

BROKESHA LAKE
Steuben County
2007 Fish Management Report

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EXECUTIVE SUMMARY

- A general lake survey was conducted on Brokesha Lake on June 14 and 15, 2007. Water chemistry and aquatic vegetation data were also collected.
- The Secchi disk reading at Brokesha Lake was 9 ft and dissolved oxygen concentrations were not adequate for fish survival below 17 ft. Submersed vegetation was found to a maximum depth of 14 ft. Brittle naiad was the most common submersed plant followed by chara and sago pondweed. Two exotic invasive species were found, Eurasian watermilfoil and curly-leaf pondweed. In all, seven species of submersed plants were collected during the survey.
- A total of 350 fish representing nine species were collected during this survey. Bluegills ranked first by number, followed by largemouth bass and redear. Largemouth bass was the dominant species collected by weight, followed by bluegill and redear.
- Bluegills grew at an average to above average rate for northern Indiana natural lakes and 37% were 6 in TL or larger. Largemouth bass grew at an average to below average rate. Very few legal size bass were collected during sampling.
- The DFW should encourage the lake residents to continue controlling Eurasian watermilfoil and curly-leaf pondweed. No fish management is recommended at Brokesha Lake at this time.

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INTRODUCTION

Brokesha Lake is a 36 acre natural lake located approximately five miles northeast of the town of Middlebury, IN in Lagrange County. The lake has a maximum depth of 20 feet and an average depth of 10 feet. The primary inlet of Brokesha Lake is a small ditch that enters the lake on the south shore and originates from Goose Pond. The outlet is a channel located on the north end of the lake that leads to Stone Lake. The outlet is navigable and used by boaters to travel back and forth between the lakes, a distance of approximately 1,000 feet. This provides the only access to Brokesha Lake as there is no access site, public or private, located on the lake itself. There is an access site on Stone Lake owned by the county which can be used by the public to reach Brokesha Lake. In addition, the Division of Fish and Wildlife (DFW) recently acquired property bordering the channel between the two lakes with the intent of constructing an access site that can be used to reach either lake.

The majority of the shoreline of Brokesha Lake is natural, consisting of woodlands and marshy areas. There only a few year around homes on the lake and one small summer cabin. These structures occupy approximately 15% of the shoreline.

The initial fisheries survey of Brokesha Lake was conducted in 1967 by DFW biologists. The purpose of this survey was to evaluate the quality of the sport fishery. The major sport fish collected were bluegills, yellow perch, largemouth bass and redear (Table 1). The Brokesha Lake fishery was considered satisfactory and no management was recommended. Follow up surveys were conducted in 1977 and 1982. A decline in the yellow perch population was noted following the 1977 survey but the overall condition of the fishery remained good. The current survey was conducted to evaluate fish population changes since the initial survey.

METHODS

This survey was conducted on June 14 and 15, 2007 as part of DFW Work Plan 300FW1F10D40621 that covers management of fish populations in natural lakes. Several physical and chemical characteristics of the water were measured in the deepest area of the lake according to the Manual of Fisheries Survey Methods (2001) standard lake survey guidelines. Submersed aquatic vegetation was sampled on August 10, 2007 using methods outlined in the Tier II Aquatic Vegetation Survey Protocol developed by the DFW Lake and River Enhancement Program and used in their aquatic vegetation control grant program. A global

positioning system (GPS) device was used to record the location of the limnological data collection site, aquatic vegetation sample sites, and fish collection sites.

Fish were collected by pulsed D.C. electrofishing the shoreline at night with two dippers for 0.67 hours. Two trap nets and two experimental-mesh gill nets were also fished overnight for one night. All fish collected were measured to the nearest 0.1 in TL. Length-frequency tables were constructed for species of concern with whole inch groups consisting of individuals measuring from X.0 to X.4 in TL and half inch groups consisting of individuals measuring from X.5 to X.9 in TL. Length-weight regression equations for Fish Management District 2 were used to estimate the weight of all fish within the sample. Five scale samples per half-inch group were collected from game species for age and growth analysis. Average length-at-age for these species was estimated using the Fraser-Lee method of back calculation and standard intercepts (DeVries and Frie 1996, Carlander 1982). Age length keys were also constructed to determine mean length at age at the time of collection.

