

STARVE HOLLOW LAKE
Jackson County
2008 Fish Management Report

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EXECUTIVE SUMMARY

- Starve Hollow Lake is a 145-acre impoundment owned by the Indiana Department of Natural Resources (IDNR), Division of Forestry. It is located in Jackson County about 7 mi south of Brownstown in southeastern Indiana. Access includes three boat ramps; only electric motors are allowed. Starve Hollow Lake is the direct water supply for Driftwood State Fish Hatchery located immediately below the dam. Maps of the property are available from Starve Hollow State Recreation Area, 4345 South County Road 275 West, Vallonia, Indiana 47281.
- A survey of largemouth bass, bluegill, and gizzard shad was conducted on Starve Hollow Lake on June 2 and 10, 2008, as part of a Division of Fish and Wildlife (DFW) work plan, which is titled, "Gizzard shad experimental management strategies".
- A total of 2,010 fish, representing 3 species, was collected during this survey. Gizzard shad ranked first by number and by weight, followed by bluegill, and then largemouth bass.
- The DC electrofishing catch rate for gizzard shad was 730.6/h, which is an increase from 125.3/h in 2007 and more than in 2006 (644.7/h), 2005 (520.7/h), and 2004 (300.0/h).
- Bluegill ranged from 2.7 to 7.4 in TL, averaging 5.6 in TL. Bluegill represented a balanced population. The bluegill proportional stock density (PSD) of 42 was in the desired range (20 to 60) for a balanced bluegill fishery; more quality-size bluegill (6.0 in and longer) were collected than in 2007. Bluegill growth was faster than in 2007. Bluegill reached 6.0 in early in their 5th year of growth, which is slightly below average for southeastern Indiana.
- Largemouth bass ranged from 4.8 to 22.8 in TL, averaging 13.2 in TL. In the sample, 35% of the bass were legal size (14.0 in or longer). Largemouth most likely reached 14.0 in during their 6th year of growth, which is average for southeastern Indiana.
- The DFW coordinated a drawdown of Starve Hollow Lake to renovate the fishery while necessary repairs were made to the spillway by the Division of Forestry. The renovation should not only enhance the sport fishery, but restore a shad-free water supply for Driftwood State Fish Hatchery.
- From May 23, 2008 through November 1, 2008, size limits were eliminated and bag limits were doubled for sport fish. Normal regulations were restored on November 2, 2008 and remain in effect.
- After the renovation, DFW restocked the lake with game fish salvaged from Starve Hollow Lake along with fingerlings of largemouth bass, bluegill, and redear sunfish.

FIGURES

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INTRODUCTION

Starve Hollow Lake is a 145-acre impoundment owned by the Indiana Department of Natural Resources (IDNR), Division of Forestry. It is located in Jackson County about 7 mi south of Brownstown in southeastern Indiana. Construction was completed in 1938. Access includes three boat ramps; only electric motors are allowed. Starve Hollow Lake serves as the primary water supply to Driftwood State Fish Hatchery as well as the Vallonia Tree Nursery. Maps of the property are available from Starve Hollow State Recreation Area, 4345 South County Road 275 West, Vallonia, Indiana 47281.

Starve Hollow Lake has a 14.0-in minimum size limit on largemouth bass. Prior fish management activities include a fishery renovation in 1987 and restocking of largemouth bass, bluegill, redear sunfish, black crappie, and channel catfish. Starve Hollow Lake is currently stocked with 2,320 (16/acre) channel catfish every other year.

Gizzard shad were first documented in Starve Hollow Lake in 1998 (Lehman 1998). Starve Hollow Lake is scheduled to be surveyed from 2005 through 2009 under a Division of Fish and Wildlife (DFW) work plan, which is titled, "Gizzard shad experimental management strategies." The work plan objectives are:

1. Report on how the illegal introductions of gizzard shad have negatively affected sport fish populations and reduced fishing opportunities.
2. Determine the most effective way(s) to control excessive gizzard shad populations.
3. Determine how sport fish populations respond to various gizzard shad management techniques.

