

BLUE RIVER GAME FISH POPULATION ESTIMATES  
Crawford, Harrison, and Washington Counties  
2008 Fish Management Report

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## EXECUTIVE SUMMARY

- The Blue River originates in Washington County and flows 74 mi through Crawford and Harrison Counties. Its confluence with the Ohio River is about 3 mi east of the Town of Leavenworth.
- Fish sampling was conducted from September 22 to 30, 2008. The sites sampled were at river miles 9.0, 14.7, 34.6, 54.5, and 62.4.
- A pulsed DC tote barge electrofisher was used to sample four stations and a pulsed DC electrofishing boat was used at river mile 34.6.
- Smallmouth bass are still growing slow and their numbers are nearly twice that found in 1998 through 2000, but the population did slightly decrease since 2006. Noticeable improvements from 2006 were the increased PSD and RSD-12 indices. Increases in both of these indices were the first since 1999.
- The rock bass population estimate was nearly identical to 2006 and statistically not significantly different from other samples. The biggest improvement in the rock bass population was the shift in the population's size structure towards larger fish.
- The game fish population estimates will be conducted next in 2010 following the same procedures as previous surveys.

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## INTRODUCTION

The Blue River originates in Washington County and flows 74 mi through Crawford and Harrison Counties. Its confluence with the Ohio River is about 3 mi east of the Town of Leavenworth. The Blue River watershed comprises 125,000 acres in Clark, Crawford, Floyd, Harrison, and Washington Counties. Most of the watershed in Clark, Floyd, and Washington Counties is agricultural, while Crawford and Harrison Counties are heavily forested. Harrison-Crawford State Forest, O'Bannon Woods, and Wyandotte Caves are located on the lower 20 mi of the Blue River. Forty-five miles of the Blue River was designated as a "State Scenic River" in 1975 to prevent public and private projects which would destroy the river's natural features. The river is best described as a high quality, high gradient stream which receives a substantial portion of its discharge from subterranean sources. The lower 5 mi of river are more indicative of a southwest Indiana lowland river.

A black bass (smallmouth, spotted, and largemouth bass) 12-in minimum size limit was enacted in the summer of 1998 in all Indiana rivers and streams. There was no previous length limit on black bass in the Blue River. In 2007, the 12-in length limit was changed to a black bass 12 to 15-in protective slot limit and 5 bass bag limit. Only two of the five harvested bass can be longer than 15.0 in.

Previous Blue River standard fisheries surveys were conducted in 1972, 1993, and 2000. Game fish population estimates have been conducted in 1998, 1999, 2000, 2002, 2004, and 2006. A recreational use and angler creel survey was conducted in 1999.

The 2006 game fish population estimate found that the smallmouth bass population was slow growing with few bass over 12.0 in. The rock bass population was growing well, but the number of rock bass over 7.0 in long was greatly reduced compared to 2004.

## METHODS

Fish sampling was conducted from September 22 to 30, 2008 at five historic stations. The sites sampled were at river mile (RM) 9.0, 14.7, 34.6, 54.5, and 62.4. River mile designations were labeled according to Hoggatt (1975). A pulsed DC tote barge electrofisher was used to sample four stations and a pulsed DC electrofishing boat was used at RM 34.6. All electrofishing was conducted during the day with two dippers. The ends of each sampling station were blocked off with a block net unless a shallow riffle was present to prevent game fish

passage. Smallmouth bass, spotted bass, rock bass, and largemouth bass were the target species. At least three electrofishing passes were conducted to remove as many game fish as possible.

All fish collected were measured to the nearest 0.1 in TL and weighed to the nearest 0.01 lb. Scales were taken from a subsample of game fish for age and growth analysis. Proportional stock density (PSD) and relative stock density (RSD) were calculated for rock bass and smallmouth bass (Anderson and Neumann 1996). Population estimates were calculated using the depletion method and expanded with the Microfish 3.0 computer program (Van Deventer and Platts 1986).