RESULTS

The Secchi disk reading at Brokesha Lake was 9 ft and dissolved oxygen concentrations were not adequate for fish survival below 17 ft. Thirty sites were randomly sampled during the plant survey, 25 of which fell within the littoral zone in water 14 ft in depth or less. A total of five native and two exotic species were identified. Aquatic plants were observed at 24 of the 25 littoral sites sampled. The maximum number of plant species found at one site was four and the mean was one. Brittle naiad was the dominant plant collected followed by chara and sago pondweed. Large-leaf pondweed was observed but not collected at any of the sample sites. The exotic species present were Eurasian watermilfoil and curly-leaf pondweed. Each was collected at only 3% of the sites. Six emergent, floating or floating leaf plants associated with wetlands, arrowhead, cattail, pickerelweed, soft rush, spatterdock and white water lily, were also observed.

A total of 350 fish representing nine species was collected from Brokesha Lake in 2007. Numerically, bluegill was the top species collected (46%) followed by largemouth bass (23%) and redear (19%). Largemouth bass was the dominant species collected by weight (34%) followed by bluegill (30%) and redear (22%).

Bluegill ranked first by number (46%) and second by weight (30%) among all species collected during this survey. The 161 bluegills collected ranged in length from 1.2 (age 1) to

10.5 (age 7) in TL and averaged 4.6 in TL. They weighed approximately 22.8 pounds. During electrofishing bluegills were collected at a rate of 208 fish per hour. Ten bluegills per lift were collected during gill netting, while trap netting yielded 19 bluegills per lift. Bluegills 6.0-in TL or larger, considered harvestable size, comprised 37% of the sample, reaching this size during their third or fourth year of life. In addition, 9% measured 8 in TL or larger. Age-1 through age-4 bluegills grew at an average rate for northern Indiana natural lakes while older fish grew at an above average rate. Bluegill was also the top species collected numerically in 1967 and 1977 and ranked second in 1982. The percentage of harvestable size bluegills collected during these surveys ranged from a low of 8% in 1967 to a high 63% in 1982.

A total of 79 largemouth bass weighing approximately 26.1 pounds were collected. Largemouth bass ranked second by number (23%) and first by weight (34%) among all species collected. They ranged in length from 3.5 (age 1) to 19.8 (age 9) in TL and averaged 7.4 in TL. Harvestable size largemouth bass (14 in TL or larger) comprised only 3% of the sample as only two legal size bass were collected. It is estimated that bass reached this size during their sixth or seventh year of life. Age-1 and age-2 largemouth bass grew at an average rate for northern Indiana natural lakes while fish in older age groups grew at a below average rate. Electrofishing yielded a catch of 154 bass per hour. No bass were collected during gill netting and only one was collected during trap netting. Largemouth bass collections in previous surveys of Brokesha Lake have always been low as they were ranked only the fifth most abundant species by number in 1967 and the sixth most abundant in both 1977 and 1982. The highest number of bass collected during these surveys was 29 fish and the average was 24. Prior to this survey, only five bass measuring 14 in TL or larger were collected in all surveys cumulatively.

Redear ranked third numerically (19%) and by weight (22%) in this survey. They ranged in length from 2.1 (age 1) to 9.1 (age 6) in TL and averaged 6.4 in TL. In total, 67 redear weighing approximately 16.5 pounds were collected. Redear measuring 6.0 in TL or larger, considered harvestable size, comprised 70% of the sample. Redear reached this size during their third year of life. Age-1 redear grew at an average rate for northern Indiana natural lakes while older fish grew at an above average rate. During electrofishing redear were collected at a rate of 42 fish per hour while 23 per lift were collected during trap netting. There were no redear collected in gill nets. Redear was the third most common species collected numerically in the 1967 and 1982 surveys and ranked fifth by number in 1977. Approximately 40% of the redear

collected in 1967 were harvestable size. This number climbed to approximately 60% in both the 1977 and 1982 surveys.

In addition to the sport species mentioned above, 14 yellow perch weighing 5.4 pounds were collected during the current survey. The largest of these perch measured 10.2 in TL. Yellow perch were the top species numerically collected in 1967 when 139 were captured. Their presence in the sample declined to one fish in 1977 and 10 in 1982.

DISCUSSION

Brokesha Lake's sport fish population is dominated by bluegills, largemouth bass and redear. Approximately 88% of the fish sample was comprised of these three species numerically and they represented 65% of the sample by weight. Bluegills and redear present the greatest opportunities for anglers. The only other sport species collected was yellow perch which were present in limited numbers.