Starve Hollow was surveyed from early to mid-June each year. Only largemouth bass, bluegill, and gizzard shad were collected. The management activity being tested at Starve Hollow was an annual winter drawdown with a goal of a 50% reduction in volume during January and February. The lake was drawn down in 2005, 2006, 2007, and 2008. However, this is the final survey under this work plan, ending one year in advance. The DFW coordinated a drawdown of Starve Hollow Lake to renovate the fishery while necessary repairs were made to the spillway by the Division of Forestry. The renovation should not only enhance the sport fishery, but restore a shad-free water supply for Driftwood State Fish Hatchery.

Largemouth bass (33,267), bluegill (88136), redear sunfish (51,536), and channel catfish (1,660) were restocked once the lake had refilled. Black crappie (14,500) are scheduled to be restocked in the fall of 2009.

METHODS

A survey of largemouth bass, bluegill, and gizzard shad was conducted June 2 and 10, 2008. Fish were collected by pulsed DC electrofishing along the shoreline on two nights with two dippers for 1.5 h. The lake's shoreline was divided into six 15-min electrofishing stations. The odd-numbered stations were sampled the first night and the even-numbered stations were sampled the second night. A GARMIN GPSmap 76 was used to record the location of the fish collection sites.

All largemouth bass and a subsample of 277 gizzard shad and 221 bluegill were measured to the nearest 0.1 in TL. The remaining shad and bluegill were counted but not measured. The length-frequency distributions of 1,169 shad and 781 bluegill were created based on the proportion by number of each half-inch group of the shad and bluegill subsamples.

Fish were not weighed; average weights for fish by half-inch groups for Fish Management District 8 were used to estimate the weight of the fish sample. Fish scale samples were taken from largemouth bass, bluegill, and gizzard shad for age and growth analysis, however, gizzard shad were not aged. The proportional stock density (PSD) was calculated for largemouth bass and bluegill (Anderson and Neumann 1996). The bluegill PSD was calculated using only the bluegill subsample. The Bluegill Fishing Potential (BGFP) index was used to assess bluegill fishing quality (Ball and Tousignant 1996).

RESULTS

A total of 2,010 fish, representing 3 species, was collected during this survey. Total weight of the fish sample was approximately 523 lbs. Gizzard shad ranked first by number and weight, followed by bluegill, and then largemouth bass.

A total of 1,169 gizzard shad was sampled that weighed 323 lbs. They ranged from 5.5 to 13.3 in TL, averaging 9.0 in TL. Relative abundance was 58% by number and 62% by weight. The DC electrofishing catch rate for gizzard shad was 730.6/h (Figure 1), which is an

increase from 125.3/h in 2007 and more than in 2006 (644.7/h), 2005 (520.7/h), and 2004 (300.0/h) (Kowalik and Lehman 2009). Gizzard shad were not aged.

A total of 781 bluegill was sampled that weighed 103 lbs. They ranged from 2.2 to 7.4 in TL, averaging 5.6 in TL. Relative abundance was 39% by number and 20% by weight. The electrofishing catch rate was 488.1/h, decreasing from 735.3/h in 2007 (Kowalik and Lehman 2009).

Bluegill represented a balanced population; the bluegill PSD was 42, which was an increase from 16 in 2007. In the subsample, 41% of the bluegill were 6.0 in or longer (i.e. quality size), an increase from 15% in 2007. The BGFP index was 15, which is in the fair category as it was in 2007. Growth at all ages in 2008 was faster than in 2007. Back-calculated lengths indicate bluegill reached 6.0 in early in their 5th year of growth, which is slightly below average for southeastern Indiana (Figure 2).

A total of 60 largemouth bass was sampled that weighed 97 lbs. They ranged from 4.8 to 22.8 in TL, averaging 13.2 in TL. Relative abundance was 3% by number and 19% by weight. The electrofishing catch rate was 37.5/h, decreasing from 78.7/h in 2007 (Kowalik and Lehman 2009). In the sample, 35% of the largemouth were 14.0 in or longer (i.e. legal size), an increase from 16% in 2007. Largemouth most likely represented a balanced population; however, the largemouth PSD of 63 is unreliable due to an insufficient sample size. The bass PSD in 2007 was 57. Back-calculated lengths indicate that largemouth most likely reached 14.0 in during their 6th year of growth, which is slower than 2007 and average for southeastern Indiana (Figure 3).