## RESULTS

### Rock bass

A total of 204 rock bass was sampled that weighed 33 lbs. They ranged in length from 1.6 to 9.3 in (Appendix 1). The PSD was a record high 44. In 2006, the PSD was abnormally low at 3. The RSD-8 was 9 which was higher than 0 in 2006, but comparable to other samples. Previous PSDs (1993 to 2002) ranged from 18 to 39 and RSD-8s ranged from 8 to 16 (Figure 1). Rock bass growth was normal averaging 6.9 in at age 4 and 7.6 in at age 5 (Table 1). The oldest rock bass were age 8 and averaged 9.3 in.

Rock bass population estimates (excluding age 0) ranged from 200 (RM 9.0) to 453/mi (RM 14.7). The average was 380/mi which was nearly identical to 2006 (Appendix 2). Previous average population estimates ranged from 119 (2000) to 765/mi (2004) (Figure 2).

### Smallmouth bass

A total of 169 smallmouth bass was sampled that weighed 23 lbs. They ranged in length from 1.5 to 14.3 in. The smallmouth bass PSD increased from 4 (2006) to 19. The RSD-12 was 6 which was similar to the previous survey. Historic PSDs and RSD-12s are shown in Figure 3. Smallmouth bass grew similar to other years averaging 9.6 in at age 3, 11.4 in at age 4, and 14.0 in at age 5 (Table 2).

Smallmouth bass population estimates (excluding age 0) ranged from 58 (RM 14.7) to 427/mi (RM 34.6) and averaged 181/mi. Previous average population estimates ranged from 119 (2000) to 304/mi (2002) (Figure 4). All previous population estimates by RM are in Appendix 2.

The smallmouth bass population was analyzed using a weighted catch curve regression. Catch curve analysis show a total annual mortality of 58%, rate of exploitation of 19%,

instantaneous rate of fishing mortality of 29%, and conditional fishing and natural mortality estimates of 25 and 40%. Catch curve analysis for the 2004 data set could not be calculated because only three age classes were found.

### Spotted bass

A total of 44 spotted bass was collected that weighed 5 lbs. They ranged in length from 2.0 to 11.2 in. All were sampled at RM 14.7 and 34.6. The oldest spotted bass sampled was age 2 which averaged 7.1 in. An age-2 spotted bass in 2006 averaged 6.9 in. Spotted bass population estimates ranged from 0 (RM 9.0, 54.5, and 62.4) to 187/mi (RM 34.6) and averaged 54/mi. Historic population estimates are in Appendix 2.

## DISCUSSION

The current findings support the recommended change to the black bass 12 to 15-in slot limit. Smallmouth bass are still growing slow and their numbers are nearly twice that found in 1998 through 2000, but the population did slightly decrease since 2006. Noticeable improvements from 2006 were the increased PSD and RSD-12 indices. Increases in both of these indices were the first since 1999. Hopefully this is an indication that the new regulation allowing anglers to harvest the abundant small bass is helping improve the population's size structure. It is too early into the new regulation to determine if it is improving the fishery. The 2010 game fish population estimate will further aid in evaluating the effects of the new regulation.

The rock bass population estimate was nearly identical to 2006 and statistically not significantly different from other samples. The biggest improvement in the rock bass population was the shifting of the population's size structure towards larger fish. There are now 9 in, 8 year old rock bass compared to the biggest, oldest, rock bass in 2006 being 7.5 in and four years old. The changes in the population were reflected by the higher stock indices.

Spotted bass are a minor component to the Blue River's fishery. They were only sampled at two of the stations. Typically, spotted bass are more abundant in the lower river because that is their preferred habitat.

## LITERATURE CITED

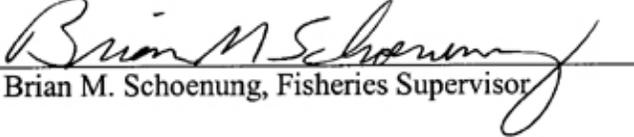
Anderson, R. O., and R. M. Neumann. 1996. Length, weight, and associated structural indices. Pages 447-482 in B. R. Murphy and D. W. Willis, editors. Fisheries techniques, 2<sup>nd</sup> edition. American Fisheries Society, Bethesda, Maryland.

Hoggatt, R.E. 1975. Drainage areas of Indiana streams. United States Geological Survey. 231 pp.

Van Deventer J. S., and W. S. Platts. 1986. Microfish interactive program. Microsoft Corporation.