Bluegills grew at an average to above average rate for northern Indiana natural lakes. The percentage of harvestable size bluegills present in the current sample was lower than what was collected in 1982, however more total fish in this size range were collected in the current survey compared to 1982 (48 and 59 bluegill respectively). In addition, 15 bluegills measuring 8 in TL or larger were collected in 2007 while none were captured in 1982. The bluegill fishery in Brokesha Lake should continue to supply anglers with good fishing opportunities.

Largemouth bass abundance in Brokesha Lake appears to have improved but the scarcity of legal size bass probably does not make this fishery very desirable for bass anglers. Bass that were age-1 and age-2 grew at an average rate for northern Indiana natural lakes while fish in older age groups grew at a below average rate. This type of situation typically results in small numbers of harvestable size bass being present in a lake. Solutions to this problem generally involve increasing the bag limit in conjunction with a decrease or removal of the size limit. This promotes anglers keeping more bass which thins the population and increases growth. However, in the case of Brokesha Lake this approach may not yield the desired results. Historically, bass collections at Brokesha Lake have been small with fish exhibiting below average to average growth. The first two surveys of Brokesha Lake included the use of A.C. electrofishing, which generally is not as productive as using D.C. power. This may have contributed to the smaller bass samples in those surveys, despite the effort being twice that of the 1982 and 2007 surveys.

It does not, however, explain the average to slow growth of the bass. The latter two surveys used D.C. electrofishing, as it became available to Indiana DFW biologists in the early 1980's. Population size appears to be a minimal factor in the presence or absence of legal size bass in the fishery.

Redear provide additional fishing opportunities for anglers at Brokesha Lake. With over 70% of the redear collected measuring 6 in TL or larger (harvestable size) this species should be attractive to anglers. All ages of redear, with the exception of age-1 fish, grew at an above average rate for northern Indiana natural lakes which should help insure good recruitment of harvestable size fish in the future.

The abundance of native aquatic vegetation in Brokesha Lake is relatively low and poses no threat to interfere with angling activities. Although two species of exotic invasive submersed plants were present, neither was posing any problems at the time of this survey. Residents have contracted chemical applicators to control the invasives and this is apparently doing an effective job in preventing over abundance or spreading of these plants.

The water quality at Brokesha Lake is considered good. No fish diseases or parasites were observed during the survey. Shoreline erosion was minimal.

RECOMMENDATIONS

- The DFW should encourage the lake residents to continue controlling Eurasian watermilfoil and curly-leaf pondweed. No fish management is needed at this time.

LITERATURE CITED

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

DeVries, D. R. and R.V. Frie. 1996. Determination of Age and Growth. Pages 483-512 *in* B. R. Murphy and D. W. Willis, editors. *Fisheries techniques*, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Submitted by: Larry A. Koza, Assistant Fisheries Biologist
Date: 1/28/08

Approved by: Stuart Shipman
North Region Fisheries Supervisor
Date: 2/15/08

Table 1. Sampling effort, species composition and relative abundance of fish collected during the 1967, 1977, 1982 and 2007 fisheries surveys of Brokesha Lake.

Species	1967	1977	1982	2007
Black crappie		3	4	
Bluegill	155	79	76	161
Bowfin		3		
Brown bullhead	1	2	19	1
Golden shiner		1	2	
Green sunfish	13	8	4	
Lake chubsucker	10	47	32	
Largemouth bass	26	17	29	79
Pumpkinseed	5	8	10	
Redear	42	20	59	67
Redfin pickerel	10	2	1	1
Spottail shiner				4
Warmouth	34	21	36	17
Yellow bullhead	2	34	94	6
Yellow perch	139	1	10	14
Total	437	246	376	350
Sampling Effort				
Electrofishing Effort	1.0 h AC	1.0 h AC	0.5 h DC	0.5 h DC
Gill Net Effort	4 lifts	8 lifts	6 lifts	2 lifts
Trap Net Effort	20 lifts*	0 lifts	3 lifts	2 lifts

Table 2. Relative abundance by select size ranges for bluegills and largemouth bass collected during the 1967, 1977, 1982 and 2007 fisheries surveys of Brokesha Lake.