DISCUSSION

In 2005 and 2006, the largemouth bass PSD at Starve Hollow Lake was near the upper limit (70) of the desired range for a balanced bass fishery, which meant that the number of 8.0 to 11.9-in bass may have become too low compared to the number of bass 12.0 in and longer. The bass PSD declined in 2007 to the middle of that desired range, which means that the bass population was well-balanced in 2007. The 2008 PSD most likely was in the desired range, but was unreliable due to an insufficient sample size and cannot be used to compare with past surveys.

Largemouth bass comprised only 3% of the total fish collected in this survey and the 2008 catch rate is less than the catch rates of 2004, 2005, 2006, and 2007. Few bass were collected less than 8.0 in; however, the percentage of legal-size bass in the sample doubled since 2007. Bass growth was slower than 2007 and similar to the district average. Dense and abundant submersed vegetation may inhibit bass from foraging on many of the small bluegill, which would negatively affect bass growth and the bluegill population.

The bluegill PSD increased from 2006 to 2007, however, it was still below the desired range for a balanced fishery because of the abundance of 3.0 to 5.9-in bluegill compared to quality-size bluegill. In 2008, the bluegill PSD was in the middle of the desired range, almost tripling from 2007. Bluegill growth increased from 2007 and was similar to growth from 2004, 2005, 2006, and the district average. Although the bluegill PSD increased, the BGFP index did not change from 2007 due in-large to a decrease in bluegill density. Bluegill over 8.0 in were still absent from the collection.

Gizzard shad were more abundant in 2008 than the previous four surveys (2004 to 2007) despite four winter drawdowns during which many shad died from stress. In 2006, gizzard shad were more abundant than in 2004 and 2005 after two years of winter drawdowns. In 2007, shad numbers were less than in 2004. After the 2007 survey, it appeared that a decrease in the relative abundance by number and by weight of shad and a decrease in the electrofishing catch rate indicated that the winter drawdowns were starting to affect the gizzard shad population. Obviously, this observation was premature, because the 2006 shad year class was well documented in this survey. Overall shad numbers rebounded in 2008. As was suggested in previous survey reports, shad at Starve Hollow may become too large by the end of their second year to be utilized by predators in the lake except for large, older bass.

The need for a shad-free water supply for Driftwood State Fish Hatchery prompted DFW to completely renovate the fishery while the Division of Forestry made repairs to the dam in the fall of 2008. Consequently, the lake will not be surveyed in 2009 under the “Gizzard shad experimental management strategies” work plan. However, the lake will be surveyed to evaluate the effectiveness of the renovation and game fish stockings.

RECOMMENDATION

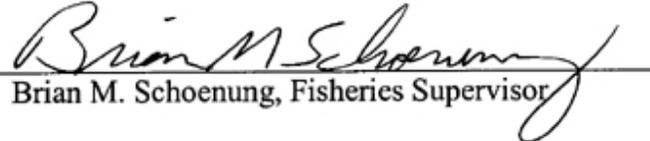
- Starve Hollow Lake should be surveyed in 2009 to determine renovation success and to evaluate the game fish stockings.
- Black crappie (14,500) should be stocked in the fall of 2009.

LITERATURE CITED

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- Ball, R. L. and J. N. Tousignant. 1996. The development of an objective rating system to assess bluegill fishing in lakes and ponds. Research report. Indiana Department of Natural Resources. Indianapolis, Indiana. 18 pp.
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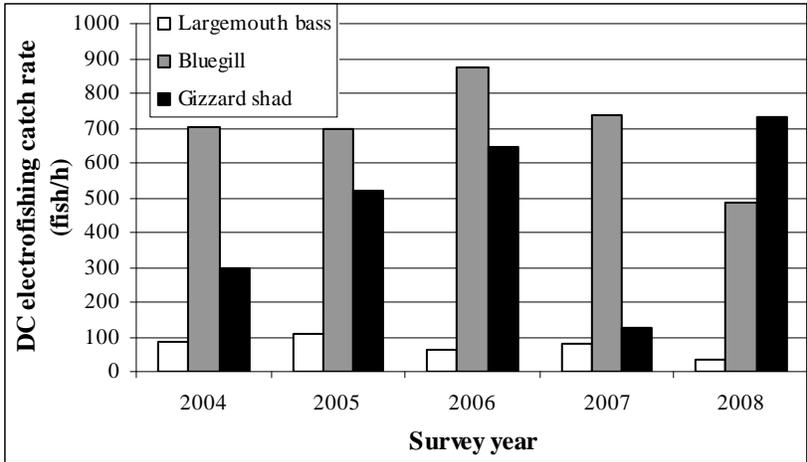


Figure 1. DC electrofishing catch rates for largemouth bass, bluegill, and gizzard shad in Starve Hollow Lake in June 2004, 2005, 2006, 2007, and 2008.