Submitted by: Daniel P. Carnahan, Fisheries Biologist

Date: December 18, 2008

Approved by:   
Brian M. Schoenung, Fisheries Supervisor

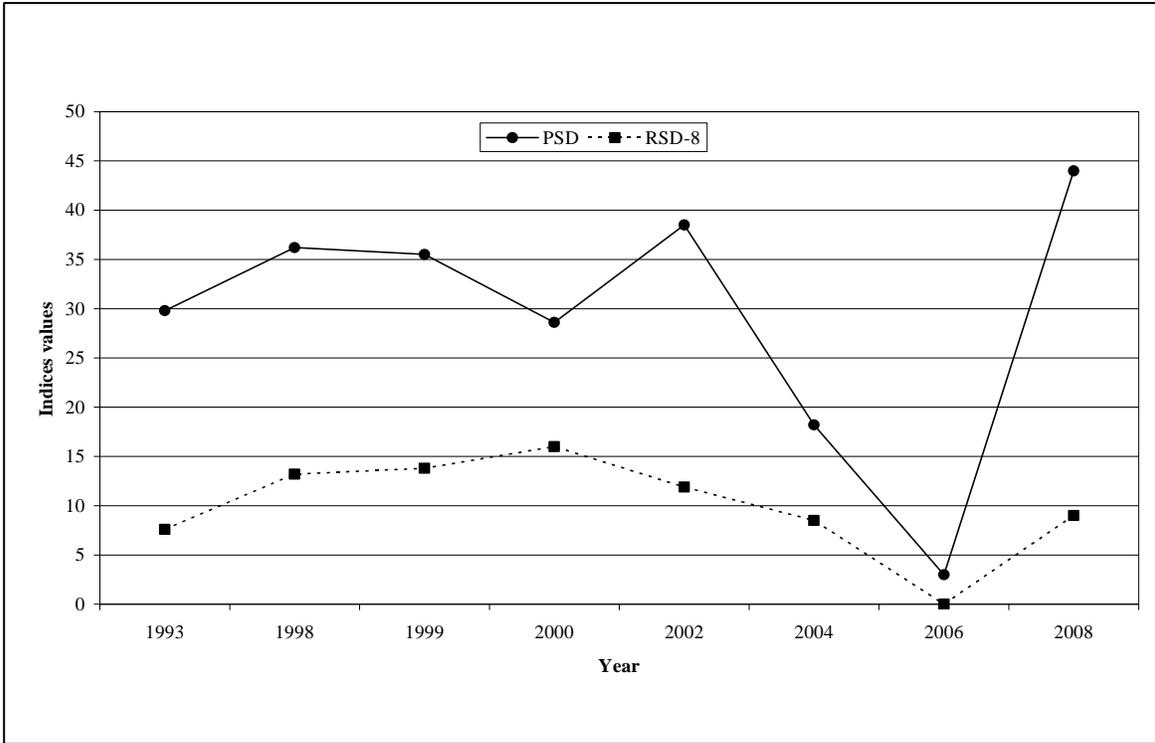
Date: March 9, 2009

Table 1. Rock bass mean length at age, 1998 to 2008.

