrounds, boat docks and ramp, pasture.

Previous surveys and investigations Fisheries survey, 1973, 1976, 1977, 1979, 1986, 1993, 2002
Pre-fish population control report, 1973

**SAMPLING EFFORT AT MONTGOMERY CITY LAKE, 6/30-7/1/2008**

ELECTROFISHING	Day hours		Night hours		Total hours
	N/A		0.5		0.5
TRAP NETS	Number of traps		Number of Lifts		Total effort
	2		1		2
GILL NETS	Number of nets		Number of Lifts		Total effort
	2		1		2
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

**PHYSICAL AND CHEMICAL CHARACTERISTICS**

Color		Turbidity	
Brown		2 Feet 0 Inches (SECCHI DISK)	
Alkalinity (ppm)*		pH	
Surface: 68.4 Bottom:		Surface: 9.2 Bottom:	
Conductivity: 240 µS		Air temperature: 80's °F	
Water chemistry GPS coordinates: wp			
N 38.67172		W -87.0365067	

**TEMPERATURE AND DISSOLVED OXYGEN (D.O.)**

DEPTH (FEET)	Degrees (°F)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°C)	D.O. (ppm)	DEPTH (FEET)	DEGREES (°C)	D.O. (ppm)
SURFACE	80.8	10.33	36			72		
2	81.1	9.80	38			74		
4	80.6	8.50	40			76		
6	77.9	5.40	42			78		
8	77.4	4.94	44			80		
10	72.7	2.12	46			82		
12	64.2	1.97	48			84		
14 (bottom)	61.2	1.90	50			86		
16			52			88		
18			53			90		
20			56			92		
22			58			94		
24			60			96		
26			62			98		
28			64			100		
30			66					
32			68					
34			69					

**COMMENTS**

Water chemistry taken at 8:29 P.M. on 6-30-08.

\*ppm-parts per million



**NUMBER, PERCENTAGE, WEIGHT, AND AGE OF Largemouth bass Population Estimate**

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	1	11.8	4.59	10
2.5					20.5				
3.0					21.0				
3.5					21.5				
4.0					22.0				
4.5					22.5				
5.0	1	0.1	NA	1	23.0				
5.5	19	1.3	NA	1	23.5				
6.0	55	3.8	NA	1	24.0				
6.5	137	9.6	0.13	1	24.5				
7.0	156	10.9	0.16	1	25.0				
7.5	78	5.4	0.20	1	25.5				
8.0	20	1.4	0.25	1, 2	26.0				
8.5	11	0.8	0.30	2, 3	TOTAL	1432			
9.0	25	1.7	0.36	2, 3					
9.5	115	8.0	0.43	2					
10.0	166	11.6	0.50	2, 3					
10.5	143	10.0	0.59	2, 3					
11.0	86	6.0	0.68	2, 3					
11.5	60	4.2	0.78	2, 3					
12.0	102	7.1	0.90	3, 4					
12.5	106	7.4	1.02	3, 4					
13.0	59	4.1	1.16	4, 5					
13.5	49	3.4	1.31	4, 5					
14.0	22	1.5	1.47	4, 5, 6, 7					
14.5	11	0.8	1.64	5, 6, 7					
15.0	7	0.5	1.83	6, 7, 8					
15.5									
16.0	2	0.1	2.25	6, 7					
16.5	1	0.1	2.48	6					
17.0									
17.5									
18.0									
18.5									

Weights calculated from AFS averages

ELECTROFISHING CATCH	320/hr	GILL NET CATCH	NA	TRAP NET CATCH	NA
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**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	17	14.0	0.01	1	19.5				
2.0	31	25.6	0.01	1	20.0				
2.5	22	18.2	0.02	1	20.5				
3.0	11	9.1	0.03	1,2	21.0				
3.5	6	5.0	0.04	1	21.5				
4.0	4	3.3	0.06	1,2	22.0				
4.5					22.5				
5.0	1	0.8	0.12	1	23.0				
5.5	2	1.7	0.15	2	23.5				
6.0	1	0.8	0.19	2	24.0				
6.5	3	2.5	0.14	3	24.5				
7.0	1	0.8	0.35	4	25.0				
7.5	5	4.1	0.41	3, 4, 5	25.5				
8.0	6	5.0	0.47	4	26.0				
8.5	5	4.1	0.50	4, 5, 6, 7	TOTAL	121	100		
9.0	4	3.3	0.63	5, 6					
9.5	1	0.8	0.74	6					
10.0	1	0.8	0.77	8					
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	240/hr	GILL NET CATCH	0.5/lift	TRAP NET CATCH	0/lift
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**NUMBER, PERCENTAGE, WEIGHT, AND AGE OF Largemouth bass Community Survey**

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	1	1.2	0.01	Not Aged	19.5				
2.0	3	3.6	0.01		20.0				
2.5	2	2.4	0.01		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	10	11.9	0.18		25.0				
7.5	14	16.7	0.20		25.5				
8.0	15	17.9	0.24		26.0				
8.5	2	2.4	0.28		TOTAL	84	100		
9.0	3	3.6	0.31						
9.5	5	6.0	0.39						
10.0	8	9.5	0.47						
10.5	6	7.1	0.51						
11.0	5	6.0	0.57						
11.5	1	1.2	0.59						
12.0	1	1.2	0.64						
12.5	2	2.4	0.71						
13.0									
13.5									
14.0	1	1.2	1.17						
14.5									
15.0									
15.5	1	1.2	2.03						
16.0	3	3.6	2.25						
16.5	1	1.2	2.48						
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	166/hr	GILL NET CATCH	1/lift	TRAP NET CATCH	0/lift
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**GPS LOCATIONS OF SAMPLING EQUIPMENT Montgomery City Lake, 2008**

GILL NETS				TRAP NETS				ELECTROFISHING			
1	N	38.67201	W -87.03769	1	N	38.67204	W -87.03769	1	N	38.67205	W -87.03826
	N		W	2	N	38.67036	W -87.04168		N	38.67187	W -87.04329
2	N	38.67012	W -87.03860	3	N		W	2	N	38.67118	W -87.04444
	N		W	4	N		W		N	38.67072	W -87.04106
3	N		W	5	N		W	3	N		W
	N		W	6	N		W		N		W
4	N		W	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