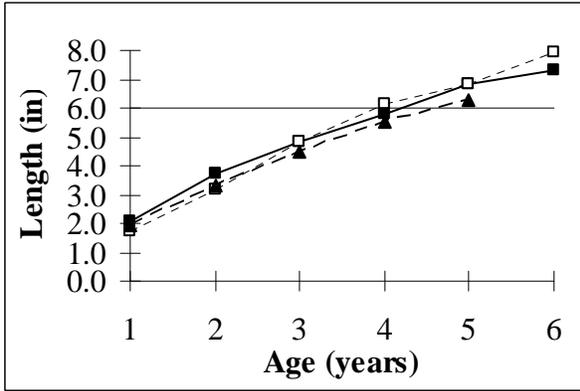


Figure 2. Starve Hollow Lake bluegill growth from 2008 survey (solid line) compared to 2007 survey (dashed line) and to average bluegill growth observed in Fish Management District 8 impoundments (dotted line).

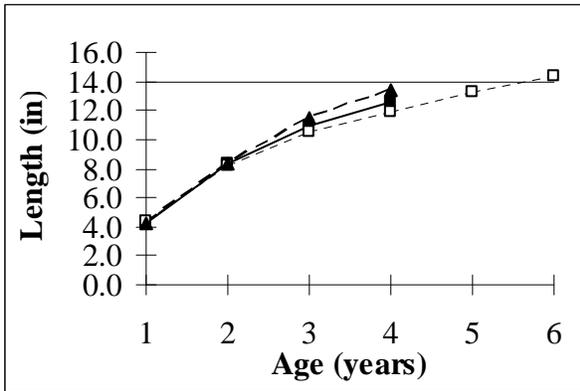


Figure 3. Starve Hollow Lake largemouth bass from 2007 survey (solid line) compared to 2006 survey (dashed line) and to average largemouth bass growth observed in Fish Management District 8 impoundments (dotted line).

LAKE SURVEY REPORT

Type of Survey	<input type="checkbox"/> Initial Survey	<input checked="" type="checkbox"/> Re-Survey
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Lake Name Starve Hollow Lake	County Jackson	Date of survey (Month, day, year) June 2 and 10, 2008
Biologist's names Larry L. Lehman, Clint Kowalik		Date of approval (Month, day, year) August 24, 2009

LOCATION		
Quadrangle Name Vallonia, IND. 1959. Photorevised 1980	Range 4E	Section 3 and 4
Township Name 4N	Nearest Town Vallonia	

ACCESSIBILITY					
State owned public access site Three concrete boat ramps		Privately owned public access site None present		Other access site Shoreline fishing on dam	
Surface acres 145	Maximum depth (ft) approximately 18	Average depth (ft) 6.7	Volume (acre feet) 972	Water level (feet MSL) 548	Extreme fluctuations 546.5-548.5 feet MSL
Location of benchmark Approximately 0.5 mile northwest of lake					

INLETS		
Name Mill Creek	Location North end of lake	Origin Farmland, forest
Unnamed	East bay of lake	Forest
Unnamed (2)	Northwest bay	Farmland, forest

OUTLETS	
Name Mill Creek	Location South side of lake at principal spillway

Water level control

POOL	ELEVATION (feet MSL)	ACRES	Bottom type
TOP OF DAM			<input type="checkbox"/> Boulder
TOP OF FLOOD CONTROL POOL			<input type="checkbox"/> Gravel
NORMAL POOL	548	145	<input checked="" type="checkbox"/> Sand
TOP OF MINIMUM POOL			<input type="checkbox"/> Muck
STREAMBED			<input checked="" type="checkbox"/> Clay
			<input type="checkbox"/> Marl

Watershed use: Watershed covers approximately 4,272 acres. Approximately 75% of the watershed is covered with hardwood forest.