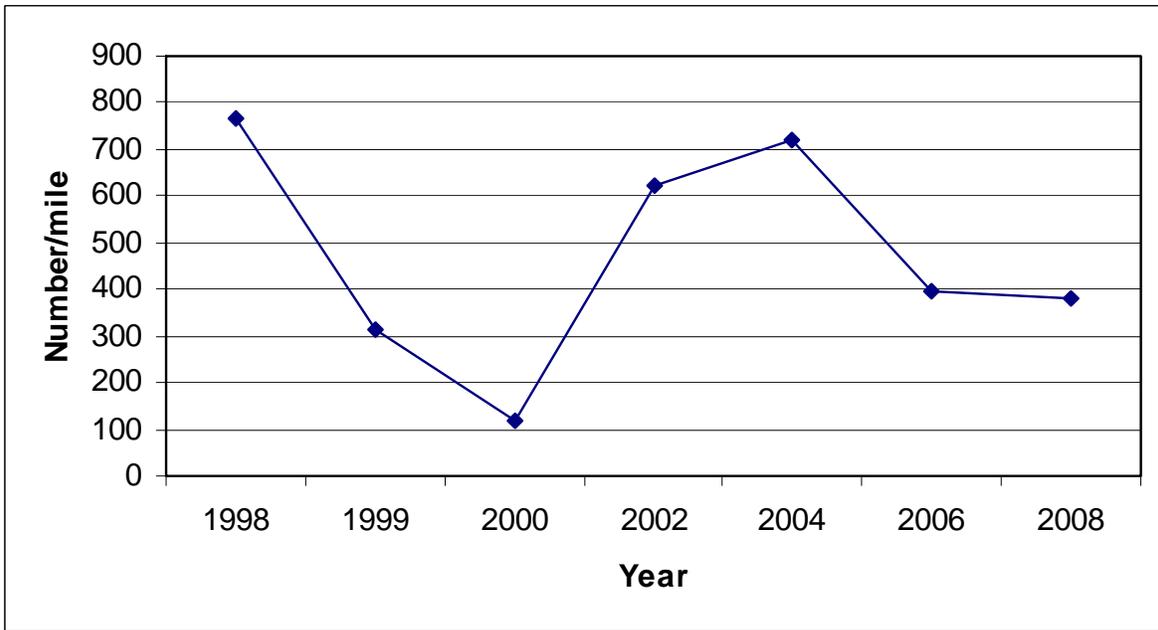
<u>Year</u>	<u>Age</u>							
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
1998	2.4	3.5	4.5	6.0	6.9	7.6	7.9	9.1
1999	2.1	3.8	4.6	6.3	7.2	8.8	8.7	9.3
2000	3.5	4.4	5.6	6.4	7.6	8.3		9.3
2002	2.5	4.5	5.7	7.3	8.4	9.2	9.8	
2004	2.5	4.2	6.0	7.0	8.1	8.8	9.1	
2006	3.6	5.2	6.3	7.8				
2008	3.2	4.2	5.9	6.9	7.6	8.2	8.8	9.3

Table 2. Smallmouth bass mean length at age, 1998 to 2008.

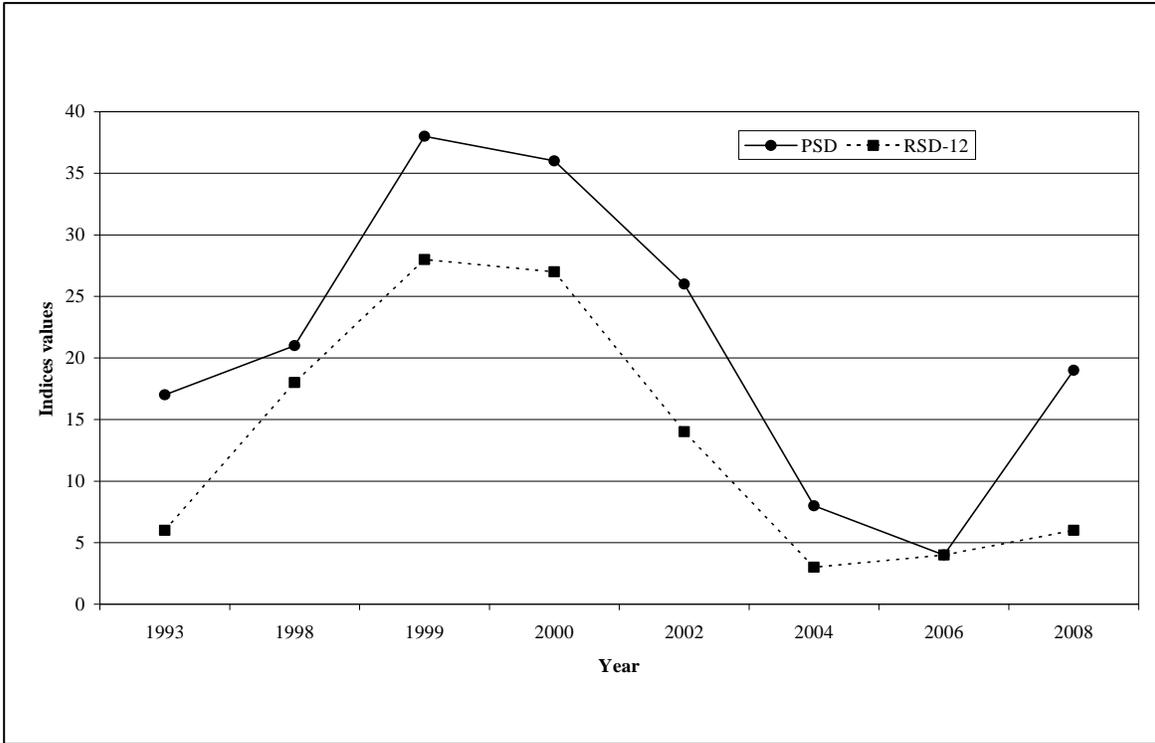
<u>Year</u>	<u>Age</u>						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
1998	4.3	6.7	9.4	10.3	14.1	14.8	17.8
1999	3.7	6.4	8.7	10.6	13.0	14.3	
2000	5.5	8.2	10.1	11.8	12.8		15.0
2002	5.0	7.8	10.2	12.2	13.8	14.8	15.8
2004	4.9	6.8	9.3	11.1			
2006	5.5	6.8	8.9				
2008	5.1	6.8	9.6	11.4	14.0		