Species	Length Range (TL)	1967	1977	1982	2007
Bluegill	3.0-5.5 in	80	41	24	66
	6.0-6.5 in	8	18	22	12
	7.0-7.5 in	4	13	26	32
	≥ 8.0 in	1	1	0	15
Largemouth bass	8.0-9.5 in	6	6	11	21
	10.0-11.5 in	14	1	3	12
	12.0-13.5 in	0	0	2	0
	14.0-17.5 in	0	0	5	0
	≥ 18.0 in	0	0	0	2



▲ Trap Net

●—● Gill Net

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

APPENDIX 1. Survey data pages

LAKE SURVEY REPORT

Type of Survey	<input type="checkbox"/> Initial Survey	<input checked="" type="checkbox"/> Re-Survey
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Lake Name Brokesha Lake	County Lagrange	Date of survey (Month, day, year) June 14-15, 2007
Biologist's name Neil D. Ledet and Larry A. Koza		Date of approval (Month, day, year)

LOCATION		
Quadrangle Name Middlebury	Range 8E	Section 19
Township Name 38N	Nearest Town Middlebury	

ACCESSIBILITY					
State owned public access site		Privately owned public access site		Other access site County owned on Stone Lake	
Surface acres 36	Maximum depth 20 Feet	Average depth 10 Feet	Acre feet 360	Water level 818.6	Extreme fluctuations None
Location of benchmark 1/2 mile north and 1 mile east at county road junction.					

INLETS		
Name Unnamed	Location South	Origin Goose pond
Unnamed	North into Stone Lake	

OUTLETS																
Name Unnamed	Location North into Stone Lake															
Water level control Variable crest dam at outlet of Stone Lake																
POOL	ELEVATION (Feet MSL)	ACRES														
TOP OF DAM																
TOP OF FLOOD CONTROL POOL																
TOP OF CONSERVATION POOL																
TOP OF MINIMUM POOL																
STREAMBED																
<table border="1"> <thead> <tr> <th colspan="2">Bottom type</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/></td> <td>Boulder</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Gravel</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Sand</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Muck</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Clay</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Marl</td> </tr> </tbody> </table>			Bottom type		<input type="checkbox"/>	Boulder	<input type="checkbox"/>	Gravel	<input checked="" type="checkbox"/>	Sand	<input type="checkbox"/>	Muck	<input type="checkbox"/>	Clay	<input checked="" type="checkbox"/>	Marl
Bottom type																
<input type="checkbox"/>	Boulder															
<input type="checkbox"/>	Gravel															
<input checked="" type="checkbox"/>	Sand															
<input type="checkbox"/>	Muck															
<input type="checkbox"/>	Clay															
<input checked="" type="checkbox"/>	Marl															

Watershed use General farming
Development of shoreline Less than 5% developed residentially

Previous surveys and investigations U.S.G.S. Hydrographic Survey 1960. IDNR Fisheries Surveys: Hudson, 1967; Peterson, 1977; Ledet, 1982.

SAMPLING EFFORT					
ELECTROFISHING	Day hours		Night hours		Total hours
			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		2		2
ROTENONE	Gallons	ppm	Acre Feet Treated	SHORELINE SEINING	Number of 100 Foot Seine Hauls

PHYSICAL AND CHEMICAL CHARACTERISTICS			
Color		Turbidity	
Blue green		9 Feet 0 Inches (SECCHI DISK)	
Alkalinity (ppm)*		pH	
Surface: 154.4 Bottom: 171.6		Surface: 9.2 Bottom: 9.2	
Conductivity: 310 micromhos		Air temperature: °F	
Water chemistry GPS coordinates: N 41.73888 W 85.65513			

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	77.0	100.3	36			72		
2	76.2	10.3	38			74		
4	75.7	10.3	40			76		
6	75.2	10.2	42			78		
8	74.1	10.1	44			80		
10	70.9	13.3	46			82		
12	65.4	16.6	48			84		
14	59.9	16.8	50			86		
16	56.7	10.1	52			88		
18	54.9	0.9	54			90		
20	53.9	0.1	56			92		
22			58			94		
24			60			96		
26			62			98		
28			64			100		
30			66					
32			68					
34			70					

COMMENTS

*ppm-parts per million

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF BLUEGILL

TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH	TOTAL LENGTH (inches)	NUMBER COLLECTED	PERCENT OF FISH COLLECTED	AVERAGE WEIGHT (pounds)	AGE OF FISH
1.0	1	0.6	0.01	1	19.0				
1.5	1	0.6	0.01	1	19.5				
2.0	11	6.8	0.01	1	20.0				
2.5	23	14.3	0.01	1,2	20.5				
3.0	26	16.1	0.02	2	21.0				
3.5	19	11.8	0.04	2	21.5				
4.0	17	10.6	0.05	2,3	22.0				
4.5	4	2.5	0.07	3	22.5				
5.0					23.0				
5.5					23.5				
6.0	6	3.7	0.17	3,4	24.0				
6.5	6	3.7	0.22	3,4	24.5				
7.0	6	3.7	0.29	4	25.0				
7.5	26	16.1	0.34	4,5	25.5				
8.0	11	6.8	0.42	4,5,6	26.0				
8.5	3	1.9	0.47	6	TOTAL	161			
9.0									
9.5									
10.0									
10.5	1	0.6	0.89	7					
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	208/hr	GILL NET CATCH	10/lift	TRAP NET CATCH	19/lift
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AGE-LENGTH KEY FOR BLUEGILL