Most of the remainder (~22%) is agriculture and grass/pasture. (source is <http://pasture.ecn.purdue.edu>)

Development of shoreline

The Department of Natural Resources has provided a beach, bathhouse, 3 boat ramps, fishing piers including

several handicap accessible piers, a boat dock with rental rowboats and canoes, mooring posts, camping, and

picnic sites. Several private homes are located on the western shore.

Previous surveys and investigations

Hydrographic survey 1959. Renovated 1961. Population study 1963. Northern pike study 1966. Creel surveys 1963, 1964,

1974, 1975, 1978, 1979, 1980, 1986. Fishery surveys 1961, 1970, 1973, 1975, 1978, 1982. Renovated 1987.

Spot-check surveys 1988, 1998. Channel catfish study 1989-1990. Bluegill quality study and largemouth estimate 1990.

Creel survey 1990. Fishery surveys 1994, 1996, 1999. Gizzard shad study 2004, 2005, 2006, 2007.

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night hours		Total hours
	0		1.6**		1.6**
TRAP NETS	Number of traps		Number of Lifts		Total effort
	0		0		0
GILL NETS	Number of nets		Number of Lifts		Total effort
	0		0		0
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls
	0				none

PHYSICAL AND CHEMICAL CHARACTERISTICS			
Color		Turbidity	
		Feet	Inches (SECCHI DISK)
Alkalinity (ppm)*		pH	
Surface: Bottom:		Surface: Bottom:	
Conductivity (6/2/08): 195 micromhos/cm		Air temperature:	
Conductivity (6/10/08): 200 micromhos/cm		°F	
Water chemistry GPS coordinates:			
N		W	

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	***		36			72		
2			38			74		
4			40			76		
6			42			78		
8			44			80		
10			46			82		
12			48			84		
14			50			86		
16			52			88		
18			54			90		
20			56			92		
22			58			94		
24			60			96		
26			62			98		
28			64			100		
30			66					
32			68					
34			70					

COMMENTS
**Electrofisher settings (6/10/08): 707 volts DC, output mode = 60 pps, and pulse width = 4.1 ms (5 amps)
***Surface water temperature: 80°F on 6/2/08 and 84°F on 6/10/08

*ppm-parts per million

NUMBER, PERCENTAGE, WEIGHT, AND AGE: Gizzard shad Starve Hollow Lake 6/2/08 and 6/10/08									
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					23.0				
5.5	21	1.8	0.05	Not aged	23.5				
6.0	114	9.8	0.07		24.0				
6.5	139	11.9	0.09		24.5				
7.0	101	8.6	0.12		25.0				
7.5	13	1.1	0.14		25.5				
8.0	4	0.3	0.17		26.0				
8.5					TOTAL	1,169			
9.0	51	4.4	0.25						
9.5	144	12.3	0.28						
10.0	232	19.8	0.34						
10.5	215	18.4	0.40						
11.0	89	7.6	0.46						
11.5	25	2.1	0.51						
12.0	9	0.8	0.60						
12.5	4	0.3	0.67						
13.0	4	0.3	0.79						
13.5	4	0.3	0.87						
14.0									
14.5									
15.0									
15.5									
16.0									
16.5									
17.0									
17.5									
18.0									
18.5									
ELECTROFISHING CATCH	730.6/h			GILL NET CATCH	N/A		TRAP NET CATCH	N/A	

NUMBER, PERCENTAGE, WEIGHT, AND AGE: Bluegill Starve Hollow Lake 6/2/08 and 6/10/08									
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	7	0.9	<0.01	1	20.0				
2.5					20.5				
3.0	28	3.6	0.02	1	21.0				
3.5	11	1.4	0.03	1	21.5				
4.0	21	2.7	0.04	1, 2	22.0				
4.5	64	8.2	0.06	2, 3	22.5				
5.0	109	14.0	0.08	2, 3, 4	23.0				
5.5	170	21.8	0.11	3, 4	23.5				
6.0	138	17.7	0.15	4	24.0				
6.5	131	16.8	0.19	4, 5	24.5				
7.0	95	12.2	0.24	4, 5, 6	25.0				
7.5	7	0.9	0.30	6	25.5				
8.0					26.0				
8.5					TOTAL	781			
9.0									
9.5					Subsample: PSD = 91/217(100) = 41.9				
10.0									
10.5					Subsample: % \geq 6.0 inches = 91/221(100) = 41.2				
11.0									
11.5					Bluegill Fishing Potential Index = 15 (fair)				
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		488.1/h		GILL NET CATCH	N/A		TRAP NET CATCH		N/A