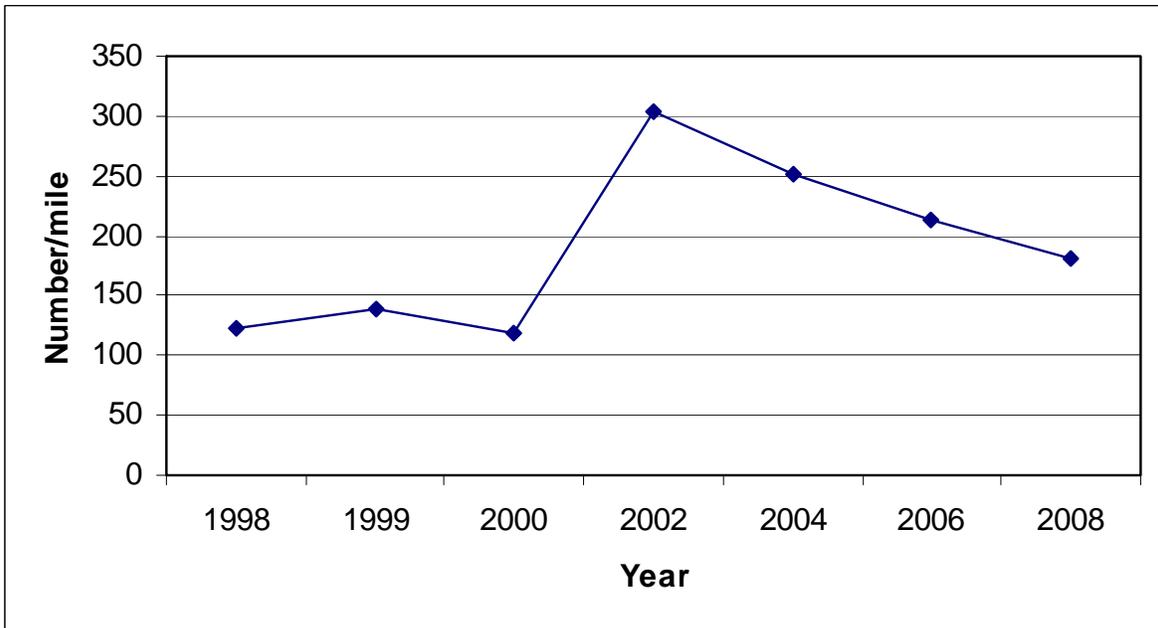
**Figure 1.** Rock bass PSD and RSD-8 indices, 1993 to 2008.



**Figure 2.** Rock bass mean population estimates, 1998 to 2008.



**Figure 3.** Smallmouth bass PSD and RSD-12 indices, 1993 to 2008.



**Figure 4.** Smallmouth bass mean population estimates, 1998 to 2008.

# APPENDIX 1

Game fish population estimate survey data.