LENGTH GROUP (inches)	NUMBER COLLECTED	NUMBER AGED	AGE											
			1	2	3	4	5	6	7	8	9	10	11	12
1.0	1	1	1											
1.5	1	1	1											
2.0	11	1	11											
2.5	23	5	18	5										
3.0	26	5		26										
3.5	19	6		19										
4.0	17	6		14	3									
4.5	4	1			4									
5.0														
5.5														
6.0	6	4			4	2								
6.5	6	3			2	4								
7.0	6	4				6								
7.5	26	4				19	7							
8.0	11	3				3	4	4						
8.5	3	2						3						
9.0														
9.5														
10.0														
10.5	1	1							1					
Total	161	47	31	64	13	34	11	7	1					
Mean TL			2.5	3.6	5.5	7.5	7.9	8.5	10.8					
SE			0.05	0.06	0.27	0.08	0.08	0.10						

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	1	1.3	3.94	9
2.0					20.0				
2.5					20.5				
3.0					21.0				
3.5	7	8.9	0.02	1	21.5				
4.0	7	8.9	0.04	1	22.0				
4.5	8	10.1	0.05	1	22.5				
5.0	3	3.8	0.07	1	23.0				
5.5	1	1.3	0.09	1	23.5				
6.0	3	3.8	0.11	1	24.0				
6.5	1	1.3	0.15	2	24.5				
7.0	6	7.6	0.18	2	25.0				
7.5	8	10.1	0.21	2	25.5				
8.0	4	5.1	0.27	2,3	26.0				
8.5	5	6.3	0.33	3,4	TOTAL	79			
9.0	8	10.1	0.39	3,4					
9.5	4	5.1	0.45	4					
10.0	6	7.6	0.53	4,5,6					
10.5	3	3.8	0.57	5					
11.0	2	2.5	0.68	5,6					
11.5	1	1.3	0.79	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	1	1.3	3.00	8					
18.5									

ELECTROFISHING CATCH	154/hr	GILL NET CATCH	0/lift	TRAP NET CATCH	1/lift
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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	12
1.0														
1.5														
2.0														
2.5														
3.0														
3.5	7	7	7											
4.0	7	5	7											
4.5	8	7	8											
5.0	3	3	3											
5.5	1	1	1											
6.0	3	3		3										
6.5	1	1		1										
7.0	6	5		6										
7.5	8	7		8										
8.0	4	4		1	3									
8.5	5	5			4	1								
9.0	8	7			5	3								
9.5	4	4				4								
10.0	6	5				4	1	1						
10.5	3	1					3							
11.0	2	2					1	1						
11.5	1	1					1							
18.0	1	1								1				
18.5														
19.0														
19.5	1	1									1			
Total	79	70	26	19	12	12	6	2		1	1			
Mean TL			4.4	7.3	8.8	9.7	10.9	10.7		18.3	19.8			
SE			0.11	0.13	0.12	0.14	0.21	0.45						

NUMBER, PERCENTAGE, WEIGHT, AND AGE OF REDEAR

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	4	6.0	0.01	1	20.0				
2.5					20.5				
3.0					21.0				
3.5	1	1.5	0.04	2	21.5				
4.0					22.0				
4.5	4	6.0	0.08	2	22.5				
5.0	3	4.5	0.10	2	23.0				
5.5	8	11.9	0.14	2,3	23.5				
6.0	8	11.9	0.18	3	24.0				
6.5	4	6.0	0.22	3	24.5				
7.0	15	22.4	0.28	3,4	25.0				
7.5	8	11.9	0.34	4,5	25.5				
8.0	6	9.0	0.41	4,5	26.0				
8.5	4	6.0	0.48	5,6	TOTAL	67			
9.0	2	3.0	0.55	6					
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	42/hr	GILL NET CATCH	0/lift	TRAP NET CATCH	23/lift
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AGE-LENGTH KEY FOR REDEAR