NUMBER, PERCENTAGE, WEIGHT, AND AGE: Largemouth bass Starve Hollow Lake 6/2/08 and 6/10/08

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	2	3.3	3.69	---
1.5					19.5	3	5.0	4.34	---
2.0					20.0				
2.5					20.5	2	3.3	4.88	---
3.0					21.0				
3.5					21.5	1	1.7	5.19	---
4.0					22.0				
4.5					22.5				
5.0	2	3.3	0.05	1	23.0	1	1.7	6.94	---
5.5					23.5				
6.0	1	1.7	0.10	1	24.0				
6.5	3	5.0	0.12	1, 2	24.5				
7.0					25.0				
7.5					25.5				
8.0	1	1.7	0.24	2	26.0				
8.5	1	1.7	0.28	2	TOTAL	60			
9.0	1	1.7	0.34	2					
9.5	2	3.3	0.41	2		PSD = 34/54(100) = 63.0 (unreliable due to small sample)			
10.0	2	3.3	0.48	2					
10.5	6	10.0	0.57	3		% \geq 14.0 inches = 21/60 = 35.0			
11.0	2	3.3	0.64	3					
11.5	5	8.3	0.74	3					
12.0	3	5.0	0.84	3, 4					
12.5	1	1.7	0.97	4					
13.0	3	5.0	1.09	4					
13.5	4	6.7	1.24	4					
14.0	4	6.7	1.39	4					
14.5									
15.0	2	3.3	1.72	5					
15.5									
16.0									
16.5	3	5.0	2.29	---					
17.0	1	1.7	2.40	---					
17.5	1	1.7	2.90	---					
18.0	2	3.3	3.20	---					
18.5	1	1.7	3.52	---					

ELECTROFISHING CATCH	36.9/h	GILL NET CATCH	N/A	TRAP NET CATCH	N/A
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Species Bluegill	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE								
				1	2	3	4	5	6	7	8	
Intercept= 0.8"	2007	9	2.2-3.8	2.7								
	2006	8	4.0-4.9	2.2	4.1							
	2005	6	4.5-5.5	2.4	3.7	4.8						
	2004	12	5.2-6.8	2	3.6	4.8	5.7					
	2003	6	6.6-7.1	1.7	3.5	4.6	5.7	6.7				
	2002	3	7.2-7.4	1.8	3.6	4.9	5.9	6.9	7.3			
			AVERAGE LENGTH	2.1	3.7	4.8	5.8	6.8	7.3			
			NUMBER AGED	44	35	27	21	9	3			

Species Largemouth bass	YEAR CLASS	Number of fish aged	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE								
				1	2	3	4	5	6	7	8	
Intercept= 0.8"	2007	5	4.8-6.5	5								
	2006	8	6.6-10.2	4.5	8.1							
	2005	10	10.4-12.0	4.1	8.3	10.8						
	2004	14	12.0-14.2	3.8	8.4	10.9	12.6					
	2003	1*	15.1	3.6	10.7	12.2	13.8	14.5				
			AVERAGE LENGTH	4.3	8.3	10.9	12.6					
			NUMBER AGED	37	32	24	14					

*Not included in average length calculations.

GPS LOCATION OF SAMPLING EQUIPMENT Starve Hollow Lake 6/2/08 and 6/10/08

GILL NETS			TRAP NETS			ELECTROFISHING		
1	N	W	1	N	W	1	N 38.81072	W -86.08244
	N	W	2	N	W		N 38.80895	W -86.07757
2	N	W	3	N	W	2	N 38.80911	W -86.07660
	N	W	4	N	W		N 38.81235	W -86.07595
3	N	W	5	N	W	3	N 38.81508	W -86.07371
	N	W	6	N	W		N 38.81770	W -86.07388
4	N	W	7	N	W	4	N 38.81735	W -86.07337
	N	W	8	N	W		N 38.81476	W -86.07662
5	N	W	9	N	W	5	N 38.81473	W -86.07669
	N	W	10	N	W		N 38.81390	W -86.08227
6	N	W	11	N	W	6	N 38.81393	W -86.08229
	N	W	12	N	W		N 38.81069	W -86.08248
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