**NUMBER, PERCENTAGE, WEIGHT, AND AGE OF ROCK 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	4	2.0	0.01	0	19.5				
2.0	5	2.5	0.01	0	20.0				
2.5	4	2.0	0.02	1	20.5				
3.0	22	10.8	0.03	1	21.0				
3.5	24	11.8	0.03	1, 2	21.5				
4.0	16	7.8	0.05	2	22.0				
4.5	9	4.4	0.07	2, 3	22.5				
5.0	5	2.5	0.09	2, 3	23.0				
5.5	10	4.9	0.14	2, 3, 4	23.5				
6.0	14	6.9	0.18	3, 4	24.0				
6.5	27	13.2	0.22	3, 4	24.5				
7.0	33	16.2	0.26	4, 5	25.0				
7.5	18	8.8	0.32	4, 5, 6	25.5				
8.0	6	2.9	0.39	5, 6	26.0				
8.5	3	1.5	0.47	6, 7	TOTAL	204			
9.0	4	2.0	0.44	6, 8					
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	N/A	GILL NET CATCH	N/A	TRAP NET CATCH	N/A
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**NUMBER, PERCENTAGE, WEIGHT, AND AGE OF SMALLMOUTH 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	1	0.6	0.01	0	19.5				
2.0	3	1.8	0.01	0	20.0				
2.5	27	16.0	0.01	0	20.5				
3.0	28	16.6	0.02	0	21.0				
3.5	14	8.3	0.03	0, 1	21.5				
4.0	3	1.8	0.03	1	22.0				
4.5	2	1.2	0.05	1	22.5				
5.0	13	7.7	0.06	1, 2	23.0				
5.5	9	5.3	0.08	1	23.5				
6.0	11	6.5	0.09	1, 2	24.0				
6.5	11	6.5	0.13	2	24.5				
7.0	10	5.9	0.16	1, 2	25.0				
7.5	8	4.7	0.20	2, 3	25.5				
8.0	1	0.6	0.21	2	26.0				
8.5	1	0.6	0.28	3	TOTAL	169			
9.0	8	4.7	0.36	3					
9.5	3	1.8	0.41	3					
10.0	4	2.4	0.47	3, 4					
10.5	3	1.8	0.56	3					
11.0	3	1.8	0.62	4					
11.5	3	1.8	0.70	4					
12.0	1	0.6	0.64	4					
12.5									
13.0									
13.5	1	0.6	0.98	5					
14.0	1	0.6	1.35	5					
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									

ELECTROFISHING CATCH	N/A	GILL NET CATCH	N/A	TRAP NET CATCH	N/A
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**NUMBER, PERCENTAGE, WEIGHT, AND AGE OF SPOTTED 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	5	11.4	0.01	0	20.0				
2.5	3	6.8	0.01	0	20.5				
3.0	1	2.3	0.02	0	21.0				
3.5	3	6.8	0.02	0	21.5				
4.0					22.0				
4.5					22.5				
5.0	1	2.3	0.05	1	23.0				
5.5	3	6.8	0.09	1	23.5				
6.0	3	6.8	0.13	2	24.0				
6.5	9	20.5	0.14	2	24.5				
7.0	10	22.7	0.17	2	25.0				
7.5	3	6.8	0.19	2	25.5				
8.0	2	4.5	0.27	2	26.0				
8.5					TOTAL	44			
9.0									
9.5									
10.0									
10.5									
11.0	1	2.3	0.61	not aged					
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	N/A	GILL NET CATCH	N/A	TRAP NET CATCH	N/A
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**ROCK BASS AGE-LENGTH KEY**

Length group (in)	Total number	Sub-sample	<u>Age</u>							
			1	2	3	4	5	6	7	8
1.5	4	0								
2	5	0								
2.5	4	3	4							
3	22	9	22							
3.5	24	10	2	22						
4	16	9		16						
4.5	9	7		3	6					
5	5	5		2	3					
5.5	10	9		2	6	2				
6	14	7			10	4				
6.5	27	10			8	19				
7	33	11				21	12			
7.5	18	11				3	7	8		
8	6	4					5	2		
8.5	3	3						2	1	
9	4	3						3		1
Totals	204	101	28	44	33	49	23	14	1	1