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	4	4	4											
2.5														
3.0														
3.5	1	1		1										
4.0														
4.5	4	2		4										
5.0	3	3		3										
5.5	8	3		3	5									
6.0	8	4			8									
6.5	4	3			4									
7.0	15	5			3	12								
7.5	8	5				6	2							
8.0	6	3				4	2							
8.5	4	3					3	1						
9.0	2	2						2						
Total	67	38	4	11	20	22	7	3						
Mean TL			2.3	5.0	6.4	7.6	8.3	9.1						
SE			0.00	0.20	0.11	0.08	0.18	0.16						

Bluegill	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE								
				I	II	III	IV	V	VI	VII	VIII	
Intercept = 0.8	2006	6	2.3-3.0	2.1								
	2005	16	2.6-4.4	1.5	2.7							
	2004	6	4.2-6.5	1.4	2.5	4.4						
	2003	11	6.1-8.1	1.5	2.6	4.5	6.7					
	2002	2*	7.9-8.2	2.0	3.4	5.6	7.2	7.9				
	2001	3	8.1-8.6	2.1	3.7	5.1	6.7	7.8	8.3			
	AVERAGE LENGTH			1.6	2.7	4.6	6.7	7.8	8.3			
	NUMBER AGED			44	38	22	16	5	3			

Species Redear	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE								
				I	II	III	IV	V	VI	VII	VIII	
Intercept = 0.6	2006	4	2.1-2.4	1.6								
	2005	7	3.9-5.6	1.6	4.0							
	2004	10	5.5-7.0	1.5	3.2	5.5						
	2003	10	7.1-8.2	1.5	2.8	5.0	7.1					
	2002	4	7.9-8.7	1.4	3.0	5.1	6.9	8.1				
	2001	3	8.9-9.1	1.6	2.7	4.3	6.4	7.8	8.7			
	AVERAGE LENGTH			1.5	3.2	5.1	7.0	8.0	8.7			
	NUMBER AGED			38	34	27	17	7	3			

Species Largemouth bass	YEAR CLASS	NUMBER OF FISH AGED	SIZE RANGE	BACK CALCULATED LENGTH (inches) AT EACH AGE								
				I	II	III	IV	V	VI	VII	VIII	
Intercept = 0.8	2006	23	3.5-5.7	3.3								
	2005	17	6.1-8.1	3.2	6.4							
	2004	11	8.2-9.4	2.8	6.2	8.1						
	2003	12	8.9-10.3	2.6	5.9	7.8	9.1					
	2002	3	10.5-11.7	2.5	6.0	8.6	9.7	10.7				
	2001	2*	10.4-11.1	2.7	5.0	6.9	8.3	9.7	10.6			
	AVERAGE LENGTH			3.0	6.2	8.0	9.2	10.7				
	NUMBER AGED			68	45	28	17	5	2			

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

*Not included in average length calculations.

GPS SAMPLING COORDINATES

GILL NETS				TRAP NETS				ELECTROFISHING			
1	N	41.74032	W 85.65533	1	N	41.73833	W 85.65331	1	N		W
	N		W	2	N	41.73883	W 85.65327		N		W
2	N	41.73750	W 85.65487	3	N		W	2	N		W
	N		W	4	N		W		N		W
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

Occurrence and Abundance of Submersed Aquatic Plants

Lake: Brokesha Lake	Secchi(ft): 12.0	SE Mean species / site: 0.19
Date: 8/8/2007	Littoral sites with plants: 24	Mean natives / site: 1.37
Littoral Depth (ft): 14.0	Number of species: 7	SE Mean natives / site: 0.18
Littoral Sites: 25	Maximum species / site: 4	Species diversity: 0.75
Total Sites: 30	Mean species / site: 1.43	Native diversity: 0.72

Species	Frequency of	Score Frequency				Dominance
	Occurrence	0	1	3	5	
Brittle naiad	50.0	50.0	26.7	13.3	10.0	23.3
Chara	43.3	56.7	3.3	13.3	26.7	35.3
Sago pondweed	23.3	76.7	23.3	0.0	0.0	4.7
Variable pondweed	13.3	86.7	10.0	0.0	3.3	5.3
Slender naiad	6.7	93.3	6.7	0.0	0.0	1.3
Curly-leaf pondweed	3.3	96.7	3.3	0.0	0.0	0.7
Eurasian watermilfoil	3.3	96.7	0.0	3.3	0.0	2.0

Other species noted: Large-leaf pondweed

Emergent species noted: Arrowhead, cattail, pickerelweed, soft rush, spatterdock, white waterlily