Age	Number	Mean length	Var	SE	Lower 95%CI	Upper 95%CI
1	28	3.2	0.06	0.05	3.1	3.3
2	44	4.2	0.29	0.08	4.0	4.3
3	33	5.9	0.53	0.13	5.7	6.2
4	49	6.9	0.20	0.06	6.8	7.1
5	23	7.6	0.16	0.08	7.4	7.8
6	14	8.2	0.39	0.16	7.9	8.5
7	1	8.8				
8	1	9.3	0.00	0.00	9.3	9.3

**SMALLMOUTH BASS AGE-LENGTH KEY**

Length group (in)	Total number	Sub-sample	<u>Age</u>				
			1	2	3	4	5
1.5	1	0					
2	3	0					
2.5	27	0					
3	28	0					
3.5	14	1	14				
4	3	3	3				
4.5	2	2	2				
5	13	9	9	4			
5.5	9	7	9				
6	11	7	5	6			
6.5	11	8		11			
7	10	8	5	5			
7.5	8	7		7	1		
8	1	1		1			
8.5	1	1			1		
9	8	8			8		
9.5	3	3			3		
10	4	4			3	1	
10.5	3	3			3		
11	3	3				3	
11.5	3	3				3	
12	1	1				1	
12.5							
13							
13.5	1	1					1
14	1	1					1
Totals	169	81	46	34	19	8	2

Age	Number	Mean length	Var	SE	Lower 95%CI	Upper 95%CI
1	46	5.1	1.35	0.17	4.8	5.5
2	34	6.8	0.65	0.14	6.5	7.1
3	19	9.6	0.60	0.18	9.2	10.0
4	8	11.4	0.35	0.21	11.0	11.9
5	2	14.0	0.13	0.25	13.5	14.5

**SPOTTED BASS AGE-LENGTH KEY**

Length group (in)	Total number	Sub- sample	<u>Age</u>	
			1	2
2	5			
2.5	3			
3	1			
3.5	3			
4				
4.5				
5	1	1	1	
5.5	3	3	3	
6	3	3		3
6.5	9	6		9
7	10	9		10
7.5	3	3		3
8	2	2		2
8.5				
9				
9.5				
10				
10.5				
11	1			
Totals	44	27	4	27

Age	Number	Mean length	Var	SE	Lower 95%CI	Upper 95%CI
1	4	5.6	0.06	0.13	5.4	5.9
2	27	7.1	0.28	0.10	6.9	7.3

## APPENDIX 2

Game fish population estimates by sampling station, 1998 through 2008.

Appendix 2. Game fish population estimates (number/mile) by sampling station, 1998 to 2008.

**SMALLMOUTH BASS**

<u>Year</u>	<u>River Mile</u>					<u>Mean</u>
	<u>9.0</u>	<u>14.7</u>	<u>34.6</u>	<u>54.5</u>	<u>62.4</u>	
1998	19	52	427	30	84	122
1999	38	240	187	91	137	139
2000	29	*	180	24	242	119
2002	171	580	527	116	126	304
2004	67	360	460	110	263	252
2006	76	380	267	*	126	212
2008	162	58	427	67	189	181

**ROCK BASS**

<u>Year</u>	<u>9.0</u>	<u>14.7</u>	<u>34.6</u>	<u>54.5</u>	<u>62.4</u>	<u>Mean</u>
1998	152	33	1,833	805	1,000	765
1999	76	300	380	439	379	315
2000	38	*	167	91	179	119
2002	276	1,080	527	585	632	620
2004	314	1,140	993	360	800	721
2006	238	860	233	*	253	396
2008	200	453	387	451	411	380

**SPOTTED BASS**

<u>Year</u>	<u>9.0</u>	<u>14.7</u>	<u>34.6</u>	<u>54.5</u>	<u>62.4</u>	<u>Mean</u>
1998	124	114	53	12	21	65
1999	19	40	67	61	0	37
2000	0	*	67	0	0	17
2002	0	0	100	0	0	20
2004	0	0	0	0	0	0
2006	29	100	93	*	0	56
2008	0	81	187	0	0	54

\* Estimate not conducted.